59.7(85)

Article IX.—ON A COLLECTION OF MARINE FISHES FROM PERU

By John Treadwell Nichols and Robert Cushman Murphy

Plates XXV and XXVI

INTRODUCTION

The latest monographic work on Peruvian ichthyology, 'The Fishes of the West Coast of Peru and the Titicaca Basin,' by B. W. Evermann and Lewis Radcliffe, was issued in 1917 as Bulletin 95 of the United States National Museum. The paper is based principally upon collections made during 1907 and 1908 by Dr. Robert E. Coker, but it purports to list all species which had been recorded from the Pacific coast and drainage of Peru up to the time of its publication. The marine fishes in the list number 152 species, of which two or three are said to be doubtful.

The present contribution is based upon incidental collecting by the junior author between October 1919 and January 1920 at points along the Peruvian coast between Independencia Bay (14° 18′ S.) and Lobos de Tierra Island (6° 23′ S.). Only 64 species are represented by specimens, but the wealth of the littoral ichthyofauna is indicated by the fact that two of these have proved to be new to science, while eight additional species are recorded for the first time from Peruvian waters. We have carefully followed Evermann and Radcliffe's systematic arrangement and nomenclature, in order to make our contribution a convenient supplement to their more comprehensive paper.

The following species are herein described as new:

Neomænis peru
Sebastodes chincha

The following species constitute additions to previous lists:

Carcharhinus limbatus
Cypselurus californicus
Eurystole eriarcha
Mugil thoburni
Hippocampus ingens
Germo argentivittatus
Xenistius californiensis
Spheroides lobatus

Aside from these, a common sting-ray, *Dasyatis brevis*, jaws and a spine of which were brought back with the present collection, was described from Peru by Garman, but the record was evidently overlooked by Evermann and Radcliffe.

The Peruvian *Trachurus*, though long known, has always been confused with extralimital species, until recently described on material from this collection as *Trachurus murphyi*.[1]

[1]Nichols, J. T., 1920, Bull. Amer. Mus. Nat. Hist., XLII, p. 479.

The present paper, therefore, brings the total number of salt-water fishes known from the Peruvian coast up to 163 species. Beyond a doubt, many additions will be made in the future, not only through the discovery of undescribed or obscure species but also from among widely distributed pelagic or littoral fishes such as, for example, the "dorado" (*Coryphæna*) and the "pejesierra" (*Pristis*), both of which are apparently familiar to the native fishermen, even though no Peruvian specimens have yet fallen into the hands of a naturalist.

Peruvian Fish Names

A careful field-record of the names by which native fishes are known to the Peruvian Indian fishermen was kept by the junior author, and a subsequent comparison of these with longer lists of names collected by Dr. Coker more than a decade earlier reveals a noteworthy agreement which implies a relatively fixed vernacular nomenclature. The names supplied by Dr. Coker for the paper by Evermann and Radcliffe are now, of course, definitely associated with the technical terminology, and the same is true of the majority of native names used in the taxonomic section of the present work. But a larger number of other Peruvian fish names, including doubtless many synonyms and localisms, are still not exactly determinable, and we believe that an attempt to allocate these, even though the list be tentative and far from complete, will not only aid future scientific investigators but may also become of use to the organizers of the great fishing industries which are certain to be developed, sooner or later, along the coast of Peru.

The names listed were derived from the sources mentioned above and also from papers by Dr. Coker published in the Boletin del Ministerio de Fomento, Lima, Peru, volumes V (1907) to VII (1908). To the author of these papers the credit for many of the determinations must also be given. The list, which should be considered as characteristic though by no means complete, lends itself to analysis into terms of three classes, as follows.

1.—Old Spanish names, chiefly of Mediterranean fishes, which have been generally reapplied in Hispanic America.

2.—Words of Spanish-American origin, many of which are metaphorical, e. g., "cruz" (cross) for *Sphyrna zygæna*, "ojo de uva" (grape-eye) for *Hemilutjanus macrophthalmos*, "pintadilla" (painted) for *Cheilodactylus variegatus*. In other instances the significance of the name is fanciful or entirely obscure, e. g., "ayanque" (jackstay) for *Sciæna deliciosa*, a term which may, however, be a corruption of "arenque"

(herring). This group includes many names which have spread to the coast of Peru from the Antilles, particularly from Cuba. Among these are "pámpano" and "jerguilla."

3.—Ancient Peruvian names of the Quichua and other Indian tongues. Doubtless many terms of which we have been unable to determine the source and primary meaning belong here.

In accordance with the genius of the language, diminutive forms are much in evidence. Such names may have come to replace the nouns from which they were originally derived, as "mojarilla," "chabelico"; or they may refer to young or small-sized examples of familiar fishes. Examples of diminutives applied in the latter sense are "ayanquito," "jurelcito," "lisita," "camotilla," "robalito," "cochinillo," "borrachin.

The Old World Spanish names mentioned in the first group above are worthy of separate citation, for most of them refer to Peruvian representatives of types of fishes common in the Mediterranean or in the streams and lakes of Spain. These alone are listed below, purely local names, as well as universal Spanish group names, such as "tiburones" (sharks) being omitted.

