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A Review of the Fossil Turtles of Australia

EUGENE S. GAFFNEY[1]

ABSTRACT

The Australian fossil record has yielded sparse but identifiable specimens of Trionychidae (?Miocene-Recent), Carretochelyidae (Pliocene-Recent), Chelidae (Miocene-Recent), Chelonioidea (Cretaceous-Recent), and Meiolaniidae (Miocene-Pleistocene). As is the case with the Recent turtle fauna, the side-necked chelids are the most common and most widespread fossil turtles. With the possible exception of the poorly known Cretaceous *Chelycarapookus,* the meiolaniids are the only major group present in the fossil record that is not represented in the Recent Australasian fauna. Various new taxa of chelids reported by De Vis around the turn of the century are not diagnosable beyond family. There are no extinct chelid species that can be substantiated at present.

INTRODUCTION

The purpose of this paper is to bring together the known occurrences of turtles in the Australian fossil record and to review previous identifications and reports that have appeared in the literature. The best chelid material has been described in Gaffney (1979a) and the relationships of the group are discussed in Gaffney (1977). The fossil trionychids, sparse but of biogeographic interest, were also described separately in Gaffney and Bartholomai (1979). I am presently studying the meiolaniids.

For my views on the generic level taxa of chelids consult Gaffney (1977). In the present paper I try to identify certain fossil taxa with taxa discussed in Gaffney (1977). I do not think that it is possible to realistically deal with specific level chelid taxa among fossils at present because of the paucity of skeletal material and descriptive work for the Recent forms. Goode (1967), Cogger (1975), and Legler and Cann (1980) refer to some osteologic features in diagnosing Recent Australian chelids but it is not consistent enough to provide useful definitive osteologic diagnoses for all the known species. Furthermore, it may well be that many of the Recent species of *Emydura* and *Chelodina* are not diagnosable osteologically. In any event, much of the Australian fossil turtle material is fragmentary and cannot even be placed to Cryptodira or Pleurodira.

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What criteria are necessary for identification and to what taxonomic level? First of all, it must not be assumed that any Cenozoic turtle from Australia is a pleurodire, let alone a chelid. Cenozoic rocks in Australia have provided two cryptodire taxa, *Meiolania* and a trionychid, that are absent in the Recent mainland fauna, and there may be more as yet undiscovered. If skulls or complete shells are available identification is relatively easy, but when shell fragments are the dominant type of specimen then there are difficulties. It is necessary to determine whether or not the pelvis was fused to the carapace and plastron in order to identify a shell as a cryptodire or pleurodire; either xiphiplastra, posterior costals, or the pelvis itself would have to be present. Among pleurodires, chelids are distinguished by lacking mesoplastra and, in most Australian chelids, lacking neural bones as well. However, nearly all cryptodires lack mesoplastra and some lack neurals so these features cannot be used alone. I have adopted a policy of identifying a specimen as Chelidae if neurals are absent on the assumption that there are no neural-less cryptodires in Australia. It remains to be seen whether or not the result is worth the assumption. Within the chelids I have relied on the taxa and characters presented in my earlier chelid paper (Gaffney, 1977) particularly the characters mentioned under Basic Taxa.

The map (fig. 1) showing the known fossil turtle sites in Australia simply points out the sparseness of the record and generally indicates the more prolific vertebrate-bearing sites. There are probably some fossil turtle localities that I have missed, and I hope that other workers will be stimulated to report on new occurrences.

Chelids, carretochelyids, trionychids, and cheloniids all occur in the Recent Australasian fauna as well as in the Australian fossil record, although trionychids no longer occur on mainland Australia, being restricted to Papua New Guinea in the region. Meiolaniids are the only real Australian novelty provided by the fossil record (fig. 2) other than the poorly known *Chelycarapookus*.

