

A CONTRIBUTION TO
THE HERPETOLOGY
OF WEST PAKISTAN

SHERMAN A. MINTON, JR.

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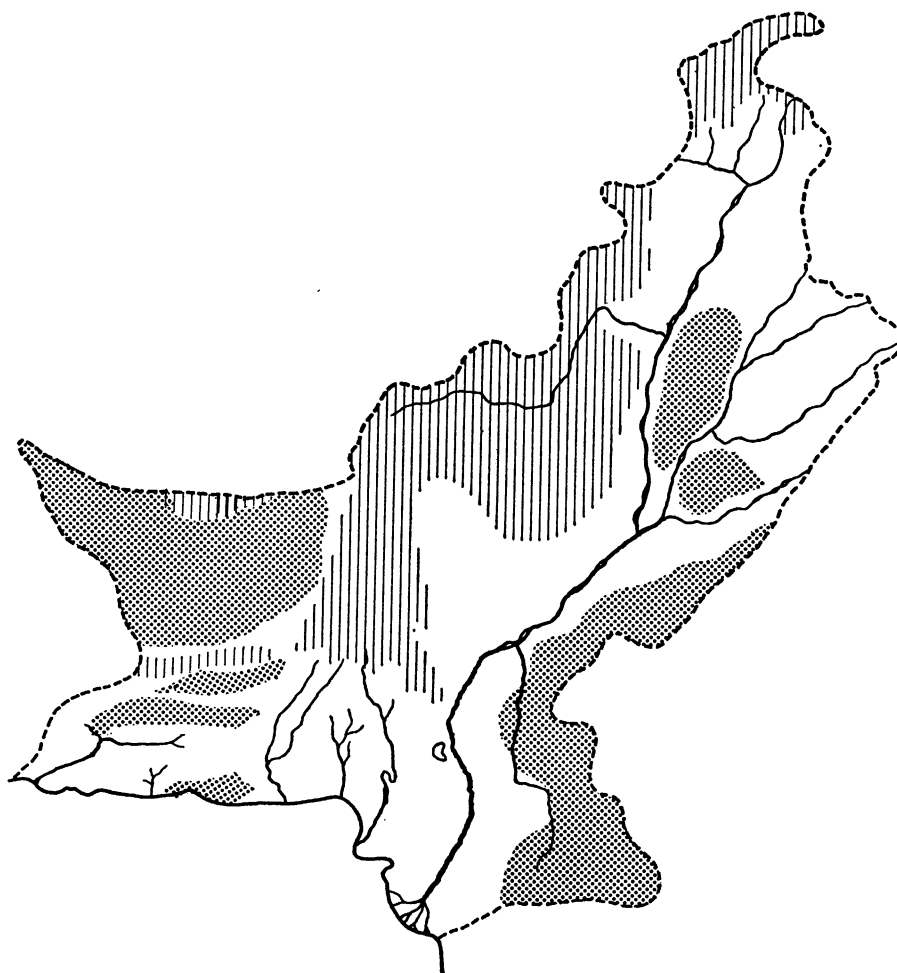
INTRODUCTION

THE PRESENT PAPER is a report on a collection of approximately 1500 amphibians and reptiles from West Pakistan and an account of natural history observations made on the herpetofauna during a period of about four years. A definitive herpetology of the province must await more complete zoological exploration and the examination of larger and more representative collections.

West Pakistan has an area of 310,236 square miles. It extends in a north-south direction from latitude $37^{\circ} 20' N.$ to latitude $23^{\circ} 45' N.$ and in an east-west direction from longitude $75^{\circ} 20' E.$ to longitude $61^{\circ} E.$ The

western part of the country, comprising the eastern section of the Iranian Plateau, is arid and mountainous. Along the northeast border are the Hindu Kush and Karakoram ranges, representing the western end of the Himalayan massif. From this highland flow the Indus and its major tributaries in widening valleys that become increasingly arid to the south. East of the lower Indus and Sutlej valleys lies the Thar or Indian Desert.

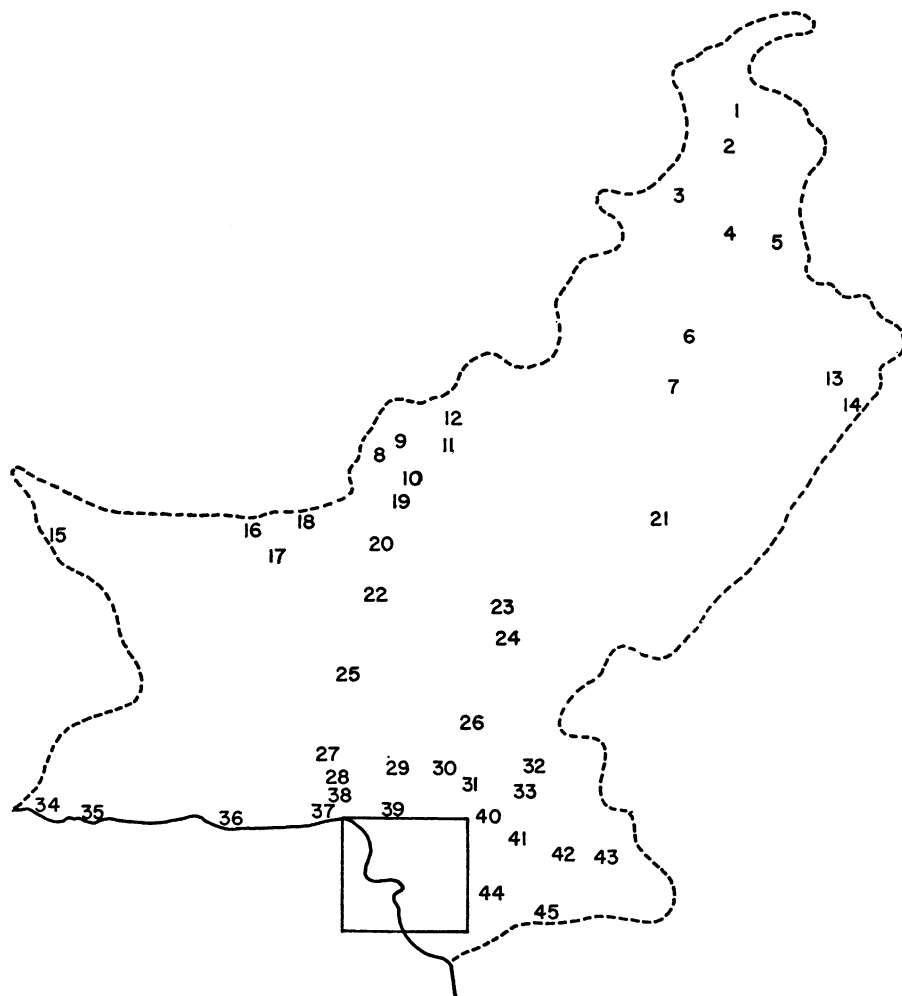
The over-all climate is arid subtropical, but there is considerable variation with altitude and latitude. Moist alpine to subalpine conditions obtain in the higher mountains, while



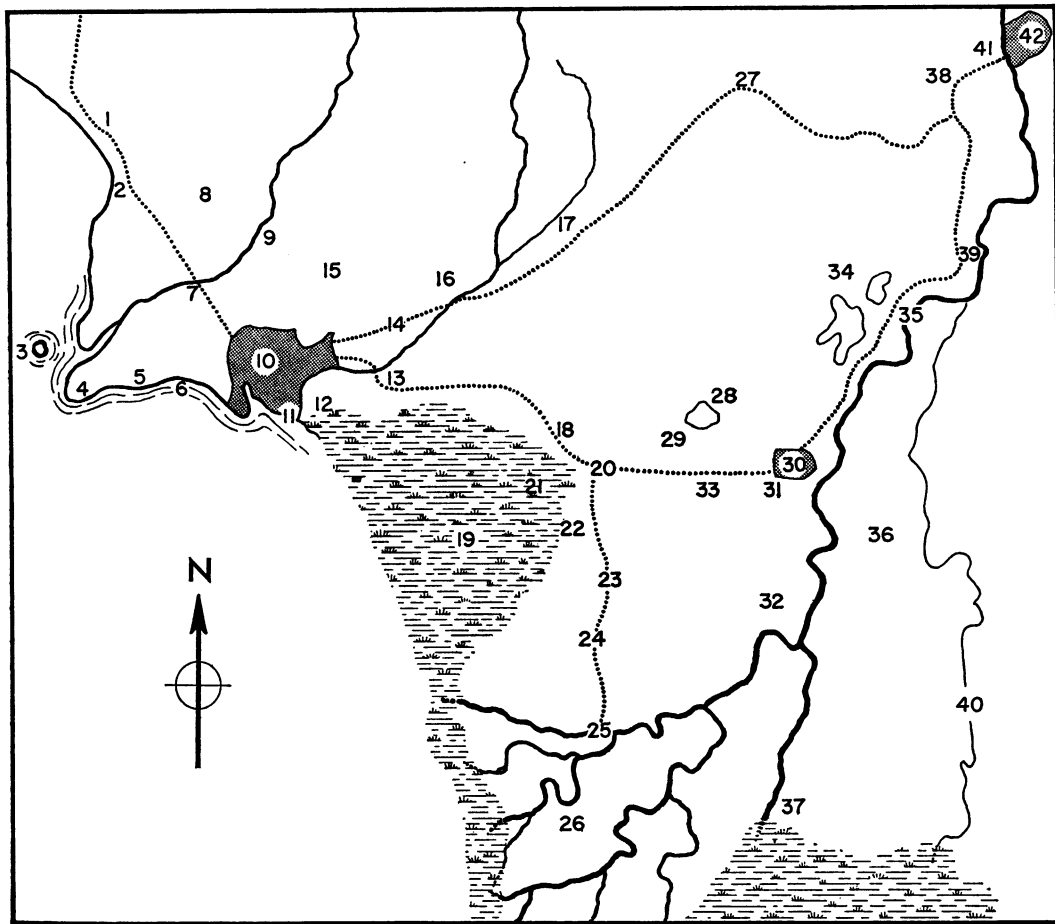
MAP. 1. West Pakistan, showing major rivers, principal regions of high land above 4000 feet (vertical lines), and major regions of sandy desert (stippled).

summer temperatures in excess of 120° F. are regularly experienced in some of the low desert valleys. The southeastern part of the prov-

ince receives most of its rainfall during the southwest monsoon which normally extends from about the first of July through the first



MAP 2. West Pakistan collecting sites and localities from whence specimens were obtained exclusive of localities in the Karachi area (enclosed by rectangle) shown on map 5. 1, Madyan and Liakot; 2, Saidu Sherif and Udigram; 3, Peshawar; 4, Campbellpore and Basal; 5, Rawalpindi, Taxila, and Dina; 6, Mianwali; 7, Fatehpur; 8, Quetta and Baleli; 9, Pishin and Khanozai; 10, Kolpur and Mach; 11, Kach, Kowas, and Ziarat; 12, Hindubagh; 13, Sheikhpura; 14, Lahore and Raiwind; 15, Mirjawa and Koh-i-Taftan; 16, Chagai; 17, Kharan; 18, Nushki, Aman Bostan, and Ahmad Wal; 19, Mastung; 20, Kalat; 21, Muzaffargarh; 22, Baghbana; 23, Jacobabad; 24, Larkana, Dokri, and Mohenjo-daro; 25, Wad; 26, Moro and Naushahro Firoz; 27, Gandrani Caves, Kud River; 28, Bela; 29, Diwana; 30, Manchar Lake, Sehwan, and Tirth Lakhi; 31, Amri and Sakrand; 32, Jamrao Head; 33, Sanghar and Burra; 34, Jiواني; 35, Gwadar; 36, Ormara and Kalamat Bay; 37, Miani Hor; 38, Uthal and Liari; 39, Hinidan Crossing; 40, Saidabad and Hala; 41, Tando Allahyar and Mirpur Khas; 42, Nabisar; 43, Noto; 44, Badin; 45, Rahim-ke-Bazaar.



MAP 3. The Karachi area, showing collecting sites as follows: 1, Naka Kharari and Sonmiani; 2, Sonmiani Beach; 3, Churma Island; 4, Cape Monze; 5, Buleji; 6, Hawke's Bay and Mauripur; 7, Hab Chowki; 8, Pab Hills; 9, Bund Murad Khan; 10, Karachi; 11, Clifton and Ghizri; 12, Korangi and Korangi Creek; 13, Landhi and Malir; 14, Malir Cantonment; 15, Mangho Pir; 16, Damlhoti and Darsano Chano; 17, Khadeji Falls and Sari Nai Canyon; 18, Dabeji; 19, Kuba Bunder; 20, Gharo; 21, Bahmbore archeological site; 22, Malik Raj; 23, Mirpur Sakro; 24, Bhuro; 25, Garho; 26, Ghorabari; 27, Thano Bula Khan; 28, Jungshahi; 29, Haleji Lake; 30, Tatta; 31, Kalankot and Makli Hill; 32, Pir Patho; 33, Tharro Hill and Gujjo; 34, Jampir; 35, Sonda; 36, Sujawal; 37, Shah Bunder; 38, Bholari; 39, Jerruck; 40, Jati; 41, Kotri; 42, Hyderabad. Dotted lines indicate principal roads.

half of September. Most of the rainfall in the northwest comes during the late winter and spring.

My observations on the herpetofauna of West Pakistan were made between June 23, 1958, and October 5, 1962, a period during which I served as Visiting Professor of Microbiology at the Postgraduate Medical Center, Karachi, and during August, 1965, when I collected in northern Baluchistan as a

member of an expedition sponsored by the American Museum of Natural History and the University of Washington. Field work was done on weekends, during vacation periods, and incidental to travel for other purposes. Travel was almost exclusively by automobile (mostly by Jeep), and a total of 43,823 miles were logged. Good all-weather roads are lacking over much of West Pakistan; a great deal of the mountain and desert country is

almost inaccessible. Excessive heat, scarcity of drinking water, dust storms, and the general roughness of the terrain often made field work difficult. The more accessible areas were visited at all seasons in order to sample the fauna under different weather conditions, but this could only be done at a few sites. In general, the best season for collecting snakes and lizards is soon after the rains; unfortunately the rains also play havoc with secondary roads.

Most of my collecting was done around the city of Karachi, in Tatta District which includes the western part of the Indus delta, and in the eastern part of Las Bela District, an arid hilly region west of Karachi. Lesser but significant collecting efforts were made in Hyderabad District which includes the lower Indus and eastern delta, Sanghar District situated on the west edge of the Thar Desert, and Dadu District which lies west of the Indus and includes Manchar Lake and the eastern part of the Kirthar Range. Two collecting trips were made to northern Baluchistan and one to Swat in the foothills of the Himalayas. Collecting sites are shown on maps 2 and 3.

For terrestrial species, collecting techniques were similar to those used in the arid southwestern United States. Road cruising at night in an automobile was usually less effective than in the United States; better results were generally obtained by searching on foot by the light of Coleman or Petromax lanterns. Diurnal species were most frequently taken between dawn and mid-morning or shortly before sunset. Only in winter or at high altitudes were reptiles likely to be seen at midday. Shooting was the most effective means of obtaining diurnal lizards. The "track and dig" technique favored by local snake catchers is productive if the collector's stamina is equal to a brisk work-out with shovel and mattock under a desert sun.

Whenever possible, small series rather than single specimens were obtained from an area. The difficulty in keeping animals alive during the hours of intense heat and the limited amount of preservative that could be carried made it unwise to try to collect large series of the more common species. Specimens found dead on roads and trails were preserved if in reasonably good condition, but this source was not very rich in material. Numerous

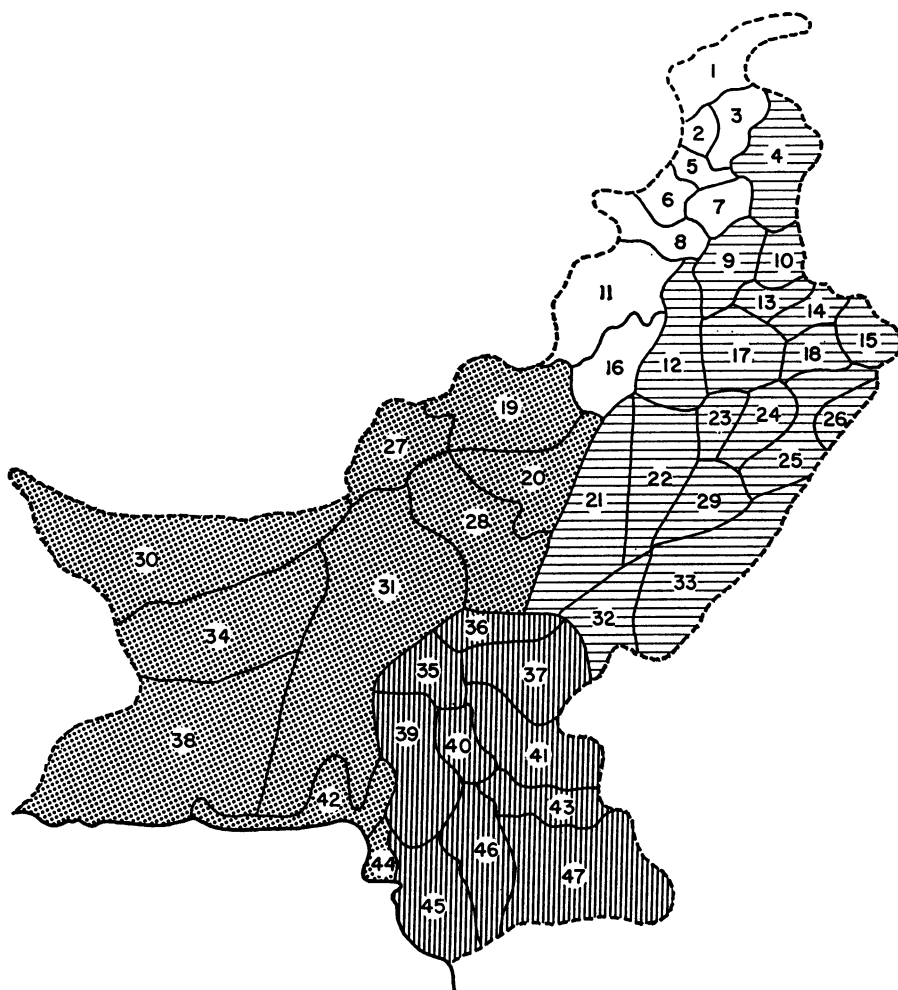
reptile species were maintained in captivity for periods up to three years to permit observations on feeding and behavior, deposition of eggs or birth of young, and the taking of photographs. Most of these captives were preserved; some were given to zoos or interested individuals. Many of the reptiles and amphibians encountered in the field were merely observed and allowed to go their way.

During the first two years in Pakistan, I bought very few specimens from snake charmers and other professional collectors; from late 1960 onward, I obtained numerous specimens in this manner. There is no gainsaying the fact that some of the Jogis, members of the snake-hunting and snake-charming tribes, are excellent collectors. They have a good practical knowledge of reptile habitats and habits and will spend many man hours in the field, living under conditions that most westerners would find intolerable. The more intelligent and trustworthy Jogis probably provide reliable data with their specimens most of the time; however, I found none of them wholly dependable. Similarly, their accounts of the behavior and habits of reptiles must be accepted with caution. Although many Jogis are keen observers, their reports are apt to be clouded by superstition, lack of knowledge, uncritical interpretations, or the simple desire to tell a good story. The assistance of native fishermen was sought occasionally to obtain marine and other strictly aquatic reptiles.

In giving localities for specimens, I have referred them to the nearest village or town having a postoffice, railroad station, or military post, or occasionally to topographic features (lakes, passes, and so on) readily found on standard maps. I have also given the district or other political subdivision with each locality. I have arbitrarily used these subdivisions as they existed on January 1, 1958, and have not attempted to keep pace with more recent realignments, since there is no assurance that any high degree of stability has been reached. I use the term "Karachi District" to refer to the former Federal District which, in 1958, extended in an approximate 20-mile perimeter outward from the city. Although Sind and Baluchistan no longer exist as political units, they have been ethnic and, to some extent, biogeographic

entities for centuries, and I continue to refer to them without qualification. The main political subdivisions are shown on map 4. Since there seem to be no widely accepted rules for the transliteration of Sindhi and

Baluchi place names from the Arabic alphabet to English, I have been arbitrary in this matter. In most cases, however, I have used the spelling of the Official West Pakistan Highway Map (1958, second edition).



MAP 4. West Pakistan political subdivisions (1958). The former Baluchistan states are designated by stippling. Sind is shown by vertical shading; the Pakistan Punjab, by horizontal shading; and the Northwest Frontier Provinces are unshaded. The districts are numbered as follows: 1, Chitral; 2, Dir; 3, Swat; 4, Hazara; 5, Mardan; 6, Kohat; 7, Peshawar; 8, Bannu; 9, Campbellpore; 10, Rawalpindi; 11, Waziristan; 12, Mianwali; 13, Jehlum; 14, Gujrat; 15, Sialkot; 16, Dera Ishmael Khan; 17, Shahpur; 18, Gujranwala; 19, Zhob; 20, Loralai; 21, Dera Ghazi Khan; 22, Muzaffargarh; 23, Jhang; 24, Lyallpur; 25, Montgomery; 26, Lahore; 27, Quetta; 28, Sibi; 29, Multan; 30, Chagai; 31, Kalat; 32, Rahimyar Khan; 33, Bahawalpur; 34, Kharan; 35, Larkana; 36, Jacobabad; 37, Sukkur; 38, Mekran; 39, Dadu; 40, Nawabshah; 41, Khairpur; 42, Las Bela; 43, Sanghar; 44, Karachi (Federal District); 45, Tatta; 46, Hyderabad; 47, Thar Parkar.

AFFINITIES AND DISTRIBUTION OF THE WEST PAKISTAN HERPETOFAUNA

WEST PAKISTAN LIES at the junction of two major faunal regions, the Palearctic and the Oriental. According to Darlington (1957, pp. 436-437): "The dry country of north-western India and beyond is 'debatable land' . . . with an impoverished fauna in which transitions occur both from east to west and from south to north. Where regional boundaries are drawn here is perhaps not very important." Reduction of the amphibian fauna is marked, with no more than a dozen species present even if some dubious and speculative records are admitted. Unless *Microhyla* occurs in the eastern part of the province, all West Pakistan amphibians belong to the large, cosmopolitan genera, *Bufo* and *Rana*. Three of the ranids, *R. cyanophlyctis*, *R. limnocharis*, and *R. tigerina*, are wide-ranging southeast Asian species. *Rana breviceps* and probably *R. strachani* are toad-like burrowing ranids confined to drier parts of the Indian subcontinent. *Rana sternosignata* belongs to a complex of central Asian montane ranids. Unless old records of *Bufo melanostictus* are accepted, all the bufonids are of Palearctic affinities.

The fresh-water turtle fauna, also impoverished, is entirely Oriental at both the genus and species level except for one representative of the cosmopolitan genus *Trionyx*. The tropicopolitan land tortoise genus *Testudo* is represented by one species entering from the northwest and another just reaching West Pakistan from peninsular India.

The crocodilians are represented by the monotypic Indian genus (and family) *Gavialis* and one species of the tropicopolitan genus *Crocodylus*.

The snake and lizard fauna of West Pakistan is relatively rich, with 13 families and 58 genera represented by conservative reckoning. If one is less critical in admitting published records, these numbers can be increased to 14 families and 68 genera. There are at least 130 species.

The West Pakistan geckos, with 10 or 11 genera and 25 to 28 species, belong predominantly to the Afro-Asian desert. Six genera are wholly confined to this region. In the

genus *Hemidactylus*, four of the seven species belong to the Oriental Region, but at least one of these has been introduced into West Pakistan by man. *Teratolepis* may be Oriental, if records for Assam and the Deccan are valid; otherwise it is endemic to the lower Indus Valley.

A similar picture is seen among the agamids. *Agama*, with 11 species; *Phrynocephalus*, with five; and *Uromastix*, with two, are all characteristic of lands to the west or northwest. Only *Calotes*, with one widely distributed species, and *Sitana* which may enter the extreme southeast represent the Oriental agamid fauna. The lacertids, with three genera and 11 species, are all Afro-Asian desert forms. *Chamaeleo zeylanicus*, the sole Indian representative of an African family, just reaches West Pakistan from the southeast. The varanids are represented by one genus and three species, one with a wide distribution across North Africa and the Middle East, one with nearly as broad a distribution to the southeast, and one endemic to northern India.

The skinks provide a somewhat more complex distribution pattern. The tropicopolitan genus *Mabuya* provides two species from the Oriental Region and perhaps one from the west. The cosmopolitan genus *Eumeces*, the distribution of which is largely complementary to that of *Mabuya*, is represented by two species entering from the west or northwest. Additional western desert forms are *Ophiomorus*, with three species; *Chalcides*, with one; and perhaps *Scincus*, with one. *Scincella*, with two species, and *Riopa*, with one, barely enter West Pakistan from the Oriental Region. *Ablepharus*, with two species, is relict through much of the Old World tropics.

Four West Pakistan genera of colubrid snakes (*Sphalerosophis*, *Eirenis*, *Lytorhynchus*, and *Telescopus*) are almost wholly restricted to the Afro-Asian desert region. Eight exclusively Oriental colubrid genera are present, and three more may be added if certain old records are accepted. Two of the genera (*Xenochrophis* and *Amphiesma*) are closely allied to each other and to the genus

Natrix, of the North Temperate zone, which is itself represented by a species in Chitral. Another predominantly holarctic genus, *Coluber*, has one eastern and four western or northwestern representatives. *Psammophis* has one virtually endemic species, *P. leithi*, as well as one western, one northern, and one eastern representative.

In the other snake families, the typhlopids are represented by two species of Oriental distribution and the leptotyphlopids by one endemic and one Afro-Asian species. The boids include *Python* with one Oriental species and *Eryx* with two Oriental and one Palearctic. The elapids are represented by one species of the Oriental *Bungarus* and an Oriental species of the predominantly African genus *Naja*. The viperids include a monotypic endemic genus, *Eristicophis*, two Afro-Asian desert genera, *Pseudocerastes* and *Echis*, one Oriental and one northwestern representative of the predominantly Palearctic *Vipera*, and a Himalayan endemic species of the Americo-Asian genus *Agkistrodon*. All seven West Pakistan hydrophid genera occur in Oriental waters. No species of sea snake is restricted to the Arabian Sea, and only *Lapemis curtus*, *Hydrophis mamillaris*, and *H. lapemoides* seem to have ranges centering in these waters. A representative of the Oriental aquatic family Acrochordidae, *Chersydrus granulatus*, has been recorded from the coast of Sind, but the report badly needs substantiation.

In summing up, the amphibians of West Pakistan are few and derived almost equally from Palearctic and Oriental sources. The two crocodilians and nearly all the non-marine turtles belong to the Oriental fauna. The lizard fauna is strongly dominated by western or northwestern deserticolous elements. This component is also prominent in the terrestrial snake fauna, but more than half of the genera are exclusively or partly Oriental. West Pakistan is not a biogeographic entity and, strictly speaking, contains no endemic genera. *Teratolepis* and *Eristicophis*, however, approach endemism closely. The number of endemic and nearly endemic species is small. The low level of endemism is probably the result of the submergence of a great part of this area beneath the Tethys Sea during the Tertiary. The region is still one of geologic instability as was tragically demonstrated by

the great Quetta earthquake of 1935.

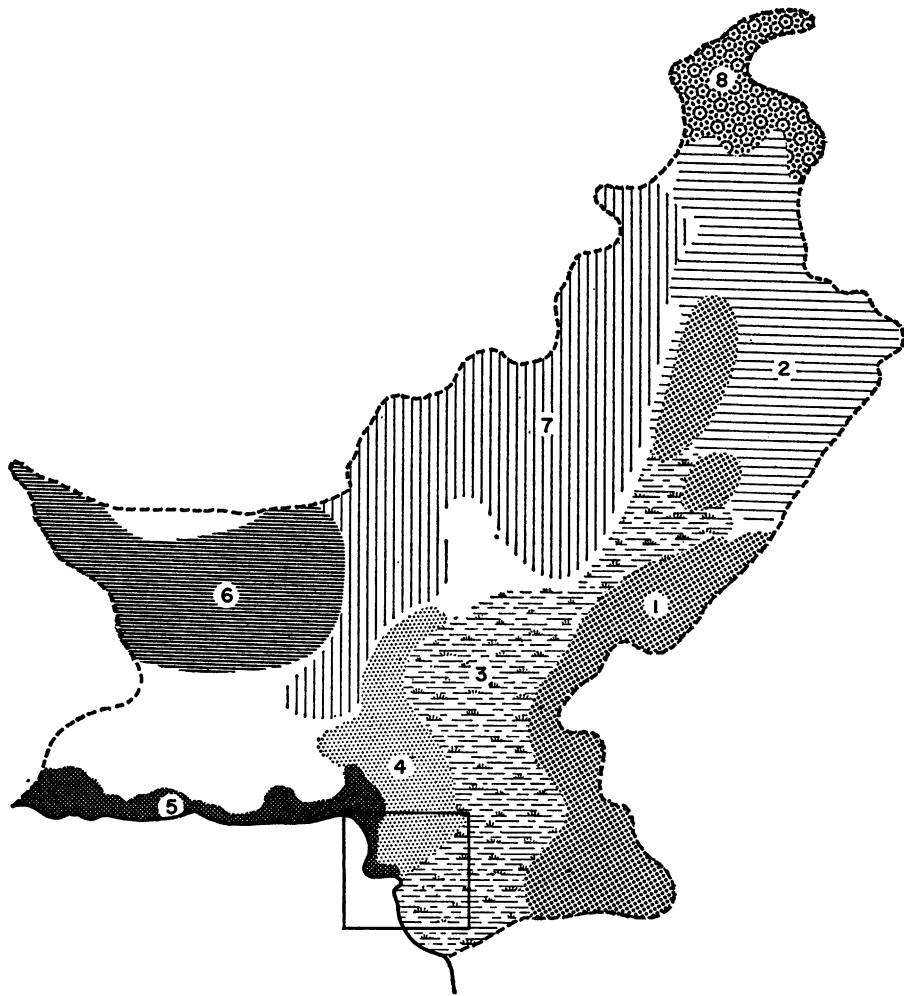
Genera common to West Pakistan and the continental United States are: *Bufo*, *Rana*, *Trionyx*, *Crocodylus*, *Hemidactylus* (introduced into the United States), *Eumeces*, *Leptotyphlops*, *Coluber*, *Natrix*, *Agkistrodon*, and perhaps *Elaphe*. There are no species in common except for *Hemidactylus turcicus* which has probably been introduced by man into both countries.

In the course of herpetological collecting in West Pakistan and in plotting distribution records, I find evidence for recognizing nine herpetofaunal divisions (map 5). These are characterized as follows:

THE THAR DESERT

Lying mostly east of the lower valleys of the Indus and Sutlej rivers, but including extensive areas between the Indus and Jhelum and between the lower Chenab and Sutlej, this is a plain of gently undulating sand hills sloping upward gradually to the northeast. Elevations generally are below 500 feet. In its northeast portion is the channel of a large, dry watercourse, the Ghaggar or Hakra. Farther southwest is the East Nara, a former channel of the Indus that now terminates blindly. To the south, the desert blends into a vast salt marsh, the Rann of Kutch. Rainfall averages 5 to 7 inches annually and is mostly concentrated during the monsoon. The southern part of the Thar is frost free; light winter frosts occur annually in the northern part. There is archeological evidence that the region was better watered as recently as the eighth century A.D., and flow in the Ghaggar did not cease until 1790. Vegetation is generally sparse, consisting of xerophilic and halophilic shrubs and grasses, but there are localized areas that support stands of lush grass and such shrubs as *Acacia*, *Prosopis*, *Zizyphus*, and *Caltropis*.

The herpetofauna is made up predominantly of wide-ranging desert forms, most of which reach the eastern limit of their range here. Distinctive are *Lytrohynchus paradoxus* and *Stenodactylus orientalis*. The unique feature of the herpetofauna is the presence of several species characteristic of north-central or peninsular India, here at the western or northern limit of their distribution. These include *Testudo elegans*, *Elaphe helenae*, *Cham-*



MAP 5. West Pakistan, showing herpetofaunal divisions described in the text; 1, Thar Desert; 2, upper Indus Basin; 3, lower Indus Valley; 4, Sind Desert; 5, Mekran coast; 6, Baluchistan Desert Basin; 7, Northwest Upland; 8, Himalayan Upland. Unshaded sections represent transitional areas or regions for which information is lacking. Rectangle encloses area shown on map 3.

aeleo zeylanicus, *Sitana ponticeriana*, and *Agama minor*. These species, and possibly some others, are considered relicts of more pluvial conditions in the recent past.

THE UPPER INDUS BASIN

This region includes most of the Pakistan Punjab and lies in the upper drainage of the Indus and its major tributaries: the Chenab, Sutlej, Jhelum, and Ravi. Although most of the region lies between 500 and 1500 feet in elevation, there is considerable diversity of

terrain from marshy riverine tracts to barren, rocky hills, the largest of which comprise the Salt Range. In the Punjab is most of the agriculturally productive land of West Pakistan. Patches of the original grassland and forest remain along the river valleys and in some of the hilly tracts. Although prolonged periods of below freezing temperature are not experienced, the winter is too cool to permit much reptile activity. Average annual rainfall varies from 13 to 18 inches; most comes during the monsoon, but there are regular light

winter rains. In addition to the major rivers of the area there are many smaller permanent streams, lakes, and ponds.

The herpetofauna consists of species characteristic of the north Indian plains and river valleys, with a considerable intermixture of western desert and arid mountain species, especially toward the northwest. The characteristic species are few and include *Cyrtodactylus montiumsalsorum*, *Varanus flavescens*, and *Riopa punctata*.

THE LOWER INDUS VALLEY

This region extends from the delta of the Indus north to the confluence of the Indus, Sutlej, and Jhelum rivers. Below this the river receives no significant tributaries, and a great deal of its water is diverted into irrigation systems, some of them centuries old. The area is essentially an enormous, elongated oasis. Nearly all the land lies below 200 feet in elevation, and the soil is predominantly clay and silt. Annual rainfall averages 7 to 13 inches and is concentrated within the monsoon period. Many shallow, seasonally fluctuating lakes and marshes, of which Manchar Lake is the largest, occur throughout the region. A long-term trend toward drier climate substantially abetted by human misuse of the land has created many tongues and islands of desert. The area is free from killing frosts. Munji grasses (*Saccharum* sp.) and tamarisk dominate the moist lowland, and a substantial gallery forest of *Acacia arabica* remains in places. Shrubs of the drier habitats include *Zizyphus*, *Prosopis*, *Capparis*, and *Salvadora*.

The herpetofauna includes plains, desert, and fresh-water species. *Enhydris pakistanica* is an endemic species. Others of which the West Pakistan range is wholly or almost wholly confined to this region are *Teratolepis fasciatus*, *Hemidactylus leschenaulti*, *Mabuya macularia*, *Eryx conicus*, *Python molurus*, *Coluber fasciolatus*, *Xenochrophis cerasogaster*, *Geoclemmys hamiltoni*, *Hardella thurgi*, and *Kachuga tectum*.

THE SIND DESERT

This rather poorly defined region includes the Kirthar Range and associated foothills, valleys, and plains exclusive of the coastal strip. Although the higher ridges exceed 2000

feet, the herpetologically significant part of the area lies below this elevation. The area is essentially frost free and intensely hot from April through October. Rainfall averages 6 to 8 inches annually. Most of it comes with the monsoon, but light winter rains fall during most years. There are several perennial streams, of which the Hab River is the largest, and many springs and water holes. The predominant rocks of the barren hills are limestones and sandstones. Characteristic plants are *Euphorbia caducifolia*, *Caltropis procerca*, *Capparis decidua*, *Cassia* sp., and *Grewia populifolia*. Tamarisk and oleander are seen around permanent water.

The herpetofauna is dominated by desert species, but Indian plains species are widely distributed along streams and on oases. Characteristic species are *Ptyodactylus homolepis*, *Tropicolotes helenae*, *Agama rubrigularis*, and *Rana breviceps*.

THE MEKLAN COAST

This is arbitrarily defined as the coastal strip below 1000 feet extending from the mouth of the Dasht River at the Iran-Pakistan border to the western edge of the Indus delta. Coastal dunes alternate with rocky cliffs. Its eastern end merges with the Sind Desert without a definite line of demarcation. Islands varying in size from a few hundred square yards to about 3 square miles lie at distances up to 16 miles off shore. The larger ones are sea-isolated peaks of the Baluchistan hills, while most of the smaller ones are flat and sandy. The Mekran coast is frost free. Rainfall is 5 to 9 inches annually, part coming with the monsoon and part, especially toward the west, coming during the winter. The aridity is partially alleviated by sea fogs. The mouths of several small rivers lie within the area, and there are scattered oases. There is little information on the vegetation of the western part of the region; toward the east it is much like that of the Sind Desert.

Characteristic species in the herpetofauna include *Chalcides ocellatus*, *Ophiomorus blanfordi*, *Acanthodactylus micropholis*, *Sphalerosphis arenarius*, and *Bufo olivaceus*. Relict populations of such Indian species as *Crocodylus palustris* and *Bungarus caeruleus* occur west to the mouth of the Dasht River.

THE BALUCHISTAN DESERT BASIN

This poorly explored area extends from the Siahan Range northeastward to the vicinity of Nushki and thence northward and westward into Afghanistan and Iran. There are great tracts of wind-blown sand interspersed with barren rocky hills; elevations are mostly between 500 and 3500 feet. Permanent water is represented by a few streams and desert marshes and widely spaced springs and water holes. Average annual rainfall is 2 to 5 inches, most of it coming during late winter and early spring. Daily minimum temperatures are often below freezing during winter. Summer is intensely hot and dry, with frequent dust storms. Except on oases and in stream valleys the vegetation is very sparse, consisting of small shrubs and clumps of grass.

The herpetofauna is characterized by a high proportion of species not found elsewhere in Pakistan. The viper, *Eristicophis macmahoni*, and all Pakistan species of the lizard genus *Phrynocephalus* are largely confined to this region. Other characteristic species include *Teratoscincus scincus*, *T. microlepis*, *Stenodactylus lumsdeni*, *S. maynardi*, *Agamura femoralis*, *Ophiomorus brevipes*, *Eremias scripta*, *E. acutirostris*, *E. aporosceles*, *Eryx tataricus*, and *Lytorhynchus maynardi*.

THE NORTHWEST UPLAND

This region extends from the high plains around Kalat and Quetta northeastward through Waziristan into the lower valleys of Swat, Dir, and Chitral. There are long ridges of rough highland enclosing open, fertile valleys. Streams are numerous, and most of them are clear and rocky. Vegetation is comparatively rich and diversified. Forests of pine, juniper, and wild olive cover some of the hills. Annual precipitation is 7 to 15 inches; the high mountains normally are snow-capped in the late winter. Summer and early autumn are hot and dry. The season of greatest reptile activity is from mid March through July.

The herpetofauna is predominantly northwestern, including such species as *Agama caucascia*, *A. rudrata*, *Eremias velox*, *Coluber*

karelini, *Psammophis lineolatus*, *Vipera lebetina*, *Testudo horsfieldi*, and *Bufo viridis*.

THE HIMALAYAN UPLAND

This zone is limited to Hunza, Gilgit, most of Swat, Dir, and Chitral, and the northwest Punjab. It is characterized by high elevations, from 5000 feet to the limit of reptilian tolerance. (*Scincella ladacense* has been recorded at 18,000 feet and *Agkistrodon himalayanus* at 16,000 feet.) The soil is thin and rocky, and there are moderate to dense forests, mostly of pine and deodar. The streams are swift, cold, and rocky. Precipitation is higher than in any part of West Pakistan, exceeding 20 inches per year. Winter is cold enough to inhibit reptile activity four to seven months of the year, and summer is cool.

The herpetofauna is limited but highly characteristic. Species include *Cyrtodactylus stoliczkai*, *Agama himalayana*, *A. agrorensis*, *A. tuberculata*, *Scincella ladacense*, *S. himalayana*, *Coluber ravergieri*, and *Agkistrodon himalayanus*.

THE MARINE ZONE

This zone includes the mangrove swamps and salt-water creeks as well as the open sea and its bays and coves. Mud flats with or without mangroves make up most of the coastal area from the mouths of the Indus to Karachi. To the west, sandy, depositing coast line alternates with rocky, eroding coast with reefs off shore. Much vital ecological information such as water temperatures at various seasons, currents, and variations in salinity were not available to me.

The herpetofauna is concentrated along the littoral; only the turtles and a few species of snakes regularly range into the open sea. The fauna consists of 14 species of sea snakes and five species of turtles. All may be considered characteristic; there is very little interchange between this fauna and that of the fresh water. At least two species of sea snakes occasionally ascend streams far enough to justify their inclusion in the Indus delta fauna. *Enhydryis pakistanica* may enter brackish water, and one fresh-water turtle, *Hardella thurgi*, has been recorded from mangrove swamp. Crocodiles have been reported from salt-water creeks.



FIG. 3. Foot of *Cyrtodactylus*, showing angulation between last and next to last phalanges.

2. Top of head with elevated casque; digits fused into opposable bundles *Chamaeleo zeylanicus* (p. 99)
No casque; digits free 3
3. Eyelids fused, forming transparent cap . . . 4
Eyelids movable 31
4. Digits dilated, forming clinging pads . . . 5
Digits not dilated 12
5. Dilated portions of digits fan-shaped
Dilated portions of digits ovoid 6
Enlarged dorsal tubercles strongly keeled, in regular rows 7
Enlarged dorsal tubercles hemispherical, irregularly arranged or absent 10
7. Pattern of strongly defined large dark saddles *Hemidactylus triedrus* (p. 85)
Pattern of small spots or blotches or almost unicolored 8
8. Six to 10 lamellae under fourth toe; males with femoral and preanal pores (fig. 4)
Nine to 15 lamellae under fourth toe; males with preanal pores only 9
Lamellae under fourth toe 11 to 15; preanal pores six to 9; average adult body length 53 to 60 mm. *Hemidactylus persicus* (p. 83)
Lamellae under fourth toe nine to 12; preanal pores four to six; average adult body length 43 to 50 mm. *Hemidactylus turcicus* (p. 84)
10. Inner toe less than half of length of second toe; continuous series of 23 to 33 preano-femoral pores *Hemidactylus frenatus* (p. 87)
Inner toe more than half of length of second; pores separated in midline by at least six scales 11
11. Many dorsal tubercles; femoral pores 20 or more; 12 or fewer lamellae under fourth toe *Hemidactylus leschenaulti* (p. 85)
Few or no dorsal tubercles; femoral pores 15 or fewer; 12 to 15 lamellae under fourth toe *Hemidactylus flaviviridis* (p. 86)
12. Digits angularly bent between last and next to last phalanx (fig. 3) 13
Digits straight 24
13. Rows of enlarged tubercles on dorsum . . . 14
Dorsal tubercles irregularly scattered or absent 18
14. Scales across mid-belly 24 or fewer . . . 15
Scales across mid-belly 25 or more 16
15. Males with preanal pores only
Males with femoral and preanal pores *Cyrtodactylus montiumsalsorum* (p. 78)
Tubercles of median dorsal rows about the same size as those of lateral rows; males with femoral and preanal pores *Cyrtodactylus fedtschenkoi* (p. 78)
Tubercles of median dorsal rows smaller than those of lateral rows; males with preanal pores only 17
17. Single row of transversely enlarged scales on under side of tail; males with six to nine preanal pores *Cyrtodactylus watsoni* (p. 79)
Scales on under side of tail small and irregularly arranged; males with four to seven preanal pores *Cyrtodactylus kachhensis* (p. 78)
18. Tail tapering gradually; limbs short, heel not reaching axilla 19
Tail tapering abruptly just behind vent; limbs long and slender, heel reaching to axilla or beyond 22
19. Small scattered tubercles on tail and body; no dark stripe through eye 20
No dorsal tubercles, all scales small; dark stripe through eye 21
20. Transversely enlarged scale row beneath tail; males with preanal pores; pattern of wavy transverse dorsal bands *Cyrtodactylus chitralensis* (p. 77)
No row of enlarged scales beneath tail; males without preanal pores; dorsal pattern of short transverse bars *Cyrtodactylus stoliczkaei* (p. 79)

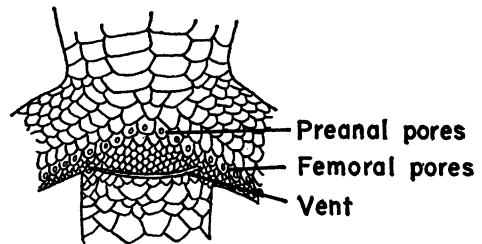


FIG. 4. Inguinal region of lizard, showing preanal and femoral pores.

21. Two pairs of postmentals; dorsal dark bands tending to blend into ground color *Tropicolotes helenae* (p. 81)
Postmentals absent or a single small pair; dorsal dark bands sharply defined *Tropicolotes depressus* (p. 82)
22. Row of enlarged scales on under side of femur; each nostril at apex of small caruncle *Agamura femoralis* (p. 80)
No enlarged scales on under side of femur; no nasal caruncles 23
23. Postmentals present *Agamura agamuroides* (p. 80)
Postmentals lacking *Agamura persica* (p. 80)
24. Tail broad and flat, with large imbricate scales; top of head with U-shaped light mark *Teratolepis fasciata* (p. 87)
Tail not as above; no U-shaped light mark on top of head 25
25. Toes fringed with pointed scales 26
Toes not fringed with pointed scales 30
26. Series of large thin scales on dorsum of tail; habitus robust, body length often exceeding 60 mm. 27
No large scales on dorsum of tail; habitus moderately slender, body length rarely exceeding 55 mm. 28
27. Large cycloid scales in 30 to 35 rows around body *Teratoscincus scincus* (p. 75)
Small scales in 100 or more rows around body *Teratoscincus microlepis* (p. 76)
28. Unregenerated tail shorter than body; males with fewer than five preanal pores *Stenodactylus orientalis* (p. 74)
Unregenerated tail longer than body; males with six or more preanal pores. 29
29. Numerous dorsal tubercles; dorsal pattern of transverse bands *Stenodactylus lumsdeni* (p. 74)
Few or no dorsal tubercles; dorsal pattern of longitudinal stripes *Stenodactylus maynardi* (p. 75)
30. Pupil of eye vertically elliptical; enlarged dorsal tubercles *Bunopus tuberculatus* (p. 74)
Pupil of eye round; dorsal scales small and granular *Pristurus rupestris* (p. 88)
31. Pupil of eye vertically elliptical; tail thick, fleshy, without spines; skin soft *Eublepharis macularius* (p. 72)
Without the above combination of characters 32
32. Size large, adult body length 300 mm. or more; snout long and pointed; tongue slender, deeply forked 33
Body length rarely exceeding 200 mm.; snout blunt; tongue thick, not forked 35
33. Tail with low, double, dorsal ridges most of its length; scales on side of neck keeled, not conical. 34
Tail round, dorsal ridges absent or present only on medial third; scales on side of neck conical. *Varanus griseus* (p. 113)
34. Strongly barred pattern throughout life; young with light bars on top of head; nostril nearer to tip of snout than to eye *Varanus flavescens* (p. 112)
Strongly barred pattern only in juveniles and they lack light bars on top of head; nostril nearer to eye than to tip of snout *Varanus bengalensis* (p. 112)
35. Body compressed laterally 36
Body slightly to strongly compressed dorso-ventrally 37
36. Dorsal crest of spinelike scales; hind feet with five toes *Calotes versicolor* (p. 88)
No dorsal crest; hind feet with four toes *Sitana ponticeriana* (p. 89)
37. Tail thick and heavy with dorsal half rings of large spiny scales 38
Tail not as above 39
38. Tail rings with about 20 spiny scales; no enlarged, pointed, dorsal tubercles *Uromastix hardwicki* (p. 90)
Tail rings with 10 or fewer spiny scales; with enlarged, pointed, dorsal tubercles *Uromastix asmussi* (p. 90)
39. Tympanum exposed 40
Tympanum concealed 50
40. Tympanum large, more or less superficial; caudal scales in regular whorls. 41
Tympanum small, deeply sunk; caudal scales irregularly disposed 46
41. Enlarged dorsal scales keeled; males with patch of callose abdominal scales 42
Enlarged dorsal scales smooth; males lacking patch of callose abdominal scales *Agama himalayana* (p. 93)
42. Caudal scales small, 30 or more around base of tail 43
Caudal scales large, usually fewer than 30 around base of tail 44
43. Enlarged dorsal scales larger than ventrals; flanks with numerous enlarged scales *Agama agroensis* (p. 91)
Enlarged dorsal scales smaller than ventrals; flanks with few enlarged scales *Agama tuberculata* (p. 93)
44. Each caudal segment distinct, with two whorls of scales; tail relatively short and thick, not exceeding 1.5 times body length. *Agama caucasica* (p. 94)
Caudal segmentation not as above; tail long, slender, more than 1.5 times body length 45

45. Enlarged dorsal scales in 12 or more rows; adults with spiny excrescences around ear opening; tail 1.8 to 2.2 times body length *Agama nupta* (p. 91)
Enlarged dorsal scales in 10 or fewer rows; spiny excrescences around ear small or absent; tail 2.3 to 2.6 times body length *Agama melanura* (p. 92)
46. Dorsal scales subequal in size and disposed in regular rows 47
Dorsal scales irregular in size and arrangement 48
47. Tail length exceeding body length; males with callose preanal scales *Agama agilis* (p. 94)
Tail length equal to or slightly less than body length; males without callose preanal scales *Agama minor* (p. 91)
48. Enlarged dorsal scales rounded; more than 100 scale rows around body; usually a red throat spot *Agama rubrigularis* (p. 96)
Enlarged dorsal scales pointed; fewer than 100 scale rows around body; no red throat spot 49
49. Dorsum with reddish or orange ocelli with dark borders; largest dorsal scales about twice size of smallest *Agama megalonyx* (p. 95)
Dorsal ocelli without dark borders or absent; largest dorsal scales more than twice size of smallest *Agama rudrata* (p. 95)
50. Dorsal scales markedly unequal in size 51
Dorsal scales of more or less the same size 52
51. Spiny scales on side of head and neck; tip of tail black *Phrynocephalus leuteoguttatus* (p. 97)
No spiny scales on head and neck; tail barred below with black and white *Phrynocephalus scutellatus* (p. 96)
52. Distal part of tail black; no dark stripe on flank 53
Tail with black and white bars on under side, distal part not black; dark stripe along flank *Phrynocephalus ornatus* (p. 97)
53. Metallic blue-green, with red, orange, and black dorsal spots; nasal shields usually in contact *Phrynocephalus euphilopus* (p. 96)
Without vivid colors or strong dorsal markings; nasal shields usually separated by small scales *Phrynocephalus maculatus* (p. 98)
54. Scales imbricate, smooth or with multiple low keels; dorsal scales of same type as ventrals; no femoral pores 55
Scales not as above; dorsal scales of markedly different type than ventrals; femoral pores usually present 69
55. Habitus serpentine; limbs vestigial; digits reduced in number 56
Habitus not markedly serpentine; limbs with four or five digits 58
56. Both fore and hind limbs with three digits *Ophiomorus tridactylus* (p. 105)
Forelimbs with four digits, hind limbs with three 57
57. Scale rows around body 22; distinct dark stripes on body *Ophiomorus brevipes* (p. 105)
Scale rows around body 20; rows of dark dots on body *Ophiomorus blanfordi* (p. 106)
58. Digits with fringe of pointed scales; snout markedly depressed; lower jaw countersunk *Scincus arenarius* (p. 103)
With none of the above characters 59
59. Eyelids fused, forming transparent cap; small and slender, average adult body length 30 to 35 mm. 60
Eyelids movable, in some cases with transparent disc; larger and more robust, adult body length 40 mm. or more 61
60. Ear opening present; 20 scale rows around midbody *Ablepharus pannonicus* (p. 103)
Ear opening absent; 18 scale rows around midbody *Ablepharus grayanus* (p. 103)
61. Supranasals present (fig. 5A) 62
Supranasals absent (fig. 5B) 68
62. Scales of some dorsal rows much wider than those of lateral rows 63
Scales of dorsal and lateral rows equal or subequal in size 64
63. Robust; 26 to 30 scale rows around midbody; orange markings on tail and flanks *Eumeces schneideri* (p. 101)
Elongate and slender; 20 to 23 scale rows at midbody; no orange markings *Eumeces taeniolatus* (p. 101)
64. Dorsal scales with multiple low keels 65
Dorsal scales smooth 66
65. Dorsal scales with three keels; vertebral light stripe *Mabuya dissimilis* (p. 100)
Dorsal scales with four to seven keels; no vertebral light stripe *Mabuya macularia* (p. 99)
66. Toes of appressed limbs touching or overlapping; 34 to 38 scale rows around midbody *Mabuya aurata* (p. 99)
Toes of appressed limbs not meeting; 32 or fewer scale rows at midbody 67
67. Scale rows at midbody 28 to 32; nostril between rostral and nasal *Chalcides ocellatus* (p. 102)
Scale rows at midbody 24 to 28; nostril in nasal *Riopa punctata* (p. 104)
68. Scale rows at midbody 32 to 36; scales from

- nape to point above vent 63 to 69
 *Scincella ladacense* (p. 105)
 Scale rows at midbody 24 to 30; scales from
 nape to point above vent 56 to 62
 *Scincella himalayana* (p. 105)
 69. Eyelids movable; gular fold present . . . 70
 Eyelids fused, forming transparent cap; gular
 fold absent 78
 70. Nostril bordered by first labial 71
 Nostril not bordered by first labial 72
 71. Dorsal scales scarcely larger than laterals;
 usually seven light stripes; tail yellow . . .
 . . . *Acanthodactylus micropholis* (p. 108)
 Dorsal scales much larger than laterals;
 stripes, if present, usually six; tail blue,
 gray, brown, or pink
 . . . *Acanthodactylus cantoris* (p. 107)
 72. Ventral scales in straight longitudinal rows;
 occipital shield present (fig. 6) 73
 Ventral scales in oblique longitudinal rows;
 occipital absent 74
 73. Occipital shield touching interparietal . . .
 *Eremias guttulata* (p. 109)
 Occipital not touching interparietal

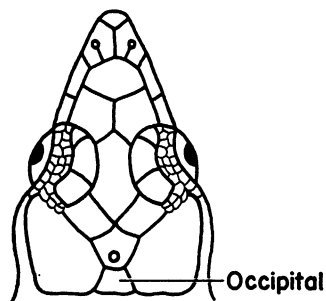
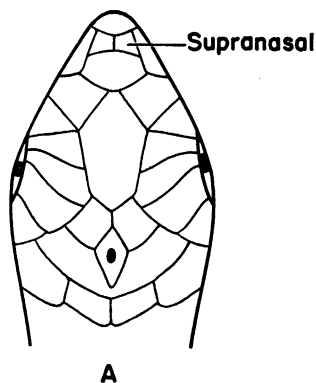
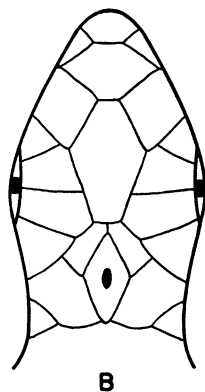


FIG. 6. Dorsal aspect of head of *Eremias guttulata*.



A



B

FIG. 5. Dorsal aspect of head. A. *Riopa punctata*. B. *Scincella himalayana*.

- *Eremias brevirostris* (p. 110)
 74. Some digits with fringe of pointed scales . 75
 Digits without fringe of pointed scales . . 77
 75. Dorsal scales at midbody 49 to 60; ventrals
 14; striped pattern
 *Eremias scripta* (p. 109)
 Dorsals at midbody 65 to 76; ventrals 18 to
 20; reticulate pattern. 76
 76. Femoral pores present
 *Eremias acutirostris* (p. 109)
 Femoral pores absent
 *Eremias aporosceles* (p. 108)
 77. Dorsal scales at midbody 55 or more; body
 length of adult 70 mm. or more; striped pat-
 tern only in young . *Eremias velox* (p. 108)
 Dorsals at midbody 50 or fewer; body length
 less than 65 mm.; striped pattern through-
 out life *Eremias fasciatus* (p. 108)
 78. Shields on crown rugose
 *Ophisops jerdoni* (p. 110)
 Shields on crown smooth
 *Ophisops elegans* (p. 110)

SNAKES

- Ventral scutes well developed, extending
 more than half of width of under side (fig.
 7C) 2
 Ventral scutes absent or reduced in size (fig.
 7B, 7A) 41
- Top of head with small scales irregularly ar-
 ranged 3
 Top of head with large symmetrical plates
 (fig. 8) 7
- Subcaudals undivided
 *Echis carinatus* (p. 159)
 Subcaudals divided 4
- Rostral flanked by large scales with free
 lateral edges; ventrals keeled
 *Eristicophis macmahoni* (p. 158)
 Rostral not as above; ventrals not keeled . 5
- A hornlike scale above eye; nostrils directed
 upward . *Pseudocerastes persicus* (p. 158)
 No hornlike scale above eye; nostrils directed

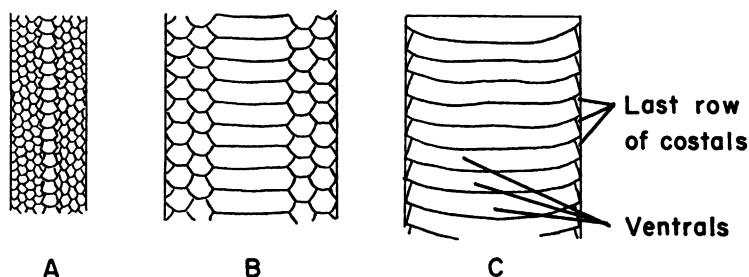


FIG. 7. Ventral aspect. A. Seasnake. B. Boa. C. Russell's viper.

- laterally 6
6. Three rows of dark spots contrasting markedly with ground color; scale rows at midbody 27 to 33 . . . *Vipera russelii* (p. 156)
Pattern of indistinct blotches; scale rows at midbody 23 to 27 . . . *Vipera lebetina* (p. 157)
7. Pit between nostril and eye; maxillary fangs folding against roof of mouth
. *Agkistrodon himalayanus* (p. 161)
No pit between nostril and eye; maxillary fangs, if present, fixed 8
8. Anterior maxillary fangs present; loreal shield absent 9
Anterior maxillary fangs absent; loreal usually present (fig. 9) 10
9. Hood seen in life; vertebral scale row not enlarged; subcaudals divided
. *Naja naja* (p. 153)
No hood; vertebral scale row distinctly enlarged; subcaudals undivided
. *Bungarus caeruleus* (p. 152)
10. Suboculars present; prefrontals three to nine; temporals small and poorly differentiated 11
Without the above combination of characters 13
11. Rostral wider than high; usually five to nine prefrontals; subcaudals in males usually 90 or more, in females 80 or more 12
Rostral higher than wide; usually three or four prefrontals; subcaudals in males 78 to 86, in females 71 to 81
. *Sphalerosophis arenarius* (p. 126)
12. Most scale rows weakly but distinctly keeled; head of adult largely black or dark red
. *Sphalerosophis atriceps* (p. 124)
Scales smooth or with trace of keels; top of head with dark curved or chevron mark or dark spots
. *Sphalerosophis diadema* (p. 126)
13. Dorsal scales smooth throughout 14
At least some of dorsal scales keeled 34
14. Anterior teeth in both jaws much enlarged; eye very dark, pupil barely visible in life 15
Teeth not as above; pupil of eye distinctly visible in life 17
15. Ventrals strongly angulate laterally; nine upper labials 16
Ventrals rounded; eight upper labials
. *Lycodon striatus* (p. 131)
16. Anal divided; loreal touching internasal
. *Lycodon aulicus* (p. 131)
Anal undivided; loreal not touching internasal *Lycodon travancoricus* (p. 133)
17. Rostral large, projecting, concave below; nostrils small slits 18
Rostral and nostrils not as above 20
18. Black cross bars on light (orange in life) ground color; suboculars present
. *Lytrochynchus maynardi* (p. 129)
Pattern not as above; no suboculars 19

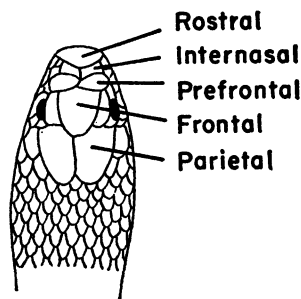


FIG. 8. Dorsal aspect of head of colubrid snake.

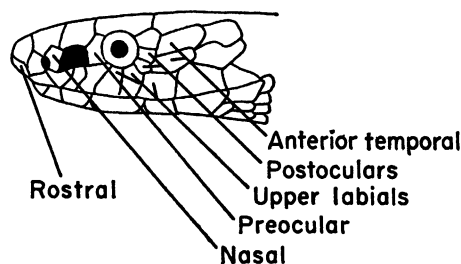


FIG. 9. Lateral aspect of head of colubrid snake with loreal shaded.

19. Dark, anchor-shaped mark on top of head; rostral rather blunt
Lytorhynchus ridgewayi (p. 131)
 Dark mark on top of head not anchor-shaped; rostral pointed
Lytorhynchus paradoxus (p. 130)
20. Ventrals notched and with lateral keel
Dendrelaphis tristis (p. 131)
 Ventrals not as above 21
21. Pupil of eye elliptical; head much wider than neck 22
 Pupil of eye round; head but slightly wider than neck 23
22. Lateral scale rows strongly oblique; fewer than 250 ventrals
Boiga trigonata (p. 138)
 Lateral scale rows not oblique; more than 250 ventrals
Telescopus rhinopoma (p. 139)
23. Head and nape with distinctive dark pattern (fig. 10); fewer than 60 subcaudals . . . 24
 Head and nape without pattern illustrated above; more than 60 subcaudals . . . 25
24. Extensive dark area on neck; 15 scale rows at midbody
Oligodon taeniolatus (p. 133)
 Dark chevrons on head and nape; 17 scale rows at midbody
Oligodon arnensis (p. 134)
25. Middle and posterior maxillary teeth enlarged; fewer than 190 ventrals; hemipenis slender, without spines or calyces . . . 26
 Maxillary teeth and hemipenis not as above; more than 190 ventrals 29
26. Top of head with irregular dark markings; central part of belly gray or reddish; more than 115 subcaudals in males and 105 in females
Psammophis schokari (p. 139)
 Top of head unicolored or striped; central part of belly yellow; 110 or fewer subcaudals in males, 105 or fewer in females . . . 27
27. Preocular in contact with frontal; top of head striped 28
 Preocular not in contact with frontal; top of head usually unmarked
Psammophis condanarus (p. 142)
28. Eight upper labials; more than 90 subcaudals
Psammophis leihi (p. 141)
 Nine upper labials; fewer than 90 subcaudals
Psammophis lineolatus (p. 141)
29. Scale rows at midbody 19 to 23; two anterior temporals; eye large 30
 Scale rows at midbody fewer than 19; single anterior temporal; eye small
Eirenis persica (p. 128)
30. Scale rows at midbody 21 or 23 31
 Scale rows at midbody 19 32
31. Dark, with light cross bands, or almost uniformly dark
Coluber fasciolatus (p. 123)

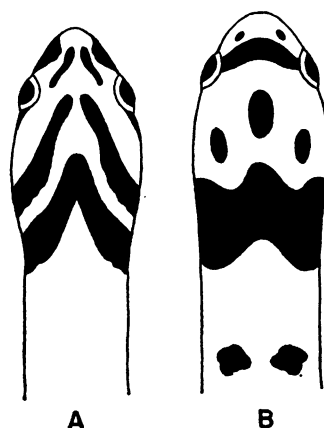


FIG. 10. Head and neck patterns. A. *Oligodon arnensis*. B. *Oligodon taeniolatus*.

- Light with dark blotches
Coluber ravergeri (p. 124)
32. Subocular present; not more than one labial touching eye
Coluber karelini (p. 122)
 No subocular; usually two labials touching eye 33
33. Pattern of small dark spots or unicolored; vertebral stripe, if present, reddish; 11 or 13 scale rows just anterior to vent
Coluber rhodorachis (p. 121)
 Pattern of dark cross bars or rhombs; short, nuchal, dark stripe usually present; 13 or 15 scale rows just anterior to vent
Coluber ventromaculatus (p. 121)
34. Valvular nostrils on upper aspect of snout
Cerberus rhynchops (p. 143)
 Nostrils lateral, without valves 35
35. Scale rows at midbody 21 or more 36
 Scale rows at midbody 19 37
36. Scales strongly keeled entire length of body; anal divided
Macropisthodon plumbicolor (p. 134)
 Scales smooth anteriorly, weakly keeled posteriorly; anal entire
Elaphe helenae (p. 127)
37. Ventrals 190 or more; adult length exceeding 125 cm.
Ptyas mucosus (p. 127)
 Ventrals 187 or fewer; length rarely exceeding 125 cm. 38
38. Pattern predominantly of alternating dark spots 39
 Pattern predominantly of longitudinal stripes 40
39. Two oblique black streaks from eye to edge of mouth; ventrals 160 or fewer
Xenochrophis piscator (p. 135)
 No black streaks from eye to edge of mouth; ventrals 160 or more

- *Natrix tessellata* (p. 134)
 40. Belly mostly dark, with light stripe on tips of
 ventrals *Xenochrophis cerasogaster* (p. 136)
 Belly pale, without markings
 *Amphiesma stolata* (p. 137)
 41. Very small and wormlike; ventrals absent;
 eyes vestigial 42
 Size moderate to large; ventrals usually pres-
 ent, at least anteriorly; eyes usually well
 developed 45
 42. Scale rows around body 14; color in life pale
 brown to pink 43
 Scale rows around body 18 to 20; color dark
 brown to almost black 44
 43. Rostral large, hooked (fig. 11); total length of
 body 80 to 120 times diameter
 *Leptotyphlops macrorhynchus* (p. 116)
 Rostral rounded; total length 55 to 70 times
 diameter
 *Leptotyphlops blanfordi* (p. 117)
 44. Scale rows around body 18; total length of
 body 60 to 100 times diameter
 *Typhlops porrectus* (p. 116)
 Scale rows around body 20; total length 40 to
 65 times diameter
 *Typhlops braminus* (p. 115)
 45. Ventral scutes almost half of width of venter
 (fig. 7B); tail round or nearly so . . . 46
 Ventral scutes much reduced or absent at
 midbody (fig. 7A); tail compressed later-
 ally 50
 46. Scale rows 35 or more; blotched, banded, or
 unicolored 47
 Scale rows 27 to 31; longitudinally striped . .
 *Enhydris pakistanica* (p. 143)
 47. Anterior supralabials with pits; pattern of
 large regular saddles; adult length 2 meters
 or more *Python molurus* (p. 117)
 No labial pits; pattern not as above; length
 not exceeding 1.3 meters 48
 48. Pattern of irregular dark blotches often
 partly fused 49
 Unicolored or with widely separated trans-
 verse bands. *Eryx johnei* (p. 118)
 49. Most of body scales keeled, those near tail
 very strongly so *Eryx conicus* (p. 119)
 Most of body scales smooth, keeled near tail
 only *Eryx tataricus* (p. 120)
 50. Top of head with large shields; tail strongly

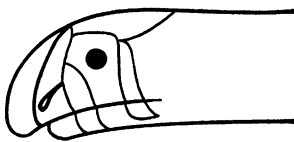


FIG. 11. Lateral aspect of head of *Leptotyphlops macrorhynchus*.

- compressed 51
 Top of head with small juxtaposed scales; tail
 weakly compressed
 *Acrochordus granulatus* (p. 143)
 51. Mental shield elongate and concealed in cleft;
 tip of rostral decurved and pointed
 *Enhydrina schistosa* (p. 147)
 Mental and rostral not as above 52
 52. Ventrals at midbody distinct, entire, usually
 larger than adjacent scales (fig. 7A) . . 53
 Ventrals at midbody divided and difficult to
 distinguish from adjacent scales 61
 53. Ventrals larger anteriorly than posteriorly;
 rostral trifid 54
 Ventrals almost uniform in size the length of
 body; rostral not trifid 55
 54. Ventrals 225 or more, anterior ones, half of
 width of body.
 *Praescutata viperina* (p. 148)
 Ventrals fewer than 220, anterior ones not
 half of width of body.
 *Lapemis curtus* (p. 149)
 55. Head black to dark olive; adult with very
 small head and long slender neck . . . 56
 Head, if black, with light curved mark on
 crown; habitus of adult not as above . 57
 56. Ventrals 390 or more; five or six maxillary
 teeth *Hydrophis fasciatus* (p. 144)
 Ventrals fewer than 390; seven to 10 maxillary
 teeth *Hydrophis mamillaris* (p. 147)
 57. Scales on thickest part of body with rounded
 or bluntly pointed tips, distinctly or feebly
 imbricate; eight or fewer maxillary teeth;
 adult length more than 1 meter 58
 Scales on thickest part of body hexagonal
 or quadrangular, feebly imbricate or juxta-
 posed; eight or more maxillary teeth; length
 rarely exceeding 1 meter 59
 58. Dark annuli laterally as wide as or wider than
 interspaces; increase of eight or more scale
 rows between neck and thickest part of
 body *Hydrophis cyanocinctus* (p. 144)
 Dark annuli laterally narrower than inter-
 spaces; increase of fewer than eight scale
 rows between neck and thickest part of
 body *Hydrophis spiralis* (p. 145)
 59. Maxillary teeth 14 or more; adult with bluish
 gray bands *Hydrophis caeruleus* (p. 146)
 Maxillary teeth eight to 13; adult with dark
 gray to greenish bands 60
 60. Top of head unmarked; ventrals 209 to 312 .
 *Hydrophis ornatus* (p. 144)
 Top of head usually with curved yellow mark;
 ventrals 314 to 372
 *Hydrophis lapemoides* (p. 146)
 61. Head very small; neck long and very slender
 62
 Habitus not as above 63

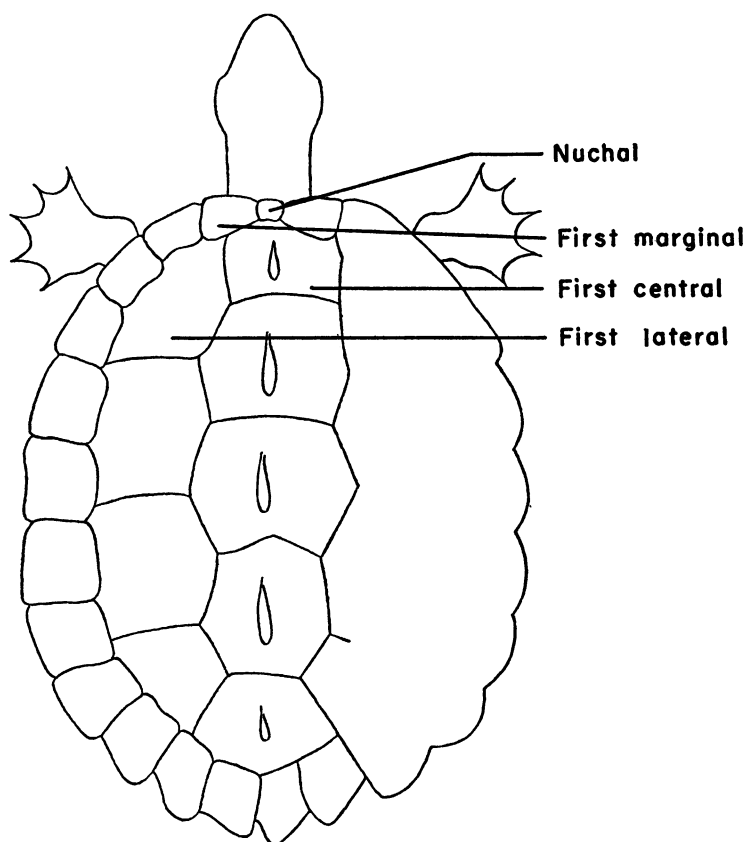


FIG. 12. Carapace of emydid turtle, showing nomenclature of laminae.

62. Ventrals more than 380; average adult length exceeding 1 meter
 *Microcephalophis cantoris* (p. 150)
 Ventrals fewer than 350; length rarely exceeding 1 meter
 *Microcephalophis gracilis* (p. 150)
 63. Scales pointed and imbricate; head chunky and body very robust
 *Astrotia stokesi* (p. 149)
 Scales juxtaposed; head long and flat; body strongly compressed laterally
 *Pelamis platurus* (p. 151)

TURTLES

- | | |
|--|---------------------------------------|
| 1. Carapace and plastron with horny laminae (fig. 12) | 2 |
| Carapace and plastron without horny laminae | 11 |
| 2. Limbs modified into flippers; digits not distinct | 3 |
| Limbs not modified into flippers; digits distinct | 6 |
| 3. Four pairs of lateral laminae; first central in contact with marginals | 4 |
| Five or more pairs of lateral laminae; first central separated from marginals | 5 |
| 4. Dorsal laminae imbricate | <i>Eretmochelys imbricata</i> (p. 62) |
| Dorsal laminae juxtaposed | <i>Chelonia mydas</i> (p. 59) |
| 5. Four pairs of inframarginal (bridge) laminae, most with pores at their posterior edge | <i>Lepidochelys olivacea</i> (p. 61) |
| Three pairs of inframarginal laminae, without pores | <i>Caretta caretta</i> (p. 61) |
| 6. Hind limbs club-shaped; toes without web | 7 |
| Hind limbs not club-shaped; toes webbed | 8 |
| 7. Carapace high; pattern of radiating yellow stripes | <i>Testudo elegans</i> (p. 67) |
| Carapace lower; little or no pattern | <i>Testudo horsfieldi</i> (p. 66) |
| 8. Carapace with three knobbed ridges; small yellow spots on head and limbs | <i>Geoclemys hamiltoni</i> (p. 65) |
| Carapace with median ridge; markings not as | |

- above 9
9. Fourth central lamina not longer than wide;
yellow stripes on head
. *Hardella thurgi* (p. 64)
Fourth central lamina distinctly longer than
wide; head unstriped 10
10. Shell high, with prominent knobbed ridge;
plastral laminae light, with black spots . .
. *Kachuga tecta* (p. 63)
Shell lower, with less distinct ridge; plastral
laminae black, with light edges
. *Kachuga smithi* (p. 62)
11. Dorsum with seven longitudinal ridges; limbs
without claws
. *Dermochelys coriacea* (p. 59)
Dorsum without ridges; limbs clawed . . 12
12. Plastron with movable flanges; bones of cara-

- pace finely granular
. *Lissemys punctata* (p. 69)
Plastron without flanges; bones of carapace
smooth to rugose 13
13. Head broad and massive, green, with black
markings; alveolar ridges wide and blunt
. *Trionyx gangeticus* (p. 68)
Head narrow, grayish, with dark-edged light
stripes; alveolar ridges narrow and sharp
. *Chitra indica* (p. 69)

CROCODYLIANS

1. Snout very slender, at least three times as long
as broad at the base
. *Gavialis gangeticus* (p. 72)
Snout broad and blunt
. *Crocodylus palustris* (p. 71)

ACCOUNTS OF SPECIES

INCLUDED HEREIN ARE all the genera and most of the species believed to occur in West Pakistan. Treated in detail are species that are represented in my collections, made from 1958 through 1962 and in August, 1965, and in collections made by Jeromie A. Anderson and sent to me. Also included are a few species not in these collections but represented in American museums by material not previously reported upon.

Since a significant part of West Pakistan is *terra incognita* to herpetologists, it is virtually certain that more species will be added to the fauna either by discovery of undescribed forms or by detection of known species within the boundaries of the province. Because it is generally more difficult to prove the absence of a species within a given region than to demonstrate its presence, I have accepted most of the literature records of amphibians and reptiles from West Pakistan, although a number have not been confirmed by recent collecting. Among the few species I have deleted is the king cobra, *Ophiophagus hannah*, previously reported on the basis of a single specimen allegedly collected near Lahore. It seems most improbable that so large and conspicuous a snake could exist in natural populations in the densely settled eastern Punjab without additional specimens reaching museum collections.

The taxonomic arrangement follows broadly the lines laid down by Malcolm Smith (1931, 1935, 1943). For each genus except a few that are clearly monotypic I have provided a brief generic diagnosis particularly applicable to the Indo-Pakistan forms, the geographic distribution of the genus, and its content. The synonymy for each species in-

cludes: (1) reference to the original description, (2) a reference to the nomenclatural combination used, (3) reference to the taxon in the "Fauna of British India" series or in a recent monograph of the group, and (4) synonyms based on material collected in West Pakistan or adjoining territory. Trinomials have been used when the material studied is clearly referable to a well-defined subspecies. It will be obvious to those who peruse this work that many problems in systematics remain for students of the West Pakistan herpetofauna. These are particularly acute in genera such as *Cyrtodactylus*, *Agama*, *Coluber*, *Sphalerosophis*, and *Eirenis*.

Measurements, scale counts, and other descriptive data are from specimens examined personally except where clearly stated otherwise. Body proportions and total lengths are those of adult or near-adult animals unless stated otherwise. Most of the color descriptions are from live or freshly preserved animals. Nearly all the material was collected within the boundaries of West Pakistan. However, I have included some specimens from immediately contiguous areas (southern Afghanistan, Kashmir, and the western part of the Indian Punjab) in the same biotic provinces as the adjoining territory in Pakistan. Accounts of habitat and habits are based largely on my observations and those of Jeromie A. Anderson. I have not attempted to summarize the literature on these topics. Total ranges of the species have been given in general terms, based on recent literature. West Pakistan ranges are based on collections and field observation as well as on the literature.

AMPHIBIANS

FAMILY BUFONIDAE

BUFO LAURENTI

Members of this genus are commonly known as toads among English-speaking peoples.

Maxillary and vomerine teeth absent; omosternum usually absent, cartilaginous if present; tongue not notched; pupil horizon-

tal; skin relatively well cornified and dry; web between toes thick, no web between fingers; conspicuous parotoid glands.

The genus is cosmopolitan except for the Australian Region, Madagascar, the Arctic, and most oceanic islands. There are about 250 species. Two species are represented in my collections. *Bufo olivaceus* (Blanford) was described from the Dasht River of Mekran but

was not collected. It is discussed with *B. andersoni*. The widespread and common southeast Asian toad, *Bufo melanostictus* (Schneider), has been reported from Tatta and Jungshahi in Sind (Murray, 1884a), but recent collectors have not found it. The record may be based on misidentified *B. andersoni*. The poorly known species *Bufo surdus* (Boulenger, 1891) is reported from western Baluchistan.

***Bufo andersoni* Boulenger**

INDUS TOAD

Bufo andersoni BOULENGER, 1883, p. 161 (type locality: Ajmere, Rajputana).

DESCRIPTION: Head distinctly wider than long; head width 35–41.5 per cent of snout-vent length; snout blunt, often slightly truncate; nostrils lateral, nearer to end of snout than to eye; interorbital space at least three-fourths of length of upper eyelid; tympanum about two-thirds of diameter of eye; single subgular vocal sac; fingers 3-1-4-2 in decreasing order of length, first (thumb) swollen and with dark callose pad on dorsum in breeding males; hind limbs rather short, tibia 34–42 per cent of snout-vent length; toes blunt, 4-3-5-2-1 in decreasing order of length, webbed more than half of their length except for fourth which is webbed 30 to 50 per cent of its length; inner metatarsal tubercle larger than outer, edges of tubercles blunt, usually dark and cornified in adults; skin of back, flanks, and dorsal surfaces of limbs more or less diffusely studded with small warts; parotoid glands more or less reniform, greatest width slightly more than half of length, greatest length 25 to 32 per cent of snout-vent length; ventral skin finely tuberculate.

Snout-vent lengths of 20 males, 44 to 62 mm.; of five females, 50 to 70 mm.

Dorsal ground color light drab gray or olive to almost black, with more or less sooty irregular mottling which is most prominent in subadult individuals; upper lip cream; ventral surfaces dirty white, rarely with a little dark mottling on chest.

VARIATIONS: Specimens from the northeastern part of the country are wartier and have larger warts, some of which are nearly the size of the tympanum, the parotoids are shorter and wider, and there is dark mottling of the chest and throat. There are, however, only four specimens from this region in my collections, and only one is near adult size.

Bufo andersoni and *B. olivaceus* appear to be closely related. Although I collected no examples of the latter species in West Pakistan, I examined part of the series from southeastern Iran reported upon by S. C. Anderson (1963). Some of the differences observed are summarized in table 1.

The range of *B. andersoni* is reported to extend westward to Muscat; however, I have seen no specimen from west of the Kud River canyon in Las Bela District. *Bufo olivaceus* is known from the Dasht River in Mekran and from southeastern Iran. It is quite possible that further study will show *andersoni* to be conspecific with *olivaceus*. A comparison of the two with the use of osteological and biological data is indicated. It is noteworthy that the westernmost specimens of *andersoni* are no more like *olivaceus* than are specimens of *andersoni* from northern Sind (Nawabshah District).

HABITS: This toad is common and widely distributed in the Indus valley. In the more arid regions it is confined to oases, water-

TABLE 1
CONSISTENT DIFFERENCES NOTED BETWEEN *Bufo andersoni* AND *Bufo olivaceus*

<i>andersoni</i>	<i>olivaceus</i>
At least a few small warts on middorsal skin	No warts on middorsal skin
Parotoid glands reniform; length, 25–32 per cent of body length	Parotoid glands wedge-shaped; length, 32–50 per cent of body length
Fourth toe 30–45 per cent webbed	Fourth toe 25–30 per cent webbed

courses, and the vicinity of temporary ponds. It is plentiful in urban areas.

The normal period of activity in the lower Indus Valley and in the city of Karachi extends from March through October. The toads are normally crepuscular or nocturnal but may be out by day during rainy or overcast weather. Adults enter water readily and often are seen swimming or floating. During damp weather they often enter houses. I saw one toad climb to a height of about 7 feet by working its way up a shallow crevice in a wall. When inactive, the toads hide in heaps of vegetation, in crevices, under stones, in burrows of other animals, and in loose soil about the roots of plants.

Breeding is initiated by warm rain or the flooding of lowlands during irrigation and continues through the warm months. The toads do not breed during the cooler rains from November through February. With the onset of the monsoon in late June or July, enormous choruses of toads assemble in temporary pools. At first they call incessantly during rain or heavy overcast; later they are heard only after dusk. The call is a harsh but not particularly loud "qui-qui-qui-qui." Audiospectrograms show a frequency of 2 to 3 kilocycles per second, with each burst of pulsations lasting approximately 0.2 second. Females seem attracted to calling males and are clasped when they approach within an inch or two. Pairs in amplexus are often seen hopping about during rainy weather.

The eggs hatch very quickly at summer temperatures. Tiny tadpoles were noted within 24 hours after rain had filled shallow pools near our house. Transforming toads 6 to 8 mm. in body length emerged from the pools 17 to 18 days later. The pools were dry 23 days after the first young transformed and 41 days after the onset of the rains. About a month later, another heavy rain initiated a second but lesser wave of breeding. During 1959 the rains were unusually heavy and prolonged, permitting an exceptional number of larvae to transform. In mid-August, about six weeks after the rains began, newly transformed toads were so numerous in places that it was impossible to avoid stepping on them. Our observations on toads marked in our compound indicate that some individuals

reach breeding size the season following transformation.

Like many other species of toads, *Bufo andersoni* often hunts near lights for the insects that swarm about. The tadpoles have been seen in great numbers about disintegrating bits of paper or cardboard. Apparently they are attracted by algae or other microorganisms that utilize this substrate.

These toads have an unpleasant smell that suggests crushed ailanthus leaves. The parotoid secretion effectively discourages dogs, cats, and some other mammalian predators but not hedgehogs. Monitor lizards and some species of snakes eat these toads. Twice I saw small toads attacked and badly injured by a large species of carabid beetle.

DISTRIBUTION: This species has been recorded from the Ganges Valley in East Pakistan to Nepal and Kashmir and southwestward to Muscat but always at comparatively low altitudes. In West Pakistan it has been collected from Saidu Sherif in Swat (ca. 2800 feet) to the delta of the Indus and west to the Kud River in Las Bela.

***Bufo viridis* Laurenti**

EUROPEAN GREEN TOAD

Bufo viridis LAURENTI, 1768, p. 27 (type locality: Vienna).

DESCRIPTION: Head similar to that of *B. andersoni*; tympanum smaller, about half of diameter of eye; subgular vocal sac; fingers like those of *andersoni*; tibia 40–43.5 per cent of snout–vent length in males, 34–36.5 per cent in females; fourth toe webbed about 10 per cent of its length; metatarsal tubercles short, blunt, not cornified; dorsal skin diffusely and heavily studded with small warts, comparatively few warts on limbs; parotoid glands triangular to oval, greatest width approximately equal to length, greatest length 11–20 per cent of snout–vent length; ventral skin finely tuberculate. Snout–vent lengths of six adult males, 37–47 mm.; of two females, 58 and 70 mm.