Name	Literal or Primary Meaning	English Vernacular Equivalent
Aguja	Needle	Barracudas, needlefish and pipefish
Albacora	Albacore	Albacore or tunny
Angelote	Figure of an angel	Angel-fish (*Squatina*)
Anguila	Eel	Eel
Bagre	Catfish	Catfish
Barbudo	Bearded	Threadfin
Bonito	Pretty	Bonito
Caballa	Mare	Mackerel
Cabrilla	Kid	Sea-bass
Cazón	Chaser, hunter	Shark
Cochino	Pig	Trigger-fish
Corvina	Resembling a crow	Corbina
Dorado	Gilded	Dolphin (*Coryphæna*)
Jurel	Scad	Scad
Lenguado	Tongue-shaped	Flounder
Lisa	Mullet	Mullet
Marrajo	Morocco (?)	Some species of large shark
Mojarilla	Little mojarra	A kind of croaker (*Stellifer*)
Morena	Moray	Moray
Peje-espada	Swordfish	Swordfish
Pejerrey	Kingfish	Silverside (*Atherinidæ*)
Pejesapo	Toadfish	Clingfish
Raya	Ray	Ray or skate

Name	Literal or Primary Meaning	English Vernacular Equivalent
Robalo	Robalo	A species of croaker (*Sciæna starksi*); not "robalo" of the Spanish Main (*Centropomus*)
Roncador	Snorer	One of the grunt family (*Brachydeuterus leuciscus*).
Sardina	Sardine	A kind of herring (*Sardinella*)
Sargo	Sea-bream	Used in Peru for a fish of the grunt family (*Anisotremus scapularis*).
Sierra	Saw	Sierra (*Scomberomorus*) Sawfish (*Pristis*)
Tollo	Tope, dogfish	Dogfish
Volador	A flyer	Flyingfish

ANNOTATED LIST OF COLLECTED MATERIAL[1]

Gyropleurodus peruanus Evermann and Radcliffe. "Gato." Lobos de Afuera Island, January 5, 1920. Washed ashore in dying condition.

Carcharhinus limbatus (Mueller and Henle). "Cazón." Jaws of this shark taken at Lobos de Tierra Island and presented by an Indian fisherman at the island on January 9, 1920.

Sphyrna zygæna (Linnæus). "Cruz." Observed both at sea and in Indian fishing communities at Lobos de Tierra. Valued for food. No specimens preserved.

Mustelus abbotti Evermann and Radcliffe. "Tollo." Callao market, December, 1919.

Mustelus dorsalis Gill. "Tollo." Callao market, December 24, 1919.

Rhinobatus planiceps Garman. "Guitarra." Caught from dock at Pacasmayo, January 2, 1920.

Dasyatis brevis (Garman). "Raya." Jaws and spine of two specimens, Paracas Bay, October, 1919. Common wherever there are shallow quiet bays along the coast, such as Paracas Bay south of Pisco. Numerous fishermen were seen who had been wounded by sting-rays, and an instance cited where a swimmer struck in the breast was unable to reach shore and so drowned.

Potamalosa notacanthoides (Steindachner). "Machete." Pisco Bay, near Isla Blanca, November 22, 1919.

Sardinella sagax (Jenyns). "Sardina." One from stomach of a female sea lion (*Otaria byronia*), Chincha Islands, October 14, 1919. Three specimens, Chincha Islands, October 26, 1919.

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[1]One specimen of each, except where otherwise noted.

The schools of this species are pursued by the sea lion of the coast, for which the sardina is apparently a favorite and selected food supply.

With reference to mixed schools of fishes, chiefly sardinas, cojinobas, caballas, and jurels, which played about the dock of Central Chincha Island in October 1919 (cf. p. 507), the junior author has recorded the following notes:

October 14. Presently a lobo [sea lion] appeared, and glided around beneath the dock, making a clear path over and over again through the groups of fish in which cojinobas were the most numerous. The fishes would dart aside with alacrity when the sea lion appeared, but they calmed down as soon as their enemy had passed, and there was no tendency toward deserting the locality. Time and time again, the lobo would shoot among the fish and take toll, but the reaction of the prey, both individually and collectively, was always the same—a momentary start of two or three feet, and then a return to lethargy.

Shortly before dark, the lobo, grown careless through luxury, hauled out on the beach below the house, where it was shot. The complete contents of its stomach was as follows: 17 sardinas, 2 caballas, 2 cojinobas, 1 jurel, 3 remains of fishes probably of the species listed, 3 stones of about 1½ inch diameter, and numerous parasitic worms.[1]

Engraulis ringens Jenyns. "Anchoveta." A number of specimens from fishermen at Pescadores Islands, off Ancon, December 13, 1919. Noted at all points along the coast.

During the afternoon of February 2, 1920, while on board a steamer off Huarmey, I estimated that a hundred shoals of anchovetas were within sight. At times, when the bonitos attacked them from beneath, large areas of the surface would be so broken by the leaping of the little fishes that the ocean hissed as though a deluge of rain were descending upon it. The most remarkable sight of all was the manner in which whole herds of lobos [sea lions] were lolling and frolicking among the anchovetas, gorging themselves to the limit of their capacity.

On other occasions I have had the good fortune to run directly over schools of anchovetas in a launch of shallow draft. Their appearance from above is amazing, for the quivering, silvery creatures seem to be packed together like sardines in a tin, except that their heads point all in one direction as their legion, which somehow seems more like an individual organism than a conglomeration of millions, streams through the gauntlet of its diverse and ubiquitous enemies (pp. 65, 66[2]).