The oldest turtles from Australia with definitive stratigraphic data are the Toolebuc chelonioids. As far as known, they are quite similar to Cretaceous chelonioids from Europe and North America. *Chelycarapookus*, which does not have definitive stratigraphic data, is presumed to be of about the same age as the Toolebuc turtles but its relationships are unknown as yet. Chelids occur in Australasia and South America in the Recent, and the rather sparse fossil record of the family is restricted to the Cenozoic of these areas as well. The Australian chelid record is notable for yielding the only fossil skull material for the family. Meiolaniids occur from the Miocene to the Pleistocene on mainland Australia and in the Pleistocene of Lord Howe Island and Walpole Island. The only other meiolaniids occur in South America (*Niolamia* and *Crossochelys*) in the (?) Cretaceous and Eocene. *Carretochelys* occurs in Australia and Papua New Guinea in the Recent fauna and as a fossil in the Miocene of Papua New Guinea.

I have not had the opportunity to examine the New Zealand fossil turtle material but Dr. Ewan Fordyce and Ms. Joan Wiffen have informed me that there are specimens from the Cretaceous and Tertiary.

The checklist is organized by state, with the states having the greater number of turtle fossils listed first.

ACKNOWLEDGMENTS

Without the help and often considerable assistance of the following individuals and their institutions, the present paper would not have been possible.

Drs. A. Bartholomai, R. Molnar, and M. Wade, Queensland Museum; Dr. A. Ritchie, Mr. R. Jones, and Mrs. D. Jones, Australian Museum; Dr. J. Pickett, Mining and Geological Museum; Dr. N. Pledge, South Australian Museum; Dr. T. Rich, National Museum of Victoria; Drs. J. Warren and P. Rich, Monash University; Drs. J. Gregory and H. Hutchison, University of California, Museum of Paleontology, Berkeley; Drs. J. Gorter and R. Nicoll, Bureau of Mines and Mineral Resources, Canberra; Dr. R. T. Wells, Flinders University.