Dorsal ground color olive to light gray or buff, with large, irregular, dark green to black spots irregularly arranged; ventral surfaces white, unmarked. After preservation, ground color of males darkening more than that of

females, and spots becoming less evident.

Body of tadpole plump, rounded; eyes dorsal; beak heavily cornified, not pointed, edges finely serrate; upper labial teeth in two rows, lower in three; lower lip with finely lobulate margin laterally; spiracle sinistral, anus in midline; tail fins a little wider than muscular portion of tail; dorsal color blackish; ventral skin and tail fins transparent. Tadpoles examined, 20–24 mm. in total length; largest with hind-limb buds. Transforming individuals have body lengths of 11–13 mm.

VARIATION: The few West Pakistan specimens examined differ from Middle East and European specimens chiefly in their small size. A similar tendency toward dwarfism is seen in some other West Pakistan amphibians.

HABITS: In the Baluchistan highlands most of these toads were found in a marshy area near a spring and along the course of streams. A juvenile was found under a stone in sparse juniper forest, and a large female was seen in a suburban garden. Altitudes of collection were between 5000 and 7500 feet.

Choruses were heard in mid-May and early June; the males were on land or in very shallow water. The call is a rather faint, melodious trill. Egg strands and small tadpoles were noticed in pools of a rocky stream on May 18; transforming toads were collected here June 8. Tadpoles were found in a small marshy pool at approximately 7500 feet on June 7. That evening a few males began to call about sunset but stopped about three hours later as the air became decidedly cool.

DISTRIBUTION: The range of *Bufo viridis* is very extensive, reaching from Germany eastward to Mongolia and central Siberia and south to Tibet, Iran, Israel, Egypt, and Morocco. The West Pakistan records are for the Baluchistan highland near Quetta, but the species probably occurs locally throughout the Northwest Frontier Provinces and alpine Punjab.

FAMILY RANIDAE

RANA LINNAEUS

This genus includes the common frogs of Asia, Europe, Africa, and North America.

Maxillary and vomerine teeth present; vertebrae diplasiocoelous; sternum bony;

digits with pointed or slightly dilated tips but without discs; tympanum prominent.

The genus contains about 300 species and is virtually cosmopolitan in distribution, being absent only from parts of Australia and southern South America, most of the Arctic, and certain oceanic islands. Of the seven species reported from West Pakistan, *Rana ridibunda* just reaches northwestern Baluchistan and is not represented in my collections. *Rana strachani* was described by Murray (1884a, as *Tomopterna strachani*) from a specimen collected near Malir, Karachi District. It has never been collected subsequently.

Rana tigerina Daudin

TIGER FROG

Rana tigerina DAUDIN, 1803, p. 64, pl. 20 (type locality: Bengal).

DESCRIPTION: Head slightly longer than wide except in large females, in which it may be slightly wider than long; head width 34–37.5 per cent of snout-vent length; snout bluntly pointed; nostrils dorsal, nearer to tip of snout than to eye; tympanum a little smaller than eye; vocal sacs protrusile through slits just anterior to insertion of arm and below angle of jaw, widely separated from each other; fingers webbed at bases, 3-1-4-2 in decreasing order of length, first (thumb) swollen and dark at base in breeding males; hind limbs long and muscular, tibia 47–52 per cent of snout-vent length; toes slightly bulbous at tips, 4-5-3-2-1 in decreasing order of length, all webbed to tips or nearly so, but web distinctly indented between toes, metatarsal tubercle small, without cornified cutting edge; prominent ridge from posterior canthus of eye above tympanum to insertion of forelimb; dorsal skin with numerous glandular ridges; skin of flanks weakly to moderately pustulose; ventral skin smooth. Snout-vent lengths of 10 adult males, 79–111 mm.; of nine adult females, 89–141 mm.

Dorsal ground color of adult light drab brown to olive, with grayish brown to blackish spots; young frogs paler, often grass green; distinct, narrow, cream-colored stripe from snout to vent and light line along upper surface of thigh and posterior aspect of tibia to heel; posterior surfaces of thighs with heavy dark mottling; lips cream, with dark

mottling; vocal sacs and in some cases chin dusky, remainder of ventral surfaces immaculate white or cream.

Body of tadpole plump, somewhat depressed; eyes dorsal, not visible from below; beak heavily cornified, pointed, with smooth edges; upper labial teeth in three long and two short rows, lower in two long and one short; lower lip with lobulate margin; spiracle sinistral; both upper and lower tail fins small, not wider than muscular portion of tail; dorsal color olive, with fine dark speckling or mottling, below yellowish. Smallest tadpoles examined, about 30 mm. in total length and having hind-limb buds; forelimbs appearing in individuals of about 45 mm. Transforming froglets, 22–25 mm. in snout–vent length.

HABITS: Never found far from water, the tiger frog is most plentiful in weed-choked ditches, marshes, and tanks. During the rains it becomes widespread in flooded lowlands. It is uncommon in large streams and canals and in pools with rocky or sandy bottom. I saw a few adult frogs in a small stream flowing through a salt marsh near Dabeji.

This large frog is shy and solitary. During the day it often spends hours crouched in grass, in a little concavity at the water's edge, or at the entrance of a drain or culvert. Here it may sit until seized, although it is a strong jumper and swimmer. At night it is more active. It is encountered throughout the year, being largely diurnal during winter and more nocturnal in summer.

In irrigated parts of the Indus Valley, breeding begins during the very hot weather of May and June. In other places it seems to be deferred until the onset of the monsoon. Males call while partly submerged in shallow water. The call is a loud, resonant "quonk-quonk," repeated irregularly. Choruses begin soon after sunset and continue until dawn. No calls were heard after the last week of July. I have not seen the eggs. The tadpoles are highly secretive and nocturnal. The first transforming individuals in the Indus delta were found late in July, and small frogs are plentiful through October.

The stomachs of eight adult frogs contained large aquatic insects such as belostomids and dytiscids, snails, and small frogs, including young of *tigerina*.

The local people do not eat frogs; indeed

the idea is abhorrent to most of them. Nonetheless, *Rana tigerina* is quite palatable and could serve as an easily obtained source of animal protein.

There is a prevalent belief that, if a woman spits into the mouth of a frog after sexual intercourse and returns the amphibian to the place where it was found, she will not become pregnant.

DISTRIBUTION: *Rana tigerina* with its subspecies occurs from Taiwan throughout southern China and the other mainland countries of southeast Asia throughout most of the Indian subcontinent and Ceylon and northward to Nepal but avoiding the mountains. In West Pakistan it is plentiful throughout most of the Indus drainage at elevations below 2000 feet. The Hab River Valley appears to mark the western limit of its range. The West Pakistan population presumably belongs to the nominate subspecies.

Rana limnocharis Gravenhorst

INDIAN CRICKET FROG

Rana limnocharis GRAVENHORST, 1829, p. 42 (type locality: Java).

DESCRIPTION: In most respects a miniature version of *R. tigerina*; head width 30–35 per cent of snout–vent length; single subgular vocal sac; fingers 3-1-2-4 in decreasing order of length; tibia 46–52 per cent of snout–vent length; toes 4-3-5-2-1 in decreasing order of length; fourth toe 60–70 per cent webbed, tips of all toes free of web and web indented between toes; dorsal skin with warts rather than ridges. Snout–vent lengths of five adult males, 24–29 mm.; of five adult females, 32–35 mm.

Coloring similar to that of *R. tigerina*, but dark dorsal spots usually less distinct; light dorsal stripe present in seven of 10 adults but in only one of nine juveniles; no light line on thigh and tibia; posterior surface of thigh dusky, in some cases with indistinct light stripe; lips dusky, with light mottling; vocal sac purplish black.

VARIATION: No subspecific designation has been applied to West Pakistan populations. The specimens are markedly smaller than specimens from Java and Thailand but differ in no other obvious way.

HABITS: These little frogs frequent shallow marshes, flooded fields, and damp grassland

near canals and ditches. I saw a few in the stream flowing from the sulphur springs at Tirth Lakhi but below the section where hydrogen sulphide odor was evident. In appearance and behavior these frogs are strikingly similar to the American *Acris*. They are good jumpers and may escape into vegetation or into water. Those that land in deep water characteristically swim back to the bank almost immediately. They are mostly nocturnal during the hot months but become increasingly diurnal during the fall. They are not active during the cool or very dry months but may occasionally be found in piles of decaying vegetation or under logs and rubbish.

Breeding begins when lowlands are flooded by rain or irrigation. The voice is a series of loud staccato notes often delivered in bursts suggesting telegraphy. A German friend referred to this frog as "der Funker." Calling males are usually on land concealed in tufts of grass or other cover. I have heard them only at night. I did not collect or identify the eggs or tadpoles. Small frogs 13–17 mm. in snout-vent length and evidently just transformed have been collected from mid-July through October.

DISTRIBUTION: This frog with its subspecies occurs from southern Japan and the Riu-Kiu Islands through the Philippines and the islands of Indonesia to the Lesser Sunda Group. On the Asian mainland it is found from east-central China west to Nepal and Kashmir. In West Pakistan it occurs in the Indus drainage from the delta north at least to Rawalpindi. Although considerably more plentiful than my collections indicate, it tends to be spotty in distribution.

***Rana cyanophlyctis* Schneider**

SKITTERING FROG

Rana cyanophlyctis SCHNEIDER, 1799, p. 137 (type locality: eastern India).

DESCRIPTION: Head wider than long; head width 36–40.5 per cent of snout-vent length; snout blunt; nostrils dorsal, nearer to tip of snout than to eye; tympanum about half of diameter of eye; paired external vocal sacs widely separated from each other; fingers 3-1-2-4 in decreasing order of length, not webbed, tips pointed; hind limbs heavily

muscled, tibia 47–52 per cent of snout-vent length; toes 4-3-5-2-1 in decreasing order of length, tips pointed; toes webbed to tips, web only slightly indented between toes; inner metatarsal tubercle usually forming a short spur, outer absent; dorsal skin with numerous small, irregularly arranged warts; skin of flanks rugose, ventral skin smooth. As noted by Taylor (1962), the lateral-line pores often harbor the larval stage of a trematode or cestode encased in a heavily pigmented cyst. This may give the impression of more or less symmetrical, punctate dark lines on the flanks and venter. Snout-vent lengths of 15 adult males, 36–46 mm.; of 19 adult females, 46–67 mm.

Dorsal ground color light olive green or brown to almost black; dorsal surfaces with irregularly arranged sooty spots; posterior surface of thigh dark, often with one or two yellow or white, irregular, longitudinal stripes; ventral surfaces white, immaculate, or with dark speckling; vocal sacs dusky.

VARIATION: Reduction or absence of the spurlike metatarsal tubercle is seen in all 18 specimens from the upland of Kalat and northern Las Bela; it is uniformly well developed in specimens from the lower Indus Valley. This is another amphibian of which the West Pakistan populations appear to be dwarfed in comparison with those to the south and east.

HABITS: This frog is almost ubiquitous in aquatic habitats below 4000 feet. It apparently tolerates considerable salinity, for it has been taken in brackish desert springs and in pools near the seacoast associated with mudskippers (*Periophthalmus* sp.). It is equally tolerant of organic pollution and is common in drains and open sewers. It has also been seen near sulphur springs. Other habitats range from clear rocky streams and pools to muddy swamps and canals. In cities it is often found in the small, steep-sided, artificial reservoirs known as mali pools and may colonize them within an amazingly short time after their construction.

These frogs seemingly can subsist indefinitely without coming onto land and spend most of their time floating motionless, with the eyes and tip of the snout above water. When alarmed they skitter across the surface

for several feet before diving and hiding on the bottom. In permanent water they are active throughout the year. They can estivate, however, for after the onset of the monsoon many frogs appear in ponds that have been dry for months.

Males of the skittering frog call at any season but do so more vigorously during warm damp weather. They are almost as vocal by day as at night. The usual call is a prolonged "crreek-crreek," suggesting the call of *Pseudacris triseriata*. An irregularly repeated quacking call is occasionally heard as well. It is likely that populations in permanent water breed almost continuously. I have seen pairs in amplexus from March through September. Young tadpoles, transforming tadpoles, and small frogs can be found at any season along the Hab River. The eggs are deposited around clumps of emergent vegetation and are enveloped in a thin, friable, jelly film. The tadpole is a sluggish, secretive bottom dweller. Tadpoles nearing transformation at lengths of 60–90 mm. were collected from a temporary pond on August 3, 39 days after the pond had been filled by heavy rain.

The frogs feed principally on aquatic invertebrates such as diving beetles, larval Odonata, Crustacea, and snails. They capture food under water. Terrestrial insects are eaten also; stomachs of several frogs collected near drains and stagnant pools were packed with muscid flies.

DISTRIBUTION: The species occurs from Thailand to Nepal and Ceylon, thence north and west to eastern Iran and southern Arabia. In West Pakistan it has been collected as far north as Swat and westward to the central part of Kalat District. It probably occurs throughout the province in aquatic habitats below 5000 feet.

***Rana sternosignata* Murray**

BALUCH MOUNTAIN FROG

Rana sternosignata MURRAY, 1885, p. 120 (type locality: Quetta).

DESCRIPTION: Head very broad and rather flat; head width 40–43 per cent of snout–vent length; snout blunt; nostrils dorsal, about

midway between eye and tip of snout; no external vocal sacs; both fore and hind limbs stout and muscular; fingers not webbed, tips blunt, 3-4-2-1 in decreasing order of length; males with dark, rough patches on first and second fingers and on tubercle at base of first; tibia 43–47.5 per cent of snout–vent length; toes 4-5-3-2-1 in decreasing order of length, webbed to tips, web slightly indented; no metatarsal tubercles; skin of back with small warts, more numerous and spinose in males; skin of flanks markedly pustulose in males; ventral skin smooth in females, males with pair of rough, callose patches on chest and small pointed tubercles scattered over entire venter; supratympanic ridge prominent; tympanum inconspicuous, less than half of diameter of eye. Snout–vent lengths of three adult males, 68–81 mm.; of four adult females, 79–91 mm.

Adults dark green, olive or black above, with small, irregularly scattered spots of yellow, orange, or light red; ventral surfaces white, with profuse, fine, dark brown or black mottling. Young dark brown or olive, with blackish blotches, yellow or orange spots usually absent.

HABITS: The Baluch mountain frog seems to be almost wholly aquatic and frequents clear pools a foot or more in depth, with sand or gravel bottom and some aquatic vegetation. The young may be found in smaller pools. Most of the frogs I saw were floating at the surface near the edge of the water or under shelter of undercut banks. Some young ones were found quite accidentally among submerged vegetation in a small puddle. The frogs apparently do not often rest on the bank or leave the water. They are powerful but rather slow swimmers.

In mid-May no frogs were heard calling, and no eggs were found. In one spring-fed pool were many small tadpoles, some large tadpoles nearing transformation, and a few small frogs. A transforming tadpole is 26.6 mm. in total length, tail length 16 mm.

The digestive tracts of two adult frogs contained fragments of aquatic insects and freshwater crabs.

DISTRIBUTION: This species is known from the Quetta Plateau in Baluchistan northward to Kabul, Afghanistan, mostly at 5000 to

7000 feet in elevation. Murray's (1885) record for Malir needs confirmation. If the species occurs in Sind and southern Baluchistan, it must be extremely local.

***Rana breviceps* Schneider**

INDIAN BURROWING FROG

Rana breviceps SCHNEIDER, 1799, p. 140 (type locality: India). BOULENGER, 1920, p. 101.

DESCRIPTION: Habitus toadlike; head short and wide, its width 39–42 per cent of snout-vent length; snout blunt; nostrils dorso-lateral, nearer to tip of snout than to eye; tympanum a little smaller than eye; sub-gular vocal sac with lateral outpouchings; fingers not webbed, 1-3-4-2 in decreasing order of length, first considerably swollen in breeding males; hind limbs short, tibia 36–41.5 per cent of snout-vent length; tips of toes slightly bulbous; toes 4-3-5-2-1 in decreasing order of length, less than half webbed; inner metatarsal tubercle long and heavy, with cutting edge, outer absent; dorsal skin smooth, with small warts and short ridges; skin of flanks and lower belly rugose to coarsely granular, chest and throat finely granular. Snout-vent lengths of seven adult males, 43–48 mm.; of two females, 47 and 49 mm.

Dorsal ground color light olive brown or tan, with indistinct dark bars on limbs and faint dark dorsal mottling; buffy patches on shoulder and flank; cream-colored middorsal stripe; indistinct buffy bars on upper lip; ventral surfaces cream; vocal sac blackish.

HABITS: These frogs were encountered in flat grassland or semi-desert close to large muddy nullahs or shallow artificial or natural ponds. They were observed only during the rainy season from early July to early October. They do not enter water except when breeding but may be found in the grass associated with the Indus toad. They are largely nocturnal but may be active by day in cloudy, humid weather. Captive individuals of *Rana breviceps* bury themselves rapidly in loose soil, using the metatarsal tubercles for digging much as do the American spadefoots (*Scaphiopus*).

The Indian burrowing frog calls after sum-

mer downpours, usually from larger, deeper collections of water than those that attract *Bufo andersoni*. The frogs may call from the bank or while partly submerged. The note is a loud, nasal "quonk," repeated at intervals of about one second. I did not observe the eggs or tadpoles. A specimen 19 mm. in body length and probably recently transformed was collected 23 days after the first heavy rain; another of 33 mm. was taken in the same area six days later.

Beetles were the predominant food item in stomachs of three adult frogs examined. Crickets and unidentified insect remains were also present.

DISTRIBUTION: *Rana breviceps* occurs throughout most of India west of the Ganges delta and northward to eastern Nepal, thence westward through Sind. I collected it only in the lower Hab and Malir River valleys near Karachi and heard its call between Ghara and Haleji Lake at the northwest edge of the Indus delta. The true extent of its West Pakistan range remains to be discovered.

FAMILY MICROHYLIDAE

MICROHYLA TSCHUDI

These are small amphibians of toadlike habitus. Maxillary and vomerine teeth lacking; omosternum absent, sternum cartilaginous; pupil round; one or two dermal ridges across palate in front of pharynx, smooth or crenulate; head narrow and mouth small; tympanum indistinct or absent.

About 30 species are found in southeast Asia, Indonesia, southern North America, and northern South America.

Microhyla ornata (Duméril and Bibron) occurs from Taiwan and southern China through most of the Indian subcontinent and has been reported from Kashmir. It probably occurs in the better-watered eastern part of West Pakistan at low elevations, although there are no definite records.

This is a tiny reddish brown species with unwebbed toes and three metacarpal and two metatarsal tubercles. In Dacca, East Pakistan, it is plentiful in rice fields and lawns on rainy nights. The call is a weak, intermittent, rasping note.

TURTLES

FAMILY DERMOCHELIDAE

DERMOCHELYS BLAINVILLE

This genus and family include a single giant marine species differing from all other turtles in having the bones of the carapace and plastron largely replaced by a mosaic of polygonal bones embedded in leathery skin.

Epidermal laminae lacking. Certain bones of dermal mosaic enlarged and arranged in rows forming seven longitudinal dorsal ridges and five ventral ones. Limbs highly modified, forming paddle-shaped flippers without claws; anterior pair much larger than posterior. Strongly marked cusp on each side of upper jaw. Carapace length of 9 feet and a weight of 1500 pounds reported for specimens from the Pacific and Indian oceans, but these are much in excess of the average.

This turtle has a circumtropical distribution and occasionally wanders northward to Nova Scotia, the British Isles, Japan, and British Columbia and south to the Cape of Good Hope, Chiloe Island (Chile), New Zealand, and southern Australia.

Dermochelys coriacea (Linnaeus)

LEATHERBACK SEA TURTLE

Testudo coriacea LINNAEUS, 1766, p. 350 (type locality: Mediterranean Sea).

Dermochelys coriacea: BOULENGER, 1889, p. 10. SMITH, 1931, p. 59.

No specimens of this turtle were examined from West Pakistan waters, but through the kindness of J. A. Anderson I obtained a photograph of an adult specimen that was found stranded at Hawke's Bay beach near Karachi during June of 1958. I know of no other recent local record. If accounts of local fishermen are to be believed, the leatherback occasionally nests on islands near the mouth of the Indus.

FAMILY CHELONIIDAE

CHELONIA LATREILLE

Marine turtles with limbs modified, forming flippers, each flipper with a single claw; neck short and incompletely retractile; one pair of prefrontal shields; tomium of lower jaw coarsely toothed, that of upper jaw with

strong ridges on inner surface; four pairs of lateral laminae, first not touching nuchal; laminae juxtaposed; four inframarginal or bridge laminae.

There is a single species.

Chelonia mydas (Linnaeus)

INDIAN OCEAN GREEN TURTLE

Testudo mydas LINNAEUS, 1758, p. 197 (type locality: Ascension Island).

Chelonia mydas: SCHWEIGGER, 1812, p. 412.

DESCRIPTION: Carapace viewed from above ovoid, widest just behind front flippers; moderately arched, with highest point at about level of front flippers; margin not flared or serrate; no keels or ridges in adult, low median keel in hatchling; central laminae wider than long in hatchling but generally longer than wide in adult; sutures between lateral laminae virtually straight; marginals 24; plastron with two low ridges in young, smooth in adult; flippers extending posteriorly to level of seventh or eighth marginal; tail of adult male long, fleshy, extending about 20 cm. beyond marginals, and terminating in heavy flattened nail. Measurements of a series of eight hatchlings: carapace length, 48–53 mm.; carapace width, 38–40.5 mm.; plastron length, 39–44 mm.; shell height, 19–22 mm.; head width, 14.5–15.5 mm. No adult specimens were measured. Weights of two adult females: 123 and 150 kilograms (270 and 330 pounds).

Carapace of adult turtle olive brown to grayish green, streaked and irregularly spotted with black; plastron cream color; dorsal aspect of head and flippers dark olive; lower jaw and throat cream. Hatchlings slate gray to black above, with flippers, and carapace except for its anterior margin, distinctly edged with cream; eyes and lateral head shields with narrow light margins; ventral surfaces cream to ivory except for distal parts of flippers which are dark gray.

HABITS: Adult green turtles are often seen in coastal waters near Karachi. Except for egg-laying females, they do not normally go ashore. They have been observed plentifully at their nesting ground on the sandy, gently sloping beach at Hawke's Bay. Toward Cape

Monze where the coast is rocky, nesting takes place in coves. There seems to be little turtle nesting at Sonmiani Beach, perhaps because of the extremely gradual slope that would require the turtles to go overland a considerable distance. The nesting ground at Clifton mentioned by Murray (1884a) does not seem to be used regularly by the turtles.

Tracks indicate that some turtles go onto the beach at all seasons, but the principal egg-laying period is from late June through early November. During these months it is regularly possible to count 10 to 20 nesting turtles during a hunt of two or three hours. Contrary to popular belief, nesting does not necessarily take place at the time of the full moon, but the turtles do tend to come onto the beach as the tide is rising. The presence of beach cottages does not seem to discourage them much, although more turtles are seen where the cottages are fewest. Most nests are situated no more than 10 yards beyond the high-tide mark. It is not uncommon for a turtle to make several false starts at nest digging, each time making a wide, shallow depression by throwing out sand violently with her front flippers. She may wander several hundred yards searching for a site. Sometimes the females seem to get lost and may die of exhaustion. When the site has been selected and a large shallow basin dug, the actual digging of the nest hole begins. Only the hind flippers are used. The completed hole is about a foot in diameter and 15 to 18 inches deep. Once the digging of this hole has begun the turtle can scarcely be diverted from her task. The eggs are extruded in bursts of six or eight, with pauses between. The count of normal eggs in four nests was 81, 108, 120, and 125. Most clutches also include a few small misshapen eggs containing only albuminous fluid. Normal eggs are spherical and 50 to 55 mm. in diameter. After egg laying is completed, the turtle scoops sand into the mouth of the hole and packs and flattens the surrounding sand by swinging and rocking movements of her shell. The construction of the nest, the laying of the eggs, and the filling of the hole took 90 to 130 minutes in cases in which we watched the whole process.

On June 28, Edgar Cook took 11 eggs from a nesting female. He buried them outdoors under 16 inches of sand in a spot protected

from run-off and flooding. The sand was kept fairly moist by rain and sprinkling. After six weeks the eggs were dug up, and two were found spoiled. The others were moved indoors and placed on moist sand heated by a lamp. The first egg hatched August 16; six others hatched during the following 72 hours. These hatchlings had large unabsorbed yolk sacs, a feature not seen in newly hatched turtles in the field.

I noted hatchlings at the beach from July 21 to October 25, the greatest number during late September and early October. Most emerge at night, but I saw a few struggling toward the sea under a blazing afternoon sun. One night I saw at least 50 hatchlings on a sandy mound about 30 feet from the surf. Within 15 minutes they had dispersed, most of them reaching the sea. The low-intensity light of a flashlight masked with a cloth seemed to attract hatchlings, while the direct full beam of the same light repelled them.

Stray dogs and jackals destroy great numbers of turtle nests. If they do not eat all the eggs, crows, other birds, and monitor lizards finish the job. On the crowded beach at Hawke's Bay, I saw one nesting turtle demolish the nest of an earlier arrival. Crabs, birds, and predatory mammals take heavy toll of the newly hatched turtles before they reach the sea.

Other activities of the green turtle are more difficult to observe. On January 7 while sailing near the entrance of Karachi Harbor, we saw a single turtle of little more than hatchling size and several large ones in an area of rather dense marine vegetation. Immature turtles with shells 12 to 15 inches long were seen in coves near Cape Monze feeding on vegetation. Using face masks and flippers, Peter Biesiot and I watched turtles of both sexes feeding in water 5 to 10 feet deep during November and December. Green turtles apparently in copulation were seen 100 to 150 yards off Hawke's Bay beach on October 5 and 12. The upper (male?) turtle's shell was mostly out of water and its head depressed; the lower turtle's head was raised and its shell visible only momentarily. The pairs appeared to be drifting with the current. Occasionally a flipper was lifted clear of the water. I swam within about 10 yards of one pair before they disappeared.

Local dietary customs protect the green turtle in West Pakistan. Although "up-country" Pakistanis sometimes taunt their maritime compatriots as "turtle-egg eaters," I saw little evidence that either the eggs or the adult turtles were eaten in Karachi or in the coastal villages. A few turtles and their eggs are taken for food by foreigners and non-Muslim nationals, but at present this constitutes no threat to the *Chelonia* population.

DISTRIBUTION: The species is circumtropical in range, with occasional stragglers reported north to New England, southern California, and Japan and south to southern Chile and the Cape of Good Hope. In addition to the records from near Karachi, Shockley (1949) reported the species as nesting in numbers at Ras Jawani near the Iranian border. Presumably it occurs in all West Pakistan coastal waters.

CARETTA GRAY

The single species of this genus differs from *Chelonia* in the following external characters: four prefrontal shields; five or more pairs of lateral laminae, first touching nuchal; three inframarginal laminae without pores; usually 26 marginals; carapace of adult brown or reddish. It is a very large turtle that may attain a carapace length of 6 feet and weight of 1000 pounds.

The species occurs in the warmer parts of all oceans but is less confirmedly tropical than the other sea turtles. It occasionally enters tidal creeks and marshes and the mouths of rivers.

Caretta caretta gigas, the race of this turtle in the Indian Ocean, undoubtedly occurs in West Pakistan waters, but I obtained no specimens. Literature records are difficult to evaluate, since this species has repeatedly been confused with *Lepidochelys olivacea*.

LEPIDOCHELYS FITZINGER

This genus is very similar to *Caretta* in external characters, differing in having four inframarginal laminae, at least some of which are pierced by pores, in having a more rounded and wider shell, and in being of a gray or olive color. These turtles are considerably smaller and do not attain a carapace length of much over 30 inches or a weight in excess of 180 pounds.

There are two species, one with a distribution centering about the Gulf of Mexico and Atlantic coast of the southern United States, the other widely distributed in the Indian and Pacific oceans.

Lepidochelys olivacea (Eschscholtz)

PACIFIC RIDLEY TURTLE

Chelonia olivacea ESCHSCHOLTZ, 1829, p. 2, pl. 3 (type locality: Manila Bay, Philippines).

Lepidochelys olivacea: FITZINGER, 1843, p. 30.

DESCRIPTION: Carapace of adult cordate when viewed from above, widest near midpoint; moderately arched, with highest point just behind front flippers; margin slightly flared; no keels or ridges in adult, hatchling with three distinct keels; usually six or seven lateral laminae, shape and arrangement often asymmetrical; usually 26 marginals, occasionally 27, 28, or 29; four inframarginals at least two pierced by pores near their posterior margins; plastron with two tuberculate ridges in young, smooth in adult; anterior flippers shorter and broader than in *Chelonia*; tail of female very short, not projecting beyond marginals, tail of male longer, extending posteriorly as far as edge of extended hind flipper. Measurements of a series of six hatchlings: carapace length, 41.5–46 mm.; carapace width, 32–39 mm.; plastron length, 33.5–37 mm.; shell height, 18.7–21 mm.; head width, 14.6–16.2 mm.

Carapace of adult uniformly dark gray; plastron bluish white to cream; head and flippers dark gray above, paler beneath. Hatchlings slate gray above; plastron dull yellowish, with more or less dusky suffusion; under surfaces of flippers dark brownish gray.

HABITS: The ridley occurs near Karachi in association with the green turtle but seems considerably less plentiful. The two species nest together at Hawke's Bay. We observed them there on October 1 and 10; Edgar Cook captured one on July 21. The behavior of one female we observed was much like that of the green turtle but less vacillating. She dug her nest, laid her eggs, and returned to the sea within 55 minutes. Hatchling ridleys were collected during September and October.

DISTRIBUTION: The range includes the warmer parts of the Pacific and Indian oceans from Baja California to Chile in the east and

from the southern islands of Japan to Australia and South Africa in the west.

ERETMOCHELYS FITZINGER

This genus, with a single species, differs from other marine turtles in having imbricate laminae except in the very young. Other external features are: four pairs of lateral laminae; four pairs of inframarginals; snout long and narrow; two pairs of prefrontals; all head shields with distinct light margins. The size is small for a sea turtle, with the carapace length rarely exceeding 30 inches and the weight less than 200 pounds.

This species is the source of commercial tortoiseshell.

***Eretmochelys imbricata squamata* Agassiz**

PACIFIC HAWKSBILL TURTLE

Eretmochelys squamata AGASSIZ, 1857, p. 382 (type locality: Indian and Pacific oceans; restricted to coasts of Ceylon by Karl P. Schmidt, 1953).

Eretmochelys imbricata squamata CARR, 1942, p. 4.

DESCRIPTION: The single specimen examined, a juvenile without collecting data but presumably of Indo-Pakistan origin, shows the following characteristics: carapace length, 173 mm.; width, 127 mm.; continuous median keel on last four centrals, no lateral keels; 26 marginals; plastron with pair of heavy keels not converging posteriorly; length of plastron, 138 mm.; shell highest just behind insertion of front flippers, its height there, 52 mm.; front flippers rather narrow, extending posteriorly to seventh marginal; head width, 30 mm.

Carapace laminae pale yellow streaked and mottled with rich brown; plastron yellow, with more or less dark pigment on posterior part of each lamina; head shields black to dark brown, with light edges; flippers black, many lateral scales with light edges.

DISTRIBUTION: This species occurs in warm oceans throughout the world but tends to be more or less localized in abundance. Records of the subspecies *squamata* extend from Madagascar along the east African coast and the coasts of Ceylon and India to southern Japan, thence across the Pacific to the coasts of Mexico, Central America, and northern South America. The hawksbill turtle evi-

dently reaches West Pakistan coasts only as a rare wanderer. There is no evidence of its breeding there.

FAMILY EMYDIDAE

KACHUGA GRAY

Shell with median ridge; axillary and inguinal buttresses well developed, extending almost to neural bones; fourth central lamina much longer than broad; skin of hind part of head divided into shields; alveolar surfaces of jaws broad, surface of upper jaw with strong median ridge; limbs not paddle-like; digits fully webbed and clawed; tail short in both sexes.

Six species are found from the Indus Valley across northern India to Burma. Two occur in West Pakistan.

***Kachuga smithi* (Gray)**

BROWN RIVER TURTLE

Batagur smithii GRAY, 1863, p. 253 (type locality: Chenab River, Punjab).

Kachuga smithii: BOULENGER, 1889, p. 57. SMITH, 1931, p. 125.

DESCRIPTION: Carapace viewed from above ovoid, widest just anterior to hind limbs, its width 67 to 76 per cent of its length; strongly arched, highest at about midpoint; shell height 36.5–42.5 per cent of carapace length; margin of carapace flared, not serrate; third central lamina quadrangular to pentagonal, with nearly straight posterior border and keel that terminates bluntly; fourth central with narrow anterior projection that just touches third; 24 marginals; plastron broadly and rigidly articulated with carapace, posterior end with wide notch, plastron length 96–99 per cent of carapace length in female, 91–93 per cent in male; head width 20.5 to 24 per cent of shell width; snout projecting well beyond lower jaw; nostrils subterminal; edges of both jaws finely serrate, large terminal cusp on lower jaw; limbs with transversely enlarged scales; digits webbed to beyond bases of nails; penis broadly lanceolate, widely cleft dorsally, enclosing a short, open, cleft cylinder, dorsal edge of which bears a pair of projections and inner surface of which is covered with papillae, crossed transversely by septum, with central thickening around sulcus spermaticus, dorsal lips of sulcus with

three or four papillae; tail of adult male slightly more fleshy than that of female and projecting free about 10 per cent of carapace length in contrast to about 5 per cent for female. Carapace lengths of eight adult females, 153–227 mm.; of three adult males, 101–108 mm.

Carapace olive brown to horn color, central ridge dark brown to black, with touches of russet in young; plastral laminae, bridge laminae, and lower sides of marginals black or dark brown bordered with yellow; head light olive to pale grayish yellow, a ruddy tinge to temporal region; canthus rostralis dark; iris pale green to sky blue; neck with faint cream stripes; limbs pale gray, margins of webs dull yellow.

HABITS: This turtle is common in river channels and in the larger canals and is occasionally found in lakes and ponds communicating with the river. It frequents muddy water with some current where there are logs, old bridge abutments, and other protruding objects. This is the only West Pakistan turtle given to the sort of social basking so common in North American emydids. This behavior is most evident in the early spring and in the fall after the summer inundation has subsided. The basking turtles are extremely alert and invariably slide into the water while the observer is some yards away. They burrow rather promptly into the mud and may sometimes be found by probing. Floods occasionally carry the turtles from their habitat, leaving them stranded in low meadows. One was found crossing a highway; shells of others trampled by cattle have been seen. The turtles are quiescent from early December to early March, but some bask during the warmest hours.

A large female weighing about 4 pounds was kept by the Gulick family in an outdoor enclosure. She was seen digging October 7 to 10. Sometime during this period she laid seven eggs 43 to 45 mm. long and 22 to 24 mm. in diameter. The eggs had smooth, firm shells. They were reburied and examined late in March. They showed no evidence of development, although the contents were liquid and fresh. Two females collected in Sanghar District contained eggs, some of which were forced out when the specimens were preserved October 12. The smallest juvenile seen

had a carapace length of about 50 mm. and was found late in April.

Our captives were omnivorous but preferred insects. They also ate meat, fish, frogs, and fruit of several kinds. They were shy turtles and did not attempt to bite.

DISTRIBUTION: This seems to be essentially a turtle of the Indus River system, although there is a single record from Rajshahi District in Bengal. In West Pakistan it is plentiful in streams of the Indus drainage north at least to Jhelum.

Kachuga tecta (Gray)

INDIAN SAWBACK TURTLE

Emys tecta GRAY, 1831, p. 23, pl. 5 (type locality: India).

Kachuga tectum: BOULENGER, 1889, p. 58; SMITH, 1931, p. 126.

DESCRIPTION: Shell higher and less tapering than in *K. smithi*, shell height 48.5–52 per cent of carapace length; third central lamina pentagonal, pointed posteriorly; keel of third central projecting posteriorly as short, blunt spine, keels of first and second centrals high and nodular, especially in young males; anterior projection of fourth central very narrow, in one of three specimens failing to touch third; other structural characters and proportions much like those of *K. smithi*. Carapace lengths of two adult females: 164 and 173 mm.; a male of 84 mm. is probably immature.

Carapace rich dark brown, in some cases narrowly edged with deep yellow or orange; vertebral keel reddish; plastron yellow to orange, with large, dark, irregular spots; head blackish, with broad bands of dull orange to red extending from behind eye to occiput; edges of jaws yellow; iris greenish; neck with narrow pale green lines; limbs dark gray edged and spotted with yellow. Colors of young more brilliant.

HABITS: Based on meager data, this seems to be more of a quiet-water turtle than *K. smithi*. I collected one sawback in a large, shallow, oxbow lake with abundant aquatic vegetation; another was captured in similar habitat by Sindhi villagers. This turtle is said to be plentiful in canals near Bubak at the margin of Manchar Lake.

The sawback seems to be less alert than *K. smithi* and not so good a swimmer. One

kept in captivity for more than a year was normally quite active both on land and in water except during the cool weather when it lay on the bottom of its tank, occasionally protruding its nose to breathe. Its disposition was generally good, but it occasionally tried to bite. It fed almost wholly upon vegetable material, preferring cucumber and melon.

DISTRIBUTION: This turtle inhabits the Ganges, Brahmaputra, and Indus river systems of northern India, its distribution being largely complementary to that of *K. smithi*. In West Pakistan *K. tecta* seems to be restricted to the Indus Valley of middle Sind within a 50-mile radius from Manchar Lake.

HARDELLA GRAY

This genus differs from *Kachuga* externally in the form of the fourth central lamina which is not longer than broad; there are also differences between the skulls of the two genera.

There is a single species.

***Hardella thurgi* (Gray)**

BRAHMINY RIVER TURTLE

Emys thurgi GRAY, 1831, pp. 22, 72 (type locality: India).

Hardella thurgi: GRAY, 1870, p. 58. SMITH, 1931, p. 122.

Hardella indi GRAY, 1870, p. 58 (type locality: Indus River).

DESCRIPTION: Carapace viewed from above ovoid, widest just anterior to hind limbs, its width 69–75 per cent of its length; moderately arched, highest a little anterior to midpoint; shell height 35–44 per cent of carapace length; margin of carapace slightly flared, not serrate; first three central laminae more or less quadrangular, fourth hexagonal, and fifth pentagonal; second, third, and fourth centrals considerably broader than long in young, becoming somewhat narrower with increased age; each central with low, heavy keel terminating near posterior edge of lamina; 24 marginals; plastron broadly and rigidly joined to carapace, posterior end with moderately wide notch, plastron length 97–101 per cent of carapace length in female, 91–94.5 per cent in male; head width 20.5–23.6 per cent of shell width; snout projecting moderately beyond lower jaw; nostrils terminal; edge of upper jaw finely serrate, alveolar surface much expanded and with central ridge; alveolar

surface of lower jaw coarsely serrate, with large central cusp; skin of hind part of head smooth; limbs with narrow, transverse scales; digits webbed well beyond bases of claws; tail of male anterior to vent thick, fleshy, projecting well beyond edge of shell, tail posterior to vent very short in both sexes. Carapace length of largest specimen, presumably a female, 533 mm.; that of another adult or near-adult female, 350 mm.; carapace lengths of two males, 160 and 145 mm.

Carapace dark brown or dark gray, becoming black along vertebral keel; free edges of marginals deep yellow except in largest individuals; dull yellow band along juncture of lateral and marginal laminae representing a hiatus in ossification of shell and disappearing in large adults; plastron cream, blotched and clouded with dark gray; head dark brown to black; amber band across snout; yellow to amber band arising above and behind eye and extending onto neck; cream stripe on upper jaw and snout below nostrils; cream to yellow stripe along lower jaw and onto neck; occasionally short yellow to amber stripe on crown; iris black, speckled with brassy; limbs dark gray, narrowly edged with pale yellow posteriorly.

HABITS: Several specimens were observed or collected in shallow, vegetation-choked lakes and ponds; others were recorded from deep quiet inlets of the Indus or from canals. These turtles are highly aquatic but sluggish, spending much of their time resting on the bottom. In quiet water they have been seen floating at the surface, but they rarely emerge to bask. Leeches and egg masses of aquatic insects are often attached to the shell and soft parts. The turtles are active throughout the year, but most were collected in October, November, February, and May. Most of the specimens obtained had carapace lengths of 90–100 mm. and apparently represent yearling reptiles. Hatchlings of this species and of other West Pakistan fresh-water turtles are extremely difficult to find and apparently hide in thick mats of vegetation in shallow water.

The digestive tract of one specimen contained only plant material. Captive individuals of *Hardella* ate fruit and vegetables of many kinds but rarely showed interest in animal food, although one small turtle ate

part of a frog. The disposition of the species is quiet and gentle.

DISTRIBUTION: This is a turtle of the Ganges, Brahmaputra, and Indus river systems, ranging from Sind eastward to Sylhet. In West Pakistan it is known from the Indus valley northward at least to Sukkur. There is a single record for a coastal mangrove swamp near Karachi.

GEOCLEMYS GRAY

In this genus the axillary and inguinal buttresses are less extensively developed, reaching about the midpoint of the costal bones; the alveolar surface of the jaw lacks a median ridge; and the carapace is tricarinate.

There is a single species.

***Geoclemys hamiltoni* (Gray)**

SPOTTED POND TURTLE

Emys hamiltoni GRAY, 1831, p. 21 (type locality: India).

Geoclemys hamiltoni: GRAY, 1855, p. 17. SMITH, 1931, p. 111.

Melanochelys pictus MURRAY, 1884b, p. 107 (type locality: Upper Sind).

DESCRIPTION: Carapace oblong, widest near midpoint, strongly arched and highest a little anterior to midpoint; margin not flared or serrate; heavy ridge on each central lamina and on upper part of first three lateral laminae, ridges terminating at or close to posterior edge of lamina and forming three serrate keels that are strikingly prominent in young turtles; 24 marginals; plastron rigidly joined to carapace; angulate laterally and with lateral keel in young; posterior end with deep notch, angulate in male and more or less lunate in female; head large and massive in adult; snout barely projecting beyond lower jaw; nostrils terminal; edges of jaws smooth, lower with central cusp; alveolar surfaces of both jaws greatly expanded; skin of hind part of head divided into more or less symmetrical shields; scales of forelimbs strongly developed and forming transverse rows, hind limbs much less scaly; digits webbed to bases of claws; tail short in both sexes but portion anterior to vent thicker in males. Measurements of a young adult male: carapace length, 177 mm.; carapace width, 114 mm.; plastron length, 163 mm.; shell height, 76 mm.; head width, 30 mm. Measurements of an adult

female: carapace length, 273 mm.; carapace width, 175 mm.; plastron length, 255 mm.; shell height, 108 mm.; head width, 50 mm. The largest individual captured (not preserved) had a carapace length of 14 inches (ca. 350 mm.) and weighed 10½ pounds.

Carapace black, with more or less wedge-shaped, yellow marks more prominent on centrals and marginals and more numerous and vivid in young, largest adults may be almost uniformly blackish; plastron dark brown to black, each lamina with a pattern of more or less radially arranged spots and striae; head black, with irregularly arranged, round, yellow spots, largest on side of snout and behind eye; iris dark brown; throat spotted like head; limbs dark gray to black, spotted with yellow.

HABITS: My specimens were collected in oxbow lakes and sloughs in quiet, shallow, rather clear water with considerable aquatic vegetation. Three were purchased from villagers near Sehwan who collected them by diving and probing about in the shallow water. Two small turtles were netted in a shallow lake along with specimens of *Kachuga tecta* and *Hardella thurgi* on October 23.

On February 21, Walter Fairervis and I saw two adult turtles, apparently of this species, in a large clear pool of a tributary of the upper Hab River. When first seen they were in water about a foot deep and were swimming slowly in a circle. We watched them through binoculars for several minutes. The larger turtle seemed to be nipping at the head and limbs of the smaller. The smaller eventually swam into dense vegetation; the larger lay on the bottom. We attempted to capture it but were unsuccessful.

Shortly after capture three turtles voided dozens of snail opercula, many shell fragments, and considerable algae. The last-mentioned material appeared to be undigested and may have been swallowed accidentally. In captivity these turtles spent most of their time resting on the bottom under shelter. The large ones were rather belligerent if disturbed; the small ones, shy and gentle. They fed readily on meat, snails, and insects but refused vegetable food.

DISTRIBUTION: The range of this species is poorly known but seems to be restricted to the Ganges and Indus river systems. In West

Pakistan it occurs in the Indus Valley from Jacobabad south to Saidabad, and, on the basis of the sight record mentioned above, in the upper Hab River. It is also reported from lakes in the Thar Parkar Desert.

FAMILY TESTUDINIDAE

TESTUDO LINNAEUS

Mostly terrestrial turtles; hind limbs columnar; anterior surface of forelimbs covered by heavy scales; toes without web; axillary and inguinal buttresses short, just reaching costal bones; costal bones alternately narrow and wide; plastron firmly united to carapace.

The genus is found extensively in Europe, Asia, Africa, South America, and certain island groups, notably the Galapagos and Seychelles. In North America it is replaced by the closely related *Gopherus* which has more strongly flattened forelimbs. There are about 45 species, two of which occur in West Pakistan.

Testudo horsfieldi Gray

AFGHAN TORTOISE

Testudo horsfieldi GRAY, 1844, p. 7 (type locality: Afghanistan). SMITH, 1931, p. 146.

Testudo baluchiorum ANNANDALE, 1906, p. 75 (type locality: Baluchistan).

DESCRIPTION: Carapace viewed from above oblong to almost circular, widest at about level of hind limbs, its width 75–85 per cent of its length; strongly arched and rather flat on top, highest near midpoint; shell height 47.5–50.5 per cent of carapace length; posterior margin of carapace decidedly flared, anterior margin less so; central laminae broader than long; 23 marginals; plastron slightly truncate anteriorly and with a broad notch posteriorly, plastron length 94–97 per cent of carapace length; head width 18–18.5 per cent of shell width; snout not projecting beyond lower jaw; edges of jaws smooth; tip of upper jaw with three blunt cusps, lower with one; integument of top and sides of head divided into shields; forelimbs and hind limbs each with four claws; tail short in both sexes. Carapace lengths of three adults: 170–208 mm.

Carapace dark brown to horn color, without definite pattern, seams between laminae pale in young; plastron more or less diffusely and heavily clouded with dark brown in

adult, yellowish with dark central blotch in young; head and limbs dark gray to khaki; iris dark brown.

HABITS: These tortoises frequent hilly, rocky terrain and seem to be most plentiful in grassy places near springs or small streams. In one small meadow I had seven individuals under observation simultaneously. They range into moderately arid rocky desert but seem to avoid areas where the soil is predominantly sand or clay. Most of those I saw were at elevations between 5000 and 7000 feet.

During May and June I found the Afghan tortoises most active about mid-morning and again during late afternoon. At night and during the hotter hours of the day the reptiles took refuge in shallow burrows beneath large boulders or outcrops of rock. Most of the tortoises seen were half-grown to adult. A small juvenile was found almost buried in gravel at the edge of a permanent stream.

A captive tortoise laid several eggs on June 8 and 10, all but one of which were accidentally broken. It measured 41 by 28 mm. and had a hard smooth shell. Another tortoise kept in a Karachi garden laid eggs at least twice. Dates were not recorded, but the young tortoises appeared during the last week of June. One hatchling given me August 1 had a carapace length of 51 mm. Three years later it had grown to 70 mm. Another individual, alive as the present paper is being written, had a carapace length of approximately 150 mm. when captured in May, 1962, and had grown to 175 mm. by October, 1964.

The adult tortoises feed almost entirely on leaves, fruit, and flowers; grass is rarely eaten, and animal food is generally ignored. The young, at least, seem especially attracted to flowers or fruit with a red color. Although they apparently can survive several weeks without water except that supplied by the plants they eat, these turtles drink frequently if water is available.

In the field these tortoises seem almost indifferent to the presence of man and domestic animals. I have seen goats and tortoises grazing within a few inches of each other and have walked close to the reptiles without evoking any particular reaction on their part. If actually touched, they withdrew their head and limbs but never attempted to bite.

The present-day inhabitants of Baluchi-

stan do not seem to eat tortoises or use their shells, but *T. horsfieldi* remains have been found in Bronze Age village sites, perhaps indicating their use in an earlier era. The local name for this species is "bari kachua," i.e., "boulder turtle."

DISTRIBUTION: The range of *T. horsfieldi* extends from the northeast shores of the Caspian Sea eastward across Kazakhstan to Lake Zaysan and thence southwestward to Waziristan and Iran. In West Pakistan it is generally distributed in northern and western Baluchistan. I have reports of its occurrence in western Mekran, and J. A. Anderson found fragments of bone and laminae in the Pab Hills of Las Bela. This is the only definite record I have of its occurrence below 4000 feet.

***Testudo elegans* Schoepff**

INDIAN STAR TORTOISE

Testudo elegans SCHOEPPF, 1792, p. 111 (type locality: India). SMITH, 1931, p. 138.

DESCRIPTION: Carapace viewed from above oblong in adult to almost circular in young, widest at insertion of hind limbs; very strongly arched, highest near midpoint, margin not flared; central and lateral laminae umbonate; nuchal absent; 23 marginals, twelfth (postcentral) about twice size of others; plastron with small shallow notch anteriorly and broad notch posteriorly; snout not projecting; edge of upper jaw finely serrate, of lower jaw coarsely serrate and with large central cusp; integument of head divided into small shields; tympanum well demarcated; forelimbs with five claws, hind limbs with four; tail very short in both sexes. Measurements of an adult male: carapace length, 200 mm.; carapace width, 127 mm.; shell height, 109 mm.; plastron length, 173 mm.; head width, 30 mm. Measurements of a small juvenile: carapace length, 52 mm.; width, 45 mm.; shell height, 36 mm.; plastron length, 45 mm.; head width, 12 mm.

Carapace very dark brown to black; growth center of each lamina yellow, with a series of yellow stripes, usually five to 10 in number, radiating from it; plastron similar; head and limbs dull yellow, spotted and mottled with black. In young turtles, radial stripes seen only on centrals and laterals and are usually three or four on each plate; margi-

nals and plastral laminae dark, with yellow mottling.

HABITS: I observed no truly feral population of this species. In the suburbs of Karachi the turtles live in semidomestication in residential compounds. They are generally active only during the monsoon period from late June through September or early October. Ole Heggem reported seeing the turtles in copulation soon after the onset of the rains, and during November his gardener accidentally destroyed a clutch of five turtle eggs. He found small young during late August and September of two consecutive years. I examined some of these juveniles. When I saw them in October the smaller ones were certainly in their first season but appeared to be several months old. I suspect that hatching occurs during February or March, and the hatchlings remain buried and quiescent until the onset of the rains. The juvenile specimen, of which the measurements are given above, was collected in May and appears to be about one year old.

The attractive pattern and gentle disposition make this species a desirable pet. My specimens fed on grass and a wide variety of fruits, leaves, and flowers but showed no interest in animal food. They drank frequently during the hot weather and seemed uncomfortable if deprived of water for more than a few days.

DISTRIBUTION: The star tortoise inhabits peninsular India and Ceylon, ranging to Orissa in the east and Sind and Kutch in the west. Records from West Pakistan are very few. Murray (1884a) reported it from the Hab River Valley. Anderson and Minton (1963) recorded three specimens from Nagar Parkar in extreme southeastern Sind.

FAMILY TRIONYCHIDAE

TRIONYX GEOFFROY

In this family the carapace, plastron, head, and limbs are covered with smooth integument; horny laminae and scales are lacking except for vestiges on the limbs. The nostrils are at the tip of a fleshy proboscis; the jaws are concealed by fleshy lips. The limbs are flipper-like; the digits are extensively webbed and bear only three claws. Additional diagnostic characters of this genus include: seven or eight pairs of pleural bones; marginal

bones absent; no cutaneous femoral flaps; and skull convex above. For additional osteological characters see Webb (1962).

The genus includes 14 or 15 species. It occurs in North America, much of Africa, and southern and eastern Asia, extending to New Guinea and some of the larger islands of Indonesia and Japan. One species inhabits West Pakistan.

***Trionyx gangeticus* Cuvier**

INDIAN SOFTSHELL TURTLE

Trionyx gangeticus CUVIER, 1824, pp. 186, 203, 206 (type locality not stated but by inference the River Ganges). SMITH, 1931, p. 167.

DESCRIPTION: Carapace viewed from above oval in adult to almost circular in young, widest near midpoint; arch of carapace low, vertebral region slightly depressed in adults; bones of carapace, hyoplastron, hypoplastron, and xiphiplastron strongly rugose and pitted in adults; plastron much shorter than carapace, hyoplastron and hypoplastron not fused to each other; integument of carapace and plastron smooth in adults, carapace with fine tuberculate ridges in young; plastral callosities not very evident in life; head broad and massive; eyes dorsolateral and situated well anteriorly; proboscis stout and of moderate length; nasal septum with lateral ridge; edges of jaws smooth, alveolar surfaces expanded and granular; few transversely enlarged scales on forelimbs; tail anterior to vent thick and fleshy, especially in male, portion posterior to vent very short in both sexes. Measurements of an adult male: length of disc, 425 mm.; width of disc, 298 mm.; height of shell, 106 mm.; length of plastron, 322 mm.; width of head, 65 mm. Corresponding measurements for an adult female: length of disc, 460 mm.; width, 325 mm.; shell height, 136 mm.; plastron length, 375 mm.; head width, 73 mm.

Carapace of adult dull olive to green, unmarked or with black reticulation; plastron ivory, somewhat grayish in region of callosities; head and limbs sage green, with black mottling, head in some with black oblique stripes; iris greenish yellow flecked with black. Young bright green, with fine, intricate, black reticulation; four fairly distinct dorsal ocelli.

HABITS: These huge turtles inhabit rivers and large canals, particularly where the water is turbid with some current and a mud bottom. The turtles do not ordinarily inhabit lakes, small waterways, or temporary bodies of water. However, one juvenile was collected in an oxbow lake, and a large adult was found in a small canal a few hundred yards from the East Nara. Along the East Nara on April 1 and 2 at least 20 adult turtles were seen basking on sand bars, on the banks, or resting in shallow water with their heads protruding. In August when the water was high and swift and most of the bars were submerged, only one turtle was seen. In early October, as the water receded, turtles were again evident but were not so plentiful as in the spring. They can sometimes be captured by hand, but netting is generally more satisfactory. Although they are normally shy and attempt to escape, they are savage biters when cornered. I treated a man bitten by a captive turtle weighing about 15 pounds. His finger was severely bruised, but the skin was unbroken.

A female weighing 29 pounds (13.2 kilograms) was collected on October 9. Her reproductive tract contained three fully developed spherical eggs 32 mm. in diameter and many immature eggs. Presumably the large eggs were part of a larger complement that had been laid a short time previously. The mouth and throat of this specimen contained neatly chopped segments of stems of aquatic plants, and the stomach and upper intestine were packed with vegetable material. The digestive tract of another turtle contained aquatic vegetation and some animal matter, probably fish.

The meat of the Indian softshell has an excellent flavor, resembling that of beef. I was told that in some cities on the Indus considerable numbers of large turtles (probably *Chitra*, *Lissemys*, and *Hardella* as well as this species) are taken for food by Hindus and other non-Muslim nationals. Fragments of *Trionyx* and *Lessemys* shell bones have been picked up frequently at archeological sites in the Indus Valley, and the turtles are depicted on Harappan pottery.

DISTRIBUTION: This species inhabits the Ganges, Indus, and Mahanadi river systems to Nepal, Orissa, and East Bengal. In the Indus drainage of West Pakistan it occurs

northward at least to Dera Ismail Khan and Montgomery.

CHITRA GRAY

This genus differs from *Trionyx* chiefly in osteological features. The skull is long, narrow, and flat above; there are eight pairs of pleural bones; for other characters see Smith (1931).

There is a single species.

Chitra indica (Gray)

NARROW-HEADED SOFTSHELL TURTLE

Trionyx indicus GRAY, 1831, p. 47 (type locality: Ganges River at Fategarh).

Chitra indica: GRAY, 1844, p. 49. SMITH, 1931, p. 162.

DESCRIPTION: Habitus and external features generally similar to those of *Trionyx gangeticus*; head long, narrow, rather flat; eyes dorsolateral, small, situated even farther anterior than in *Trionyx gangeticus*; proboscis very short; nostrils small, nasal septum without lateral ridge; edges of jaws smooth and very sharp, alveolar surfaces smooth and but slightly expanded; limbs more flipper-like and nails shorter than those of *T. gangeticus*. Reported to be one of the largest fresh-water turtles, attaining a disc length of 800 mm. Measurements of a subadult female: disc length, 315 mm.; disc width, 231 mm.; shell height, 66 mm.; plastron length, 235 mm.; head width, 39 mm.

The only live specimen examined was pale bluish gray, with dark gray reticulation on the dorsal surface; plastron ivory; head and limbs of same color as disc; faint, yellowish, dark-edged stripes on neck; iris pale brassy. A preserved juvenile showed four rather indistinct dorsal ocelli and an extremely intricate pattern of dark reticulation on the carapace.

HABITS: This turtle appears to be more restricted in habitat than the Indian softshell and is confined to sandy sections of the Indus and other large rivers. One specimen was obtained from a native fisherman who took it in his nets late in October. It was a mild-tempered animal in captivity, although clearly a creature that should be treated with caution. Its anatomical peculiarities suggest that it is highly aquatic and probably depends to a great extent on pharyngeal respi-

ration. The form of the head and jaws suggests a carnivorous diet.

DISTRIBUTION: This turtle is known from the Ganges, Sutlej, and Indus rivers of India, Pakistan, and Nepal and from the Ratburi River of Thailand. There is a questionable record for Malaya. The distribution of the species in West Pakistan may include all the lower and middle Indus Valley, but definite records are few.

LISSEMYS SMITH

A pair of hinged cutaneous flaps protecting hind limbs; the hyoplastron and hypoplastron fused; bones of carapace and some of those of plastron coarsely granular; anterior section of plastron movable; marginal bones present posteriorly.

The genus is essentially Indian in distribution; the three included forms are currently treated as subspecies.

Lissemys punctata punctata (Lacépède)

INDIAN FLAP-SHELL TURTLE

Testudo punctata LACÉPÈDE, 1788, p. 446 (type locality: India).

Lissemys punctata punctata: SMITH, 1931, p. 157.

DESCRIPTION: Carapace viewed from above broadly oval in adult to circular in young, widest just anterior to hind limbs, width of disc 77–86 per cent of its length; carapace moderately arched, shell height 35–40.5 per cent of carapace length; margin of carapace smooth, slightly flared posteriorly; marginal bones not united with pleurals; plastron large but mostly cartilaginous, its length 88–97.5 per cent of carapace length; pair of large flaps that can be closed over hind limbs and smaller flap over tail; seven plastral callosities; head large, its width 21.5–25 per cent of carapace width; proboscis short and stout; nasal septum without lateral ridge; eyes more lateral than in other West Pakistan trionychids; edges of jaws smooth, alveolar surfaces expanded and granular; claws large and heavy; penis thick, oval, with deep dorsal cleft and four pointed, soft papillae; tail very short in both sexes. Carapace lengths of two adult males, 145 and 162 mm.; of three adult females, 170–250 mm. Females with carapace lengths of 270 to 275 mm., and weights of 4.3 to 4.5 kilograms (about 10 pounds), were collected, but none of this size was preserved.

Smallest turtles examined light olive brown, with numerous round spots and dashes of dull yellow; carapace narrowly edged with pale yellow; plastron cream; head and limbs gray, with light yellow spots on head and neck. Older juveniles and young adults with more vivid yellow spots and dashes on carapace; occasionally these fuse, reducing the ground color to a reticulum; head pattern usually showing pair of curved light marks on crown and light postocular stripe; iris pale yellow; plastron cream to ivory, with gray patches over callosities. Large adults dark olive brown, with irregular dull yellow ocelli edged with black and many small yellow dots; occasionally uniform drab brown above.

HABITS: These turtles are plentiful in shallow muddy ditches, lakes, and marshes. A rich hydrophyte flora does not seem essential to them, and they are often found in situations that are dry several months of each year. They occur in the main channels of rivers and in large canals but are not plentiful there.

These turtles are frequently seen swimming lazily in quiet shallow water or basking on the bank or on rafts of vegetation. Rarely do they climb onto logs or other projecting objects. They are less wary than many aquatic turtles and sometimes may be caught by hand. They are most in evidence from the onset of the rains to the end of January but may be seen at any time. They are often found crawling about on land but never at any great distance from water. A captive that escaped from its tank was found several weeks later digging out of a flower bed after the soil had been thoroughly wetted. Presumably the wild turtles also burrow to escape desiccation.

Most flap-shells have a mild disposition, but it is unwise to trust large ones. Newly captured individuals withdraw the limbs and head behind the protective flaps. A bright yellow secretion with a faintly fishy odor and

taste often exudes from small openings near the junction of plastron and carapace.

On September 27 about mid-afternoon I saw an individual of *Lissemys* digging a nest in a shady spot about 7 feet from the edge of a pond. She dug slowly with alternate movements of her hind feet. She was alarmed before completing her nest and scrambled into the water. A captive weighing 9.5 pounds laid 14 eggs on November 1 and 2. Two smaller captive turtles deposited clutches of six and 10 eggs during the second and third weeks of November. The eggs are spherical or nearly so, hard-shelled, and 24 to 30 mm. in diameter. I was not successful in hatching them, and the majority seemed to be infertile. One egg was accidentally left in a paper cup in my study for about four months. When opened, the contents were fluid and had no unpleasant odor. The smallest juvenile had a carapace length of 35 mm. and was taken in a shallow, weed-choked ditch on July 27. I momentarily mistook it for a large water beetle. J. A. Anderson collected specimens of similar size in ponds in the Karachi Zoological Gardens during late July and August. A specimen with a length of 59 mm. was collected November 5.

I have seen flap-shells in the field feeding on aquatic vegetation. In captivity the species is omnivorous, although the tastes of individual animals vary. Food taken included meat scraps, fish, frogs, melon, cucumber, apple, and pear. A large turtle killed and ate a smaller individual of *Kachuga* confined with it.

DISTRIBUTION: The subspecies *punctata* occurs in the Indus and Ganges river systems from the Northwest Frontier Provinces east to Sikkim and south to Kutch and East Bengal. Other subspecies occur in Burma and in peninsular India and Ceylon. In West Pakistan *Lissemys* is more widely distributed than any other turtle. It has been reported from the Tank Zam in Dera Ismail Khan District, and I found fragments of a specimen near Dina in Rawalpindi District. It occurs southward in the Indus drainage to the delta.

CROCODILIANS

FAMILY CROCODYLIDAE

CROCODYLUS LAURENTI

The general appearance of crocodiles is too well known to require comment. In this genus

there are fewer than 20 teeth on the dentary bone, and the fourth mandibular tooth fits into a notch in the upper jaw. The nasal bones are in contact with the premaxillae.

The 12 species have a circumtropical distribution; one occurs in West Pakistan.

***Crocodylus palustris* Lesson**

SNUB-NOSED CROCODILE; MUGGER

Crocodylus palustris LESSON, 1834, p. 305 (type locality: River Ganges). SMITH, 1931, p. 47.

DESCRIPTION: Snout bluntly rounded, its width about 60 per cent of its length; no longitudinal ridges anterior to or between eyes; 19 teeth in upper jaw on each side, fourth and tenth largest; 15 in lower jaw, fourth and tenth largest; eye with vertically elliptical pupil; ear opening an oblique slit behind eye; four rather small postoccipital plates in transverse series, followed after an interval by five large, heavy nuchals; 18 mid-dorsal plates from neck to point above vent, each plate with four to six heavy ridges; 16 rectangular smooth plates across middle of belly; tail with 33 segments; armored at base with four heavy dorsal ridges; distal half with high single crest. Snout-vent length of juvenile specimen, 255 mm.; tail, 257 mm. The largest of the individuals seen in the wild or at the Mangho Pir shrine I estimate to be about 3 meters in total length.

Young olive, with blackish blotches; adults light brown, with darker mottling, to almost uniform black.

HABITS: Like most large wild animals, the mugger is extremely shy and difficult to observe. Information from hunters confirmed by my own field work indicates that crocodiles are most frequently seen during the late fall and early winter when they bask on the bank or float at the surface. On February 21 and 22, Walter Fairservis and I saw at least three crocodiles by night and two by day in pools of the upper Hab River. In the same area on November 10 and 11 I saw one large crocodile floating at the surface about mid-morning, and my daughter surprised a small one on the bank about sunrise. By way of contrast, trips to this and other known habitats were wholly unproductive of crocodile sightings during the summer.

These reptiles prefer quiet water 5 to 12 feet deep, with part of the bank deeply undercut and part sloping. They prefer slightly muddy water to clear, but dense aquatic vegetation seems to be avoided, at least by the larger animals.

I know of no authentic instance of a crocodile's attacking a man in West Pakistan, and the reptiles do not seem to take domestic animals except under unusual circumstances. Fish and turtles seem to be their principal food. A young crocodile I had in captivity several weeks refused food and showed a consistently bad disposition. When annoyed, it hissed and made a honking sound.

At Mangho Pir near Karachi is a well-known crocodile shrine in an oasis that once contained a permanent fresh-water marsh. Today the crocodiles are confined to a walled tank about 10 by 25 yards. During my visits I counted about two dozen adult and subadult animals in the enclosure. Several were badly mutilated, probably from fighting among themselves. No particular homage is paid to the reptiles, but pilgrims and tourists are emphatically urged to contribute to the support of the crocodiles and their caretakers. I am told that young crocodiles hatch within the tank each year, usually in June or July. They soon disappear, probably being eaten by the larger reptiles, although some may escape from the enclosure. The largest crocodiles are widely believed to be familiars of the original Pir or saint and thus several hundred years old. Needless to say, there is no objective evidence to support this claim. The population, however, may well be derived from that originally living free on the site.

There seems to be no systematic hunting of crocodiles for their hides, but sportsmen have greatly reduced their number in the more accessible habitats. The river and lake peoples regard the reptiles as a nuisance to their fishing, and kill them when conditions permit.

The name "mugger" is apparently derived from "magarmach," a generic Indian name for crocodilians of any species. The snub-nosed crocodile is known to the Sindhis as "wugu."

DISTRIBUTION: This crocodile ranges from Assam west through most of India and Ceylon to extreme southwestern Baluchistan. There are questionable records for Java and Burma. In West Pakistan it occurs throughout the Indus Valley in the rivers, lakes, and the larger canals north at least to Multan and Bahawalpur. Small populations inhabit the Hab River at least to Diwana. On the Mek-

ran coast crocodiles are known from the Hingol and Dasht rivers, the latter locality being only a few miles from the Iranian border.

FAMILY GAVIALIDAE

GAVIALIS OPPEL

This genus and family contain a single living species. Fossil species are known from a number of Indo-Pakistan localities.

Gavialis gangeticus (Gmelin)

GAVIAL

Lacerta gangetica GMELIN, 1789, p. 1057 (type locality: River Ganges).

Gavialis gangeticus: GRAY, 1831, p. 56. SMITH, 1931, p. 39.

DESCRIPTION: Snout very slender, its length 3.5 to 5.5 times its width at base; maxillary bones in broad contact dorsally; nasals widely separated from premaxillae; 27 to 29 teeth in upper jaw, 25 to 26 in lower, first three lower teeth fitting into notches in upper jaw; adult male with large protuberance on end of snout; nuchal and dorsal plates in continuous series of 21 or 22. Males reported to reach a length of 21 feet (6 meters); females smaller. Dorsal color dark olive with indistinct sooty blotches. (Based on literature and live specimen in Karachi Zoo.)

HABITS: Except for a questionable sight record near Sehwan, I did not encounter the gavial during my stay in West Pakistan. It seems to be a rare animal in the province today, although N. B. Chugtai says it is seen regularly in the East Nara in Sanghar District, especially in winter when it basks on sand bars. It seems to be a strictly fluvial reptile rarely found in lakes or ponds. Fishermen occasionally report very large crocodiles from salt-water creeks near the mouth of the Indus; it is uncertain whether they represent this species or *Crocodylus*.

The local name for the gavial is "say-sar." The river people of Sind who encounter crocodilians with more or less regularity do not show any particular fear of them. Such is not true of the farm and village folk who know the reptiles largely by hearsay. Neither the gavial nor the mugger is known to be a man-eater except under most unusual circumstances.

DISTRIBUTION: The gavial is known from the Indus, Ganges, Brahmaputra, and Mahanadi river systems of India, Pakistan, and Nepal and from the Sweli River of Upper Burma. Its present range in West Pakistan is poorly known but probably includes the lower Indus and its major tributaries. There are historical accounts of its occurrence in the Ravi at Lahore.

LIZARDS

FAMILY GEKKONIDAE

EUBLEPHARIS GRAY

Eublepharis and a few related genera differ from other geckos in having movable eyelids; the pupil is elliptical. Other generic characteristics are: straight digits with a series of transverse lamellae on under side; tail cylindrical, fleshy, distinctly segmented if unregenerated; dorsum with minute granules intermixed with tubercles, ventral scales flat and imbricate; males with femoral pores forming a widely obtuse angle; a pair of large postmentals in contact with each other.

This genus is closely related to the American *Coleonyx*. *Eublepharis* has an apparently relict distribution in southwest Asia, India, and the Riu-Kiu Islands. There are four species, one of which occurs in West Pakistan.

Eublepharis macularius (Blyth)

FAT-TAILED GECKO

Cyrtodactylus macularius BLYTH, 1854, p. 737 (type locality: Salt Range, Punjab).

Eublepharis macularius: JOHN ANDERSON, 1871b, p. 163. SMITH, 1935, p. 127.

Eublepharis fasciolatus GÜNTHER, 1864b, p. 429 (type locality: Hyderabad, Sind).

DESCRIPTION: Head large, wide, distinct from neck, snout bluntly pointed; ear opening crescentic, slightly smaller than eye, margined with tubercles; body rather robust, slightly flattened dorsoventrally; lateral fold and well-developed axillary pocket; hind limbs reaching to shoulder; tail shorter than snout-vent length, nearly always regenerated in adult animals, regenerated portion often very fleshy and bulbous; dorsal tubercles conical,

irregularly arranged on body, in annuli on tail; ventral scales in 22 to 30 (mean 25.9) rows at midbody; femoral pores 10 to 14; upper labials eight to 11; lower labials eight to 12. Snout-vent length of 10 adult males, 110–158 mm.; of seven adult females, 109–127 mm.

Color of juvenile dark brown to black above, with two or three wide yellow bands across trunk, a milk-white nape band extending forward through ear onto lips; tail with four to six transverse white bands narrower than interspaces between them, belly white to straw. Dorsal color of adult straw yellow to pale violaceous gray, usually showing trace of juvenile bands; dorsum with blue-black spots, in some cases discrete and sparse, in others fusing into a reticulum.

HABITS: The fat-tailed gecko inhabits rocky desert and sparse grassland with clay soil but avoids sand. It tends to live in colonies. On the northern part of Malir Cantonment near Karachi the lizards are concentrated along a buried water pipeline where crevices provide shelter and seepage supplies permanent moisture. Here, during the peak season of activity, 50 to 100 lizards may be seen during a hunt of two or three hours. Another large colony inhabits rock walls supporting the highway in Bolan Pass near Mach.

The fat-tailed gecko is strictly nocturnal. At sunset the lizards' heads begin to appear at the holes and crevices that shelter them. Later the lizards emerge and forage if the weather is suitable. Dry, cool, or very windy weather inhibits activity; hot, still, humid nights bring them out in greatest numbers. In Sind and Las Bela they apparently hibernate from mid-November through early March. The greatest number of individuals are seen from late September through the first half of October. A high proportion are young of the season. Most of the lizards seen during March and April are large adults; there is reason to think activity at this time may be related to breeding.

A female of *Eublepharis* in my collection evidently mated between March 25 and April 8, although copulation was not witnessed. She was separated from males thereafter. Her first two eggs were laid April 21, followed by one on May 10, and one May 12,

and two on June 8. The eggs of the last clutch were fertile; presumably the earlier ones were also. Other captive females have deposited eggs during May and June, and I found large eggs in a female collected August 2. A captive specimen in the United States laid three eggs on September 11. The eggs are oval and have smooth, pliable shells. Seven that I measured were 31 to 35 mm. in greatest diameter and 13 to 16 mm. in the least. Although the eggs developed in an apparently normal fashion for as long as four weeks, none successfully hatched. Field observations indicate that most of the young appear during September and early October. Growth is rapid. A specimen with a body length of 47 mm. at the time of capture on June 22 reached the size and appearance of a young adult by late November. Another individual, measuring 51 mm. when collected on September 29, had increased to 67 mm. by mid-December, when it ceased feeding for the winter.

These lizards have been collected only on the ground. Their movements are normally slow and deliberate. They often walk with the body held well off the ground. When annoyed, they rise high on their legs, with the back arched or laterally bowed; the tail is raised and slowly waved about. They open the mouth and make a noise like air going out of a small balloon or the spitting of a kitten. They bite readily and, when handled, excrete a clear, foul-smelling liquid from the vent.

Stomachs of specimens collected during late summer and fall contained predominantly the remains of grasshoppers, crickets, beetles, and lizards. Other food items identified were dragonflies, ant lions, and scorpions. Prey is slowly stalked or ambushed and captured with a sudden lunge. Just before lunging, the lizard often flicks the tip of its tail.

This lizard makes an excellent terrarium animal. At least two specimens sent to the United States are still living six years after capture.

This reptile is the dreaded "khun" or "han-khun" of the Sindhis. Not only is its bite or sting believed to cause instant death, but its body fluids are also considered lethal upon contact.

DISTRIBUTION: The range of *Eublepharis macularis* extends from southern Transcaspia

and Iraq westward to the Northwest Frontier Provinces and south to Rajputana and the Khandesh District of India. Occurrence in West Pakistan is apparently general. It has been collected at an elevation of approximately 6800 feet in northern Baluchistan.

BUNOPUS BLANFORD

Leviton and Anderson (1963) reinstated this genus to include those geckos with straight, clawed, unfringed digits and dorsal lepidosis of both granules and tubercles. The genus *Alsophylax* is restricted to non-tuberculate species. As redefined, *Bunopus* contains eight species and occurs from North Africa eastward to Sind. *Alsophylax* has not been recorded from West Pakistan but probably occurs, for *A. pipiens* has been collected near Kabul in Afghanistan.

Bunopus tuberculatus Blanford

BALUCH ROCK GECKO

Bunopus tuberculatus BLANFORD, 1874a, p. 454 (type locality: Bahu Kalat, Mand, and Bampur, Baluchistan).

Alsophylax tuberculatus: SMITH, 1935, p. 36.

DESCRIPTION: Head of moderate size, snout bluntly pointed; eye large, pupil elliptical; ear opening a small, oval slit; body of moderate build, slightly flattened dorsoventrally; digits straight without fringing scales; males with five or six preanal pores; tail filiform, tapering evenly to a pointed tip; dorsal scales minute, granular, intermixed with flattened tubercles arranged in 10 to 13 longitudinal rows; ventral scales small, smooth, imbricate; caudal scales in annuli; no postmental; upper labials nine to 12; lower labials eight to 12. Snout-vent length of four males, 38–46 mm.; of four females, 44–48 mm.; tail slightly longer than body in both sexes.

Dorsal ground color pale grayish to light brown, with indistinct dark gray cross bands or scattered blackish tubercles; belly white; tail with nine to 11 alternating light and dark bands.

VARIATION: The above description is based on a series of nine specimens from Nushki. An adult female and a juvenile collected near Kach differ as follows: dorsal tubercles more strongly keeled, tail slightly less than snout-vent length, ground color yellowish, with dark brown to blackish bands more promi-

nent. A series of three specimens from Hyderabad are similar.

HABITS: Near Nushki this species was plentiful in sandy fields associated with such strict arenacoles as *Stenodactylus* and *Teratascincus*. In the Baluchistan Hills at about 6500 feet, specimens were collected in scrubby vegetation and among boulders along a stream. The species is apparently strictly terrestrial and nocturnal; the only individual found during the day was concealed under a stone. Females taken in northern Baluchistan May 14 and 21 contained one or two large eggs apparently almost ready to be deposited.

The name "chogol" is applied to this species as well as to *Cyrtodactylus* and other small, nondescript, ground geckos.

DISTRIBUTION: The range extends from eastern Arabia and Iran to Sind and eastern Afghanistan. The species is common in parts of northern and western Baluchistan but uncommon or very local in Sind and Las Bela. I suspect the British Museum specimens that are labeled "Hyderabad, Sind" are from the Lakhi Hills in the western part of Hyderabad District rather than from the immediate vicinity of the city.

STENODACTYLUS FITZINGER

This genus of small desert geckos resembles *Bunopus* in general appearance and lepidosis but differs in having digits fringed with small pointed scales.

About seven species are distributed from North Africa to the Indian Desert. Three occur in West Pakistan. *Stenodactylus lumsdeni* (Boulenger, 1887a), recorded from northern Baluchistan between Nushki and Helmand, is not represented in my collections.

Stenodactylus orientalis Blanford

SIND SAND GECKO

Stenodactylus orientalis BLANFORD, 1876b, p. 21 (type locality: Rohri and Shikarpur District, Upper Sind). SMITH, 1935, p. 33.

Stenodactylus dunstervillei MURRAY, 1884a, p. 363 (type locality: Hala, Sind).

DESCRIPTION: Habitus similar to that of *Bunopus tuberculatus*. Upper labials 10 to 12; lower labials nine to 13; no postmental; all digits with fringe of small, pointed scales;

femoral pores absent from three of eight adult males, one to four in number in others; dorsal scales small, subimbricate, intermixed with round, flattened tubercles that may be numerous or sparse; ventral scales small, imbricate, smooth in four of 16 specimens studied, lightly to moderately keeled in others; caudal scales in annuli. Snout-vent length of eight adult males, 41–48 mm.; of three females, 50–55 mm.; tail length, 70–88 per cent of snout-vent length.

Dorsal color brownish to pale gray, with three to five indistinct, dark gray bands; tail yellowish, with distinct dark rings; belly white.

VARIATION: The westernmost specimen, A.M.N.H. No. 88302, from coastal Las Bela near the mouth of the Hingol River, has unusually prominent dorsal tubercles arranged in regular rows, being black on a pallid, almost uniform background. Further collecting along the Mekran coast may show the presence of an undescribed form in this area.

HABITS: These lizards inhabit dunes and tracts of fine loose sand with sparse vegetation. They have been found on the seacoast within a hundred yards of the high-tide mark but have not been collected above 600 feet.

During hot weather these lizards emerge about sunset and are active most of the night. Their fringed toes permit them to run rapidly over fine sand where geckos with pads such as *Hemidactylus* are almost helpless. *Stenodactylus* characteristically burrows directly into the sand and has been dug up from several inches below the surface. The season of greatest abundance is March and early April, but specimens have been collected from mid-February through October. Females containing large eggs have been taken between March 26 and April 11.

These geckos often twitch the tip of the tail when excited. When handled, they make a faint snarling noise and often void excrement. Although they feed without hesitation on termites and other small, soft-bodied insects, I have been unable to keep them alive in captivity much longer than a month.

DISTRIBUTION: Although this gecko doubtless ranges into western Rajputana, it is virtually a Sind endemic. The known range extends from the southern Thar Desert west along the coast to about the mouth of the

Hingol River and inland to the base of the Kirthar Range.

Stenodactylus maynardi Smith

WHIP-TAILED SAND GECKO

Stenodactylus maynardi SMITH, 1933, p. 18 (type locality: Baluchistan near the Afghan border).

DESCRIPTION: Differs from other West Pakistan members of its genus most strikingly in the long, slender tail that is 138 to 150 per cent of the snout-vent length. Upper labials 12 to 14; lower labials 11 to 13; fringing scales on toes larger than those of *S. orientalis*; eight preanal pores; dorsal tubercles small and sparse; ventral scales keeled in all specimens examined. Snout-vent length of three adult males, 40–43 mm.; of two adult females, 48 mm. each.

Dorsal color pale grayish yellow to straw; dark markings generally disposed as four longitudinal stripes, two median ones extending onto tail for more than half of its length; distal part of tail and belly white.

HABITS: The behavior of this species is much like that of *S. orientalis*. Most of my specimens were collected on large sand dunes; one was taken at the edge of a sandy cultivated field. A female collected May 14 contained two large eggs.

DISTRIBUTION: This little-known species has been reported only from northwestern Baluchistan but undoubtedly occurs in adjoining Iran and Afghanistan.

TERATOSCINCUS STRAUCH

These are medium-sized to large geckos characterized by toes that are fringed with pointed scales and a series of enlarged scales on the dorsal surface of the tail.

They are confined to Asian deserts from Transcaspia to Baluchistan. Two of the four species occur in West Pakistan.

Teratoscincus scincus (Schlegel)

TURKESTAN PLATE-TAILED GECKO

Stenodactylus scincus SCHLEGEL, 1858, pp. 16–17 (type locality: Ili River, Turkestan).

Teratoscincus scincus: BOULENGER, 1885a, p. 12. SMITH, 1935, p. 30.

DESCRIPTION: Head large, much swollen at temples in adults, distinct from neck, snout bluntly pointed; eye large, with lidlike supraocular ridge; ear opening large, slitlike,

oblique; scales on top and side of head small, juxtaposed; upper labials nine to 12; lower labials nine to 13; usually an enlarged scale between mental and first lower labial; body robust, subcylindrical; limbs long; digits straight, terminating in sharp claws and fringed with pointed scales; males without preanal or femoral pores; tail tapering abruptly from vent, tip rather blunt; dorsal and ventral scales large, cycloid, in 31 to 35 rows at midbody; a series of 13 to 16 large, thin plates on dorsum of tail. Snout-vent length of five adult males, 96–113 mm.; of four adult females, 91–101 mm.; tail 60–73 per cent of snout-vent length in females, 50–71 per cent in males.

Dorsal ground color subject to metachroic change, mottled with pale gray, yellow, orange, and various shades of brown; two wide, longitudinal, dark brown stripes usually present but not extending onto tail which is without definite markings; sides and belly pale pinkish to white. Young dark yellow to light orange, with four to five sooty transverse bands on body and a similar number on tail.

HABITS: These interesting geckos apparently are restricted to tracts of fine, wind-blown sand. They are nocturnal, appearing soon after sunset and being active most of the night, at least during late April and May. They ordinarily walk slowly, with the body held off the ground, and leave a distinctive spoor. They run rapidly when surprised in the open but if cornered will lunge at an attacker, making a faint but distinct snarling sound. The tail is slightly elevated and undulated rapidly from side to side, producing a faint sibilant sound. They bite powerfully. The skin is quite friable and comes off in large patches if the lizard is roughly handled. Most of my captives that were injured in this manner died after a few days but under natural circumstances might well have survived. Two specimens showed evidence of having regenerated a considerable area of skin in times past.

Two of these lizards were tracked to burrows and dug out from depths of about 10 to 15 inches. The burrow entrances had been loosely closed with sand.

Jeromie A. Anderson reported that the eggs are laid from late April to early June. They are almost spherical and about 15 mm. in

diameter. The shell is soft at first but hardens within an hour. The eggs hatched after 77 days. The average body length of the young was 53 mm., total length, 88 mm.

The stomach of one specimen contained a large unidentified insect larva and a cricket. Another contained fragments of vertebrate remains, apparently a small lizard.

I have kept these lizards in captivity for several weeks, although they refused most of the insects and other small animals offered them for food. They were successfully forced with bits of meat dipped in egg.

The natives near Nushki regard *Teratoscincus* with much the same superstitious dread that peoples of Sind and southern Baluchistan feel toward *Eublepharis* and *Teratolepis*.

DISTRIBUTION: This species occurs from the eastern shore of the Caspian Sea to Tadzhikistan and southward to northwestern Baluchistan. Here it is not recorded east of Nushki nor south of Kharan.

Teratoscincus microlepis Nikolsky

BALUCH PLATE-TAILED GECKO

Teratoscincus microlepis NIKOLSKY, 1899, p. 145 (type locality: Duz-Abad, east of Kerman, Persia). SMITH, 1935, p. 32.

DESCRIPTION: Habitus similar to that of *T. scincus*; ear opening proportionally a little larger and supraocular ridge better developed; upper labials 12 to 16; lower labials nine to 13; no enlarged scale between mental and first lower labial; dorsal and ventral scales small, juxtaposed, in 100 or more rows at midbody; 10 enlarged plates on dorsum of tail. Snout-vent length of only adult specimen, a female, 73 mm.; tail, 40 mm.

Dorsal ground color yellow to light brown, about six dark transverse bands that may be straight-edged or V-shaped, dark brown or grayish in adult, reddish in young; tail with five or six dark cross bands.

HABITS: Near Nushki this species was found in sandy areas with *T. scincus* but was considerably less plentiful than the larger species. Its habits seem to be much like those of *scincus*, but it is slower and not so prone to the irascible display of temper characteristic of *scincus*. Its skin is not so easily injured as that of *scincus*. An adult specimen kept several weeks in captivity refused all food except

larvae of an unidentified large sand beetle.