Ophichthus callaënsis (Guenther). "Anguila." Found dead on sandy beach, head of Independencia Bay, November 18, 1919.

Gymnothorax wieneri Sauvage. "Morena." One from Lobos de Tierra Island, January 6, 1920; one from dock at Pacasmayo, January 3, 1920; one from Lobos de Tierra Island, January 14, 1920.

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[1]Murphy, field note.
[2]Murphy, R. C., 1922, 'Peruvian Fisheries,' Brooklyn Museum Quarterly, IX, No. 1, pp. 44–70.

Galeichthys peruvianus Luetken. "Bagre." One seined from sandy beach, North Chincha Island, November 23, 1919; and one from Callao market, December, 1919.

Tylosurus stolzmanni (Steindachner). One from pelican stomach, Lobos de Tierra Island, January, 1920.

Cypselurus californicus (Cooper). "Volador." Central Chincha Island, November 11, 1919. A single specimen about a foot long washed ashore in dying condition. More material may make it possible to separate this from the Californian fish. The only differences we find are somewhat shorter pectoral and longer ventral, 1.4 and 3.3, respectively, in length to base of caudal.

Eurystole eriarcha (Jordan and Gilbert). Nine specimens seined from beach of North Chincha Island, November 24, 1919; as many seined at same place, November 23, 1919.

Basilichthys affinis (Steindachner). "Pejerrey." A number of specimens, Lobos de Tierra Island, head of Independencia Bay, North Chincha Island, and Callao market.

Mugil cephalus Linnæus. "Lisa." From fishing boat south of Paracas Peninsula, November 19, 1919. Mullets about a foot long were seen on the ground in the colonies of breeding pelicans. One of about 18 inches, center of Santa Rosita Id., could scarcely have been anything but *cephalus*.

Mugil thoburni Jordan and Starks. "Lisa." Several from lagoon of Paracas Bay, October 19, 1919, and November 10, 1919. Small mullet are exceedingly abundant in the shallow lagoons where they are often left stranded by the retreating tide.

Sphyræna idiastes Heller and Snodgrass. "Aguja," "Picuda." Lobos de Tierra Island, January 10, 1920.

Siphostoma aciculare (Jenyns). Native name not recorded in notes; Coker gives "aguja." Washed ashore on Central Chincha Island, October 13, 1919.

Hippocampus ingens Girard. "Caballito." Dried specimen taken at Lobos de Tierra Island about December, 1919, and presented by an Indian fisherman at the island on January 8, 1920. There is no reason to doubt that this specimen was actually taken at Lobos de Tierra.

Scomber japonicus Houttuyn. "Caballa." Several specimens, Chincha Islands, and Pescadores Islands off Ancon.

Sarda chilensis (Cuvier and Valenciennes). "Bonito." Two specimens purchased at the water-front market, Callao, December 24, 1919.

"One evening in late October the launch entered the strait of the Chinchas after dark, its course a blaze of phosphorescence. The bonitos

were foraging, and their erratic, zig-zag wakes were also marked in fiery lines. It gave one a new impression of the speed with which these fish move and of the extreme irregularity of their course." (Murphy, field note.)

Germo argentivittatus (Cuvier and Valenciennes). "Albacora." We identify the photograph of a tunny taken between Lobos de Tierra and Lobos de Afuera as this species. In the type description *argentivittatus* was credited to the Atlantic, but also mentioned from the Indian Ocean (Dussumier). Our photograph agrees with the description and also with notes made on a specimen labelled Malabar, Dussumier, which was examined by the senior author in the Paris Museum some years ago. Day does not list the species in 'Fauna British India, Fishes,' and there may be some error in the localities to which it has been assigned. This species has the lower parts very beautifully and regularly marked with vertical white or silvery stripes and rows of oval spots in alternation. For the rest, it is somewhat intermediate between typical *Thunnus* and the albacores (*Germo*), having a breast fin more elongate than in any true tuna, though not so abnormally long as in other species of albacores.

Neptomenus crassus Starks. "Cojinova." A small specimen from the shelter of a large jellyfish, Central Chincha Island, October 23, 1919. Two large specimens from Pescadores Islands, off Ancon, December 13, 1919, and Central Chincha Island, October 27, 1919.

The following notes by the junior author refer to the abundance of this species.

Owing to the abundance of Peruvian marine fishes which travel in dense schools, the *fisga* or gig is often an effective instrument in the hands of the fishermen. In late afternoon at the Chincha Islands, when the guano workmen had ceased their toil and the day wind had died down, the Indians used to congregate upon the mole of Central Island, for the purpose of striking gigs into the masses of fish which oscillated in the swells below. I remember many quiet October evenings in 1919 when, during the hour before sunset, vast shoals composed mostly of four species—herrings, mackerels, cojinobas, and scads—filled the shallow water near the shores of the Chinchas. All the fish were of about the same length, nine or ten inches, and, although the cojinobas appeared to be the most numerous, the four species mingled rather indiscriminately, for a single thrust would often bring up several kinds together. It was necessary only to wait until well bunched groups had gathered below, and then to hurl the Neptunic *fisga*. When it was drawn out by its lanyard, the steel fork would usually have two or three, or sometimes more, silvery fish transfixed by the prongs. While some of the Indians were cheerily casting the gig, others were scarcely less successful with a curious contrivance consisting merely of a weighted line with many hooks attached to it at intervals of a few inches. The line would be lowered gently to the bottom; at the

opportune moment it would be jerked upward through the concentrated fishes, hooking them at random by their bellies, fins, snouts, or tails.[1]

Trachurus murphyi Nichols. "Jurel." One, North Chincha Island, October 13, 1919; one, Central Chincha Island, October 27, 1919.