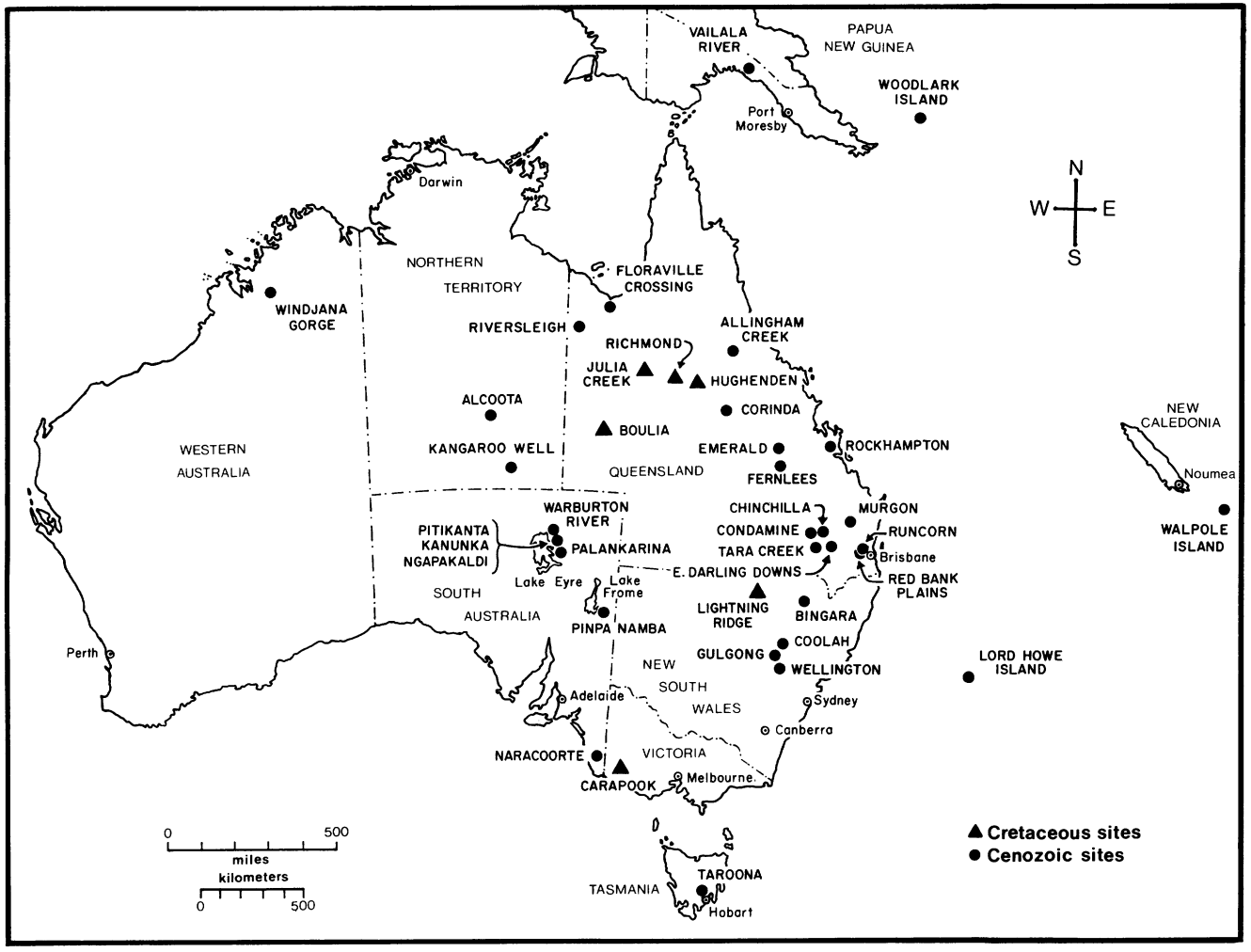

FIG. 1. A map of the Australasian region showing localities that have yielded fossil turtle material.

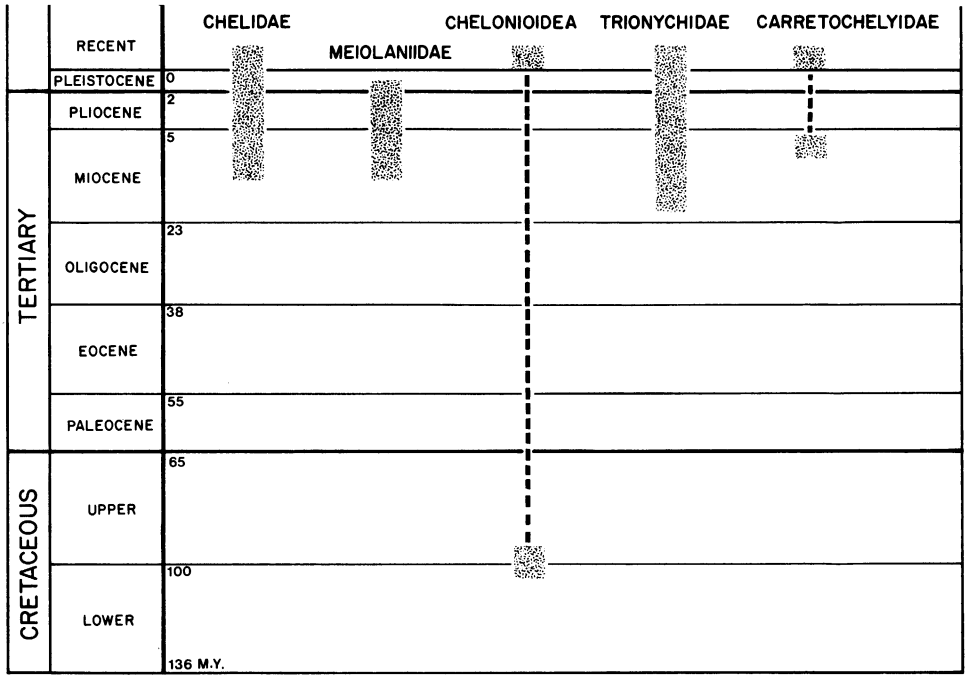

FIG. 2. Stratigraphic range of turtle groups found in the Australasian region.

Most of the information in this paper was gathered on trips to Australia in 1976 and 1980. The 1980 trip was made possible by a Visiting Curatorship given to me by the Australian Museum, Sydney, for which I am very grateful.

The illustrations are the products of Ms. Lorraine Meeker, Mr. Chester Tarka, and the author. The Queensland Museum supplied figures 9 and 10.