DISTRIBUTION: The records of this species are for the vicinity of Nushki and Kharan in Baluchistan westward into the Dasht-i-Lut near Kerman in Iran.

CYRTODACTYLUS GRAY

Following Underwood (1954) I place in this genus the species formerly included in *Gymnodactylus*.

Toes clawed, slightly compressed laterally, and strongly bent dorsoventrally between last and next to last phalanx. Enlarged dorsal tubercles present and, in all but one of forms considered here, arranged in longitudinal rows. Tail not tapering abruptly behind vent. Most of West Pakistan species small, drab lizards without conspicuous markings.

The genus is a large one, distributed from the shores of the Mediterranean through south Asia to Australia and islands of the southwest Pacific. Seven forms are known from West Pakistan; all are treated here as species. *Gymnodactylus chitralensis* (Smith, 1935) is not represented in my collections. It is known only from Chitral. The relationships of the Pakistan forms are far from satisfactorily known. Although these geckos are often plentiful and not difficult to collect, material is lacking from several critical areas.

Cyrtodactylus scaber (Heyden)

KEELED ROCK GECKO

Stenodactylus scaber HEYDEN, 1827, p. 15 (type locality: Arabia).

Gymnodactylus scaber: SMITH, 1935, p. 42.

Gymnodactylus brevipes BLANFORD, 1874a, p. 453 (type locality: Bampur, east Persia).

DESCRIPTION: Head moderately large;

snout blunt, slightly depressed; eyes large, pupil vertically elliptical; ear opening a vertical slit smaller than pupil; head scales small, granular, interspersed with larger tubercles; upper labials normally eight, lower labials eight; two or three postmentals, anterior pair in contact in midline; body flattened dorsoventrally, with a weak lateral fold; digits long, slender; males with preanal pores; dorsal tubercles large, trihedral, in longitudinal rows, separated by one or two rows of small granules, median rows of about same size as laterals; lateral rows of tubercles on tail large, forming blunt spines; scales near lateral fold small, juxtaposed; ventral scales larger, imbricate, in fewer than 23 rows across belly at midbody; a row of enlarged scales on under side of tail.

Dorsal color light gray to tan, with irregularly arranged blackish spots that form cross bands on tail; belly white.

Variation in the material examined is summarized in tables 2 and 3.

HABITS: This species has been collected in areas of dry grassland, on rocky hillsides, and in moderately sandy desert with sparse, xerophytic vegetation. It does not often enter inhabited buildings but has been collected at night on the walls of crumbling brick and clay structures as well as on the ground. During the day it has been found concealed under rocks, clods, and rubbish. One collected in February was in a low shrub apparently basking. Two collected December 5 were active at night in decidedly cool weather.

This gecko, like many other small species, often makes a faint squawking noise when handled.

DISTRIBUTION: The range of the species

TABLE 2
VARIATION IN SCALE COUNTS IN THREE SPECIES OF *Cyrtodactylus*
(Figures in parentheses are means.)

	<i>scaber</i>	<i>kachhensis</i>	<i>watsoni</i>
Number of specimens	19	30	20
Transverse ventral scale rows	17-24 (19.9)	24-39 (31.4)	33-47 (40.0)
Femoral and preanal pores	4-7 (5.5)	4-7 (4.7)	5-9 (7.3)
Upper labials	7-10 (8.4)	8-11 (9.3)	8-11 (9.5)
Lower labials	7-9 (7.8)	7-10 (8.0)	7-9 (8.3)
Dorsal tubercles, rows	9-12 (11.0)	10-13 (11.5)	11-14 (12.5)

extends from Egypt eastward in arid habitat to Rajputana.

West Pakistan specimens referred to this species have been collected in the middle and upper parts of the Indus Valley, along the eastern edge of the Thar Desert, and in the Las Bela hills west of the Porali River. It has been collected in the same habitat as *C. kachhensis*.

Cyrtodactylus montiumsalsorum (Annandale)

SALT RANGE ROCK GECKO

Gymnodactylus montium-salsorum ANNANDALE, 1913, p. 313 (type locality: Salt Range, Punjab). SMITH, 1935, p. 42.

DESCRIPTION: Habitus, scalation, and pattern very similar to those of *C. scaber* and *C. fedtschenkoi*; differing from former species by presence of a continuous series of preanal and femoral pores in male.

DISTRIBUTION: Recorded only from the Salt Range in the northwestern Punjab and known from very few specimens.

Cyrtodactylus fedtschenkoi (Strauch)

TURKESTAN ROCK GECKO

Gymnodactylus fedtschenkoi STRAUCH, 1887, p. 46 (type locality: Samarkand, Turkestan). SMITH, 1935, p. 41.

DESCRIPTION: Very similar to preceding two species. Differs from *C. scaber* in having both preanal and femoral pores, from *C. montiumsalsorum* in greater number of scales across belly at midbody, 28 to 36 as opposed to 23 or 24 in *montiumsalsorum*. It appears likely that the latter is but an eastern subspecies of *fedtschenkoi*.

To this species or *montiumsalsorum* I tentatively assign a specimen (S.A.M. No. 691) collected 2 miles west of Nushki in flat, sandy desert. It is a male 42 mm. in snout-vent length, with a regenerated tail. Although apparently not quite sexually mature, it clearly shows a series of 23 preanofemoral pores. Other features of the scalation are as follows: upper labials 10, lower labials nine; two large postmentals, anterior pair in contact, and a third smaller pair; 10 rows of dorsal tubercles separated by one or two rows of tiny granules; scales across belly at midbody 23; a regular row of enlarged scales on under side of tail. The animal in life was light brownish

gray, with irregularly arranged black spots that formed cross bands on the distal part of the tail.

DISTRIBUTION: This species is found from Transcaspia to southern Kazakhstan and southward through western Baluchistan. In West Pakistan it has been reported from several localities in Baluchistan.

Cyrtodactylus kachhensis (Stoliczka)

WARTY ROCK GECKO

Gymnodactylus kachhensis STOLICZKA, 1872a, p. 79 (type locality: Kutch).

Gymnodactylus kachhensis kachhensis: SMITH, 1935, p. 43.

Gymnodactylus petrensis MURRAY, 1884a, p. 362 (type locality: Sind).

DESCRIPTION: In habitus and scalation similar to *C. scaber*; differs in that dorsal tubercles of median rows are smaller than those of lateral rows, and rows separated by three to five rows of granules; ventral scales in 24 to 39 rows across belly at midbody; under side of tail with small scales irregularly arranged.

Dorsal color drab light brown, occasionally grayish; blackish spots small, sparse, irregularly arranged; belly white.

Variation in the material examined is summarized in tables 2 and 3.

HABITS: This is a plentiful little lizard in dry, rocky places. It is most readily collected during cool weather or immediately after rain when many may be found during the day under thin slabs of rock, dead euphorbia stalks, or other superficial cover. In hot and dry weather the lizards seek deeper retreats and are active at night. Although usually seen on the ground, they climb well and have been seen clinging to the under side of ledges and the roofs of abandoned huts. They rarely enter inhabited buildings.

Females containing large eggs have been collected during nearly every month. The eggs, one or two to a clutch, are found in fine powdery soil under stones or within decaying euphorbia stalks. They are oval, about 9.5 by 7 mm., and have thin, fragile shells. They do not adhere to one another or to adjacent objects. An egg found March 23 hatched May 5.

DISTRIBUTION: This species is found over most of Kutch and Sind, and coastal Las Bela extending inland along the Hab and probably

other river valleys. It has not been taken at elevations above 1000 feet.

***Cyrtodactylus watsoni* (Murray)**

QUETTA ROCK GECKO

Gymnodactylus watsoni MURRAY, 1892, p. 68 (type locality: Quetta).

Gymnodactylus kachhensis watsoni: SMITH, 1935, p. 44.

Gymnodactylus ingoldbyi PROCTER, 1923, p. 121 (type locality: Ladha, Northwest Frontier Provinces).

DESCRIPTION: Similar to *C. kachhensis* but differing in having ventral scales in 33 to 47 rows across belly at midbody; more preanal pores in males; under side of tail with row of enlarged scales; usually a dark collar across nape; greater average size.

Smith may be correct in considering this form a subspecies of *kachhensis*, but I have seen no intermediate individuals in the area where the two forms approach each other. The transition is sudden at the edge of the Iranian Plateau and seems to involve all the characters mentioned above.

Variation in the material examined is summarized in tables 2 and 3.

HABITS: These geckos have been collected in rocky mountainous country at elevations from approximately 1500 to 6000 feet. Their behavior is much like that of *C. scaber* and *C. kachhensis*, but they may be somewhat diurnal at high altitudes. Twice I saw individuals of *watsoni* running about on rocks in full daylight although in shade. In the city of Quetta, where there are no *Hemidactylus* geckos, this species may live in residences. It usually hides behind boxes and under furniture and does not emerge to run about on the walls and ceilings.

DISTRIBUTION: Specimens that I identify as this form have been collected from extreme northern Las Bela to Quetta and north-eastward to Swat and the northern Punjab. The extension of the range northward into Afghanistan is unknown.

***Cyrtodactylus stoliczkai* (Steindachner)**

KARAKORAM ROCK GECKO

Gymnodactylus stoliczkai STEINDACHNER, 1869, p. 15 (type locality: Karoo Valley north of Dras, Kashmir). SMITH, 1935, p. 57.

Cyrtodactylus yarkandensis JOHN ANDERSON, 1872, p. 381 (type locality: Ladak).

Gymnodactylus walli INGOLDBY, 1922, p. 1051 (type locality: Chitral).

DESCRIPTION: Characterized by sparse, scattered, hemispherical dorsal tubercles; tail length not exceeding snout-vent length; tail slightly expanded at base, without row of enlarged scales on under side; males without femoral or preanal pores.

I tentatively refer to this species a specimen (S.A.M. No. 683) collected near Udigram in Swat. It is a female 39.5 mm. in snout-vent length, with an intact tail of 37 mm.; head as in other members of the genus; ear opening oval, about half of size of pupil; nine upper and eight lower labials; one pair of postmentals; digits shorter and thicker than in other West Pakistan cyrtodactyls; dorsal scales small, subimbricate or juxtaposed; tubercles small, hemispherical, sparse, arranged in irregular, widely separated, transverse rows; and ventral scales small, subimbricate, 39 across belly at midbody.

Dorsal color in life amber shading to lemon on tail; a series of eight irregular, broken, transverse, black bars on body, most of them narrowly edged posteriorly with white; flanks and dorsal surfaces of head, tail, and limbs with scattered black dots; belly pale yellow; alternating black and white bars on labials.

A specimen from Kashmir (C.N.H.M. No. 8687) is small and badly faded, with most of the tail missing. There are 27 scale rows across the belly, nine upper and seven lower labials, and two pairs of postmentals. In other respects it resembles the Udigram specimen.

The type specimen of *Gymnodactylus walli* that is currently referred to this species is much more tuberculate than the specimens described above. Its dorsal lepidosis approaches the condition seen in *C. chitralensis*, but the subcaudals are not enlarged. The species *stoliczkai* as now recognized may prove a composite of two forms.

HABITS: The Udigram specimen was found in the early morning of March 30 curled under a stone in the bed of a small, narrow ravine in wooded, hilly country at about 2900 feet in elevation. It was rather sluggish in its movements.

DISTRIBUTION: This species is known from

Ladakh and Kashmir westward to Chitral and the Northwest Frontier Provinces.

AGAMURA BLANFORD

This genus contains three species, all represented in the West Pakistan fauna. These geckos are very long-legged, and the tails taper abruptly posterior to the vent.

Agamura persica (Duméril)

BLUNT-TAILED SPIDER GECKO

Gymnodactylus persicus DUMÉRIL, 1855-1856, p. 481 (type locality: Persia).

Agamura persica: BLANFORD, 1876a, pp. 358-359. SMITH, 1935, p. 61.

Agamura cruralis BLANFORD, 1874a, p. 455 (type locality: Bahu Kalat and Askan, Baluchistan).

DESCRIPTION: Head large, chunky, distinct from neck; snout bluntly pointed, nostrils slightly elevated; eye large, with prominent, lidlike, superciliary ridge; nine to 12 upper and lower labials; anterior lower labials longer than wide; no postmental; body flattened dorsoventrally, with weak lateral fold; limbs long and slender, heel reaching to axilla or beyond; digits long, slender, angularly bent as in *Cyrtodactylus*; no femoral or preanal pores; scales of entire dorsum small, granular, intermixed with hemispherical, irregularly arranged tubercles; ventral scales imbricate, about 25 across belly at midbody; tail strongly narrowed just behind vent, cylindrical, blunt-tipped, its length about equal to snout-vent length in males, slightly shorter in females; scales of tail subequal in size and arranged in annuli. Snout-vent lengths of four adults, 58 to 64 mm., without sexual dimorphism in material examined.

Dorsal color dull yellowish gray, with five darker gray cross bands on body, nine or 10 on tail; belly dirty white, in some cases streaked or flecked with gray. In young, bands sooty black and, in some, enclosing small light dots.

HABITS: These peculiar lizards have been taken on cliffs and rocky terraces from about 100 to 3000 feet in elevation. They are largely but not exclusively nocturnal. A large adult was collected March 2 about midday. It was on the ground and ran under the shelter of a small shrub where it remained motionless until picked up. When disturbed, the lizards

usually flatten their bodies against the ground until touched, then they run rapidly. Contrary to the statement of Boulenger (1890), the tail is easily broken, usually detaching at the base.

Jeromie A. Anderson reported that captives of this species have laid eggs in June. A small juvenile was collected September 23.

DISTRIBUTION: The species occurs from Iran eastward along the coast to Cape Monze near Karachi and inland to Waziristan.

Agamura femoralis Smith

SHARP-TAILED SPIDER GECKO

Agamura femoralis SMITH, 1933, p. 17 (type locality: Kharan, Baluchistan).

DESCRIPTION: Snout more pointed than in *A. persica*; each nostril at apex of caruncle formed from rostral and first upper labial; eye and labials like those of *persica*; a pair of postmentals in contact; dorsal scales as in *persica*; ventrals in 17 to 21 rows at midbody, increasing in size posteriorly; males with six (rarely five) preanal pores; under side of femur with nine to 12 enlarged scales in both sexes; tail definitely longer than body in both sexes and terminating in sharp tip. Snout-vent lengths of 10 adults, 52 to 60 mm.

No living material has been examined.

Dorsal color of freshly preserved specimens similar to that of *persica*; five dark cross bands on body and eight to 10 on tail; pattern in juvenile similar but more vivid.

HABITS: Specimens were obtained near rocky outcrops in sandy country. They are terrestrial and nocturnal. Jeromie A. Anderson reports that they flatten against the ground when approached, elevate their tails and twitch them from side to side. Females collected June 7 contained large eggs. The tail is broken or regenerated in more than half of the specimens examined.

DISTRIBUTION: The known records are for Kharan and Chagai districts in northwestern Baluchistan.

Agamura agamuroides (Nikolsky)

NIKOLSKY SPIDER GECKO

Gymnodactylus agamuroides NIKOLSKY, 1899, p. 384 (no type locality designated).

Cyrtodactylus agamuroides: STEVEN C. ANDERSON, 1963, p. 438.

DESCRIPTION: Habitus same as that of *A. persica*; nostrils not at apex of caruncle; anterior postmentals in contact, posterior, if present, small and not in contact; labials and dorsals like those of other members of genus; ventrals in 21 to 24 rows at midbody; male with four preanal pores; scales on under side of femur enlarged but not in regular series; tail slightly longer than body, tip blunt. Snout-vent length of adult male, 45 mm.

Dorsal ground color ashy gray to pale brown, shading to dull yellow on distal part of tail; five gray to sooty cross bands or transverse rows of blotches on body and eight on tail; belly white.

HABITS: Virtually nothing known of the habits. One specimen was collected at night on the rock-strewn floor of a desert canyon at about 700 feet in elevation. It was very active, leaping quickly from one rock to another. Steven C. Anderson (1963) obtained one under a rock, apparently during the day.

DISTRIBUTION: The range is from south-eastern Iran (Seistan and Kerman provinces) to northwestern Las Bela.

TROPIOCOLOTES PETERS

Having relatively uniform scales that may be strongly imbricate to juxtaposed, no enlarged tubercles; no lateral fold; toes angulate between last and next to last phalanx but only weakly so; ear opening smaller than pupil of eye; males without femoral pores. Very small geckos, snout-vent length rarely exceeding 35 mm.

These geckos inhabit desert regions from North Africa to Sind. Four species have been described.

Tropicolotes helenae (Nikolsky)

BANDED DWARF GECKO

Microgecko helenae NIKOLSKY, 1907, p. 265 (type locality: Arabistan, Persia = Khuzistan, Iran).

Tropicolotes helenae: MERTENS, 1956, p. 92.

DESCRIPTION: Head distinct from neck, flat; snout bluntly pointed; eye moderately large; ear opening tiny, oval; normally eight (rarely seven or nine) upper labials and seven (rarely six or eight) lower labials; anterior postmentals large and in contact, posterior pair small and widely separated; two pairs of large scales immediately behind rostral and

between nostrils; remaining head scales and those of body and tail small, subequal, weakly imbricate or juxtaposed; body and tail somewhat flattened dorsoventrally; limbs and digits well developed but short. Subdigital lamellae smooth, 12 to 16 beneath fourth toe. Snout-vent lengths of 16 males, 25–30 mm.; of eight females, 27–32 mm.; tail slightly longer than head and body in both sexes.

Dorsum pale straw to chrome yellow or amber; five transverse dark bands on body and six to eight on tail, anterior edge of each band irregular and lighter in color, tending to shade into ground color, especially in large adults, posterior edge dark, straight, in some cases bordered by a white line; bands, particularly on tail, distinctly narrower than interspaces between them; dark line from snout through eye extending above forelimbs to fuse with first two or three cross bands; limbs unmarked, grayish; under surfaces pale pinkish white.

HABITS: The distribution of this small gecko coincides closely with that of the large shrub *Euphorbia caducifolia*, which appears to be the lizards' favorite habitat, although they also frequent rock crevices. They have been taken in both flat and hilly country but rarely at elevations above 700 feet. The majority have been discovered by raking through heaps of dead euphorbia stalks. The lizards are plentiful in this situation from mid-November until the end of February, being most readily found after the infrequent winter showers or fogs. During the warm, moist nights of September and October these lizards have been seen slipping in and out of cracks between stones. They are quite agile. The tail is very easily broken; indeed it sometimes seems that a light jar is enough to detach it.

In captivity the lizards feed on small arthropods such as fly larvae, newly hatched spiders, and termites. A single egg about 8 by 5.5 mm. is laid. Hatching has been observed after an incubation period of five to eight weeks. The smallest young taken in the field are about 15 mm. in body length. They have been found in February, July, and September.

DISTRIBUTION: The form described here occurs in Las Bela and lower Sind. A single

specimen from Mirjawa in extreme north-western Baluchistan differs in having smaller scales, more reduced postmentals, and very narrow dark bands with distinct light edges. Nikolsky's type series of *helenae* has apparently been lost. Differences between the West Pakistan material and the specimen from southwestern Iran referred to *helenae* by Steven C. Anderson (1963) are slight and suggest subspecific relationship.

***Tropicolotes depressus* Minton and Anderson**

MOUNTAIN DWARF GECKO

Tropicolotes depressus MINTON AND ANDERSON, 1965, p. 59 (type locality: Kach, Quetta Division, West Pakistan).

DESCRIPTION: Habitus similar to that of *T. helenae* but more flattened dorsoventrally; labials as in *helenae*; postmentals absent or a single small pair, not in contact; no enlarged internasal and postrostral scales; 17 or 18 lamellae beneath fourth toe; male with pair of enlarged preanal scales bearing pits. Snout-vent length of adult male, 29 mm.; of sub-adult female, 27 mm.; tail in female shorter than body.

Dorsum saffron yellow; three to five transverse dark bands on body and six on tail, all bands sharply defined, without light edges, narrower than interspaces between them; dark band across neck; dark stripe from snout through eye and onto neck, fusing with nuchal band; dark bar on occiput; limbs unmarked; ventral surfaces pale pinkish white.

HABITS: The known specimens have been taken on rocky hillsides with sparse vegetation at elevations between 6000 and 6500 feet. They were found after dark in the open. No plant equivalent to *Euphorbia caducifolia* occurs in their habitat, and the lizards presumably find shelter in rock crevices.

DISTRIBUTION: This species has been found only in the mountains of northern Baluchistan near Quetta.

HEMIDACTYLUS OKEN

The geckos of this large genus are characterized by dilated ovoid digits. Most subdigital lamellae divided by a median furrow; under surfaces covered thickly with microscopic, bristle-like projections; whole foot a highly efficient clinging organ.

There are at least 35 species in the genus.

Although originating in the Old World tropics and subtropics, several of the species have been transported by man and now have virtually tropicopolitan ranges. Seven species are known from West Pakistan.

***Hemidactylus brooki* Gray**

SPOTTED INDIAN HOUSE GECKO

Hemidactylus brooki GRAY, 1845, p. 153 (type locality: Borneo). SMITH, 1935, p. 89-91.

Hemidactylus gleadowi MURRAY, 1884a, p. 360 (type locality: Sind, near Jerruck).

Hemidactylus kushmorensis MURRAY, 1884b, p. 109 (type locality: Bhaner, Upper Sind).

DESCRIPTION: Head ovoid, distinct from neck: snout blunt; eye large; ear opening oval, about one-third of diameter of eye; head scales small, granular; usually eight to 10 upper and seven or eight lower labials; two pairs of postmentals, anterior ones larger and in contact; body flattened dorsoventrally, no lateral fold; body scales granular with rows of trihedral tubercles; ventral scales small, cycloid, imbricate; tail plump, with annuli of spinelike tubercles above and a row of large wide scales below; males with preanal and femoral pores.

Dorsal ground color dark brown to light gray, showing considerable metachroic change; black spots often arranged in quincuncial groups; two dark lines on snout usually passing through eye; belly white.

VARIATION: No attempt has been made to assign subspecific rank to the West Pakistan populations of this gecko. They differ from the description of Indonesian material in de Rooij (1915, pp. 32-33) in having fewer preanofemoral pores and fewer rows of dorsal tubercles and in the absence of dark dots on the ventral scales. Variation in the material examined is summarized in tables 3 and 4.

HABITS: In wooded parts of the Indus Valley and on oases, this gecko is commonly found under the bark of trees, in and under logs, and in piles of dead branches and other rubbish. It is a common house gecko in cities and towns of the Indus drainage but not in Karachi where it seems to be supplanted by *Hemidactylus turcicus*. In this city, *brooki* is uncommon and largely confined to parks and gardens. In Sind it is the most terrestrial of the small hemidactyls and is found on the ground almost as frequently as while climb-

TABLE 3

VARIATION IN SNOUT-VENT LENGTH (IN MILLIMETERS) AMONG ADULTS OF THREE SPECIES OF *Cyrtodactylus* AND SEVEN SPECIES OF *Hemidactylus*
(Figures in parentheses are means.)

	Number of Specimens		Snout-Vent Length	
	Males	Females	Males	Females
<i>Cyrtodactylus scaber</i>	8	5	39-44 (41.7)	39-45 (41.7)
<i>Cyrtodactylus kachhensis</i>	14	12	34-43 (36.3)	35-42 (38.8)
<i>Cyrtodactylus watsoni</i>	13	4	41-53 (47.6)	49-54 (51.3)
<i>Hemidactylus brooki</i>	11	11	40-55 (45.5)	43-55 (48.4)
<i>Hemidactylus flaviviridis</i>	9	10	53-72 (62.8)	57-73 (66.8)
<i>Hemidactylus frenatus</i>	5	3	39-52 (45.1)	40-46 (41.9)
<i>Hemidactylus leschenaulti</i>	4	4	47-58 (51.5)	48-61 (56.3)
<i>Hemidactylus persicus</i>	8	5	52-62 (57.4)	53-58 (55.4)
<i>Hemidactylus triedrus</i>	2	3	75-79	67-77 (73.3)
<i>Hemidactylus turcicus</i>	7	6	42-48 (44.7)	42-48 (45.5)

ing. It is almost wholly nocturnal. During the winter it is inactive but can be found easily by searching under cover.

As with the majority of geckos, two eggs are laid at a time. Egg laying seems to be almost continuous from March through October, although it is not known how many clutches are laid by single females. Seven eggs, evidently three or four clutches, were found in a rotten palm log on September 4. Four of these hatched between September 29 and October 14. Captives deposited clutches July 11 and September 12. The latter eggs hatched October 25-26.

In a forest near the Indus I saw a pair of golden-backed woodpeckers (*Brachypternus benghalensis*) feeding on small geckos that they captured under bark. *Hemidactylus brooki* was common there and probably was the species being preyed upon.

Local names applied to house geckos and some other small lizards are "chhipkali," "chiplee," and "chuttee." The geckos may be of considerable importance in the control of mosquitoes and other undesirable insects. Although they are sometimes accused of tainting food or water, geckos are usually tolerated in houses and occasionally are encouraged.

DISTRIBUTION: *Hemidactylus brooki* occurs from Borneo and south China through much of tropical Asia and the northern half of Africa. It has been introduced into the West Indies.

Occurrence is general in Sind and through most of the Pakistan Punjab except at high elevations. At Saidu Sherif in Swat at about 3100 feet in elevation, I collected it on the verandas of the hotel. From the Sind desert westward it is found locally on oases, whether as a natural relict or as an introduction I cannot say.

Hemidactylus persicus Anderson

PERSIAN GECKO

Hemidactylus persicus JOHN ANDERSON, 1872, p. 378 (type locality: Shiraz, Persia). SMITH, 1935, p. 87.

DESCRIPTION: In habitus and scalation similar to *H. brooki*. Differs in being of larger size, in having greater number of lamellae on under side of toes, and in absence of femoral pores in males; preanal pores present. Skin thin and easily injured.

Ground color rich brown to yellowish, dorsal tubercles in life conspicuously pale; pattern of irregularly arranged black dots or lines on back, cross bands on tail; a prominent dark stripe from tip of snout through eye; belly white.

Variation in the material examined is summarized in tables 3 and 4.

HABITS: The Persian gecko is plentiful in rocky desert and around cliffs. On oases and in the transition zone between desert and flood-plain forest, it is often found on trees. It rarely enters inhabited buildings but is common in old Moslem tombs in the desert

and in abandoned stone and mud huts. This gecko is a good climber and wholly nocturnal. During the day and in the coolest part of the year, it hides under rocks or bark or in crevices and euphorbia clumps.

Eggs have been found under stones and bark, among euphorbia roots, and behind exfoliating rock flakes from late July to mid-September. Clutches have hatched during September and October, and very small young have been seen in the field from late June through October.

DISTRIBUTION: The range of the species extends from eastern Arabia north to southern Iran and east to Sind and Waziristan. Distribution in West Pakistan appears to be general in desert at low and moderate elevations, although I have no records east of the Indus. I have collected *H. persicus* at approximately 3400 feet in the Bolan Pass and at about the same altitude in Kalat District near Wad.

***Hemidactylus turcicus turcicus* (Linnaeus)**

MEDITERRANEAN GECKO

Lacerta turcica LINNAEUS, 1758, p. 202 (type locality: "in Oriente," restricted to Turkey in Asia by Karl P. Schmidt, 1953).

Hemidactylus turcicus turcicus: MERTENS, 1925, p. 60. SMITH, 1935, p. 86.

Hemidactylus karachiensis MURRAY, 1884a, p. 361 (type locality: Karachi).

DESCRIPTION: Very similar to *H. persicus*

and *H. brooki*. Males of *H. turcicus* readily differentiated from those of *brooki* by having only preanal pores. Adults of *H. persicus* average appreciably larger than those of *H. turcicus*. *Hemidactylus persicus* has, on the average, more subdigital lamellae than *turcicus*. Variation in the material examined is summarized in tables 3 and 4.

HABITS: In West Pakistan *H. turcicus* is a house gecko frequenting suburbs in preference to busy commercial sections of cities. Outside buildings it may be found around the bases of palm fronds and under rocks and rubbish. While active these lizards spend most of their time climbing, although they seldom make continuous vertical ascents of more than a few feet. While mostly nocturnal, they sometimes move about by day, especially in cool or overcast weather. The voice is a faint squeak.

There seems to be no particular breeding season in Karachi. Hatchlings and females containing large eggs have been seen during every month. At deposition the eggshells are soft and adhere to almost any surface. They harden within an hour or so. The eggs average 9.2 by 8 mm. Inside houses the eggs have been found behind loose wallpaper, in furniture and luggage, and in other little-disturbed places. Several lizards may use one site. On August 20 I found 16 eggs and fragments of perhaps a dozen others under a large rock. Although I looked under many

TABLE 4
VARIATION IN SCALE COUNTS AMONG WEST PAKISTAN SPECIES OF *Hemidactylus*
(Figures in parentheses are means.)

	Number of Specimens	Lamellae, 4th Toe	Femoral and Prenal Pores	Upper Labials	Lower Labials	Dorsal Tubercles, Rows
<i>Hemidactylus brooki</i>	34	6-10 (8.05)	15-27 (21.1)	8-11 (9.0)	7-10 (7.55)	14-19 (15.9)
<i>Hemidactylus flaviviridis</i>	34	12-15 (13.0)	9-14 (11.6)	11-14 (12.4)	9-12 (10.6)	None or very few
<i>Hemidactylus frenatus</i>	16	9-11 (10.0)	23-29 (26.8)	10-11 (10.6)	8-10 (9.0)	None or few scattered
<i>Hemidactylus leschenaulti</i>	10	10-11 (10.3)	20-24 (22.0)	10-11 (10.2)	7-10 (9.2)	Many scattered
<i>Hemidactylus persicus</i>	23	11-15 (12.6)	6-9 (7.1)	9-11 (10.2)	7-10 (9.2)	13-16 (14.3)
<i>Hemidactylus triedrus</i>	11	9-10 (9.1)	24-30 (27.0)	8-9 (8.5)	7-9 (8.2)	13-16 (14.4)
<i>Hemidactylus turcicus</i>	23	9-12 (10.1)	4-6 (5.2)	8-10 (9.1)	7-9 (7.9)	13-16 (14.5)

other rocks nearby, I found only four more eggs and a few shell fragments. By October 11, 16 of these 20 eggs had hatched; the last pair hatched October 27. On July 1, I found a crack in a cement wall crammed with eggs of this gecko and saw one egg hatch. The shell apparently was burst by a sudden effort of the hatchling which then lay motionless a few seconds before running quickly up the wall.

DISTRIBUTION: The range of this subspecies was probably originally confined to the Mediterranean coasts and islands. It has been transported extensively by man and now occurs in the West Indies, eastern Mexico, and the southern United States as well as in southwest Asia and North Africa. Occurrence in West Pakistan strongly suggests introduction by sea. The species is plentiful in Karachi and its environs, including the islands in and near the harbor. My only peripheral records are for Sehwan, a very old Indus city about 200 miles from the mouth of the river, and Ghorabari in the lower delta near the coast.

Hemidactylus triedrus (Daudin)

BLOTCHED GECKO

Gecko triedrus DAUDIN, 1802 (1802-1803, vol. 4), p. 155 (type locality unknown).

Hemidactylus triedrus: LESSON, 1834, p. 311. SMITH, 1935, pp. 88-89.

DESCRIPTION: This is a large, heavily tuberculate member of the *brooki* group of *Hemidactylus*. Color and pattern are distinctive; it is much the handsomest of the Pakistan hemidactyls. Ground color yellowish; back with three large, rich brown saddles narrowly edged with black; tail with regular dark and light rings; head with one or two yellow stripes behind eye and another across nape; belly white to pale flesh color.

HABITS: The blotched gecko has been collected in flat, semi-arid country with scrub vegetation. It is not an urban species nor does it enter buildings. A nocturnal reptile, it has been seen at dusk emerging from crevices and rodent burrows. It has been taken only during hot, humid weather from May through October, being most plentiful after the rains. Although it climbs well, and there are trees, walls, and buildings in some of the places where it has been collected, I have found it only on or close to the ground. In Malir Cantonment it is associated with *Eublepharis*

macularius, and its defensive behavior is similar, viz., rising high on the legs, lashing the tail, and making a spitting sound. Superficially, at least, *H. triedrus* does not seem to benefit from the association, for *Eublepharis* feeds upon its young.

Stomachs of wild-caught *H. triedrus* contained crickets, grasshoppers, and spiders. It is a fairly hardy species in captivity.

Females containing large eggs have been seen during May and June, and the small young are plentiful in September and early October.

DISTRIBUTION: The range extends from Ceylon through much of peninsular India to the vicinity of Karachi. In West Pakistan it has been collected only in the coastal plain between Karachi and the Indus delta.

Hemidactylus leschenaulti Duméril and Bibron

BARK GECKO

Hemidactylus leschenaulti DUMÉRIL AND BIBRON, 1836 (1834-1854, vol. 3), p. 364 (type locality: Ceylon). SMITH, 1935, pp. 97-98.

DESCRIPTION: Habitus similar to that of other members of genus; scales of back, limbs, and top of head minute, granular, intermixed with small hemispherical tubercles irregularly scattered and more numerous posteriorly; tubercles of tail in annuli, lateral ones larger and spinose; ventral scales small, imbricate; males with preanal and femoral pores; transversely enlarged scales on under side of tail.

Ground color ashy gray, showing meta-chroic change but not so markedly as does *H. flaviviridis*; several distinct wavy cross bands, gray to sooty; dark, irregular stripes from behind eye to shoulder and in some cases posteriorly onto flanks; ventral surfaces white.

HABITS: This is a sylvatic and arboreal gecko found by preference on large trees such as mango and banyan, occasionally on but not inside buildings. Those taken during the day have been concealed under bark of standing trees usually several feet above the ground. At night during warm weather they run about on the tree trunks but rarely descend to the ground.

A female containing large eggs was collected March 9. Small young were plentiful on the "Burra Bagh" oasis near Bela on Sep-

tember 22, but none was noted there in March.

DISTRIBUTION: The range is from Ceylon and peninsular India north and west to Rajputana and eastern Las Bela. My West Pakistan records are for forest along the Nara in Sanghar District and for the city of Bela and a nearby oasis. Jeromie A. Anderson reports he has specimens collected on oases in the Thar Desert. The records from Thar and Sanghar districts probably represent a natural extension of the range northward in more pluvial times; a similar distribution pattern is seen for some other reptile species. The Bela population is disjunct and separated by about 150 miles of desert. While it may be a natural relict, the probability of human introduction there is strong.

***Hemidactylus flaviviridis* Rüppell**

YELLOW-BELLIED HOUSE GECKO

Hemidactylus flaviviridis RÜPPELL, 1835 (1835-1840), p. 18 (type locality: Massaua, Eritrea). SMITH, 1935, pp. 98-99.

Hemidactylus coctaei DUMÉRIL AND BIBRON, 1836 (1834-1854, vol. 3), p. 365 (type locality: Bengal and Bombay). MURRAY, 1884a, p. 359.

DESCRIPTION: Similar to *H. leschenaulti* from which it differs in the following particulars: dorsal tubercles absent or greatly reduced in number; spinose tubercles on tail fewer and proportionally smaller; fewer than 15 preanofemoral pores; more subdigital lamellae. Comparison of these two species in the material examined is summarized in tables 3 and 4.

At night these lizards are pale gray and virtually without markings; by day they are brown to olive, with wavy, dark cross bands; ventral surfaces lemon yellow.

HABITS: This gecko is very strongly an edificial species, seldom seen far from buildings. If not the most plentiful lizard in Karachi, it is certainly the most familiar, being found everywhere within the city. It has occasionally been found on such large trees as the banyan, and this may be its original habitat. It is very agile and a splendid climber, never remaining long on the ground. It is the only local species that seems fully at home clinging to ceilings. It will climb glass surfaces unless they are highly polished and is

often seen silhouetted against windows. In buildings it tends to live above the Mediterranean and spotted house geckos although often found with them. Within buildings, the yellow-bellied house gecko is sometimes active by day, but it is normally nocturnal. It rarely is active when the temperature is below 65° F. It may rest during the day clinging to a wall in full view, but it more commonly hides in crevices.

The birdlike chirping of *Hemidactylus flaviviridis* can be heard at a distance of about 50 feet on a still night. It begins about the first of April and is heard through the warm weather.

The eggs have been found under the edge of gutters, behind fuse boxes, and in stacks of lumber and boxes from early April through July. Hatchlings have been noted from late May to early August. Eggs laid by captive lizards have hatched after an average incubation period of 57 days.

These geckos frequently station themselves near electric lights where they capture many types of insects. The prey is often surprisingly large in comparison with the lizard's size. By early fall, the larger lizards may become so fat they drop from the ceiling. This lizard is pugnacious and often pursues smaller geckos of its own or other species. Fights, presumably between adult males, occasionally are seen.

DISTRIBUTION: This species occurs from the shores of the Red Sea and around the coasts of Arabia and Iran, thence across northern India to West Bengal and south to the vicinity of Bombay. Over an undetermined but considerable part of this territory, it has been introduced by man.

In West Pakistan the species is found throughout most of the province at elevations below 3000 feet but always in association with human habitation. It is difficult to avoid the conclusion that man has been chiefly responsible for disseminating this gecko in West Pakistan, but the species is so widespread that its introduction must have been very early or its spread unusually rapid.

Smith (1935) suggested that *flaviviridis* and *leschenaulti* are conspecific. In West Pakistan the two approach each other and probably overlap, yet I know of no locality where both may be collected at the same site. I have seen

no specimens that I regard as intergrades or hybrids between the two species.

***Hemidactylus frenatus* Schlegel**

SOUTH ASIAN WAIF GECKO

Hemidactylus frenatus SCHLEGEL, 1836, pp. 366-368 (type locality: Java). SMITH, 1935, pp. 95-96.

DESCRIPTION: Habitus and scalation similar to those of *H. leschenaulti*. It is a smaller lizard and also differs in the following particulars: first toe less than half of length of second; preanofemoral pores in continuous series of 23 or more; dorsal tubercles scattered or partly in linear arrangement or virtually absent. See tables 3 and 4 for variation.

Ground color tobacco brown to pale gray; a dark stripe often extending through eye onto sides to groin; in some cases a row of dark spots on each side of midline; tail often reddish in young; belly dirty white.

HABITS: Parks and nurseries, particularly where there are coconut palms, are the characteristic habitat of this gecko in West Pakistan. Its habits appear to be much like those of the other small members of the genus. Most of my specimens were obtained during the cooler months of the year from the axils of palm fronds or beneath bark and rubbish. Although it is characteristically a domestic gecko over much of its range, I never collected or observed it in a house in Karachi, even in those adjoining a nursery where it is plentiful. At Mirpur Sakro one was collected clinging to a window curtain in bright daylight. Apparently it has difficulty competing successfully with other domestic species of *Hemidactylus*. In outdoor situations it has been collected with *H. turcicus* and *H. brooki*.

Many eggshells and a few unhatched and apparently non-viable eggs were found in palm axils on November 23 and December 13. The eggs average 9.8 by 8.3 mm. Immature lizards were plentiful but none appeared to be a hatchling. The smallest specimens were seen in early May. The call of this gecko is a series of four or five loud, staccato notes similar to the sound of a coin tapped against a window pane.

DISTRIBUTION: Today this lizard is virtually tropicopolitan, and the limits of its

original range may never be known, although it was probably south Asian. I have observed it at several localities in the city of Karachi and at Garho and Mirpur Sakro in the Indus delta. The distribution is much like that of *H. turcicus* and suggests introduction at modern or ancient seaports.

TERATOLEPIS GÜNTHER

Pending anatomical study and comparison with related African forms, I regard this genus as monotypic and probably confined to the region near the delta of the Indus.

***Teratolepis fasciata* (Blyth)**

SIND BROAD-TAILED GECKO

Homonota fasciata BLYTH, 1853a, p. 468 (type locality: Jaulna, Hyderabad Province).

Teratolepis fasciata: GÜNTHER, 1869, pp. 504-505. SMITH, 1935, pp. 123-124.

DESCRIPTION: Small, rather stocky, snout-vent lengths of three adult males, 42-49 mm., of five adult females, 50-56 mm.; tail markedly flattened dorsoventrally, wider than head, constricted at base and pointed at tip, length 60-65 per cent of body length. Eye with well-developed supraorbital ridge; ear opening a small oblique slit; body flattened dorsoventrally, no lateral fold; limbs well developed, digits rather short, flattened but not appreciably dilated; subdigital lamellae wide, undivided, nine to 12 in number on fourth toe; claw arising proximal to end of digit. Scales on crown of head polygonal, juxtaposed; upper labials eight to 10, lower seven or eight; two or three pairs of postmentals, anterior just touching; dorsal body scales imbricate, uniform; ventral scales similar to dorsals but smaller; scales on both dorsal and ventral aspects of tail more than twice size of body scales and strongly imbricate; males with six to eight preanal pores.

Dorsal ground color dark gray to sooty black, with light gray to buff cross bands and a prominent, curved, light mark on top of head behind eyes; tail and limbs more or less variegated or mottled; ventral surfaces dirty white, with scattered dark brown or gray flecks. Young similarly marked, but slightly darker.

HABITS: The known sites where this lizard has been collected are ridges or patches of high ground rising out of the flatness of the

delta and free from flooding. Most are rocky and nearly all are capped with groups of stone tombs or other structures. Usually there is considerable scrubby vegetation. The lizards are terrestrial and nocturnal and seem to be most active during the hot weather of April, May, and June. Although they can run with fair speed for a short distance, they are normally slow and deliberate in their movements. When alarmed they usually curl the body so that the large tail is presented toward the attacker; less often the tail is elevated and waved. The tail detaches only at the basal constriction.

The lizards are inactive during cool weather. In late November and early December, Jeromie A. Anderson took about a dozen specimens from beneath bricks and flat stones in a seventeenth-century Baluch graveyard. In captivity Anderson's specimens began mating in February, and the first clutch of eggs was laid March 8. The same female may lay several clutches of two eggs each. Eggs that were laid by one of my captive specimens on June 26 were 9 by 9.8 mm. They hatched August 10. The young were 22 mm. in body length; 33 and 35 mm. in total length.

In captivity the lizards feed on small roaches, crickets, house flies, and termites. Jeromie A. Anderson (1964) gave additional information on the habits of this lizard.

DISTRIBUTION: The only records, aside from those in West Pakistan, are for Jaulna in Hyderabad Province and the Khasi Hills in Assam. If valid, they give the species a range (possibly discontinuous) across northern India. In view of the absence of other Indian specimens, I feel both these records may be incorrect, and the known range of the species is confined to the Tatta and Hyderabad districts of Sind.

PTYODACTYLUS GRAY

Terminal portions of digits fan-shaped, with lamellae radiating outward from base and transverse plates on unexpanded section of digit; claws retractile.

There are two species, one widely distributed in the Middle East and North Africa; the other, *Ptyodactylus homolepis* (Blanford, 1876b), was described from the vicinity of Shikarpur in Sind. It is a large gecko, 90 to 110 mm. in snout-vent length

when adult; tail slender, rounded, tapering rather abruptly from base; limbs long and slender. The scales are uniformly granular above, feebly imbricate ventrally; there are no dorsal tubercles; the mental is elongate, almost separating the first pair of postmentals.

The Middle Eastern species, *P. hasselquisti*, is rather plentiful and inhabits rock crevices and old buildings. In contrast, *P. homolepis* is either rare or extremely local, for very few specimens have been collected. The known records are confined to the Kirthar Range in western Sind.

PRISTURUS RÜPPELL

A round pupil and straight digits without clinging pads characterize the small geckos of this genus.

There are seven species distributed through the desert regions of northeast Africa and the Middle East. They are said to be diurnal and to frequent rocky places. Murray (1884a) reported *P. rupestris* from Karachi, but his specimens have been lost and other persons have failed to find it there. The record may be in error, but there is a distinct possibility that some species of the genus occurs in the western part of Mekran. The easternmost records for Iran are from islands in the Persian Gulf.

FAMILY AGAMIDAE

CALOTES CUVIER

Body laterally compressed; dorsonuchal crest present; no femoral or preanal pores.

Lizards of this genus are characteristic animals of forested regions of southeast Asia where about 25 species occur. One reaches West Pakistan.

Calotes versicolor (Daudin)

INDIAN GARDEN LIZARD

Agama versicolor DAUDIN, 1802 (1802-1803), vol. 3, p. 395 (type locality: India; restricted to Pondicherry by Smith, 1935).

Calotes versicolor: JERDON, 1853, p. 470. SMITH, 1935, pp. 189-193.

Calotes viridis GRAY, 1846a, p. 429 (type locality: Madras). MURRAY, 1884a, p. 367.

Calotes grandisquamis (nec Günther, 1875) MURRAY, 1886, pp. 81-82.

DESCRIPTION: Head large, markedly swollen at angle of jaw in males; canthus rostralis

present; eye large, but opening small and almost horizontal; tympanum about diameter of eye opening; males with gular sac; limbs long, well developed; digits long, slender, slightly compressed laterally, terminating in strong claws; tail almost round, slender, filiform, its length 232–285 per cent of snout-vent length. Head scales irregularly arranged, juxtaposed; 10 to 13 upper and 11 to 14 lower labials; body scales keeled, imbricate, with more or less pointed tips, in 37 to 47 (mean 41.8) rows at midbody; a crest of 41–49 lanceolate spines from occiput to base of tail, more prominent in males. Snout-vent length of 14 adult males, 96–129 mm.; of six females, 86–101 mm.

Dorsal color light sandy or olive through shades of brown to sooty gray depending on metachroic change; usually a sequence of light transverse bars and light dorsolateral stripes, more marked in juveniles; head and shoulders of males suffused with orange or dull red; throat and chest orange to red, with black mottling; belly whitish, with dark streaks.

HABITS: This basically arboreal lizard occurs wherever there are trees or shrubs. While it tolerates considerable aridity, it is most abundant in mesic situations such as the low land along streams, desert oases, and city gardens. Although quite at home on the ground, these lizards are more often found in shrubs or tangles of vines. They climb with great agility, often jumping from branch to branch. The toes are prehensile, and the long tail is used for balancing. They hide behind stems or branches, flattening the body laterally until they are almost invisible. When sleeping or basking, they usually lie with the body closely pressed against a stem. The adults may climb 20 feet or so to station themselves on the top of a tree or bush. The period of activity in warm weather extends from dawn to shortly after sunset, but they are most active two to five hours after sunrise. In cooler weather they spend most of the time in piles of decaying vegetation, hollow logs, or beneath stones. Even in winter, however, the young and half-grown individuals emerge about midday to bask an hour or two.

From late April through June, the males show brilliant color and are quite aggressive toward other males. Females containing large

eggs have been collected from early June through September. One deposited 11 eggs on August 30; another, 16 on June 28. Seven clutches of eggs, six to 19 in number, have been found in city gardens between June 29 and October 22. Measurements of 39 eggs show greatest diameters ranging from 12 to 23.5 mm. and least from 8.5 to 14 mm.; the shells are soft, smooth, and pliable. Dates of hatching for four clutches are August 3, August 15–17, September 6–7, and October 23–25. Hatchlings are 25–35 mm. in body length, 78–90 mm. in total length. Observations on the lizards living free in our compound indicated that breeding size is reached 16 to 20 months after hatching.

Garden lizards have been seen feeding on spiders and various kinds of large diurnal insects such as grasshoppers and butterflies.

The domestic cat is an important predator on these lizards in cities. I have also seen them preyed upon by kestrels, kingfishers, and snakes. My wife saw a combat between a house crow and a large individual of *Calotes* in which the lizard, by a combination of adroit maneuvering and threatening behavior, escaped without serious injury.

The garden lizard is considered poisonous and generally feared by both Pakistanis and westerners. It can inflict a painful, though trifling, bite if picked up. The common vernacular name in Karachi is "girgit" or "girgitan"; in Sind it is called "shyee." This species and some other agamids are particularly abhorred, because the reptiles' habit of bobbing is considered a mockery of Moslem prayer. They are sometimes called "kafir-girgit" (more or less translatable as "infidel lizard"), and it is particularly meritorious to kill one on Friday.

DISTRIBUTION: The range of the species extends from Sumatra to south China and west through nearly all of India and Ceylon. It is common and generally distributed through Sind and the Punjab northward to Swat and southern Afghanistan. In Baluchistan its distribution is decidedly spotty and confined to oases and margins of watercourses.

SITANA CUVIER

This genus contains one species, *Sitana ponticeriana*. It resembles a small *Calotes* but has no dorsal crest and four instead of five

toes on the hind feet. Males show a large gular fan, red, black, and blue in color.

It is found in dry open country throughout much of India but not in true desert. Murray (1886) recorded it from the Thar Parkar District of Sind near the border of Kutch.

UROMASTIX MERREM

A genus of large, bulky lizards with heavy tails that are armed with half-rings of spines.

There are eight species distributed across North Africa and the Middle East to India. Two occur in West Pakistan. *Uromastix aemussi* (Strauch) is reported from western Baluchistan near the Iranian border. It is a larger and more vividly marked species than *U. hardwicki*; the caudal spines are larger and heavier, and there are dorsal spines as well. It is said to inhabit rocky hills. No specimens have been examined.

Uromastix hardwicki Gray

INDIAN SPINY-TAILED LIZARD

Uromastix Hardwickii GRAY, in Hardwicke and Gray, 1827, p. 219 (type locality: Kanauj District, United Provinces). SMITH, 1935, pp. 244-247.

DESCRIPTION: Head small and chunky; snout blunt; eye small; ear opening a vertical slit as large as eye, its anterior border denticulate; body dorsoventrally flattened, a prominent fold from behind ear over shoulder to flank; limbs short and stout; toes fringed with pointed scales; tail broad, heavy, tapering evenly, its length 69-79 per cent of snout-vent length. Head scales small, irregularly arranged; 11-13 upper and 12-14 lower labials; body scales minute, granular above, quadrangular and imbricate ventrally; femoral pores present in both sexes, combined count 29-38; large spinelike scales on posterior aspect of thighs; scales of tail in annuli, those on dorsal and lateral aspects enlarged, forming short, heavy spines, numbering 17-22 in basal annuli. Snout-vent length of six adult males, 168-240 mm.; of five females, 143-207 mm.

Adults dull sandy, yellowish, khaki, or brown, with darker reticulation; throat white, with dark spots; belly white, a blue-black spot in groin. Young brown to khaki, with numerous black spots that tend to fuse on

sides; sides of head and shoulders mottled with white.

HABITS: To some extent the spiny-tailed lizards occupy the niche filled in some other semi-desert regions by burrowing rodents such as the ground squirrels of the genus *Citellus*. The Indian spiny-tailed lizard inhabits sparse grassland and flat desert with moderately dense clay soil. It is terrestrial and tends to live in colonies. It is not unusual to see 50 or so animals in a hunt of two or three hours. The lizards dig an easily recognized burrow with a semicircular entrance almost flush with the surface. The opening is often plugged with loose earth while the lizard is inside. Most burrows go down steeply a foot or so, then bend and continue at a more gentle slope. Some are no more than 18 to 24 inches in total length, but most are longer. A group of us once dug 3 feet down and about 9 feet laterally after an unusually big individual. We gave up, exhausted, with the lizard somewhere in the subsoil beyond. Normally only one adult lives in a burrow; occasionally two do. For a short time in July and August, family groups of young may occupy a burrow, sometimes with an adult. Sometimes eight or 10 young attempt to dive into the burrow at once and may block the entrance momentarily with their bodies while their tails wave ludicrously in the air. Predation and wandering reduce the number within a few weeks. The lizards have a homing instinct and will run 50 yards or so to reach a particular hole. On the other hand, they occasionally try to enter a burrow obviously too small or one occupied by another lizard that promptly ejects the interloper. When emerging from its burrow, the lizard often rises as high as possible on its forelimbs, apparently to look around. I have never seen the tail presented at the mouth of the burrow when the lizard is alarmed. Abandoned *Uromastix* burrows are sometimes occupied by toads, snakes, or lizards of other species.

Spiny-tailed lizards emerge from their burrows about two hours after sunrise and are active until about an hour before sunset, unless the day is heavily overcast or intensely hot. The adult lizards are most in evidence during late March and early April. They are rarely seen from mid-November through February in the Karachi area, although a few

emerge briefly and bask at the entrance of their holes.

Evidence from dissections and observations of captives indicate a breeding season in March and early April, with eggs laid from late April into June. The eggs are oval, about 25–30 mm. in greatest diameter, and have thin, papery shells. Clutches examined numbered eight to 14. Some burrows excavated by Paul Nicoll in September had side passages 12–18 inches long. At the ends of some were masses of eggshells. The young begin to appear late in June.

The adults seem to be wholly vegetarian. We have seen them nibbling young grass, flowers, and leaves. The newly hatched lizards also feed on insects.

Spiny-tailed lizards make no active attempt at defense, but the thorny tail and spines on the thighs make a large one rather uncomfortable to hold. I have seen them preyed upon by jackals and hawks, particularly the laggar falcon.

The local name for the spiny-tailed lizard is "sonder." The desert peoples capture the lizards for food and for their fat which is said to have aphrodisiac and other medicinal properties. They are sometimes hawked in the bazaars, live or cooked to order. The natives usually capture the lizards by digging them from burrows. If water is available, it may be poured down the hole to drive the reptile out.

DISTRIBUTION: The Indian spiny-tailed lizard occurs from the United Provinces of India to Kathiawar and west to the Northwest Frontier Provinces and southeastern Baluchistan. West Pakistan records are confined mostly to that part of the province east of the Iranian plateau and below 1500 feet in elevation.

AGAMA DAUDIN

The 11 West Pakistan species of this genus fall into two groups, one composed of six large, rock-inhabiting, montane species (*nupta*, *melanura*, *caucasia*, *tuberculata*, *agrorensis*, and *himalayana*); the other, of five medium-sized, terrestrial species. In the former group enlarged dorsal scales are in more or less regular longitudinal or oblique series, the tympanum is large and superficial, and the caudal scales are in regular whorls.

In the latter group (*agilis*, *megalonyx*, *minor*, *rudrata*, and *rubrigularis*) enlarged dorsal scales are irregularly scattered or lacking, the tympanum is small and deeply recessed, and the caudal scales are irregularly disposed.

No examples of *Agama agrorensis* (Stoliczka) were obtained. This species is allied to *nupta* and *melanura* and is known from Kashmir, Chitral, and the Alpine Punjab. Mertens (1959b) gave an account of it. *Agama minor* (Hardwicke and Gray) is a stocky, short-tailed agamid somewhat similar to *megalonyx* in markings; the males lack callose preanal scales. It is terrestrial and said to be crepuscular and rather sluggish. It is known from northern and central India perhaps east to Chittagong (the type locality) and west to Kutch, Kathiawar, and probably southeastern Sind. As *Charasia ornata*, Murray (1886) reported it from the Thar Parkar District. Although it has not been collected there recently, there is no reason to doubt the record.

The genus as a whole is confined largely to Africa and western Asia, with one or two species in southeastern Europe. There are about 50 species.

Agama nupta nupta de Filippi

LARGE-SCALED ROCK AGAMA

Agama nupta DE FILIPPI, 1843, p. 407 (type locality; Persepolis). SMITH, 1935, p. 219.

Stellio nuptus: BLANFORD, 1876a, p. 317.

DESCRIPTION: Head triangular from above, moderately flat in profile; eye about equal to tympanum in size; supraorbital ridge prominent; margins of ear opening with conspicuous spiny excrescences; prominent gular fold but no gular sac; body moderately flattened dorsoventrally; limbs long and strong; digits slender, laterally compressed, claws large; tail round, evenly tapering, its length 184–220 per cent of snout–vent length. Scales on top and sides of head small, smooth, juxtaposed; scales of throat quadrangular, smaller than ventrals, subimbricate; 14–18 upper labials and 14–17 lower labials; middorsal scales large, keeled, in 16–20 rows; lateral scales less than half of size of dorsals; ventrals a little larger than laterals; scales of hind limbs and tail large, mucronate; whorls of tail scales each composed of three annuli; basal annuli (exclusive of two or three just behind vent) composed of 18–25 scales; males with a

patch of callose preanal scales and another patch in midventral area. Snout-vent length of five adult males, 126–151 mm.; of four females, 118–148 mm.

Dorsal surfaces dull brown to khaki or pale buff, with numerous irregularly scattered, black and yellowish scales; head of male often somewhat paler than body; tail with indistinct light and dark rings, distal third brown to black; throat and chest in males bright blue, shading to whitish on belly; ventral surfaces of females straw to whitish.

***Agama nupta fusca* (Blanford)**

YELLOW-HEADED AGAMA

Stellio nuptus fuscus BLANFORD, 1876a, p. 319 (type locality: Kalagan and Jalk, Baluchistan).

DESCRIPTION: Differing from nominate subspecies in coloring of male and in certain details of scalation. Spiny excrescences around ear opening larger than in *n. nupta* and more numerous; 13–16 upper and 14–16 lower labials; enlarged middorsal scales in 13–16 rows; basal tail annuli composed of 13–22 scales; dorsal scales generally more strongly mucronate than in *n. nupta*. Snout-vent length of five adult males, 137–162 mm.; of five females, 129–140 mm.

Entire head of male (in spring, at least) canary yellow, remainder of body, limbs, and tail dark brown to sooty black above and below save for sparse yellow speckling on back and for callose ventral and preanal scales which are amber; females drab brown to russet, indistinctly speckled with yellow; distal part of tail black; ventral surfaces straw. Juveniles grayish yellow, with narrow, rather irregular cross bands of brown, in some cases forming reticulate pattern; most of head black, with yellow chevron on crown and large yellow spots on temporal area, occiput, neck, and shoulders; tail banded almost to tip which is black. I have not seen young of the nominate subspecies.

HABITS: This is a very shy lizard, always found in rocky areas with vertical or near vertical surfaces and crevices that provide shelter. Other factors, possibly the type of vegetation, regulate distribution, for the species is spotty in occurrence. It has been taken at elevations up to 6000 feet.

In southern Baluchistan during late Feb-

ruary and early March, a period that may represent the breeding season, the large males, 17–20 inches long, perch conspicuously upon rocky pinnacles. Accumulated droppings and other evidence indicate that the lizards use these sites for several days at least. I saw one male pursue another that apparently had trespassed upon his territory. Females also display themselves at this season but are not so conspicuous as the males. Later during the year, the adult lizards are seldom seen. Small young, 45–50 mm. in body length, begin to appear in June and are found as late as November. The species does not hibernate in the Karachi area but doubtless does so farther north.

An examination of two stomachs and numerous fecal pellets indicates that the adults feed largely on grasses and flowers; no animal material was recognized.

DISTRIBUTION: The range of the species as a whole extends from eastern Iraq east to Sind and north to Afghanistan, apparently coinciding fairly closely with the Iranian plateau. Specimens that I refer to the nominate race have been collected from Kach and the Bolan Pass and westward to Galangar, Chagai District, and southward to the vicinity of Khuzdar. Examples of *fusca* have been collected near Khadeji Falls about 30 miles northeast of Karachi, near Diwana on the upper Hab River, and in the southern part of the Pab Hills.

***Agama melanura* (Blyth)**

BLACK ROCK AGAMA

Laudakia (Plocoderma) melanura BLYTH, 1854, p. 738 (type locality: Salt Range, Punjab).

Agama melanura: BOULENGER, 1885a, p. 363. SMITH, 1935, pp. 218–219.

Stellio liratus BLANFORD, 1874a, p. 453 (type locality: Saman, Dasht Province, Baluchistan).

DESCRIPTION: Body more lightly built than of *A. nupta* and more flattened dorsoventrally; tail longer and more slender, comprising 231–266 per cent of snout-vent length; circumaural scaly excrescences small or absent; 11–15 upper and lower labials; enlarged middorsal scales in six to 11 rows; whorls of tail scales composed of a single annulus, basal ones composed of 17–22 scales. Snout-vent lengths of eight adult males, 119–142 mm.; of five females, 98–130 mm.

Adult males sooty black above and black to dark gray beneath, with patches of callose scales and under sides of feet lighter; adult females dark brownish gray, with traces of paler dorsal spots; light gray to dull white below, with chrome yellow on under side of tail at its base and on under side of thighs. Smallest juveniles seen, about 60 mm. in snout-vent length, dusky gray, with faint, light dorsal spots; belly white; throat mottled with gray.

VARIATION: Of two large males from Ormara on the Mekran coast, the entire head, neck, and shoulder region is yellow, this color being extended as irregular spots onto the anterior dorsum. A subadult male from the same locality is ashy gray on the head and anterior half of the trunk. In general appearance these lizards are strikingly similar to *A. nupta fusca* from Khadeji Falls, but scale counts and body proportions are typical of *melanura*.

HABITS: This lizard inhabits cliffs and rock crevices. Its habits are much like those of *A. nupta*. Both species occur in the southern Pab Hills, but *melanura* is more common.

Breeding apparently takes place during early spring, and the young begin to appear in June.

Adults seem to be herbivorous; one stomach contained small berries and flower buds.

DISTRIBUTION: This species is restricted to low and moderate elevations from eastern Iran through Baluchistan to the Salt Range and the western hills of Sind.

Agama tuberculata Hardwicke and Gray

KASHMIR ROCK AGAMA

Agama tuberculata HARDWICKE AND GRAY, 1827, p. 218 (type locality: Bengal). SMITH, 1935, pp. 214-216.

DESCRIPTION: Habitus similar to that of *A. melanura*, but tail heavier and shorter, comprising 163-194 per cent of snout-vent length; 10-12 upper and lower labials; middorsal scales keeled, not larger than ventrals and but little larger than laterals, in 10-13 rows; annuli at base of tail composed of 31-40 scales. Snout-vent length of five males, 102-128 mm.; of one female, 102 mm.

Adults brown to bluish or greenish gray, with darker mottling; ventral surfaces of

males heavily marbled with dark blue; females cream; young similar to adults, but dorsal markings more conspicuous.

HABITS: We found this montane species along the Swat River from about 4000 to 6600 feet; it doubtless occurs higher. At the time of our visit, March 28 and 29, the lizards were seen in numbers sunning on large boulders. All sizes except very small juveniles were noted, but adult males predominated. They quickly took shelter under rocks or in crevices but usually emerged within a few minutes.

Fecal pellets examined consisted almost wholly of vegetable matter, but some lizards, especially young ones, were seen apparently pursuing insects. One large lizard seized a chicken bone thrown near it, shook it vigorously, and retreated under a rock with the bone in its jaws.

Distribution: The species occurs in mountainous country from eastern Afghanistan through most of Nepal.

Agama himalayana himalayana (Steindachner)

HIMALAYAN ROCK AGAMA

Stellio himalayanus STEINDACHNER, 1869, p. 22 (type locality: Ladak).

Agama himalayana: BOULENGER, 1885a, p. 362.

Agama himalayana himalayana: SMITH, 1935, p. 213.

DESCRIPTION: Habitus similar to that of *A. tuberculata*; tail comprising 137-182 per cent of snout-vent length; eight to 10 upper and nine to 11 lower labials; middorsal scales smooth, in eight to 10 rows; lateral scales small, granular; ventrals larger than laterals but smaller than middorsals; annuli at base of tail composed of 25-35 scales. Largest specimen examined a male with snout-vent length of 82 mm.; a doubtfully mature female has it 77 mm.

No fresh material of this species has been examined. Preserved specimens are bluish gray, with a faint light vertebral stripe bordered with black flecks; neck, shoulders, and anterior dorsum with scattered light spots; throat and chest of male with dark vermiculation and suffusion.

DISTRIBUTION: The nominate subspecies occurs in the western Himalayas to Tadzhik in the Soviet Union. Another subspecies

occurs in Tibet. In West Pakistan it is known from Gilgit and Chitral.

***Agama caucasica* (Eichwald)**

NORTHERN ROCK AGAMA

Stellio caucasicus EICHWALD, 1831, p. 187 (type locality: Tiflis and Baku, Caucasus).

Agama caucasica: BOULENGER, 1885a, p. 367. SMITH, 1935, pp. 220–221.

DESCRIPTION: Most robust of West Pakistan rock agamas; tail stout, comprising 130–153 per cent of snout–vent length; 13–16 upper and lower labials; middorsal scales weakly keeled, of about same size as ventrals, in six to nine rows; each tail segment made up of two annuli, annuli at base of tail composed of 25–30 scales, dorsal and lateral tail scales with short, heavy spines; similar spinose scales on sides of belly and on posterior thighs. Snout–vent lengths of six males, 112–139 mm.; of two females, 131 and 135 mm.

Ground color highly variable, changing both from one locality to another and individually with metachrosis, ranging from almost black through shades of brown to yellow or ochre; usually transverse rows of yellow spots ringed with black; ventral surfaces black to dark gray in males, a little lighter in females; throat of male vividly spotted with yellow.

HABITS: This species is strictly a rock lizard found among boulders in stream beds and on cliffs and rock fences. My records are for elevations between 6000 and 9000 feet. The adult lizards appear several hours after sunrise after the rocks are quite warm to the touch and become scarce after mid-afternoon. The young are active over a longer period. This is the least cautious of the rock agamas that I have encountered and can often be captured by hand.

Field observations and the dissection of a female indicate a breeding season in May and early June, with about a dozen eggs laid during June or July.

Adult lizards feed mostly on plants, with insects and small lizards being taken occasionally; one captive ate two individuals of *Cyrtodactylus* confined with it. The young seem to feed largely on insects.

DISTRIBUTION: The species is found from the Caucasus east and south to Waziristan

and northern Baluchistan. It is plentiful in the mountains from Kalat to Ziarat.

***Agama agilis* Olivier**

BRILLIANT AGAMA

Agama agilis OLIVIER, 1807 (1801–1807, vol. 4), p. 394 (type locality: neighborhood of Baghdad). SMITH, 1935, pp. 221–223.

Agama isolepis BOULENGER, 1885a, p. 342 (no type locality given).

DESCRIPTION: Habitus similar to that of *A. nupta*, but head somewhat less flat; tympanum smaller than eye, deeply recessed, a fringe of small, pointed scales above ear opening; gular fold well developed, gular sac present in males; claws proportionally smaller than in rock agamas; tail round, slender, evenly tapering, its length 154–180 per cent of snout–vent length in males and 131–159 per cent in females. Eyelids with fringe of pointed scales; small nuchal and temporal scales; dorsal scales keeled, imbricate, more or less equal in size; lateral and ventral scales slightly smaller than dorsals; scales of tail not arranged in annuli, ventral rows strongly keeled; males with a row of nine to 11 callose preanal scales; upper labials 14–18, lower 14–19; scale rows around body 62–82 (mean 71.8). Snout–vent length of 13 males, 79–106 mm.; of five adult females, 78–91 mm.

This lizard displays rapid, vivid, meta-chroic change. Males normally brown, gray, or dull yellow, with faint darker cross bands and light spots on flanks, becoming more or less completely suffused with bright cobalt blue on body, tail becoming bright yellow with dark brown bands; throat, chest, and belly normally whitish streaked with gray and lavender, becoming intense ultramarine blue. Females normally brown, with black cross bands enclosing a vertebral row of reddish rhomboid spots and two rows of lateral light spots, becoming pale gray, with orange cross bands enclosing pale yellow spots; ventral surfaces white, lightly striped with gray and lavender. Young marked similarly to females but lacking orange and reddish hues.

VARIATION: There is reason to believe *Agama agilis* is a composite of more than one species. Three specimens from northwestern Baluchistan are small, pallid, and unusually long-legged, with large scales on the crown and temporal region. They differ considerably

from specimens collected near Karachi but resemble the description of specimens from northeast of Kandahar reported by Leviton and Anderson (1961).

HABITS: This lizard is most plentiful in flat, open desert with clay or gravel soil and scattered shrubs or vegetation-covered mounds; it is less frequently found on sand. Males often station themselves on chunks of rock or other slightly elevated objects, but such is about the limit of their climbing ability. Although the species fully merits the name "*agilis*," not every individual will run when alarmed. Some crouch flat against the ground in the shade of a bush and may be caught by hand. The lizards are normally diurnal, but the young are active until dark. During mid-summer I have seen an occasional young one run across my path as I was collecting at night with a Coleman lantern. It may have been disturbed while sleeping in the open. Adults are rarely seen in the Karachi area from late October until mid-March, but juveniles may be out on warm, sunny, winter days.

Indirect evidence such as the finding of large eggs in females and the development of bright colors by both sexes indicates that breeding begins in May and continues through early August. On August 3 I saw a brightly colored male bobbing before a dark female. When alarmed, the male became dark, and both lizards ran and were lost to view. Young with snout-vent lengths of 30–35 mm. have been seen from the first week of July through November.

Captive lizards have fed on insects, particularly crickets and grasshoppers.

When approached by a comparatively small animal such as another lizard, this agama rises high on its legs, inflates its throat, and opens its mouth. It may lunge at the enemy by rarely bites.

Remains of one of these lizards was found in the den of an Indian fox (*Vulpes bengalensis*); snakes and birds are other known predators.

The Sindhi name "karrun" is applied to this lizard and to some of the rock agamas.

DISTRIBUTION: The over-all range extends from eastern Iraq and northeastern Arabia across most of Iran and southwestern Afghanistan to western Rajasthan. Occurrence in

West Pakistan is general in Sind and Baluchistan below 6000 feet; in the upper Indus basin the species occurs at least to Mianwali.

***Agama megalonyx* (Günther)**

AFGHAN GROUND AGAMA

Trapelus megalonyx GÜNTHER, 1864a, p. 159 (type locality: Afghanistan).

Agama megalonyx: BOULENGER, 1885a, p. 347. SMITH, 1935, p. 224.

DESCRIPTION: Habitus similar to that of *A. agilis* but more robust and shorter; tail tapering abruptly posterior to vent, its length 120–150 per cent of snout-vent length in males, 111–122 per cent in females; upper labials 15, rarely 16, lower labials 16 to 18; middorsal region with large and small keeled scales irregularly intermixed, largest scales about twice size of smallest; lateral scales about size of smallest dorsals; ventrals smooth, about size of laterals; scale rows around body 71–88 (mean 79.3). Snout-vent length of four adult males, 53–64 mm.; of two adult females, 71–74 mm.

Jerome A. Anderson says that males in June are metallic bronze above, with five or six dark cross bands enclosing reddish ocelli; throat cobalt blue; mauve patches behind forelimbs; ventral surfaces dirty white, with faint gray mottling. Females are pale gray to brown, with cross bands enclosing dull orange to cream ocelli edged with black; throat and ventral surfaces white. Juveniles resemble females.

HABITS: This species was collected around the margin of a flat area with predominantly clay soil (perhaps an old lake bed) at about 5500 feet in elevation. Those I captured were appreciably less alert and active than *A. agilis*. A small juvenile with a body length of 36 mm. was collected August 19.

DISTRIBUTION: This species is recorded from the north-central Baluchistan plateau (Quetta and northern Kalat districts) and adjacent Afghanistan. Murray's (1884a) record for Sind has generally been considered erroneous, but the occurrence of the species in the northern Kirthar Range does not seem unlikely.

***Agama rudrata baluchiana* Smith**

BALUCH GROUND AGAMA

Agama rudrata OLIVIER, 1807 (1801–1807, vol.

2), p. 429 (type locality: Persia and northern Arabia).

Agama ruderata baluchiana SMITH, 1935, pp. 223-224 (type locality: Quetta District, Baluchistan).

DESCRIPTION: Habitus similar to that of *A. agilis*; body short and stocky, dorsoventrally flattened; limbs long, slender; tail tapering abruptly posterior to vent, its length 114-118 per cent of snout-vent length. Head scalation similar to that of *A. agilis*; 15-17 upper and lower labials; dorsal scales imbricate, keeled, pointed, varying markedly in size, larger scales intermixed at random with smaller; lateral and ventral scales small, more or less of same size; 80-82 scale rows around body. Snout-vent lengths of two females, 82 and 88 mm.

Females earth brown to drab light gray, with irregular cross bands of dull orange to pale red; ventral surfaces whitish, without bright colors. No males examined.

HABITS: This species has been collected in rocky, semi-arid plateau country at 5900 to 6500 feet in elevation. It is a ground-dwelling lizard, secretive and rather sluggish, never going far from crevices or dense clumps of vegetation. Specimens collected late in May contained large eggs, and one of them deposited seven on June 3. The eggs were subspherical and 11-13 mm. in greatest diameter. A captive specimen fed on grasshoppers and roaches.

DISTRIBUTION: This subspecies is restricted to north-central Baluchistan (Quetta and Sibi districts). The range of the species as a whole extends westward to Turkey and Israel.

Agama rubrigularis (Blanford)

RED-THROATED AGAMA

Trapelus rubrigularis BLANFORD, 1876b, p. 25 (type locality: foot of the Kirthar Hills, west Sind).

Agama rubrigularis: BOULENGER, 1885a, p. 346. SMITH, 1935, p. 224.

DESCRIPTION: Habitus similar to that of other ground agamas; dorsal scales a little larger than ventrals, in 100-112 (mean 105.6) rows around middle of body; enlarged dorsal scales arranged in irregular transverse rows; 16-18 upper labials and 14-18 lower labials. Body length of two adult males, 85 and 95

mm.; of two adult females, 68 and 75 mm.; tail 110-124 per cent of snout-vent length in males, 106-107 per cent in females.

Dorsal color pale drab gray or sandy, with many small, pale yellow spots which are more distinct in males; indistinct dark bands on hind legs and tail; shoulder and anterior forearm of adult black; central portion of throat red in adults of both sexes; belly dirty white, unmarked.

HABITS: One specimen was collected at the base of the Lakhi Hills in flat clay desert with very sparse grass at an elevation of less than 300 feet. It was found in warm, overcast weather resting at the edge of a road on August 14 and contained large eggs nearly ready for deposition. A juvenile 33 mm. in body length was collected August 10. It was found at night running about rather aimlessly at the edge of a road.

DISTRIBUTION: The species is apparently restricted to the eastern edge of the Iranian plateau from Mach and Dadhar southward.

PHRYNOCEPHALUS KAUP

These small to medium-sized lizards are similar in general configuration to ground agamas such as *A. rubrigularis*; however, the external ear opening is lacking.

The genus includes about 40 species and is restricted to western and central Asia. Five species occur in West Pakistan. The beautifully colored *P. euptilopus* (Alcock and Finn, 1896) was not obtained. It is known from the desert basin region of northwestern Baluchistan.

Phrynocephalus scutellatus (Olivier)

GRAY TOAD AGAMA

Agama scutellata OLIVIER, 1807 (1801-1807, vol. 3), p. 110 (type locality: near Ispahan, Persia).

Phrynocephalus olivieri DUMÉRIL AND BIBRON, 1837 (1834-1854, vol. 4), p. 517 (based on Olivier's specimens). MURRAY, 1884a, p. 368.

Phrynocephalus scutellatus: SMITH, 1935, pp. 229-230.

Phrynocephalus tickeli GRAY, 1845, p. 260 (type locality: Afghanistan).

DESCRIPTION: Head almost round viewed from above; snout very blunt, with nostrils almost terminal; nasals in contact; prominent supraorbital ridge; eye small, lids with fringe

of pointed scales; gular fold present; body markedly flattened dorsoventrally, with weakly developed lateral fold; limbs long, slender; digits with fringe of pointed scales; tail tapering abruptly posterior to vent, slender, round, its length 141–148 per cent of snout–vent length; head scales small, granular; those of chin and throat larger and smooth; upper labials 13 or 14, lower 12–14; dorsum with minute granular scales, becoming larger on tail and limbs; ventral scales larger than dorsals, quadrangular, subimbricate, in 38–48 rows across middle of belly; no femoral pores or patches of callose scales in males. Snout–vent length of males, 42 and 44 mm.; of female, 46 mm.

Dorsal ground color predominantly gray, becoming darker on flanks and with scattered flecks of both lighter and darker hue; a broad lavender to magenta vertebral stripe in adults; dark bands on limbs and tail; ventral surfaces white, under side of tail with six or seven black bands.

HABITS: My specimens were taken where the soil consisted of fine sand heavily strewn with gravel and boulders and with very little vegetation. The species was not found on adjacent clay soil or in sand dunes. It is a very active lizard, running rapidly from one boulder or clump of vegetation to another. It was not observed to bury itself in sand to escape capture but ran into burrows. When cornered, it rises high on its legs, opens its mouth, lashes its tail, and lunges toward the enemy.

DISTRIBUTION: The range includes most of the desert basins of Iran, Afghanistan, and Baluchistan. Jeromie A. Anderson recently obtained specimens near Ormara on the Mekran coast. Murray's (1884a) record for Sind has not been confirmed.

***Phrynocephalus leuteoguttatus* Boulenger**

YELLOW-SPECKLED TOAD AGAMA

Phrynocephalus leuteoguttatus BOULENGER, 1887a, p. 497 (type locality: between Nushki and the Helmand River, Afghan-Baluchistan frontier). SMITH, 1935, p. 235–236.

DESCRIPTION: Habitus similar to that of *P. scutellatus*, but head not so flat; digital scale fringes better developed; tail thicker and shorter, its length approximately equal to snout–vent length; temporal region with small spinose scales; 12–15 upper and 11–14

lower labials; back with small imbricate scales intermixed with larger keeled tubercles; scales of dorsal aspect of limbs and tail mucronate; ventral scales as in *scutellatus*, in 35–44 rows across midbelly. Snout–vent lengths of nine males, 38–44 mm.; of five females, 38–41 mm.

Dorsal color in life gray to blue-black, with numerous irregularly scattered, small, round, brassy spots about size of eye; dorsal aspect of limbs sandy to pinkish; proximal part of tail dusky pink, tip black; throat, belly, and under side of limbs white.

HABITS: This lizard is restricted to areas of fine, windblown sand with sparse vegetation but is very abundant in this habitat. It is less speedy than many desert lizards. When alarmed, it often runs a few feet and buries itself in the sand with rapid lateral shivering movements, disappearing within a second or two but leaving a distinctive mark that enables a collector to find it. When moving about undisturbed, many of the lizards pump the tail rhythmically up and down, keeping the tip curled dorsally.

In the field I saw the lizards feeding on nymphs of the migratory locust that had recently hatched in vast numbers. Captives accepted small insects of several kinds but seldom survived more than a few days.

Females collected in May contained two to four large eggs. No young were seen at that time, but they were abundant in late August.

DISTRIBUTION: The known records are for desert basins in western Baluchistan east to Nushki and western Las Bela. The extent of the range into adjoining Iran and Afghanistan is unknown.

***Phrynocephalus ornatus* Boulenger**

STRIPED TOAD AGAMA

Phrynocephalus ornatus BOULENGER, 1887a, p. 496 (type locality: between Nushki and the Helmand River, Afghan-Baluchistan frontier). SMITH, 1935, pp. 232–233.

DESCRIPTION: Most slender and lightly built of West Pakistan toad agamas; head without spinose temporal scales; nasals usually in contact (80% of specimens examined); 12–15 upper and nine to 12 lower labials; dorsal scales small, imbricate, of uniform size; ventral scales in 34–42 rows at midbelly; digital fringe scales and claws long and thin;

tail tapering evenly, its length 133–142 per cent of snout–vent length in males, 119–125 per cent in females. Snout–vent length of seven adult males, 35–40 mm.; of two females, 40 mm.

Active, healthy adults light gray to sandy brown, with one to three pairs of raspberry-colored spots on anterior dorsum and scattered dark dots; lateral stripes white to pale yellow, bordered with black; tail pale lemon below, with four or five black cross bands; other ventral surfaces milk white.

HABITS: This species and *P. leuteoguttatus* commonly occur together in areas of fine, windblown sand, but I have the impression that *leuteoguttatus* is more common on steep slopes such as the faces of large dunes. During May, individuals of *P. ornatus* were active most of the day despite intense heat from about 10:00 A.M. to 5:00 P.M. They tended to remain close to bushes. When in direct sunlight, they hold their bodies as far as possible from the ground; in shade they flatten against the sand but rarely dig in. They are speedy and usually attempt to escape by running from bush to bush. Captives spent the night buried just under the surface of sand. The relationship of *P. ornatus* to *P. leuteoguttatus* is quite similar to that between *Callisaurus* and *Phrynosoma* in the Sonoran Desert of America.

Captive specimens fed readily on ants and termites but proved susceptible to chilling and dampness and did not survive long.

All the specimens seen near Nushki in May seemed to be adults. Apparently young hatch later in the summer and mature when less than a year old.

DISTRIBUTION: The known range of this species coincides closely with that of *P. leuteoguttatus*.

***Phrynocephalus maculatus* John Anderson**

BLACK-TAILED TOAD AGAMA

Phrynocephalus maculatus JOHN ANDERSON, 1872, p. 389 (type locality: Awada Shirza, Persia). SMITH, 1935, pp. 233–234.

DESCRIPTION: One of larger species with body form somewhat like that of *Agama agilis*; no spinose head scales; nasals not in contact; 13–16 upper and 13–15 lower labials; body scales much as in *P. ornatus*; ventrals in 49–52 rows at midbelly; digital fringe

scales weakly developed; tail rather thick and heavy, its length 138–152 per cent of snout–vent length. Snout–vent length of four adult males, 79–85 mm.; no adult females collected.

General color above sandy brown finely speckled with black and dull yellow and with faint dark bars on limbs and proximal part of tail, distal third of tail black; ventral surfaces dirty white, young with a wash of pinkish orange extending posteriorly from vent.

HABITS: I found these lizards only in a flat, playa-like area with rather hard-packed, sandy clay soil. The tract was almost totally devoid of cover, either plant or rock, and these lizards seemed to be the only resident vertebrates. They barely entered tamarisk scrub on one side of the tract and were not seen among the sand dunes on the other. In May the lizards appeared about two hours after sunrise and were active until about noon. They characteristically perched on any elevated object, particularly the small piles of earth and stone marking the course of the road. Their initial reaction to disturbance was to back off a few inches, with the end of the tail elevated, curled dorsally into a spiral, and waved from side to side. If more seriously alarmed, they ran with great speed. They would invariably escape a single collector, but two or more persons working together could usually fatigue the lizard until it was easily captured. Because of the singularly barren habitat, few lizards were able to find holes or crevices. They sometimes stopped suddenly and flattened against the ground.

Their droppings consisted largely of beetle and other insect remains plus small seeds and other bits of plant material. Captives fed on grasshoppers, crickets, and other insects but were not hardy.

DISTRIBUTION: This species occurs from Arabia and Iraq east to Afghanistan and northern Baluchistan as far as Nushki.

FAMILY CHAMAELEONIDAE

CHAMAELEO LAURENTI

Chameleons are a most distinctive group of lizards, among their most prominent characters being the long, extensile tongue, digits yoked in opposable bundles, ventrally coiled prehensile tail, and protuberant independently movable eyes.

This genus is largely confined to Africa and Madagascar, but species occur in Arabia, the Mediterranean islands, India, and the Seychelles. The Indian species just enters West Pakistan.

***Chamaeleo zeylanicus* Laurenti**

INDIAN CHAMELEON

Chamaeleo zeylanicus LAURENTI, 1768, p. 46 (type locality not stated but by inference Ceylon). SMITH, 1935, p. 251.

DESCRIPTION: Head and body markedly compressed laterally; prominent orbital and occipital ridges fusing posteriorly to form a casque; a low vertebral crest of bluntly pointed scales; blunt, posteriorly directed spurs on hind feet, more prominent in males; tail slightly compressed laterally, tapering abruptly posterior to vent and then more gradually, tip blunt, length 111–123 per cent of snout–vent length; scales of head generally larger than those of body; 20–25 upper and lower labials; body scales irregular in size, shape, and arrangement, juxtaposed; tail scales quadrangular and in annuli; a series of 97–116 large, tuberculate scales along ventral midline from chin almost to vent. Body length of four males, 110–153 mm.; of three females, 98–111 mm.

Dorsal color generally green but ranging from pale yellowish to dark olive, depending on metachroic change; usually indistinct white or yellowish spots on sides; venter yellowish to greenish white; upper labials and enlarged midventral scales ivory.

HABITS: The West Pakistan specimens of this chameleon were found on oases in the Thar Desert. The collectors reported finding them only on bushes and shrubs. All were adult or subadult animals.

In captivity the lizards were slow moving but alert. A pair were seen in copulation October 10 and 11. Four other females laid clutches of 10 to 18 eggs between November 25 and December 12. The average dimensions of the eggs were 9 by 18 mm.

In captivity the lizards fed on grasshoppers and dragonflies. The insects were usually captured with the tongue but if large were occasionally seized in the jaws.

DISTRIBUTION: The Indian chameleon occurs throughout Ceylon and peninsular India. The recently discovered relict colonies

in the southern Thar Desert represent the northwesternmost limit of the range.

FAMILY SCINCIDAE

MABUYA FITZINGER

In this large tropicopolitan genus the dorsal and ventral scales are similar in size and shape, imbricate, polished, smooth or keeled; eyelids movable; palatine and pterygoid bones united along midline of palate; limbs well developed, pentadactyl; nostril in nasal shield; supranasals present.