Trachinotus paloma Jordan and Starks. "Pámpano." Lobos de Tierra Island, January 10, 1920. Young ("pámpanitos") seined in shallow cove, Lobos de Tierra Island, January 6, 1920.

Acanthistius pictus (Tschudi). "Cherlo." Several caught from dock at Pacasmayo, January 3, 1920; one specimen killed with dynamite off North Chincha Island, October 25, 1919 ("choromelo"). Two young seined in cove at Lobos de Tierra Island, January 6, 1920 ("ayanquito").

Hemilutjanus macrophthalmos (Tschudi). "Ojo de Uva." Three specimens killed with dynamite off North Chincha Island, October 25, 1919.

Paralabrax humeralis (Cuvier and Valenciennes). "Cabrilla," "Cabrilla fina." Specimens from Lobos de Tierra Island, South Guañape Island, Isla Blanca Pisco Bay, Pescadores Island off Ancon, North Chincha Island.

Paranthias furcifer (Cuvier and Valenciennes). "Cabinsa." South Guañape Island, January 1, 1920. This fish shares with *Isacia* the name "Cabinsa" on account of superficial resemblance.

Neomænis peru, new species

Type, No. 7415, American Museum of Natural History, Lobos de Tierra Island, January 6, 1920, R. C. Murphy; our only specimen. Length to base of caudal, 280 mm. Depth in this measure, 2.9; head, 2.6. Greatest thickness in head, 2.2; eye, 4.5; snout, 3.0; interorbital, 4.0; maxillary, 2.9; longest dorsal spine, 2.9; second anal spine, 4.5; longest dorsal ray, 3.7; longest anal ray, 2.1; pectoral, 1.3; ventral, 1.8; caudal (to tip of upper lobe), 1.4½; depth of caudal peduncle, 3.3.

Back little elevated. Lower jaw slightly projecting, maxillary not quite reaching front of the large eye. Teeth in jaws small, upper jaw with small weak canines, none in the lower jaw. Villiform teeth on vomer, palatines and tongue, those on the vomer in a roughly diamond-shaped patch somewhat prolonged behind so that the two posterior faces of the diamond are concave. Preopercle finely serrate behind, more coarsely so on its lower limb. Posterior margin with a very shallow re-entrance. Interorbital strongly convex. Ten gill-rakers on the lower limb of the first arch, the longest ½ eye. Dorsal X, 13. Anal III, 8, pointed, the second spine a little shorter but stronger than the third. Caudal lunate, with pointed lobes, the upper a little the longer. Scales below the lateral line roughly parallel with it, those above in very oblique series, about 56 in number. Scales on cheek and opercle but none on preopercle. Head naked

[1]Murphy, *loc. cit.*, p. 52.

above. A single row of large scales with several rows of smaller ones behind it slanting across the side of the nape, and an area with small imbedded scales behind eye.

Color in spirits pale brownish, darker above, a dusky spot in the axil, central caudal rays narrowly tipped with black. Color in life red, the fish resembling *Holocentrus* in color and general appearance.

The species is evidently a food fish of considerable importance, for the Indians from whom the specimen was obtained at Lobos de Tierra had already salted several hundred of the same kind. Its vernacular name is "estrella."

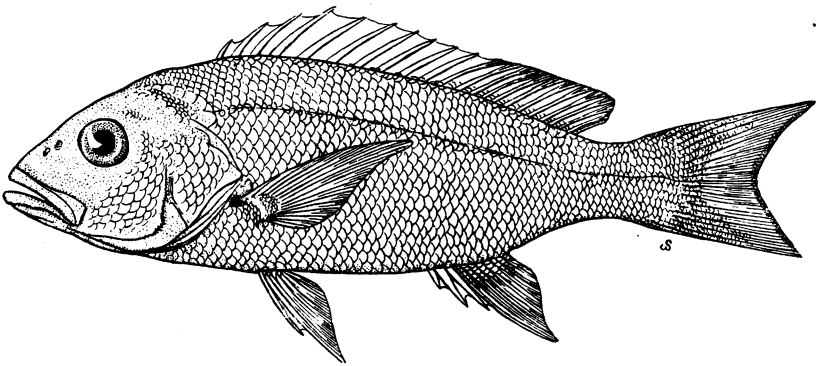

Fig. 1. *Neomænis peru*, type.

Xenistius californiensis Steindachner. "Jurelcito," "Chulita," "Cabrillita," "Chitita," names probably given erroneously under the impression that this is the young of familiar species. Several hundred specimens seined off sandy beach, North Chincha Island, November 23 and 24, 1919. About fifty specimens, cove on Lobos de Tierra Island, January 6, 1920. All young.