Two species are common in West Pakistan. *Mabuya aurata* (Linnaeus), a common skink of the Middle East, was reported from Sind by Murray (1884a). The validity of this record is questionable, but there is a possibility the species occurs in western Mekran.

***Mabuya macularia* (Blyth)**

BRONZE GRASS SKINK

Euprepes macularius BLYTH, 1853b, p. 652 (type locality: Rangpur, Bengal).

Mabuya macularia: BOULENGER, 1887a, p. 182. SMITH, 1935, pp. 264–266.

DESCRIPTION: Head small, snout short, not depressed; eye small, lower lid not scaly but lacking a clear window; ear opening oval, slightly smaller than eye; no preauricular lobules; six or seven upper and seven lower labials; one postmental; dorsal scales with five to seven low keels; lateral and ventral scales smooth; number of scales along midline from base of head to above the vent 37–43 (mean 40.37); scale rows around middle of body 27–29; limbs short, appressed toes in adults just overlapping or separated by one to three scales; tail round, with even taper, its length 136–162 per cent of snout–vent length, males apparently with longer tails, but few adults with unregenerated tails are captured. Snout–vent lengths of nine adult males, 52–63 mm.; of six adult females, 52–65 mm.

Dorsum bronzy, with marked iridescence, uniform or specked with black; sides darker, being black in males with rows of small white dots, in females brown to gray, with the light dots sparse or absent; belly white. Young resemble females.

VARIATION: As pointed out by Smith (1935, p. 265), this species shows more light pigment on the sides and a generally paler coloring in the northwestern part of its range.

Comparison of specimens from the Karachi and Las Bela districts with those from the Indus delta shows the former to be more lightly pigmented on the sides, but I find no other differences within the West Pakistan sample. West Pakistan specimens are smaller than specimens from south India and Ceylon.

HABITS: The bronze grass skink is a shy and sinuous lizard, usually glimpsed as it slips through low vegetation and fallen leaves. It inhabits grassland and the edges of cultivated fields, also parks and gardens, and may be very abundant locally. It is most often found from the onset of the rains to mid-December but is active throughout the year. During the cooler months it is diurnal, but in hot weather it is decidedly crepuscular and nocturnal. On July 22 in the Indus delta, the grass in places was fairly alive with these little skinks from 10:00 P.M. until at least 2:00 A.M. The weather was rainy, and water was rising rapidly in the low land. Flooding probably helped concentrate the lizards on strips of higher ground, but I have also taken them at night during the dry season though not in such numbers. Along the Indus this skink is often associated with *M. dissimilis*.

Males show bright vermilion pigment on the lips and sides of the body from late June through September. This is presumably a breeding color. Females from July through September are heavy with eggs. A few untended clutches of four to six eggs presumed to be of this species were found under piles of decaying grass during July and August. Small young have been observed from late June through early October.

DISTRIBUTION: The species as currently defined ranges from Laos and Cambodia to northern Malaya and west through most of Burma, India, and Ceylon to southern Baluchistan.

In West Pakistan it has been collected only from lower Sind west to Karachi, with a disjunct colony on an oasis near Bela. The latter may represent introduction by man.

***Mabuya dissimilis* (Hallowell)**

STRIPED GRASS SKINK

Euprepes dissimilis HALLOWELL, 1860, p. 78 (type locality: Bengal).

Mabuya dissimilis: BOULENGER, 1887a, p. 175. SMITH, 1935, pp. 261–262.

Euprepes monticola GÜNTHER, 1864a, p. 80 (type locality: Sikkim).

Euprepes guentheri BLANFORD, 1879, p. 123 (new name for *monticola* Günther). MURRAY, 1886, p. 74.

Euprepes petersi STEINDACHNER, 1869, p. 43 (type locality: Chamba, Punjab).

Mabuia hodgarti HORA, 1927, p. 2 (type locality: Rawalpindi).

DESCRIPTION: Head similar to that of *M. macularia*; lower eyelid with clear disc; three to five small, preauricular lobules; six to eight upper and six to seven lower labials; one postmental; dorsal scales usually with three keels, occasionally with two; ventral scales smooth; number of scales along midline 44–51 (mean 47.7); scale rows around middle of body 33–38, usually 34; appressed toes touching or overlapping except in large fat adults; tail length, 168–194 per cent of snout–vent length. Snout–vent lengths of five adult males, 77–90 mm.; of seven females, 78–92 mm.

Dorsal ground color dark brown to light olive or greenish; stripes dull yellow, margined with black dots that may fuse into lines; sides with small white spots and a white line below eye; belly greenish white. No marked sexual dimorphism in color or change in color or pattern with age.

HABITS: My observations on the habitat of this lizard are quite different from those reported by Smith (1935, p. 262) who implied that it is a predominantly xeric species. I found it only in damp grassland where it is often plentiful. Although largely terrestrial, it readily enters water when pursued and may climb into low shrubs. It is most frequently seen during late October and November after the heat has moderated but before drying of the low land. At this season it is most active in the forenoon. During the rainy season it is active during the cooler hours of early morning and late afternoon and is to some extent nocturnal. From December until the onset of the monsoon it is rarely seen. Females collected early in November contained large eggs; however, these may not be laid until spring.

In the field I have seen these skinks feeding on insects and spiders; one was seen with a small frog in its jaws. Captives feed readily but are delicate and require a regular supply of drinking water.

DISTRIBUTION: The range is from West Bengal and Bihar across the plains of northern and central India. The range in West Pakistan extends from the delta of the Indus north to Rawalpindi and Campbellpore but not westward onto the Iranian Plateau. The West Pakistan material is quite different in pattern and color from the few specimens that I have seen from the eastern part of the range.

EUMECES WEIGMANN

In external characters, the skinks of this genus resemble those of the genus *Mabuya*. They differ in having the palatine and pterygoid bones separated along the midline of the palate and in other skeletal features. The scales are smooth and the temporals better developed in this genus than in *Mabuya*.

Whereas *Mabuya* is largely tropical in distribution, *Eumeces* is mostly confined to the north temperate zone. There are about 45 species. Three have been reported from West Pakistan, but two of them are closely related and probably conspecific.

***Eumeces taeniolatus* (Blyth)**

YELLOW-BELLIED MOLE SKINK

Eurylepis taeniolatus BLYTH, 1854, p. 739 (type locality: Salt Range, Punjab).

Pleistodon scutatus THEOBALD, 1868, pp. 25–26 (apparently based on Blyth's specimens).

Eumeces taeniolatus: STOLICZKA, 1872a, p. 75. TAYLOR, "1935" [1936], p. 111.

Eumeces scutatus: BOULENGER, 1887a, p. 382.

DESCRIPTION: Head small; snout bluntly pointed; eye a little larger than ear opening, lower lid scaly only around edge; ear opening a vertical slit; two or three small, preauricular lobules; eight upper and six to eight lower labials; two postmentals; scales of median dorsal row about twice as wide as those of adjoining rows, divided anteriorly, number of these scales from nape to above vent 75–80 (mean 77.1); scale rows around middle of body 20 or 21 in 12 specimens, 23 in a thirteenth; limbs and toes short, failing to touch by a distance about equaling head width; tail round and thick at its base, with little taper in proximal third, tail length about 150 per cent of snout–vent length, but few specimens have complete, unregenerated tails. Snout–vent length of seven adults, 97–117 mm.; two of the three largest specimens are females.

Dorsum pale sandy to bronze, speckled with cream; three dark brown stripes enclosing pale flecks; tail speckled and variegated black, brown, and pale gray; ventral surfaces usually bright yellow, occasionally peach color; no marked color differences between sexes. Young brassy, each scale edged with black, no stripes; tail with narrow, irregular black bars on pale gray background.

VARIATION: In specimens from Sind, the median dark stripe extends unbroken from the occiput to or almost to the level of insertion of the hind legs. In specimens from the alpine Punjab, northern Baluchistan, and Transcaspia, the median stripe is shorter, extending less than half of the distance from the occiput to the insertion of the hind limbs. The Arabian specimen figured by Haas (1957, fig. 9) is distinctly different in pattern from West Pakistan specimens.

HABITS: These secretive lizards have been dug from burrows and found under rocks. Occasionally they venture into the open. One was taken March 30 crossing a road about noon; another was collected on the road about an hour after sunset during intensely hot weather in late May. Sparse grassland with loose clay soil seems to be a characteristic habitat, but specimens have also been taken on rocky hillsides up to 6800 feet in elevation. They have been found throughout the year. Nothing is known of breeding save that a small juvenile 47 mm. in snout–vent length was collected September 4. Captives are mild tempered. They feed poorly and spend most of their time buried. Beetle larvae seem to be their chief food.

The Sindhi name for this lizard is "putturguchni." In the Punjab, the name "baamni" is applied to this lizard and to other snakelike species.

DISTRIBUTION: This almost certainly polytypic species is known from southwestern Arabia to Transcaspia and east to Kutch and Kashmir. In West Pakistan it probably occurs throughout the province exclusive of the high mountains and sandy desert but is not an easy species to collect in numbers.

***Eumeces schneideri blythianus* (John Anderson)**

ORANGE-TAILED SKINK

Mabouia blythiana JOHN ANDERSON, 1871c, p. 186 (type locality: Amritsar, Punjab).

Eumeces blythianus: BOULENGER, 1887a, p. 385. TAYLOR, "1935" [1936], pp. 143-146.

DESCRIPTION: Head of moderate size, slightly swollen at temples; snout rather long and narrow; eye a little larger than ear opening; four to six preauricular lobules; eight upper and six or seven lower labials; no postnasal; single postmental; scales of two median dorsal rows distinctly wider than those of adjoining rows, 55-60 from nape to point above vent; scale rows around middle of body 28; limbs stout, appressed toes overlapping; tail round, with even taper, its length 146-170 per cent of snout-vent length. Snout-vent length of three adults, 93-111 mm.

Dorsal color of adults pale gray, with vermilion stripes from temporal region to groin; dorsum of tail vermilion to orange, with orange scales scattered irregularly over limbs and back; lips and chin chrome yellow; belly white. A half-grown specimen is dark gray to black, with four brassy stripes and a cream-colored lateral stripe, most of the tail orange, and scattered orange scales on the dorsum.

VARIATION: *Eumeces zarudnyi* was described by Nikolsky (1899) from specimens collected at Seistan and Kirman in eastern Iran. Mertens (1959b) referred specimens collected on the Mekran coast and Astola Island to this form, considering it a subspecies of *E. schneideri*. A specimen from Ormara has two postmentals but resembles *blythianus* in other details of the lepidosis. It has an unusually long tail, 180 per cent of the snout-vent length, is generally paler in color, and lacks the scattered orange scales on the back. On the basis of material examined, I think that *blythianus* and *zarudnyi* are at best subspecies. At present it seems advisable to consider them conspecific with *schneideri*.

HABITS: All the specimens collected were in more or less rocky places at elevations below 500 feet. One was on a bluff overlooking the sea; another was under a slab of concrete with an adult *E. taeniolatus*. Two individuals, one of which escaped, were in the open during mid-morning. These big skinks bite powerfully, retaining their hold and sometimes rotating their body.

DISTRIBUTION: *Eumeces blythianus* previously was known from the Afridi country along the Afghan border near Khyber Pass and from the type specimen purchased from a

merchant who allegedly obtained it at Amritsar in the Punjab. My specimens extend the range southward to the coastal plain at Karachi. If *zarudnyi* is a valid subspecies, it occurs from eastern Iran to intergrade with *blythianus* on the Mekran coast.

CHALCIDES LAURENTI

Nostril between rostral and nasal; supranasals present. Limbs small to vestigial, although relatively well developed in West Pakistan representative of genus; body cylindrical and tail thick at base.

There are about a dozen species distributed from Spain and the Canary Islands across northern Africa and southern Europe and through the Near and Middle East to Sind.

Chalcides ocellatus (Forskål)

OCellate SKINK

Lacerta ocellata FORSKÅL, 1775, p. 13 (type locality: Egypt).

Chalcides ocellatus: BOULENGER, 1887a, p. 400. SMITH, 1935, p. 349.

DESCRIPTION: Head small; snout short, bluntly pointed; eye small, central portion of lower lid with translucent disc; ear opening about as large as eye, no preauricular lobules; seven upper and six or seven lower labials; single postmental; body cylindrical; scales smooth and of almost uniform size throughout; number of scales along midline from base of head to point above vent 62-71; scale rows around middle of body 28 or 29; limbs and digits well developed but short, appressed toes separated by at least 20 scales; tail round, tapering to pointed tip, regenerated in all specimens examined. Snout-vent lengths of three adult specimens, 90-108 mm.

Dorsal color of freshly preserved specimens bronzy, shading to pale yellow or cream on sides and belly; black scales arranged in irregular transverse rows on body and more regular annuli on tail, each dark scale split longitudinally by a cream-colored bar; top and sides of head speckled with dark; labials cream, with dark bars.

HABITS: Little was learned concerning the habits of this skink in West Pakistan. Jeromie A. Anderson and others say it may be found in both rocky and sandy terrain at elevations below 500 feet. The species is reported to be live bearing, but there is no information on

the breeding or birth of young in the West Pakistan population.

DISTRIBUTION: With its subspecies this form occurs throughout the Mediterranean region and eastward through the northern part of Saudi Arabia and around the shores of the Persian Gulf to the Mekran coast. The known West Pakistan records are restricted to this coastal strip. I have seen specimens from Ormara and Astola Island. Jeromie A. Anderson says the species occurs east to the Miani Hor, and Murray (1884a) reported it from Karachi.

SCINCUS LAURENTI

Snout wide and markedly depressed, lower jaw countersunk; limbs short but well developed, digits fringed with pointed scales.

There are eight species found from Algeria to eastern Iran and possibly West Pakistan. Murray (1884a) described *S. arenaria* from specimens presumably collected on sandy plains near the Hab River. Subsequent collectors have not taken specimens of this genus in West Pakistan. Smith (1935) and others have put *arenaria* in the synonymy of *S. mitranus*, but the actual systematic assignment of the West Pakistan populations, if any exist, must await the collection and examination of specimens. It is somewhat surprising that a rather large and distinctive reptile should not be rediscovered in the relatively well-collected lower valley of the Hab River.

ABLEPHARUS FITZINGER

The salient characteristic of skinks of this genus is the fusion of the eyelids to form a transparent cap. The two West Pakistan species are very small, slender lizards with weakly developed limbs.

The genus contains about 25 species distributed from southeastern Europe through the Old World tropics, with one species spread through the Pacific islands to the west coast of South America, part of this range probably representing introduction by man.

Ablepharus pannonicus FITZINGER

MEDITERRANEAN DWARF SKINK

Ablepharus pannonicus FITZINGER, 1823, p. 103 (type locality: Bokhara). SMITH, 1935, p. 310.

Ablepharus brandti STRAUCH, 1868, p. 565.

MURRAY, 1884a, p. 354 (type locality: Samarkand, Turkestan).

Blepharosteres agilis STOLICZKA, 1872c, p. 126 (type locality: southwest of Kalabagh, Punjab).

DESCRIPTION: Head small, snout short, bluntly pointed; eye of medium size, surrounded by small scales; ear opening smaller than pupil; seven upper and six lower labials; one postmental; scales along dorsal midline from occiput to point above vent 53–57 (mean 55.5); scale rows around midbody 20; limbs slender, appressed toes separated by three to five scales; tail round, with even taper, its length 160–180 per cent of snout-vent length. Snout-vent length of four adults, 29–33 mm.

Middorsal region bronze; cream to pale greenish stripe from upper orbit to base of tail; black stripe from snout through eye to base of tail; upper labials cream; chin and throat whitish, flecked with blue; belly pale bluish gray; sides of tail with light and dark flecks; limbs and under side of tail tinged with red.

HABITS: My specimens were obtained on rocky hillsides sparsely forested with juniper at an elevation of 7000 feet. Most of those captured were under rocks or boards, but several individuals were seen creeping among the leaves of the forest floor. They are not particularly fast, but their small size makes them difficult to capture.

DISTRIBUTION: This species occurs from Hungary, Greece, and islands of the eastern Mediterranean to Tadzhikistan, Afghanistan, and the northern Punjab. The West Pakistan records are all for the mountainous northern sections of the province from Quetta to Chitral except for Murray's (1884a) report of specimens from Karachi, where it may have been introduced. I did not collect it there.

Ablepharus grayanus (Stoliczka)

EARLESS DWARF SKINK

Blepharosteres grayanus Stoliczka, 1872a, p. 74 (type locality: Waggar District, northeastern Kutch). MURRAY, 1884a, p. 354.

Ablepharus grayanus: BOULENGER, 1887a, p. 352. SMITH, 1935, p. 311.

DESCRIPTION: Differs from *A. pannonicus* chiefly in absence of external ear opening, although a dimple may be present; scales along dorsal midline from occiput to point

above vent 49–57 (mean 52.6); scale rows around midbody normally 18, rarely 17 or 19. Snout–vent lengths of seven adults, 27–32 mm.

Middorsal region brassy, generally paler than in *pannonicus*; lateral dark stripe brown; ventral surfaces white to pale bluish; no red tint to limbs or tail.

HABITS: These tiny skinks have been found in such situations as arid rocky desert, urban gardens, oases, offshore islands, and the interior of buildings. They are mostly secretive and terrestrial, but one was collected on a wall about 3 feet above the ground. Several have been found in or near ant nests. They are reported to feed mostly upon ants; my limited observations confirm the report. The absence of eyelids and ear openings may be adaptations to ant eating as well as to burrowing, for this reduces the body openings vulnerable to attack by these insects.

Specimens of this dwarf skink have been found throughout the year, usually by searching under cover. Those living in our compound sometimes basked briefly on the terrazzo steps, particularly on hot, humid mornings. Small young 13 to 16 mm. in body length were seen during April and August.

DISTRIBUTION: The limits of the range of this species are not well known, and some of the northern records may refer to *A. pannonicus*. The present species is definitely known from Kutch, Sind, mostly west of the Indus, eastern Baluchistan, and the Punjab and Northwest Frontier Provinces at low altitudes. The colony at Frere Hall, Karachi, mentioned by Murray (1884a) and others still exists.

RIOPA GRAY

Lower eyelid scaly, with or without transparent disc; nostril in nasal; supranasals present; pterygoid bones united anteriorly; palatal notch shallow, not extending to level of eyes.

The genus occurs from the islands of Indonesia through southeast Asia, with one species reaching West Pakistan.

Riopa punctata (Linnaeus)

DOTTED GARDEN SKINK

Lacerta punctata LINNAEUS, 1766, p. 369 (type locality: Asia).

Riopa punctata: SMITH, 1935, p. 318.

Riopa hardwicki GRAY, 1845, p. 96 (type locality: Madras). MURRAY, 1886, p. 74.

DESCRIPTION: Small, short-legged skink but larger and more robust than *Ablepharus*; lower eyelid with transparent disc; ear opening almost round, smaller than eye, no preauricular lobules; six or seven upper and seven lower labials; single postmental; dorsal scales smooth; 72 scales along midline from nape to above vent; 24 scale rows around midbody; toes of appressed limbs failing to meet by about 10 scale rows; tail round, thick at base, incomplete in only West Pakistan specimen examined. Latter specimen subadult; snout–vent length, 56 mm.

Central part of back brassy, with four rows of black dots, two lateral ones more distinct; a wide, cream-colored band from tip of snout passing above eye onto sides of body and tail, ventral to this a black band passing through eye and onto tail and body; three rows of small black dots from axilla to groin and onto tail; ventral surfaces white.

HABITS: The single specimen collected was under a stone in a moderately damp, shady, grassy spot. The weather was cool (late February), and the lizard made no attempt to escape.

DISTRIBUTION: This is a common species from West Bengal through most of India and Ceylon. In West Pakistan the species is restricted to the extreme eastern part of the province at low and moderate altitudes. It is known from the Lahore and Hazara districts of the Punjab; Murray (1886) recorded it from Sind but without definite locality.

SCINCELLA MITTLEMAN

Mittleman (1950) established this genus for the small skinks defined, in part, by the presence of a transparent disc in the lower eyelid; no supranasals; one or two pairs of enlarged preanals; four supraoculars; six or seven supralabials; frontonasal and rostral wider than long; and limbs of moderate length and pentadactyl.

The genus contains at least 35 species occurring in southeast Asia, Japan, the Philippines, Indonesia, Central America, and the southern United States. Two species occur in West Pakistan, both in the extreme north.

***Scincella himalayanum* (Günther)**

HIMALAYAN GROUND SKINK

Eumeces himalayanus GÜNTHER, 1864a, p. 86 (type locality: western Himalayas).

Lygosoma himalayanum: BOULENGER, 1887a, p. 257. WALL, 1911b, p. 133.

Leiolopisma himalayanum: SMITH, 1935, pp. 299–300.

DESCRIPTION: In addition to generic characters listed above: snout bluntly pointed; ear opening oval, smaller than eye; paired frontoparietals; prefrontals separated in nine of 11 specimens, just touching in one, and widely in contact in one; six or seven upper labials; scales smooth, in 24–28 rows at midbody; scales from nape to above vent number 53–62 (mean 56.4); toes of appressed limbs overlapping widely; tail round, with even taper, its length 131–158 per cent of snout-vent length. Snout-vent length of four adult males, 43–49 mm.; of one adult female, 53 mm.

Dorsum iridescent bronze, with indistinct lighter and darker flecks; vertebral dark stripe present in some individuals; narrow, brassy, lateral stripe with irregular edges; below this a broad, dark brown stripe beginning on snout and passing through eye and above forelimb, bordered below by a narrow, irregular, whitish stripe edged with black; stripes continued onto proximal part of tail, distal part bronzy, with light and dark flecks; top of head and limbs bronzy, with dark speckling; ventral surfaces bluish white.

HABITS: Two specimens were collected in the Kagan Valley during late May in open grassy country at about 9000 feet in elevation.

DISTRIBUTION: This species occurs in mountainous regions from Nepal west to southern Turkmenistan S.S.R. In West Pakistan it has been taken in Chitral and in the Hazara District.

***Scincella ladacense* (Günther)**

GLACIER SKINK

Eumeces ladacensis GÜNTHER, 1864a, p. 88 (type locality: Ladak).

Leiolopisma ladacense: SMITH, 1935, p. 300.

Euprepes stoliczkai STEINDACHNER, 1869, p. 45 (type locality: Spiti River Valley, Kashmir).

Euprepes kargilensis STEINDACHNER, 1869, p. 46 (type locality: Kargil, Kashmir).

DESCRIPTION: Similar in habitus and lepidosis to *L. himalayanum*; frontoparietals divided asymmetrically, one half slightly to markedly larger than other; prefrontals not in contact; eight supralabials unilaterally or bilaterally in three of four specimens examined; scale rows at midbody 33 or 34; scales from nape to above vent 63–69 (mean 67.0); tail, 104–117 per cent of snout-vent length. Snout-vent length of three adults, 51–55 mm.

No fresh material of this species has been examined. Middorsal region bronze, with more or less heavy dark flecking and scattered light-edged scales; dark lateral stripe from eye to groin, more prominent in males and usually enclosing light spots; ventral surfaces bluish white.

DISTRIBUTION: This decidedly alpine lizard occurs from western Nepal to the Karakoram. It has been collected several times at altitudes above 10,000 feet and has been reported from Kahajeng Khola, Nepal, at 18,000 feet, the highest altitude attained by any cold-blooded vertebrate. The known West Pakistan localities are confined to Baltistan.

OPHIOMORUS DUMÉRIL AND BIBRON

Limbs present but greatly reduced in size; with three or four digits, head wedge-shaped; with lower jaw countersunk; general habitus serpentine.

The genus contains six species found from southeastern Europe to the Indian Desert. Three occur in West Pakistan. *Ophiomorus brevipes* (Blanford) has not been examined. It is closely related to *O. blanfordi*.

***Ophiomorus tridactylus* (Blyth)**

INDIAN SAND-SWIMMER

Sphenocephalus tridactylus BLYTH, 1853b, p. 654 (type locality: Afghanistan).

Ophiomorus tridactylus: BOULENGER, 1887a, p. 394. SMITH, 1935, pp. 346–347.

DESCRIPTION: Head small, wedge-shaped in profile, snout pointed; eye very small, lids fused with clear disc in lower lid; no external ear opening; usually six upper labials, occasionally five or seven; five or six lower labials; body scales smooth, in 21 or 22 rows; forelimbs very small and poorly developed; hind limbs more than twice as long as forelimbs but slender and weak; three toes on both fore

and hind feet; tail thick, with little taper proximally but tapering sharply to pointed tip distally, tail length 63–85 per cent of snout–vent length. Snout–vent length of nine males, 77–86 mm.; of 11 females, 83–98 mm.

Dorsum golden yellow to tan; tail paler and tending to be grayish; belly pearly white. Tail sky blue in young.

VARIATION: In a series of eight specimens collected along the Afghan border from Quetta westward to Nok Kundi, the dorsum is immaculate or marked with a pair of dorso-lateral rows of black dots, and the scales along the midline from the nape to a point above the vent number 102–118 (mean 110.8). In 18 specimens from Sind and Las Bela, the dorsum is marked with six to 10 rows of black dots that often fuse into fine lines, and the scales along the dorsal midline number 97–110 (mean 103.4).

HABITS: Fine, loose sand is essential for the lizards of this genus. In coastal localities they occur on beaches to the limit of vegetation. Characteristically they glide along just under the surface of the sand but may emerge completely or burrow downward at least a foot. Distinctive sinuous tracks advertise their presence. The tracks generally radiate from bushes or large rocks that shelter the animals during periods of inactivity. They are most active one to three hours after sunrise. Twice we collected these lizards well after nightfall wriggling across paved roads. Observations on captives indicate nocturnal activity is not unusual. One specimen was taken on the grounds of Jinnah Central Hospital where the soil is not particularly sandy. This animal, however, may have been introduced in building sand.

The season of greatest activity near Karachi is from early March through April and again after the monsoon. On February 12, before many lizards were active, we collected seven specimens by digging into small sand hillocks covered by grass tufts or bushes. Most of the lizards lay near the junction of an upper layer of dry sand with a deeper layer of slightly moist sand. They were not torpid but were less active than during the warmer months.

A specimen collected near Sanghar on April 1 contained four large yolk masses surrounding small embryos. Young 75–85 mm. in total

length have been collected near Karachi in late June.

Stomach contents consisted of insect remains, mostly unrecognizable, but jaws of soldier termites and ant lions were identified. There was much sand and detritus in the stomachs.

The names “reg-mahi” or “ret-machi,” literally sand-fish, are widely applied to these lizards. Many are collected for the hakeems or local medical practitioners. From the visceral fat of the skinks is made a preparation known as “majun-i-reg-mahi,” said to be a sexual stimulant and useful for “strengthening of weak nerves and famished tissues.”

***Ophiomorus blanfordi* Boulenger**

MEKRAN SAND-SWIMMER

Ophiomorus blanfordi BOULENGER, 1887a, p. 395 (type locality: southern Persia or Baluchistan, probably near the coast). SMITH, 1935, p. 222.

DESCRIPTION: Differing from *O. tridactylus* in having four rather than three toes on forefeet. Only specimen examined, an adult female with snout–vent length of 96 mm. and a stubby, regenerated tail.

Color similar to that of *O. tridactylus*; vertebral and dorsolateral paired rows of dots that tend to form three longitudinal stripes; indistinct single rows of dots between them on posterior half of body.

HABITS: Shockley (1949) obtained specimens from coastal sand dunes with sparse vegetation. Their behavior in the field and in captivity is much like that of *O. tridactylus*.

DISTRIBUTION: This species presumably occurs in the coastal region of western Baluchistan and adjacent southeastern Iran. The only definite locality, however, is Ras Jiwani near the mouth of the Dasht River. The considerable similarities among the three species of *Ophiomorus* in West Pakistan strongly indicate a need for collecting in the presumed areas of sympatry.

FAMILY LACERTIDAE

ACANTHODACTYLUS WEIGMANN

The West Pakistan lacertids are all similar in habitus, being small to medium-sized lizards with the head distinct from the neck, not strongly depressed or otherwise modified; eye well developed; ear opening present; snout pointed; body slender with well-devel-

oped limbs; and tail long, round, and tapering evenly to a fine point. In this genus the first upper labial borders the nostril, and the toes bear a fringe of pointed scales.

There are about a dozen species distributed from North Africa and the Mediterranean coast of France to northwestern India in desert habitat. Two occur in West Pakistan.

***Acanthodactylus cantoris cantoris* Günther**

INDIAN FRINGE-TOED SAND LIZARD

Acanthodactylus cantoris GÜNTHER, 1864a, p. 73 (type locality: Ramnagar).

Acanthodactylus cantoris cantoris: SMITH, 1935, p. 371.

DESCRIPTION: Eyelids movable, lower lid about half scale-free and translucent; ear opening oval, vertical, about as large as eye; gular fold well developed, bordered anteriorly by scales larger than those of throat; dorsal scales keeled, imbricate, about twice size of laterals; ventral scales smooth, juxtaposed, rectangular to trapezoidal, arranged in weakly oblique longitudinal rows; caudal scales keeled and arranged in annuli; femoral pores present in both sexes. Snout-vent length of 18 adult males, 56–72 mm.; of six adult females, 61–70 mm. Scale counts in the material studied are summarized in table 5.

Adults reddish brown to gray, usually speckled with white and often with traces of pale longitudinal stripes anteriorly in females; tail bluish gray; belly white. Hatchlings black, with six longitudinal yellow stripes extending length of body and two onto proximal part of tail; a seventh stripe often present on neck and shoulders; distal part of tail sky blue.

VARIATION: The preceding description is based on specimens from Sind and eastern Las Bela. Specimens from the Pakistan Punjab are similar. Adults from the Nushki area of northern Baluchistan in life are uniformly khaki above; young are brown, with rows of small yellowish spots rather than stripes. For comparison of scale characters see table 5.

***Acanthodactylus cantoris blanfordi* Boulenger**

MEKRAN FRINGE-TOED SAND LIZARD

Acanthodactylus cantoris blanfordi BOULENGER, 1918, p. 154 (type locality: Jask, Baluchistan, and Bam, Persia). SMITH, 1935, p. 372.

DESCRIPTION: Similar to *Acanthodactylus cantoris cantoris* except for larger lateral scales which are only a little smaller than those of middorsum. To this subspecies I refer two specimens from Ormara. In these lizards the lateral scales are more than half of the size of the middorsals; they are in 28 and 32 rows across the back at midbody. The larger lizard, a subadult female, has 29 femoral pores, considerably fewer than any example of *c. cantoris* examined. The tail of the smaller specimen was said to have been distinctly pink in life; a trace of this color remained after several months of preservation.

HABITS: These lizards are characteristic of sandy places such as dunes, beaches, and the beds of dry watercourses. They are very common along the seacoast, occasionally wandering to the high-tide mark. Although they may wander into sites completely devoid of vegetation, such places are not permanent habitats for the species. They may occur in clay and gravel desert adjacent to sandy tracts.

These sun-loving reptiles emerge from their burrows an hour or so after dawn and are most active during the forenoon. About midday they retreat to holes or the shade of vegetation. There may be a brief period of activity an hour or so before sunset. The lizards often burrow directly into the sand but may also use holes of crabs, mammals, and other species of lizards. They do not climb or swim. During their time of greatest activity, they usually dodge from bush to bush instead of entering a burrow. Adult lizards are seldom seen during December and January, but there is no real hibernation.

Females containing large eggs have been collected from late March through July. Young begin to appear about the end of June and become increasingly common through the first half of October. Individuals with juvenile color and pattern are common during the late fall and winter. They become progressively scarcer from March onward, until it is most unusual to see a really juvenile lizard during May and early June. Apparently sexual maturity is reached in about one year.

Sand lizards have been seen feeding on crickets, grasshoppers, butterflies, caterpillars, beetles, and unidentified flying insects. They show much agility in capturing prey.

The insects are often large in proportion to the size of the lizard and may be shaken and battered against the ground for some time before being swallowed. The lizards sometimes lick droplets of dew or rain from rocks and plants.

DISTRIBUTION: The species occurs from Ferozepur and Agra in central India westward to eastern Iraq and Saudi Arabia and north at low and moderate elevations to southern Afghanistan and the Northwest Frontier Provinces. The nominate subspecies occupies the northern and eastern part of this range, presumably intergrading with *blanfordi* in western Kalat and Las Bela. Another subspecies, *schmidtii*, occurs in southwestern Iran and Saudi Arabia. *Acanthodactylus cantoris* seems to be a form of the coastal plain, desert basins, and sandy flood plains of rivers; it avoids the mountains.

***Acanthodactylus micropholis* Blanford**

YELLOW-TAILED SAND LIZARD

Acanthodactylus micropholis BLANFORD, 1874b, p. 33 (type locality: Magas, Baluchistan). SMITH, 1935, p. 373.

DESCRIPTION: Generally similar to *A. cantoris*; lower lid scaly; dorsal scales less than twice size of laterals; ventrals in straight rows. Snout-vent lengths of five adults, 50–58 mm. Scale counts given in table 5.

Adults marked with seven bright yellow stripes separated by zones of black or dark brown, lateral ones enclosing small, round, light spots; limbs grayish brown spotted with yellow; tail bright yellow; belly white. Young similar to adults but lacking light spots in dark areas between stripes.

HABITS: In western Las Bela, *A. micropholis* inhabits sandy places in stream beds and canyons, whereas *A. cantoris* abounds in the sandy alluvium between the hills and the seacoast. The species apparently meet only in narrow strips at the mouths of canyons. The habits of the two species seem to be very similar. During late February and March, the population of *A. micropholis* seemed to consist almost wholly of adult and subadult individuals; in late September, most of the lizards seen were young.

DISTRIBUTION: The range of this species is poorly known but apparently extends from southeastern Iran eastward to the Porali

River in Las Bela. The northern limits are undefined.

EREMIAS WEIGMANN

First upper labial not in contact with nostril; in other external characters resembling *Acanthodactylus*. Digits may or may not be fringed with pointed scales.

About 45 species are known from central Asia to southeastern Europe and south to Africa and western India. Seven species occur in West Pakistan. No specimens of *E. aporosceles* (Alcock and Finn) or *E. fasciata* (Blanford) have been examined. The former species occurs in northwestern Baluchistan; the latter ranges from the Northwest Frontier Provinces and Afghanistan to eastern Iran.

***Eremias velox persica* Blanford**

PERSIAN STEPPE LACERTA

Eremias persica BLANFORD, 1874b, p. 31 (type locality: near Ispahan, Persia).

Eremias velox persica: BOULENGER, 1921, p. 312.

DESCRIPTION: Largest and most robust of West Pakistan lacertids; eye rather small, no larger than ear opening, lower lid scaly but with a small translucent area; gular fold prominent and bordered anteriorly by row of enlarged scales; scales of crown slightly rugose; occipital absent or very small; dorsal scales juxtaposed, granular, slightly larger on flanks; ventral scales rhomboid, juxtaposed, arranged in oblique longitudinal rows; caudal scales keeled, arranged in annuli; femoral pores present in both sexes. Snout-vent length of six adult males, 78–82 mm.; of five adult females, 81–96 mm. Scale counts in the material examined shown in table 5.

Ground color of adults sandy brown to tan, with a wide, irregular, black or dark brown stripe from shoulder to base of tail. On dorsum additional dark markings and light spots of white or pale gray; dorsal markings may be heavy or light and often linear in arrangement; tail similar to dorsum; limbs with indistinct light spots; ventral surfaces white. Young having alternating stripes of black and straw yellow, black stripes enclosing small light spots; distal part of tail bluish.

HABITS: This species frequents scrub and sparse grassland but apparently avoids extreme desert conditions. I did not find it in

the extensive sand desert near Nushki but collected it in small sandy areas near Mastung and Quetta. In mountains, where it occurs to at least 7500 feet, it usually frequents dry stream beds. Like the smaller local lacertids, it is diurnal and lives in burrows frequently situated at the base of a shrub. It prefers to skulk under protection of vegetation and traverses open spaces at high speed. It often scratches and roots about in ground litter, apparently in search of insects. Limited data indicate a spring breeding season, with eggs laid from late May to early July. Young appear near Quetta late in August.

DISTRIBUTION: The range of this subspecies is largely confined to the northern part of the Iranian Plateau, intergrading with that of *E. v. velox* from Transcaspia eastward to Tadzhikistan. The range in West Pakistan extends along the northern border from Waziristan westward through the Quetta region almost to Nushki. Within this area, it seems to be a common species.

***Eremias acutirostris* (Boulenger)**

RETICULATE DESERT LACERTA

Scapteira acutirostris BOULENGER, 1887a, p. 114 (type locality: between Nushki and Helmand, Baluchistan).

Eremias acutirostris: LANTZ, 1928, p. 64.

DESCRIPTION: General appearance similar to that of *E. velox* but slightly less robust; head scales similar to those of *velox*; dorsal scales granular, not becoming larger on flanks; ventrals in oblique longitudinal rows; both fingers and toes with well-developed fringe of flat, pointed scales. Snout-vent length of three adults, 62–70 mm.

Ground color light brown, with a fine reticulum of reddish brown over back and limbs enclosing pale grayish areas; ventral surfaces pale lemon yellow to white.

HABITS: This very active species is highly adapted to life in loose sand. Nearly all my specimens were collected on slopes of dunes and blowouts. The lizards run rapidly over the softest surfaces and frequently burrow into the sand and tunnel beneath its surface.

DISTRIBUTION: The known range of the species is confined to desert basins of northwestern Baluchistan and adjoining Afghanistan and Iran.

***Eremias scripta* (Strauch)**

CASPIAN DESERT LACERTA

Podarces scripta STRAUCH, 1867, p. 424 (type locality: Aralo-Caspian Desert).

Scapteira scripta: BOULENGER, 1887a, p. 112.

Eremias scripta: SMITH, 1935, p. 386.

DESCRIPTION: More slender than preceding species; lower eyelid with large clear disc; ear opening smaller than eye; scales bordering gular fold anteriorly about same size as those of throat; shields of crown smooth; occipital absent; dorsal scales granular, last few lateral rows slightly enlarged; ventrals in oblique longitudinal rows; digits with fringe of small pointed scales. Two adult males have snout-vent lengths of 45 and 46 mm.

Dorsal color tan to golden brown, becoming pale bluish gray on tail; pair of black stripes from behind eye to tip of tail; dorsum between stripes with black lines and vermiculations; sides and ventral surfaces cream to white.

HABITS: I obtained examples of this species in flat, sandy terrain with relatively numerous shrubs and grass clumps. The habits of these lizards were much like those of other lacertids. One was taken as it was swallowing a grasshopper nymph.

DISTRIBUTION: The range extends from Transcaspia to eastern Khazakistan and south to Iran and northern Baluchistan, east to Nushki. I found the species rather uncommon.

***Eremias guttulata watsonana* Stoliczka**

LONG-TAILED DESERT LACERTA

Eremias (Mesalina) watsonana STOLICZKA, 1872b, p. 86 (type locality: Sind, between Karachi and Sukkur).

Eremias guttulata watsonana: SMITH, 1935, p. 389.

Mesalina pardalis (nec Lichtenstein): BLANFORD, 1876b, p. 26 (type locality: Sind).

DESCRIPTION: Habitus slender, typically lacertid; lower eyelid with large transparent disc; ear opening about size of eye; scales bordering gular fold anteriorly larger than those of throat; shields of crown smooth; occipital present, touching interparietal in 38 of 42 specimens; dorsal scales granular, slightly or not at all enlarged on flanks; ven-

trials in straight longitudinal rows; digits without fringe of pointed scales. Scale counts in material examined given in table 5. Snout-vent length of nine adult males, 42–51 mm.; of 12 adult females, 43–55 mm.

Dorsal color pale gray or brownish to dark olive; usually two pairs of indistinct, light, longitudinal stripes; middorsum usually with numerous whitish spots and black speckling, black spots often forming incomplete rings around light ones; distal part of tail uniform grayish; limbs with faint light spots; ventral surfaces white to pale straw.

HABITS: This lizard prefers rather flat situations and occurs from virtually sea level to at least 7000 feet. It frequents arid country and is one of the few vertebrates that regularly inhabits the almost barren talus fans. It is usually not plentiful on powdery alluvial clay and sandy soils and is absent from tracts of loose sand. The lizards are active at all seasons in the southern part of West Pakistan but are most plentiful in the period after the monsoon and early in the spring. They appear soon after sunrise in hot weather and shortly before noon in winter. They are uncommon during the afternoon. They live under stones or in holes at the base of bushes but apparently do not dig their own holes or burrow into the soil as some other local lacertids do. During their period of activity they tend to follow roughly circular paths 4 to 6 feet in diameter around bushes or tufts of grass. They feed on small insects. Data from Las Bela indicate an early spring breeding season, with young appearing about May and reaching maturity by the onset of winter. A female containing four eggs nearly ready for deposition was collected near Quetta in early June. Young 23–28 mm. in body length were plentiful in northern Baluchistan during early August. At this time, few adults were seen.

DISTRIBUTION: The subspecies *watsonana* occurs from Rajputana to southern Afghanistan and westward to Syria and northern Arabia, intergrading with the nominate race around the northern end of the Red Sea. It occurs throughout the arid parts of West Pakistan but often rather spottily. It is common in Las Bela and along the eastern edge of the Thar Desert but rare in the intervening area.

Eremias brevirostris (Blanford)

SHORT-NOSED DESERT LACERTA

Mesalina brevirostris BLANFORD, 1874b, p. 32 (type locality: Kalabagh, Punjab, and Tumb Island, Persian Gulf).

Eremias brevirostris: BOULENGER, 1890, p. 177.

DESCRIPTION: Very similar to *E. guttulata watsonana* from which it differs in having a somewhat shorter snout; occipital shield usually separated from interparietal (three of four specimens examined); and possibly in average number of femoral pores (see table 5). Pattern differences also seen in material from Las Bela. Specimens of *brevirostris* brownish, with a sooty stripe from tympanum to groin bordered below by a white stripe; middorsum with light spots and black flecks but without any tendency for light spots to be bordered with black.

HABITS: Specimens were collected on sandy or silty soil near the Miani Hor, a brackish-water lake near the coast in Las Bela. *Eremias guttulata* in that locality inhabits rocky situations along dry stream beds. The two species seem to be quite similar in behavior.

DISTRIBUTION: The range extends from the northwestern Punjab west to Syria. The few West Pakistan records are confined to the Iranian Plateau and coastal Las Bela. The distribution seems to be discontinuous.

OPHISOPS MÉNÉTRIÉ

Small lacertids characterized by transparent lower eyelids completely or partially fused with upper lids to form a cap over eye.

There are five species distributed from southeastern Europe and northeastern Africa to western India. One species is widely distributed in West Pakistan. Another, described as *Gymnops meizolepis* by Stoliczka (1872c, p. 124) has been placed in the synonymy of the wide-ranging *Ophisops elegans* by recent authors. The original specimen was collected southwest of Kalabagh in the Punjab; apparently no others have been taken since.

Ophisops jerdoni Blyth

PUNJAB SNAKE-EYED LACERTA

Ophisops jerdoni BLYTH, 1853b, p. 653 (type locality: Mhow, Indore).

Ophisops jerdoni: SMITH, 1935, p. 377.

TABLE 5

RATIO OF LENGTH OF TAIL TO SNOUT-VENT (S-V) LENGTH AND VARIATION IN SCALE COUNTS IN WEST PAKISTAN LACERTIDS
(Figures in parentheses are means.)

	Number of Specimens	Scale Rows		Large Supraoculars	Supralabials	Infralabials	Femoral Pores		Tail Length/ S-V Length
		Dorsal	Ventral				Males	Females	
<i>Acanihodactylus cantoris</i> (Sind)	30	27-35 (31.55)	11-13 (12.1)	3 or 4	7 or 8, rarely 6 or 9	6 or 7, rarely 8	34-47 (40.8)	36-47 (40.1)	1.71-2.36 (2.017)
<i>Acanihodactylus cantoris</i> (Nushki)	12	33-45 (37.9)	12-14 (13.1)	3	7, rarely 6 or 8	6 or 7	36-40 (37.3)	35-41 (36.6)	1.63-2.25 (1.937)
<i>Acanihodactylus micropholis</i>	9	43-54 (48.55)	9-10 (9.8)	2 or 3	7 or 8	6 or 7	40-43 (41.5)	0	1.86-2.24 (1.973)
<i>Eremias velox</i>	24	52-68 (61.3)	14-16 (14.8)	2 or 3	9 to 11	7 to 9	34-45 (38.7)	32-39 (36.55)	1.42-2.06 (1.805)
<i>Eremias acutirostris</i>	5	65-73 (69.4)	18-20 (18.6)	2 or 3	7 to 9	7 or 8	25-28 (26.6)	22-26 (24.0)	1.60-1.85 (1.710)
<i>Eremias scripta</i>	4	49-60 (54.0)	14	2	8	5 or 6	26-32 (28.3)	—	1.92-2.39 (2.203)
<i>Eremias guttulata</i>	42	36-52 (43.4)	8-10 (8.3)	2, rarely 3	8 or 9, rarely 7 or 10	6 to 8, rarely 9	21-30 (25.2)	21-26 (22.7)	1.70-2.58 (2.058)
<i>Eremias brevirostris</i>	4	40-47 (41.75)	9-10 (9.8)	2	8 or 9	7 or 8	28-31 (29.0)	27	2.15-2.45 (2.330)
<i>Ophisops jerdoni</i>	32	21-27 (23.6)	6-7 (6.6)	2	7 or 8	6 or 7, rarely 8	16-18 (17.7)	12-14 (13.8)	1.58-2.18 (1.794)

Pseudophiops theobaldi JERDON, 1870, p. 71 (type locality: alpine Punjab).

Ophiops bivittata BEDDOME, 1870, p. 172 (type locality: Punjab).

DESCRIPTION: Small but of typical lacertid habitus; ear opening oval, a little smaller than eye; gular fold weakly developed, bordered by scales of irregular size; scales of crown rugose; occipital well developed, in contact with interparietal; dorsal scales keeled, imbricate; lateral scales of about same size as dorsals, smooth or weakly keeled; ventral scales smooth, trapezoidal, arranged in straight, longitudinal rows; caudal scales keeled, in annuli; femoral pores in both sexes; toes without fringe of pointed scales. Snout-vent length of eight adult males, 31–39 mm.; of 10 females, 32–41 mm. Variations in scale counts of specimens examined summarized in table 5.

Dorsal ground color khaki, chestnut, or dark olive drab, deeper and richer on flanks; white to lemon yellow stripe from behind eye onto base of tail, second and often less distinct stripe from upper lip to groin; zone between stripes and on each side of midline with short, dark, transverse bars, more prominent in males; throat and lower flanks of breeding males bright yellow in specimens from southern part of range, green in north; remainder of ventral surfaces white. Young similar to adults in color and pattern.

HABITS: These little lizards are plentiful in moderately dry, rocky terrain and also on the alluvial plains of the Indus Valley along dikes and edges of cultivated fields. In Las Bela, at the western edge of their range, the lizards are confined to oases and the margins of streams. They have been collected at elevations up to about 5500 feet.

Ophisops is diurnal, terrestrial, and moderately secretive. Often found under rocks and rubbish, it darts rapidly from one bit of shelter to another. It may be found at any season over most of its West Pakistan range and is the only lizard commonly active on the cooler winter days. In late February and March and again during the monsoon season, males show what seems to be breeding pigmentation and females are gravid. A captive laid four eggs on August 4, and Jeromie A. Anderson found several clutches buried in loose, slightly moist soil during late July and

early August. The eggs have tough, papery shells and measure about 5 by 7 mm. The smallest young, body length 15–20 mm., have been collected from July through November. The lizards feed on small insects.

DISTRIBUTION: The range extends from the Northwest Frontier Provinces and the northern Punjab south to Rewa State and Bellary in western India. The westernmost records are Bela and Kolpur in eastern Baluchistan.

FAMILY VARANIDAE

VARANUS MERREM

Most species large to very large, usually exceeding 1 meter in length; head covered with small polygonal scales; body scales granular above, squarish ventrally, not imbricate; tongue slender, forked, and retractile into a sheath; eye with round pupil and movable lids; ear opening conspicuous.

There are about 30 species distributed from Africa through southern Asia to Australia, New Guinea, and associated islands. Three inhabit West Pakistan. *Varanus flavescens* (Gray) is not represented in my collections. It ranges from Assam and West Bengal westward to Sind. In West Pakistan it is known from Dokri in Larkana District and from the eastern Punjab at low and moderate elevations. Near Dokri it is said to occur in groves of date palms.

Varanus bengalensis (Daudin)

INDIAN MONITOR

Tupinambis bengalensis DAUDIN, 1802 (1802–1803, vol. 3). p. 67 (type locality: Bengal).

Varanus bengalensis: BOULENGER, 1885b, p. 310.

Varanus monitor SMITH, 1935, p. 402.

Monitor dracaena GRAY, 1838, p. 393 (type locality: India).

Varanus lunatus GRAY, 1845, p. 10 (type locality: India).

DESCRIPTION: Head long and narrow, with snout pointed; distance from nostril to eye 55–75 per cent of distance from nostril to tip of snout; longitudinal diameter of ear opening at least half of vertical diameter; neck long; lateral fold well developed on neck, weakly on body; limbs long and powerful; tail laterally compressed for most of its length and with a low double crest of scales except at its base and tip; tail length, 170–185 per cent of

snout-vent length in males, 152–170 per cent in females; scales of neck, back, and belly subequal, in 132–176 rows at midbody: no femoral pores. Snout-vent length of six adult males, 317–378 mm.; of six females, 280–380 mm.

Large adults dull khaki to dark brown above, usually without definite markings but with scattered light and dark scales, especially on limbs, tail, and flanks; tip of tail whitish; ventral surfaces dirty white, with dark clouding and speckling, especially on chin and throat. Young dull orange to light brown, with 10–13 narrow yellow to cream cross bands on body alternating with equal number of narrow black ones; tail with alternating light and dark bands except for light tip.

HABITS: At elevations below 2500 feet the Indian monitor is one of the most ubiquitous of local reptiles, although it generally avoids large tracts of wind-blown sand and talus fans. In the desert it is most plentiful along nullahs and around cliffs. In the Indus Valley it abounds in the dense vegetation bordering marshes and canals. It is occasionally seen along the seacoast on the banks of tidal creeks or among dunes.

The Indian monitor is diurnal. In the desert it usually appears about two hours after sunrise and forages until the intense heat drives it to shelter. In marshland it is active throughout the day. When it is undisturbed, its movements are sinuous and graceful. When alarmed, it breaks into a clumsy run but can usually outdistance a man in the sort of terrain where it is found. The lizards live in burrows, dense clumps of vegetation, clefts in rocks, hollow logs, and crevices around bridges or old buildings. I have seen them in holes and fissures of vertical cliffs, but they rarely climb trees. They take to water readily and swim with the tail used for propulsion and the legs pressed against the body. I saw one in a large well where it was said to have lived for at least a year. Monitors are very strong, and extracting one from a burrow or crevice is no easy task. Their chief mode of defense is lashing with the tail, but they also claw and bite. A large one is unpleasant to deal with.

Indian monitors are in semi-hibernation from late November through the first half of

March. They are most in evidence during and after the monsoon.

Female monitors collected during July and early August have contained 24–29 large eggs apparently nearly ready for deposition. One laid 19 eggs on August 4 and 5. These eggs had soft, pliable shells and measured 33–45 mm. in greatest diameter, 27–33 mm. in least. The young are very secretive, and few have been collected. They are usually seen from late June through August. The smallest one examined had a snout-vent length of 98 mm. and total length of 227 mm.

Examination of stomachs of five adult monitors show that a diversified diet is eaten. Vertebrate food items included a musk shrew, a striped palm squirrel, a snake (*Xenochrophis piscator*), and a lizard (*Calotes*). One stomach was well filled with tenebrionid beetles; another, with fragments of crabs and crayfish. Other invertebrates identified were large locusts and solfugids. One monitor had downy feathers adhering to its lips when captured; another was seen on a canal bank swallowing a fish. I saw an exceptionally large monitor digging its way into the burrow of a mammal; another big one was nosing about a sea-turtle nest that had been dug out by dogs or jackals.

This monitor is hardy in captivity but never becomes tame. One collected August 31 and apparently a juvenile of the season grew to adult size in about 30 months.

DISTRIBUTION: The range of this species extends from Burma to Nepal and west to eastern Iran and extreme southeastern Uzbekistan. It apparently ranges throughout West Pakistan at low and moderate elevations. I collected one at about 3000 feet in the Swat River valley.

Varanus griseus konieczyi Mertens

INDIAN DESERT MONITOR

Tupinambis griseus DAUDIN, 1803 (1802–1803, vol. 8), p. 352 (type locality: Egypt).

Varanus griseus: BOULENGER, 1885b, vol. 2, p. 306.

Varanus griseus konieczyi MERTENS, 1954b, p. 355 (type locality: Korangi near Karachi, Pakistan).

Psammosaurus scincus EICHWALD, 1831, p. 190 (type locality: Egypt).

DESCRIPTION: Similar to *V. bengalensis* but

slightly more robust, with wider head and shorter neck; distance from nostril to eye 28–40 per cent of distance from nostril to tip of snout; longitudinal diameter of ear opening less than half of vertical diameter; tail round, without crest of scales, its length in adult males 120–128 per cent of snout–vent length, in adult female 109 per cent; scales of neck slightly larger and more acuminate than those of dorsum; scale rows at midbody 109–136. Snout–vent length of three adult males, 309–345 mm.; of adult female, 313 mm.

Dorsal color of adult dull yellow, heavily speckled with dark gray; four dark gray cross bands on trunk bordered by and often enclosing irregular rows of yellow spots; top of head dark gray, a wide black stripe through ear onto neck and a shorter, narrower one behind eye; proximal half of tail with cross bands similar to those of body, distal half sooty black, with whitish tip; limbs grayish, with yellow spots; ventral surfaces white, with a little dark speckling on throat. Young pale grayish yellow, with sooty black cross bands, those on body bordered by or enclosing lemon yellow spots; tail with eight to 12 strongly defined black bands.

***Varanus griseus caspius* (Eichwald)**

TRANSCASPIAN DESERT MONITOR

Psammosaurus caspius EICHWALD, 1831, p. 190 (type locality: Dardsha Peninsula, east coast of Caspian Sea).

Varanus griseus caspius: MERTENS, 1954b, p. 355.

DESCRIPTION: Similar in habitus and scalation to *V. g. konieczyi*, but tail longer, 148 per cent of snout–vent length in only adult examined, its medial third slightly compressed laterally and with an indistinct crest of scales; scale rows at midbody 143. This subspecies reaches a larger size than does *konieczyi*.

Dorsal ground color pale sandy, becoming orange to reddish on tail; six or seven narrow black cross bands on trunk not bordered by or enclosing light spots; top of head reddish, with distinct black stripes through eye and ear; proximal part of tail banded, distal part unmarked, whitish. In a young specimen pattern and colors more intense and vivid, dorsal black bands alternating with narrow

bands of orange-red; there were 17 tail bands.

HABITS: These monitors live from sea level to elevations of about 4000 feet and show a decided preference for sandy soil. In the flat clay desert between Karachi and Hyderabad, *V. g. konieczyi* and *V. bengalensis* occur together, but the latter is by far the more common. *Varanus g. caspius* is fairly common in the desert basins of northwestern Baluchistan where *bengalensis* apparently does not occur.

Both subspecies of *griseus* seem to be secretive animals spending much of their time in burrows or crevices. Tracks indicate that *caspius* is most active in the early morning. I have no records of desert monitors from late October to early May, but the season of activity is undoubtedly longer.

When cornered, these monitors rise on their legs, flatten the body, and tilt the back toward the enemy. They inflate the throat and hiss loudly. The performance seems to be mostly bluff, although the lizard may strike several hard blows with its tail. They rarely bite.

I kept desert monitors in captivity for almost two years and found them more phlegmatic than Indian monitors but also more prone to illness. They were quiet but not torpid from about the middle of November to early March. They did not feed during this period but sometimes took water. One individual was quite active during late March and early April of its first year in captivity and repeatedly rubbed its nose sore in trying to escape. Later it became more placid. This behavior was not so evident the second spring in captivity.

Captive lizards fed readily on mice, rats, frogs, fish, meat, and eggs. Live prey was crushed in the jaws. One monitor was regularly allowed to run free in the compound, where I saw it capture and swallow toads. The secretion of the toads' parotoid glands seemed to have no effect upon the reptile.

Newly hatched desert monitors have been collected in August and September. The smallest had a snout–vent length of 94 mm. and a total length of 187 mm.

The local name, "gho" or "gho-pard," is widely used for monitors of any species. They are hunted for their skins which are made into shoes and drum heads. Oil made from

visceral fat of monitors is used for treatment of failing eyesight in the aged. There are several superstitions concerning monitors. According to one of the more curious ones, a man should keep his mouth closed if a "gho" is watching him, for if the lizard sees his teeth some disaster will surely befall him.

DISTRIBUTION: The subspecies *koniecznyi* occurs in arid habitat from central India

westward through Sind and most of the Punjab, and *caspius* occurs in deserts from Transcaspia to southern Khazakstan and southward through much of Iran and Afghanistan into northern Baluchistan. Intergradation between the two presumably takes place in eastern and southern Baluchistan. To the west, *caspius* intergrades with the nominate race.

SNAKES

FAMILY TYPHLOPIDAE

TYPHLOPS DUMÉRIL AND BIBRON

Small reptiles of snakelike habitus but classified with lizards by some authorities. Head shields modified and reduced in number; eye small, concealed beneath scales; maxillae transverse to long axis of skull; no teeth in lower jaw; all body scales smooth, ventrals not enlarged; tail very short, as wide as head, terminating in sharp spine.

The genus is circumtropical in distribution and contains about 170 species, of which two occur in West Pakistan.

Typhlops braminus (Daudin)

BRAHMINY BLIND SNAKE

Eryx braminus DAUDIN, 1803 (1802–1803, vol. 7), p. 279 (based on Russell, 1796, pl. 43; type locality: Vizagapatam, India).

Typhlops braminus: CUVIER, 1829, p. 73. SMITH, 1943, p. 46.

DESCRIPTION: Rostral large, snout rounded; usually four upper labials, last two in contact with ocular; nasal suture usually terminating at edge of preocular (15 specimens), occasionally at junction of first and second labials (two specimens); 20 scales round body in 14 specimens, 19 in three, and 18 in three; scale rows from occiput to base of tail 291–348 (mean 322.5); scales from vent to tail spine eight to 11 (mean 9.0); diameter of body contained 38–65 times in total length; tail length 1.15–2.5 per cent of total length. Total length of eight adults, 134–157 mm.

Dorsal color of most specimens chestnut brown, becoming slightly paler ventrally; snout, chin, and under side of tail cream. Two specimens from Lahore dark purplish brown.

VARIATION: Specimens of this snake from

Karachi and environs appear to be more slender and paler in color than specimens from Bengal and peninsular India.

HABITS: These little burrowing snakes are rather common in city gardens and vacant lots where the soil is loose but not extremely sandy. They have also been found in flood-plain forest under rocks and logs. They are taken most frequently during cool or wet weather and sometimes crawl about on the surface after rain. Some, particularly young ones, have been found in situations unusual for a snake, such as a gutter in the most exclusive shopping district of Karachi, the second floor of a shop on the same street, a hospital ward, and the bathroom of a modern apartment.

Three well-developed eggs were found in a snake collected early in January; other gravid females were taken early in December and early in May. Although two of these snakes were kept alive more than a month, the eggs were not laid. The smallest young, 61 and 68 mm. in total length, were collected August 3 and September 7, respectively.

Microscopic examination of the intestinal contents of two specimens showed bits of chitin, fragments of what appeared to be fungus mycelium, and sand grains.

DISTRIBUTION: The present-day range of this species includes all of southeast Asia as well as localities in Arabia, South Africa, islands of the Indian and Pacific oceans to Hawaii, and Guerrero and Michoacan in Mexico. Its occurrence beyond the oriental faunal region is largely, if not wholly, the result of introduction by man. In West Pakistan I collected it in and near Karachi, in the lower Indus Valley, and at Lahore and Peshawar. It doubtless occurs through most of the Indus drainage at low and moderate eleva-

tions but is probably absent from most of the arid Baluchistan highland.

***Typhlops porrectus* Stoliczka**

SLENDER BLIND SNAKE

Typhlops porrectus STOLICZKA, 1871, p. 426 (type locality: Bengal). SMITH, 1943, p. 46.

DESCRIPTION: Configuration and scales of head similar to those in *T. braminus* except nasal suture usually touching second labial and usually not dividing nasal shield completely (eight of 10 specimens); 18 scales round body in nine specimens and 17 in three; scale rows from occiput to base of tail 388–430 (mean 412.5); scales from vent to tail spine six to nine (mean 7.3); diameter of body contained 58–99 times in total length; tail length 1.3–2.0 per cent of total length. Total lengths of four presumed adults, 146–165 mm. The marked difference in thickness between this species and *T. braminus* is more evident in the adults than in the young. Small individuals of *braminus* are distinctly more slender than adults, whereas the young of *porrectus* are slightly less attenuated than the adults.

Dorsal color dark brown to almost black, becoming slightly paler ventrally; snout, chin, and under side of tail cream.

HABITS: The true habitat of these peculiar little snakes is unknown but may be ant or termite nests. All of my specimens were found in urban areas in houses, on footpaths, and under stones. Two were collected in Empress Market, one of the busiest places in Karachi. They apparently had been uncovered by the razing of an old concrete platform. I collected one on February 11 as it was crawling in bright sunlight within a thickly populated refugee encampment. It was being chivied about by a group of excited persons who seemed curiously unwilling to harm it. I could not tell if their behavior was motivated by fear or by some superstitious regard for the reptile.

DISTRIBUTION: The range includes most of India, Ceylon, and upper Burma. In West Pakistan the species is recorded from Karachi, Tatta, Lahore, and the Northwest Frontier Provinces, its range apparently being much the same as that of *T. braminus*.

FAMILY LEPTOTYPHLOPIDAE

LEPTOTYPHLOPS FITZINGER

Small snakes superficially similar to typhlopids in habitus, reduced eyes, modified head shields, and absence of enlarged ventrals; maxillae more or less parallel to long axis of skull, toothless; a few teeth present in lower jaw.

The genus contains about 80 species distributed from the southwestern United States through most of South America and through most of Africa to southwest Asia. Two species occur in West Pakistan.

***Leptotyphlops macrorhynchus* (Jan)**

BEAKED THREAD SNAKE

Stenostoma macrorhynchum JAN, 1861, p. 190 (type locality: Sennar, Egyptian Sudan).

Leptotyphlops macrorhynchus: SMITH, 1943, p. 60.

DESCRIPTION: Rostral very large, projecting well beyond lower jaw and bordering upper lip, its projecting under surface concave; nostril slitlike and situated low in nasal which also borders upper lip; ocular large, separating two supralabials; 14 scales round body; scale rows from occiput to base of tail 300–359 (mean 339.5); scales from vent to tail spine 43–53 (mean 47.7); diameter of body contained 80–115 times in total length; tail length 9.1–10.3 per cent of total length. None of the six specimens examined appears to be mature. The largest has a total length of 160 mm.

Color in life very pale flesh or brownish pink, translucent, slightly paler ventrally.

VARIATION: An adult, 176 mm. in total length, collected near Jamrao Head, Sanghar District (A.M.N.H. No. 85859), is more robust than the other specimens (diameter of body contained 64 times in length) and has fewer scale rows (287 from occiput to vent; 38 from vent to tail spine). The rostral is less prominent than in the other four specimens but decidedly more prominent than in a specimen of *L. blanfordi* of approximately equal size. Only the examination of more material can resolve the status of individuals such as this one and also determine the relationship of West Pakistan populations with the Middle Eastern and African populations referred to *macrorhynchus*.

HABITS: Most specimens have been found during the cooler months. One was taken at an archeological site about 3 inches below the level that was being excavated and about 5 feet below the original ground level. It was in fragments of a decaying tree root. One collected April 1 was crawling on the surface of a sandy trail about an hour after sunset. Mr. Mohammad Ashan, who brought me two of these snakes as well as specimens of *Typhlops porrectus* and *T. braminus*, reported that the snakes dropped from crevices in the mud and thatch roof of his house. The smallest specimen, 100 mm. long and 0.9 mm. in diameter, was collected April 5.

DISTRIBUTION: The species as now defined ranges from the Sudan and Egypt through parts of Iraq, Iran, and Arabia to the Indus Valley and north to Quetta.

***Leptotyphlops blanfordi* (Boulenger)**

SIND THREAD SNAKE

Glauconia blanfordi BOULENGER, 1890, p. 243 (type locality: Sind).

Leptotyphlops blanfordi: SMITH, 1943, p. 61.

DESCRIPTION: Snout rounded; rostral not so large and protruding and not concave below; scale rows 268–272 from occiput to base of tail and 37–39 from vent to tail spine; diameter of body contained 57–61 times in total length; tail 9.6–10.4 per cent of total length; other features of lepidosis like those of *L. macrorhynchus*.

Middorsum (five or six scale rows) in life pale pinkish brown, remainder of body very pale pink, line of demarcation abrupt but irregular.

HABITS: These specimens were collected by Jeromie A. Anderson during early December. They were under stone slabs in loose sandy soil and were quite active. The larger specimen, 186 mm. in length, contained an egg 25 mm. long and 2.5 mm. in diameter. Its digestive tract contained numerous fragments of chitin and sand grains.

DISTRIBUTION: Records for this species are from the Indus delta northward through the southern Punjab to Sibi and the Northwest Frontier Provinces. Some form of *Leptotyphlops* occurs in northwestern Baluchistan (Alcock and Finn, 1896; Jeromie A. Anderson, personal communication), but no specimens are available.

FAMILY BOIDAE

PYTHON DAUDIN

Mostly large to very large snakes; top of head with large symmetrical plates; ventrals not extending full width of venter; pupil of eye vertically elliptical; dorsal scales smooth, in 60–75 rows; subcaudals divided.

The seven species are found in Africa and southeast Asia, including the islands of Indonesia and the Philippines.

***Python molurus molurus* (Linnaeus)**

INDIAN PYTHON

Coluber molurus LINNAEUS, 1758, p. 225 (type locality: India).

Python molurus: BOULENGER, 1890, p. 246.

Python molurus molurus: SMITH, 1943, p. 106.

DESCRIPTION: No preserved specimens from West Pakistan were examined; however, a young adult male and a subadult individual were obtained and eventually presented to the Philadelphia Zoological Garden. In head pattern and in the absence of suboculars, West Pakistan specimens are typical of the subspecies *molurus*. The ground color of the snakes examined is pale gray to yellow, paler on the flanks; dorsal series of large tan to walnut brown saddles alternating with lateral bars and spots of the same color; top of head often pinkish; belly yellow with dark marbling, especially toward the tail. Most adult pythons from West Pakistan measure 8 to 10 feet. The largest python brought to the Karachi Zoo from West Pakistan during my stay in the country measured 15 feet and weighed 115 pounds, according to data supplied by Dr. A. A. Quraishy; it was certainly an impressively large snake.

HABITS: These big snakes inhabit marshes, gallery forest, and rocky ledges if near to marshes or streams. Their refuges are burrows near the edge of water, dense clumps of vegetation, large rotted logs, caves, and ruins. They are most active at night, but local collectors report that the snakes sometimes bask in the open on warm, humid days. They crawl in an almost straight line, leaving a distinctive track. Although slow on land, they swim rapidly and apparently spend considerable time in the water. I saw a large one that had been gaffed by fishermen in the Nara Canal.

Pythons are largely torpid from late October through February. Four very fat ones, the largest 12 feet long, were dug out by snake charmers near Tatta during January.

When cornered, pythons hiss loudly but often make no effective defense. They can, however, strike rapidly and powerfully, and their teeth inflict deep, ugly wounds. A python of 10 feet or more can knock a man off his feet by coiling about his legs.

Smith (1943) reported that mating in northern India takes place during hibernation. The smallest python that I saw was taken August 13 and measured 23 inches. It grew to 31 inches during the next four months.

Captive pythons are generally sluggish and good-natured. They feed readily on mammals, birds, and lizards. One snake shortly after capture voided a large mass of hair, and scales identifiable as those of a monitor lizard. An unidentified mammal is in the stomach of a small python preserved in the collection of the Zoological Survey of Pakistan.

Residents of areas where pythons are common do not seem particularly afraid of them. Local names for the python are "azdar" and "arar."

DISTRIBUTION: The range of the nominate subspecies is essentially confined to Pakistan, India, and Ceylon; the subspecies *bivittatus* extends the range into the Indo-Chinese subregion. In West Pakistan, according to information from professional snake hunters and natives, pythons are found at scattered localities throughout the Indus delta and the lower valley, mostly east of the river northward at least to Nawabshah District. I also have reports from Haleji Lake and from near Dureji in the upper Hab Valley.

ERYX DAUDIN

Stout, short-tailed snakes usually less than 1 meter in length; top of head covered with small scales; ventrals not extending full width of venter; subcaudals undivided; eye small, with vertically elliptical pupil.

Seven species are known, ranging from North Africa and southeastern Europe to western China, Bihar, Orissa, and Ceylon. Two species are well known from West Pakistan. A third species occurs in the desert basin of northwestern Baluchistan.

Eryx johni (Russell)

INDIAN SAND BOA

Boa johni RUSSELL, 1801 (1801-1809), p. 18, pls. 16-17 (type locality: Tranquebar, India).

Eryx johni: BOULENGER, 1890, p. 248. SMITH, 1943, p. 113.

Eryx persicus NIKOLSKY, 1907, p. 290 (type locality: Aquiliashker, Arabistan, southwest Persia).

DESCRIPTION: Head not distinct from neck; snout broad, wedge-shaped; rostral shield wide and heavy; nostril slitlike between enlarged nasals; upper labials nine to 12, almost invariably 10 or 11; lower labials 13-18; mental groove present; no chin shields; eye completely surrounded by nine to 12 small scales; body robust, cylindrical, with very little taper; tail markedly blunt, its width in well-nourished individuals equaling or exceeding head width; dorsal scales smooth or weakly keeled anteriorly, becoming more heavily keeled posteriorly; scale rows at mid-body 51-61, reduction to 33-43 just anterior to vent; ventrals in males 193-212 (mean 198.8), in females 198-215 (mean 209.1); anal small, undivided, bordered by a small plate on each side; subcaudals in males 28-40 (mean 33.3), in females 29-34 (mean 31.0); tail terminating in a large shield. Total lengths of six adult males, 654-953 mm.; of five adult females, 831-945 mm. Tail comprising 10.0-12.6 per cent of total length in adult males; 8.2-10.9 per cent, in adult females.

Young snakes light buff to reddish, with 11-17 sooty cross bands on body; tail whitish, with two to five black bands; belly cream, lightly checkered with dark gray and pale orange.

The snakes become darker with age, until most large adults are almost uniformly coffee colored to dark brown with a trace of pale mottling on the flanks, and indication of the light tail rings. Occasional snakes reach adult size, with distinct bands, although they become darker both dorsally and ventrally. It appears that the most reddish juveniles are destined to become the darkest adults. Both color phases may occur in the same geographic area and habitat. I saw a large adult of uniform pale tan color in a snake charmer's basket.

HABITS: Flat desert with loose clay soil and sparse grass appears to be an optimum habitat for this species. Despite the popular name, it is not common where the soil is predominantly sand, and it is rare or absent in rocky areas and damp country.

Sand boas are normally nocturnal but sometimes are abroad by day in cooler weather and after rains. Dates of collection are from late March through November, with no particular peak of abundance.

Sand boas ordinarily crawl slowly with little lateral undulation but may resort to sidwinding locomotion when alarmed. They usually attempt to escape by burrowing. They make no active defense but assume an irregular coil with their head hidden and the conspicuously banded tail exposed. The tail is often deeply scarred, indicating that this ruse may be life-saving. Blair Allen and I once found a large sand boa coiled on open ground, its tail torn and bleeding. Tracks indicated that it had been attacked by a fox or small jackal. Its injuries were trivial and healed in a few days.

On the night of April 17 a captive male sand boa 30 inches long was seen attempting copulation with a female of 33 inches. The posterior halves of their bodies were tightly intertwined, but the male made no attempt to grip the female with his jaws. The light apparently alarmed them, and they separated. The female was observed for the following 10 months but produced no young. The smallest wild-caught snakes measure 225–255 mm. and have been collected in August and early September. Two such individuals after three years in captivity measured only 500–550 mm., although they fed heavily and were stouter than the average wild snake. One of them, four years after capture, measured only 620 mm. and was not yet sexually mature.

The stomach of a 345-mm. sand boa contained a young musk shrew. Captive snakes feed readily on lizards and small mammals. The snakes are clumsy at capturing prey in the open, thus suggesting that most of their hunting is done underground. They are powerful constrictors. An individual 450 mm. long can readily kill and swallow adult mice.

This snake is known locally as “dum-we” (no tail) or “do-sar” (two heads). The Sindhis believe one end of the snake functions as a

head for one season and the other end the following season. Snake charmers often exhibit this species and may mutilate the tail to simulate eyes and a mouth.

DISTRIBUTION: This species is said to occur throughout most of West Pakistan and adjoining parts of Afghanistan and Iran and eastward through Rajputana and the Central Provinces of India. My records are confined to the coastal plain from the Hab River Valley eastward into the Thar Desert and northward in the Indus Valley to central Sind at elevations not exceeding 500 feet.

***Eryx conicus* (Schneider)**

RUSSELL'S SAND BOA

Boa conica SCHNEIDER, 1801, p. 268 (based on Russell, 1796, pl. 4; type locality: Madras).

Gonglyophis conicus: MURRAY, 1884a, p. 386.

Eryx conicus: BOULENGER, 1893, p. 124. SMITH, 1943, p. 112.

DESCRIPTION: Head slightly distinct from neck; rostral wide but without free edge and wedge shape of that of *E. johnei*; nostril slit-like, between nasals and internasal; upper labials 11–13; lower labials 14–17; mental groove absent; no chin shields; eye completely surrounded by 10–14 small scales; body robust, cylindrical, tapering abruptly just anterior to vent; tail very short and bluntly pointed; dorsal scales keeled, keels particularly heavy on posterior third of body and tail; scale rows at midbody 45–55, reduction to 25–31 just anterior to vent; ventrals 161–176 (mean 169.1); anal small, undivided, flanked by one or two small plates on each side; subcaudals 17–22 (mean 18.6). I find no sexual dimorphism in ventral and subcaudal counts among the small group of specimens studied. Total length of adult male, 588 mm.; of three adult females, 637–846 mm.; tail length in adults, 5.5–6.5 per cent of total length.

Ground color light gray to yellowish or rusty, more intense on middorsum; irregular dark brown to sooty blotches, median series narrowly edged with dull yellow and usually more or less fused with each other, lateral series irregularly scattered; usually a dark stripe behind eye; belly white, occasionally with scattered gray flecks.

HABITS: In West Pakistan *Eryx conicus* appears to frequent somewhat more moist ter-

rain than does *E. johni*, showing a decided preference for sand or loose silty soil. It is sluggish and a persistent burrower. Captives may remain buried for weeks, not emerging even at night. They often lie with the tip of the snout protruding from the soil. If they emerge, it is usually for a short period soon after sunset, and it is then that I have collected them. One taken during the winter was buried under several inches of sand among roots of a tamarisk bush.

When disturbed, Russell's sand boa coils, flinches violently if touched, and sometimes makes a slashing strike. The tail is not so prominently displayed as in *E. johni*. Although it can often be handled freely, its temper is uncertain, and it inflicts a painful bite for a small snake.

In captivity I have fed the adults on small rodents and the young on lizards. Prey is killed by constriction.

A female 670 mm. long gave birth to a single young one on July 11, and another female 710 mm. long gave birth to 11 young on July 21. The young snakes measured 190–225 mm. One of these young grew about 35 mm. during a year of captivity.

DISTRIBUTION: The range of the species extends from Bihar and Orissa westward through India and Ceylon to Sind. My specimens were obtained in the Indus Valley from Sanghar District southward except for a single individual collected in suburban Karachi. Since snake charmers often exhibit this boa, the Karachi specimen may have been a release or escape.

***Eryx tataricus* (Lichtenstein)**

TARTARY SAND BOA

Boa tatarica LICHTENSTEIN, in Eversmann, 1823, p. 146 (type locality: Aral Sea).

Eryx tataricus: TERENCEV AND CHERNOV, 1949, p. 230, fig. 105.

DESCRIPTION: Head not distinct from neck; snout blunt; rostral much wider than high; nostril slitlike in nasals which are in contact with each other; upper labials 11 or 12, lower labials 16; mental groove present; no chin shields; eye surrounded by 10 or 11 small scales; body robust, cylindrical, with slight taper; tail blunt, terminating in large shield; dorsal scales smooth anteriorly, weakly keeled posteriorly; scale rows at midbody 49,

reduction to 29 just anterior to vent; ventrals 179; subcaudals 26. Total length of larger specimen (male), 347 mm.; tail, 38 mm.

Dorsal color buff, shading to white on sides; median series of about 50 brownish blotches irregular in shape and arrangement; sides with dark flecks and dashes; belly immaculate white.

HABITS: Specimens were collected in flat sandy terrain with scattered shrubs and clumps of grass. One was dug from a small hillock in company with a sand swimmer (*Ophiomorus tridactylus*). Another was collected on the road at night. When alarmed, these boas curled up, often with the tail tip distinctly elevated above the coils. They did not attempt to bite.

In captivity a specimen fed on nestling and weanling mice, killing the larger animals by constriction. It remained almost continually hidden in the sand of its cage, emerging only to capture prey.

DISTRIBUTION: This species has been reported from the region of the Aral Sea eastward to the Altai Mountains, thence southward at low and moderate elevations to Iran and northwestern Baluchistan.

FAMILY COLUBRIDAE

COLUBER LINNAEUS

Top of head with large, symmetrical plates; eye large, with round pupil; dorsal scales smooth, with apical pits (occasionally a few weakly keeled rows posteriorly in *C. ravergeri*), in 17–25 rows at midbody; ventrals extending full width of venter, 150–250 in number; tail long and slender; subcaudals divided; 12–18 maxillary teeth.

The genus contains about 25 species and is essentially holarctic in distribution, with only a few forms ranging into the tropics. It may well be true that the genus does not represent a natural assemblage, but the only recent attempt at its partition on a worldwide basis (Inger and Clark, 1943) is not satisfactory when applied to the Asian forms. Five species of *Coluber* are definitely known from West Pakistan. Murray (1884a) reported *C. gracilis* from Sind, but the record may well have been based on a juvenile of *C. fasciolatus*. Wall (1908) reported the African *C. florulentus* from Quetta, but this record, too, appears to have been based on a misidentification.

***Coluber ventromaculatus* Gray**

GLOSSY-BELLIED RACER

Coluber ventromaculatus GRAY, 1833-1834, pl. 80 (no type locality stated). SMITH, 1943, p. 168.

DESCRIPTION: Head long, rather narrow but distinctly wider than neck; height of rostral about equal to width; nostril bordered by nasals and internasal; two preoculars, upper more than twice size of lower; normally two or three postoculars, rarely one; upper labials normally nine, rarely eight, with fifth and sixth touching eye; lower labials normally nine or 10, rarely 11; normally two anterior and three posterior temporals; posterior chin shields longer and narrower than anterior; body slender, cylindrical, with even taper; scale rows at midbody 19, reduction to 13, rarely 15, just anterior to vent and occasionally an increase to 20 or 21 on neck; ventrals in males 195-209 (mean 199.9), in females 199-213 (mean 205.3); subcaudals in males 108-115 (mean 111.4), in females 97-106 (mean 103.9); anal divided. Total length of seven adult males, 738-1260 mm.; of three adult females, 764-913 mm.; tail length 25-29.5 per cent of total length.

Dorsal ground color grayish white to pale sandy or reddish brown; a dorsal series of 57-74 cross bars composed of brown or gray scales edged with black and an alternating series of smaller spots, some of which may touch tips of ventrals, these markings tending to fade out on posterior third of body; head of same hue as body, with symmetrical darker mottling on top; short dark vertebral stripe present in 22 of 26 specimens examined; belly white, with a pearly iridescence.

HABITS: These little racers inhabit sparse grassland or clay or sandy desert with scrubby vegetation. They are largely terrestrial but sometimes climb into low bushes. They have been collected during every month and are plentiful throughout the warm season. They are most active from sunset until about two hours after darkness. A few have been found late at night or during the early morning. Resting individuals have been taken under stones and in euphorbia mounds. They are quick and shy but often bite if annoyed.

Two bats were found in the stomach of a large specimen collected February 6, and the stomach of another large individual con-

tained a young musk shrew. A young individual had fed on an *Acanthodactylus*, and the stomach of another small specimen contained a gecko, *Hemidactylus flaviviridis*. Captives fed readily on most sorts of lizards but usually refused skinks. Nestling mice were occasionally eaten by the larger snakes. Prey is chewed vigorously and often immobilized or killed before being swallowed.

The smallest specimens collected measured 280-290 mm. They were found from late July through January. A subadult individual measuring about 625 mm. when captured grew approximately 150 mm. during 18 months in captivity.

The local name "sagi" is applied to this species and to other slender, spotted or unicolor snakes.

DISTRIBUTION: This species occurs from Almora, United Provinces, south to the Khandesh District near Bombay and west to Uzbekistan and Israel. Presumably it occurs throughout West Pakistan, but my specimens were all obtained in Sind and eastern Las Bela at elevations below 600 feet.

***Coluber rhodorachis* (Jan)**

CLIFF RACER

Zamenis rhodorachis JAN, 1865, p. 356 (type locality: Persia).

Coluber rhodorachis: PARKER, 1931, p. 516.

Zamenis ladacensis JOHN ANDERSON, 1871a, p. 16 (type locality: Ladak).

DESCRIPTION: Habitus similar to that of *C. ventromaculatus* but more slender; head scales essentially as in *ventromaculatus*; scale rows at midbody 19, reduction to 13 just anterior to vent in nine specimens and to 11 or 12 in six, increase to 20 or 21 rows on neck occasionally, more rarely reduction to 17; ventrals in males 207-214 (mean 209.7), in females 206-217 (mean 211.6); subcaudals in males 130-137 (mean 132.7), in females 127-136 (mean 131.3); anal divided. Total length of five adult males, 859-1043 mm.; of two females, 949-1009 mm.; tail length 28.5-34 per cent of total length.

Dorsal ground color pale to medium gray, in some cases with a brownish or greenish cast; anterior half of body with short cross bars or alternating spots of gray, chestnut, or pale russet, posteriorly unicolor; head gray or brownish with pale yellowish preocular and

postocular bar; belly ivory, shading to buff posteriorly and usually with dark gray spots at tips of ventrals.

VARIATION: The above description is based on a series of 15 specimens collected within or near the Karachi District. Two juveniles from near Peshawar were pale brownish gray, without dark ventral or dorsal markings but with vertebral stripes that were light orange to vermilion in the freshly preserved animals. One of these snakes was a male with 217 ventrals and 147 subcaudals; the other, a female with 214 ventrals and 130 subcaudals. Two males collected near Ziarat in the Baluchistan mountains have low ventral counts of 199 and 202. One of these snakes showed the typical spotted pattern; the other was uniformly greenish gray in life. This specimen (S.A.M. No. 711) also has an anomalous head shield between the loreal and third upper labial. Shockley (1949) reported a specimen with 229 ventrals and 141 subcaudals from Ras Jawani on the Mekran coast near the Iranian border.

HABITS: This snake shows a preference for cliffs, canyons, and other rocky situations. In Karachi it is often found in residential compounds bordering abandoned stone quarries. It is difficult to capture, for it retreats into deep crevices upon the slightest alarm. During hot weather it is most active in the early morning and shortly before sunset; in cooler weather and at high altitudes it has been found abroad about midday. In Karachi it has been collected during every month but most frequently during April and at the end of the monsoon. The smallest ones, 290–300 mm., have been collected in August and September. Geckos (*Cryptodactylus* and *Hemidactylus*) were found in stomachs of three specimens. Captives feed readily on lizards.

DISTRIBUTION: This species is found from Ladak in the western Himalayas south to western Sind and westward to Turkmen S.S.R., Syria, Arabia, and Somaliland. It probably occurs throughout West Pakistan exclusive of the Thar Desert and upper Indus basin. It has been taken in mountains to elevations of at least 7000 feet.

***Coluber karelini* Brandt**

SPOTTED DESERT RACER

Coluber (Tyria) karelini BRANDT, 1838, p. 243 (type locality: southwest Asia). SMITH, 1943, p. 169.

DESCRIPTION: Habitus of *C. ventromaculatus*; head scales similar save for a large, lower postocular that prevents sixth upper labial from touching eye; scale rows at midbody 19, reduction to 13 just anterior to vent, increase to 21 on neck in one specimen; ventrals 198–204 (mean 200.7); subcaudals in male 95, in female 96; anal divided. Total length of larger male, 665 mm. (tail incomplete); of female, 700 mm.; tail length 25 per cent of total length.