Anisotremus scapularis (Tschudi). "Chita." A few, North Chincha Island, etc., and one Callao market, December, 1919.

Isacia conceptionis (Cuvier and Valenciennes). "Cabinsa." Chincha Islands, early November, 1919 (3 specimens), and Pescadores Islands, off Ancon, December 13, 1919.

Doydixodon lævifrons (Tschudi). Called "chititas," and considered to be the young of *Anisotremus scapularis*. A number from rock pools, South Chincha Island, November 21, 1919. The large specimen figured ("babunco") Pl. XXVI, was taken at the Ballestas Islands, on November 30.

Cynoscion analis (Jenyns). "Robalito." Three specimens, Callao market, December, 1919.

Stellifer minor (Tschudi). "Mojarilla." Three specimens from dock at Pacasmayo, January 3, 1920, etc. On the long pier at Pacasmayo, January 8, there were many fishermen catching this sand haunting fish with "sand-bugs" (*Emerita analoga*) for bait.

Sciæna fasciata (Tschudi). "Burro," "Caracha," "Pintadilla." Several specimens; Chincha Islands, Paracas Bay, Pacasmayo.

It seems to us peculiarly unfortunate that this fish is set off by Evermann and Radcliffe from its congeners by lesser scale count. The scales of our specimens are sufficiently irregular in arrangement to allow of considerable latitude in counting, but appear smaller than those of *Sciæna gilberti!*

Sciæna deliciosa (Tschudi). "Ayanque," "Lorna." Two specimens, seined in cove at Lobos de Tierra Island, January 6, 1920, ("Ayanquito"); one seined off beach of North Chincha Island, November 24, 1919; larger ones from Callao market, December 18, 1919. One caught in casting net, Paracas Bay, November 11, 1919. The specimen last mentioned is deeper and more compressed than the others of the same size, with different outlines, but we find no technical characters to separate it.

Sciæna gilberti Abbott. "Corvina." Young examples called "Corvinita" and "Lorna." One, 24 inches long, Callao waterfront market, December 24, 1919. We also place here a small fish, obtained with *Sciæna deliciosa* of same size, Callao market, December 18.

Menticirrhus cokeri Evermann and Radcliffe. Two specimens, one seined off sandy beach, North Chincha Island, November 23 and 24, 1919.

Polyclemus peruanus (Steindachner). "Coco." Callao waterfront market, December 24, 1919.

Oplegnathus insignis (Kner). "Castañeta," "Señora"; "Mero" (the large black examples). Specimens from North, South and Central Chincha Islands.

This fish reaches a size of at least 28 inches total length. One of approximately this size was killed by dynamite, in about 5 fathoms of water over rocky bottom. Another of 14 inches killed at the same time was preserved. These large specimens were uniform blackish in life. Smaller ones marked with yellow and black bands were common in rock pools at the Chincha Islands.

Caulolatilus princeps (Jenyns). "Pejeblanco." Specimens from Chincha and Pescadores Islands; and one from South Island of Guañape, January 1, 1920, caught on hand line in rock pool. The depth as given by Evermann and Radcliffe does not hold for this material. Specimens 200 to 360 mm. long to base caudal have depth, 3.4 to 3.7; head, 3.5 to 3.6. Dorsal soft rays, 26, anal 25.

Pinguipes chilensis (Molina). "Camote." Killed with dynamite, North Chincha Island, October 25, 1919.

Cheilodactylus variegatus Cuvier and Valenciennes. "Pintadilla." Specimens killed with dynamite, North Chincha Island, October 25, 1919; and one, South Island of Guañape, January 1, 1920, caught on hand line in rock pools.

Chromis crusma (Cuvier and Valenciennes). "Coco" (at the Chincha Islands). Coker gives "Chavelita" and other names. Four specimens dynamited, North Chincha Island, October 25, 1919.

Nexilosus latifrons (Tschudi). "Coco," "Coquito." Rock pool in cave, South Chincha Island, November 21, 1919.

Bodianus eclancheri (Valenciennes). "Negro." Lobos de Afuera Island, January 5, 1920.

Pimelometopon darwinii (Jenyns). "Mulata." Three specimens dynamited, North Chincha Island, October 25, 1919; and one from Lobos de Tierra Island, January 13, 1920.

Halichœres dispilus (Guenther). "Doncella," (Central and Southern); "San Pedrano," (Northern). Specimens from North Chincha and Lobos de Afuera Islands.

Balistes polylepis Steindachner. "Cochino," "Pejechancho." Lobos de Tierra Island, January 8, 1920.

Spheroides lobatus (Steindachner). "Póncoñol." Caught on hook, Lobos de Tierra Island, January 8, 1920.

Sebastodes chincha, new species

Eight specimens of Scorpænidæ from the Chincha Islands varying from 35 to 95 mm. in length, collected in November, 1919, are referable to a single species. The vernacular name is "Peje-Diablo." They agree with *Sebastodes* (*Sebastichthys* is used by Evermann and Radcliffe) and suggest *S. rosaceous* of the North American coast, except that, whereas teeth are well developed on the vomer, they appear to be absent from the palatines. Although this character would technically throw them into *Sebastopsis*, they are here described as *Sebastodes* on the basis of their apparently close relationship to species of that genus. Eleven soft dorsal rays only, and invariably, exclude the possibility of their being *Sebastichthys chamaco* Evermann and Radcliffe, which has 14, though they look very much like the figure of that fish.