Dorsal ground color pale gray to buff, with median series of 52 to 56 black spots or short cross bands and an alternating series of smaller lateral spots, most of them extending onto tips of ventrals; these markings remaining fairly distinct on body but tending to fade out on tail; top of head of same hue as body, unmarked; dark spot below eye and on temporals; loreal and postocular regions cream; belly milk white to ivory.

The three West Pakistan specimens examined agree well with material from Uzbek S.S.R. and Iran.

HABITS: The only specimen with detailed collecting data was found freshly killed about sunset in a cultivated section of Urak Valley at an elevation of approximately 6500 feet. Jeromie A. Anderson has collected the species in similar terrain near Pishin.

DISTRIBUTION: Known from Transcaspia to Kirghiz and southwestward to Iran and northern Baluchistan. The West Pakistan records are confined to the Quetta-Pishin area.

***Coluber* sp.**

VARIEGATED SAND RACER

DESCRIPTION: Snout more pointed than in *C. ventromaculatus*, *C. rhodorachis*, and *C. karelini*; rostral projecting and strongly concave on under side; three preoculars and two to four postoculars; nine upper labials, with fifth touching eye, except in one specimen in which oculars completely surround eye; nine or 10 lower labials; two anterior and three posterior temporals; scale rows at midbody 19, reduction to 13 posteriorly in seven specimens and to 11 in one, increase to 21 rows anteriorly in two; ventrals in males 227, 231, in females 228–235 (mean 230.9); subcaudals in males 121, 122, in females 113–122 (mean 117.4); anal divided. Total length of adult

male, 818 mm.; of three females, 1016–1098 mm.; tail length 25–26 per cent of total length.

Dorsal ground color pale gray or light tan, with about 100 irregular cross bands composed of dark brown or gray scales edged with black; top of head often dull reddish, with shields narrowly edged with cream; yellowish bars on ocular and temporal region; belly immaculate pearly gray to white.

HABITS: These snakes have been collected in relatively flat sandy country with sparse vegetation. All were in the open, three being taken between sunrise and midmorning and two between sunset and darkness. They are very quick, alert snakes and savage biters. One captive fed on sand lizards (*Acanthodactylus*).

DISTRIBUTION: West Pakistan specimens of this form have all been collected in the desert basin near Nushki. I have seen specimens from southeastern Iran in the collection of the State Razi Institute near Teheran.

The status of this form and its relationships to other racers of the Middle East and North Africa will not be clear until monographic treatment of the group is undertaken. It is distinct from *ventromaculatus*, *rhodorachis*, and *karelini* in the regular presence of a third preocular, high ventral count, and body pattern. Its nearest relative appears to be *rhodorachis*. An adult male racer from Kach in the Baluchistan highlands (A.M.N.H. No. 88470) has 227 ventrals and 125 subcaudals combined with a pattern and circumocular lepidosis of *rhodorachis* type. A female (S.A.M. No. 679) from the Kud River near the Las Bela-Kalat border has 237 ventrals and 135 subcaudals, a pattern more suggestive of this form than of coastal *rhodorachis*, and circumocular scales as in *rhodorachis*. I cannot identify this form with Afghan specimens reported by Leviton and Anderson (1961) or with Iranian specimens of *rhodorachis* reported by Steven C. Anderson (1963). Although I originally identified these Nushki snakes as *karelini* on the basis of circumocular lepidosis, the two are quite different in pattern and in ventral and subcaudal counts. The nearest relative to *karelini* appears to be *ventromaculatus*; the two differ only in the regular presence of a third postocular in *karelini*, in head markings, and in the stronger blotched pattern of *karelini*. In the Quetta

region *rhodorachis* and *karelini* are probably sympatric, although they have not actually been taken together. Near Karachi, both *rhodorachis* and *ventromaculatus* are common and sympatric although somewhat segregated ecologically.

Coluber fasciolatus Shaw

BANDED RACER

Coluber fasciolatus SHAW, 1802, p. 528 (based on Russell, 1796, p. 26, pl. 21; type locality: India). SMITH, 1943, p. 170.

DESCRIPTION: Head short, very little wider than neck; rostral large, broader than high; nostril bordered by nasal and internasal; one or two preoculars and two postoculars; eight upper labials, fourth and fifth touching eye; nine or 10 lower labials; two anterior and two or three posterior temporals; posterior chin shields of about same length as anterior but narrower; body moderate, about twice as thick as in *C. rhodorachis*, and with even taper; scale rows at midbody 23, reduction to 21 on neck and to 17 just anterior to vent; ventrals in males 212–222 (mean 218.0), in females 221–234 (mean 227.8); subcaudals in males 93, 94, in females 82, 89, 89; anal divided. Total length of two adult males, 886 and 1245 mm.; of four females, 1005–1340 mm.; tail length 20–23 per cent of total length.

Ground color cinnamon to grayish brown, with bases of scales darker; indistinct light grayish cross bands on anterior part of body in younger snakes, adults unicolored; belly cream, this color extending onto first scale row and lower parts of upper labials.

HABITS: This species seems to frequent rather dry grassland where the soil is loose or there are many rodent burrows. One was collected in mid-January coiled in the early afternoon sun on an embankment at the edge of a cultivated field. Specimens obtained from Jogis were dug out during cool weather. It seems to be more of a burrower than the other local racers and very secretive during warm weather, when two were collected while we were road cruising at about dusk.

Captives fed fairly well on mice and lizards. Prey is constricted. The snakes do not resent gentle handling but, once aroused, are very pugnacious, flattening their bodies and striking and biting furiously.

DISTRIBUTION: This essentially Indian snake occurs from West Bengal through peninsular India and northern Ceylon north and west to the United Provinces and the Larkana District of Sind.

***Coluber ravergieri* Ménériés**

MOUNTAIN RACER

Coluber ravergieri MÉNÉTRIÉS, 1832, p. 69 (type locality: Baku). SMITH, 1943, p. 172.

DESCRIPTION: Head short, blunt, decidedly wider than neck; rostral wider than high; nostril between nasals; two preoculars and two or three postoculars; nine upper labials, fifth and sixth touching eye which is smaller than in other local snakes of genus; 10 or 11 lower labials; three anterior and three posterior temporals; posterior chin shields a little longer than anterior; body of moderate thickness; scale rows at midbody 21, reduction to 15 just anterior to vent; ventrals 204, 210; subcaudals 88 in only specimen with intact tail (female); anal divided; body length of adult female, 980 mm.; tail (incomplete), 150 mm.

Dorsal color light grayish brown, with median series of 61 olive median bars on body alternating with small lateral spots, these tending to fuse into stripes on tail; top of head with indistinct dark mottling; dark bar from below eye to edge of lip; belly pale tan to dirty white.

HABITS: One was collected on a sparsely forested rocky hillside at about 7500 feet in elevation. It was basking about noon on June 2. Wall (1911b) collected specimens at 11,000 feet in Chitral; one was picked up in a snow drift.

DISTRIBUTION: This is a central Asian species found from Transcaucasia to Israel and eastward to western Mongolia and northern Baluchistan. Its range in West Pakistan is restricted to mountainous areas from the northern part of Kalat District to Chitral.

SPHALEROSOPHIS JAN

Large snakes characterized by fragmentation of certain head shields, particularly prefrontals, oculars, and temporals; anal undivided; scale rows at midbody 25-43.

The genus occurs in arid and semi-arid regions from North Africa to central India. Marx (1959) recognized six forms four of

which are considered subspecies. Indo-Pakistan populations display confusing variation in color and pattern. At least two species occur; the status of the other forms cannot be decided at present. The key to the problem is the status of the form *atriceps*. Nearly all workers have regarded it as but a color variety of *diadema*. It shows no marked difference from *diadema* in scale characters, and the young of the two are quite similar in pattern. However, no one has compared really adequate series of the two, nor have young of known parentage been hatched and raised in captivity. On the other hand, adult *atriceps* are strikingly different in appearance from typical *diadema*, reach a larger size, and have more strongly keeled scales. Over most of Sind and eastern Las Bela *atriceps* occurs to the exclusion of *diadema* but is widely sympatric with *arenarius*. Near Rawalpindi and in the Northwest Frontier Provinces, typical *diadema* alone was seen, although few specimens were examined from this region. According to literature records, both *diadema* and *atriceps* occur throughout much of northern India (Punjab and Central Provinces), but clear-cut intermediate specimens have not been reported. On the Quetta Plateau, *atriceps* seems to be sympatric with *d. schirazianus*.¹ Information is lacking for other areas. In this account I recognize *atriceps* as a species, defining it on the basis of material from Sind and Las Bela. Although the number of specimens of this and related species preserved and studied in detail is rather small, I saw a good many others, including dead snakes too badly damaged for preservation, specimens in local collections, particularly the Pakistan Army Medical School and Gordon College collections (both at Rawalpindi), and specimens in the possession of snake charmers.

***Sphalerosophis atriceps* (Fischer)**

ROYAL SNAKE

Zamenis diadema var. *atriceps* FISCHER, 1885, p. 102 (type locality: Himalayas).

¹ During the summer of 1965 five specimens of *Sphalerosophis* were obtained in the Quetta-Pishin-Ziarat region. Two were identifiable as *atriceps* and three as *diadema schirazianus*. A total of nine specimens, four of *atriceps* and five of *d. schirazianus*, have been examined from this presumed area of sympatry.

Sphalerosophis diadema diadema (part) MARX, 1959, p. 347.

Zamenis diadema melanoides WALL, 1914b, p. 211 (type locality: Jodpur, Rajputana, and Baluchistan).

DESCRIPTION: Head long; snout somewhat truncate and temporal region decidedly wider than neck; rostral wider than high; nostril large, situated between nasals; two loreals; eye large, surrounded by supraocular and seven to nine small scales; 10–13 upper labials and 11–14 lower labials; anterior chin shields longer than posterior, latter usually not in contact with each other; temporals fragmented into 10–16 small scales; prefrontals fragmented into five to eight scales; body moderately slender, with even taper; dorsal scales keeled, in 27–31 rows at midbody, reduction to 19–21 rows just anterior to vent and usually reduction of two to four rows on neck; ventrals in males 232–248 (mean 238.6), in females 244–254 (mean 248.2); subcaudals in males 101–114 (mean 109.2), in females 96–110 (mean 103.0); anal undivided. Total length of eight adult males, 1418–1640 mm., of five adult females, 1408–1614 mm.; tail in males 21–24.5 per cent of total length, in females 20–23 per cent.

Adults extremely variable in color and pattern; commonest color variety straw yellow to orange or dusky pink, with irregular black flecks and blotches as though snake had been spattered with tar; head red, mottled with black or largely black shading to dark red on nape and temples; belly peach color to pink, immaculate or mottled with dark gray; chin and throat white.

A less common color phase represented by specimens from the lower Indus Valley is deep yellow to orange, with a median row of about 55 sooty blotches, many of them fused along the midline; two alternating rows of smaller dark spots; head black; and lateral tips of ventrals dark gray, central portions orange lightly flecked with gray. The most strongly melanistic phase is dark greenish gray, with black blotches faintly edged with yellow or completely black; belly dark gray marbled with pink; it has been collected at three widely separated localities. Young are light tan or buff, with median series of 51 to 55 maroon saddles narrowly edged with white and two alternating lateral series, the upper

row elongate, in some cases fused into a broken line; dark U- or Y-shaped mark on crown; dark stripe across supraoculars and frontal and from eye to angle of mouth; dark bars on upper labials and dark mottling on snout; belly white.

HABITS: These big snakes frequent a variety of habitats varying from dense scrub to almost barren clay desert but seem to be nowhere particularly common. They inhabit burrows of small mammals, rock outcrops, old tombs, and other ruins. They have been collected from near sea level to about 6500 feet. Like most desert snakes, they are nocturnal except for brief periods in the spring and fall. Dates of collection are from early March to late November. They are alert and active. When cornered they assume a loose coil, with the neck gathered in S-shaped loops. They hiss loudly and can deliver a powerful strike.

A blotched male and melanistic female were seen in copulation the nights of March 11 and 12. The female laid three eggs May 29 and another a week later. The eggs were 68–78 by 16–22 mm. and had soft, flabby shells. The following year the same pair mated April 20 and 21; three more similar eggs were laid May 9. On May 9 of the next year, this female laid a third clutch of five eggs. According to data supplied by Roger Conant (personal communication), these eggs measured 71–76 by 24–27 mm.; the shells were apparently normal. Copulation was not witnessed, but the snake was caged with her mate of previous years. A female of the yellow phase laid eight eggs October 25–26. These measured 56–60 by 26–28 mm. and were not adherent. None of these eggs was successfully hatched, although the last clutch developed normally for about two weeks before mold attacked them. The smallest wild-caught specimen measured 380 mm. and was found in mid-November.

Captive specimens tend to be bad tempered. They feed well on mice, young rats, and sparrows. The prey tends to be small in proportion to the size of the snake. Usually the snakes press struggling animals against the floor or wall of the cage with a coil; occasionally they employ true constriction. The yellow phase of this snake is known as "kourar" in Sind.

DISTRIBUTION: Recorded from Gilgit in the western Himalayas, Ambala in the Indian Punjab, and Allahabad, Uttar Pradesh, southwestward to Kutch and thence westward to the Quetta and Las Bela districts of Baluchistan.

***Sphalerosophis diadema diadema* (Schlegel)**

EASTERN DIADEM SNAKE

Coluber diadema SCHLEGEL, 1837, p. 148 (based on Russell, 1801 [1801-1809], p. 34, pl. 30; type locality: Buchier "in the environs of Bombay").

Sphalerosophis diadema diadema (part): MARX, 1959, p. 347.

DESCRIPTION: Shape and lepidosis of head similar to those of *S. atriceps*; ocular ring composed of eight to 11 scales; eight to 11 prefrontals; dorsal scale rows as in *atriceps* but scales very weakly keeled; ventrals in male 243, in females 248 and 252; subcaudals in male 104, in females 101 and 105. Largest specimen examined has a total length of 956 mm. Larger specimens have been reported, but this species apparently never reaches the length attained by *atriceps*. Tail 21.4-21.7 per cent of total length.

Adults display pattern and head markings similar to those described for juveniles of *atriceps*; 57-65 body blotches; head markings and blotches dark brown to chestnut on a dark yellow to tan ground color; belly white to pale pink, with little dark pigment. The only small juvenile examined was similar to the adults in color and pattern.

***Sphalerosophis diadema schirazianus* (Jan)**

PERSIAN DIADEM SNAKE

Periops parallelus var. *schiraziana* JAN, 1865, p. 356 (type locality: Shiraz, Iran).

Sphalerosophis diadema schirazianus: MERTENS, 1956, vol. 111, p. 96.

DESCRIPTION: Habitus and lepidosis generally similar to those of *atriceps* and *d. diadema*; eight to 10 scales in ocular ring; six to nine prefrontals; dorsal scales at midbody 25 or 27, reduction posteriorly to 19 or 17 rows, scales smooth or with traces of keels; ventrals

in males 231 and 234, in females 240 and 244; subcaudals in males 91 and 93, in female 79. Total length of adult male, 1029 mm.; of adult females, 1047 and 1316 mm., tail of larger individual incomplete; tail length 21 per cent of total length in male, 18.7 per cent in female.

Dorsal ground color pale gray to buff or khaki; median series of 51-53 light olive to dark gray blotches; head markings as in *diadema* in three specimens; U-shaped mark absent from one; belly white, in some cases with gray smudges on lateral tips of ventrals. The rich yellow and reddish tints conspicuous in other Pakistan *Sphalerosophis* are absent, and melanistic individuals apparently do not occur.

HABITS: Specimens of *d. diadema* were collected on lightly wooded rocky hillsides, and a specimen of *d. schirazianus* was found in flat clay desert near a village. The altitudinal range is from near sea level to at least 6000 feet. The snakes were collected during the day, but so little collecting has been done within their range that the significance of this fact is slight. Their behavior is similar to that of *atriceps*. Captive specimens fed on mice.

DISTRIBUTION: As here defined, *d. diadema* occurs from the Northwest Frontier Provinces and northern Punjab, northern Rajasthan, and the western part of the United Provinces. The subspecies *schirazianus* occurs from Transcaspia south to the Zagros Mountains of Iran and east to Tadzhikistan and to Quetta and western Las Bela in Baluchistan. Intergrade specimens between *diadema* and *schirazianus* have not been examined, but the two are obviously closely related.

***Sphalerosophis arenarius* (Boulenger)**

RED-SPOTTED DIADEM SNAKE

Zamenis arenarius BOULENGER, 1890, p. 329 (type locality: Sind and Karachi, restricted to Karachi by Marx, 1959).

Sphalerosophis arenarius: SCHMIDT, 1930, p. 226.

DESCRIPTION: Snout more pointed than in *diadema*, and rostral higher than wide; six to eight small scales surrounding eye; nine to 11 upper labials; 10-12 lower labials; three to six, usually four, prefrontals; dorsal scales keeled, in 23-27, usually 25, rows at midbody, reduction to 15, 17, or 18 rows just anterior to vent and often reduction of two rows on neck; ventrals in males 226-238 (mean 231.1), in females 235-257 (mean 247.3); subcaudals in

¹ Maps of India of the early nineteenth century show no town of Buchier near Bombay, nor is the name one that would be common in that part of India. "Buchier" is one of several variant spellings for the city on the Persian Gulf now known as Bushire, and the ventral and subcaudal counts given for the specimen are those of a snake of Iranian rather than Indian origin. Wall (1914b) does not believe *Sphalerosophis* occurs near Bombay.

males 78–86 (mean 82.0), in females 71–81 (mean 77.0); other scale characters like those of *diadema*. Total length of four adult males, 1118–1183 mm.; of five adult females, 969–1281 mm.; tail in males 18–20 per cent of total length, in females 16.5–19 per cent.

Ground color light gray to buff, with seven rows of alternating reddish spots, median row largest and numbering 54 to 72 from nape to base of tail, caudal spots tending to fuse into stripes; head pattern similar to that of juvenile *diadema*; belly immaculate white, with high gloss.

HABITS: A combination of sandy soil adjacent to rock outcrops is preferred by this snake, although it has also been taken in flat clay desert. It is common near Ghizri, a coastal village situated near low rocky bluffs. Dates of collection are from March through November except for a specimen found during archeological excavations in January. It is almost exclusively nocturnal during the hot weather.

A large specimen killed October 3 contained 10 eggs apparently almost ready for deposition. In its stomach was a freshly swallowed gerbil.

These snakes are mild-tempered and make excellent captives, although they require warm, dry quarters. Adults feed readily on small mammals; the young prefer lizards but will take nestling mice. Prey is constricted as a rule. I have seen captive snakes make a passage under stones or other objects by raking out sand with a J-shaped curve of the neck.

The local name in Las Bela is "surmar."

DISTRIBUTION: All unequivocal records for this snake are confined to the coastal plain of Las Bela and Sind west of the Indus. One of my specimens was purchased from a snake charmer who claimed it was collected near Dadu in the Indus Valley; I have reason to question the reliability of this record. There is a record for Rajputana without specific locality.

ELAPHE FITZINGER

Moderate-sized to large snakes; 12–24 maxillary teeth subequal in size; scales smooth or weakly keeled, with apical pits; hemipenis with complete band of spines proximal to extensive non-spinulose calyculate area; squamosal bone as long as or longer than quadrate.

The genus contains about 40 species. The majority occur in southeast Asia, but several are found in North and Middle America and in Europe. *Elaphe helenae* (Daudin), a common species of peninsular India, was reported from Karachi and Sind by Murray (1884a) but has not been collected recently. Krishna and Dave (1954) reported it from Jaisalmer in Rajputana.

PTYAS FITZINGER

Very long but rather slender snakes; 20 to 28 maxillary teeth; two or three loreals; 15 to 18 scale rows at midbody.

There are two species widely distributed in south Asia.

Ptyas mucosus (Linnaeus)

DHAMAN

Coluber mucosus LINNAEUS, 1758, p. 226 (type locality: India).

Ptyas mucosus: GÜNTHER, 1864a, p. 249. SMITH, 1943, p. 159.

DESCRIPTION: Head long, distinctly wider than neck, snout bluntly pointed; rostral higher than wide; nostril between nasals and first upper labial; usually three loreals, occasionally four, rarely two; preoculars two, upper about four times size of lower; postoculars two, rarely three; two anterior and two posterior temporals; eight upper labials, fourth and fifth touching eye; nine or 10 lower labials; posterior chin shields in contact anteriorly and slightly longer than anterior; body slender, cylindrical, with even taper; scale rows at midbody 17, rarely 16, reduction to 14 or 15 just anterior to vent, usually increasing to 19, 20, or 21 rows on neck; scales with pair of apical pits, smooth anteriorly, feebly keeled in midline posteriorly; ventrals 190–197 (mean 193.3), no sexual dimorphism in material examined; subcaudals in males 110–117 (mean 114.6), in females 105, 113; anal divided. Total length of four adult males, 1900–2080 mm.; of two adult females, 1700 and 1794 mm.; tail 25–27.5 per cent of total length.

Ground color gray or dull tan to dark olive brown, many scales with black tips and edges, especially posteriorly, other scales with yellow or light tan edges; labials and occasionally other lateral head shields strongly edged with black; top of head unmarked; belly white to cream, free edges of ventrals and

subcaudals black. Young snakes show irregular light tan to dull yellow cross bands on anterior half of body.

HABITS: Dhamans characteristically inhabit damp grassland or cultivated areas around villages. They may wander into adjacent forest or semi-desert. They often enter water and swim rapidly, with the head held well clear of the surface. They climb into trees and bushes and have been found in walls and roofs of thatched huts.

They are diurnal, alert, and active, often escaping into vegetation or water or into a hole. When cornered, they arch the neck and distend it vertically. At the same time, they emit a deep resonant hiss, almost a growl if the snake is a large one. They can inflict savage bites.

A freshly captured adult snake disgorged a skink (*Mabuya dissimilis*) and two large frogs (*Rana tigrina*). Frogs seem to be preferred over other food by captive snakes, although rats and mice are taken readily by some individuals. Active prey is killed by the snake's pressing it against the floor or side of the cage.

Dhamans hibernate from December through February, although they may bask on mild days. Like most Indus Valley snakes, they are difficult to find during the hot, dry spring and early summer. The smallest specimen that I collected measured 611 mm. and was taken early in April. The Jogis say the eggs hatch at the end of the rainy season.

In captivity Dhamans tend to be nervous and bad-tempered and often refuse food.

The cow-sucking legend, almost identical with that told in the United States, is frequently told concerning the Dhaman.

DISTRIBUTION: The range is very extensive, reaching on mainland Asia from south China and Viet Nam through all of India and westward into Iran and southern Afghanistan to Transcaspia. The species is also reported from Formosa, Ceylon, Java, Sumatra, and the Andaman Islands. In West Pakistan it has been reported north to Chitral and west to Baluchistan. My specimens were collected in the lower Indus Valley and delta. I saw a dead specimen in Clifton a few hundred yards from the seacoast. It may have been discarded there by a snake charmer. Distribution to the west and northwest is very prob-

ably discontinuous and relict, for the Dhaman is not a desert snake.¹

EIRENIS JAN

This is a genus of small snakes apparently derived from and closely related to that section of the genus *Coluber* that includes *rhodrachis* and associated species. Stickel (1951) separated it from *Contia* which he restricts to western North America; his paper gave some details of the skull and hemipenes of the two genera. *Eirenis* itself is probably not a natural assemblage and badly needs monographic treatment.

The dozen or so species now recognized range from North Africa and islands of the eastern Mediterranean through southwest Asia to extreme western India. All West Pakistan material is currently referred to a single species.

Eirenis persica (John Anderson)

DARK-HEADED DWARF RACER

Cyclophis persicus JOHN ANDERSON, 1872, p. 392 (type locality: Bushire, Persia).

Contia persica: BOULENGER, 1894, p. 263. SMITH, 1943, p. 188.

Eirenis persica: STICKEL, 1951, p. 128.

Contia angusticeps BOULENGER, 1894, p. 262 (type locality: Cherat, Baluchistan).

Pseudocyclophis walteri BOETTGER, 1888, p. 262 (type locality: Neu-Serachs, northeast Persia).

Contia mcMahonii WALL, 1911a, p. 1037 (type locality: Baluchistan).

DESCRIPTION: Head long, flat, slightly distinct from neck; snout blunt, rostral much wider than high; nostril in nasal; loreal absent or tiny; eye small, pupil round, not distinct in life; single preocular and postocular; six to eight upper labials, third and fourth touching eye; seven or eight lower labials; anterior chin shields much longer than posterior; single anterior and one or two posterior temporals; body slender, cylindrical, with little taper; scales smooth, with apical pits;

¹ Three specimens of *Ptyas* (one not preserved) were seen in the Quetta District during the summer of 1965. These snakes were very dark above and virtually without markings; below, rich deep yellow more or less suffused with brown. Ventral counts were slightly higher (201, 204) than for specimens from Sind; other scale counts are within the limits given. These snakes were found in the immediate vicinity of permanent water.

anal divided; tail slender and filiform. Length of largest male examined, 378 mm.; of largest female, 503 mm. Variation in dorsal, ventral, and subcaudal scales shown in table 6.

Dorsal ground color from light brown to pale gray, buff, or pinkish, with bases of scales darker; some specimens unmarked, others with 50–65 transverse dark bars, narrow and distinct anteriorly, becoming wider and tending to fade out posteriorly; head uniform gray to blackish from snout to nape or with light transverse band just behind eyes and another crossing tips of parietals; ventral surfaces and lips white to cream.

VARIATION: Table 6 indicates the presence of a long-tailed form with high ventral and subcaudal counts in western Baluchistan (Las Bela and Chagai districts) and a slightly shorter-tailed form with fewer ventrals and subcaudals in Waziristan and the Northwest Frontier. The barred pattern is not a juvenile characteristic as Smith (1943) implied nor does it seem to be restricted to any particular geographic area. I suspect the situation is similar to that existing in the American genus *Sonora* in which the closely related species *episcopa* and *semiannulata* both display ringed and unicolored phases. Very probably neither West Pakistan form is identifiable with topotypic *persica* from southwestern

Iran (see Steven C. Anderson, 1963), but assignment of names to the West Pakistan populations is premature.

HABITS: Records of this snake are from rocky and usually hilly terrain, with vegetation varying from sparse xeric scrub to light mesic forest. It has been found in the open at night or discovered concealed beneath stones. The habitus of the species suggests it is a crevice dweller rather than a true burrower.

DISTRIBUTION: Specimens identified as this species have been reported from Turkmen S.S.R. to Jarmo, Iraq, and eastward through Iran and most of West Pakistan to Swat and western Sind.

LYTORHYNCHUS PETERS

Rather small sand-burrowing snakes; rostral large, angularly bent, projecting lateral edge free, strongly concave below; nostril a narrow slit between nasals; dorsal scales without apical pits; subcaudals in double row.

The genus occurs in desert region from North Africa to extreme western India. Three of the six species occur in West Pakistan.

Lytorhynchus maynardi Alcock and Finn

MAYNARD'S AWL-HEADED SNAKE

Lytorhynchus maynardi ALCOCK AND FINN, 1896, p. 562 (type locality: south of Koh-Malik-

TABLE 6

VARIATION IN SELECTED CHARACTERS AMONG SOME WEST PAKISTAN SNAKES OF THE GENUS *Eirenis*

Locality, Sex, and Museum Number	Dorsal Scale Rows	Ventrals	Sub- caudals	Ratio of Total Length to Tail Length	Body Pattern	Light Head Bands Postoccipital Parietal
Waziristan, ♂, B.M. No. 1923.10.13.41	16–15–13	206	84	0.227	Ca. 50 bars	Yes Yes
Waziristan, ♀, B.M. No. 1923.10.13.42	16–15–15	202	76	0.224	Dark speckling	Yes Yes
Parachinar, Northwest Frontier Provinces, ♂, B.M. No. 1907.7.31.10	15–15–15	199	75	0.226	Few faint bars	Faint Yes
Malakand Agency, ♂, B.M. No. 1900.7.10.13	15–15–13	188	80	0.227	Unicolored	Yes Yes
Malakand Agency, ♀, B.M. No. 1900.7.10.14	15–15–13	196	64+	—	Unicolored	Yes Yes
Udigram, Swat, ♀, S.A.M. No. 685	15–17–15	198	72	0.226	Unicolored	Yes Yes
Nushki, Chagai, ?, R.S.M. No. 1963.23.198	13–15–13	238	92	0.233	Unicolored	No No
Porali Valley, Las Bela, ♀, S.A.M. No. 894	15–15–14	218	99	0.262	Ca. 65 bars	No No

do-Khand, Afghan-Baluchistan frontier). SMITH, 1943, p. 192.

DESCRIPTION: Head long, slightly distinct from neck; snout sharply pointed, long; posterior extension of rostral almost completely separating internasals; loreal present; eye bordered by supraocular and six or seven small scales; pupil round; two anterior and two or three posterior temporals; upper labials normally seven, occasionally six or eight; lower labials nine to 11; mental with small anterior projection fitting notch at base of rostral; posterior chin shields slightly longer and narrower than anterior; body slender, subcylindrical, with even taper; scale rows at midbody 19, increasing to 20 or 21 on neck, reduction to 13–15 just anterior to vent; ventrals in males 186, 193, in females 190–202 (mean 195.5); subcaudals in males 58, 61, in females 53–63 (mean 57.9); anal divided. Total length of two adult males, 378 and 395 mm.; of six adult females, 360–452 mm.; tail 17–19.4 per cent of total length.

Dorsal ground color pale orange to pinkish, with 36–45 jet black cross bands on body and 12–15 on tail, in some cases an alternating series of faint lateral spots; elongate dark blotch from frontal onto neck; in some a faint postocular stripe; ventral surfaces and labials white.

HABITS: These snakes were common in tracts of fine, wind-blown sand near Nushki. In mid-May they emerged from the sand about an hour after sunset and were active until about midnight when the temperature dropped appreciably. When frightened by lights, they glided rapidly over the sand and often dived below its surface. When restrained they are pugnacious little snakes, drawing the forepart of the body into S-shaped loops and vibrating the tip of the tail. They strike repeatedly but almost always with the mouth closed.

In captivity they were poor feeders, although some took small lacertids and geckos, overpowering them by constriction and then shaking them repeatedly as they were being swallowed. During the humid monsoon weather in Karachi, it became almost impossible to keep the terrarium for the snakes dry, and they stopped feeding and died.

DISTRIBUTION: This snake is a characteristic element of the herpetofauna of the

Baluchistan Desert basin. Records are from Nushki west to the Iranian border.

***Lytorhynchus paradoxus* (Günther)**

SIND AWL-HEADED SNAKE

Aconitophis paradoxus GÜNTHER, 1875, p. 232 (type locality: northern India, restricted to Zangipur, northern Sind).

Lytorhynchus monticornis WERNER, 1926, p. 243 (type locality: Sind).

Lytorhynchus paradoxus: BOULENGER, 1890, p. 323. SMITH, 1943, p. 191.

DESCRIPTION: Snout slightly less projecting than in *maynardi*; two preoculars and two postoculars, usually a subocular; two anterior and two or three posterior temporals; eight upper labials, fifth touching eye; 10 or 11 lower labials; mental and chin shields like those in *maynardi*; body slightly stouter than that of *maynardi*; scale rows at midbody 19, rarely 21, increasing to 21 or 23 on neck, decreasing to 15 posteriorly; ventrals in males 169, 173, 178, in females 180, 181; subcaudals in males 45, 48, 46, in females 40, 40; anal divided. Total length of three adult males, 299–345 mm.; of adult female, 382 mm.; tail 14.5–15.5 per cent of total length.

Dorsal ground color pale brown to grayish white, with median series of 40–51 brown to sooty blotches separated by cream interspaces, a pale tan lateral series of blotches; top of head with dark elongate blotch; dark postocular stripe; belly white.

HABITS: These snakes have been collected among sand dunes at night. One was burrowing into sand at the base of a bush; others were on paved roads. When alarmed the snakes assume a figure-8 coil, with the tail curled in a spiral and the head hidden.

One specimen disgorged a sand gecko (*Stenodactylus orientalis*) a few hours after capture. Captives fed readily on small lizards. They were sometimes seen on the surface during the cooler daylight hours. One laid two eggs in a damp spot beneath a shard of pottery on May 8. They measured 35 by 9 mm. and were adherent laterally. Although apparently fertile, the eggs failed to hatch.

DISTRIBUTION: This species represents its genus in the Thar Desert. Known localities are in the northern part of Muzaffargarh District south to Umarkot and the Baran Nai southwest of Kotri.

Lytorhynchus ridgewayi* Boulenger*AFGHAN AWL-HEADED SNAKE**

Lytorhynchus ridgewayi BOULENGER, 1887c, p. 413 (type locality: Chinkalok, Afghanistan). SMITH, 1943, p. 190.

Lytorhynchus gabrielis WERNER, 1938, p. 268 (type locality: Ziarat, Baluchistan).

DESCRIPTION: Snout pointed but projecting least of three Pakistan species; two preoculars and three postoculars, usually one or more suboculars that separate eye from labials; temporals like those in *paradoxus*; seven to nine upper labials; 10 or 11 lower labials; prefrontals fused into single shield; mental without anterior projection; posterior chin shields shorter than anterior and widely separated; scale rows at midbody 19, increasing to 21 anteriorly and reduction to 15 posteriorly; ventrals in male 163, in female 172; subcaudals 50 in both specimens; anal undivided. Both specimens examined are juveniles: total length of male, 241 mm.; tail, 48 mm.; female, 387 mm.; tail, 68 mm.

Dorsal ground color pale gray to buff, with 41–49 blotches in median series, these black to dark brown anteriorly and light brown, with darker edges, posteriorly; two alternating lateral series of paler blotches; head with dark, anchor-shaped mark, arms extending through eye to angle of mouth, shank extending toward nape where it may fuse with first body blotch; belly white.

HABITS: Apparently less of a sand snake than the other two local members of the genus, my specimens were collected in gravel desert with considerable scrubby vegetation. They were found at night on the road.

One specimen kept several weeks in captivity fed readily on small lizards. Like other *Lytorhynchus* species I have had, it was a constrictor and had the peculiar habit of shaking its prey before swallowing it. It was a quiet little snake, reacting to disturbance by curling up and hiding its head.

DISTRIBUTION: The range extends from Transcaspia and central Iran east through much of Afghanistan and northern Baluchistan. The eastern limit of the range is not well known. The species is reported from Ziarat at approximately 8000 feet in elevation.

DENDRELAPHIS BOULENGER

Large-headed, slender, arboreal snakes;

pupil round; maxillary teeth 20–34; scales smooth, in 13 or 15 rows, vertebral row more or less enlarged; ventrals with lateral keel and notch on each side corresponding to keel; skin between scales usually blackish.

There are at least a dozen species distributed throughout southeast Asia through the islands of Indonesia and Malaysia to eastern Australia.

The Indian bronzeback, *D. tristis* (Daudin), was recorded from Sind by Smith (1943), apparently on the basis of B.M. No. 60.3.19.1441. This specimen was part of a large Indian collection made by the Schlagintweit brothers and presented to the British Museum in 1860. It is an adult female with 185 ventrals, 127 subcaudals, and other scale counts typical of the species. The handwritten label is now almost illegible but appears to read "Sabzil Kot, Sindh." I cannot find this locality on modern maps, but "kot" (fort) is a common suffix to place names in Sind. Jeromie A. Anderson and his collectors have made special efforts to find this snake on oases in the Thar Desert but have been unsuccessful.

LYCODON BOIE

Small to medium-sized snakes; head flat; maxillary bone strongly arched; anterior three to six maxillary teeth enlarged, separated from others by distinct gap; eye dark, iris almost invisible in life, pupil vertically elliptical.

The genus is characteristic of southeast Asia, with one of the 20 or so species ranging northwest to Transcaspia. This species is found through much of West Pakistan. The common and widely distributed *Lycodon aulicus* has been recorded from Karachi and Sehwan (Murray, 1884a), but there seem to be no recent reports of the species from West Pakistan. A third species is reported on the basis of one specimen. Several species of wolf snakes frequent dwellings and warehouses and thus are particularly apt to be transported by man.

Lycodon striatus striatus* (Shaw)*NORTHERN WOLF SNAKE**

Coluber striatus SHAW, 1802, p. 527 (based on Russell, 1796, pls. 16, 26; type locality: Vizagapatam and Hyderabad).

Lycodon striatus: STOLICZKA, 1870, p. 200. SMITH, 1935, p. 261.

Lycodon striatus striatus: CHERNOV, 1935, p. 189.

DESCRIPTION: Head slightly distinct from neck; snout blunt; rostral about twice as wide as high; nostril between nasals; loreal elongate, in contact with internasal; one preocular and two postoculars; two (rarely one) anterior and three posterior temporals; upper labials normally eight (nine unilaterally in three specimens, bilaterally in one), fourth and fifth touching eye; nine or 10 lower labials; anterior chin shields longer than posterior; body slender, cylindrical, with even taper; dorsal scales smooth, with apical pits; scale rows at midbody 17, reduction to 15 posteriorly; ventrals in males 173–188 (mean 176.5), in females 182–200 (mean 190.3); subcaudals in males 51–58 (mean 54.0), in females 40–51 (mean 44.9); anal divided. Total length of seven adult males, 363–426 mm.; of five adult females, 437–488 mm.; tail length in males 17–18.9 per cent of total length; in females, 13.5–15.2 per cent.

Dorsal ground color jet black in young snakes to light chocolate brown in largest adults; from 16 to 21 white to cream transverse bars from nape to base of tail; sides with numerous short white dashes, more pronounced posteriorly; nape dark, in some cases with faintly light-edged scales but no collar; upper labials white to cream; belly white, dark dorsal pigment encroaching onto ventrals anteriorly.

***Lycodon striatus bicolor* (Nikolsky)**

GOLDEN-SPOTTED WOLF SNAKE

Contia bicolor NIKOLSKY, 1903, p. 96 (type locality: Transcaspia).

Lycodon striatus bicolor: CHERNOV, 1935, p. 189.

DESCRIPTION: Differing from nominate race in having a distinct, narrow, light collar at nape; a high number of light (golden yellow in life) transverse bars, 35 or more from nape to level of vent; an increased number of subcaudals, 60–70 in males, 50–60 in females.

To this subspecies I refer a male (S.A.M. No. 661) collected 11 miles southwest of Quetta: head and dorsal scalation not differing from that of typical form; ventrals 177; subcaudals 63; tail length 21.8 per cent of

total length; 39 pale gold, transverse bars on body; cream collar crossing nape and extending anteriorly to blend with light color of labials.¹ A female from Malir Cantonment near Karachi (A.M.N.H. No. 86896) has 196 ventrals; 57 subcaudals; tail 17.9 per cent of total length; 27 gold transverse bars; light collar on nape. I regard this individual as an intergrade between *bicolor* and *striatus*. It is significant, however, that typical examples of *striatus* have been collected about 10 miles southeast of Malir.

HABITS: Wolf snakes have been collected in cultivated land along canals, mango groves, desert scrub, and on oases. They seem to require a moderate amount of moisture. They are secretive and nocturnal during the hot months. They seem to prowl after rains or at other times when humidity is high and have been found from 30 minutes after sunset to shortly after daybreak. Dates of collection are from late February through October.

The stomach of one individual contained remains of a skink. Captives feed readily upon small lizards.

Two freshly collected individuals in Jerome A. Anderson's collection copulated the night of March 3. When I observed them, they were united only at the vent. Their bodies made an angle of about 45 degrees, and they were quiet except for a slight wiggling of their tails. The female laid four eggs on April 18; the eggs measured 25–28 mm. by 9–11 mm.

This snake superficially resembles the young of the Indian krait, and the defensive behavior of the two is similar, viz., flinching, flattening the body, and hiding the head under coils. The wolf snake rarely strikes but when handled will sometimes run its nose along the skin and take a deliberate bite. I have seen individuals of *Lycodon* vibrate the tip of the tail when alarmed. Although many persons confuse this snake with the krait, a surprising number recognize it as a distinct and less dangerous species. The local name, also applied to other snakes with narrow light and dark bands, is "abi-sangchul," literally "half-krait."

¹ During 1965, typical specimens of *Lycodon s. bicolor* were collected at Hinidan Crossing on the upper Hab River and on the Hazarganji Game Reserve near Quetta.

DISTRIBUTION: The species *striatus* as a whole occurs from Transcaspia and eastern Iran east to Chota Nagpur and south through peninsular India and Ceylon. The subspecies *bicolor* occurs in the northwestern part of this range, entering West Pakistan in upland Baluchistan and Waziristan. The West Pakistan populations I refer to *s. striatus* occur in the Indus Valley at least as far north as Jacobabad and west in the coastal plain to Bela. Intergradation between *striatus* and *bicolor* presumably occurs along the edge of the Baluchistan highlands.

***Lycodon travancoricus* (Beddome)**

TRAVANCORE WOLF SNAKE

Cercaspi travancoricus BEDDOME, 1870, p. 169 (type locality: Travancore Hills).

Lycodon travancoricus: BOULENGER, 1890, p. 293. SMITH, 1943, p. 259.

DESCRIPTION: Head distinct from neck; snout wider and more depressed than in *L. striatus*; nostrils between two subequal nasals; loreal not in contact with internasal; oculars and temporals like those in *striatus*; nine upper labials with third, fourth, and fifth touching eye; dorsal scale rows like those in *striatus*; ventrals angulate laterally, 162 in single West Pakistan specimen, a male; anal undivided. Body length, 330 mm.; tail incomplete.

Dorsal ground color of preserved specimen dark purplish brown; 29 yellowish cross bars from nape to base of tail forking on sides to enclose triangular dark spots; indistinct nuchal collar; belly light and unmarked.

DISTRIBUTION: Smith (1943) recorded this species from the western part of peninsular India north to Matheran and east to Jubblepore and Vizagapatam. It is recorded from West Pakistan on the basis of a single specimen (C.N.H.M. No. 42211) collected in the gardens of Hyderabad College on September 15, 1944. James A. Peters, who presented the specimen to the museum, wrote: "... it is very likely that this particular specimen was given to me by Tulyani or one of his colleagues. . . . I would not vouch for it as strongly as I would had I collected it myself."

The specimen conforms to the description of *L. travancoricus* except for the unusually low ventral count. It is possible that old

records of *L. aulicus* from Sind may be based on this form.

OLIGODON BOIE

Snakes of this genus are characterized by marked enlargement and lateral flattening of maxillary teeth; palatine teeth often vestigial; head short; eye with round pupil; dorsal scales smooth, in 13–23 rows; subcaudals paired.

The genus is southeast Asian in distribution, with two of the approximately 60 species reaching West Pakistan.

***Oligodon taeniolatus* (Jerdon)**

STREAKED KUKRI SNAKE

Coronella taeniolata JERDON, 1853, p. 528 (based on Russell, 1796, pl. 19; type locality: Vizagapatam).

Oligodon taeniolatus: WALL, 1921, p. 239. SMITH, 1943, p. 223.

Oligodon subgriseum DUMÉRIL AND BIBRON, 1854 (1834–1854, vol. 7), p. 59 (type locality: Pondicherry).

DESCRIPTION: Head barely distinct from neck; snout blunt; rostral large, higher than wide and extending posteriorly, almost separating internasals; nostrils between nasals; loreal present; one preocular; two, occasionally three, postoculars; one or two anterior and two posterior temporals; seven upper labials, third and fourth touching eye; seven or eight lower labials; anterior chin shields about thrice length of posterior; body slender, of almost uniform diameter from neck to vent; dorsal scales in 15 rows at midbody, occasionally increasing to 17 rows anteriorly and decreasing to 13 or 14 rows posteriorly; ventrals 190–206 (mean 197.9), without evident sexual dimorphism; subcaudals 50–55 (mean 52.6); anal divided. Body length of five adult males, 411–544 mm.; of one female, 428 mm.; tail length, 14.5–16.8 per cent of total length.

Ground color pale khaki to bronzy; body crossed with 36–47 narrow, wavy, dark gray bands narrowly edged with white; narrow white vertebral and lateral stripes, these usually faint and may be absent anteriorly; nape with W-shaped dark collar, of which central projection touching tips of parietals; dark band across head at level of eyes; three dark spots between this band and nuchal collar; ventral surfaces white.

HABITS: These snakes have been taken in flat clay desert, on oases, and in suburban gardens to elevations of about 1700 feet. Nearly all that I personally collected were on roads and trails two to four hours after sunset. One was found December 18 quite stiff and cold in a pile of trash. These little snakes are slow-moving and quiet. When annoyed they flatten the head and curl the tail into a spiral.

Reptile eggs appear to be an important food of these snakes. In feeding on large eggs, they slit the shell with the teeth to collapse the egg, or they may insert the head into the egg to ingest its contents. Occasional captives also fed on small lizards.

A female in Jeromie A. Anderson's collection laid three eggs late in June and swallowed them a few hours later.

The name "kukri snakes" has been used for *Oligodon* by several writers on Asian herpetology because of the fancied resemblance of the enlarged maxillary teeth to the blade of a kukri, or Ghurka knife. The snakes seem to have no local name in West Pakistan.

DISTRIBUTION: The range of *O. taeniolatus* extends from Bihar, India, to southeastern Baluchistan and south through peninsular India to Ceylon. In West Pakistan it occurs in lowlands from the delta of the Indus north to Rawalpindi and west to Bela.

***Oligodon arnensis* (Shaw)**

RUSSET KUKRI SNAKE

Coluber arnensis SHAW, 1802, p. 526 (based on Russell, 1796, fig. 38; type locality: Vizagapatam and Arni).

Oligodon arnensis: WALL, 1921, p. 231. SMITH, 1943, p. 225.

DESCRIPTION: Habitus and head scales similar to those of *O. taeniolatus*, but loreal absent from two of six specimens; dorsal scales in 17 rows at midbody, decreasing to 15 posteriorly; ventrals 175–191 (mean 182.6); subcaudals in males 47–52 (mean 49.2), in female 40. Total length of four adult males, 459–618 mm.; tail length 16–17.5 per cent of total length.

Ground color of adult tan to buff, with sides paler; young somewhat darker and more reddish; body crossed with 32–41 black bands narrowly edged with cream; nape with V-shaped black mark, its apex touching tips

of parietals; anterior to this a second similar mark, its apex touching frontal; third dark mark across prefrontals and through eye; ventral surfaces white.

HABITS: On February 28 a small specimen was found shortly before noon on a canal road in rather damp grassy country. Jogi collectors brought in a few of these snakes from localities in the Indus delta. They were collected at night during hot weather.

A snake of this species kept for a short time in captivity was more active by day than at night. It was mild-tempered and did not curl its tail as *O. taeniolatus* does.

DISTRIBUTION: This species is found from East Bengal and central Nepal west to the Indus Valley and south through peninsular India and Ceylon. Definite West Pakistan records are few (Bannu, Larkana, and localities in Tatta District).

NATRIX LAURENTI

Malnate (1960) redefined this genus as follows: "Hemipenes and sulci spermaticus simple; maxillary teeth in continuous series, the teeth becoming larger posteriorly in the series; . . . internasals narrowed anteriorly, nostrils dorsolateral; apical pits absent or present."

The genus contains 21 species and is largely holarctic in distribution with a few species reaching the tropics in Malaysia and Mexico. Wall (1923) recorded *Natrix tessellata* from Chitral.

MACROPISTHODON BOULENGER

Body rather stout, with head distinct from neck; 11–18 maxillary teeth followed by two large, ungrooved fangs directed almost straight posteriorly; scales keeled, with apical pits, in 19–27 rows.

There are four species distributed from Taiwan and south China to Malaya and westward through most of India. The common Indian species, *Macropisthodon plumbicolor*, has been recorded from Sind (Murray, 1884a).

XENOCHROPHIS GÜNTHER

Malnate and Minton (1965) united this genus with *Fowlea* which had previously been separated from *Natrix* by Malnate (1960). The genus may currently be defined as follows: hemipenes and sulci spermaticus

forked; maxillary teeth 22–31, in continuous series, with posterior or median teeth strongly or slightly enlarged; internasals narrowed anteriorly; nostrils dorsolateral, in single or divided nasal; dorsal scales in 19 or 17 rows, apical pits absent or obscure and restricted to neck, keels present on at least some scale rows.

There are four species, two of which occur in West Pakistan.

***Xenochrophis piscator* (Schneider)**

CHECKERED KEELBACK

Hydrus piscator SCHNEIDER, 1799, p. 247 (based on Russell, 1796, p. 38, pl. 33; type locality: East Indies).

Natrix piscator: POPE, 1935, p. 120. SMITH, 1943, p. 293.

Xenochrophis piscator: MALNATE AND MINTON, 1965, p. 19.

DESCRIPTION: Head slightly flattened, distinct from neck; snout bluntly pointed; rostral wider than high; nostrils between nasals; single large loreal; eye of moderate size, with round pupil; preocular normally single, rarely double; postoculars three, rarely four; usually two long, narrow, anterior temporals and two, three, or four posterior temporals; nine, rarely eight, or 10, upper labials with fourth and fifth touching eye; 10, rarely nine, lower labials; posterior chin shields longer than anterior and not in contact; tubercles on anterior chin shields in adult males; body cylindrical, of moderate thickness and with even taper; scale rows at midbody 19 in every specimen examined, reduction posteriorly to 17, rarely 16 or 18, occasionally reduction to 17 or 18 rows on neck, rarely an increase to 20; scales of lateral rows smooth, those of median rows feebly keeled; ventrals in males 135–141 (mean 137.5), in females 139–152 (mean 146.2); subcaudals in males 71–78 (mean 73.3), in females 62–73 (mean 66.3); anal divided. Total length of adult male, 816 mm.; of eight adult females, 830–1198 mm.; tail length 23.3–26.8 per cent of total length in males, 21.7–23.8 per cent in females.

Dorsal ground color olive green, gray, or light reddish brown, with five rows of small blackish bars narrower than interspaces separating them, often fused, forming reticulum anteriorly and fading out posteriorly;

head of about same hue as body, a narrow dark stripe from below eye to edge of lip and another from just behind eye to edge of lip; belly white to cream, usually with small black marks at anterolateral tips of ventrals. Young snakes having a pair of small light spots on parietals.

VARIATION: The above description is based on a sample of six males and 12 females from the western part of the Indus delta. Another sample of six males and five females shows a different pattern, with the black blotches as wide as or wider than the interspaces and arranged quincuncially on a dull yellow or pale olive ground color; and the head greenish, with dark subocular and postocular stripes. This pattern is associated with distinctly higher subcaudal counts; 86–97 (mean 92.7) in males and 83–87 in females and slightly higher ventral counts, 137–144 (mean 141.3) in males and 148–152 (mean 149.8) in females. This form may also reach a greater size, a female 50 inches (*ca.* 1270 mm.) having been examined as opposed to 1200 mm. for the largest individual of the small blotched pattern. The small-blotch pattern seems to predominate in the marshes between Mirpur Sakro and Bhuro, whereas the large-blotch or checkerboard pattern predominates north of Mirpur Sakro and at Kalankot near Tatta. I have seen individuals of both patterns from Manchar Lake. Individuals of intermediate pattern also are seen. At present there seems no adequate reason to regard these as more than variants of a single form. Subspecies of *Xenochrophis piscator* have been described and undoubtedly exist, but their ranges, especially on the Asian mainland, have not been well determined. For this reason, no subspecific designation is given to the West Pakistan populations.

HABITS: The checkered keelback is most plentiful in large marshes protected from violent fluctuation in water level and with dense aquatic vegetation, in weed-choked ditches, and in wet-weather ponds. It is uncommon in or absent from the main streams of the Indus and most canals.

These snakes are seen most frequently during and after the monsoon, when seasonal rains greatly expand the available shallow, fresh-water habitat. They are in partial hibernation during January and December but

may emerge during the warmest hours. They are difficult to find during the spring and early summer. They are diurnal during cooler weather, and largely crepuscular and nocturnal in the hot season. They do not have the propensity for basking characteristic of most North American water snakes but are usually seen swimming slowly just under the surface or resting in shallow water, with only the top of the snout above the surface and the tail twisted around a submerged object. They rarely go more than a few feet from water. When cornered, they may rear up almost a third of their length and flatten the neck. Most are vicious biters that never become tame in captivity, although they feed well.

Only fish have been found in stomachs of wild-caught snakes, but captives take frogs readily. The snakes capture prey either by waiting in ambush near riffles and other places where schools of small fish congregate or by swimming through dense aggregations of fish. In the fall, when many fish are trapped in drying pools, these water snakes gorge themselves and become very fat.

Jeromie A. Anderson obtained several checkered keelbacks heavy with eggs in late February. Between March 8 and 29, seven of these snakes laid clutches of 34–75 eggs. The eggs were 27–31 mm. in greatest length and 15–18 mm. in least and were adherent to one another, forming one to three large clusters. Each clutch contained three to eight abnormally small or deformed eggs. Hatching began April 26 and continued through the first week of May. Hatchlings are 180–225 mm. in total length. Many young snakes 250–350 mm. in length are seen in the field during the latter half of July and August. Snakes 400–500 mm. in length make up the bulk of those seen during late October and November. These individuals almost certainly mature during the next summer at about one year of age.

Despite its abundance, this snake seems to have no definitive name locally. Like other species found in fresh water, it is called "paniwala" or "nadiwala."

DISTRIBUTION: The range of *Xenochrophis piscator* embraces the entire distribution of the genus, extending from Borneo and Taiwan westward across the mainland and islands of south Asia to the Indus drainage.

West Pakistan records are confined to the valley of the Indus and its major tributaries. I have seen no specimen from north of Jhang District, Punjab, but Smith (1943) reported that it ranged to the Northwest Frontier Provinces and Baluchistan.

***Xenochrophis cerasogaster* (Cantor)**

DARK-BELLIED MARSH SNAKE

Psammophis cerasogaster CANTOR, 1839, p. 52 (type locality: near Calcutta).

Xenochrophis cerasogaster: GÜNTHER, 1864a, p. 274. SMITH, 1943, p. 317.

DESCRIPTION: Head long, narrow, distinct from neck; snout blunt; rostral about as wide as high; nostril in nasal; preocular single; postoculars three, occasionally four; usually two elongate anterior temporals and three posterior; nine, occasionally eight, upper labials, usually only fourth touching eye; 10, occasionally nine or 11, lower labials; posterior chin shields a little longer than anterior, not in contact, with a few tubercles in males; body more slender than in *X. piscator*; scale rows at midbody 19, reduction posteriorly to 17, usually an increase to 20 or 21 on neck; scales keeled except for lateral two or three rows; ventrals in males 144–148 (mean 146.5), in females 153–159 (mean 155.0); subcaudals in males 77–78, in females 63–71 (mean 68.3); anal divided. Total length of two adult males, 577 and 668 mm.; of 13 adult females, 726–973 mm.; tail length 26–27 per cent of total length in males, 21.5–23 per cent in females.

Dorsal ground color dark brown, olive, or russet, with faint, dull yellow stripe on fifth and sixth scale rows; a canary yellow stripe on lateral tips of ventrals and lower part of first scale row, in some cases narrowly edged with red anteriorly and extending onto head to include most of supralabials; temporal region often with russet tinge; belly purplish black posteriorly, becoming gray, heavily flecked and marbled with red anteriorly; chin and throat white, with red flecks and mottling; under side of tail black or dark gray. Young almost completely black below except for flecks of red and cream on chin and throat. The amount of red ventral pigment seems to increase with age, at least in females.

HABITS: These snakes are abundant in quiet shallow water with much emergent vegetation such as lotus, *Ipomoea*, and water-

lily. The snakes are diurnal, shy, and active. They are usually found in grass at the edge of marshes or resting on lily pads or other plants and swim away rapidly when alarmed. None has been taken during the winter, and they are difficult to find during the hot, dry spring and early summer. They are plentiful from the end of the rains until mid-November.

Two specimens in Jeromie A. Anderson's collection laid clutches of 20 eggs each during the first week of April. The eggs were similar to those of *X. piscator* but slightly smaller and more globular. A juvenile 250 mm. in total length was collected May 31.

These snakes rarely bite when captured, but make poor captives. They feed poorly, although an occasional individual will take small fish or frogs. Fish were found in stomachs of two individuals collected in the wild. Wall (1907) reported that they feed largely upon shrimp.

The Jogis know this snake as "meeka."

DISTRIBUTION: The range of the species extends from Assam and Bengal west to lower Sind and north to central Nepal. West Pakistan records are mostly confined to the Indus delta, but specimens have been collected north to Sanghar and Dadu districts (Manchar Lake).

AMPHIESMA DUMÉRIL AND BIBRON

Malnate (1960) separated this genus from *Natrix*, redefining it as follows: "Hemipenes and *sulci spermaticus* simple; maxillary teeth in continuous series gradually becoming larger posteriorly . . . or the last two teeth abruptly enlarged; . . . internasals broad anteriorly, nostrils lateral; apical pits present or absent."

There are about 40 species found from the Far Eastern provinces of the Soviet Union to northeastern Australia and westward to the Indus. One species occurs in West Pakistan.

***Amphiesma stolata* (Linnaeus)**

STRIPED KEELBACK

Coluber stolatus LINNAEUS, 1758, p. 219 (type locality: Asia).

Natrix stolata: POPE, 1935, p. 128. SMITH, 1943, p. 303.

Amphiesma stolata: DUMÉRIL AND BIBRON, 1854 (1834-1854, vol. 7), p. 724.

DESCRIPTION: Head not flattened, distinct

from neck; snout rounded, rostral about as wide as high; nostril between nasals; loreal small, square; eye moderate-sized, with round pupil; normally one preocular and three postoculars; one anterior and one or two posterior temporals; upper labials usually seven, rarely eight, third and fourth in contact with eye; lower labials normally 10, rarely nine or 11; posterior chin shields longer than anterior and not in contact with each other; body cylindrical, rather slender, with even taper; scale rows at midbody 19, reduction posteriorly to 17, rarely a decrease to 17 or increase to 20 on neck; scales keeled except for lowest row; ventrals in males 143 (two), in females 150 (two) and 151 (two); subcaudals in males 71, 73, in females 64, 73; anal divided. Only adult specimen examined a female with body length 478 mm., tail 75 mm. (tip missing).

Ground color light olive brown, with a pair of pale yellow stripes on scale rows 5, 6, and 7 at midbody and rows 4, 5, and 6 posteriorly, these tending to break into spots and dashes anteriorly; dark brown to black spots in fields between stripes, these becoming more prominent anteriorly; top of head bluish gray to olive, frontal and parietals edged with black; black V on neck, its apex directed posteriorly; short black bars in front of and below eye and from postoculars to angle of mouth; belly white to cream, usually with black dots at tips of ventrals.

HABITS: In appearance and habits this snake resembles the garter snakes of the eastern United States. It has been collected in damp grassland but not necessarily near any large body of water. One was found basking in the afternoon sun at the edge of a road early in November; another was found under bark of a fallen tree in March.

Jeromie A. Anderson collected a striped keelback that laid 10 eggs on May 21. They were adherent in a single cluster and measured 20 to 22 mm. in greatest diameter, 13 to 14 mm. in least. They began to hatch June 7.

A specimen taken in East Pakistan had five newly transformed frogs in its stomach. Captives feed on small fish and amphibians.

DISTRIBUTION: The range extends from the valley of the Mekong River in Laos and Thailand north to southern China and west through India and Ceylon to the valley of the Indus. The range in West Pakistan is prob-

ably confined to the valley of the Indus and its main tributaries. In lower Sind it is a rare snake. Farther north it may be locally common, for three specimens were received from an American military installation near Peshawar within a three-month period.

BOIGA FITZINGER

Large-headed, large-eyed snakes, with body laterally compressed; scales smooth, with apical pits, vertebral row enlarged; maxillary teeth 10–14, followed by large grooved fangs.

Little is known of the action and toxicity of the venom, but there seem to be no authentic reports of serious poisoning in man from the bite.

The genus occurs from northern Australia and the islands of Indonesia through southern Asia to tropical Africa. There are some 30 species, one of which occurs in West Pakistan.

Boiga trigonata trigonata (Schneider)

INDIAN GAMMA SNAKE

Coluber trigonatus SCHNEIDER, 1802 (1800–1802, vol. 4), p. "156" [256] (based on Russell, 1796, pl. 15; type locality: Vizagapatam).

Boiga trigonatum: NIKOLSKY, 1916, p. 187. SMITH, 1943, p. 349.

DESCRIPTION: Head triangular, much wider than thin neck, rather flat; rostral strongly concave below, slightly wider than high; nostril large, between nasals; loreal present; eye large, with vertically elliptical pupil; one preocular and two postoculars; two anterior temporals, normally three posterior temporals, rarely two or four; upper labials eight, rarely nine, with third, fourth, and fifth touching eye; lower labials 10 or 11, rarely nine; posterior chin shields shorter than anterior and widely separated from each other; body and tail slender, with even taper; dorsal scales elongate, rows strongly oblique, 19, 21, or 23 at midbody, reduction posteriorly to 15, 13, or 17 rows, usually a reduction of two rows anteriorly; ventrals in males 212–237 (mean 223.7), in females 230–239 (mean 234.0); subcaudals in males 84–92 (mean 87.0), in females 76–85 (mean 81.8); anal undivided. Total length of nine adult males, 664–825 mm.; of four adult females, 810–988 mm.; tail length 18.8–20.6 per cent of total length in males, 17.6–17.9 in females.

Dorsal ground color light brown, shading to grayish on sides; a series of 40–50 irregular, transverse, white bars margined with black, more prominent anteriorly and fading out on tail; top of head chestnut, typically with light, Y-shaped mark, bifurcation of which is near posterior tips of parietals; a dark bar from behind eye to angle of mouth; ventral surfaces dull white, speckled with dark gray.

Boiga trigonata melanocephalus (Annandale)

DARK-HEADED GAMMA SNAKE

Dipsadomorphus trigonata melanocephalus ANNANDALE, 1904, p. 209 (type locality: Iran-Baluchistan frontier).

Boiga trigonata melanocephala: MERTENS, 1956, p. 97.

DESCRIPTION: Differing in color and pattern from typical form; scale counts of single specimen examined within range of variation found in West Pakistan specimens of *t. trigonata*. In *melanocephalus* top of head black, with only a trace of light Y mark; labials and chin dark; ground color much darker than in southern specimens; transverse white bars without black edges, 53 in only specimen examined; belly white, without dark speckling.

HABITS: Gamma snakes were encountered in diverse situations ranging from gallery forest to sparse desert scrub, but they seem to avoid highly arid, rocky or sandy terrain and elevations above 3000 feet. They are commonly found in city gardens. Most of those that I collected were on the ground, but captives are fond of climbing, and I have found shed skins in shrubs and tangles of vines. The snakes may be found throughout the year at Karachi but are most active from April through October. Adult males are especially common during May and early June. Nocturnal during most of the year, the snakes may be abroad by day in winter.

My experience with this snake varies from that of Gharpurey (1954) and others who characterize it as "intrepid" and "fierce." I have found it a slow-moving, rather placid reptile. When startled, particularly at night, it draws its forebody into a series of S-shaped loops and may strike, but often with the mouth closed. I have captured several with my hands but have never been bitten. When alarmed, it often shakes and twitches its tail

but does not exhibit the rapid, rhythmic tail vibration seen in many American colubrids and crotalids.

A gamma snake 940 mm. long laid eight eggs August 28. They were 31–39 mm. in greatest diameter and 13–15 mm. in least. Most were adherent in a single cluster. Five hatched October 30; the young were 240–265 mm. in total length. One grew to a length of 430 mm. within nine months. Another snake of about 900 mm. killed on August 31 contained 11 eggs apparently not quite ready to be laid. Snakes of hatchling size have been found from late September to early November.

A small bird was found in the stomach of one specimen, and lizards (*Calotes* and *Acanthodactylus*) were in the stomachs of three others. Captives fed on lizards and nestling sparrows.

DISTRIBUTION: The range of the species is from Sikkim and northern Bengal westward to Transcaspia and southward through all peninsular India to Uva Province, Ceylon. The species presumably occurs through all of West Pakistan exclusive of the higher mountains. The subspecies *melanocephalus* ranges from western Baluchistan through eastern Iran and Saudi Arabia north to southern Uzbekistan.

TELESCOPUS WAGLER

Head wide, very distinct from neck; maxillary teeth eight to 12 followed by a pair of large, grooved fangs; eye large, with vertically elliptical pupil; scales smooth, with apical pits.

The seven species of the genus occur in southeastern Europe, North Africa, and southwestern Asia to Waziristan. One species is known from West Pakistan.

Telescopus rhinopoma (Blanford)

INDIAN DESERT CAT SNAKE

Dipsas rhinopoma BLANFORD, 1874b, p. 34 (type locality: Karman, south Iran).

Tarbophis rhinopoma: BOULENGER, 1895, vol. 9, p. 325. SMITH, 1943, p. 360.

Dipsadomorphus jollyi WALL, 1914a, p. 167 (type locality: Kacha Thana, Baluchistan).

DESCRIPTION: Head triangular, distinct from neck, flat, snout broad; body cylindrical, moderately slender, with even taper. Scale

characters of only specimen examined, a half-grown female (B.M. No. 94-10-4.4), as follows: rostral slightly wider than high; nostril small, in nasal; loreal in contact with eye; one preocular and two postoculars; three anterior temporals, posterior temporals not differentiated; nine upper labials, fourth, fifth, and sixth touching eye; 12 lower labials; posterior chin shields not well differentiated, much smaller than anterior; 23 scale rows at midbody, reduction to 17 just anterior to vent; ventrals 278; subcaudals 77; anal undivided. Total length, 476 mm.; tail, 76 mm.

Ground color of preserved specimen grayish buff, with median series of 84 dark brown, squarish blotches on body much wider than interspaces and alternating with poorly defined lateral series; dark Y-shaped mark on crown, its stem fusing with dark nuchal collar; dark curved band across snout; belly dark brown, shading to whitish on chin and throat.

HABITS: Virtually nothing is known of this species. It has been taken in arid, rocky hills at elevations up to 2300 feet. Related species are nocturnal and feed almost entirely on lizards.

DISTRIBUTION: The species is known from south-central Iran east to Waziristan (Kirgi and Jandola). Other West Pakistan localities are Miranshah, Tochi Valley, and Kacha Thana in western Baluchistan. There is a single record from Sind without definite locality.

PSAMMOPHIS FITZINGER

Maxillary teeth 10–13, one or two in the middle moderately to markedly enlarged, last two enlarged, grooved and directed backward; hemipenes short and very slender, without spines or calyces; nostril between nasals; eye large, with round pupil; scales smooth; body slender and tail long, with divided subcaudals.

There are about 20 species, most of them African. Four of the five Asian species occur in West Pakistan.

Psammophis schokari (Forskål)

AFRO-ASIAN SAND SNAKE

Coluber schokari FORSKÅL, 1775, p. 14 (type locality: Yemen).

Psammophis schokari: BOULENGER, 1896, p. 157. SMITH, 1943, p. 363.

Psammophis sindanus STOLICZKA, 1872a, p. 83 (type locality: Sind).

DESCRIPTION: Head long, narrow, distinct from neck; snout bluntly pointed; rostral higher than wide; loreal long and narrow; preocular single; two, rarely three, postoculars; anterior end of frontal just touching preocular; two anterior and two or three posterior temporals; nine upper labials, fifth and sixth touching eye; 10 or 11 lower labials; posterior chin shields of about same length as anterior and in contact with each other; body cylindrical and very slender; scale rows 17 at midbody, reduction posteriorly to 11, occasionally to 13, occasionally reduction to 15 or 16 rows on neck; ventrals 173–186 (mean 178.8), with no sexual dimorphism evident in sample examined; subcaudals in males 118–130 (mean 125.8), no females with complete tails examined; anal divided in nine specimens, entire in six. Body length of seven adult males, 591–770 mm.; of four adult females, 715–822 mm.; tail length 33.5–35.5 per cent of total length in males; total length of largest male, 1177 mm.; of largest female, 1160 mm., with part of tail missing.

Color and pattern highly variable; ground color light olive, chestnut, dark brown, or gray. Top of head with symmetrical dark markings; dark stripe from snout through eye; labials white, flecked and spotted with black; central part of belly usually bluish gray, occasionally reddish or almost black.

About one-fourth of the West Pakistan specimens examined show a well-developed pattern of five stripes; the first pair milk white and on the lateral tips of the ventrals and lower half of the first scale row; the second pair cream to straw and involving all of the fourth scale row, half of the third, and the edge of the fifth; the vertebral stripe less than one scale row wide and usually fading out on the posterior half of body. The lateral stripes are bordered with a narrow black line or row of dots. About one-fifth of the specimens are uniformly gray or brown above except for the head markings. The remainder show intermediate types of pattern, with stripes faintly developed or absent except for their black edges. There seems to be no ontogenetic change in color or pattern. The colors, however, seem to show some metachroic change. A specimen collected in coastal

sand dunes was markedly paler than one collected the same day in rather dense scrub. After about three days in captivity on a shaded veranda, the two were virtually identical in color.

VARIATION: Material from West Pakistan is not adequate to show clear-cut geographic variation within the region. I have the impression that the striped color phase predominates in the Thar Desert, whereas unicolored specimens are found mostly in the coastal plain between Karachi and the mouths of the Indus. A specimen collected near Nushki shows faint cross bars on the anterior half of the body.

HABITS: Found in a variety of xeric situations from sea level to about 5500 feet, this snake is characteristic of sandy desert with sparse vegetation. Its home is usually a burrow at the base of a bush or under a rock. I have seen captives rake loose sand from beneath objects with a loop of the neck and thus excavate a shallow hiding place. They often climb into low bushes and bask in the morning sun. Mostly diurnal, the snakes may be crepuscular during hot weather, and one was collected about three hours after sunset. They are alert, speedy, and difficult to capture.

Lizards (*Acanthodactylus cantoris* and *Agama agilis*) were found in the stomachs of two specimens. Jeromie A. Anderson says that the larger snakes also feed on birds; one he collected disgorged a recently swallowed finch-lark. Captives take lizards readily but refuse small rodents. A small snake about 360 mm. in length seized the neck of a large individual of *Cyrtodactylus kachhensis*. It gripped the lizard for about five minutes, then released it as evidently being too large to swallow. The lizard was incapable of coordinated movements and died soon afterward. The snake next seized a smaller gecko behind the forelimbs and held it six minutes until it was limp and apparently dead before swallowing it. An adult sand snake attacked a large individual of *Eublepharis*, and there followed a combat lasting almost an hour and ending with both animals virtually exhausted. The fat-tailed gecko had been badly bitten about the head. It lost an eye but survived. In catching and handling *Psammophis* I have been bitten several times without any sign of envenoma-

tion. It is unlikely that any of these snakes was able to engage its rear fangs.

Local snake catchers say that it is common to find two sand snakes in one burrow, particularly during winter and spring. A female found dead on the highway April 6 contained six eggs about 35 mm. long. Another, 1275 mm. long, contained five eggs of about the same size when it died in captivity on May 1. The smallest young, measuring 300–350 mm., have been found from early July through most of September.

The local name, "tormar" (literally snake of the tor or euphorbia), is applied to this and to other slender striped snakes.

DISTRIBUTION: The range is extensive: Morocco across the whole of North Africa, Saudi Arabia, and Iran, and southern Turkistan east to Kashmir and south to Kutch. This snake presumably occurs throughout West Pakistan exclusive of the Himalayan region and the more humid river valleys.

***Psammophis leithi* Günther**

PAKISTAN RIBBON SNAKE

Psammophis leithi GÜNTHER, 1869, p. 505 (type locality: Sind). SMITH, 1943, p. 366.

DESCRIPTION: Shape of head similar to that of *P. schokari*; preocular single, in contact with frontal, two postoculars; one anterior and two posterior temporals; upper labials eight, rarely nine, fourth and fifth touching eye; lower labials nine or 10; posterior chin shields a little larger than anterior, in contact with each other; body a little less slender than that of *P. schokari*; dorsal scale rows as in *schokari*; ventrals in males 167–172 (mean 169.7), in females 172–187 (mean 178.5); subcaudals in males 104–109 (mean 105.8), in females 96–104 (mean 100.2); anal entire in all but one of specimens examined. Total length of five adult males, 750–838 mm.; of three adult females, 779–895 mm.; tail length in males 31.5–32.5 per cent of total length, in females 30.5–31.6 per cent.

Ground color yellowish gray to pale amber or straw, darker on sides; a pair of black to walnut brown stripes arising on internasals and continuing length of body, becoming wider posteriorly and fusing on tail; at mid-body occupying most of fifth, sixth, and seventh scale rows. Often dark color of sides

forming distinct stripe posteriorly on first and second scale rows. Top of head with dark, median, longitudinal stripe and dark stripe through eye; labials cream, with reddish brown mottling on lower labials and anterior upper labials; two rows of reddish brown spots or dashes on throat; lateral tips of ventrals milk white, central portion lemon yellow.

In contrast to marked variability of pattern in *schokari*, the pattern of this species is relatively constant. The only considerable variation noted was the virtual absence of the dark stripes anteriorly from two individuals.

HABITS: This species is moderately plentiful in marsh and grassland along the lower Indus. It is also found in clay or sand desert and along the seacoast but always where there is considerable scrubby vegetation. Here it occurs with *P. schokari* and in the marshy lowland with *P. condanarus*. The Pakistan ribbon snake is diurnal. It often climbs into bushes and low trees, and one was seen swimming at the edge of a marsh. Although these snakes can move quickly, they sometimes "freeze" when surprised in the open. They have been seen throughout the year but are most plentiful during the summer and fall.

The stomachs of two specimens contained skinks (*Mabuya dissimilis* and *M. macularia*). Captives feed on lizards but refuse other types of food. Prey is constricted, and venom may help in subduing it. These snakes are rather nervous but rarely bite. I kept a specimen in captivity about two years.

Snakes about 350 mm. in length and presumably young of the season have been collected from late September to early December.

DISTRIBUTION: This essentially north Indian snake is known from Fyzabad, in the United Provinces, to Poona and west to Waziristan and southeastern Baluchistan. West Pakistan records are from Azad Kashmir to the southern Thar and west to Waziristan and southern Kalat District. Almost all are for elevations below 2000 feet.

***Psammophis lineolatus* (Brandt)**

STEPPE RIBBON SNAKE

Coluber (Taphrometopon) lineolatus BRANDT, 1838, p. 243 (type locality: Transcaspia).

Psammophis lineolatus: SMITH, 1943, p. 367.

Psammophis triticeus WALL, 1912, p. 634 (type locality: Baluchistan).

DESCRIPTION: This species has been placed in a separate genus by several workers because the median maxillary teeth are not strongly enlarged and not separated by a diastema from those behind them. The dentition of *P. leithi*, however, approaches this condition, and the two species are close in other respects. The only West Pakistan specimen examined has the preocular in contact with the frontal; two postoculars; two anterior and two or three posterior temporals; nine upper labials, fourth, fifth, and sixth touching eye; nine lower labials; scale rows at midbody 15, increasing to 17 anteriorly and decreasing to 13 posteriorly; ventrals 180; subcaudals 81; and anal divided. The specimen is an immature female; total length, 490 mm.; tail, 116 mm.

Ground color light grayish buff; pair of dark stripes arising at level of eyes and continuing length of body, medium brown, with many scales tipped or edged with black, stripe at midbody on fifth and sixth scale rows; fainter dark stripe posteriorly on first and second scale rows; head markings similar to those of *P. leithi*; central part of belly lemon yellow, with dark median stippling and dark line at lateral tips of ventrals.

HABITS: The single specimen at hand was found freshly killed on the highway about mid-morning on June 4. The elevation was about 5000 feet and the surrounding terrain gravelly desert, with sparse grass and scattered shrubs. Another snake, tentatively identified as this species, was seen in similar terrain at about 7000 feet in elevation.

DISTRIBUTION: This is a central Asian species found from Transcaspia and northern Iran east to Mongolia and northwest China. It just enters West Pakistan on the Quetta Plateau.

***Psammophis condanarus* (Merrem)**

INDIAN SAND SNAKE

Coluber condanarus MERREM, 1820, p. 107 (based on Russell, 1796, pl. 27; type locality: Ganjam District, Orissa).

Psammophis condanarus: BOULENGER, 1890, p. 365. SMITH, 1943, p. 364.

DESCRIPTION: Shape of head similar to that of preceding species; preocular not in contact with frontal, two postoculars; one anterior and two or three posterior temporals; upper labials eight or nine, with fourth and fifth touching eye; 11 lower labials; posterior chin shields equal in length to anterior, in contact with each other; body most robust of West Pakistan species; scale rows at midbody 17, reduction to 13 posteriorly; ventrals in two males 173, 176; subcaudals 84, 81; anal divided. Total length, 922 and 994 mm.; tail lengths, 220 and 235 mm. No females examined.

Dorsum pale olive to brassy; pair of dark brown stripes on fifth and sixth scale rows, not continued onto head; reddish brown stripes on first, second, and third scale rows continued onto head through eye to snout; lateral zone between stripes cream to straw yellow continued as light stripe above eye; upper labials greenish white, this color extending posteriorly as a band on lateral tips of ventrals and lower half of first scale row; central part of belly cream, margined with thin, reddish brown line.

VARIATION: The few specimens that I have seen were collected in the Indus delta. They differ from north Indian specimens in having four rather than five dark stripes, resembling in this respect the subspecies *indochinensis*. In the position of the stripes and in ventral counts, they are closer to *c. condanarus*. Their subspecific status cannot be established from the material at hand; the delta population may well represent an undescribed race.

HABITS: The examples of this snake that I have seen were taken by Jogi collectors during late February and early March. They reported that the snakes are diurnal and frequent high grass, usually near water. A captive specimen was mild tempered but quick and active. It fed on lizards, using both constriction and venom to subdue them.

DISTRIBUTION: The nominate subspecies occurs from extreme western Bengal and Orissa to the vicinity of Bombay and north into Sind, Punjab, and the United Provinces. The subspecies *indochinensis* occurs in south Burma, Thailand, Laos, and Cambodia. West Pakistan records are few (Jacobabad, Lahore, the Indus delta), and the range may be discontinuous.

ENHYDRIS SONNINI AND LATREILLE

Thoroughly aquatic snakes; nostrils dorsal, valvular; 10–16 maxillary teeth followed by grooved fangs; eye small, with vertically elliptical pupil; nasals in contact with each other; loreal present; scales smooth; subcaudals divided.

There are about 17 species distributed from north Queensland and the Indo-Australian archipelagos to Taiwan and westward through central and northern India to the mouth of the Indus. There is one species in West Pakistan.

Enhydris pakistanica* Mertens*SIND RIVER SNAKE**

Enhydris pakistanica MERTENS, 1959a, p. 117 (type locality: Jati, Sind, West Pakistan).

DESCRIPTION: Head small, slightly distinct from neck; snout bluntly pointed, rostral wider than high; two internasals; one preocular and two postoculars; two anterior and three or four posterior temporals; eight upper labials, fourth touching eye; 11 lower labials; chin shields not well differentiated; body stout and cylindrical, with even taper; skin rather loose and scales with high gloss; scale rows at midbody 27–31, reduction to 23 or 21 rows posteriorly and increase of two or four rows anteriorly; ventrals small, 158–164 in both sexes; subcaudals in males 91, 92, in female 75; anal divided into two or three small plates. Total length of two males, 690 and 867 mm.; of female, 769 mm.; tail in males 28.5–29 per cent of total length, in female 24.3 per cent.

Dorsum light olive brown, with three black stripes, middle one wider than others; sides and belly dirty white to butter yellow, grayish brown lateral stripe tinged with russet, midventral black stripe; head dark, without markings, chin and throat white flecked and clouded with brown.

HABITS: To my knowledge, all specimens of this reptile have been captured by the Tatta Jogis. They say that the snakes are found in large shallow ponds near channels of the Indus but not in the stream itself. Some of the sites are near brackish water, and one (Shah Bunder) was a seaport during the early Moslem period. Collectors report that the snakes are diurnal, almost entirely aquatic, and very

shy. They have been taken from late April through November and are said to bury themselves in mud at the edge of ponds with the approach of cool weather. They swim well; on land they are quick and rather jerky in their movements. They rarely bite. The tongue is not flicked out as it is by most land snakes but may be protruded slowly while the snake swims.

DISTRIBUTION: This species is known only from the delta of the Indus—Jati, Shah Bunder, Ghorabari (sight record).

CERBERUS CUVIER

Nostrils dorsal; maxillary teeth 12–17, followed by a pair of grooved fangs; scales keeled, in 21–29 rows; parietal shields broken up into small scales.

There are three species distributed from the Philippines and islands of Indonesia around the coasts of south Asia. They are aquatic snakes, particularly common in tidal rivers. Murray (1884a) recorded *Cerberus rhynchops* from the Indus delta. A specimen formerly in the collection of the Karachi Museum and labeled *Cerberus rhynchops* is actually *Xenochrophis cerasogaster*.

FAMILY ACROCHORDIDAE**ACHROCHORDUS HORNSTEDT**

Strictly aquatic snakes showing many of specializations seen in Hydrophidae. Nostrils dorsal; scales on top of head small and granular; point of chin with projection fitting into deep notch in upper jaw; body skin loose; scales juxtaposed and tuberculate; no ventrals; tail short, round or nearly so.

These snakes inhabit both fresh and salt water. The family contains a single genus, with two species distributed from the Solomon Islands and northern Australia around the coasts and islands of southeast Asia at least to Bombay. Murray (1886) recorded *Chersydrus* (= *Acrochordus*) *granulatus* from the coasts of Sind and Mekran. The specimens on which his records are based cannot now be found, and recent collectors have failed to find the species.

FAMILY HYDROPHIDAE**HYDROPHIS LATREILLE**

Marine or brackish-water snakes; tail laterally compressed; nostrils dorsal, in nasal

shields that are in contact with each other; poison fangs short, fixed, followed after an interval by one to 18 maxillary teeth; eye small, with round pupil; loreal absent; ventrals small but generally distinct.

The genus appears to be undergoing rapid evolution and shows a confusing range of variation. The 22 currently recognized species range from the Persian Gulf to the Idzu Sea of Japan, southward to the coast of Tasmania and across the Pacific to the Gilbert Islands. Seven species are known from West Pakistan waters; five were collected during the course of this study. *Aturia lindsayi* (Gray) and *Hydrophis chloris* (Günther) were reported from waters near Karachi by Murray (1886). Both these names are considered synonyms of *H. fasciatus* (Schneider). I obtained no examples of *H. fasciatus*. My earlier record (Minton, 1962) is based on a specimen of *H. mamillaris*. *Hydrophis ornatus* (Gray) was recorded from Muscat by Smith (1926) and from the Persian Gulf by Volsøe (1939). It should occur in West Pakistan waters.

The variation in West Pakistan specimens of *Hydrophis* with respect to selected characters is summarized in table 7.

Hydrophis cyanocinctus Daudin

ANNULATED SEASNAKE

Hydrophis cyanocinctus DAUDIN, 1803 (1802-1803, vol. 7), p. 383 (based on Russell, 1801-1809, pl. 9; type locality: Sunderbunds). SMITH, 1926, p. 56.

Hydrophis tuberculata JOHN ANDERSON, 1871a, p. 18 (type locality: Calcutta). MURRAY, 1884a, p. 393.

Hydrophis dayanus STOLICZKA, 1872b, p. 89 (type locality: Karachi).

Hydrophis asperrimus MURRAY, 1886, p. 85 (type locality: Karachi Sea and Persian Gulf).

DESCRIPTION: Head moderately small and slightly distinct from neck; rostral wider than high, with small, median, downward prolongation; four to seven maxillary teeth separated from fangs by a wide interval; one preocular and two, occasionally one, postocular; one or two anterior and two to four posterior temporals; seven or eight upper labials with third and fourth or fourth and fifth in contact with eye; nine or 10 lower labials; anterior and posterior chin shields short, broad, subequal; body more or less cylindrical anteriorly, and laterally compressed posteriorly; scales imbricate, with central keel or row of tubercles; scale rows at midbody 41-48, decrease of 10-16 rows on neck and of two to six rows just anterior to vent; ventrals distinct, about twice size of adjacent scales anteriorly and a little smaller posteriorly, numbering 327-384 (mean 359.8), as in most members of the genus, many ventrals fragmented, making accurate count difficult; three to six enlarged preanal scales. Total length of six adult males, 1185-1502 mm.; of five females, 1358-1808 mm.; tail in males 9.3-10.5 per cent of total length, in females 7.3-8.5 per cent.

Dorsal ground color dirty white, pale

TABLE 7

SUMMARY OF VARIATION IN WEST PAKISTAN SPECIMENS OF THE GENUS
Hydrophis; DATA IN PART FROM SMITH (1926)

(Figures in parentheses are data from areas other than West Pakistan.)

	Number of Specimens	Maxillary Teeth	Scale Rows at Neck	Scale Rows at Midbody	Difference	Ventrals	Anterior Temporals	Dark Bands on Body	Maximum Length (in Mm.)
<i>cyanocinctus</i>	30	5-7	28-33	39-48	10-16	♂ 314-384 ♀ 330-383	1 or 2	51-67	1502 ♂ 1808 ♀
<i>spiralis</i>	6	5-7	27-32	33-39	4-8	338-350	1	46-54	2000
<i>lapemoides</i>	6	8-11	29-33	39-45	10-14	324-346	2 or 3	33-44	960
<i>ornatus</i>	1	11	35	41	6	260	2	46	915
<i>mamillaris</i>	3	6-8	28-30	39-43	11-14	302-380	2 or 3	42-57	811
<i>caerulescens</i>	1	14	37	46	9	306	2	37	(800)
<i>fasciatus</i>	0	(5)	(30)	(50)	(20)	(450)	(1)	(50)	(1000)

greenish, or yellow, with 48–67 sooty cross bands, central portions of which often enclose lighter scales, bands widest on middorsum, narrower on sides; in about half of specimens examined bands encircling body, in others, midventral region clear or marked with longitudinal black stripe; dorsally cross bands wider than interspaces between them; tail somewhat darker than body with six to nine black bands; head in young blackish, with yellow curved mark on crown, in adult olive, reddish, or dull yellow, with black mottling in most individuals; chin and throat dark gray.

HABITS: Most of my specimens were netted by fishermen in shallow, muddy, mangrove swamps during the monsoon season. During late September and October snakes identified as this species were seen in Karachi harbor, possibly heading toward the open sea. Three specimens were obtained during December 12 to 20 miles off shore; two of these were netted at night. No more were found in the mangroves until March 6 when an adult female was taken. Her eggs were large but consisted mostly of yolk; no embryos could be seen.

These snakes can crawl on land with considerable facility, and an adult can lift its head 10 cm. or so from the ground. Most of those that I had alive attempted to bite if restrained.

The stomach of one snake contained an inionid fish about 130 mm. long. Another snake disgorged an unidentified eel.

Venom yields from these snakes were small, and the venom is considerably less toxic for experimental animals than that of the beaked seasnake (*Enhydrina*). *Hydrophis cyanocinctus* is, however, a dangerous species, and fatalities from its bite are on record. Most of the local fishermen show no particular fear of seasnakes. One man told me seasnake bites cause only temporary pain which is relieved by rubbing the wound with salt. Another said the bites may cause paralysis but are not fatal. Inquiries among Karachi physicians revealed no report of poisoning by seasnake bite. The fact is difficult to explain, since there are numerous well-authenticated accounts of fatal and serious bites by the same species of snakes, especially *Enhydrina*, from Malaya (Reid, 1956, 1957). The yield and

toxicity of venom collected from seasnakes in Karachi waters are close to those reported for Malayan specimens.

DISTRIBUTION: A wide-ranging species, the annulated seasnake is found from the Persian Gulf to the Idzu Sea of Japan southward to Ceylon and the islands of Indonesia, although it is rare south of the equator. It is not uniformly distributed, however, being rare or unknown on the eastern side of the Gulf of Siam, the Burmese coast, and the eastern coasts of India. In West Pakistan waters it appears to be one of the most common seasnakes.

Hydrophis spiralis (Shaw)

YELLOW SEASNAKE

Hydrus spiralis SHAW, 1802, p. 564 (type locality: Indian Ocean).

Hydrophis spiralis: GRAY, 1849, p. 54. SMITH, 1926, p. 48.

Hydrophis robusta GÜNTHER, 1864a, p. 364 (type locality not known). MURRAY, 1884a, p. 394.

Hydrophis temporalis BLANFORD, 1881, p. 680 (type locality: Gangestum, Iran).

Hydrophis bishopi MURRAY, 1884a, p. 391 (type locality: Karachi).

Hydrophis aurifasciata MURRAY, 1886, p. 87 (type locality: Karachi Sea).

DESCRIPTION: Head a little larger than that of *H. cyanocinctus* and slightly distinct from neck; rostral, maxillary teeth, and chin shields like those of *cyanocinctus*; one preocular and one or two postoculars; one anterior and two posterior temporals; seven upper labials, with third and fourth touching eye; nine lower labials; body more slender and less compressed than that of *cyanocinctus*; scales imbricate, smooth or weakly keeled posteriorly; scale rows at midbody 35–39, decrease anteriorly of seven rows and posteriorly of three or four; ventrals 340–350 (mean 345.7); two to five preanals. This appears to be the largest of the seasnakes, with a record length of 2745 mm. for a specimen from Penang. The largest specimen examined is a subadult female with a total length of 1199 mm. and tail 102 mm.

Dorsal ground color golden yellow to yellowish green, scales narrowly margined with black; flanks and ventral surface pinkish white; body encircled by 44–48 black annuli, widest in vertebral region and becoming nar-

rower on flanks and ventrally, narrower than interspaces between them and containing many light-centered scales, especially on posterior half of body; tail with four to seven bands and irregular black patch near tip; head uniformly yellow in adult, blackish, with yellow horseshoe-shaped mark, in young; chin and throat white to pale gold.

HABITS: Two specimens were obtained by commercial fishermen well off shore. Sport fishermen on several occasions reported seeing large yellow snakes that were probably this species. All reports were during the winter months. No specimens of *H. spiralis* were taken in the mangrove creeks and swamps that seem to be a favorite habitat of some other seasnake species. Jeromie A. Anderson reports that a specimen nearly 2 meters long inflated its neck when annoyed and bit savagely. The venom is similar in toxicity to that of *H. cyanocinctus*.

DISTRIBUTION: The range extends from the Persian Gulf around the coasts of India to Celebes and Philippines. In West Pakistan waters the species is more plentiful than my collecting would indicate.

Hydrophis lapemoides (Gray)

PERSIAN GULF SEASNAKE

Aturia lapemoides GRAY, 1849, p. 46 (type locality: Ceylon and Madras).

Hydrophis lapemoides: GÜNTHER, 1864a, p. 375. SMITH, 1926, p. 86.

Hydrophis stewarti JOHN ANDERSON, 1872, p. 399 (type locality: Orissa). MURRAY, 1884a, p. 390.

DESCRIPTION: Head like that of *H. cyanocinctus*; nine or 10 maxillary teeth separated from fangs by small but distinct interval; one preocular and two or three postoculars; two or three anterior and two or three posterior temporals; seven or eight upper labials, with third and fourth or third, fourth, and fifth touching eye; eight lower labials; body proportions more or less like those of *H. cyanocinctus*; scales feebly imbricate on neck, juxtaposed on posterior half of body with a central tubercle; scale rows at midbody 39–43, decrease of 10–14 rows anteriorly and four posteriorly; ventrals 325–336; five preanals. Total length of adult male, 949 mm.; tail, 82 mm.

Ground color pale gray, shading to white

on sides and ventrally; 36–44 cross bands that are wider than their interspaces in vertebral region but becoming faint and narrow on sides and may or may not encircle the body; dull greenish in adults, blackish in young; tail with six or seven dark bands; top of head olive, with dull, yellow, curved mark, its apex between nostrils, distinct in young, faint in or absent from adult; chin and throat dirty white.

HABITS: Little is known concerning this rather rare seasnake. A subadult individual was taken in a night trawl set at 2 fathoms. An adult was washed up dead on the beach at Hawke's Bay about noon on June 25. Volsøe (1939) gave a good account of the species.

DISTRIBUTION: The range apparently centers about the Persian Gulf and Mekran coast, but specimens have been reported along the coasts of India and Ceylon to Orissa.

Hydrophis caeruleus (George Shaw)

MANY-TOOTHED SEASNAKE

Hydrus caeruleus GEORGE SHAW, 1802, p. 561 (type locality: Indian Ocean).

Hydrophis caeruleus: GRAY, 1842 (1831–1844), p. 62. SMITH, 1926, p. 90.

DESCRIPTION: Head small, not distinct from neck which is slender but not markedly elongated; body two to three times diameter of neck and strongly compressed laterally; scales feebly imbricate or juxtaposed, distinctly keeled. Particulars of single known West Pakistan specimen, a subadult female (R.S.M. No. 1963.2.27), as follows: maxillary teeth 14, no distinct gap between fangs and first tooth of series; one preocular and one postocular; two anterior and four posterior temporals; seven upper labials with third and fourth touching eye; nine lower labials; posterior chin shields smaller than anterior and not well differentiated from surrounding scales; scale rows at midbody 46, decreasing to 37 on neck and to 38 just anterior to vent; ventrals 306; preanals four; total length, 686 mm.; tail, 68 mm.

The specimen in hand when examined a few weeks after preservation was bluish gray above and slightly lighter below. Encircling the body were 38 wide black annuli; the

head and anterior part of the neck were uniformly dark gray.

HABITS: The West Pakistan specimen was netted February 17 in a mangrove swamp near Karachi.

DISTRIBUTION: The range of the species extends from Karachi around the coasts of India, Burma, and Malaya to the northern coasts of Java and Borneo, thence northward to the Bay of Tsingtau in China. A weakly differentiated subspecies, *H. c. thai*, occurs in the Gulf of Siam.

***Hydrophis mamillaris* (Daudin)**

BOMBAY SEASNAKE

Anguis mamillaris DAUDIN, 1803 (1802–1803, vol. 7), p. 340 (based on Russell, 1796, pl. 44, type locality: Vizagapatam).

Hydrophis mamillaris: BOULENGER, 1896, p. 277. SMITH, 1926, p. 88.

Hydrophis tessellatus MURRAY, 1886, p. 86 (type locality: Karachi Sea and Persian Gulf).

DESCRIPTION: Head small, not distinct from neck which is slender and much elongated in adult; rostral wider than high; seven maxillary teeth separated from fangs by wide intervals; one preocular and one or two postoculars; two anterior and three posterior temporals; seven or eight upper labials, the third and fourth or fourth and fifth touching eye; nine or 10 lower labials; chin shields well developed, posterior pair a little larger than anterior; body laterally compressed posteriorly; scales weakly imbricate anteriorly, becoming juxtaposed posteriorly with central tubercle or short keel; scale rows at midbody 39–41, decreasing anteriorly to 28 or 30 and posteriorly to 35 or 39; ventrals small, carinate, 325–380; four to six preanals. Total length of adult male, 841 mm.; tail, 74 mm. The contrast between the slender neck and moderately robust body is not evident in the juvenile.

Ground color light gray in adult, white in juvenile; body encircled by 42–57 black bands, somewhat narrower on sides and much wider dorsally than interspaces between them; head, chin, and throat uniform black; wide black ventral stripe in one specimen; tail black or with light lateral bars.

In an earlier paper I incorrectly figured a specimen of this snake as *Hydrophis fasciatus* (Minton, 1962, fig. 71).

HABITS: An adult specimen was found in a shallow sandy tide pool near a rocky point about midday on February 12. It was very sluggish and seemed ill or injured. Examination revealed a severe infection of the jaws. A juvenile 457 mm. in length was collected in a mangrove creek on October 12.

DISTRIBUTION: This rare seasnake is known from coastal Las Bela around the coasts of India to Vizagapatam. Most of the known specimens have been collected near Bombay.

ENHYDRINA GRAY

Differing from *Hydrophis* in configuration of lower jaw, chin being deeply cleft and mental elongate and largely concealed between first infralabials; ventrals poorly differentiated, especially on anterior third of body.

There is one species.

***Enhydrina schistosa* (Daudin)**

BEAKED SEASNAKE

Hydrophis schistosus DAUDIN, 1803 (1802–1809, vol. 7), p. 386 (based on Russell, 1801–1803, pl. 10; type locality: Tranquebar).

Enhydrina schistosa: STOLICZKA, 1870, p. 213. SMITH, 1926, p. 36.

DESCRIPTION: Head of moderate size and slightly distinct from neck; rostral wider than high, with prominent, median, downward prolongation giving beaklike profile; fangs followed after a wide interval by two or three maxillary teeth; one preocular and one or two postoculars; two, rarely one, anterior temporals and three or four posterior temporals; four well-differentiated anterior upper labials, last two usually in contact with eye, followed by three to five small, wedge-shaped shields; nine, rarely eight or 10, lower labials; chin shields not well differentiated; all head shields densely studded with fine tubercles, especially in males; body moderately stout, laterally compressed; skin of neck loose; scales subimbricate, with short central keel; scale rows at midbody 51–59 in males, 53–63 in females, rows on neck 53–40, reduction of six to 18, rows just anterior to vent 46–35, reduction of 13–21; ventrals very small, numbering 303–359 (mean 323.7), but so poorly differentiated on anterior third of body that reliable count is impossible; two to six preanals. Total lengths of 15 adult males, 859–995 mm.; of six adult females, 897–1162

mm.; tail in males 11.2–13.7 per cent of total length, in females 10.2–11.6 per cent.

Juveniles and most adults dirty white to pale greenish gray, with olive to blackish cross bands most distinct on posterior half of body and tending to fuse anteriorly; belly and sides white to pale straw; head greenish, without markings, chin and throat white; sides of tail with few to many black scales irregularly arranged; large adults often almost uniform olive above. Newborn young milk white, with 42–50 jet black cross bands almost encircling body posteriorly and tapering to point on sides anteriorly; top of head dark olive; tail black.

HABITS: This species is most frequently taken in moderately shallow water with a muddy bottom but has been encountered where the bottom is sandy or rocky. It ascends streams to about the limit of tidal flow. Like most other seasnakes of the Karachi area, it is seen most frequently in off-shore waters during the period of generally calm seas from November through February. At this time the reptiles lie at or just under the surface. Two captured off Churna Island on December 19 had their bodies intertwined. Both were adult males. During the monsoon the snakes enter tidal creeks and other sheltered spots. On June 22 two adults and an immature male were collected at the mouth of the Malir River in water less than 2 feet deep. On September 3 a large individual of *Enhydrina* was found dead on the road near the bridge over Gharo Creek at a point nearly 10 miles from the open sea. It is likely that the snake was captured in the water by a bird or other predator and abandoned on the road. Although individuals of *Enhydrina* have not been seen leaving the water voluntarily, they are not wholly helpless on land. Although this snake seems unable to lift its head or strike, it crawls fairly rapidly for short distances.

A female 1052 mm. in total length collected in a mangrove swamp near Korangi on July 10 contained four young measuring 320–327 mm. They were well developed and fully pigmented, but the hemipenes of the three males were still extruded.

Stomachs of five snakes contained one to three fish, the largest about 150 mm. long. Genera identified were *Tetrodon*, *Coilia*, and

Harpodon. A sixth stomach contained several large prawns.

Enhydrina is ordinarily an inoffensive reptile but will sometimes bite when restrained. It is responsible for a significant number of fatal snake bites throughout its wide range, but none were reported to me during my stay in Karachi. The venom is extremely toxic, perhaps the most toxic of any species of snake, and the unusually wide gape permits it to bite effectively.

DISTRIBUTION: The range of this seasnake extends from the Gulf of Oman and the Seychelles eastward to the coast of southern Viet Nam and southward along the Australian coast to Rockhampton. It seems to be the commonest seasnake in waters near Karachi.

PRÆSCUTATA WALL

Combination of rather short, wide head, elongate body, and large anterior ventrals is sufficient as external characteristics for the identification of this genus.

There is one species.

Praescutata viperina (Schmidt)

VIPERINE SEASNAKE

Thalassophis viperina SCHMIDT, 1852, p. 79 (type locality: Java).

Praescutata viperina: WALL, 1921, p. 391. SMITH, 1943, p. 448.

Hydrophis jayakari BOULENGER, 1887b, p. 408 (type locality: Muscat).

DESCRIPTION: Head short, wide, somewhat depressed and distinct from neck; rostral wider than high, with three short, downward projections fitting grooves in chin; three to five maxillary teeth separated from fangs by a short interval; one, occasionally two, preoculars and two, occasionally one, postoculars; two anterior and three or four posterior temporals; six or seven upper labials, third and fourth, or both, in contact with eye; seven or eight lower labials; anterior and posterior chin shields wide, subequal; body moderately thick, laterally compressed posteriorly; scales juxtaposed, smooth or with short central keel; scale rows at midbody 38–47, decrease of 10–14 rows anteriorly and of three to nine rows just anterior to vent; anteriormost ventrals more than half of width of neck, decreasing in size posteriorly until

those just anterior to vent no larger than adjacent scales; 233, 237 in males, 262, 278 in females; four or five enlarged preanals. Only adult example examined, a female 700 mm. in total length, tail, 78 mm.

Ground color pale peach to greenish white, with series of 25–32 rhomboid dorsal blotches more or less fused along midline and black to dark green in color. In three of four specimens examined, these extending far down sides on posterior half of body to fuse with a wide mid-ventral black stripe and enclose oval spots of ground color on sides. Top of head dark, without markings; upper labials, chin, and throat whitish; tail black. This pattern may be characteristic of the juvenile and young adult snakes; the ventral and lateral dark pigment seems to fade with age.

HABITS: Two juveniles, each about 400 mm. in length, were collected in tidal creeks on February 15 and June 30; one of the localities was several miles from open sea. The stomach of one contained a small mudskipper (*Periophthalmus*). An adult was killed at Hawke's Bay October 15. Mrs. Harold Beeson, who gave me the specimen, said the snake was crawling on the beach at the edge of the surf.

DISTRIBUTION: The range of this species is from the Persian Gulf around the coasts of India to southern China and the northern coasts of Borneo and Java. It is a rather uncommon snake in West Pakistan waters.

ASTROTIA FISCHER

The single species of this genus, *Astrotia stokesi* (Gray, 1846b), is a large seasnake of particularly massive build with a large head. Its size, plus the strongly imbricate body scales and divided ventrals that are not well differentiated from the adjacent scales, distinguishes it from other seasnakes. Although not generally plentiful, it is a species that has been reported to form immense aggregations numbering thousands of individuals. One such aggregation was reported to me by aviators participating in naval exercises off Karachi in November, 1960. The species of snake was not determined, and I obtained no specimens of *Astrotia* during my residence in Karachi.

The range of this species is from the north-

ern coasts of Australia along the Malayan and Indian coasts to Mekran. *Hydrophis guttata* (Murray, 1887; type locality: Mekran coast) is a synonym of this species.

LAPEMIS GRAY

Short, deep-bodied seasnakes; ventrals distinct anteriorly, small or absent posteriorly; dorsal scales juxtaposed, lowest rows larger than others.

The genus occurs from the Persian Gulf to southern Japan south to Ceylon and northern Australia. There are two species, one of which occurs in West Pakistan waters.

Lapemis curtus (Shaw)

SHORT SEASNAKE

Hydrus curtus SHAW, 1802, p. 562 (type locality unknown).

Lapemis curtus: GRAY, 1842 (1831–1844), p. 60. SMITH, 1926, p. 112.

DESCRIPTION: Head short, chunky, slightly distinct from neck; rostral wider than high and strongly trifold as in *Praescutata*; three to five maxillary teeth separated from fangs by wide interval; preoculars and postoculars single; two anterior and three or four posterior temporals; parietals divided into five or six small shields; six or seven upper labials with fourth touching eye; nine lower labials; anterior chin shields small and not in contact with each other, posterior absent; body short, very strongly laterally compressed throughout; scales smooth or with central tubercle; males with short spines on lowest rows of scales; scale rows 29–35–31 (male) and 34–39–33 (juvenile); first 30–40 ventrals as wide as or wider than adjacent scales, remainder smaller but distinct, 165 in male, 180 in unsexed juvenile; two enlarged preanals. Total length of male, 676 mm.; tail, 51 mm.

Ground color pale olive, shading to white or pale yellow on sides; 46–53 black or dark olive cross bars often alternating to form a zigzag band and fading out on sides; top of head dark gray or olive; distal half of tail black.

HABITS: The best account of this species in the western part of its range was given by Volsøe (1939). One of the West Pakistan specimens was collected on the rocky coast near the entrance to Karachi harbor.

DISTRIBUTION: This species is known from the Persian Gulf to Ceylon and along the east coast of India to the neighborhood of Madras. It is said to be fairly common along the western Mekran coast but is rare at Karachi.

MICROCEPHALOPHIS LESSON

Head small and neck long and slender, contrasting markedly with thick body; ventrals entire anteriorly, divided by median fissure posteriorly.

There are two species, both found in West Pakistan waters.

***Microcephalophis gracilis gracilis* (Shaw)**

COMMON SMALL-HEADED SEASNAKE

Hydrus gracilis SHAW, 1802, p. 560 (type locality unknown).

Microcephalophis gracilis: LESSON, 1834, p. 320. SMITH, 1926, p. 121.

Hydrophis guentheri MURRAY, 1884a, p. 396 (type locality: Karachi).

DESCRIPTION: Head very small, narrow, convex above, not distinct from neck; rostral large, somewhat higher than wide; four to six maxillary teeth separated from fangs by short interval; single preoculars and postoculars and temporals; five or six upper labials, third and fourth in contact with eye, second in contact with prefrontal; six or seven lower labials; anterior and posterior chin shields short, subequal; neck slender, cylindrical; body stout and laterally compressed; scales anteriorly smooth, elongate, imbricate; posteriorly juxtaposed, hexagonal, with small central tubercles; scale rows at midbody 31 or 33, decreasing to 18 or 19 on neck and to 27 or 29 just anterior to vent; ventrals distinctly larger than adjoining scales on anterior third of body, divided and with heavy tubercles posteriorly; 256, 261 in males, 247–276 (mean 262.8) in females; two to four preanals. Total length of two adult males, 793 and 945 mm.; of four females, 831–860 mm. Tail length 8.1–9.2 per cent of total length; no demonstrable sexual dimorphism.

Anterior part of body, including all of head, chin, and throat, black to dark olive, with white or pale yellow spots on side of neck or with light cross bands; posterior part pale yellow to greenish, white with gray cross bands (three specimens) or more or less uniform gray above and light laterally and ven-

trally (three specimens). Newborn young dark, with about 40 light bars or paired spots.

HABITS: In water, the agility of the elongated forebody of these snakes is amazing. They are awkward and virtually helpless on land. In his field notes for January 18, 1963, Jeromie A. Anderson recorded the following observation: "Off Kalmath Lagoon 35 miles west of Ormara, Mekran Coast several (*M. gracilis*) were observed on the sea's surface above and around a large shoal of small red shrimp. . . . An estimated 20 specimens, apparently identical in size, were seen; some strung out, one close behind the other, in threes to sixes, in 'follow the leader' formation. . . . They appeared to be rather swift swimmers. Four specimens were collected in three net scoops of shrimp."

A specimen collected September 3 in a mangrove swamp contained a single large embryo 331 mm. in length. Development of the young snake was apparently complete; it should have been born within a matter of hours.

DISTRIBUTION: The range of the nominate subspecies is from the Persian Gulf around the coasts of India, north along the China coasts to Hong Kong, and south to Borneo and perhaps northern Australia. The subspecies *microcephalus* occurs in the Straits of Malacca and the north coast of Java. Near Karachi *M. gracilis* appears to be rather uncommon.

***Microcephalophis cantoris* (Günther)**

CANTOR'S SMALL-HEADED SEASNAKE

Hydrophis cantoris GÜNTHER, 1864a, p. 374 (type locality: Penang).

Microcephalophis cantoris: WALL, 1921, p. 330. SMITH, 1926, p. 124.

Distira gillespieae BOULENGER, 1899, p. 642 (type locality: Karachi).

DESCRIPTION: Habitus, dentition, and head shields similar to those of *M. gracilis* except second upper labial not touching prefrontal and there are seven or eight lower labials; scales smooth, imbricate anteriorly; posteriorly juxtaposed with small tubercles in row or cluster; scale rows at midbody 40–43, decreasing to 23 on neck and to 33–41 just anterior to vent; ventrals 393–404 (mean 396.5); four preanals. Larger than *M. gracilis*; total length of three adult males, 1155–1392

mm.; tail 9.2–10.4 per cent of total length; no females examined.

Anterior half of body light olive to yellow above, paler below, about 25 gray to black bars and median black ventral stripe; posterior half of body dark olive above, yellowish laterally, in some cases with faint darker lateral bars.

HABITS: My specimens were collected by fishermen, using throw nets in shallow water with muddy or sandy bottom. They were inoffensive snakes and never attempted to bite. Dates of collection were from early July through September. Although I attempted to extract venom from three large individuals of this species, I never obtained a detectable amount.

DISTRIBUTION: This species has been recorded on the west coasts of India and Pakistan from Karachi to Cannore and on the east from Orissa to Chittagong. The Penang provenience of the type may be in error; at least the species has not been taken there subsequently. It seems to be rather rare throughout its range.

PELAMIS DAUDIN

This genus includes a single strongly pelagic species with the greatest range of any known snake, being found over a great part of the Pacific and Indian oceans.

Pelamis platurus (Linnaeus)

PELAGIC SEASNAKE

Anguis platura LINNAEUS, 1766, p. 391 (type locality unknown).

Pelamis platurus: STOLICZKA, 1872b, p. 92. SMITH, 1926, p. 116.

DESCRIPTION: Head long, narrow, flat, distinct from neck; snout blunt, rostral about as wide as high; six to nine (usually seven or eight) maxillary teeth separated from fangs by a wide interval; one preocular and two, rarely three, postoculars; two, occasionally three, anterior temporals and two to four posterior temporals; six to eight upper labials, usually with one to three small intercalated scales, fourth in contact with eye bilaterally in four specimens, separated from eye by subocular unilaterally or bilaterally in six specimens; nine to 13 lower labials, first five much larger than others; three subequal pairs of chin shields widely separated from one

another; body markedly compressed laterally for most of length, neck not slender; scales juxtaposed, quadrangular, smooth, lowest rows with minute tubercles in males; scale rows at midbody 47–63, reduction anteriorly of six to 13 rows and posteriorly of 10–16 rows; ventrals divided and so poorly differentiated for most of length that accurate count is impossible; three to five slightly enlarged preanals. Total length of three adult males, 485–567 mm.; of one adult female, 631 mm.; tail length 11.5–14 per cent of total length in males, 10 per cent in female.

Ground color lemon yellow to cream, paler ventrally; a brown dorsal stripe, 10–19 scale rows wide, extending length of body; top and sides of head of same hue as stripe; a little dark pigment often present on chin; tail with black and white bars or vermicular markings. One small juvenile showing a series of dark lateral bars on posterior third of body, fusing with dorsal stripe which is somewhat sinuous; on sides anterior to these are several oval dark spots.

VARIATION: This species shows considerable pattern variation over its range, although no geographical races are recognized. Smith (1926) recorded seven reasonably distinct pattern variants. Specimens from waters around Karachi are remarkable for their pale dorsal stripes. In seven of nine specimens the stripe in the fresh specimen was dark amber to tan; two of these snakes had virtually no melanin in the pattern except on the tail. In one specimen the stripe was almost black, the normal color for the species, and in one from Karachi waters and one from the Mekran coast the stripe was dark brown. Although juveniles tend to have darker stripes than adults, the palest individual examined had a total length of only 357 mm. The yellow pigment of the sides is also less intense in the West Pakistan specimens.

HABITS: Normally pelagic, these snakes are rapid, graceful swimmers. One kept several days in an aquarium floated motionless at the surface for long periods. On land the snakes are almost helpless and soon show signs of distress. Apparently they cannot breathe normally out of water. Most of my specimens were found cast up on sandy beaches. One was found in a mass of floating seaweed near a reef, and another was taken by a fishing party

about 20 miles off shore. On a voyage to the Seychelles, I saw an individual of *Pelamis* about a day's run by steamer from Karachi. Clusters of barnacles were attached to the skins of two specimens.

One captive individual tried repeatedly to bite when picked up with forceps; others would not do so under any provocation. I was unable to extract a detectable amount of venom from this species.

Dates of collection are from late November through the first half of April. A very small individual 230 mm. in total length was found March 22 in a mangrove swamp.

DISTRIBUTION: This snake is known from the Persian Gulf to the Cape of Good Hope eastward to waters around North Island, New Zealand, thence north to Possiet Bay, Kamchatka. In American waters it is found from the Gulf of California to the coast of Ecuador. It is moderately common in West Pakistan waters.

FAMILY ELAPIDAE

BUNGARUS DAUDIN

Fixed, hollow maxillary fangs followed by two to four small teeth; maxillary bone not extending anterior to palatine; vertebral scale row strongly enlarged in all but one species; at least half of subcaudals undivided.

There are 12 species found from Indonesia to Taiwan and on the mainland of southeast Asia from south China to southern Baluchistan. One occurs in West Pakistan.

Bungarus caeruleus (Schneider)

INDIAN KRAIT

Pseudoboa caerulea SCHNEIDER, 1801 (1800-1802), p. 284 (based on Russell, 1796, pl. 1; type locality: Vizagapatam).

Bungarus caeruleus: FAYRER, 1874, p. 11. SMITH, 1943, p. 413.

Bungarus sindanus BOULENGER, 1897, p. 73 (type locality: Umarkot, Sind).

DESCRIPTION: Head flat, barely distinct from neck, snout blunt; rostral slightly wider than high; nostril between nasals; eye small, with round pupil barely distinguishable in life; fangs followed after wide interval by two or three small teeth; loreal absent; one preocular and two postoculars; one anterior and two posterior temporals; seven upper labials, third and fourth touching eye; eight lower

labials; anterior and posterior chin shields wide and of about same size; body cylindrical, with slight taper; scale rows on body 15 in every specimen examined, 17 rows on neck in 10 of 12 specimens, 15 or 16 in others; ventrals 205-216 (mean 212.2), showing no sexual dimorphism; all subcaudals undivided, 46-54 (mean 49.4) in males, 43 or 44 in females; anal undivided. Total length of five adult males, 875-1288 mm.; of one adult female, 1090 mm.; tail length in males 12.2-14 per cent of total length, in females 12.6-13 per cent.

Dorsal ground color jet black to dark brown; a series of three to nine light vertebral spots on neck and forebody followed by 38-56 narrow, transverse bands usually arranged in pairs, marks milk white in young, becoming yellowish in adults; upper labials white in young, yellow in adult; ventral surfaces uniform white.

VARIATION: Nearly all the specimens examined were collected between Karachi and the lower valley of the Indus. None showed 17 scale rows at midbody, the characteristic of the subspecies *sindanus*. Shockley (1949) reported a specimen from Ras Jiwani in extreme southwestern Pakistan that had 235 ventrals. It was an unusually large male with a total length of 62 $\frac{3}{4}$ inches (1595 mm.).

HABITS: Most of the specimens were collected in grassland or semi-desert with moderately dry alluvial soil; others were found in marsh and in suburban gardens. None were collected at elevations above 500 feet. The snakes seem to avoid very rocky or sand terrain.

Kraits are strongly nocturnal and rarely prowl until two hours after sunset. Their seasonal activity shows a decided peak during September and early October. From November through April they are rarely taken except by Jogis who dig them from burrows. Most that I have found were lying quietly in the open and made no attempt to escape or defend themselves. When touched or alarmed, they coil loosely, with the body slightly flattened and the head concealed. They often make jerky, flinching movements; rarely they elevate the tail and curl its tip. They do not strike but may turn quickly and bite at the source of annoyance.

Jogis report the eggs are laid during early

summer. The smallest juvenile collected measured 332 mm. and was taken July 22.

The stomach of one specimen contained a toad; another contained remains of an unidentified snake.

Kraits that I had in captivity remained concealed during the day but were quite active at night. None of them took food. Mice, lizards, and frogs put into their cage were ignored. Snakes, including other kraits, were sometimes attacked. Harmless snakes (*Coluber*, *Psammophis*) succumbed to bites; other kraits seemed unaffected. Vipers (*Echis*) were not attacked. Indeed the kraits seemed to fear them.

A fair number of human fatalities are said to result from the bite of this snake, but the information is generally unreliable. A probable case at Hyderabad reported to me by Dr. Najib Khan was characterized by rapidly developing respiratory paralysis and death within two hours. The snake was not examined, but the circumstances of the bite suggest that a krait rather than a cobra was responsible. In another city, I was told a hospitalized patient was fatally bitten when he stepped barefooted upon a krait that had crawled into the ward.

Much confusion is attached to the name "krait." Americans, Europeans, and urban, westernized Pakistanis apply it to nearly any small snake, including *Typhlops*. In rural Sind, *Bungarus* is well known under the names "sangchul" and "pee-un." The former has been translated for me as "stonesucker" or "stonebreaker"; the latter as "drinker." It is widely believed that the snake does not bite but sucks the breath of sleeping persons. It is also believed that the victims will survive if they are not permitted to see daylight until they have recovered. The abdominal pain and paralysis of the swallowing muscles sometimes seen in cases of krait poisoning evidently have given rise to the story that intolerable thirst follows the bite. Perhaps the krait is the original dipsas of classical and medieval serpent lore.

DISTRIBUTION: This species occurs from western Bengal through peninsular India and Ceylon. In West Pakistan it is reported from the vicinity of Rawalpindi west to Peshawar and southward through the Punjab and Sind. The only definite Baluchistan record known

to me is for Ras Jawani near the mouth of the Dasht River and probably represents a well-isolated population.

NAJA LAURENTI

Anterior ribs elongate, neck dilatable into hood; maxillary bone extending anterior to palatine; fangs alone on maxilla or followed by one to three small teeth; scales smooth, rows strongly oblique, especially on anterior half of body; nostril large, between nasals; loreal absent; subcaudals divided.

There are six species distributed over nearly all of Africa, the mainland of Asia from southern China west to Baluchistan and Transcaspia, and the major islands from Taiwan to Java. One species occurs in West Pakistan where it is represented by two subspecies.

Naja naja naja (Linnaeus)

INDIAN COBRA

Coluber naja LINNAEUS, 1758, p. 221 (type locality: "India orientale").

Naja naja naja: SMITH, 1943, p. 427.

Naja naja indusi DERANIYAGALA, 1960, p. 50 (type locality: Ambala, Punjab).

Naja naja karachiensis DERANIYAGALA, 1961, p. 210 (type locality: Karachi).

DESCRIPTION: Head wider and heavier than that of *Bungarus* but slightly distinct from neck; rostral wider than high; eye moderately large, with round pupil; single tiny tooth on maxilla behind fangs in about half of specimens; one, rarely two, preoculars and three postoculars; two anterior and three or four posterior temporals; seven upper labials, third largest, touching both nasal shield and eye except in one specimen in which it is separated from eye by a second preocular, fourth also touching eye; eight, rarely seven or nine, lower labials; small triangular shield (cuneate) between fourth and fifth lower labial at oral margin, present in 22 of 23 specimens, a second similar shield between fifth and sixth lower labials in four of 23; anterior and posterior chin shields subequal in size, posterior pair not in contact with each other; body subcylindrical posteriorly, dorsoventrally flattened anteriorly; scale rows across widest part of hood usually 25 (14 specimens), less often 23 or 24 (six specimens) or 26 or 27 (three specimens); reduction to 21 rows at

midbody and to 13–15 rows just anterior to vent; ventrals in males 182–192 (mean 186.8), in females 183–196 (mean 190.5); subcaudals in males 61–68 (mean 64.1), in females 57–62 (mean 60.0); anal undivided. Total length of seven adult males, 1211–1515 mm.; of nine adult females, 1294–1650 mm.; tail length in males 17.7–18.8 per cent of total length, in females 16.4–17.6 per cent.

Snakes of about 900 mm. and more uniformly jet black, dark olive, or dark brown above; ventrally pale gray to butter yellow more or less heavily suffused with slate gray or dark brown posteriorly and laterally; ventral side of hood usually with two to four irregular, dark, transverse bars, occasionally uniformly dark; chin and throat dark. Young steel gray to pale brown, with slightly darker and dark-edged scales producing variegated effect; usually a spectacle mark on dorsal aspect of hood; head and neck dark olive to brown; ventral surfaces white to cream, with dark bands on neck. Change from hatchling to adult pattern required about 18 months in a captive snake.

***Naja naja oxiana* (Eichwald)**

OXUS COBRA

Tomyris oxiana EICHWALD, 1831, p. 171 (type locality: Transcaspia).

Naja naja oxiana: STEJNEGER, 1907, p. 395.

DESCRIPTION: Juveniles showing pattern of wide, dark transverse bars; adults more or less uniformly brown; no spectacle or ocellus mark on hood; ventral surfaces in both young and adult pale yellow to white, usually with dark bars on ventral aspect of hood. Scale rows across the hood 23–25; ventral counts high (195 or more); subcaudals 62–70 in females, 65–75 in males. Cuneate usually absent.

To this form I refer a juvenile specimen from the vicinity of Peshawar (A.M.N.H. No. 88443) and two specimens from Kach in the Baluchistan mountains between Quetta and Ziarat. The juvenile specimen shows 30 wide and 27 narrow dark bands alternating with one another except just behind the head; the venter is uniformly light except for dark bars on the neck. The snake is a male with 198 ventrals and 66 subcaudals; there are 23 scale rows across the hood. The head is damaged, but the cuneate is present on one

side; there are eight upper labials on this side. The smaller snake from Kach (S.A.M. No. 709), a female 1150 mm. in total length, in life was medium brown, with a faint indication of paler bands. There was a trace of orange at the base of the hood. The venter was unmarked except for wide dark neck bands and a few flecks. There are 23 scale rows across the hood, 202 ventrals, and 65 subcaudals; the cuneate was present but small. Except for the presence of the cuneate, this snake is virtually identical with two females of *oxiana* from Mt. Kopet-Dagh in Turkmenistan S.S.R. The larger Kach snake (A.M.N.H. No. 88469), a female 1390 mm. in total length, was dark brown above and superficially not much different from specimens from Sind, but many of the scales had narrow light margins, and the venter was uniform pale yellow, with only a trace of neck bands. It shows 24 scale rows across the hood, 202 ventrals, and 63 subcaudals; the cuneate is present.

Two specimens (A.M.N.H. No. 2851 from the Sutlej Valley, Punjab, and S.A.M. No. 716 from Rawalpindi) differ from both *oxiana* and the Sind population. Both are young adult males with 25 and 27 scale rows across the hood, 189 and 190 ventrals, and 61 subcaudals; the cuneate is present in both, though very small in the Sutlej Valley specimen. The Rawalpindi specimen before preservation presented the variegated appearance of young juveniles from Sind. The Sutlej Valley specimen after many years of preservation is almost uniform pale brown, which may be close to its original color. Both show well-developed spectacle marks on the dorsal aspect of the hood and no dark bars on the ventral aspect. These snakes conform rather well to Deraniyagala's *Naja naja indusi*, but they can equally well be considered less melanistic variants of the Sind form. An adult male from Lyallpur District (U.M.M.Z. No. 125654) has 28 scale rows across the hood, 184 ventrals, and 58 subcaudals, and a cuneate. This specimen, after less than a year of preservation, is a brown of a paler hue than that of any Sind specimen, has no dorsal hood mark, but has two dark ventral bars and the remainder of the venter pale, becoming suffused with brown posteriorly. The taxonomy of *Naja* on the entire Asian mainland is re-

plete with problems, and the assignment of subspecific status to any population must be regarded as purely tentative.

HABITS: Cobras occur in many habitats but are most plentiful in rather damp grassland and around cultivated areas. They are common in villages and are occasionally found in the suburbs of Karachi and Rawalpindi. I have no records for a truly arid habitat, but the species occurs on oases and in patches of acacia scrub. Specimens have been collected from sea level to approximately 6500 feet in the Baluchistan highland.

Cobras are diurnal during most of the year but tend to be crepuscular in hot weather. Most of my specimens were obtained during and soon after the monsoon from July through the first half of October, but I have records of active cobras during every month at Karachi. During the winter the Jogis capture many cobras by digging them from burrows.

Typical refuges for cobras are holes in embankments or about the bases of trees, clumps of munji grass, and dens of small mammals. Cobras have good vision for moving objects up to a distance of about 10 yards, and they almost invariably try to escape when encountered. When cornered they spread the hood, hiss, and strike repeatedly, although often inaccurately. A hunter who brought me a large cobra said he noticed the snake at a distance of about 50 yards when it reared and spread its hood upon being attacked by a hawk.

The stomach of one cobra contained a large skink (*Mabuya dissimilis*); another stomach contained a frog.

Cobras remain irritable in captivity but generally do well if given a place to hide. Otherwise they literally worry themselves to death. They are indiscriminate feeders, taking frogs, reptiles, and small mammals. They do not seem to rely much upon venom in subduing prey but deal with active animals in much the same way as such large colubrids as *Masticophis* and *Ptyas*. A juvenile cobra in my collection ate two saw-scaled vipers each more than half its length. Neither species' venom seemed to have much effect on the other.

A snake charmer showed me a clutch of nine alleged cobra eggs laid early in May.

Young snakes 300–355 mm. in length have been found during the last week of June and early July. A snake in this size range virtually doubled its length during its first year of captivity and was of adult size before the end of its second year. A subadult female about 1100 mm. when collected grew about 450 mm. during the subsequent 18 months.

Cobras are greatly feared, and fatal bites are occasionally reported in the local press. However, I saw no hospitalized cases. A Tatta Jogi was bitten on the hand by a cobra he was pulling from a bush and died about three hours later. Another man of the same tribe was bitten on the thigh a few weeks later and lay almost completely paralyzed for several hours but recovered. On the other hand, some of the bites reported to me by Jogis were quite trivial. The greatest danger to the average person occurs when the snake is encountered unexpectedly in close quarters and cannot readily escape. Angry cobras bite and hold on, chewing savagely. Under such circumstances a large amount of highly toxic venom is injected, and death may occur within an hour.

The name "cobra" is used in the vernacular of both Pakistanis and foreigners. Some urban Pakistanis use the word in its original sense to designate any snake. In rural Sind, the cobra is known as "nagu" or "kala nag." The young are sometimes called "pambu." Near Quetta the cobra is known as "chummar," perhaps a contraction of "chamchamar" or "spoon snake."

A great deal of myth and folklore is associated with cobras. Mr. Ziauddin Bulbul of Dadu writes: "Our (Sindhi) literature mentions the Waseeng as the King of Snakes. . . . It is supposed to be the cobra turned white due to age or contact with buried riches which the Waseeng is said to be guarding. . . . The cobra is supposed to give a wide berth to a human being who entertains no evil design. . . . If you happen to be confronted with a cobra. . . stand quite still and say, 'Go on your way; I am no enemy of yours. I belong to the peaceful Ummat Muhammadi.' Generally speaking the cobra is not considered to be aggressive like the Khappur (*Echis*). . . . The cobra that is entirely black, back as well as stomach, is given the name Taleehar. Some cobras of this kind are supposed to pos-

sess a 'mun,' a dark brown substance that shines on a dark night and instantly heals snake-bite, provides antidote for all poisons, and attracts wealth and good luck. Some Jogees used to offer such 'muns' for sale in old days when we had not yet absorbed much of Lord Macauley's English." A fuller account of Sindhi beliefs concerning cobras and other reptiles is found in Thakur (1959). The subject is a fascinating one; its exegesis awaits a student with background in Indian ethnology and culture as well as herpetology.

DISTRIBUTION: The range of *Naja naja* as currently defined includes all of the southeast Asian mainland and most of the larger islands and archipelagos. The nominate subspecies occurs through most of the Indian subcontinent and Ceylon. It is in contact with the subspecies *kaouthia* in Bengal and *atra* probably in Assam. In West Pakistan it is found from the northeastern Punjab southward throughout Sind and west into eastern Las Bela. The subspecies *oxiana* occurs from Transcaspia and southern Turkmenistan east across most of Afghanistan to Kashmir, the Northwest Frontier Provinces, and north-eastern Baluchistan. Intergradation presumably takes place in the northern Punjab and in Baluchistan.

FAMILY VIPERIDAE

VIPERA LAURENTI

Poisonous snakes with large, hollow, maxillary fangs that fold against roof of mouth; no pit between eye and nostril; more than three head shields or scales across top of head between eyes; nostrils lateral; eye with vertically elliptical pupil; eye not in contact with labials; dorsal scales keeled, keels without serration; ventrals smooth; subcaudals divided.

The genus is essentially palearctic, with one species ranging extensively into the Asian tropics to Taiwan and Java. There are 10 species, two of which occur in West Pakistan.

Vipera russelii russelii (George Shaw)

RUSSELL'S VIPER

Coluber russelii GEORGE SHAW, 1797 (1796-1797, vol. 8), pl. 291 (based on Russell, 1796, pls. 7, 32; type locality: Coromandel coast).

Vipera russelii: BOULENGER, 1890, p. 420.

Vipera russelii russelii: SMITH, 1943, pp. 482-483.

DESCRIPTION: Head rather long, distinctly wider than neck, snout bluntly pointed; rostral about twice as high as wide; nostril large, crescent shaped, in large nasal; distinct canthus rostralis; supraocular entire; 11 or 12 upper labials separated from eye by three or four rows of small scales; 13-15 lower labials; anterior chin shields short and wide, posterior not well differentiated from surrounding scales; body stout, flattened dorsoventrally, tapering evenly posteriorly and anteriorly; dorsal scales keeled except for lowest row, in 31 or 29 rows at midbody, reduction posteriorly to 23 or 21 rows, usually an anterior reduction of two or four rows; ventrals 164-173 (mean 168.5), no sexual dimorphism evident; subcaudals in males 53, 56, in females 46-49 (mean 47.0); anal undivided. Total length of two adult males, 1245 and 1332 mm.; of two females, 1004 and 1098 mm.; tail length 16 per cent of total length in males, 14.2-15.3 per cent in females.

Dorsal ground color light tan to sandy; a vertebral series of 23-29 large, oval, chestnut spots, with black or dark brown borders narrowly edged with cream, these spots fused to a greater or lesser extent; lateral series of similar but smaller spots, below which are scattered dark flecks with light edges; two large dark spots at base of head; a light, V-shaped mark with its apex on top of snout; labials and sides of snout mottled with brown and cream; belly pinkish beige to white, with black semilunar spots; chin and throat white, many scales tipped with black.

HABITS: Russell's vipers frequent grassland, cultivated fields, salt-bush scrub, and the margins of marshes. They are most frequently found when low land is flooded by rain or irrigation. One found crossing the road about an hour after sunset retreated into a thick bush and began hissing vigorously. Another was found well after midnight coiled in damp undergrowth in a little grove of trees. It might have gone unnoticed had it not raised its head slightly, showing the white throat. Although these vipers are nocturnal most of the year, a freshly killed one was found on the highway in midafternoon late in October.

A large male that I had in captivity for two years was sluggish and placid in disposition, spending most of its time in a loose coil at the

back of its cage. It paid no attention to movement or light jarring of the cage, stimuli that often arouse cobras and saw-scaled vipers, and usually responded to more vigorous annoyance only by hissing. It would, however, occasionally strike suddenly and unexpectedly. It fed readily on rats. Prey was invariably struck and released, the animal usually dying almost instantly.

Personnel of the Pakistan Bureau of Laboratories tell me that Russell's vipers usually give birth to young during June. There are 20–25 young in an average litter, and they measure 250–300 mm.

Although a very dangerous species, the relative rarity of this snake makes it of little importance as a cause of snake bite in most of Sind. Local physicians report the symptoms of poisoning cannot be distinguished from those seen in *Echis* bites. A probable case of a bite by a Russell's viper was reported to me by an American hunter who said that one of his beaters was bitten by a large, heavy snake resembling a rattler and developed symptoms of severe poisoning.

Most of the Sindhi people apply the name "khuppur" to Russell's viper and to large *Echis*. Russell's viper is occasionally called "kauryala" by those who have immigrated to Sind from other parts of the subcontinent.

DISTRIBUTION: The nominate subspecies occurs from the Indus Valley to Kashmir and East Bengal and southward through most of peninsular India and Ceylon. Other subspecies occur in southeast Asia to Taiwan and a few islands of Indonesia. The range in West Pakistan is not well known but presumably includes eastern Sind and the river valleys of the Punjab at low elevations. Occurrence is spotty. It is not a rare snake in parts of Tatta District but seems to be absent from or very rare in the Karachi District.

Vipera lebetina obtusa Dwigubsky

LEVANTINE VIPER

Coluber lebetinus LINNAEUS, 1758, p. 216 (type locality: Cyprus).

Vipera lebetina: BOULENGER, 1890, p. 421. SMITH, 1943, p. 486.

Vipera peilei MURRAY, 1892, p. 72 (type locality: Zandra, Afghanistan and Quetta).

Vipera obtusa DWIGUBSKY, 1832, p. 30 (type locality: Jelisawetpol, Transcaucasia).

Vipera lebetina obtusa: TERENTEV AND CHERNOV, 1940, p. 163.

DESCRIPTION: Head shorter and wider than that of *V. russelii*; rostral about as wide as high; supraoculars usually divided; 10 or 11 upper labials separated from eye by two or three rows of small scales; 12–14 lower labials; chin shields like those of *russelii*; body habitus like that of *russelii*; dorsal scale rows 25–23–19 or 23–25–19, keeled except for lowest row; ventrals 168–176; subcaudals in male 48, in female 42. Body length of adult male, 927 mm., tail 121 mm.; of adult female 1161 mm., tail 131 mm.

Dorsal ground color dusty khaki to buff, with minute darker punctuations; about 40 indistinct cross bands of darker gray; belly buff, becoming white anteriorly, more or less heavily clouded with gray; tail pinkish brown.

HABITS: This snake is recorded from dry, rocky, mountainous country, for the most part between 3000 and 7000 feet in elevation. A dead and somewhat mutilated adult was brought to our camp at Ziarat by a Baluchi tribesman. He said that the snakes were not found near the town or in the high mountains but were rather common in a valley about 6 miles below the town. The snakes are greatly feared by the local people who believe they both bite and sting with the tail.

DISTRIBUTION: The species as a whole ranges from Cyprus and the Cyclades Islands to North Africa and east through the Near and Middle East to Kashmir, eastern Afghanistan, and northern Baluchistan. The range of *obtusa* extends from the Caucasus to Lebanon eastward through southern Turkmenistan and Uzbekistan to the eastern limit of the range. In West Pakistan it is known from Waziristan southward to the Quetta Plateau.

PSEUDOCERASTES BOULENGER

Differing from *Vipera* in dorsolateral position of nostrils and presence of a deep and well-developed supranasal sac; dorsal scales with fine striations and keels that do not reach the tip of scale but terminate in small knob; supralabials with serrated lower margin and groove inside to receive lower lip; erect, hornlike scale above eye; presence of

scales between nasal and rostral and between nasal and first supralabial.

The above-mentioned features plus evidence of a distinctly different type of venom seem sufficient grounds for maintaining the genus *Pseudocerastes*, contrary to Marx and Rabb (1965) who synonymized it with *Vipera*.

There is a single species with populations distributed from the Sinai Peninsula to Waziristan.

***Pseudocerastes persicus* (Duméril and Bibron)**

PERSIAN HORNED VIPER

Cerastes persicus DUMÉRIL AND BIBRON, 1854 (1834–1854, vol. 7), p. 1443 (type locality not stated; by inference, Iran).

Pseudocerastes persicus: BOULENGER, 1896, p. 501. SMITH, 1943, p. 490.

DESCRIPTION: Head short, wide, very distinct from neck; snout blunt, rostral small, wider than high, markedly concave; eye surrounded by 16–18 small scales; 12–14 upper labials separated from eye by three rows of small scales; 14–17 lower labials; anterior chin shields large, posterior not differentiated from surrounding scales; body moderately stout, dorsoventrally flattened, tail tapering abruptly from vent; dorsal scales thin, weakly keeled except for lowest row; scale rows at midbody 23 or 25, increasing anteriorly two rows in three of five specimens, decreasing two rows in one, decreasing posteriorly to 18 or 19 rows; ventrals 146–151 (mean 148.6); subcaudals in males 43, 46, in females 42, 44; anal undivided. Largest male, 577 mm. in total length, tail 87 mm.; largest female, 548 mm., tail 70 mm. Smith (1943) gave the maximum length as 890 mm.

Dorsal ground color pale gray or bluish gray to khaki; median series of 28–33 rectangular gray or brownish gray blotches or cross bands usually much narrower than interspaces between them, a faint alternating series of spots on sides; dark band from nostril to angle of jaw, lower edges of labials white; throat in some cases with black spots; belly white; tip of tail black in larger snakes, midportion pinkish.

HABITS: Collectors report that these vipers are found in both sandy and rocky terrain to elevations of about 6000 feet. They have been taken in the open only at night and have been found by day in burrows and crevices among

rocks. They employ the sidewinding type of locomotion of many heavy-bodied desert snakes. When disturbed, they hiss loudly but are generally rather placid in disposition. Captives feed on lizards and small mammals. Shockley (1949) reported one that lived nearly four years. Two presumed young of the year, 224 and 253 mm. in length, were collected near Ormara in mid-September.

Venom of the Israeli subspecies, *fieldi*, is reported to be extremely toxic but has little hemorrhagic or local necrotizing effect (Shulov and others, 1958). Jeromie A. Anderson saw a young Mekrani who had been bitten four days previously by a horned viper. The boy was very weak and appeared to be jaundiced but seemed to be recovering.

DISTRIBUTION: This subspecies occurs from Azerbaydzhan to the head of the Persian Gulf and eastward to central Afghanistan and western Las Bela. Definite West Pakistan records are known as far east as Manguli in southwestern Kalat. *Pseudocerastes bicornis*, described from a fragmentary specimen from Gomal Pass, Waziristan, is best regarded as at most a northeastern subspecies of *persicus*.

ERISTICOPHIS ALCOCK AND FINN

This monotypic genus is restricted to desert basins of western Baluchistan and adjacent Afghanistan and Iran. Marx and Rabb (1965) defined the genus as follows: "A viperine with the dorso posterior projection of premaxilla spatulate; dorsal scale rows in straight rings; ventrals and gulars keeled; 'butterfly scaled' snout region above rostral."

***Eristicophis macmahoni* Alcock and Finn**

LEAF-NOSED VIPER

Eristicophis macmahoni ALCOCK AND FINN, 1896, p. 564 (type locality: desert south of Helmand, Baluchistan). SMITH, 1943, p. 493.

Pseudocerastes latirostris GUIBÉ, 1957, p. 136 (type locality: Tasuki, 120 kilometers from Zabol on road to Zahedan, Iran).

DESCRIPTION: Head large, wide, very distinct from neck; rostral wider than high, strongly concave, flanked laterally by two pairs of large shields, lateral edges of which projecting free, these separated from each other in midline by small scales; nostril slit-like, between nasal, supranasal, and several small scales; eye surrounded by 16–25 small

scales; 15 or 16 upper labials arranged as in *Pseudocerastes* and separated from eye by three rows of scales about twice as large as those of ocular ring; 16 or 17 lower labials; anterior chin shields large, no posterior chin shields; body stout, strongly flattened dorso-ventrally, tail tapering abruptly from vent; skin soft and loose; dorsal scales with short keels not terminating in knobs; scale rows at midbody 23-29, increase of two or four rows anteriorly and decrease to 19 or 20 rows just anterior to vent; ventrals 140-145 (mean 143.8), a pair of keels on each ventral; subcaudals in males 32-35 (mean 33.3), in females 27-31 (mean 29.3); anal undivided. Total length of two adult females, 624 and 707 mm., tail lengths 52 and 64 mm., respectively; no adult males examined.

Dorsal ground color light tan to khaki; a series of 20-25 small, black, lateral spots each surrounded partly or completely by group of smaller cream spots; young with a series of about 30 darker brown dorsal cross bands; all markings more distinct posteriorly; narrow whitish line from above eye to angle of mouth; top of head with scattered dark flecks; labials, throat, and ventral surfaces white; base of tail with distinct cross bands, tip unmarked, yellowish.

HABITS: These snakes appear to be restricted to fine loose sand and are able to bury themselves by a peculiar rocking or peristaltic motion that usually ends with a shaking of the head that leaves the snout and eyes free of sand. Jeromie A. Anderson (personal communication) wrote, "Every scale of *Eristicophis* is designed for sand burrowing, and . . . even on a hard floor it tries to burrow as though it knows no resistant surface."

These vipers appear to be wholly nocturnal and have been collected from mid-April through August. The smallest specimen, 221 mm. in total length, was collected late in June.

A specimen in captivity commonly crawled by rectilinear movement but resorted to side-winding when hurried or alarmed.

It was an alert and bad-tempered snake. When angered, it hissed loudly and raised its head and a loop of its body well above the ground in the manner of some rattlesnakes and struck with great vigor. It fed readily on mice. Prey was seized as it approached the

snake, lying buried in the sand. The snake usually retained its grip until the animal was dead or nearly so.

The venom of *Eristicophis* in experimental animals shows strong hemorrhagic activity much like that of *Echis* venom. C. J. Shaw (1925) reported presumed cases, one of them fatal.

DISTRIBUTION: The range includes the desert basin region of northwestern Baluchistan, adjacent Iran, and doubtless parts of Afghanistan. There is an unconfirmed report from the Rajasthan Desert of northwestern India. In West Pakistan, according to Jeromie A. Anderson, it occurs from Nushki to the Iranian border and southward to Kharan. All localities are at elevations below 4000 feet.

ECHIS MERREM

Small vipers similar to *Vipera* except nostrils dorsolateral; lateral scale rows strongly oblique, scales of these rows with heavy serrate keels; subcaudals undivided.

The genus occurs in northern Africa southward to Ghana and Kenya, through the Middle East from Arabia northward into southern provinces of Russian Asia, and eastward through the drier parts of India to northern Ceylon. There are two species; one occurs in West Pakistan.

***Echis carinatus* (Schneider)**

SAW-SCALED VIPER

Pseudoboa carinata SCHNEIDER, 1801 (1800-1802), p. 285 (based on Russell, 1796, pl. 2; type locality: Arni, near Madras).

Echis carinata: WAGLER, 1830, p. 177. SMITH, 1943, p. 487.

DESCRIPTION: Head short, distinctly wider than neck, snout blunt; rostral about twice as wide as high; nostril in divided nasal; eye surrounded by 13-21 small scales, superior one or two usually slightly larger than others; nine to 12 (usually 10 or 11) upper labials separated from eye by circumoculars and one additional row of scales, rarely two rows; 10-13 lower labials; anterior chin shields broad, usually followed by three pairs of slightly enlarged scales; body of moderate to somewhat slender build, slightly flattened dorsoventrally, tail short and rather abruptly tapering from vent; all dorsal scales keeled but only

keels of strongly oblique lateral rows serrate, scale rows 3 through 9 usually being so modified; scale rows at midbody 28–35 (29 or 31 in 36 of 42 specimens), reduction posteriorly to 17–21 rows, an anterior reduction of four to eight rows; ventrals 156–181 (mean 164.7), no apparent sexual dimorphism; subcaudals in males 30–35 (mean 32.3), in females 27–31 (mean 29.1); anal undivided. Total length of 19 adult males, 392–808 mm.; of 15 adult females, 345–768 mm.; tail length 9.3–11.5 per cent of total length in males, 8.1–10 per cent in females.

Dorsal ground color light buff or tan to olive brown or chestnut; a median row of 28–36 whitish spots with dark edges; sides with narrow, undulating, white line, dorsal portions of loops usually more conspicuous than ventral; top of head with light trident or arrowhead mark typically with three prongs directed posteriorly and one anteriorly; a pale stripe from eye to angle of mouth; labials light or with dark spots; belly white to pale pinkish brown stippled with dark gray; chin and throat white.

VARIATION: Four specimens, all males, from northern Baluchistan and the Northwest Frontier Provinces have higher than average ventral counts, 172–180 (mean 176.7), and more light median spots, 33–35. In other respects they do not differ significantly from the series of 42 specimens from Sind and Las Bela. There is considerable variation in ground color. The palest specimens seen were collected in sand dunes of Sanghar District; the darkest were collected on small islands near Karachi. A specimen obtained by Jeromie A. Anderson was normally patterned posteriorly but showed a distinct white vertebral stripe on the anterior two-thirds of the body.

Constable (1949) restricted the nominate subspecies to peninsular India and Ceylon and assigned all other populations to the subspecies *pyramidum*. Scale counts of West Pakistan specimens are intermediate between those given for the two subspecies. Since the sample examined by Constable was small and not representative of the species throughout its range, I have assigned no trinomial to the the West Pakistan populations.

HABITS: This amazingly adaptable snake occurs on rocky, sandy, and alluvial soils,

with vegetation varying from sparse xerophytes to moderately dense grass and scrub. In mountains near Kalat it occurs to at least 6000 feet. It generally avoids marsh and gallery forest, but I found one at the edge of Manchar Lake. Its skin was wet, and it had apparently just crawled out of the water. Jeromie A. Anderson has seen vipers on islands near the mouth of the Malir River enter salt water when pursued.

My observations differ from those of Wall (1921) and Gharpurey (1954) who reported that *Echis* is largely diurnal and may be seen during the hot season exposed to the full force of the sun. I found it almost entirely nocturnal during hot, dry weather. During the rainy season it often climbs into euphorbia, acacia, or other shrubs to heights of as much as 7 feet and basks during the early morning. These basking snakes, however, are well protected from excessive heat. During cooler weather, *Echis* is sometimes found sunning in the open but is more frequently found under stones or in mounds of dead euphorbia stalks. The snakes have been found during every month, with peak abundance late in the monsoon season and shortly afterward, viz., from August through early October. There is a secondary peak in late March at the beginning of the hot weather.

Captive specimens were observed in what appeared to be courtship behavior during late February and March, but no copulation was observed. From three to 11 embryos were found in females collected during late March and April; the smallest gravid snake measured 345 mm. A captive female gave birth to nine young on July 23. They measured 129–152 mm. except for two stillborn and deformed individuals that were smaller. Young snakes 150–160 mm. in length have been collected from early June through the first half of August.

Amphibians (seven *Rana breviceps*, one *Bufo andersoni*, and one unidentified) were found in six *Echis* stomachs. Other food items were: mammals (striped palm squirrel, unidentified mice), three stomachs; gecko (*Hemidactylus persicus*), one stomach; invertebrates (large centipedes, locusts), three stomachs. Jeromie A. Anderson reports that the vipers living on coastal islands feed on mudskippers (*Periophthalmos*). Captive

snakes fed on mice, lizards, centipedes, and locusts. In feeding, the snakes often retain their grip on prey, even rolling over in the manner of constrictors. Their venom acts quickly on mammals, more slowly on cold-blooded vertebrates, and has little effect on invertebrates. These snakes remain dangerously bad-tempered in captivity. They occasionally bite one another when annoyed. Two in my collection died from such a cause. One of them showed extensive subcutaneous hemorrhages.

When hurried, *Echis* often resorts to side-winding. This manner of locomotion is commonly used on sand and on hard surfaces such as highways. Most saw-scaled vipers seek only to escape until cornered or restrained. They then assume their peculiar defensive coil, rubbing inflated loops of the body together to make a distinctive sizzling noise. They strike quickly and repeatedly, with considerable reach for a small snake.

Two instances of singular behavior by these vipers deserve description in detail. One snake was basking in a completely barren spot soon after sunrise. When alarmed it came directly toward me, actually looping against my feet. I moved 10 feet or so in a different direction, and the snake followed. By a series of such moves I led the reptile some 40 feet from the spot where I first saw it. Each time it stopped close to my feet, and it often bit at them when I moved. In the second instance, the snake was routed out of cover in a euphorbia mound. It came directly toward me with a rapid sidewinding motion. When I side-stepped, it made for my daughter standing a few feet away. She also retreated, and the snake snapped into a defensive coil, striking at every moving object. It is easy to interpret such behavior as aggressive, but it is also possible that the snake was attracted by the shadow cast by a standing person. This might be seen by the frightened reptile as a shrub or rock offering possible refuge. Be that as it may, a barefoot person might easily be bitten under such circumstances. In this connection, one of my patients, bitten as he entered a bathhouse about dusk, said the snake "chased him round the room until it was killed."

Najib Khan (1960) reported 39 proved or suspected *Echis* bites, with three deaths observed at Hyderabad during the period from

August to November. If this report is representative, there may be several hundred cases annually in Sind and Las Bela, with perhaps 20 to 50 deaths. Clinical symptoms of poisoning, as reported by Najib Khan and confirmed by my observations on a few cases, include incoagulability of the blood, with hemorrhages internally and externally, marked local pain, fever, headache, a high incidence of serious late complications, with fatalities as late as 12 days after the bite, and poor response to treatment.

The most widely used local names for the saw-scaled viper in Sind and Las Bela are "loondee" and "khuppur." In the Karachi area it is often called "afee" and "jalabia," the latter name being also given to a pretzel-shaped sweetmeat. It is often called "krait" by Americans and Europeans.

This snake figures prominently in folklore as the "flying death of Rajputana" or "ghoramar," a snake that can leap from the sand and bite a man on a galloping horse. In Jogi legend the khuppur is an outlaw snake that once hid above the lintel of a door and bit Gogol Vir, lord of all snakes.

DISTRIBUTION: The range of *Echis carinatus* is essentially that given for the genus. It occurs throughout West Pakistan exclusive of the Himalayan region and is very plentiful throughout Sind, the lowland Punjab, and the Mekran coast.

AGKISTRODON BEAUVOIS

Maxillary fangs of viperine type; pit between eye and nostril; top of head with large symmetrical shields occasionally broken up into small scales on snout; nostrils lateral; eye with vertically elliptical pupil; no rattle on end of tail.

The genus occurs in central and south-eastern Asia, the eastern and central United States, and Middle America. There are 12 species, of which one inhabits West Pakistan.

Agkistrodon himalayanus (Günther)

HIMALAYAN PIT VIPER

Halys himalayanus GÜNTHER, 1864a, p. 393 (type locality: Garhwal, western Himalayas.)

Ancistrodon himalayanus: BOULENGER, 1890, p. 424. SMITH, 1943, p. 495.

DESCRIPTION: Head of moderate size, distinctly wider than neck, snout blunt; rostral

slightly higher than wide; nasal partially divided; two preoculars and two postoculars, lower postocular long, almost separating eye from labials; temporals irregular in size and number, usually fused with posterior labials; seven upper and nine or 10 lower labials; anterior chin shields short and broad, posterior absent; body of moderate thickness, tapering evenly posteriorly and anteriorly; dorsal scales keeled, in 21 rows at midbody, reduction to 17 posteriorly; ventrals 162; subcaudals 53 in only specimen examined (male); anal undivided. Total length, 586 mm.; tail, 96 mm.

Dorsal ground color of preserved specimen light brownish gray, with median series of dark brown blotches and poorly developed lateral series; wide black band from eye to angle of mouth; upper labials pale, with dark

stippling; belly light gray, with dark clouding and stippling.

HABITS: This is a mountain snake largely restricted to elevations above 5000 feet. It has been recorded from the foot of Dharmasala Glacier at 16,000 feet. Villagers at Liakot, Swat, said snakes conforming to the general description of this species were plentiful on the rocky, lightly wooded hillsides during warm weather but had not yet emerged at the time of our visit in late March. Wall (1928) reported that the bite of this viper is accompanied by local pain and swelling, but serious envenomation does not occur.

DISTRIBUTION: This species is confined to the western Himalayas from Sikkim to Chitral but may be locally abundant. It probably occurs throughout the Himalayan region of West Pakistan.

LIST OF SPECIMENS EXAMINED

THE SPECIMENS THAT ARE LISTED below comprise the material on which the descriptions of the species are largely based. All were examined personally. All localities are in West Pakistan unless otherwise specified. Localities are listed under political subdivisions (map 4) which are listed alphabetically. Specimens from extremely vague localities or localities that could not be found are not listed. The following abbreviations are used for the collections in which the specimens are deposited:

A.M.N.H. the American Museum of Natural History
 B.M., British Museum (Natural History), London
 C.A.S., the California Academy of Sciences, San Francisco
 C.N.H.M., Chicago Natural History Museum (now the Field Museum of Natural History), Chicago
 E.K., Eugen Kramer, Basel, Switzerland, personal collection (no numbers given)
 I.N.H.S., Illinois Natural History Survey, Urbana, Illinois
 M.S.U., Michigan State University, East Lansing, Michigan (no numbers given)
 R.S.M., Royal Scottish Museum, Edinburgh
 S.A.M., Sherman A. Minton, Indianapolis, Indiana, personal collection
 U.M.M.Z., University of Michigan Museum of Zoology, Ann Arbor
 U.S.N.M., United States National Museum, Smithsonian Institution, Washington, D.C.
 Z.S.P., Zoological Survey of Pakistan, Karachi (no numbers given)

Bufo andersoni

Hyderabad Dist.: Hyderabad, A.M.N.H. Nos. 64394–64396; 3 miles east of Tando Allahyar, A.M.N.H. Nos. 67560–67562. Karachi Dist.: Karachi, A.M.N.H. No. 62809 (5), S.A.M. No. 579 (2), U.M.M.Z. No. 122015 (6), I.N.H.S. No. 9172; Malir Cantonment, M.S.U. (3); Orangi, A.M.N.H. No. 64282. Lahore Dist.: Raiwind, A.M.N.H. Nos. 62954–62956. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. Nos. 67701–67704; 20 miles northwest of Bela, A.M.N.H. No. 67705; 35 miles north of Bund Murad Khan, A.M.N.H. No. 64393; 1.5 miles south of Uthal, A.M.N.H. No. 67004; Gandrani Caves, A.M.N.H. No. 68373. Lyallpur Dist.: Lyallpur, U.M.M.Z. No. 125629 (3). Muzaffargarh Dist.: 1.5 miles south of Muzaffargarh, A.M.N.H. No. 62950. Nawabshah

Dist.: 1.5 miles south of Moro, A.M.N.H. Nos. 62951–62953. Rawalpindi Dist.: Dina, A.M.N.H. Nos. 68374, 68375. Swat: Saidu Sherif, S.A.M. No. 681; Udigram, A.M.N.H. No. 68377. Tatta Dist.: 7 miles south of Gharo, A.M.N.H. No. 62810; 2 miles east of Gharo, A.M.N.H. Nos. 62811, 62812.

Bufo olivaceus

Mekran Dist.: Dasht River, B.M. No. 74.11.23.122. Iran: Minab, C.A.S. Nos. 86610, 86615, 86569–86571, 86595.

Bufo viridis

Kalat Dist.: 6 miles northwest of Mastung, A.M.N.H. Nos. 75182–75186. Quetta Dist.: Quetta, A.M.N.H. No. 68393; Hanna Lake, A.M.N.H. Nos. 75187, 75188. Sibi Dist.: 4 miles southeast of Kowas, A.M.N.H. No. 67568; Kach, A.M.N.H. Nos. 68390–68392; Ziarat, A.M.N.H. Nos. 67563–67567, S.A.M. No. 666.

Rana tigerina

Dadu Dist.: Manchar Lake, A.M.N.H. No. 65587. Hyderabad Dist.: 2 miles east of Hyderabad, A.M.N.H. No. 67577; 12 to 14 miles northwest of Badin, A.M.N.H. Nos. 69081, 69082. Las Bela Dist.: Hinidan Crossing, A.M.N.H. No. 64392. Montgomery Dist.: Sheikhpura, A.M.N.H. Nos. 45806–45818, 45850–45852. Nawabshah Dist.: 1.5 miles south of Moro, M.S.U. Sanghar Dist.: Jamrao Head, A.M.N.H. Nos. 67710–67713. Sibi Dist.: Sibi, A.M.N.H. No. 67578. Tatta Dist.: 5 miles northwest of Tatta, A.M.N.H. No. 63804; 5 miles west of Tatta, I.N.H.S. No. 9174; 6 miles north of Mirpur Sakro, S.A.M. No. 587; between Mirpur Sakro and Bhuro, A.M.N.H. Nos. 62820–62822; 4.5 miles south of Bhuro, A.M.N.H. No. 64535, U.M.M.Z. No. 122614; 7.5 miles east of Gharo, A.M.N.H. Nos. 65585, 65586; Dabeji, U.M.M.Z. No. 122014.

Rana limnocharis

Dadu Dist.: Manchar Lake, A.M.N.H. Nos. 65588, 65589. Hyderabad Dist.: 5 miles west of Mirpur Khas, A.M.N.H. No. 67569. Nawabshah Dist.: Naushahro Firoz, U.M.M.Z. No. 122020. Sanghar Dist.: Jamrao Head, A.M.N.H. Nos. 67706–67709. Tatta Dist.: 5 miles west of Tatta, M.S.U., I.N.H.S. No. 9175; 5 miles northwest of Tatta, A.M.N.H. Nos. 63802, 63803; 3 miles east of Bhuro, S.A.M. No. 593; 1 mile west of Bhuro, U.M.M.Z. No. 122021; 5 miles northwest of Mirpur Sakro, A.M.N.H. No. 62960; 6 miles southeast of Mirpur Sakro, A.M.N.H. No. 62961–62963, U.M.M.Z. No. 122019.

Rana cyanophlyctis

Hyderabad Dist.: 5 miles west of Mirpur Khas, A.M.N.H. Nos. 67570-67573. Kalat Dist.: 15 miles south of Wad, A.M.N.H. Nos. 67009-67013; 33 miles south of Wad, A.M.N.H. Nos. 67007, 67008; 14 miles south of Baghbana, A.M.N.H. Nos. 68378-68381. Karachi Dist.: Karachi, S.A.M. No. 612 (2), I.N.H.S. No. 9173; Orangi, A.M.N.H. Nos. 64283, 64284; Hab Chowki, A.M.N.H. Nos. 62813-62816, 65578, 65579. Lahore Dist.: Raiwind, A.M.N.H. Nos. 62957-62959. Las Bela Dist.: 11 miles north of Bela, A.M.N.H. No. 65581; Hinidan Crossing, A.M.N.H. Nos. 64390, 64391; 1 mile east of Diwana, A.M.N.H. Nos. 64385-64389; Gandrani Caves, A.M.N.H. No. 65580. Nawabshah Dist.: Naushahro Firoz, U.M.M.Z. No. 122012. Sanghar Dist.: Jamrao Head, U.M.M.Z., No. 122615. Sibi Dist.: Sibi, A.M.N.H. No. 67574; Mach, A.M.N.H. Nos. 67575, 67576. Swat: Mingora, A.M.N.H. No. 68376. Tatta Dist.: 15 miles northeast of Malir, A.M.N.H. Nos. 65582, 65583.

Rana sternosignata

Kalat Dist.: 6 miles northwest of Mastung, A.M.N.H. Nos. 75190-75193. Quetta Dist.: near Quetta, A.M.N.H. Nos. 57971-57976; Baleli, A.M.N.H. Nos. 68382-68385, S.A.M. No. 714, U.M.M.Z. No. 123422; 5 miles northeast of Bostan, S.A.M. No. 934; 12 miles east of Pishin, A.M.N.H. Nos. 68386-68389.

Rana breviceps

Karachi Dist.: 2 miles northeast of Karachi, A.M.N.H. Nos. 67579, 67580; Malir Cantonment, A.M.N.H. Nos. 64287-64289, S.A.M. No. 616, U.M.M.Z. No. 122016; Ghizri, M.S.U., U.M.M.Z. No. 123421; 4.5 miles northeast of Hab Chowki, U.M.M.Z. No. 122017, I.N.H.S. No. 9176. Tatta Dist.: 6 miles east of Landhi, A.M.N.H. No. 64286.

Chelonia mydas

Karachi Dist.: Hawke's Bay Beach, A.M.N.H. Nos. 81533-81535, 82222, 85469, I.N.H.S. No. 9188, U.M.M.Z. No. 121961, S.A.M. No. 591.

Lepidochelys olivacea

Karachi Dist.: Hawke's Bay Beach, A.M.N.H. Nos. 85470-85472, S.A.M. No. 592; near mouth of Karachi Harbor, U.M.M.Z. No. 123456.

Kachuga smithi

Dadu Dist.: 1 to 2 miles south of Sehwan, A.M.N.H. No. 91469, U.M.M.Z. No. 123452. Hyderabad Dist.: Hyderabad, S.A.M. No. 629. Larkana Dist.: Rice Canal, A.M.N.H. Nos.

86920-86922; near Dokri, A.M.N.H. Nos. 93437, 93438. Sanghar Dist.: 5 miles south of Jamrao Head, A.M.N.H. No. 85814; 7 miles southeast of Sanghar, A.M.N.H. Nos. 85595-85597. Tatta Dist.: 5 miles southeast of Tatta, A.M.N.H. No. 89328; near Sonda, U.M.M.Z. No. 123457, I.N.H.S. No. 9692.

Kachuga tecta

Dadu Dist.: 2 miles north of Sehwan, A.M.N.H. No. 89329; Manchar Lake, R.S.M. No. 1963.33.82. Hyderabad Dist.: 5 miles northwest of Saidabad, A.M.N.H. No. 91470.

Hardella thurgi

Dadu Dist.: 14 miles south of Sehwan, A.M.N.H. No. 85599. Hyderabad Dist.: Hyderabad, A.M.N.H. No. 86553; 5 miles northwest of Saidabad, A.M.N.H. Nos. 85811-85813. Karachi Dist.: 10 miles southeast of Karachi, A.M.N.H. No. 88313. Sanghar Dist.: 15 miles south of Jamrao Head, A.M.N.H. No. 87451. Sukkur Dist.: 12 miles northwest of Sukkur, A.M.N.H. No. 82004. Tatta Dist.: 5 miles southeast of Tatta, A.M.N.H. Nos. 89330, 89331, U.M.M.Z. No. 123459; near Jerruck, S.A.M. No. 630.

Geoclemys hamiltoni

Dadu Dist.: near Sehwan, A.M.N.H. No. 89333, S.A.M. No. 938. Hyderabad Dist.: 5 miles northwest of Saidabad, A.M.N.H. No. 85598, S.A.M. No. 651. Jacobabad Dist.: no specific locality, Z.S.P.

Testudo horsfieldi

Kalat Dist.: 21 miles northeast of Kalat, A.M.N.H. No. 91466. Quetta Dist.: 16 miles northeast of Quetta, A.M.N.H. No. 93440; 3 miles northeast of Quetta, U.M.M.Z. No. 123451. Sibi Dist.: 4 miles southeast of Kowas, A.M.N.H. No. 86923.

Testudo elegans

Karachi Dist.: Karachi suburbs, A.M.N.H. No. 87450, S.A.M. No. 627.

Trionyx gangeticus

Dadu Dist.: 1.5 miles south of Sehwan, S.A.M. No. 652. Hyderabad Dist.: 5 miles northwest of Saidabad, A.M.N.H. No. 85810. Sanghar Dist.: 7 miles southeast of Sanghar, A.M.N.H. No. 85592. Tatta Dist.: Indus near Tatta, A.M.N.H. Nos. 85809, 89332.

Chitra indica

Tatta Dist.: Indus near Tatta, A.M.N.H. No. 85594; Sonda, Z.S.P.

Lissemys punctata

Dadu Dist.: Amri, A.M.N.H. No. 85593. Hyderabad Dist.: Hyderabad, A.M.N.H. No. 82220. Muzaffargarh Dist.: 1.5 miles south of Muzaffargarh, A.M.N.H. No. 93439; 5 miles south of Muzaffargarh, U.M.M.Z. No. 123458. Sanghar Dist.: 7 miles southeast of Sanghar, A.M.N.H. No. 91467. Sukkur Dist.: Madeji, A.M.N.H. No. 81846. Tatta Dist.: 4 miles southeast of Jungshahi, S.A.M. No. 640; Jati, A.M.N.H. Nos. 90082, 90181; 4 miles south of Mirpur Sakro, A.M.N.H. No. 84006; 2.5 to 5 miles north of Mirpur Sakro, A.M.N.H. No. 82219, U.M.M.Z. No. 121944; Haleji Lake, A.M.N.H. No. 91468; 1 mile west of Gujjo, I.N.H.S. No. 9661.

Crocodylus palustris

Sanghar Dist.: East Nara 8 miles northeast of Sanghar, S.A.M. No. 642. Tatta Dist.: Haleji Lake, A.M.N.H. No. 96134.

Eublepharis macularius

Karachi Dist.: Hill Park, I.N.H.S. No. 9177; Malir Cantonment, A.M.N.H. Nos. 81982, 81991, 88364, U.M.M.Z. Nos. 122003, 123440, S.A.M. No. 606 (2), M.S.U.; 3 miles east of Hab Chowki, A.M.N.H. Nos. 82191, 82192, U.M.M.Z. No. 122004. Las Bela Dist.: 16 miles north of Bela, A.M.N.H. No. 87425. Quetta Dist.: 16 miles northeast of Quetta, A.M.N.H. No. 88594. Sibi Dist.: Bolan Pass near Mach, A.M.N.H. No. 86858; Kach, A.M.N.H. Nos. 88581-88583. Zhob Dist.: Cherat, A.M.N.H. No. 57594; Fort Sandeman, A.M.N.H. No. 57595; 21 miles west of Hindubagh, U.M.M.Z. No. 123439.

Bunopus tuberculatus

Chagai Dist.: near Nushki, A.M.N.H. Nos. 88525-88530, U.M.M.Z. No. 123448, S.A.M. No. 693 (2). Hyderabad Dist.: Hyderabad, B.M. No. 87.9.28.2. Kharan Dist.: near Kharan, U.M.M.Z. No. 125634. Sibi Dist.: Kach, A.M.N.H. No. 88578, S.A.M. No. 710.

Stenodactylus orientalis

Dadu Dist.: Thana Bula Khan, A.M.N.H. No. 85428; 2.5 miles south of Sehwan, A.M.N.H. No. 89326. Las Bela Dist.: Sonmiani Beach, A.M.N.H. No. 85815, I.N.H.S. No. 9567; Naka Kharari, A.M.N.H. No. 85816; Miani Hor, A.M.N.H. No. 88302. Sanghar Dist.: 5 miles south of Sanghar, A.M.N.H. No. 85560; Burra, A.M.N.H. Nos. 85817-85819, U.M.M.Z. No. 122617; 11 miles south of Jamrao Head, A.M.N.H. Nos. 85820-85822, 87445. Tatta Dist.: 2 miles east of Gharo, S.A.M. No. 613.

Stenodactylus maynardi

Chagai Dist.: 1.5 miles west of Nushki, A.M.N.H. No. 88536; 9 to 11 miles northwest of Nushki, A.M.N.H. Nos. 88539-88543, U.M.M.Z. No. 123449, S.A.M. No. 705.

Teratoscincus scincus

Chagai Dist.: 1.5 miles west of Nushki, A.M.N.H. Nos. 88531-88535, U.M.M.Z. No. 123441; 9 to 11 miles northwest of Nushki, A.M.N.H. No. 88545, S.A.M. No. 703 (2). Kharan Dist.: near Kharan, A.M.N.H. No. 92683, I.N.H.S. No. 9688.

Teratoscincus microlepis

Chagai Dist.: 1.5 miles west of Nushki, A.M.N.H. No. 88524, S.A.M. No. 692; 9 to 11 miles northwest of Nushki, A.M.N.H. No. 88544, S.A.M. No. 704.

Cyrtodactylus scaber

Dadu Dist.: 2.5 miles northwest of Tirth Lakhi, A.M.N.H. No. 84044, S.A.M. No. 637; 5 to 6 miles south of Sehwan, A.M.N.H. Nos. 89322-89325. Hyderabad Dist.: 1 mile west of Kotri, A.M.N.H. No. 86859. Larkana Dist.: Mohenjodaro, A.M.N.H. No. 84278. Las Bela Dist.: Gandrani Caves, A.M.N.H. No. 88482; 42 miles southwest of Liari, A.M.N.H. No. 88301. Sanghar Dist.: 5 miles south of Sanghar, A.M.N.H. Nos. 85558, 85559; 2 miles west of Sanghar, A.M.N.H. No. 85557, S.A.M. No. 648; Jamrao Head, A.M.N.H. No. 87427; Burra, A.M.N.H. Nos. 85827-85829, U.M.M.Z. No. 122618.

Cyrtodactylus kachhensis

Dadu Dist.: Unapur, A.M.N.H. No. 84045; 5 miles south of Sehwan, A.M.N.H. No. 89321. Karachi Dist.: Karachi, A.M.N.H. Nos. 81530, 81531; Hill Park, M.S.U.; International Airport, A.M.N.H. No. 82193, S.A.M. No. 584; 3 miles east of Landhi, A.M.N.H. No. 81529; Buleji, A.M.N.H. No. 81528; 3 miles southeast of Bund Murad Khan, A.M.N.H. No. 84043; 7 miles northwest of Karachi, U.M.M.Z. No. 122006 (5). Las Bela Dist.: 7 to 8 miles south of Diwana, A.M.N.H. Nos. 84279, 84280; 42 miles southwest of Liari, A.M.N.H. No. 88300; 2 miles west of Hab Chowki, U.M.M.Z. No. 122005 (2); 16 miles north of Bela, U.M.M.Z. No. 123447. Tatta Dist.: 2 miles west of Gharo, I.N.H.S. No. 9179; 1 mile south of Gujjo, C.N.H.M. Nos. 121571, 121572. Pir Patho, A.M.N.H. No. 89320; Jerruck, A.M.N.H. No. 82194; Haleji Lake, A.M.N.H. Nos. 81820-81822.

Cyrtodactylus watsoni

Campbellpore Dist.: 8 miles south of Campbellpore, A.M.N.H. No. 88475. Kalat Dist.: 23 miles north of Bela, A.M.N.H. No. 85825; 8 miles south of Kalat, A.M.N.H. No. 88500; 33 miles south of Wad, A.M.N.H. No. 85826; 2 miles south of Wad, A.M.N.H. Nos. 88504–88510. Las Bela Dist.: 20 miles north of Bela, A.M.N.H. No. 87426. Quetta Dist.: 7 miles northwest of Kolpur, A.M.N.H. No. 86862; 10 miles south of Quetta, S.A.M. No. 933. Sibi Dist.: Bolan Pass, A.M.N.H. No. 86860; Kach, A.M.N.H. Nos. 88579, 88580. Swat: Udigram, A.M.N.H. No. 88495.