Characters of the Species.—Dorsal XII, I, 11; Anal III, 5½. Scales firm, ctenoid. Head scaly except for jaws which are naked. The two upper rays of pectoral simple, then 5 branched rays, eleven lower rays, including the excerted ones at

apex of the fin, simple. Interorbital narrow and concave. Gill-rakers short and stumpy. Second anal spine longer and stronger than third. Three or four sharp spines on the mid-line of the caudal peduncle above. Bright red in life. Brownish with dark saddles in spirits. Peritoneum pale.

DESCRIPTION OF TYPE.—No. 7784, American Museum of Natural History, Chincha Islands, November 23 to 30, 1919, R. C. Murphy. Length to base of caudal, 95 mm. Depth, 2.7 in this measure; head, 2.6; greatest thickness (back of head), 4.1. Eye, snout, and depth of peduncle equal, 3.7 in head; interorbital, 6.2; maxillary, 1.7; longest dorsal spine, 2.8; second anal spine, 1.8½; longest dorsal ray, 2.3; anal ray, 2.1; pectorals, 1.2; ventrals, 1.6; caudal (equals maxillary), 1.7. The

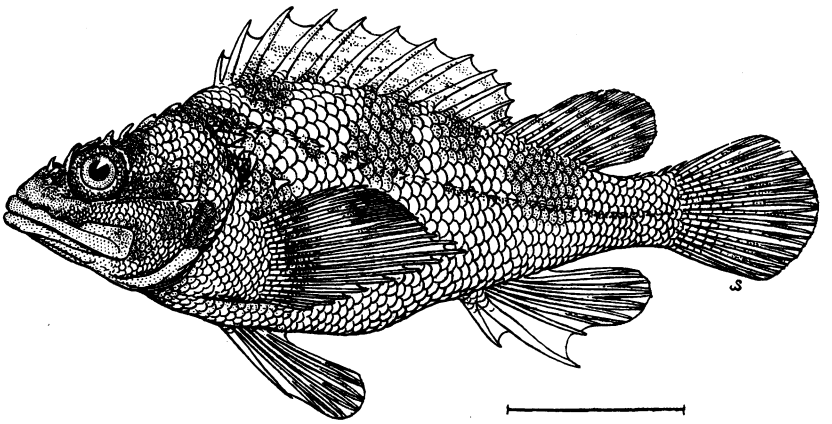

Fig. 2. *Sebastodes chincha*, type, scale 1 inch.

upper edge of pectoral consists of two approximate slender rays or one deeply divided ray. Below this are 5 well-forked rays, and then several thick, simple, more or less excerted ones. Back elevated; jaws equal. Developed gill-rakers, 2 plus 5. A short, sharp nasal spine. A low, blunt preocular spine. Supraocular, postocular, tympanic, parietal and nuchal spines present. The postocular larger than the supraocular, the tympanics farthest apart; parietal and nuchal close together forming a ridge diverging caudad from its fellow. A sharp suborbital ridge with its largest spine under the posterior part of the eye. A very small spine further forward, and a small one at its posterior terminus in front of the upper preopercular spine. Three spines on the preopercle, the upper slightly the largest. Two on the opercle of about equal size. Two small ones, one before the other, at the shoulder, and one over the pectoral. Coronal spine very small, sharp. A pair of low ridges in the interorbital space, each ending in a low spine. Four sharp spines on the mid-line of the caudal peduncle above, the next to the last best developed. About 45 scales.

Scorpæna histrio Jenyns. "Peje-Diablo." Specimens from South Guañape Island.

Paralichthys adspersus (Steindachner). "Lenguado." Specimens from sandy beach, North Chincha Island; seined at head of Independen-

cia Bay; Central Chincha Island, October 26, 1919, (bright green eye surrounded by gold line); and Callao market.

Lepisoma xanti (Gill). "Trambollo." Specimens from South Guañape Island, and South Chincha Island.

Alticus gigas (Steindachner). "Borracho," "Sueño." Windward rocky beach, South Chincha Island, November 22, 1919. "Borracho" means drunk, and eating this fish is supposed to make one sleepy and to cause dreams. A meal of them acts like a heavy dose of a narcotic, according to Indians at the Chincha Islands.

Salarias rubropunctatus Cuvier and Valenciennes. "Borrachin." Eleven specimens seined off beach of North Chincha Island, November 24, 1919.

Genypterus chilensis (Guichenot). "Congrio." Dynamited, North Chincha Island, October 25, 1919.

Gobiesox sanguineus (Mueller and Troschel). "Pejesapo." Several from the Chincha Islands.

Arbaciosa hieroglyphica Evermann and Radcliffe. "Pejesapo." One from lagoon of Paracas Bay, November 12, 1919. Two young specimens seined in cove at Lobos de Afuera Island, January 5, 1920.

A DISCUSSION OF THE PERUVIAN SHORE FISHES

The entire Peruvian coast lies well within the tropics. Nevertheless, its shore-fish fauna is subtropical or temperate rather than tropical in character. The reason is not far to seek, namely the cold Humboldt Current. As a matter of fact, Peruvian fishes are somewhat comparable with those of the Mediterranean. We find here an admixture of species which are more abundant near the Equator with others which are distinctly temperate, such as *Trachurus*.

The closest faunal affinities are with the Californias, many species being common both to the coast of Peru and to the waters lying just outside the tropics in the northern hemisphere. The present collection has increased the number of forms common to the temperate waters of the two hemispheres. The two new species described are related to California species, and six of the other eight added to the fauna of Peru are California species. Only two of the additions are widely distributed tropical forms.

It is interesting to contrast these conditions as existing in the Pacific with conditions on the Atlantic coast of the Americas. In the Atlantic there are two sharply marked faunæ, the Boreal and the Equatorial; Cape Cod in summer and Cape Hatteras in winter divide them. The

northern fauna extends little changed from this point to the shores of Greenland, the southern as little changed across the Equator to Rio de Janeiro, Brazil, at the Tropic of Capricorn. The reason is obvious. Here the Trade Wind currents, deflected by the continents to leeward, spread out fanwise, over many degrees of latitude, giving the whole area a very similar warm-water fauna.

In the Pacific conditions are reversed. Currents flow from high latitudes towards the Equator. This restricts the tropical area to a very narrow belt, so narrow, indeed, that it is crossed by a number of species; though sufficiently effective to divide the fishes of California and Mexico from those of Peru to a greater extent than those of Florida are separated from South Atlantic Brazil.

As we go northward there is no such sharp line in the North Pacific as we find between warm and cold-water fishes in the North Atlantic. This would reasonably be the case because the higher latitudes of the west coast of America are to leeward of the ocean and therefore have a more equable temperature. Perhaps the isolation of the Pacific from the Arctic by Bering Strait and the shallow sea between it and the Aleutians is also a contributing factor.

One can scarcely consider the peculiar and unfamiliar relationships of the Peruvian fish fauna—a temperate fish fauna in the tropics of the southern hemisphere allied to the temperate fish fauna of the northern hemisphere—without becoming interested in primary divisions of the world's fish faunæ.

The fishes of the world lend themselves most conveniently to primary faunal divisions not by climates or continental isolation, as is the case with every other class of vertebrates, but by conditions of waters in which they occur. Beginning at the bottom are the deep-sea fishes found for the most part below the 100-fathom line. Secondly, we have the shore fishes occurring on comparatively shallow off-shore banks as well as along the coast-line. Fishes of the high seas, occurring at the very surface of the ocean, even in parts most remote from land, do not form a group by themselves, but merely a sub-division of the tropical sub-division of shore-fishes.

Another primary group would be fresh-water fishes of all the continents and the larger islands. We have drawn up below a provisional schedule of primary divisions and sub-divisions of the world's fish fauna, arranged in key form, based on such data as are immediately at hand, adding in parentheses characteristic forms of some of the divisions, and general boundaries of the marine shore divisions.

FAUNAL DIVISION OF THE FISHES OF THE WORLD

1.—(*a*) Fresh-water fishes; see 2.
(*b*) Marine fishes; see 3.
2.—(*a*) Holarctic (Cyprinidæ); see 4.
(*b*) Southern (Cichlids and Characins); see 5.
3.—(*a*) Deep-sea fishes (below 50 fathoms, and sub-surface on the high seas).
(*b*) Shore fishes (down to 100 fathoms, and surface of the high seas); see 7.
4.—(*a*) Arctic (*Salvelinus*).
(*b*) Asiatic (*Cobitis*).
(*c*) North American (Centrarchids).
5.—(*a*) African (Mormyrids).
(*b*) Neotropical; see 6.
(*c*) Australian (Primitive fishes only).
6.—(*a*) Central American (Viviparous Pœcilliids dominant).
(*b*) South American (Gymnotids).
7.—(*a*) Boreal (Cottids and Gadids. Roughly extending southward to Alaska, Boston, Mass., Norway, and the sea of Okhotsk).
(b^1) Pacific Temperate (*Sebastodes*); see 8. (Roughly meeting the Arctic fauna in northern Japan; along the A eutians and south to Mexico, more or less broken at the Equator to appear again on the coast of Peru).
(c^1). Mediterranean. (Roughly from British Isles to Mediterranean).
(d^1) Cape Temperate. (Roughly, Cape of Good Hope, S. Australia, New Zealand, etc.).
(*e*) Tropical; see 9. (Roughly warm seas of the World, the complement of 7 *a*, *b*, *c*, *d*, *f*).
(*f*) Southern (Nototheniids. Roughly Antarctic and Subantarctic seas, north to the limit of Nototheniids).
8.—(*a*) Northern.
(*b*) Peruvian.
9.—(*a*) Shore (Scarids and Pomacentrids); see 10.
(*b*) High seas (*Coryphæna* and Exocœtids).
10.—(*a*) Pacific.
(*b*) Indian.
(*c*) Atlantic.

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[1] *Trachurus*, characteristic of three temperate divisions.

Limiting the discussion to shore fishes which make up very much the majority in species and individuals of the fish life of the world, they are divided, much as are the faunal groups of land animals, by the joint control of two factors, climate and isolation. Lines of phylogenetic relationship tend to develop within the limits of a single group but also run across the groups, and in so doing give what would seem to be an indication of the relationship of group to group and of the evolution of the faunæ as we now find them.