Cyrtodactylus fedtschenkoi

Chagai Dist.: 2 miles west of Nushki, S.A.M. No. 691.

Cyrtodactylus stoliczkai

Kashmir: Kargil, C.N.H.M. No. 8687; Swat: Udigram, S.A.M. No. 683.

Agamura agamuroides

Las Bela Dist.: Gandrani Caves, S.A.M. No. 678. Iran: East of Kuh-i-Ginau, C.A.S. No. 86370.

Agamura femoralis

Chagai Dist.: Koh-i-Taftan, A.M.N.H. Nos. 92681, 92682, S.A.M. No. 860 (2), R.S.M. Nos. 1964.58.2–1964.58.9.

Agamura persica

Kalat Dist.: 23 miles north of Bela, R.S.M. No. 1962.21.33. Las Bela Dist.: 17 to 20 miles north of Bela, A.M.N.H. Nos. 87424, 90427, S.A.M. No. 673.

Tropicolotes helenae

Chagai Dist.: Mirjawa, S.A.M. No. 937. Dadu Dist.: 5 miles east of Thana Bula Khan, I.N.H.S. No. 9185; 5 miles south of Sehwan, A.M.N.H. No. 89327. Karachi Dist.: 7 miles northwest of Karachi, U.M.M.Z. Nos. 122007 (2); 2 miles southeast of Hab Chowki, A.M.N.H. No. 81827, S.A.M. No. 598; 4 miles east of Landhi, C.N.H.M. Nos. 109925, 109926, A.M.N.H. No. 81532 (2). Las Bela Dist.: Pab Hills, C.A.S. Nos. 93938–93951; 22 miles northwest of Bund Murad Khan, A.M.N.H. No. 85429; 5 to 7 miles north of Uthal, A.M.N.H. Nos. 84030–84032, C.N.H.M. No. 109927; 7 miles north of Diwana, A.M.N.H. No. 84281. Kalat Dist.: 23 miles north of Bela, A.M.N.H. Nos. 85823, 85824. Tatta Dist.: Haleji Lake, A.M.N.H. Nos. 81825, 81826, S.A.M. No. 600, C.N.H.M. No. 109924. Thar Parkar Dist.: Nabisar, I.N.H.S. No. 9689, A.M.N.H. No. 96181.

Tropicolotes depressus

Quetta Dist.: Kolpur, R.S.M. No. 1964.58.1. Sibi Dist.: Kach, A.M.N.H. No. 93003.

Hemidactylus brooki

Hyderabad Dist.: Hyderabad, A.M.N.H. No. 85430; 5 miles west of Saidabad, A.M.N.H. Nos. 85830, 85831; Badin, A.M.N.H. Nos. 88286, 88287; 14 miles northwest of Badin, A.M.N.H. Nos. 89316, 89317. Karachi Dist.: Malir Cantonment, A.M.N.H. No. 84040, S.A.M. No. 619; 1.5 miles northeast of Karachi, A.M.N.H. No. 82197; 1 mile southeast of Hab Chowki, A.M.N.H. No. 84039. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. No. 85563, I.N.H.S. No. 9606. Muzaffargarh Dist.: 1 mile south of Muzaffargarh, A.M.N.H. Nos. 81830–81832. Nawabshah Dist.: Naushahro Firoz, U.M.M.Z. No. 121979 (2); Moro, S.A.M. No. 605. Rawalpindi Dist.: Taxila, A.M.N.H. No. 88486. Sanghar Dist.: 5 miles south of Jamrao Head, A.M.N.H. Nos. 85832, 87428–87430. Swat: Saidu Sherif, A.M.N.H. No. 88487. Tatta Dist.: Garho, A.M.N.H. Nos. 84272, 84273; 4.5 miles southwest of Jerruck, A.M.N.H. Nos. 82196, 84042 (2); Jerruck, A.M.N.H. No. 85432; 3.5 miles northeast of Bhuro, A.M.N.H. Nos. 84270, 84271; 4.5 miles west of Dabeji, A.M.N.H. No. 81834; 2 miles west of Tatta, A.M.N.H. No. 81526.

Hemidactylus flaviviridis

Dadu Dist.: Thana Bula Khan, A.M.N.H. Nos. 85434–85437. Hyderabad Dist.: Hyderabad, A.M.N.H. No. 86863; 5 miles northwest of Saidabad, A.M.N.H. No. 85836; 14 miles northwest of Badin, A.M.N.H. No. 89315. Jacobabad Dist.: Shikarpur, A.M.N.H. Nos. 86864, 86865. Karachi Dist.: Karachi, A.M.N.H. Nos. 81521, 81522, 82000, 82001, 82201, 82202, 81992, U.M.M.Z. No. 121982 (3), S.A.M. No. 581 (2), I.N.H.S. No. 9566, M.S.U.; International Airport, I.N.H.S. 9178. Larkana Dist.: Mohenjo-daro, U.M.M.Z. No. 123445 (3). Muzaffargarh Dist.: 1 mile south of Muzaffargarh, A.M.N.H. Nos. 81828, 81829. Nawabshah Dist.: Naushahro Firoz, U.M.M.Z. No. 121980. Rawalpindi Dist.: Rawalpindi, A.M.N.H. Nos. 39379, 39380. Tatta Dist.: Jerruck, A.M.N.H. Nos. 82200, 85438, C.N.H.M. No. 121565.

Hemidactylus frenatus

Karachi Dist.: Karachi, A.M.N.H. Nos. 88288–88296; Municipal Sewage Farm, A.M.N.H. Nos. 84037, 84038, S.A.M. No. 638. Tatta Dist.: Mirpur Sakro, A.M.N.H. No. 84036; Garho, A.M.N.H. Nos. 84274–84276.

Hemidactylus leschenaulti

Las Bela Dist.: Bela, A.M.N.H. No. 85834; 5 miles north of Bela, A.M.N.H. Nos. 87431-87435. Sanghar Dist.: 5 miles south of Jamrao Head, A.M.N.H. No. 85833, S.A.M. No. 659.

Hemidactylus persicus

Dadu Dist.: Thana Bula Khan, A.M.N.H. No. 85433. Kalat Dist.: 23 miles north of Bela, A.M.N.H. No. 85835; 2 miles south of Wad, A.M.N.H. Nos. 88502, 88503. Karachi Dist.: Hill Park, A.M.N.H. No. 81999; International Airport, U.M.M.Z. No. 121976; 3.5 miles east of Landhi, A.M.N.H. Nos. 81989, 81990; Hab Chowki, A.M.N.H. Nos. 81527, 84034, 84035, U.M.M.Z. No. 121975. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. Nos. 85561, 85562, I.N.H.S. No. 9603; 5 miles north of Uthal, A.M.N.H. No. 84033. Sibi Dist.: Bolan Pass, A.M.N.H. No. 86866. Tatta Dist.: Haleji Lake, A.M.N.H. Nos. 81835, 81836, S.A.M. No. 601; Jerruck, A.M.N.H. No. 85431; Kalankot, A.M.N.H. Nos. 87436, 87437.

Hemidactylus triedrus

Karachi Dist.: Malir Cantonment, A.M.N.H. Nos. 87438-87442, I.N.H.S. 9605, M.S.U., U.M.M.Z. No. 121977; Mangho Pir, A.M.N.H. No. 82198. Las Bela Dist.: Hinidan Crossing, A.M.N.H. No. 96180. Tatta Dist.: 4.5 miles west of Dabeji, A.M.N.H. No. 82199, S.A.M. No. 618.

Hemidactylus turcicus

Dadu Dist.: Sehwan, A.M.N.H. No. 89319. Karachi Dist.: Karachi, A.M.N.H. Nos. 88297-88299, 82203, 82204, 81523-81525, 81833, U.M.M.Z. Nos. 121983, 121985, 121978, C.N.H.M. No. 121562, S.A.M. No. 580; Malir Cantonment, M.S.U.; Bunker Island, A.M.N.H. Nos. 87443, 87444. Tatta Dist.: 2 miles west of Tatta, U.M.M.Z. No. 121984; 3 miles east of Ghorabari, A.M.N.H. No. 84277.

Teratolepis fasciata

Tatta Dist.: Makli Hill, A.M.N.H. No. 88365; 7 miles west of Tatta, A.M.N.H. Nos. 82195, 82402, S.A.M. No. 614; Gharo, A.M.N.H. No. 87446; Malik Raj, A.M.N.H. No. 88303, I.N.H.S. Nos. 9655, 9656.

Calotes versicolor

Dadu Dist.: 5 miles southeast of Thana Bula Khan, A.M.N.H. No. 84263. Hyderabad Dist.: Hyderabad, A.M.N.H. Nos. 85440, 85441, 84260-84262; Badin, A.M.N.H. No. 88312; 2 miles south of Motari, A.M.N.H. No. 86856. Kalat Dist.: 31 miles north of Bela, A.M.N.H. No. 88519.

Karachi Dist.: Karachi, A.M.N.H. No. 81997, U.M.M.Z. Nos. 121986-121989; 2 miles southeast of Hab Chowki, A.M.N.H. No. 81987; 3.5 miles east of Landhi, I.N.H.S. No. 9180, A.M.N.H. Nos. 81983, 81984, S.A.M. No. 594 (2). Las Bela Dist.: Sonmiani Beach, A.M.N.H. No. 84264; Hinidan Crossing, A.M.N.H. No. 84265; 20 miles northwest of Bela, A.M.N.H. No. 87421; 17 miles south of Bela, A.M.N.H. No. 87420. Sanghar Dist.: Sanghar, M.S.U.; 7 miles southeast of Sanghar, A.M.N.H. No. 85574. Tatta Dist.: 4 miles north of Garho, A.M.N.H. No. 89309; 5 miles northeast of Mirpur Sakro, A.M.N.H. No. 81818; Haleji Lake, A.M.N.H. No. 81819; Ghorabari, A.M.N.H. No. 85439; 12 miles northwest of Jungshahi, A.M.N.H. No. 86857; 2 miles southwest of Jerruck, A.M.N.H. No. 86855; 4 miles northeast of Bhuro, U.M.M.Z. No. 121990. Thar Parkar Dist.: 4 miles east of Rahim-ke-Bazaar, A.M.N.H. No. 88311.

Uromastix hardwicki

Campbellpore Dist.: 7 miles south of Campbellpore, A.M.N.H. No. 88478. Dadu Dist.: Jhangar, A.M.N.H. Nos. 89307, 89308; 1 mile southeast of Thana Bula Khan, A.M.N.H. No. 82185. Karachi Dist.: Hill Park, A.M.N.H. No. 85382; International Airport, A.M.N.H. No. 81518, U.M.M.Z. No. 121963; Korangi, A.M.N.H. No. 82184; 3.5 miles east of Landhi, A.M.N.H. No. 85442; 2 miles southeast of Hab Chowki, A.M.N.H. No. 81519. Las Bela Dist.: 33 miles north of Bund Murad Khan, A.M.N.H. No. 84266. Tatta Dist.: 8 to 11 miles southeast of Landhi, A.M.N.H. Nos. 82183, 82468, 82469, I.N.H.S. No. 1816, S.A.M. No. 586; 7 miles north of Jerruck, A.M.N.H. No. 84267.

Agama nupta

Chagai Dist.: 1 mile west of Galangar, A.M.N.H. No. 96143. Dadu Dist.: Khadeji Falls, 23 miles northeast of Malir, A.M.N.H. Nos. 85839, 88308-88310, R.S.M. Nos. 1962.20.63, 1962.20.64, S.A.M. No. 677; 4 miles southeast of Thana Bula Khan, A.M.N.H. No. 84259. Kalat Dist.: 14 miles north of Baghbana, A.M.N.H. No. 88499. Karachi Dist.: Cape Monze, S.A.M. No. 596; 3 miles northeast of Hab Chowki, A.M.N.H. Nos. 82189, 82190. Las Bela Dist.: Pab Hills, R.S.M. No. 1962.20.62, S.A.M. No. 597; 1 mile east of Diwana, A.M.N.H. No. 84258. Quetta Dist.: near Quetta, A.M.N.H. Nos. 74581, 74582; 15 miles southwest of Quetta, A.M.N.H. No. 96144; 12 to 14 miles northeast of Quetta, A.M.N.H. Nos. 96145-96147; 8 miles northwest of Baleli, A.M.N.H. Nos. 96148, 96149. Sibi Dist.: Bolan Pass, A.M.N.H. No. 86854, S.A.M. No. 668; 4 miles southeast of Kowas, A.M.N.H. No. 86853.

Agama melanura

Campbellpore Dist.: 7 miles south of Campbellpore, A.M.N.H. Nos. 88476, 88477. Las Bela Dist.: Pab Hills, A.M.N.H. Nos. 88483, 88484, S.A.M. No. 688, U.M.M.Z. No. 122311, R.S.M. Nos. 1962.9.21, 1962.9.22, 1962.26.66–1962.26.72; near Ormara, R.S.M., unnumbered.

Agama tuberculata

Swat: 1 mile south of Kolalai, A.M.N.H. No. 88491; 2 miles north of Liakot, A.M.N.H. Nos. 88492–88494; Madyan, A.M.N.H. Nos. 88488–88490, S.A.M. No. 682.

Agama himalayana

Kashmir: Shimsa Kharbu, C.N.H.M. No. 8666; Godai, C.N.H.M. No. 734; Panamik, C.N.H.M. Nos. 8670–8672, 8682.

Agama caucasica

Kalat Dist.: 8 miles south of Kalat, A.M.N.H. No. 88501. Loralai Dist.: 9 miles east of Ziarat, S.A.M. No. 663; 14 miles east of Ziarat, A.M.N.H. Nos. 86848, 86849. Quetta Dist.: 16 miles north-east of Quetta, A.M.N.H. Nos. 88595, 88596; Kolpur, R.S.M. Nos. 1962.21.35, 1962.21.36. Sibi Dist.: 1 mile east of Ziarat, A.M.N.H. No. 86850, U.M.M.Z. No. 122620; 3 miles east of Ziarat, A.M.N.H. Nos. 86851, 86852; 6 miles east of Ziarat, A.M.N.H. No. 96140; 4 miles southeast of Kowas, A.M.N.H. No. 86646.

Agama agilis

Chagai Dist.: 1.5 miles south of Ahmad Wal, A.M.N.H. No. 96138; 11 miles east of Nushki, S.A.M. No. 697; 10 miles northwest of Nushki, A.M.N.H. No. 88549; Quila Safed, R.S.M. No. 1964.8.8. Dadu Dist.: 17 miles southwest of Thana Bula Khan, A.M.N.H. No. 85443; 1 mile southeast of Thana Bula Khan, A.M.N.H. No. 82186. Jhang Dist.: Bhravi Desert, U.M.M.Z. No. 125635. Kalat Dist.: 6 miles northwest of Mastung, A.M.N.H. Nos. 96135–96137; 4 miles south of Mastung, A.M.N.H. Nos. 88517, 88518; 13 miles south of Khuzdar, A.M.N.H. No. 88498. Karachi Dist.: International Airport, A.M.N.H. Nos. 81517, 81979, 82187, 82188, S.A.M. No. 585 (2); Hawke's Bay Beach, A.M.N.H. No. 86842; 2 miles southwest of Mauripur, A.M.N.H. No. 84256; Ghizri, R.S.M. No. 1964.8.7. Las Bela Dist.: 9 miles north of Bela, A.M.N.H. No. 84257; 8 miles west of Hab Chowki, A.M.N.H. No. 81817; 42 miles southwest of Liari, A.M.N.H. No. 88304; 30 miles southwest of Liari, A.M.N.H. Nos. 88305–88307. Quetta Dist.: 8 miles south of Quetta, A.M.N.H. Nos. 86843, 86844; Khanozai, A.M.N.H. No. 88589. Sanghar Dist.: 5 miles south of Sanghar, A.M.N.H. Nos. 85564, 85565; 2

miles northeast of Sanghar, M.S.U. Tatta Dist.: 10 miles southeast of Landhi, U.M.M.Z. No. 121992; Bahmbore Archeological Site, U.M.M.Z. No. 121991; 12 miles northwest of Jungshahi, A.M.N.H. No. 86845. A juvenile in the American Museum collection from 10 miles southeast of Gulistan, Quetta Dist., cannot be assigned to this species, and its identity remains uncertain.

Agama megalonyx

Quetta or Sibi Dist.: near Kolpur, R.S.M. Nos. 1964.8.12–1964.8.15, S.A.M. No. 861, A.M.N.H. Nos. 96141, 96142.

Agama rudrata

Sibi Dist.: Kach, A.M.N.H. No. 88585, S.A.M. No. 708.

Agama rubrigularis

Sibi Dist.: south of Kolpur, R.S.M. Nos. 1963.23.31–1963.23.32; 1 mile northwest of Mach, A.M.N.H. No. 96151; Dadhar, S.A.M. No. 932, A.M.N.H. No. 96150.

Phrynocephalus leuteoguttatus

Chagai Dist.: between Quetta and Nushki, A.M.N.H. Nos. 88520–88523; 8 to 10 miles northwest of Nushki, A.M.N.H. Nos. 88554–88558, S.A.M. No. 700; Nushki, U.M.M.Z. No. 123443 (2), I.N.H.S. Nos. 9769–9771; 2 miles northwest of Ahmad Wal, A.M.N.H. Nos. 88570–88573.

Phrynocephalus ornatus

Chagai Dist.: 8 to 10 miles northwest of Nushki, A.M.N.H. Nos. 88550–88553, S.A.M. No. 701, I.N.H.S. Nos. 9767, 9768; 2 miles northwest of Ahmad Wal, A.M.N.H. Nos. 88567–88569. Kharran Dist.: near Kharran, A.M.N.H. No. 88479.

Phrynocephalus scutellatus

Chagai Dist.: 1 mile north of Nushki, A.M.N.H. Nos. 88537, 88538, S.A.M. No. 706. Las Bela Dist.: near Ormara, A.M.N.H. Nos. 96156–96160.

Phrynocephalus maculatus

Chagai Dist.: Aman Bostan: A.M.N.H. Nos. 88559–88562, U.M.M.Z. No. 123442, S.A.M. No. 702. No specific locality: C.N.H.M. No. 730.

Chamaeleo zeylanicus

Thar Parkar Dist.: between Nabisar and Chachro, A.M.N.H. No. 90431, S.A.M. No. 719; Noto, U.M.M.Z. No. 123460, A.M.N.H. Nos. 90429, 90430, M.S.U., I.N.H.S. No. 9690.

Mabuya macularia

Hyderabad Dist.: Hyderabad, A.M.N.H. No. 84293; Badin, A.M.N.H. Nos. 88283–88285.

Karachi Dist.: Municipal Sewage Farm, A.M.N.H. Nos. 84064–84072. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. Nos. 85570–85572. Tatta Dist.: 8 miles east of Tatta, A.M.N.H. No. 85444; Jer-ruck, A.M.N.H. No. 85445; 4 miles north of Garho, A.M.N.H. Nos. 89312, 89313; Pir Patho, A.M.N.H. No. 89311; 3 miles east of Ghorabari, A.M.N.H. No. 84292; 4 miles south of Mirpur Sakro, A.M.N.H. No. 84063, S.A.M. No. 636, I.N.H.S. No. 9570; 4 miles west of Dabeji, A.M.N.H. No. 84291, U.M.M.Z. No. 122616; Tharro Hill, M.S.U.

Mabuya dissimilis

Dadu Dist.: Amri, A.M.N.H. Nos. 85568, 85569. Karachi Dist.: 3.5 miles east of Landhi, A.M.N.H. No. 82208. Tatta Dist.: 5 to 6 miles north of Mirpur Sakro, A.M.N.H. No. 88282, U.M.M.Z. No. 122000; 3 to 4 miles south of Mirpur Sakro, A.M.N.H. Nos. 84056–84062, I.N.H.S. Nos. 9204, 9571, U.M.M.Z. No. 122001; 4 miles north of Garho, A.M.N.H. No. 89314; 2.5 miles west of Bhuro, S.A.M. No. 623 (2).

Eumeces taeniolatus

Hyderabad Dist.: 9 miles east of Tando Allahyar, A.M.N.H. No. 86875. Karachi Dist.: International Airport, U.M.M.Z. No. 121998; 2 miles northwest of Damlhoti, A.M.N.H. No. 88281; Malir, Z.S.P.; Churma Island, A.M.N.H. No. 84053. Rawalpindi Dist.: Dina, A.M.N.H. No. 88485. Sibi Dist.: Kach, A.M.N.H. No. 88584. Tatta Dist.: 4 miles southwest of Jerruck, A.M.N.H. No. 85446; 4 miles west of Dabeji, A.M.N.H. Nos. 84052, 84290, S.A.M. No. 634; 9 miles northeast of Landhi, A.M.N.H. No. 84289; Kalankot, A.M.N.H. No. 87419; Jampir, A.M.N.H. No. 88497.

Eumeces schneideri

Karachi Dist.: International Airport, S.A.M. No. 607; Buleji, A.M.N.H. No. 81976; Malir, Z.S.P. Las Bela Dist.: Liari, A.M.N.H. No. 96217; Ormara, R.S.M. unnumbered. Tatta Dist.: 4.5 miles west of Dabeji, A.M.N.H. No. 84051.

Chalcides ocellatus

Las Bela Dist.: Ormara, R.S.M. Nos. 1963.33.16, 1963.33.17. Mekran Dist.: Astola Island, Z.S.P.

Ablepharus pannonicus

Loralai Dist.: 9 miles east of Ziarat, A.M.N.H. No. 88575, S.A.M. No. 712. Sibi Dist.: 1 mile east of Ziarat, A.M.N.H. Nos. 86873, 86874.

Ablepharus grayanus

Dadu Dist.: Sari Nai Canyon, A.M.N.H. No. 85842. Karachi Dist.: Karachi, C.N.H.M. No.

121561, A.M.N.H. Nos. 82206, 81985, 81988, 84294, I.N.H.S. No. 9184, R.S.M. No. 1962.26.14, S.A.M. No. 617; 3.5 miles northeast of Hab Chowki, U.M.M.Z. No. 122002; Churma Island, A.M.N.H. No. 84054. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. Nos. 85841, 87418; 5 miles north of Uthal, A.M.N.H. No. 84055. Tatta Dist.: 4.5 miles west of Dabeji, A.M.N.H. No. 82207.

Riopa punctata

Lahore Dist.: Jahangir Park, Lahore, S.A.M. No. 731.

Scincella himalayanum

Hazara Dist.: Shogram, Kaghan Valley, S.A.M. No. 895 (2). Kashmir: Gulmarg, A.M.N.H. Nos. 39388–39394.

Scincella ladacense

Kashmir: Mulbekh, C.N.H.M. Nos. 8690, 8691; between Srinagar and Leh, C.N.H.M. No. 8690; Kargil, C.N.H.M. No. 8688.

Ophiomorus tridactylus

Chagai Dist.: 1.5 miles west of Nushki, S.A.M. No. 689; 1.5 miles south of Ahmad Wal, A.M.N.H. No. 96239; no specific locality, C.N.H.M. No. 731. Dadu Dist.: Sari Nai Canyon, A.M.N.H. No. 85843. Karachi Dist.: Karachi, A.M.N.H. No. 86876; Clifton, M.S.U.; Hill Park, A.M.N.H. No. 82205, S.A.M. No. 608, 4 miles northeast of Karachi, U.M.M.Z. No. 121999; Malir Cantonment, A.M.N.H. No. 86880; Ghizri, A.M.N.H. Nos. 86877–86879. Las Bela Dist.: Sonmiani Beach, A.M.N.H. Nos. 85845–85848, I.N.H.S. No. 9568, S.A.M. No. 656. Quetta Dist.: near Quetta, A.M.N.H. Nos. 75607–75611. Afghanistan: Dashti-Margo, A.M.N.H. Nos. 74578, 77109.

Ophiomorus blanfordi

Mekran Dist.: Jiواني, C.N.H.M. No. 43437.

Acanthodactylus cantor

Chagai Dist.: 8 to 11 miles northwest of Nushki, A.M.N.H. Nos. 88574, 96182–96188, S.A.M. No. 696; 2 miles northwest of Ahmad Wal, A.M.N.H. Nos. 88565, 88566. Dadu Dist.: Unapur, A.M.N.H. No. 84046; 1 mile southeast of Thana Bula Khan, A.M.N.H. No. 82215; Sari Nai Canyon, A.M.N.H. Nos. 85850, 85851. Karachi Dist.: Karachi, U.M.M.Z. No. 121994, R.S.M. Nos. 1964.58.19–1964.58.21; Clifton, A.M.N.H. No. 81516; Hawke's Bay Beach, U.M.M.Z. Nos. 122993 (2), 121995 (3), M.S.U., S.A.M. No. 609, I.N.H.S. No. 9183; International Airport, A.M.N.H. Nos. 81513–81515. Las Bela Dist.: 8 to 10 miles west of Hab Chowki, A.M.N.H. Nos. 81837, 81838,

S.A.M. No. 603 (2); Bela, A.M.N.H. No. 84282; Miani Hor, A.M.N.H. Nos. 84284–84286, 88270–88272; Hinidan Crossing, A.M.N.H. Nos. 88273, 84283; Ormara, R.S.M. Nos. 1964.58.17, 1964.58.18. Mianwali Dist.: 12 miles south of Mianwali, A.M.N.H. Nos. 88473, 88474, S.A.M. No. 687. Sanghar Dist.: 5 miles south of Sanghar, A.M.N.H. No. 85573. Tatta Dist.: 3 miles west of Gharo, A.M.N.H. Nos. 81511, 81512; Pir Patho, A.M.N.H. No. 89310.

Acanthodactylus micropholis

Kalat Dist.: 23 miles north of Bela, A.M.N.H. No. 85849. Las Bela Dist.: 16 to 20 miles north of Bela, A.M.N.H. Nos. 87422, 87423, U.M.M.Z. No. 123446, S.A.M. No. 672; 30 miles southwest of Liari, A.M.N.H. Nos. 88266–88269.

Eremias velox

Chagai Dist.: 6 miles southeast of Nushki, R.S.M. No. 1964.58.14. Kalat Dist.: 4 miles northeast of Mastung, A.M.N.H. Nos. 88512–88516, U.M.M.Z. No. 123444; 6 miles northwest of Mastung, A.M.N.H. No. 96215. Quetta Dist.: Khanozai, A.M.N.H. No. 88588; 11 miles west of Khanozai, A.M.N.H. No. 96216; 4 miles southwest of Pishin, A.M.N.H. Nos. 88592, 88593; Panjpai, A.M.N.H. No. 96212; Urak, A.M.N.H. No. 96214. Sibi Dist.: Kach, A.M.N.H. Nos. 88586, 88587, 96206–96210; 4 miles southwest of Kach, A.M.N.H. No. 96213; 1.5 miles northeast of Kolpur, A.M.N.H. No. 96211; 1 mile east of Ziarat, A.M.N.H. Nos. 86868–86870, S.A.M. No. 662; 5 miles northwest of Ziarat, A.M.N.H. No. 88576.

Eremias acutirostris

Chagai Dist.: 8 to 11 miles northwest of Nushki, A.M.N.H. Nos. 88547, 88548, 96190, S.A.M. No. 698; 2 miles northwest of Ahmad Wal, A.M.N.H. No. 88564.

Eremias guttulata

Chagai Dist.: Qila Safed, R.S.M. No. 1964.58.15; Aman Bostan, A.M.N.H. No. 88563. Hyderabad Dist.: 7 miles southwest of Kotri, A.M.N.H. No. 85567. Kalat Dist.: 26 miles south of Wad, A.M.N.H. Nos. 85855, 85856; 6 miles northwest of Mastung, A.M.N.H. Nos. 96203, 96204. Las Bela Dist.: 11 miles north of Bela, A.M.N.H. Nos. 84047, 84048, U.M.M.Z. No. 121997; 2.5 miles northeast of Diwana, A.M.N.H. Nos. 85547–85549, S.A.M. No. 647; Gandrani Caves, A.M.N.H. No. 88480; Hinidan Crossing, A.M.N.H. No. 88274; 30 miles southwest of Liari, A.M.N.H. No. 88278. Quetta Dist.: Quetta, A.M.N.H. Nos. 74583–74585; 2 miles northwest of Quetta, A.M.N.H. Nos. 96198, 96199; near Baleli,

A.M.N.H. Nos. 96194–96197; 10 miles northwest of Baleli, A.M.N.H. No. 96202; 11 miles south of Quetta, A.M.N.H. No. 96201; Hanna Lake, A.M.N.H. Nos. 96191–96193; 3 miles northwest of Kolpur, A.M.N.H. No. 86867, R.S.M. No. 1964.58.16; Khanozai, A.M.N.H. No. 88590; Sariman, A.M.N.H. No. 88591. Sanghar Dist.: 5 miles south of Sanghar, A.M.N.H. No. 85566; 2 miles northeast of Sanghar, M.S.U. Sibi Dist.: 5 miles northwest of Ziarat, A.M.N.H. No. 88577; 1 mile east of Ziarat, S.A.M. No. 713, I.N.H.S. No. 9657.

Eremias scripta

Chagai Dist.: 11 miles northwest of Nushki, A.M.N.H. No. 88546, S.A.M. No. 699; Galangar, R.S.M. Nos. 1963.23.1, 1963.23.2.

Eremias brevirostris

Las Bela Dist.: Miani Hor, A.M.N.H. Nos. 84287, 88275, 88276; 30 miles southwest of Liari, A.M.N.H. No. 88277.

Ophisops jerdoni

Dadu Dist.: Sari Nai Canyon, A.M.N.H. Nos. 85852, 85853. Hyderabad Dist.: 5 miles northwest of Saidabad, A.M.N.H. No. 85854. Kalat Dist.: 3.5 miles south of Wad, A.M.N.H. No. 88511. Kalat or Sibi Dist.: 1 mile south of Kolpur, A.M.N.H. No. 86872. Karachi Dist.: Karachi, C.N.H.M. No. 121559, I.N.H.S. No. 9182; 2 miles east of Hab Chowki, A.M.N.H. No. 82209; International Airport, A.M.N.H. Nos. 82210–82212, 81839, 81840; 3 miles southwest of Bund Murad Khan, A.M.N.H. No. 84049; Cape Monze, U.M.M.Z. No. 121996; Buleji, S.A.M. No. 582. Lahore Dist.: near Raiwind, A.M.N.H. No. 81814. Las Bela Dist.: 8 miles south of Diwana, A.M.N.H. No. 84288; 2 miles west of Hab Chowki, C.N.H.M. No. 121560; 28 miles north of Bund Murad Khan, C.N.H.M. No. 121588. Swat: near Saidu Sherif, A.M.N.H. Nos. 81842–81845, S.A.M. No. 604. Tatta Dist.: 15 miles northwest of Malir, A.M.N.H. No. 84050; 2.5 miles west of Bhuro, A.M.N.H. No. 82214; 9 miles southeast of Thana Bula Khan, C.N.H.M. Nos. 121556, 121557; 4.5 miles southwest of Jerruck, A.M.N.H. No. 82213. Thar Parkar Dist.: 4 miles east of Rahim-ke-Bazaar, A.M.N.H. Nos. 82279, 82280.

Varanus bengalensis

Dadu Dist.: Khadeji Falls, A.M.N.H. No. 86881. Hyderabad Dist.: 12 miles northwest of Badin, A.M.N.H. No. 89306. Karachi Dist.: between Hawke's Bay and Mauripur, U.M.M.Z. No. 121965; Darsano Chano, S.A.M. No. 626; Hill Park, A.M.N.H. No. 84073; Korangi, A.M.N.H. No. 86883. Las Bela Dist.: Hab

Chowki, A.M.N.H. No. 81520. Sanghar Dist.: 15 miles south of Jamrao Head, A.M.N.H. No. 87447. Swat: Udigram, A.M.N.H. No. 88496. Tatta Dist.: 9 miles southeast of Landhi, A.M.N.H. Nos. 85450, 85451; 11 miles southeast of Landhi, I.N.H.S. No. 9208; 8 miles east of Landhi, A.M.N.H. No. 82218; Gujjo, A.M.N.H. No. 86882; 3 miles east of Ghorabari, A.M.N.H. No. 84295; 7 miles west of Tatta, A.M.N.H. No. 82216; 3 miles south of Mirpur Sakro, A.M.N.H. No. 82217.

Varanus griseus

Chagai Dist.: 11 miles northwest of Nushki, S.A.M. No. 694. Hyderabad Dist.: near Bholari, M.S.U., A.M.N.H. No. 87448. Jhang Dist.: Bhravi Desert, U.M.M.Z. No. 125639. Karachi Dist.: Ghizri, U.M.M.Z. No. 123438, A.M.N.H. No. 87449; Clifton, S.A.M. No. 645; 4 miles east of Landhi, A.M.N.H. No. 86884. Tatta Dist.: 3 miles northeast of Gharo, A.M.N.H. No. 82002; Jungshahi, A.M.N.H. No. 88361.

Typhlops braminus

Karachi Dist.: Karachi, C.N.H.M. No. 121563, M.S.U., A.M.N.H. Nos. 81847, 85454, 85576, 85853, 85857, 86885, 87452; Hill Park, A.M.N.H. No. 85577; 0.5 mile east of Karachi, A.M.N.H. No. 85453, S.A.M. No. 599, U.M.M.Z. No. 121974; Clifton, A.M.N.H. No. 82168. Lahore Dist.: Shalimar Gardens, Lahore, A.M.N.H. No. 88436, S.A.M. No. 680. Peshawar Dist.: 5 miles south of Peshawar, A.M.N.H. No. 88442. Tatta Dist.: Tatta, R.S.M. No. 1962.21.58; Pir Patho, A.M.N.H. No. 89301; 4 miles south of Jerruck, A.M.N.H. No. 85452.

Typhlops porrectus

Karachi Dist.: Karachi, A.M.N.H. Nos. 84015, 84016, 84250, 84251, 88466, 89302, 89303, S.A.M. No. 602 (2), I.N.H.S. No. 9335. Lahore Dist.: Shalimar Gardens, Lahore, A.M.N.H. No. 88437. Tatta Dist.: Tatta, U.M.M.Z. No. 123429.

Leptotyphlops macrorhynchus

Dadu Dist.: Amri, A.M.N.H. No. 85575. Karachi Dist.: Karachi, A.M.N.H. No. 84252, S.A.M. No. 643 (2); Ghizri, R.S.M. No. 1962.26.123. Las Bela Dist.: Pattro Pass, Pab Hills, R.S.M. No. 1963.20.67. Sanghar Dist.: 11 miles southwest of Jamrao Head, A.M.N.H. No. 85859.

Leptotyphlops blanfordi

Tatta Dist.: Malik Raj, S.A.M. No. 675, R.S.M. No. 1962.9.30.

Eryx johnei

Hyderabad Dist.: 3 miles east of Tando Allahyar, A.M.N.H. No. 86886. Karachi Dist.: Ghizri, U.M.M.Z. No. 123430; Malir Cantonment, M.S.U., I.N.H.S. No. 9186; Hawke's Bay Beach, S.A.M. No. 831; International Airport, A.M.N.H. No. 81504; 1 to 3 miles east of Landhi, A.M.N.H. Nos. 81503, 84010. Las Bela Dist.: 1 mile west of Hab Chowki, U.M.M.Z. No. 123841. Nawabshah Dist.: 3 miles north of Dalatpur, A.M.N.H. No. 86887. Sanghar Dist.: Jamrao Head, A.M.N.H. No. 87455. Tatta Dist.: 3 to 5 miles west of Dabeji, A.M.N.H. No. 84009, M.S.U., U.M.M.Z. No. 121964, S.A.M. No. 589; 7 to 9 miles east of Landhi, A.M.N.H. Nos. 81505, 86888; 1 mile east of Gharo, A.M.N.H. No. 86889; 2 miles west of Gharo, A.M.N.H. Nos. 84007, 89275; Jampir, A.M.N.H. No. 88453; Bhambore archeological site, A.M.N.H. No. 84008; 3 miles southeast of Tatta, A.M.N.H. No. 89274. Thar Parkar Dist.: near Nabisar, A.M.N.H. No. 91571.

Eryx conicus

Hyderabad Dist.: 3 miles west of Mirpur Khas, A.M.N.H. No. 87454. Karachi Dist.: Hill Park, A.M.N.H. No. 89273. Sanghar Dist.: 9 miles northeast of Sanghar, S.A.M. No. 649. Tatta Dist.: near Tatta, U.M.M.Z. No. 125641; Jati, U.M.M.Z. No. 125640; Pir Patho, I.N.H.S. No. 9693.

Eryx tataricus

Chagai Dist.: 2 miles west of Ahmad Wal, S.A.M. No. 936.

Python molurus

Tatta Dist.: 6 miles southeast of Tatta, S.A.M. No. 939; Haleji Lake, Z.S.P. Thar Parkar Dist.: No specific locality, Z.S.P.

Coluber ventromaculatus

Karachi Dist.: Karachi, A.M.N.H. Nos. 85455, 88465; International Airport, A.M.N.H. No. 85580, U.M.M.Z. No. 122609; Ghizri, A.M.N.H. No. 89294, U.M.M.Z. No. 123433; Hill Park, A.M.N.H. No. 84020, I.N.H.S. No. 9206; 1 mile east of Karachi, A.M.N.H. No. 84246; 3.5 miles northeast of Karachi, A.M.N.H. No. 81994; 2 miles east of Landhi, A.M.N.H. No. 82001; Clifton, A.M.N.H. Nos. 84021, 85867; Malir Cantonment, A.M.N.H. No. 81506. Larkana Dist.: Mohenjo-daro, A.M.N.H. No. 84245. Las Bela Dist.: 2 miles west of Hab Chowki, A.M.N.H. No. 85864; Hinidan Crossing, A.M.N.H. No. 88257. Sanghar Dist.: 11 miles southwest of Jamrao Head, A.M.N.H. Nos. 85865, 85866. Tatta Dist.: Jampir, A.M.N.H. Nos. 88258,

88259; 4 miles west of Dabeji, A.M.N.H. No. 85302; 2 miles west of Gharo, S.A.M. No. 588; between Pir Patho and Gullham Ullah, U.M.M.Z. No. 123428.

Coluber rhodorachis

Dadu Dist.: Khadeji Falls, A.M.N.H. No. 85863. Karachi Dist.: Karachi, A.M.N.H. Nos. 85578, 86898, 87481; Hill Park, A.M.N.H. Nos. 84247, 85301, 85579, 89293, I.N.H.S. No. 9569; 3 miles northeast of Hab Chowki, S.A.M. No. 620, M.S.U.; Churma Island, A.M.N.H. No. 84022. Las Bela Dist.: Gandrani Caves, S.A.M. No. 679; Pab Hills, U.M.M.Z. No. 121970, A.M.N.H. No. 85456. Peshawar Dist.: 5 miles south of Peshawar, A.M.N.H. No. 88439, S.A.M. No. 686. Sibi Dist.: Kach, A.M.N.H. No. 88470; 5 miles northwest of Ziarat, A.M.N.H. No. 88468; 7 miles southwest of Ziarat, S.A.M. No. 711. Tatta Dist.: 5 miles southwest of Jerruck, A.M.N.H. No. 82181.

Coluber karelini

Chagai Dist.: 2 miles east of Nushki, A.M.N.H. No. 96222; 10 to 12 miles northwest of Nushki, R.S.M. No. 1962.26.112, A.M.N.H. No. 87460, S.A.M. No. 695, U.M.M.Z. No. 123436; 2 miles northwest of Ahmad Wal, A.M.N.H. No. 88464; Chagai, C.N.H.M. Nos. 140277, 140278. Quetta Dist.: near Pishin, S.A.M. No. 931, A.M.N.H. No. 96219; 2 miles east of Hanna, A.M.N.H. No. 96220. (The specimens from Chagai District may represent an undescribed form, perhaps related to *rhodorachis*.)

Coluber fasciolatus

Hyderabad Dist.: 14 miles northwest of Badin, A.M.N.H. No. 89292. Larkana Dist.: near Larkana, S.A.M. No. 653; Mohenjo-daro, U.M.M.Z. No. 123423. Tatta Dist.: 4 miles east of Tatta, A.M.N.H. No. 88260; Pir Patho, A.M.N.H. Nos. 89155, 89291, R.S.M. No. 1962.26.97; 1 mile east of Sonda, I.N.H.S. No. 9659.

Coluber ravergieri

Kalat Dist.: Mastung, R.S.M. No. 1964.58.19. Loralai Dist.: 9 miles east of Ziarat, S.A.M. No. 664. Quetta Dist.: near Pishin, A.M.N.H. No. 96221.

Sphalerosophis atriceps

Karachi Dist.: Karachi, U.S.N.M. No. 18490; International Airport, A.M.N.H. No. 88363; 4 miles north of Karachi, S.A.M. No. 621; 3.5 miles east of Landhi, A.M.N.H. Nos. 82171, 88362; Malir Cantonment, A.M.N.H. No. 85458, S.A.M. Nos. 595, 611; 12 miles northeast of Malir,

A.M.N.H. No. 87670. Las Bela Dist.: 5 miles north of Bela, U.M.M.Z. No. 123424; near Diwana, E.K. Nawabshah Dist.: 1 mile south of Moro, S.A.M. No. 669. Quetta Dist.: Quetta, U.S.N.M. No. 52142. Sibi Dist.: 9 miles northeast of Kach, A.M.N.H. No. 91570; 1.5 miles southwest of Kach, A.M.N.H. No. 96232; 1 mile north of Kowas, A.M.N.H. No. 96231. Tatta Dist.: Jungshahi, M.S.U.; 8 miles north of Jerruck, A.M.N.H. No. 81978.

Sphalerosophis diadema

Las Bela Dist.: near Ormara, R.S.M. No. 1965.25.10, S.A.M. No. 896. Quetta Dist.: 9 miles northeast of Pishin, A.M.N.H. Nos. 96229, 96230; 5 miles southwest of Pishin, A.M.N.H. No. 88467; Quetta, U.S.N.M. No. 52143. Rawalpindi Dist.: Rawalpindi, Z.S.P. Swat: Udigram, A.M.N.H. No. 88438, S.A.M. No. 684.

Sphalerosophis arenarius

Dadu Dist.: no specific locality, A.M.N.H. No. 87669. Karachi Dist.: Karachi, A.M.N.H. No. 84017; Ghizri, R.S.M. Nos. 1962.26.100, 1962.26.101, 1962.26.117, A.M.N.H. Nos. 89152, 89153; Malir Cantonment, A.M.N.H. No. 84248, C.N.H.M. No. 109928; Landhi, A.M.N.H. No. 82003; 3.5 miles east of Landhi, S.A.M. No. 641. Las Bela Dist.: 3 miles east of Naka Kharari, A.M.N.H. No. 84255; 16 miles northwest of Sonmiani, A.M.N.H. No. 91479; 10 miles west of Hab Chowki, U.M.M.Z. No. 122612.

Ptyas mucosus

Dadu Dist.: Amri, A.M.N.H. No. 85861. Hyderabad Dist.: 12 miles north of Badin, U.M.M.Z. No. 125642. Quetta Dist.: 9 miles northeast of Pishin, A.M.N.H. No. 96227; 5 miles northeast of Bostan Junction, S.A.M. No. 935. Tatta Dist.: Tatta, R.S.M. No. 1962.26.94; 3 miles east of Tatta, A.M.N.H. No. 85862; Tharro Hill, A.M.N.H. No. 91480; 4 miles west of Tatta, S.A.M. No. 583; 4 miles south of Mirpur Sakro, A.M.N.H. 84244, 87668; 6 miles south of Bhuro, A.M.N.H. No. 87667; near Sonda, A.M.N.H. No. 88451.

Eirenis persica

Bannu Dist.: Parachinar, B.M. No. 1907.7.31.10. Chagai Dist.: near Nushki, R.S.M. No. 1963.23.198. Las Bela Dist.: 10 miles west of Liari, S.A.M. No. 894. Mardan Dist.: Malakand Agency, B.M. Nos. 1900.7.10.13, 1900.7.10.14. Quetta Dist.: Spezand, Z.S.P., Swat: Udigram, S.A.M. No. 685. Waziristan: no specific locality: B.M. Nos. 1923.10.13.41, 1923.10.13.42.

Lytorhynchus maynardi

Chagai Dist.: 1.5 miles west of Nushki, A.M.N.H. Nos. 88458-88460, M.S.U., I.N.H.S. No. 9658, S.A.M. No. 690, U.M.M.Z. No. 123435; 8 to 10 miles northwest of Nushki, A.M.N.H. Nos. 88461-88463.

Lytorhynchus paradoxus

Dadu or Hyderabad Dist.: Baran Nai near Bholari, A.M.N.H. No. 89295. Muzaffargarh Dist.: 11 miles south of Fatehpur, A.M.N.H. No. 88446. Sanghar Dist.: Jamrao Head, A.M.N.H. No. 87461; Burra, S.A.M. No. 658. Thar Parkar Dist.: Umarmot, E.K.

Lytorhynchus ridgewayi

Quetta Dist.: 7 miles south of Quetta, S.A.M. No. 667; 5 miles northwest of Kolpur, A.M.N.H. No. 86897. Sibi Dist.: Kolpur, A.M.N.H. Nos. 96223, 96224.

Lycodon striatus

Hyderabad Dist.: 11 miles south of Hala, A.M.N.H. No. 86893. Jacobabad Dist.: Jacobabad, S.A.M. No. 657. Karachi Dist.: Malir Cantonment, A.M.N.H. No. 86896. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. No. 87462; 2.5 miles west of Hab Chowki, R.S.M. No. 1963.33.15; Hinidan Crossing, A.M.N.H. No. 96226. Nawabshah Dist.: 13 miles northeast of Sakrand, A.M.N.H. No. 88449. Quetta Dist.: 11 miles southwest of Quetta, S.A.M. No. 661; Hazarganji Game Preserve, 15 miles southwest of Quetta, A.M.N.H. No. 96225. Tatta Dist.: Tatta, R.S.M. Nos. 1962.21.52-1962.21.56, I.N.H.S. No. 9691; 5 miles south of Tatta, A.M.N.H. No. 89286; Pir Patho, R.S.M. No. 1962.21.57; between Pir Patho and Gullham Ullah, U.M.M.Z. No. 123427; 6 miles east of Landhi, A.M.N.H. Nos. 86894, 86895.

Lycodon travancoricus

Hyderabad Dist.: Hyderabad, C.N.H.M. No. 42211.

Oligodon taeniolatus

Dadu Dist.: Amri, A.M.N.H. No. 85584. Karachi Dist.: 1 mile east of Karachi, A.M.N.H. No. 84018; 2.5 miles southeast of Mauripur, A.M.N.H. No. 81986; Malir, S.A.M. No. 615. Las Bela Dist.: 5 miles north of Bela, A.M.N.H. No. 87463; Pab Hills, R.S.M. No. 1962.26.129. Rawalpindi Dist.: Rawalpindi, A.M.N.H. No. 89290. Tatta Dist.: Tatta, R.S.M. No. 1962.26.128; Makli Hill, A.M.N.H. No. 88452; 3 miles west of Dabeji, A.M.N.H. No. 84019.

Oligodon arnensis

Larkana Dist.: Larkana, S.A.M. No. 654. Tatta Dist.: Tatta, R.S.M. Nos. 1962.26.130-1962.26.133; between Tatta and Kalankot, A.M.N.H. No. 88255.

Xenochrophis piscator

Hyderabad Dist.: Badin, A.M.N.H. No. 88265. Jhang Dist.: Shorkot, U.M.M.Z. No. 125647. Jacobabad Dist.: 12 miles southeast of Shikarpur, A.M.N.H. No. 86892. Tatta Dist.: between Mirpur Sakro and Bhuro, A.M.N.H. Nos. 87464-87472, 82421-82423, 82169, 85303, I.N.H.S. No. 9572, S.A.M. No. 631; 5 to 6 miles north of Mirpur Sakro, A.M.N.H. Nos. 88261, 88262, 88264, U.M.M.Z. No. 122610; 1 mile east of Mirpur Sakro, A.M.N.H. Nos. 88263, 88330; Kalankot, A.M.N.H. Nos. 88455-88457, U.M.M.Z. No. 123426; 9 miles south of Bhuro, A.M.N.H. Nos. 89287, 89288.

Xenochrophis cerasogaster

Dadu Dist.: Near Sehwan, A.M.N.H. Nos. 85581, 85582. Hyderabad Dist.: near Badin, A.M.N.H. Nos. 89276-89278. Sanghar Dist.: 7 miles southeast of Sanghar, A.M.N.H. No. 85583. Tatta Dist.: Kalankot, A.M.N.H. Nos. 87476-87480; 1 mile west of Tatta, A.M.N.H. No. 89279, I.N.H.S. No. 9574; near Pir Patho, A.M.N.H. Nos. 89280, 89281; near Jati, A.M.N.H. Nos. 89282-89284; 4 miles south of Mirpur Sakro, S.A.M. No. 632, A.M.N.H. No. 85457, U.M.M.Z. No. 122611, C.N.H.M. No. 121569.

Amphiesma stolata

Peshawar Dist.: 5 miles south of Peshawar, A.M.N.H. Nos. 88440, 88441, 88444. Tatta Dist.: Mirpur Sakro, A.M.N.H. No. 96218; 3.5 miles north of Mirpur Sakro, S.A.M. No. 633; near Jati, A.M.N.H. No. 89289; 2 miles east of Bhuro, A.M.N.H. No. 85304.

Boiga trigonata

Campbellpore Dist.: 10 miles north of Basal, A.M.N.H. No. 88445. Hyderabad Dist.: 10 miles north of Kotri, A.M.N.H. No. 86890; 3 miles north of Saidabad, A.M.N.H. No. 86891; 12 miles north of Badin, U.M.M.Z. No. 125642. Karachi Dist.: Karachi, A.M.N.H. Nos. 81507, 81508, M.S.U., U.M.M.Z. No. 121973; Hill Park, S.A.M. No. 628, A.M.N.H. No. 85300; 3.5 miles east of Landhi, A.M.N.H. Nos. 82172, 82173. Muzaffargarh Dist.: 9 miles south of Fatehpur, A.M.N.H. No. 88447. Rawalpindi Dist.: Rawalpindi, A.M.N.H. No. 39387. Tatta Dist.: Tatta, R.S.M.

Nos. 1962.26.95, 1962.26.96; 1 mile west of Tatta, A.M.N.H. No. 89298; Jerruck, I.N.H.S. No. 9573; 3 miles west of Dabeji, A.M.N.H. No. 81509; 2 miles west of Gharo, A.M.N.H. No. 84243; 6 miles east of Landhi, A.M.N.H. No. 84014; 8 miles east of Landhi, C.N.H.M. No. 121568.

Psammophis schokari

Chagai Dist.: near Nushki, R.S.M. Nos. 1962.26.107, 1962.26.108; no specific locality, C.N.H.M. No. 732. Dadu Dist.: Khadeji Falls, M.S.U. Hyderabad Dist.: 3 miles north of Hyderabad, A.M.N.H. No. 88450. Karachi Dist.: 6 miles northwest of Karachi, S.A.M. No. 610; Ghizri, U.M.M.Z. No. 123425. Las Bela Dist.: Pab Hills, R.S.M. No. 1962.26.110; 10 miles west of Hab Chowki, A.M.N.H. No. 82170; Naka Kharari, A.M.N.H. No. 85298. Sanghar Dist.: 8 miles south of Jamrao Head, A.M.N.H. No. 87475. Tatta Dist.: 7 miles east of Landhi, A.M.N.H. No. 81998; 9 miles southeast of Landhi, A.M.N.H. No. 85299; 3 miles northeast of Jerruck, A.M.N.H. No. 88454; Makli Hill, C.N.H.M. No. 121566. Thar Parkar Dist.: 5 miles east of Rahim-ke-Bazaar, S.A.M. No. 823; Umarkot, E.K.

Psammophis leithi

Karachi Dist.: 2 miles west of Malir, A.M.N.H. No. 89285; 6 miles northeast of Hab Chowki, A.M.N.H. No. 84249; Hawke's Bay Beach, A.M.N.H. No. 85860; 1.5 miles east of Landhi, A.M.N.H. No. 84012. Las Bela Dist.: 8 miles west of Hab Chowki, U.M.M.Z. No. 121971. Sanghar Dist.: Sanghar, A.M.N.H. No. 85585. Tatta Dist.: 1 mile south of Gujjo, C.N.H.M. No. 121570; 1 mile north of Bhuro, A.M.N.H. No. 87666; 2 miles east of Bhuro, S.A.M. No. 624; 1.5 miles northeast of Mirpur Sakro, A.M.N.H. No. 84013; 4 miles south of Mirpur Sakro, I.N.H.S. No. 9205; 3 miles east of Debeji, A.M.N.H. No. 81850; Malik Raj, U.M.M.Z. No. 123432.

Psammophis lineolatus

Quetta Dist.: 12 miles southwest of Quetta, S.A.M. No. 660.

Psammophis condanarus

Tatta Dist.: Pir Patho, S.A.M. No. 676; Sujawal, A.M.N.H. No. 92684.

Enhydryis pakistanica

Tatta Dist.: Jati, A.M.N.H. No. 89296, U.M.M.Z. No. 123843; Shah Bundar, S.A.M. No. 718, A.M.N.H. No. 96233.

Hydrophis cyanocinctus

Karachi Dist.: Karachi, U.M.M.Z. Nos. 64489, 122613; Ghizri Creek, A.M.N.H. No. 88252, 9.A.M. No. 670; off Cape Monze, A.M.N.H. No. S1572, R.S.M. Nos. 1963.20.16, 1963.20.17; 12 miles off Karachi, S.A.M. No. 821; Korangi Creek, A.M.N.H. No. 86908, R.S.M. No. 1963.20.18; Yari Creek, A.M.N.H. No. 87489. Las Bela Dist.: off Ormara, R.S.M. Nos. 1963.-33.16, 1963.33.20.

Hydrophis spiralis

Tatta Dist.: Khara Coast off Indus delta, R.S.M. No. 1963.20.28, S.A.M. No. 820.

Hydrophis lapemoides

Karachi Dist.: Hawke's Bay, S.A.M. No. 715. Persian Gulf: latitude 26° 39' N., longitude 50° 07' E., C.N.H.M. No. 82577.

Hydrophis caerulescens

Karachi Dist.: Korangi Creek, R.S.M. No. 1963.20.27.

Hydrophis mamillaris

Karachi Dist.: Korangi Creek, A.M.N.H. No. 90433. Las Bela Dist.: Sonmiani Beach, S.A.M. No. 655.

Enhydryna schistosa

Karachi Dist.: off Karachi, A.M.N.H. Nos. 81855-81863, M.S.U., U.M.M.Z. No. 121962, I.N.H.S. No. 9068; Karachi Harbor, A.M.N.H. No. 87488, Turtle Cove near Buleji, A.M.N.H. No. 81851; Churma Island, A.M.N.H. No. 84023, S.A.M. No. 639; Korangi Creek, A.M.N.H. No. 86902+brood, A.M.N.H. Nos. 86903-86906; mouth of Malir River, A.M.N.H. Nos. 86899-86901. Las Bela Dist.: Sonmiani Beach, U.M.M.Z. No. 125655. Mekran Dist.: off Gwadar, A.M.N.H. Nos. 81852-81854. Tatta Dist.: Gharo Creek at Gharo, A.M.N.H. No. 81510; Khudi Creek, Indus delta, R.S.M. Nos. 1963.20.29, 1963.20.30.

Praescutata viperina

Karachi Dist.: Korangi Creek, R.S.M. No. 1963.20.31; Hawke's Bay, S.A.M. No. 650. Tatta Dist.: Kuba Bundar, A.M.N.H. No. 87491.

Lapemis curtus

Karachi Dist.: Manora, Z.S.P. Mekran Dist.: off Gwadar, Z.S.P.

Microcephalophis gracilis

Karachi Dist.: Korangi Creek, R.S.M. Nos. 1963.20.74, 1963.20.75; Hawke's Bay, S.A.M.

No. 717. Las Bela Dist.: Kalamat Bay, R.S.M. No. 1963.20.63, A.M.N.H. No. 90432. Tatta Dist.: Khara coast, R.S.M. No. 1963.20.62.

Microcephalophis cantoris

Karachi Dist.: Korangi Creek, A.M.N.H. No. 86909; Clifton Beach, A.M.N.H. No. 87490, S.A.M. No. 671.

Pelamis platurus

Karachi Dist.: Korangi Creek, R.S.M. Nos. 1963.20.32, 1963.20.33; Hawke's Bay, I.N.H.S. No. 9207, S.A.M. No. 644; Sandspit, A.M.N.H. No. 85590; Clifton Beach, A.M.N.H. Nos. 84024, 88253; Cape Monze, A.M.N.H. No. 85591; 20 miles off Cape Monze, A.M.N.H. No. 85868. Persian Gulf: no specific locality, A.M.N.H. No. 66605.

Bungarus caeruleus

Hyderabad Dist.: Badin, A.M.N.H. No. 87483. Jacobabad Dist.: 6 miles southeast of Jacobabad, A.M.N.H. No. 86910. Karachi Dist.: 1 mile east of Karachi, A.M.N.H. No. 89299; near International Airport, A.M.N.H. No. 86911, S.A.M. No. 622; Malir Cantonment, M.S.U., S.A.M. No. 674; 3.5 miles east of Landhi, A.M.N.H. No. 85586. Tatta Dist.: near Tatta, I.N.H.S. No. 9660; 3.5 miles south of Mirpur Sakro, A.M.N.H. No. 87482; Jati, U.M.M.Z. No. 123437; Jampir, A.M.N.H. No. 89300.

Naja naja

Dadu Dist.: Amri, A.M.N.H. No. 85870. Karachi Dist.: Hill Park, M.S.U., A.M.N.H. No. 85871; between Malir and Landhi, A.M.N.H. No. 85464; near mouth of Hab River, A.M.N.H. No. 85869; 3.5 miles east of Landhi, A.M.N.H. No. 84011. Khairpur Dist.: 2 miles north of Hingora, A.M.N.H. No. 88448. Las Bela Dist.: 15 miles northwest of Sonmiani, A.M.N.H. No. 87484; Diwana, S.A.M. No. 863. Lyallpur Dist.: Gutwala Forest, U.M.M.Z. No. 125654. Peshawar Dist.: 5 miles south of Peshawar, A.M.N.H. No. 88443. Rawalpindi Dist.: Rawalpindi, S.A.M. No. 716. Sanghar Dist.: 7 miles southeast of Sanghar, A.M.N.H. No. 85587. Sibi Dist.: Kach, S.A.M. No. 709; 4 miles west of Kach, A.M.N.H. No. 88469. Tatta Dist.: near Dabeji, A.M.N.H. No. 88254; 4 miles northeast of Bhuro, A.M.N.H. No. 86912; 6 miles east of Gharo, U.M.M.Z. No. 122608; 4 miles south of Mirpur Sakro, S.A.M. No. 635; Indus delta, I.N.H.S. No. 9336. Lower Sind: no specific locality. A.M.N.H. Nos. 85459-85463, 86913-86915. Sutlej Valley, Punjab:

A.M.N.H. No. 2851. Siwalik Hills, A.M.N.H. Nos. 39396, 39397.

Vipera russelii

Jacobabad Dist.: near Jacobabad, S.A.M. No. 646. Tatta Dist.: 3.5 miles south of Mirpur Sakro, A.M.N.H. No. 85589; 1.5 miles south of Mirpur Sakro, A.M.N.H. No. 87487. Lower Sind: no specific locality, A.M.N.H. Nos. 85465, 85466.

Vipera lebetina

Sibi Dist.: near Kolpur, R.S.M. No. 1964.58.25; 6 miles south of Ziarat, S.A.M. No. 665.

Pseudocerastes persicus

Chagai Dist.: Kacha Thana, B.M. No. 1937.3.1.11. Kalat Dist.: Manguli, B.M. No. 1937.3.1.12. Las Bela Dist.: near Ormara, R.S.M. Nos. 1964.58.26, 1964.58.27, S.A.M. No. 862.

Eristicophis macmahoni

Chagai Dist.: near Chagai, S.A.M. No. 832; 22 miles west of Nushki, A.M.N.H. 96234; 8 to 11 miles northwest of Nushki, R.S.M. No. 1964.58.24, A.M.N.H. No. 96235. Baluchistan: no specific locality: A.M.N.H. Nos. 92722, 92723, C.N.H.M. Nos. 140280, 140309.

Echis carinatus

Chagai Dist.: 8 miles northwest of Nushki, A.M.N.H. No. 96237; 5 miles west of Ahmad Wal, A.M.N.H. No. 96236. Dadu Dist.: 5 miles south of Manjhand, A.M.N.H. No. 89304. Hyderabad Dist.: Hyderabad, A.M.N.H. No. 85467. Jhang Dist.: Bharavi Desert, U.M.M.Z. No. 125656. Kalat Dist.: 6 miles south of Kalat, A.M.N.H. No. 96238. Karachi Dist.: Karachi, M.S.U., A.M.N.H. No. 81499; Hill Park, U.M.M.Z. Nos. 121968, 121969; 4 miles northwest of Karachi, U.M.M.Z. No. 121967; 7 miles northwest of Karachi, U.M.M.Z. No. 121966; Malir Cantonment, A.M.N.H. No. 81497; Landhi, A.M.N.H. No. 81498; 3.5 miles east of Landhi, I.N.H.S. No. 9187; 4.5 miles northeast of Hab Chowki, A.M.N.H. Nos. 82223, 82175-82177, S.A.M. No. 590 (2); 1 mile southeast of Hab Chowki, A.M.N.H. No. 81496; 3 miles southwest of Bund Murad Khan, A.M.N.H. No. 84025; 2 miles west of Mauripur, A.M.N.H. No. 82174; islands near mouth of Malir River, A.M.N.H. Nos. 88471, 88472. Las Bela Dist.: 12 miles north of Bela, A.M.N.H. No. 84253; 17 miles north of Bela, A.M.N.H. No. 84254; 20 miles north of Bela, A.M.N.H. No. 87486; 2 miles west of Hab Chowki, A.M.N.H. No. 81981; 10 miles west of Hab Chowki, A.M.N.H. No. 81980; 42 miles southwest of

Liari, A.M.N.H. No. 88249; Hinidan Crossing, A.M.N.H. No. 88250. Nawabshah Dist.: 5 miles south of Kazi Ahmad, A.M.N.H. No. 86916. Sanghar Dist.: 15 miles northeast of Sanghar, A.M.N.H. No. 85588; Burra, A.M.N.H. Nos. 86918, 86919. Tatta Dist.: 5 miles east of Tatta, A.M.N.H. No. 82179; 1 mile east of Dabeji, M.S.U.; 3 miles east of Dabeji, A.M.N.H. No. 81501; 9 miles west of Dabeji, A.M.N.H. No. 81502; 12 miles southeast of Landhi, A.M.N.H. No. 82178; 2.5 miles southwest of Jerruck,

A.M.N.H. No. 82180; 5 miles south of Gharo, A.M.N.H. No. 81500; 4 miles west of Gujjo, A.M.N.H. No. 81977; Haleji Lake, A.M.N.H. Nos. 81848, 81849; Makli Hill, C.N.H.M. No. 121567. Thar Parkar Dist.: 4 miles east of Rahimke-Bazaar, A.M.N.H. No. 88251. Afghanistan: Dasht-i-Margo, A.M.N.H. No. 70593.

Agkistrodon himalayanus

Kashmir: Darakyja Mountain, Pir Punjab Range, A.M.N.H. No. 39395.

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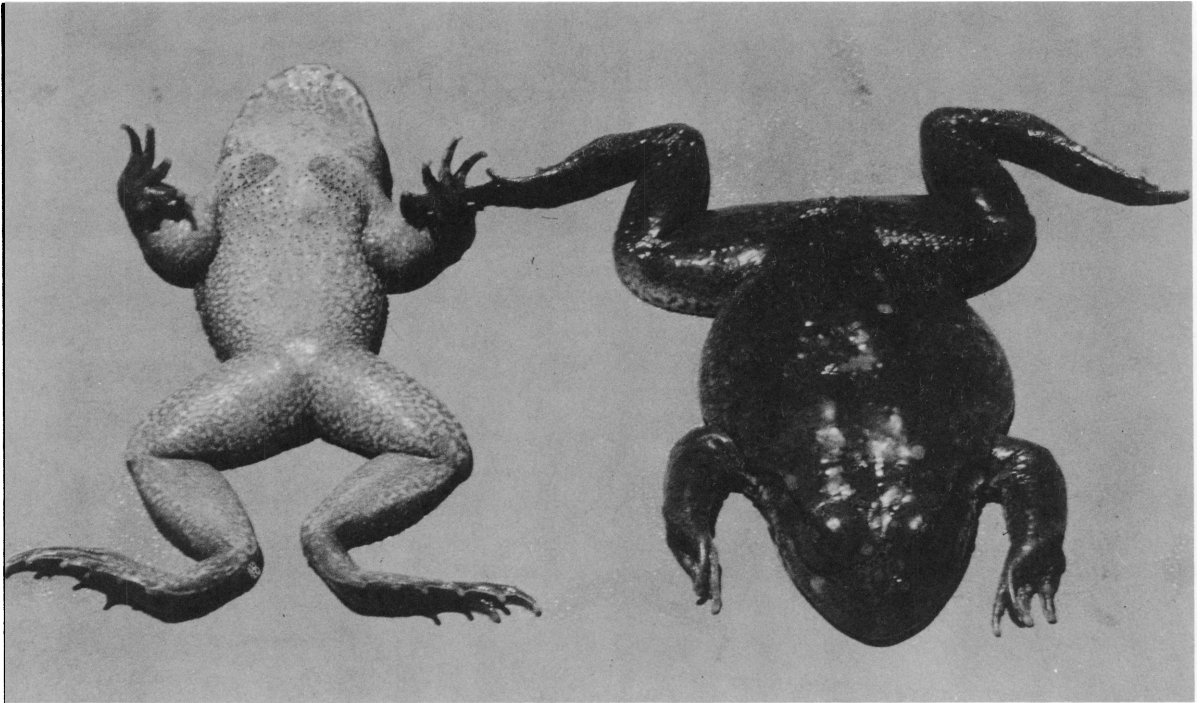
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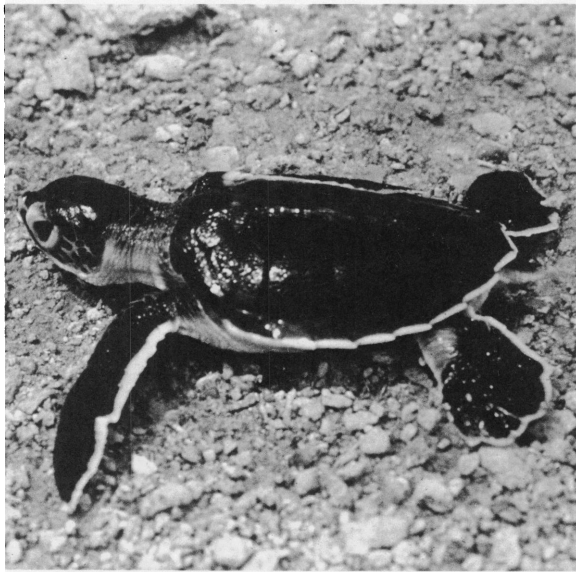
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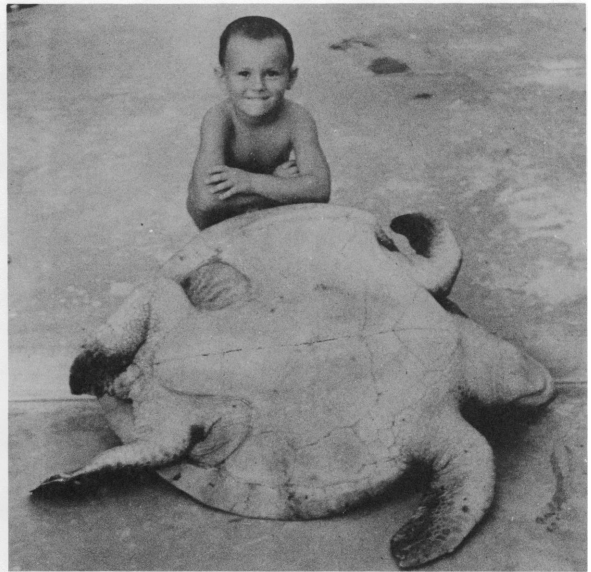
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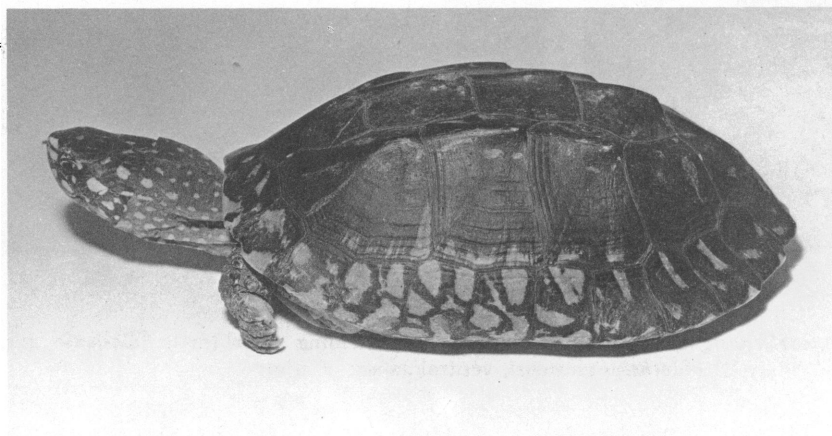
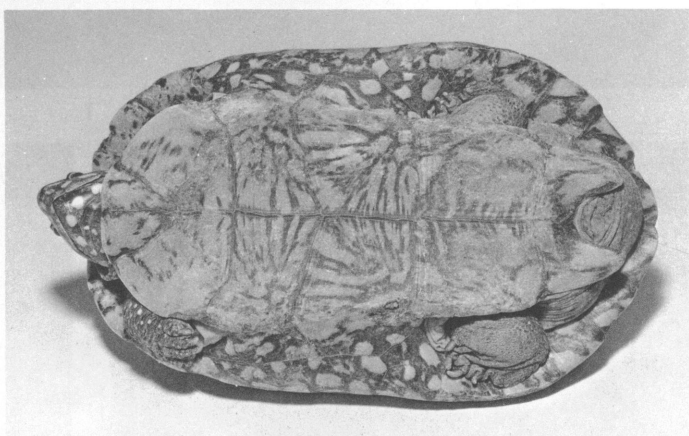
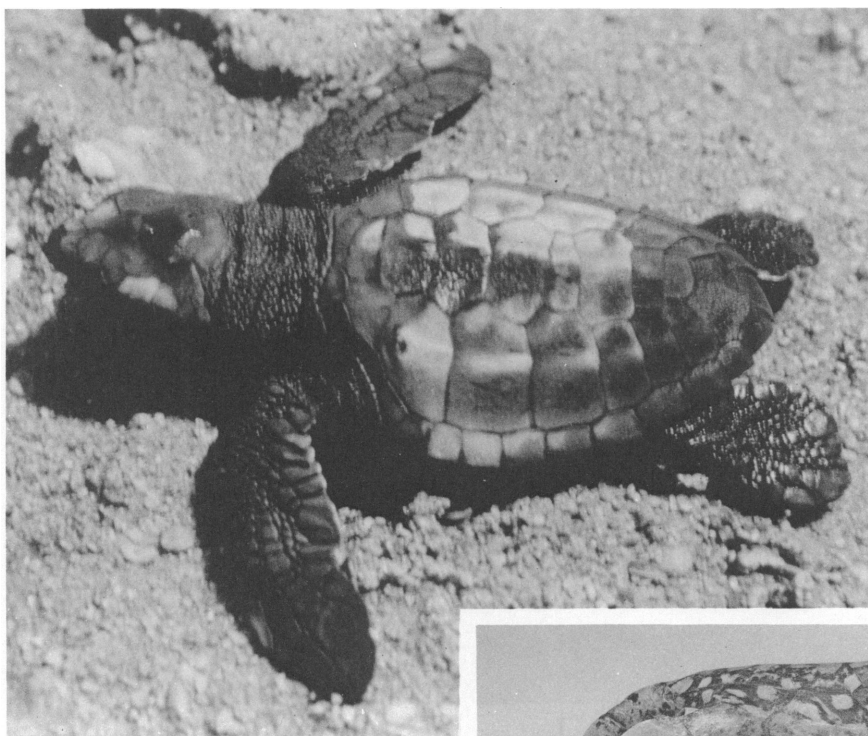


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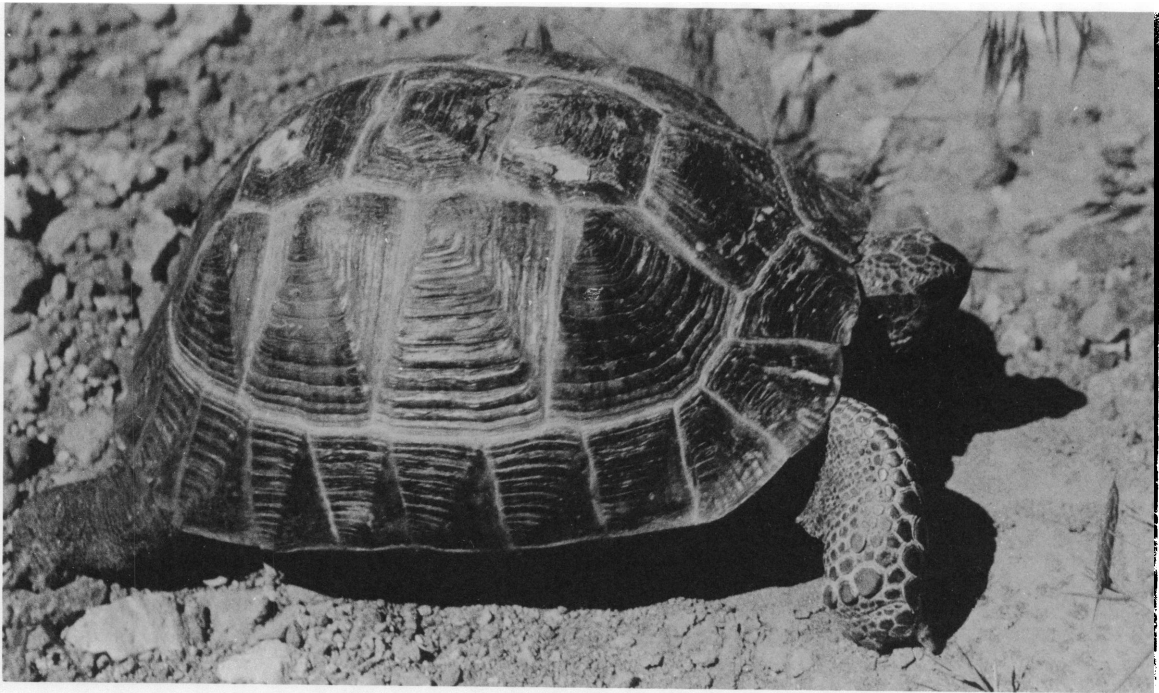


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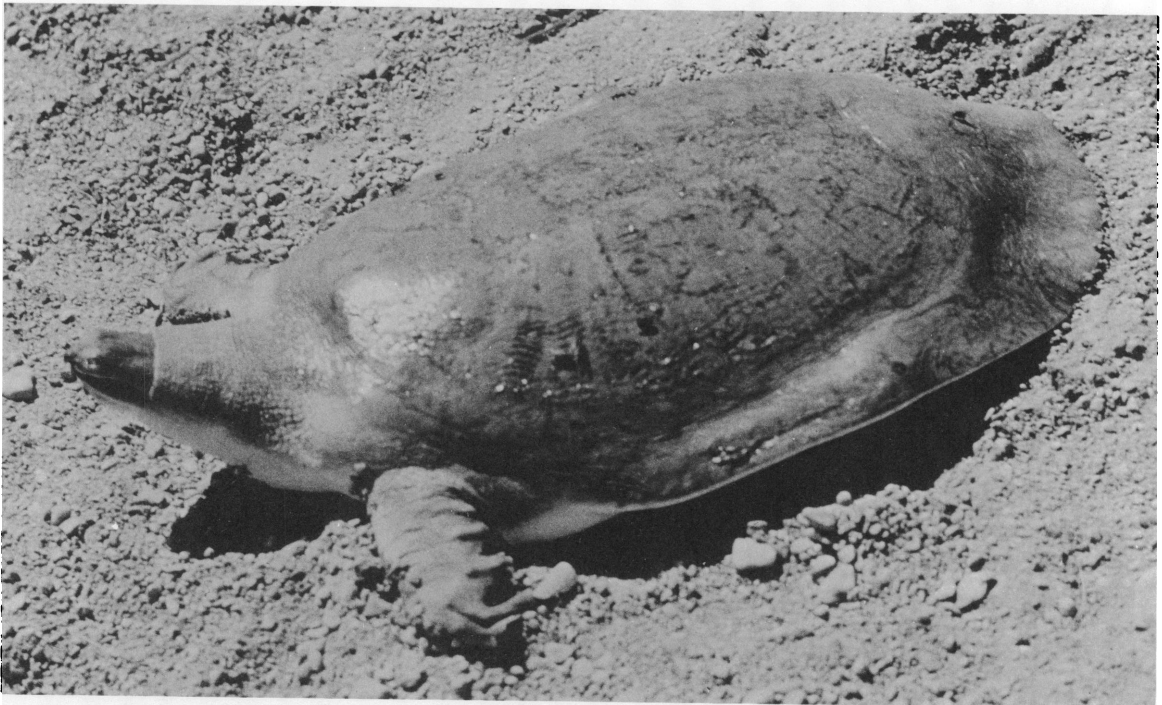
1. Baluch mountain frog (*Rana sternosignata*), Quetta District. 2. Hatchling green turtle (*Chelonia mydas*), Hawke's Bay Beach. 3. Pacific ridley (*Lepidochelys olivacea*), ventral aspect of adult



1. Hatchling *Lepidochelyys*, Hawke's Bay Beach. 2, 3. Spotted pond turtle (*Geoclemys hamiltoni*); photographs by Isabelle H. Conant. 2. Under side. 3. Side view, Sehwan



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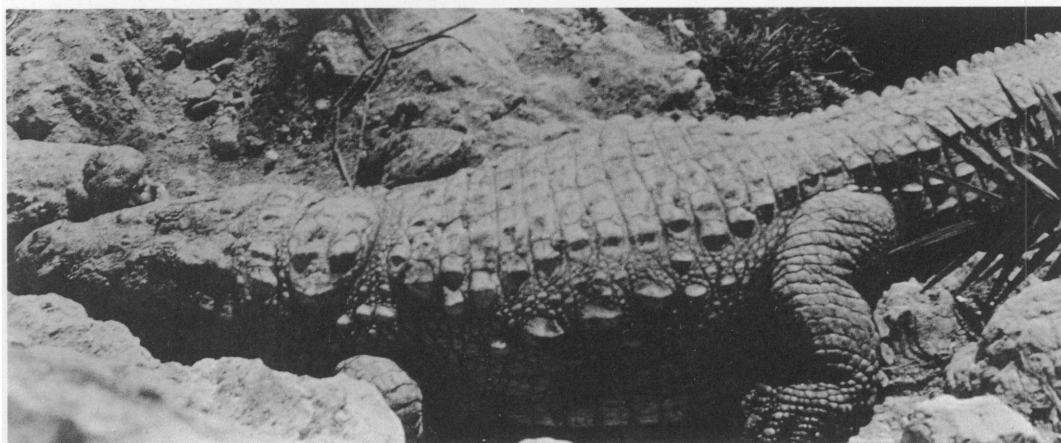


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1. Afghan tortoise (*Testudo horsfieldi*), Kalat District. 2. Narrow-headed softshell turtle (*Chitra indica*), lower Indus



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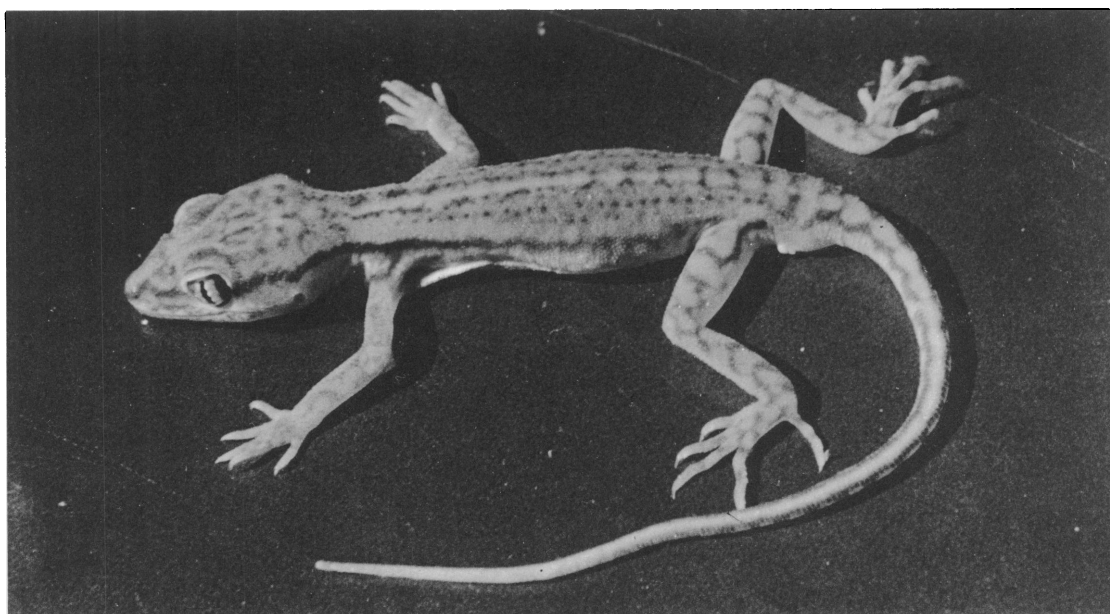


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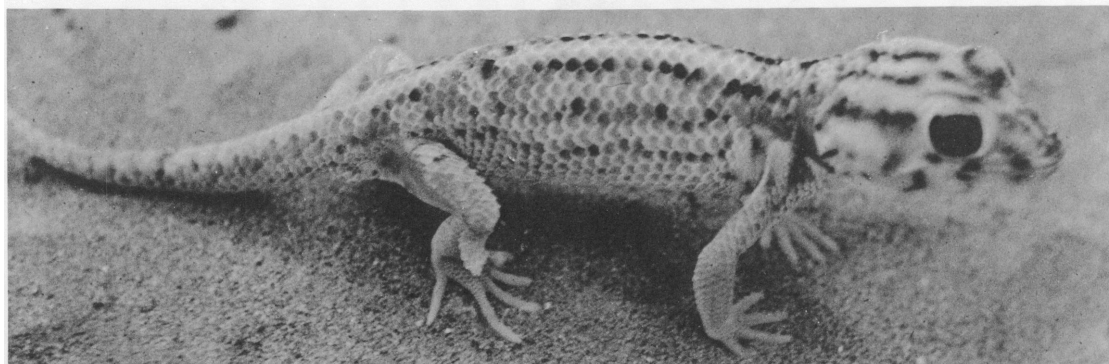


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1. Indian softshell turtle (*Trionyx gangeticus*), lower Indus. 2, 3. Snub-nosed crocodile (*Crocodylus palustris*). 2. Adult at Mangho Pir shrine. 3. Juvenile, Sanghar District