The Arctic or Boreal fauna shows closest phylogenetic affinities with the temperate Pacific fauna. An incident of this is to be found in the abundance of cottoid fishes. Comparing the Arctic with the temperate Pacific cottoids, it will be noticed that it is among the latter that the more primitive forms are extensively developed. According to Matthew's Law of Dispersal the primitive forms should continue to exist at the periphery of an evolutionary center. If we accept this view we have an Arctic influence predominating among temperate Pacific fishes, and crossing the Equator to Peru.

Again, the affinities of the Mediterranean or Atlantic temperate fauna are with the tropical. An incident in this relationship is the development of the wrasses in each. The temperate wrasses are obviously more primitive than those of the tropical coral reefs, and by Matthew's Law again the tropics are near the center of distribution and the tropical influence extends northward to the British Isles.

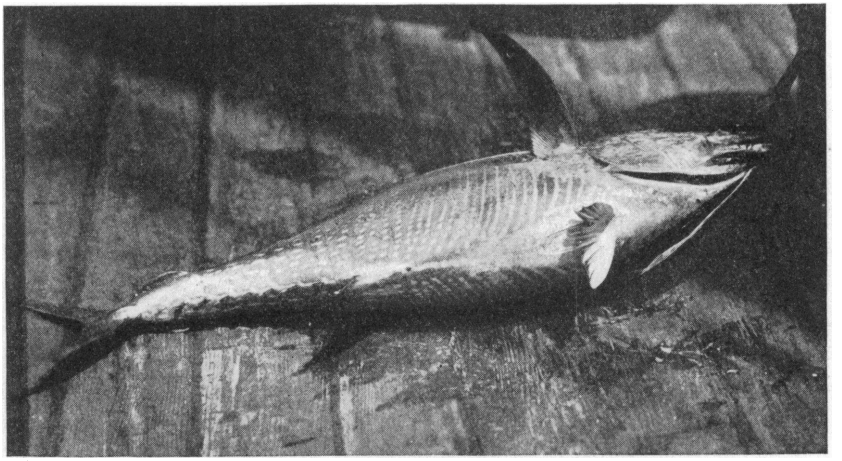
The influence of the third, the southern or Antarctic element, appears to be confined more or less within its own boundaries.

PLATES XXV AND XXVI

PLATE XXV

(Figures 1 and 2)

Germo argentivittatus (Cuvier and Valenciennes). Caught on hand line between Lobos de Afuera and Lobos de Tierra Islands, Peru, January 5, 1920.



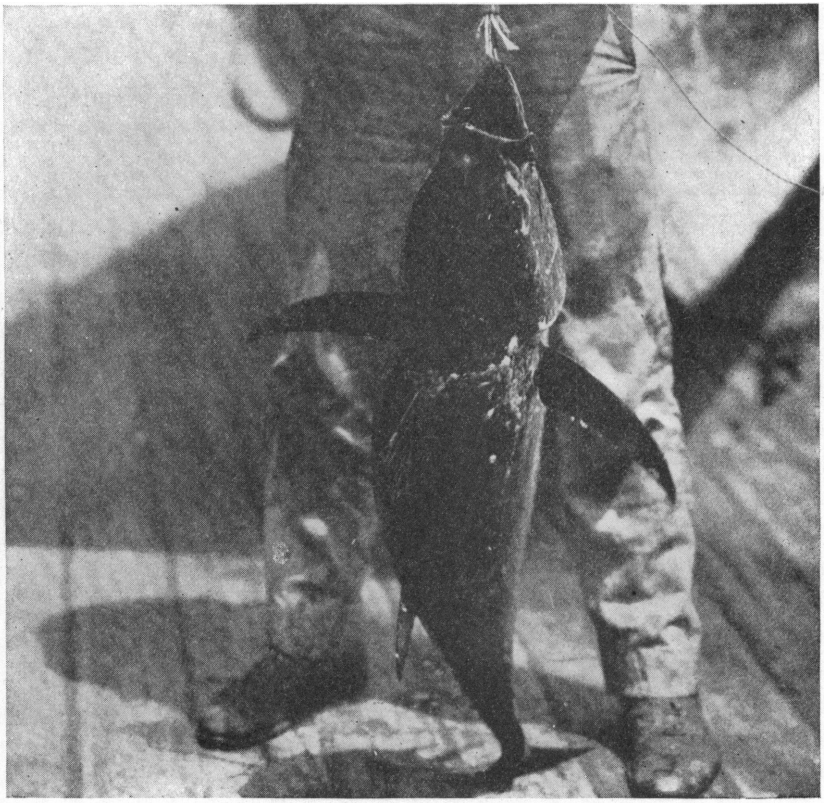


PLATE XXVI

Fish from rocky bottom, Ballestas Islands, Pisco Bay, November 30, 1919.

Fig. 1. Left to right: mulata (*Pimelometopon darwinii*); babunco (*Doydixodon lævifrons*); cabrilla (*Paralabrax humeralis*); cabrilla (*Paralabrax humeralis*); ojo de uva (*Hemilutjanus macrophthalmos*); burro (*Sciæna fasciata*); coco, chavelita (*Chromis crusma*); chita (*Anisotremus scapularis*).

Fig. 2. Left to right: mero, señora (*Oplegnathus insignis*); pintadilla (*Cheilodactylus variegatus*); mulata (*Pimelometopon darwinii*).