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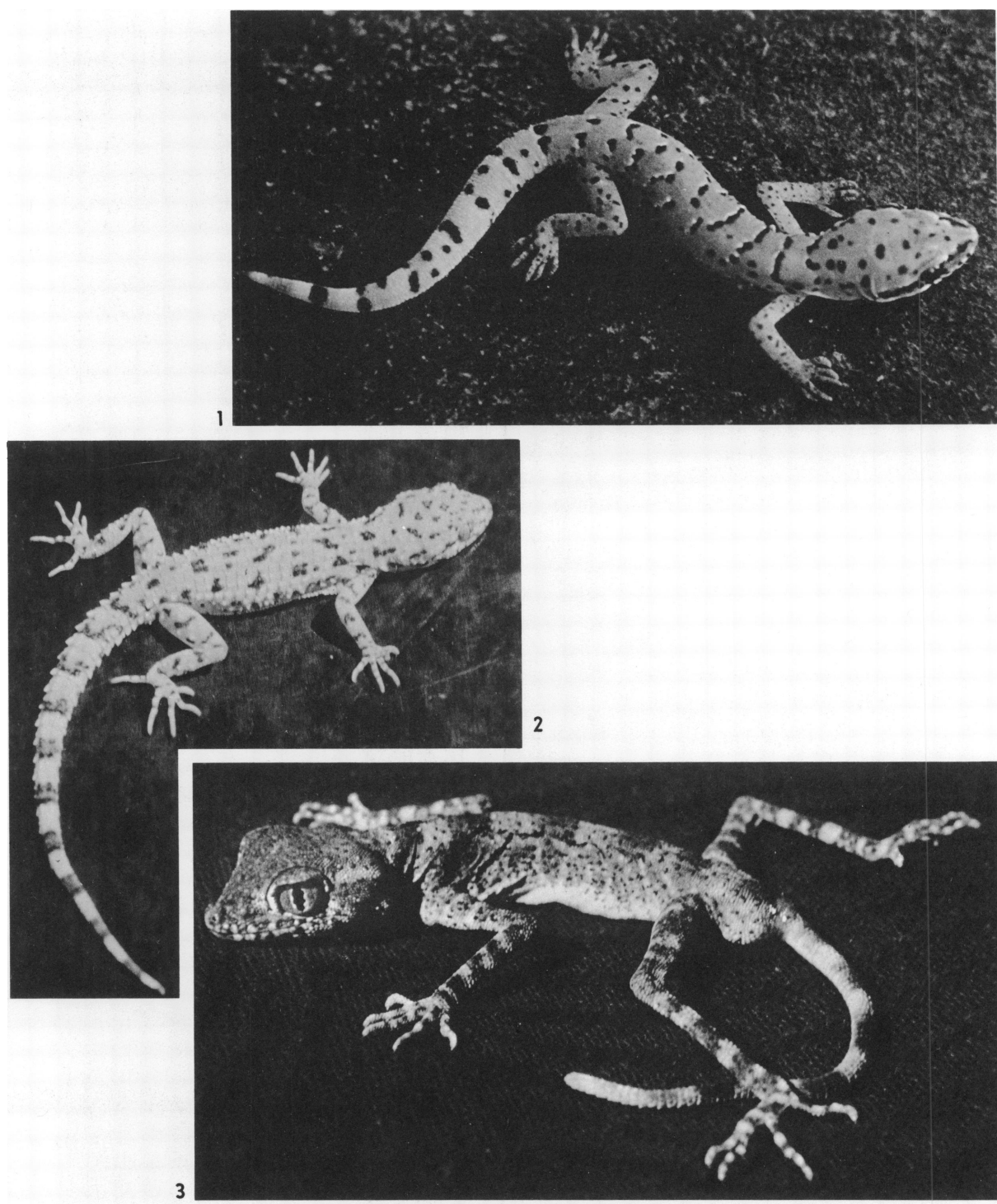


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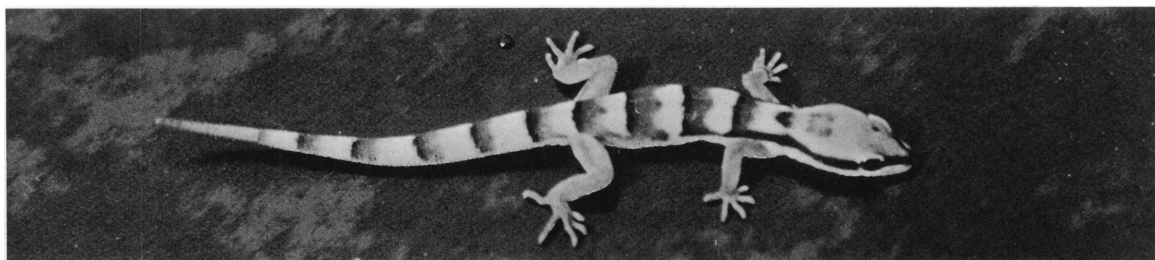


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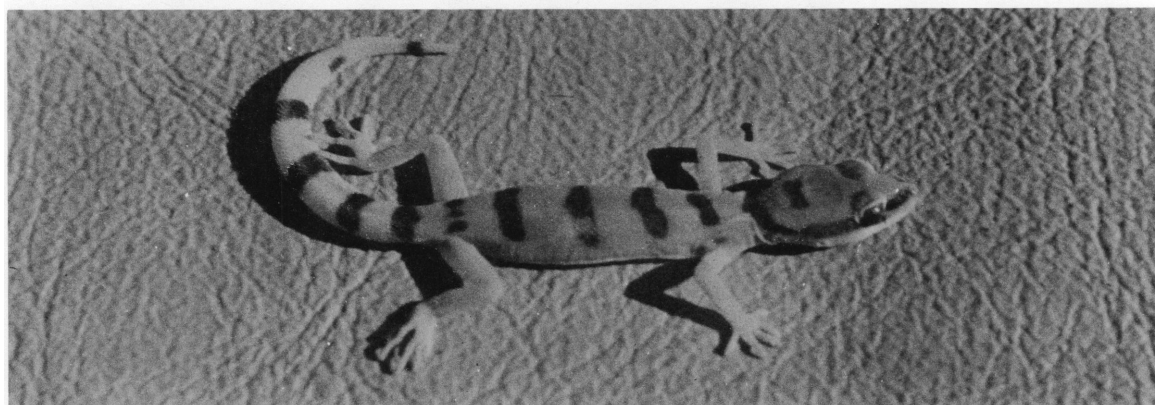
1. Whip-tailed sand gecko (*Stenodactylus maynardii*). 2. Turkestan plate-tailed gecko (*Teratoscincus scincus*). 3. Baluch plate-tailed gecko (*Teratoscincus microlepis*). All from Nushki



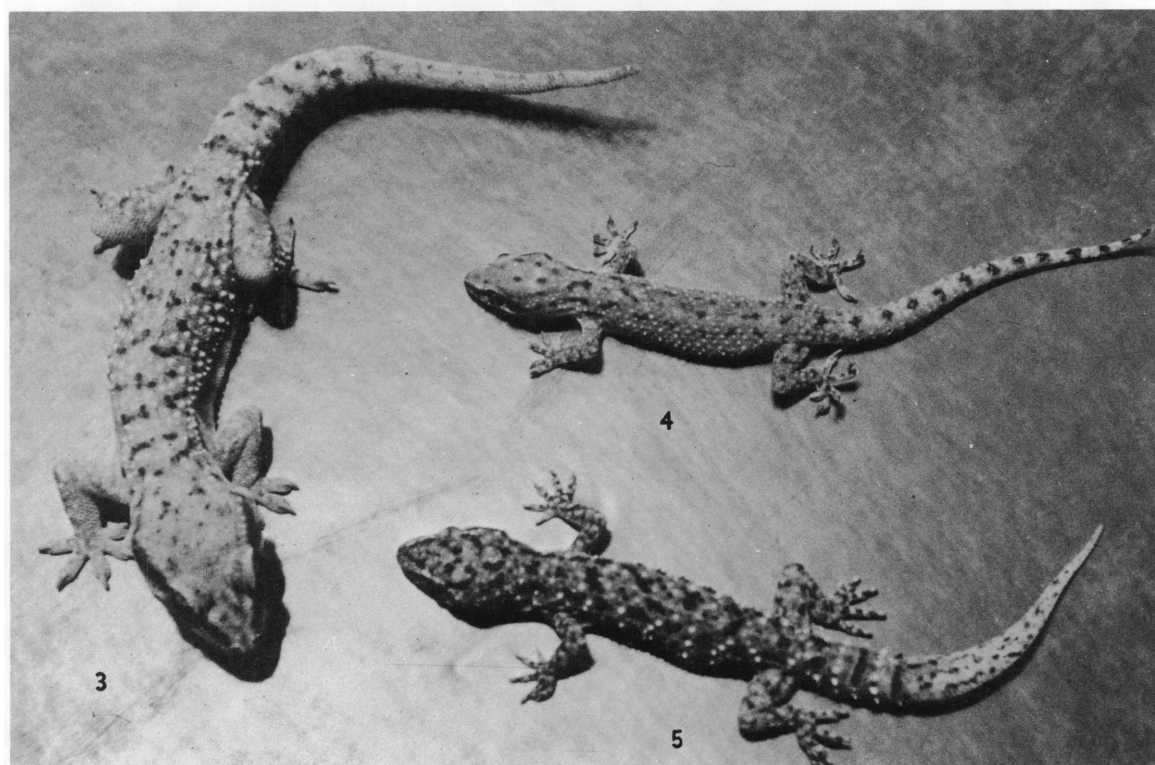
1. Karakoram rock gecko (*Cyrtodactylus stoliczkaei*), Swat. 2. Keeled rock gecko (*Cyrtodactylus scaber*), Sanghar District. 3. Blunt-tailed spider gecko (*Agamura persica*), Las Bela



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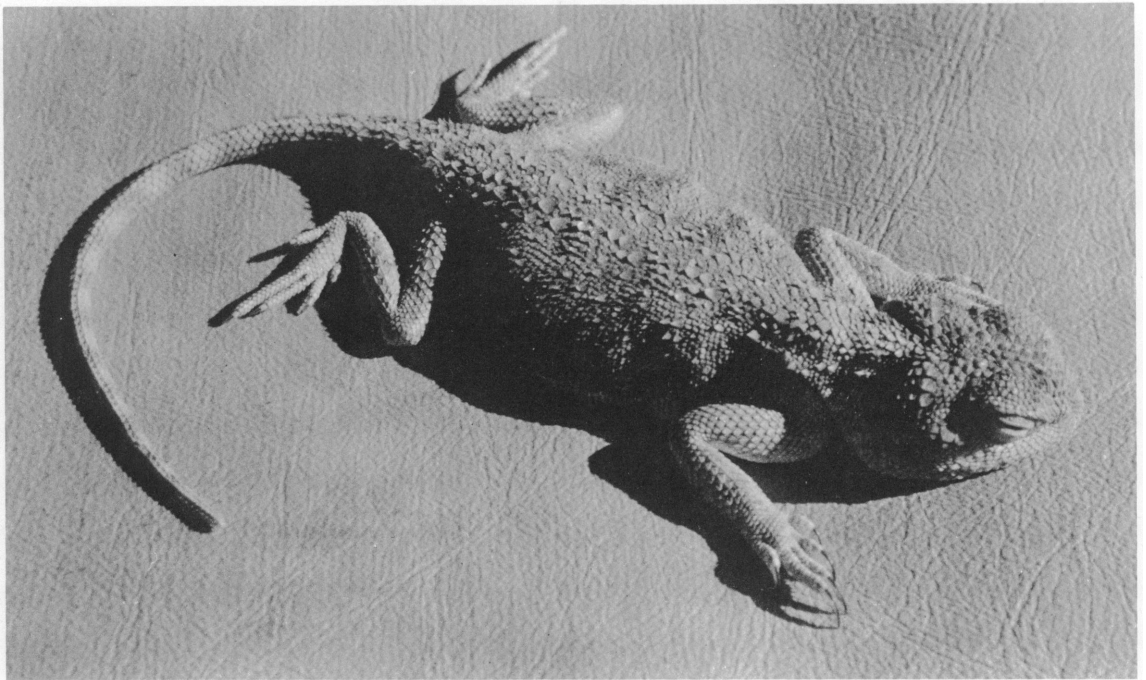
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1. Banded dwarf gecko (*Tropicolotes helenae*), near Landhi. 2. Mountain dwarf gecko (*Tropicolotes depressus*), type specimen, Kach, Sibi District. 3. Persian gecko (*Hemidactylus persicus*), Haleji Lake. 4. Mediterranean gecko (*Hemidactylus turcicus*), Karachi. 5. Spotted Indian house gecko (*Hemidactylus brooki*), Karachi



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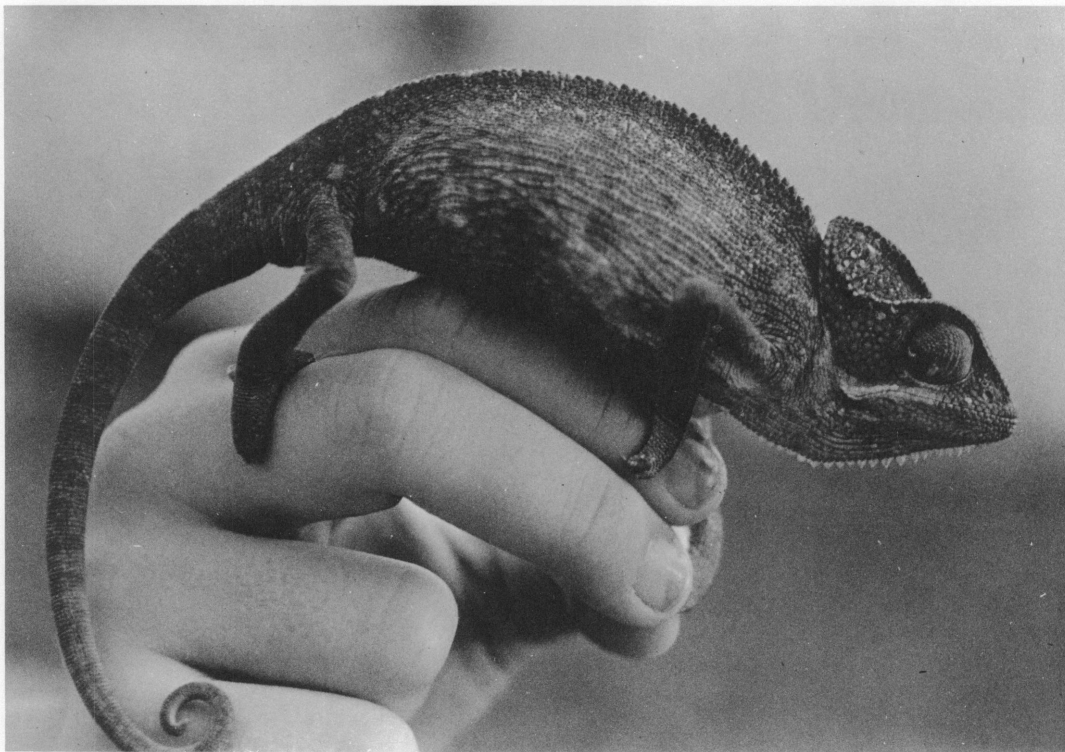
1. Afghan ground agama (*Agama megalonyx*), Kolpur. 2. Baluch ground agama (*Agama rudrata baluchiana*), Kach, Sibi District



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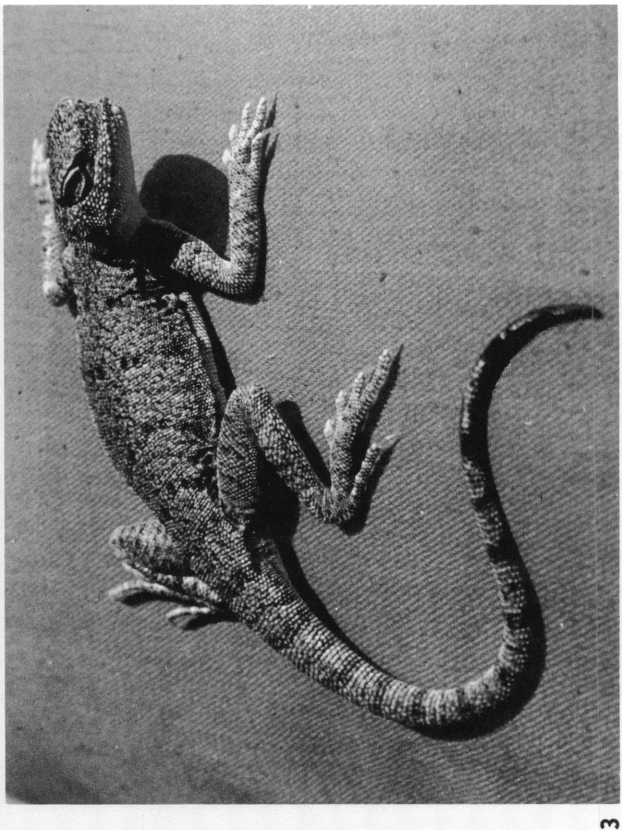
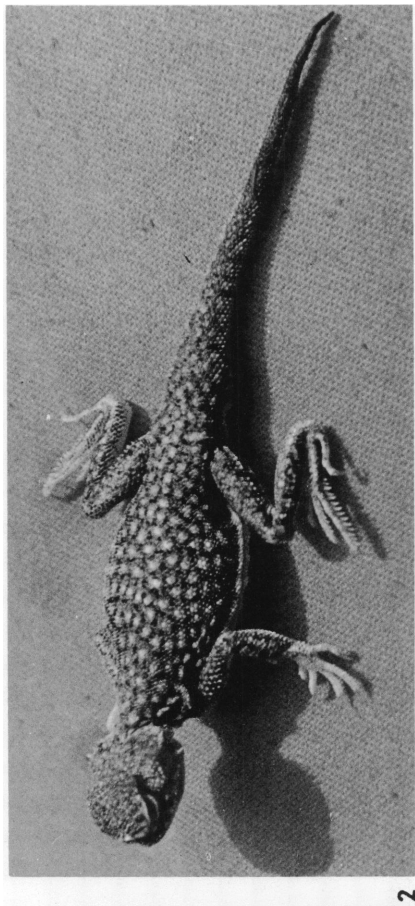


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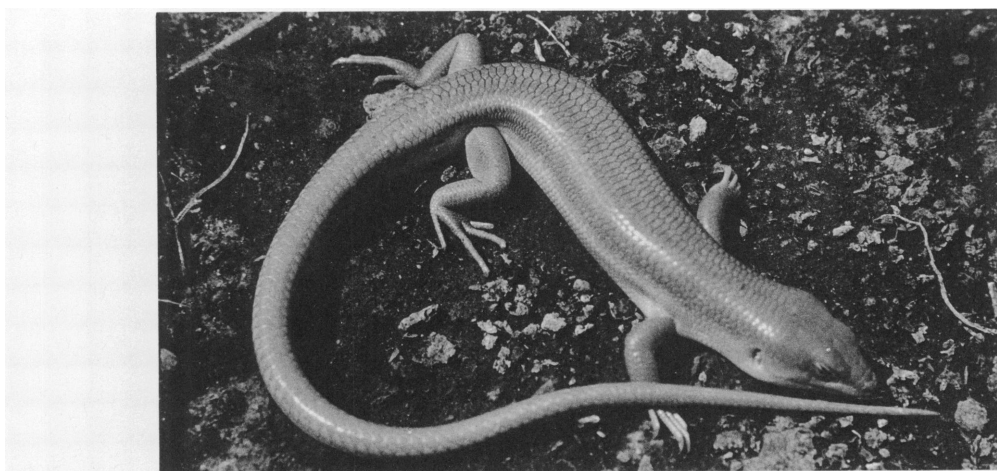


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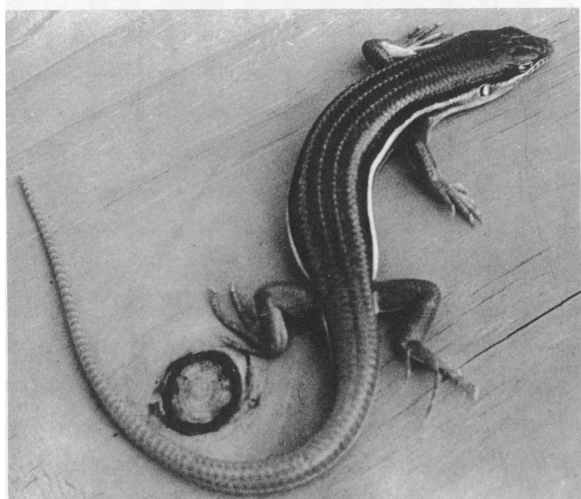
1. Yellow-headed agama (*Agama nupta fusca*), Khadeji Falls, Dadu District. 2. Brilliant agama (*Agama agilis*), Landhi. 3. Indian chameleon (*Chamaelio zeylanicus*), Thar Parkar District



1. Striped toad agama (*Phrynocephalus ornatus*). 2. Yellow-speckled toad agama (*Phrynocephalus leuteoguttatus*). 3. Black-tailed toad agama (*Phrynocephalus maculatus*). All from the Nushki area



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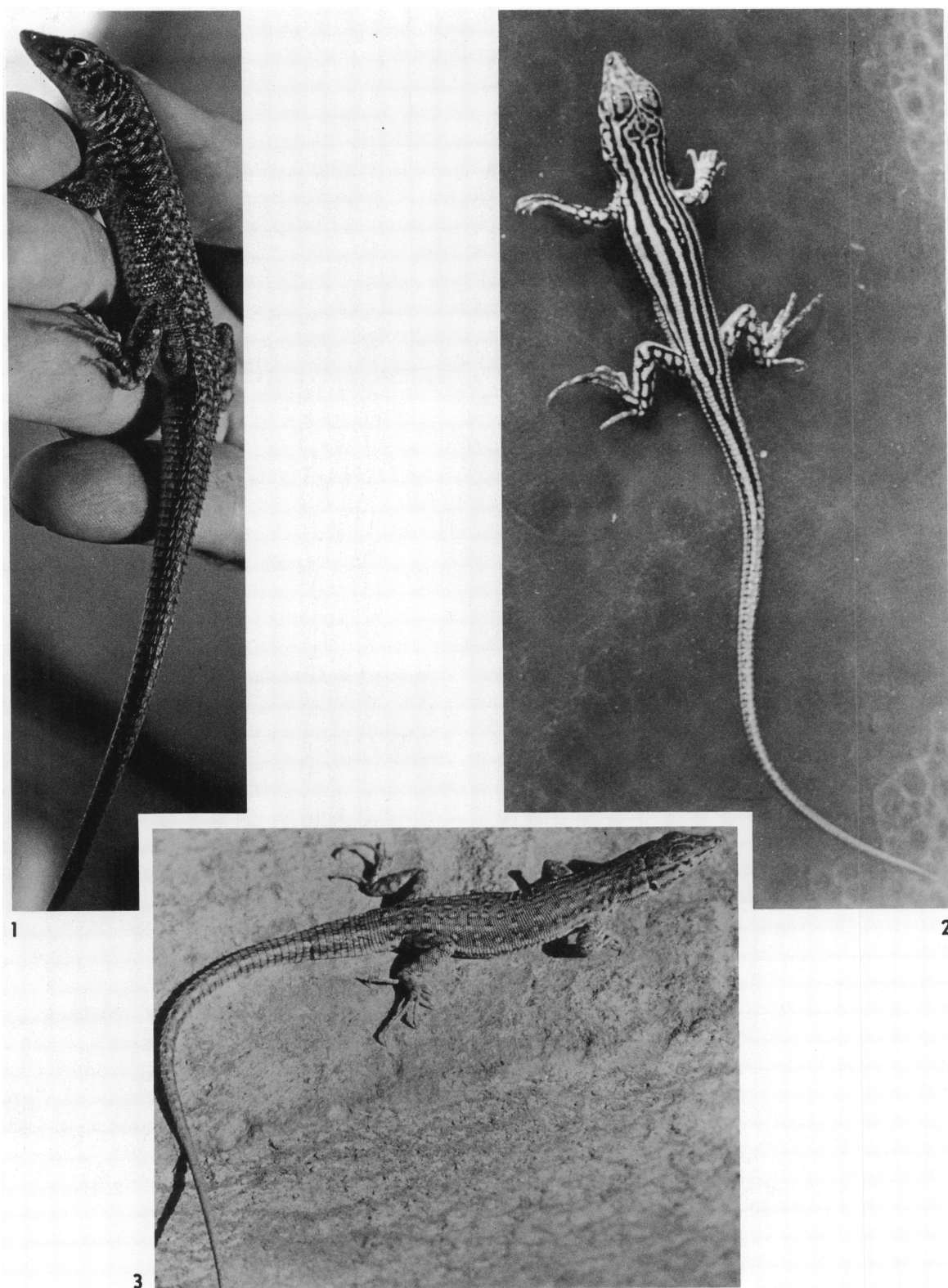


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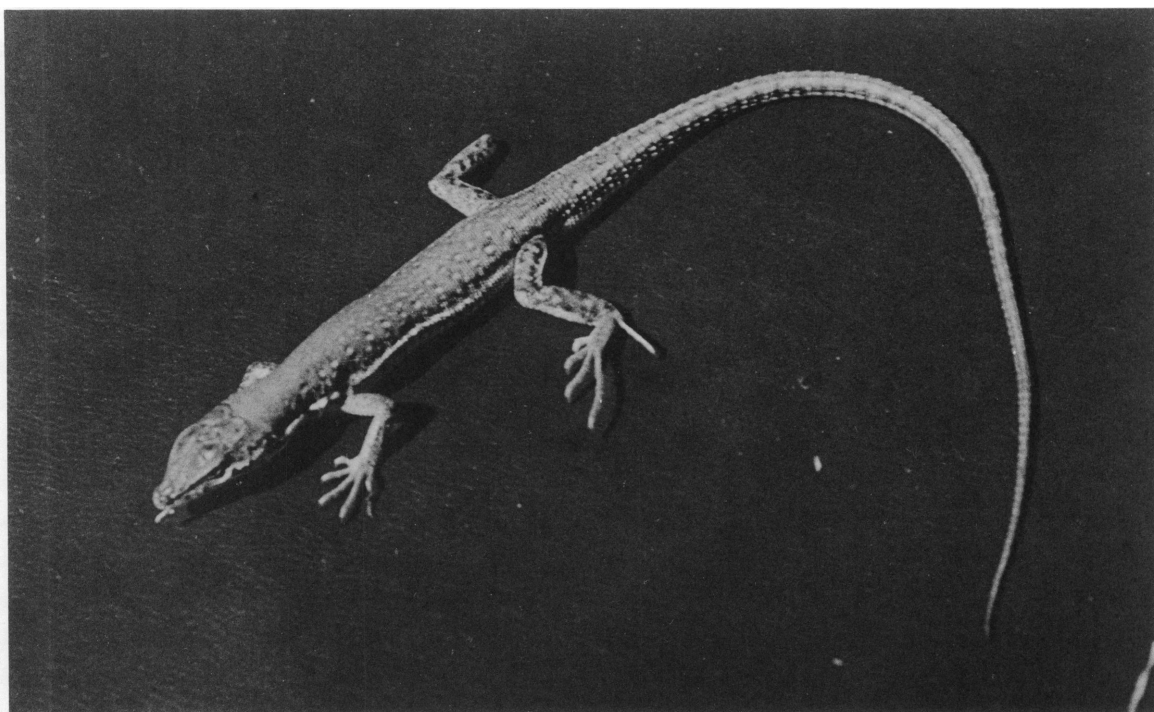


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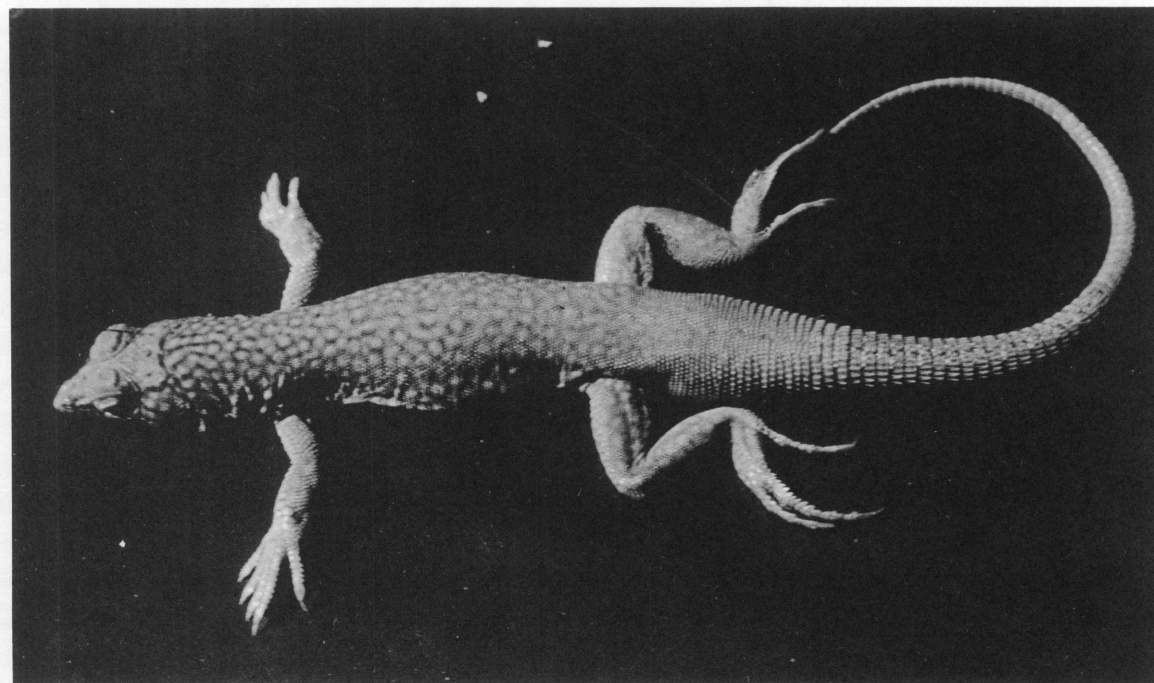
1, 2. Orange-tailed skink (*Eumeces schneideri blythianus*), Karachi District. 1. Adult. 2. Half-grown individual. 3. Striped grass skink (*Mabuya dissimilis*), Mirpur Sakro



1, 2. Indian fringe-toed sand lizard (*Acanthodactylus cantoris cantoris*). 1. Adult, Malir Cantonment.
2. Juvenile, Karachi. 3. Long-tailed desert lacerta (*Eremias guttulata*), Quetta



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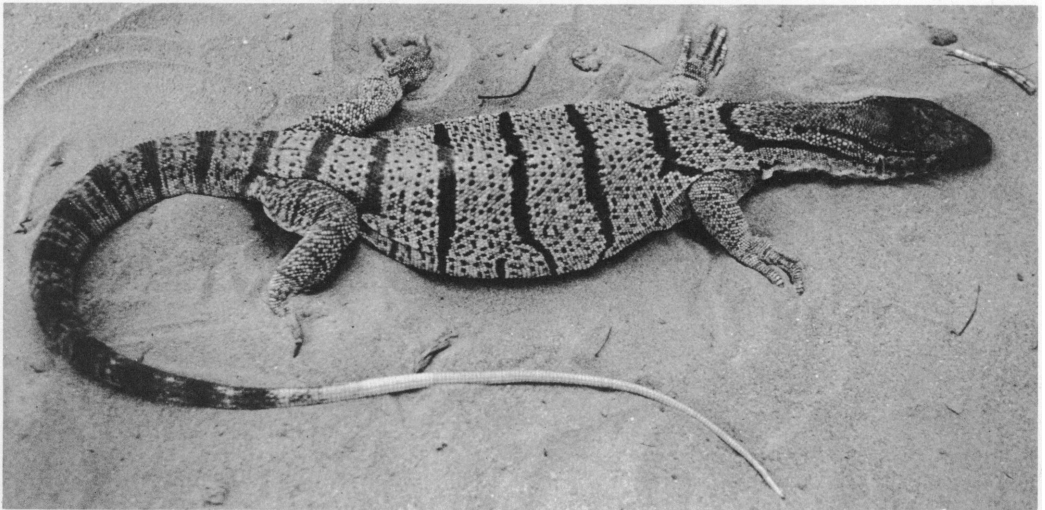


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1. Short-nosed desert lacerta (*Eremias brevirostris*), Miani Hor, Las Bela District. 2. Reticulate desert lacerta (*Eremias acutirostris*), Nushki



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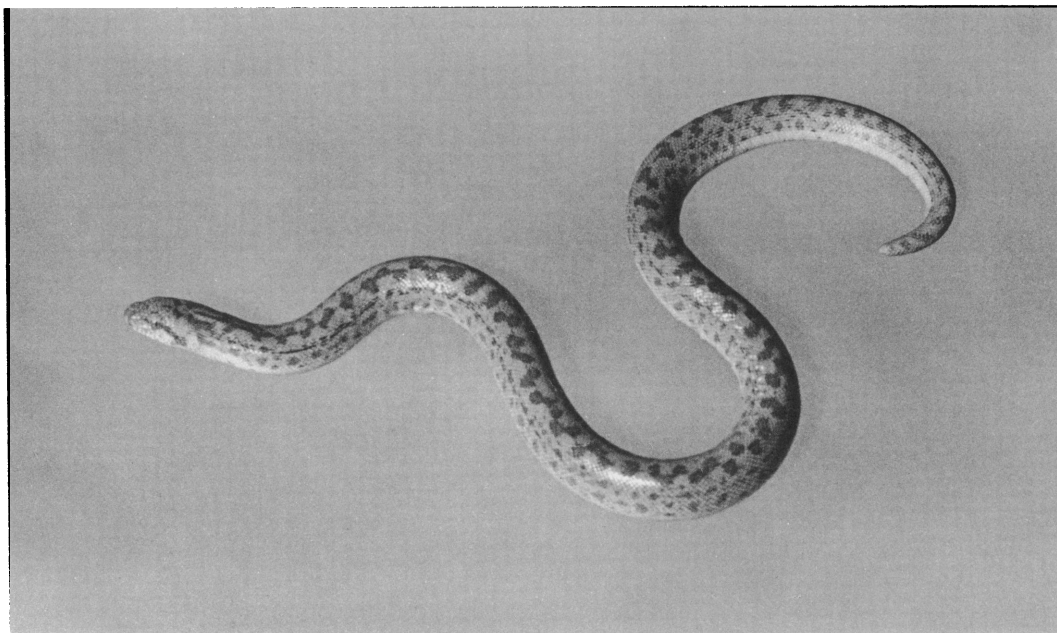


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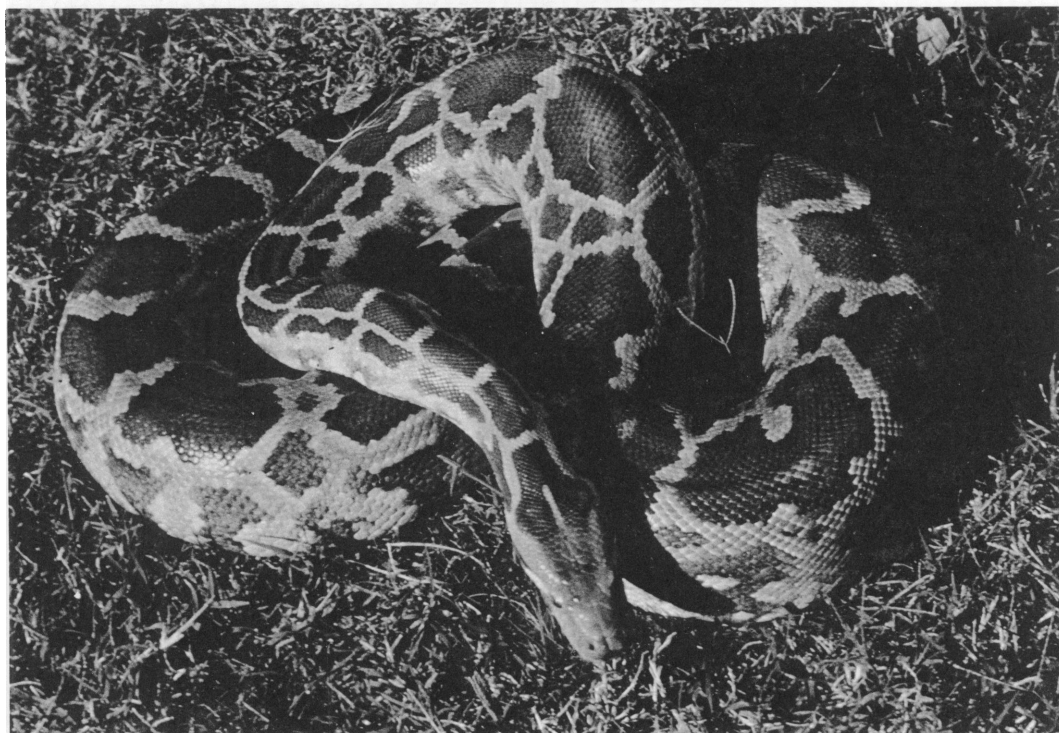


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1. Persian steppe lacerta (*Eremias velox persica*), Pishin. 2. Transcaspian desert monitor (*Varanus griseus caspius*), Nushki. 3. Indian desert monitor (*Varanus griseus koniecznyi*), Malir; photograph by Isabelle H. Conant

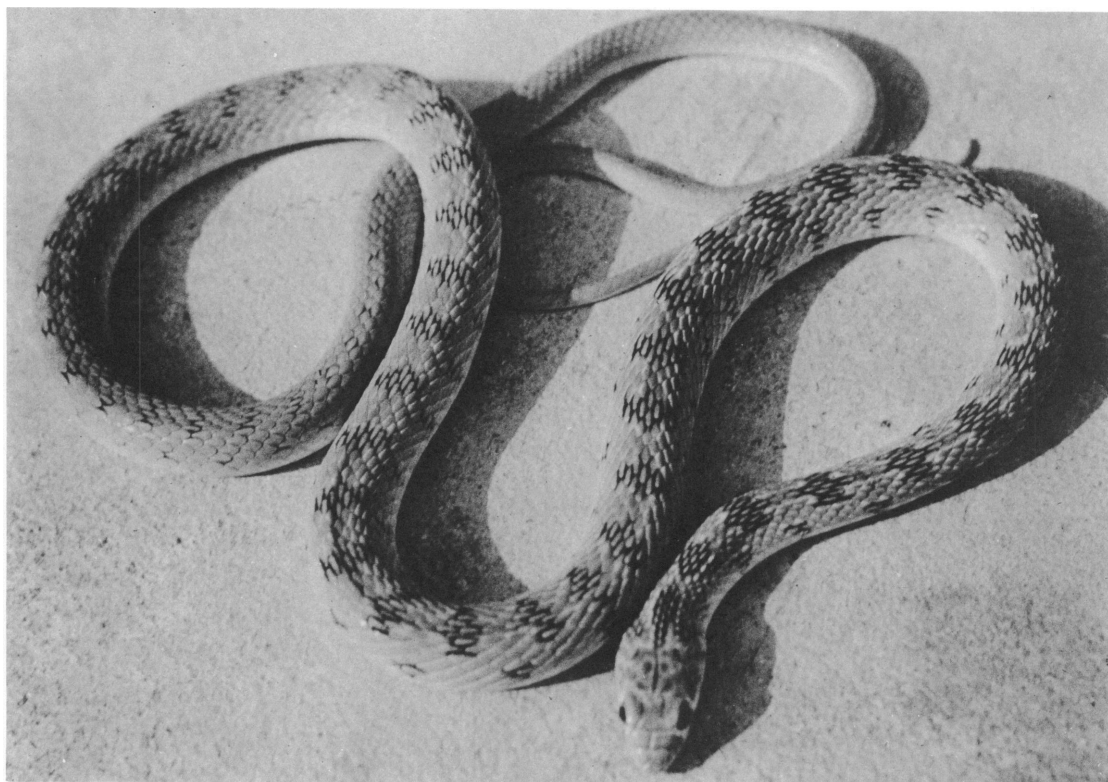


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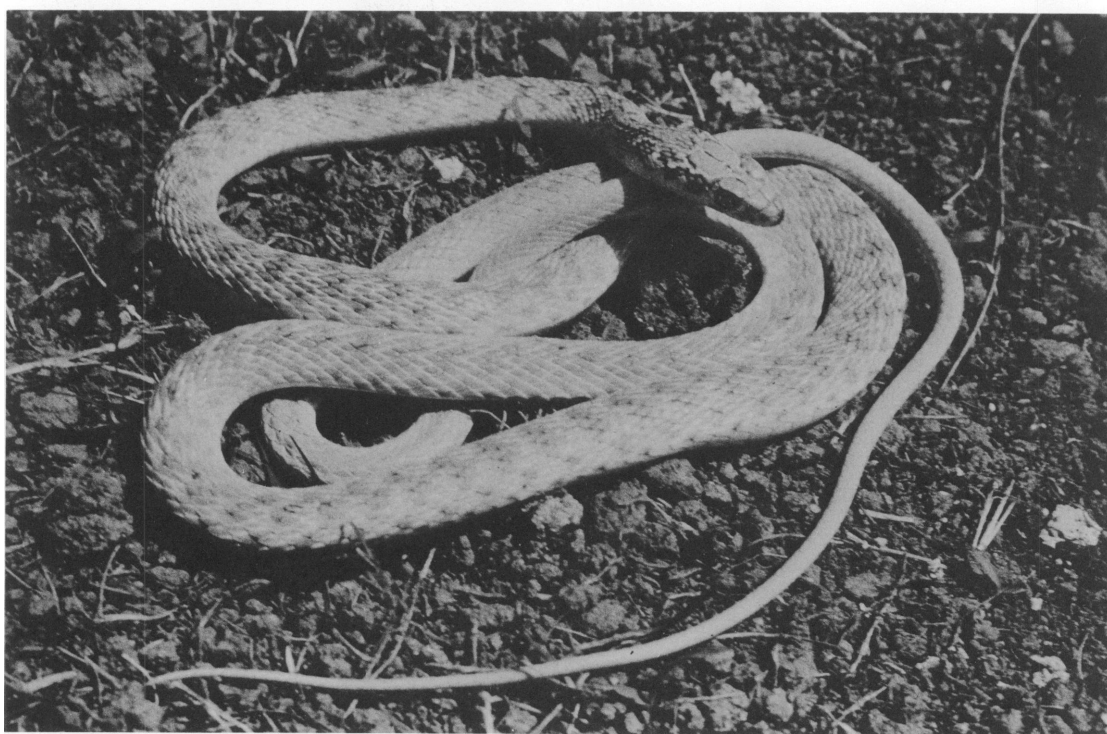


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1. Tartary sand boa (*Eryx tataricus*), Ahmad Wal, Chagai District. 2. Indian python (*Python molurus molurus*), Sanghar District

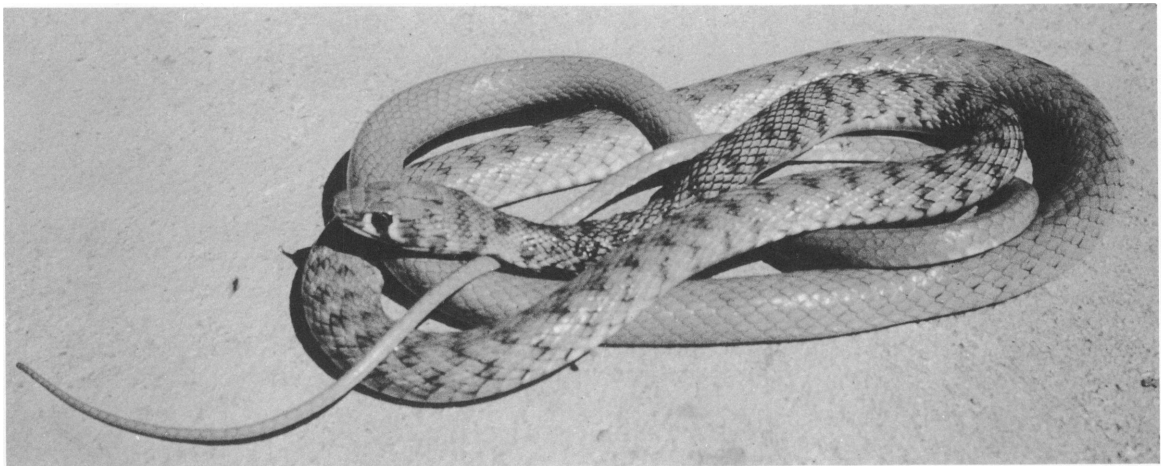


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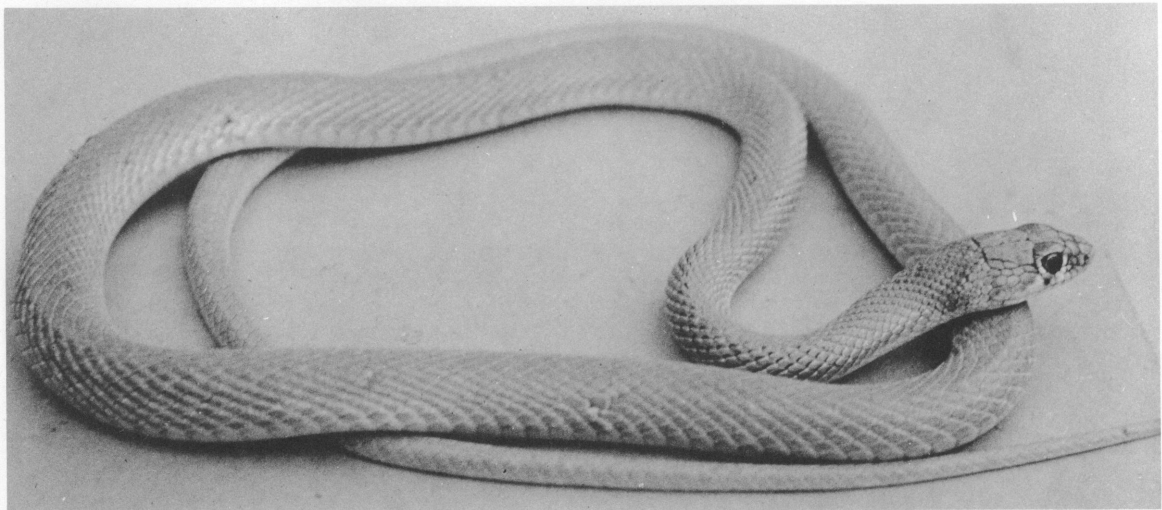


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1. Glossy-bellied racer (*Coluber ventromaculatus*), Karachi. 2. Variegated sand racer (*Coluber* sp.), Nushki



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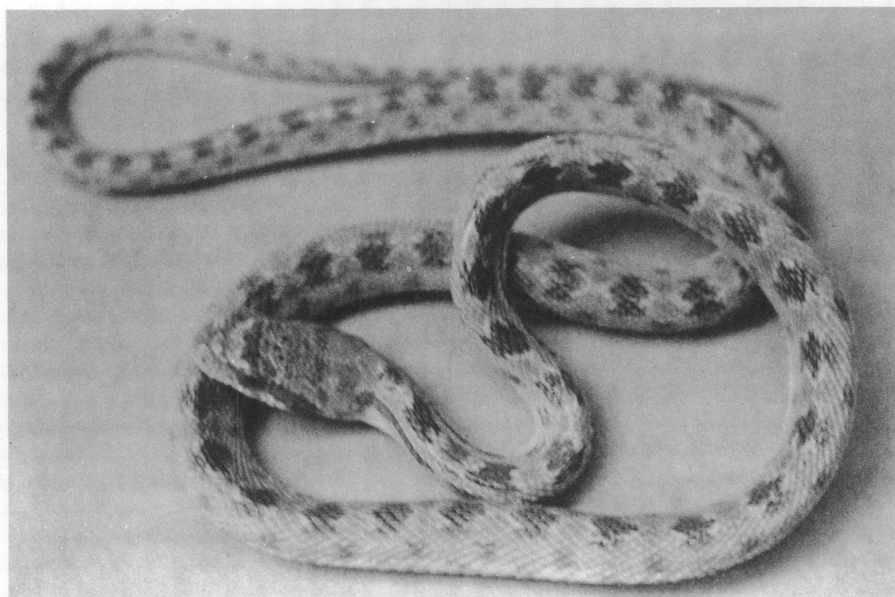
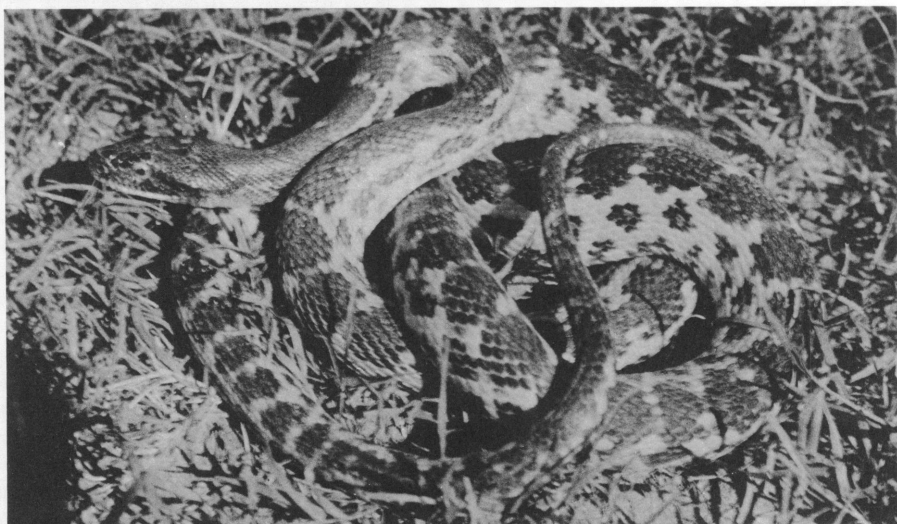
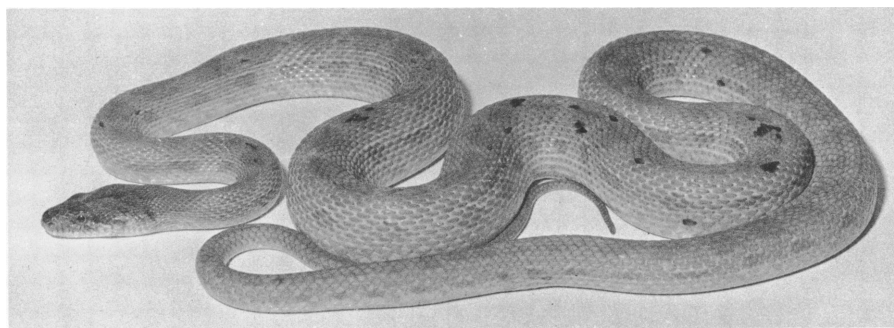


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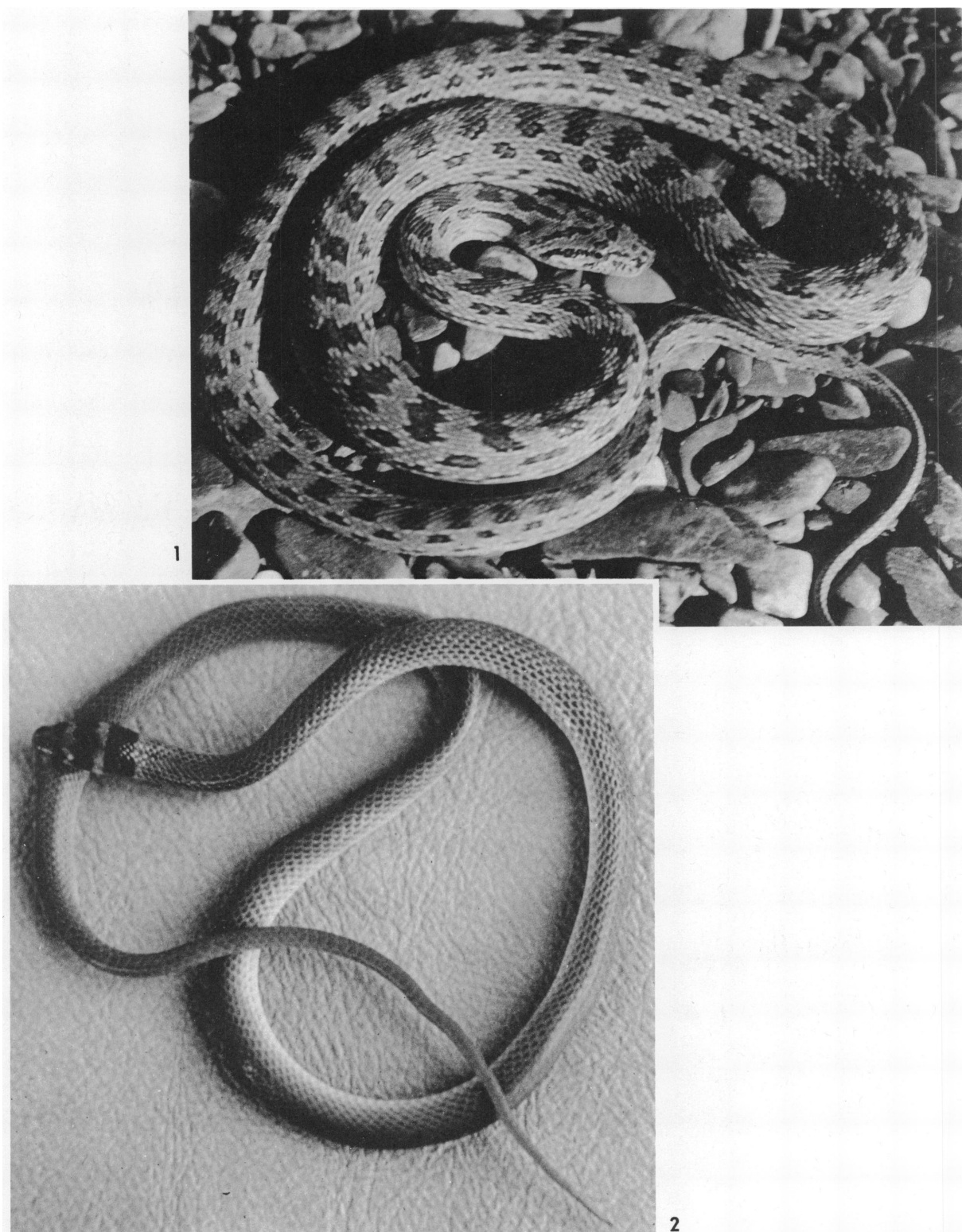


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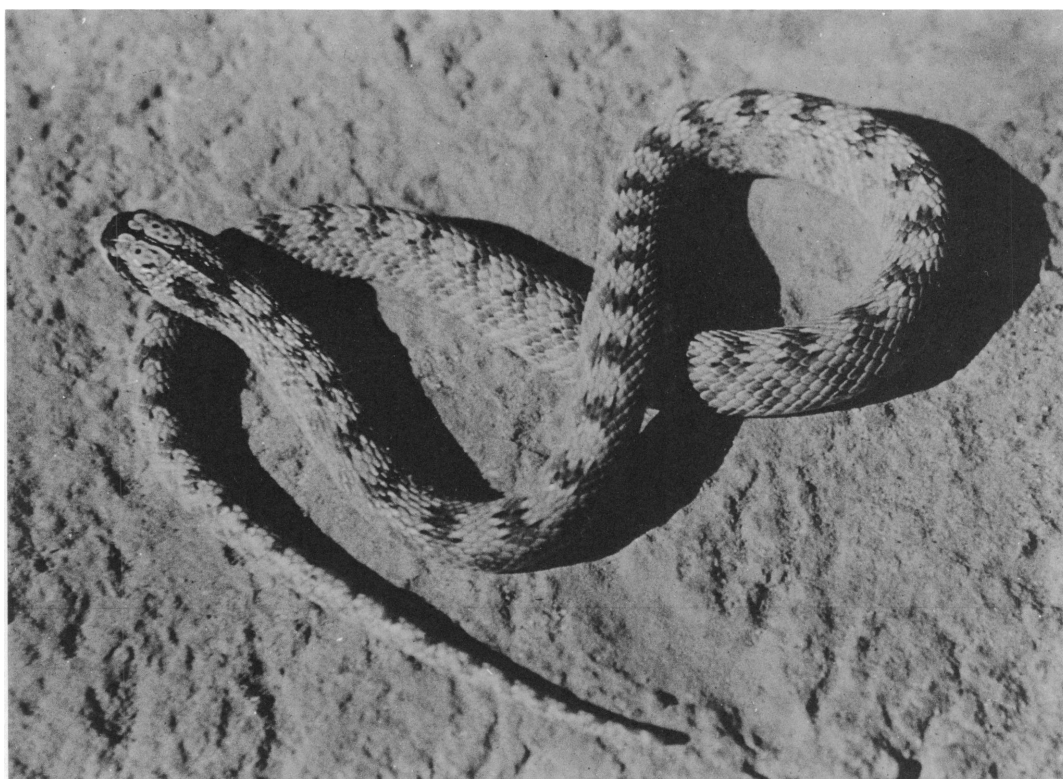
1, 2. Cliff racer (*Coluber rhodorachis*). 1. Blotched phase, Karachi. 2. Unicolored phase, Ziarat. 3. Royal snake (*Sphalerosophis atriceps*), juvenile, Malir



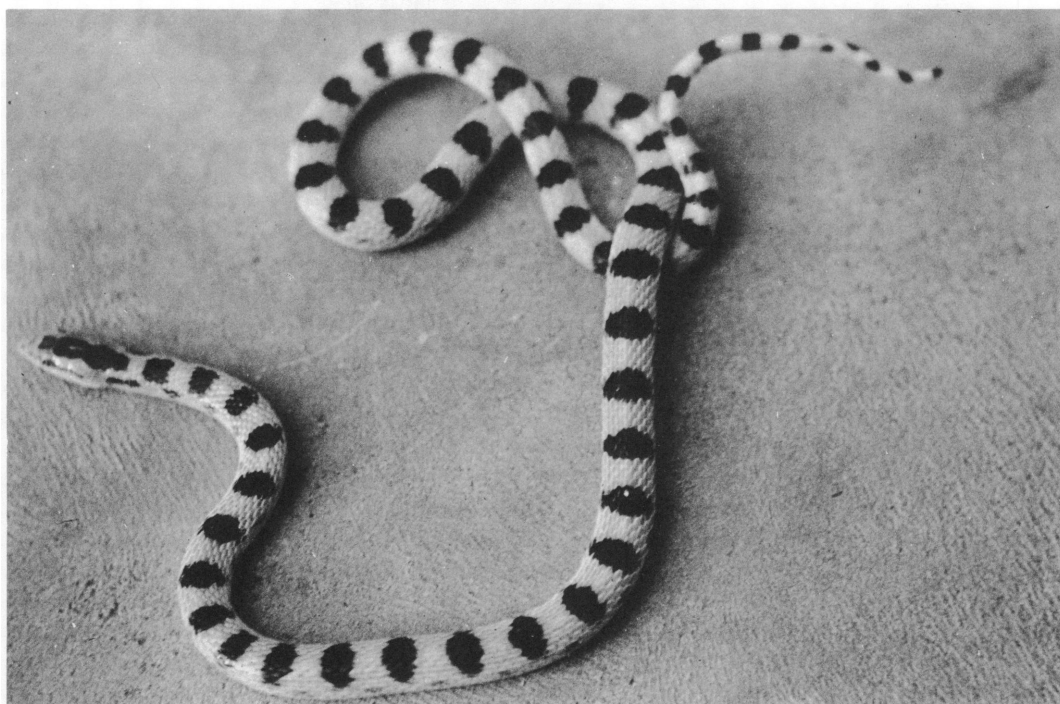
1, 2. *Sphalerosophis atriceps*. 1. Adult of yellow phase, Malir; photograph by Isabelle H. Conant. 2. Adult of blotched phase, Badin. 3. Persian diadem snake (*Sphalerosophis diadema schirazianus*), juvenile, Ormara, Las Bela



1. Eastern diadem snake (*Sphalerosophis diadema diadema*), subadult, Swat. 2. Dark-headed dwarf racer (*Eirenis persica*), Udigram, Swat



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2

1. Afghan awl-headed snake (*Lytorhynchus ridgewayi*), Quetta. 2. Maynard's awl-headed snake (*Lytorhynchus maynardi*), Nushki

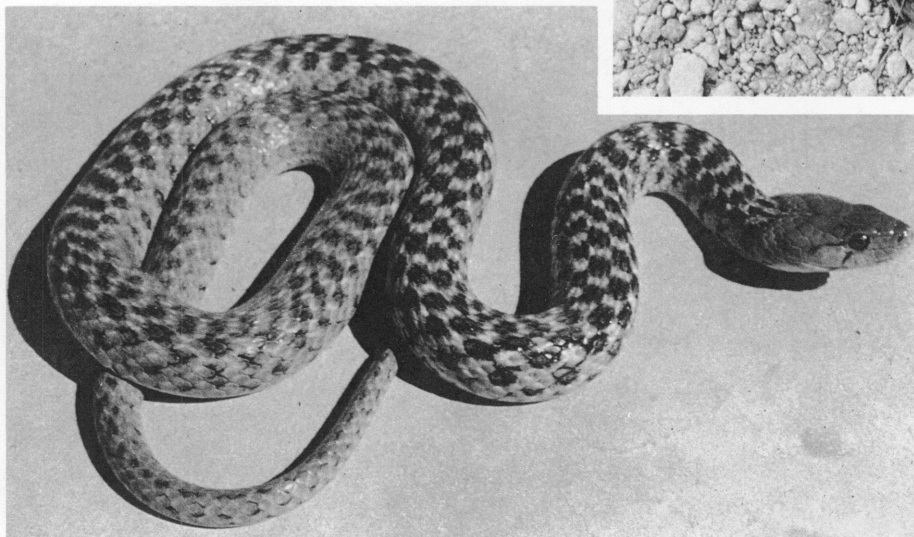
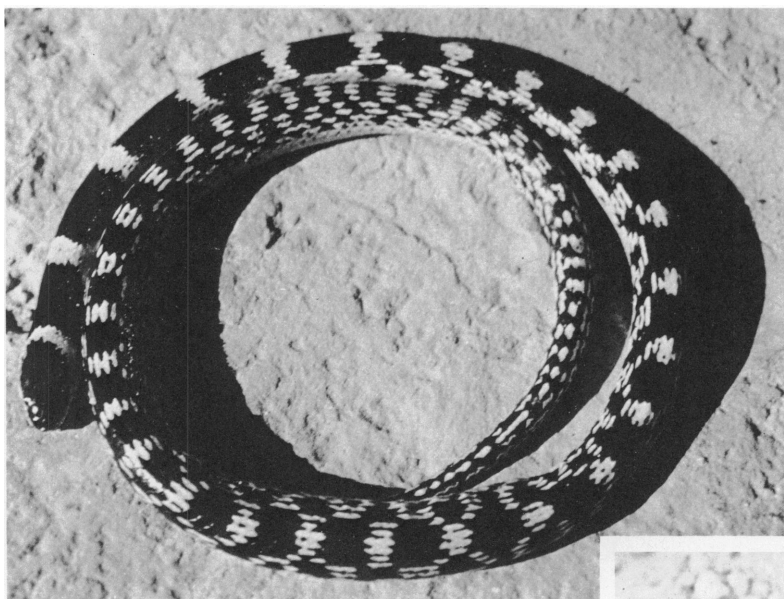


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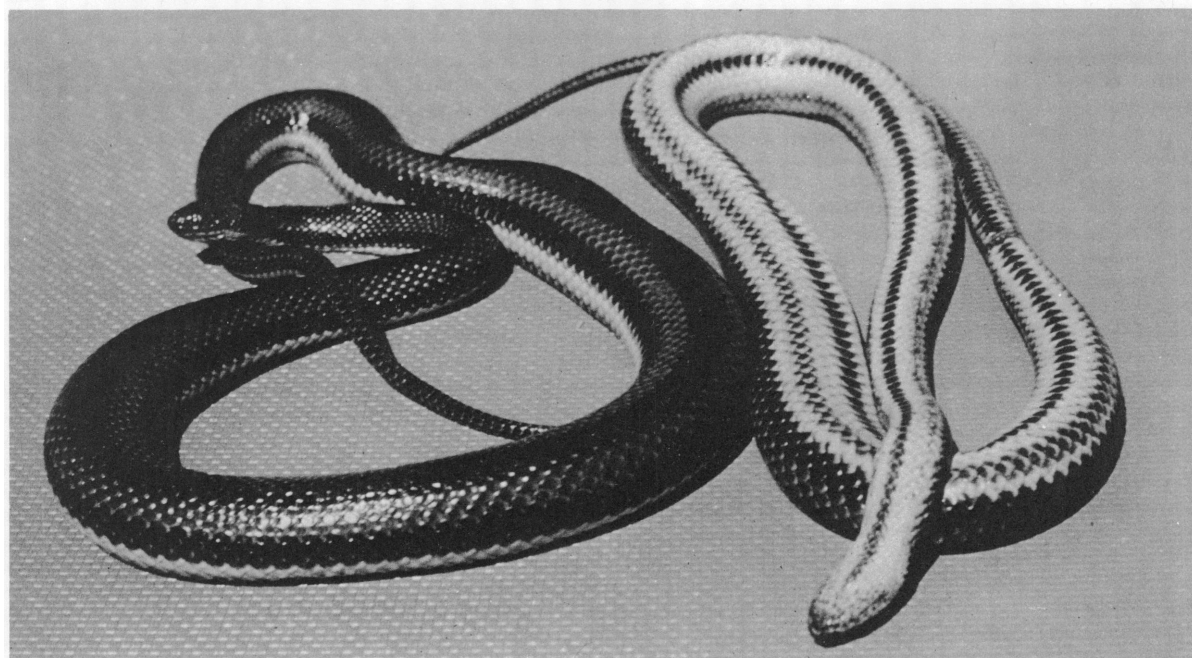
1. Sind awl-headed snake (*Lytorhynchus paradoxus*), Sanghar District. 2. Northern wolf snake (*Lycodon striatus striatus*), Jacobabad



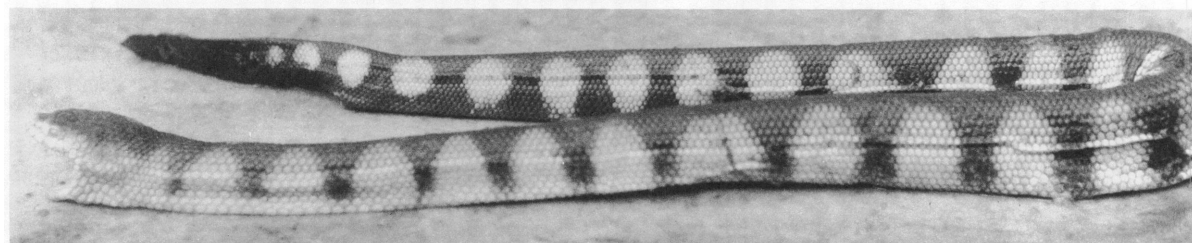
1. Golden-spotted wolf snake (*Lycodon striatus bicolor*), Quetta District. 2, 3. Checkered keelback (*Xenochrophis piscator*). 2. Small-blotched variety, Tatta District. 3. Checkered variety, Manchar Lake



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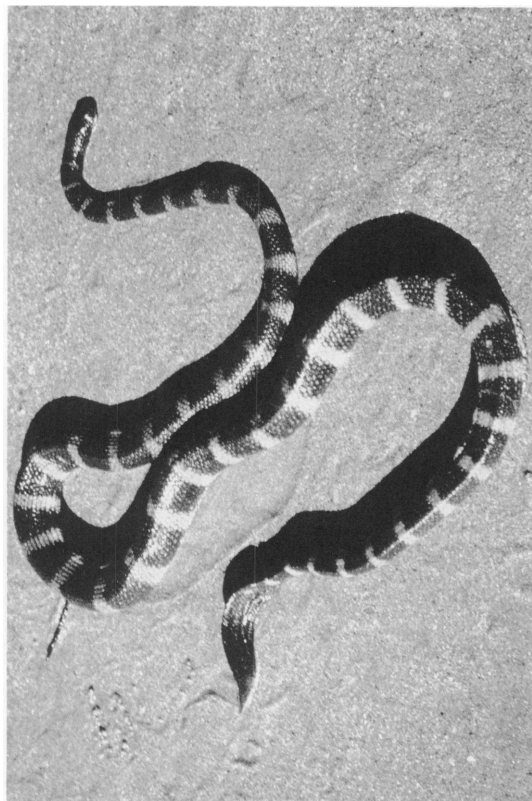


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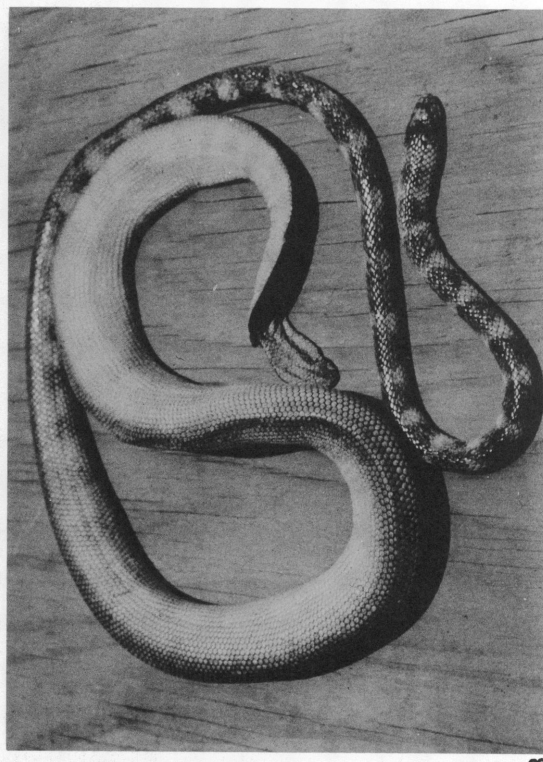
1. Indian sand snake (*Psammophis condanarus*), Pir Patho. 2. Sind river snakes (*Enhydris pakistanica*), Indus delta. 3. Viperine seasnake (*Praescutata viperina*), Indus delta



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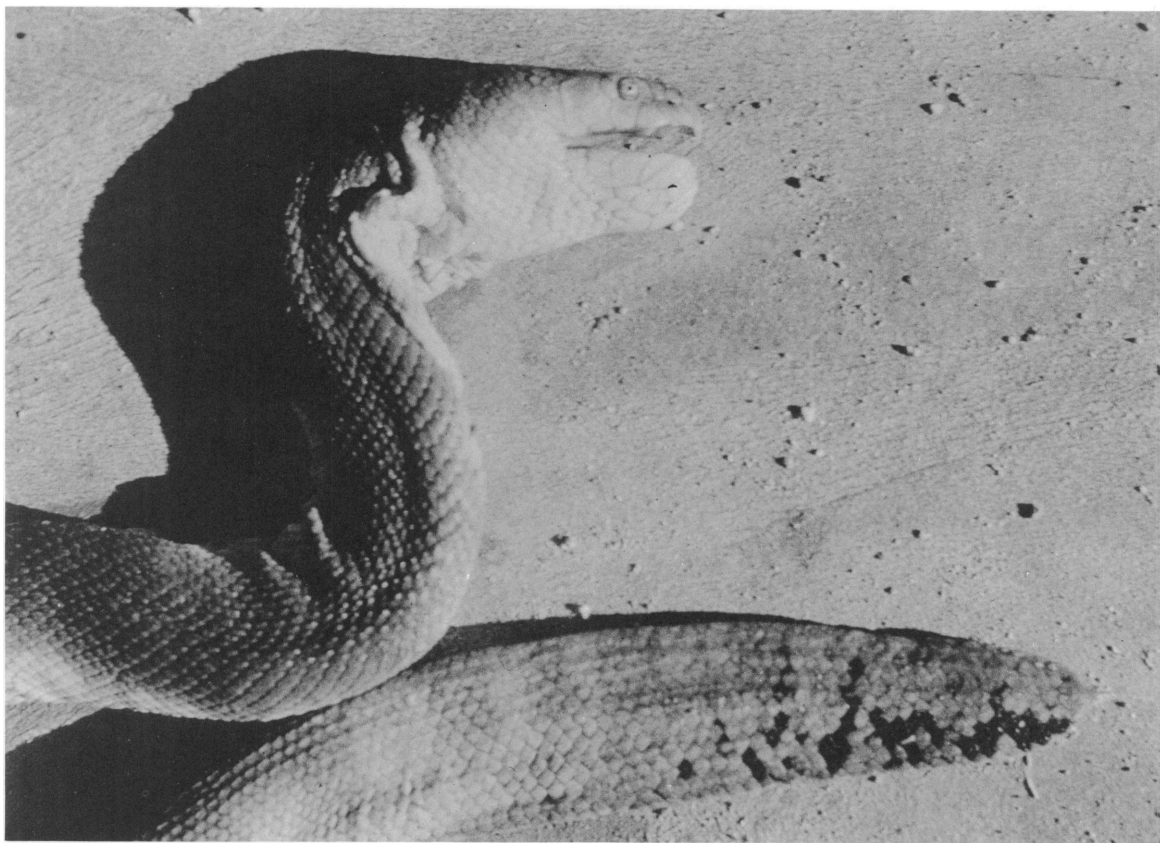


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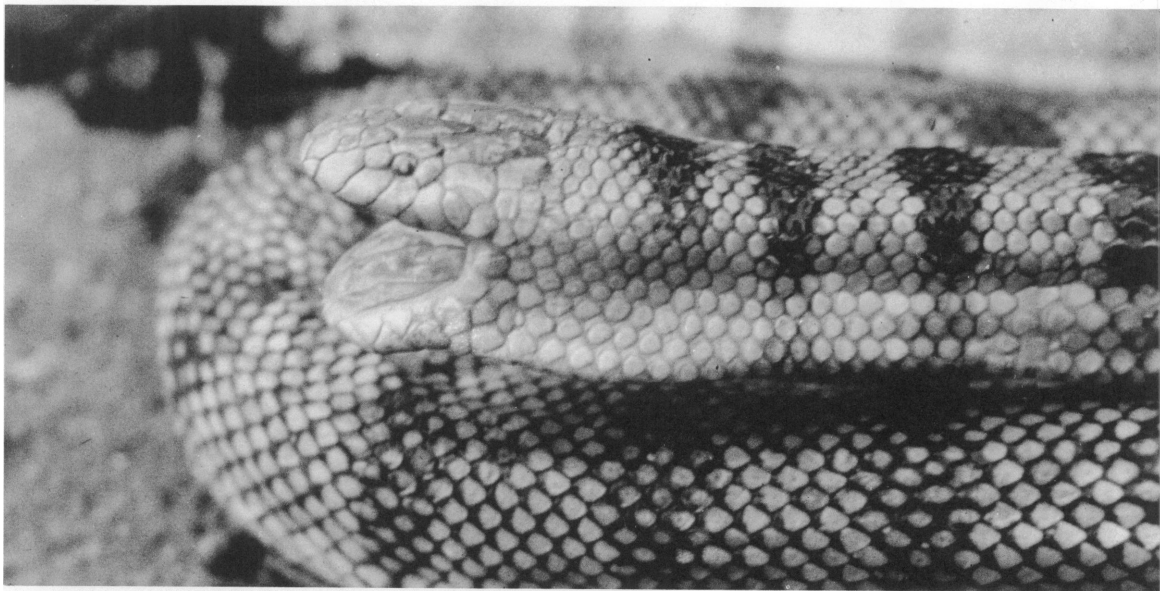


4

1. Annulated seasnake (*Hydrophis cyanocinctus*), Karachi. 2. Bombay seasnake (*Hydrophis mamillaris*), Sonmiani Beach. 3. Cantor's small-headed seasnake (*Microcephalophis cantoris*), Karachi. 4. Pelagic seasnake (*Pelamis platurus*), Hawke's Bay



1

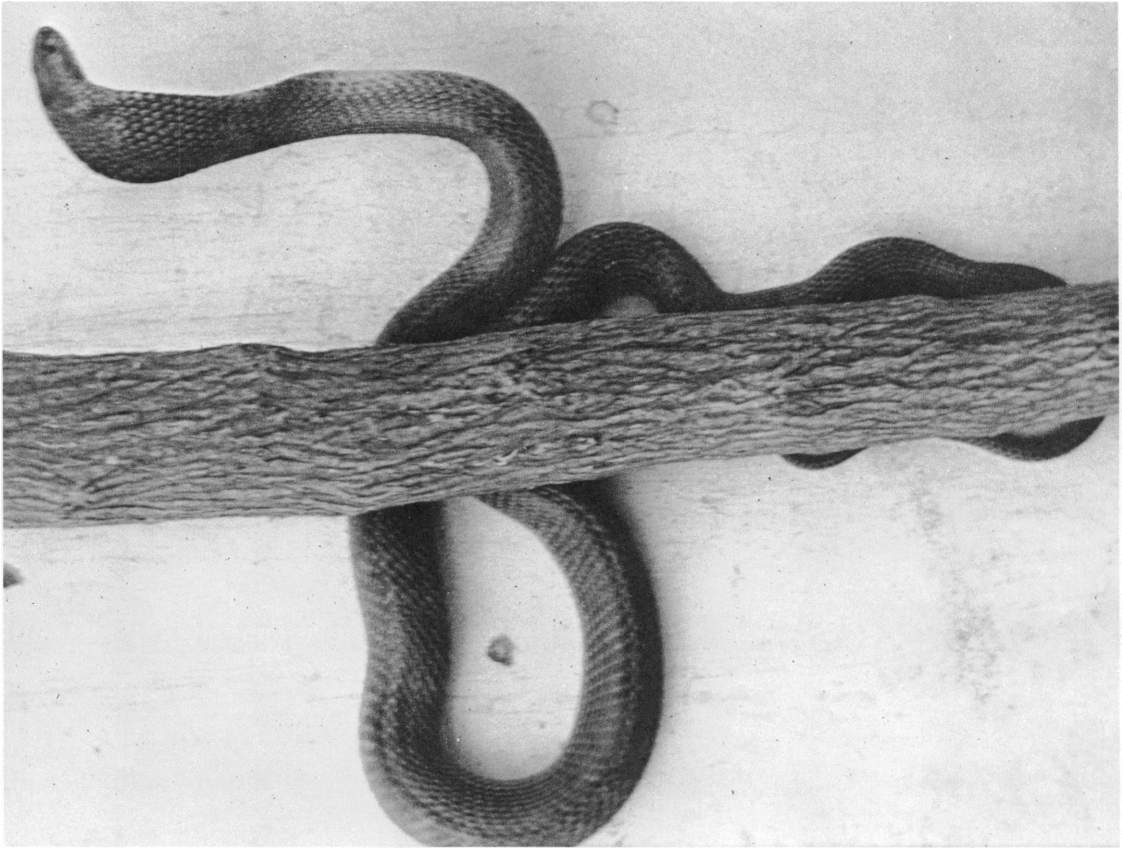


2

1. Beaked seasnake (*Enhydrina schistosa*), Karachi. 2. Yellow seasnake (*Hydrophis spiralis*), Karachi



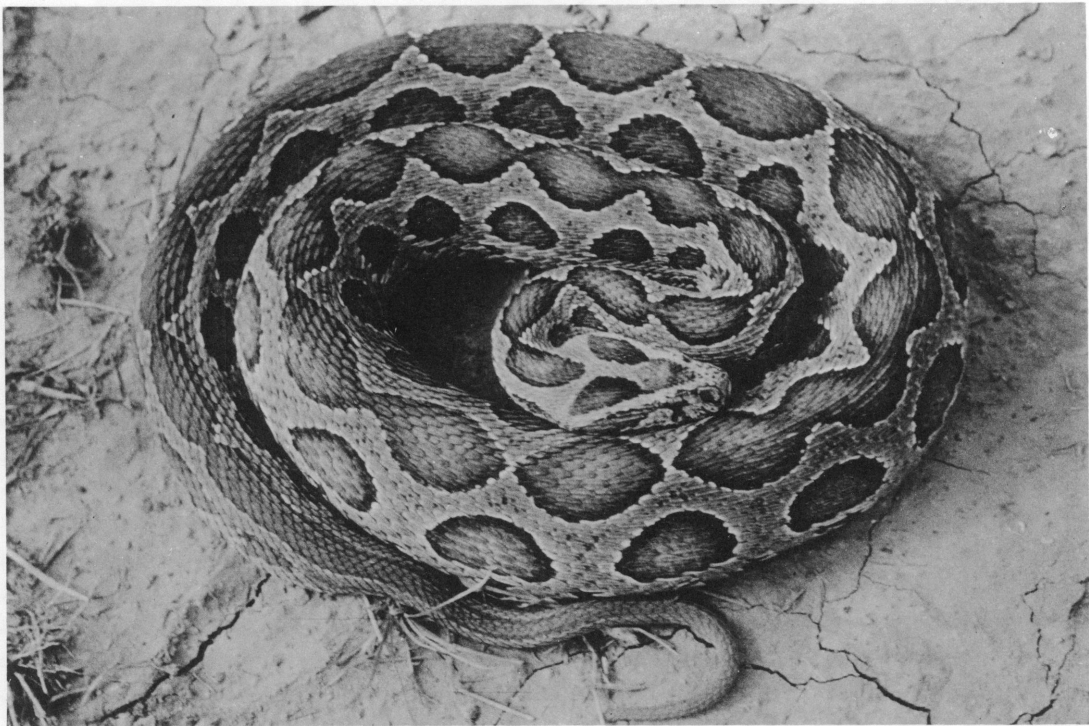
1. Indian cobra (*Naja naja naja*), adult, Tata District.



2. Oxus cobra (*Naja naja oxiana*), adult, Kach, Sibi District

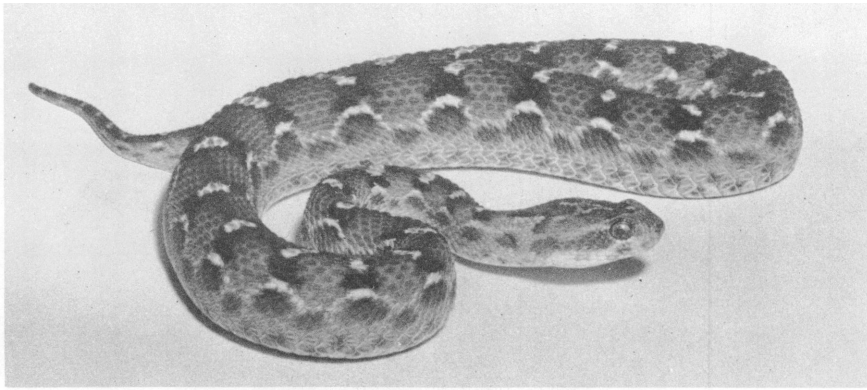


1

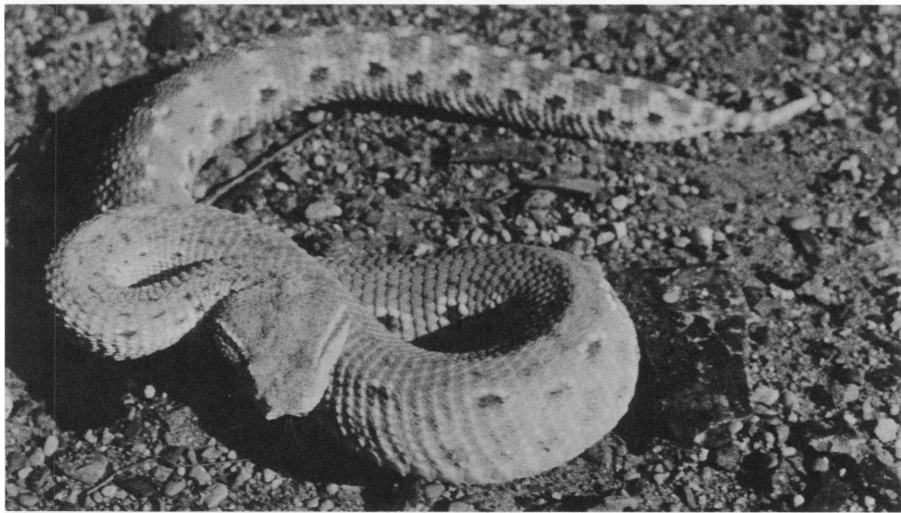


2

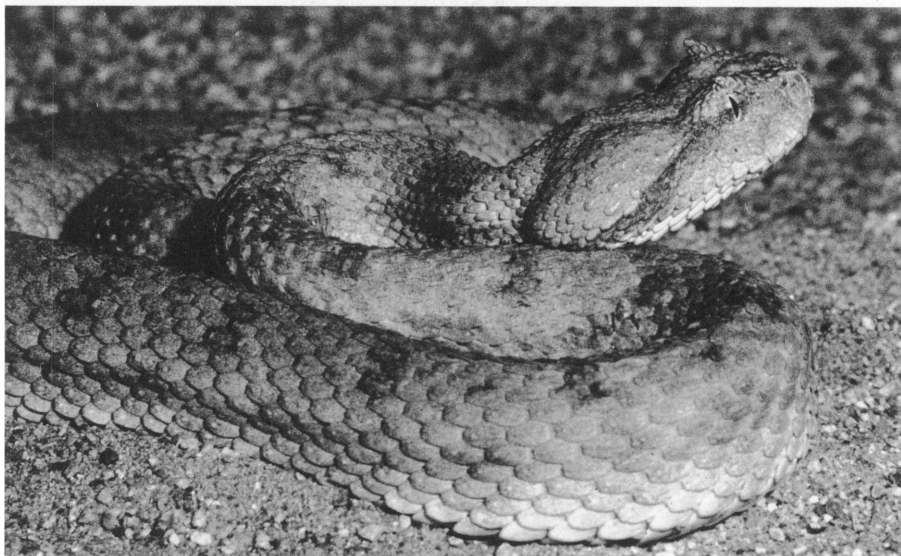
1. Indian krait (*Bungarus caeruleus*), Malir Cantonment. 2. Russell's viper (*Vipera russelii russelii*), Gujjo, Tatta District



1



2



3

1. Saw-scaled viper (*Echis carinatus*), Tatta District; photograph by Isabelle H. Conant. 2. Leaf-nosed viper (*Eristocophis mcmahoni*), Chagai District. 3. Persian horned viper (*Pseudocerastes persicus*); photograph by Hymen Marx