ABBREVIATIONS

AM, Australian Museum, Sydney
AMNH, American Museum of Natural History, New York
BMNH, British Museum (Natural History), London
CPC, Bureau of Mineral Resources, Canberra
MM, Mining and Geological Museum, Sydney
MU, Monash University, Clayton
NMV, National Museum of Victoria, Melbourne
QM, Queensland Museum, Brisbane
SAM, South Australian Museum, Adelaide
UCMP, University of California, Museum of Paleontology, Berkeley
UT, University of Tasmania, Hobart

QUEENSLAND

TAXON: *CRATOCHELONE BERNEYI*

CONSISTS OF: QM F14/550, type specimen, portion of left shoulder girdle; proximal ends of left humerus, radius, and ulna, plastral fragments; figured and described by Longman (1915).

HORIZON: Presumably from the Toolebuc Limestone, Albian, Early Cretaceous; based on locality and matrix. See Bartholomai, 1969, p. 250.

LOCALITY: "Sylvania Station, twenty miles west of Hughenden . . ." (Longman, 1915, p. 24), Queensland.

DISCUSSION: Zangerl (1960, p. 309) remarked in reference to *Cratochelone*: "The material permits no useful comparison" and I can add little to this, even after an exami-

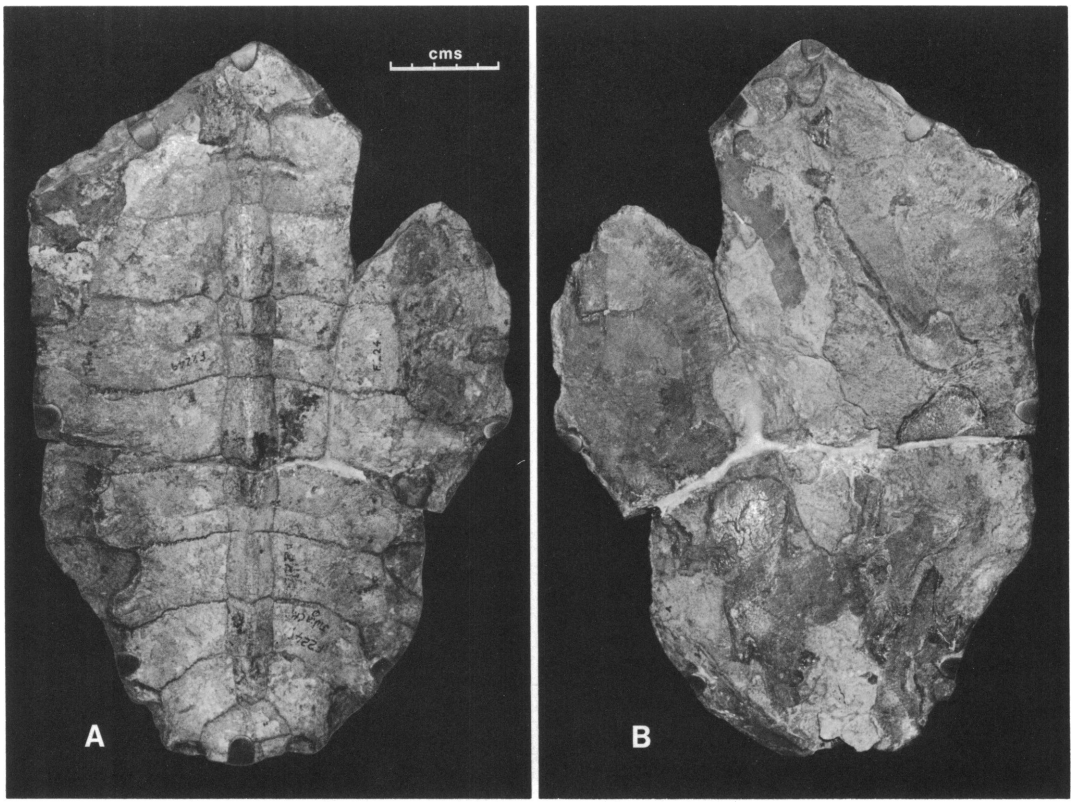

FIG. 3. *Notochelone costata,* Chelonioidea. Toolebuc Limestone, Early Cretaceous, Julia Creek, Queensland. QM F2249, carapace (A), and partial plastron (B). See figure 4 for restoration.

nation of the specimen. The specimens could belong to any one of a number of chelonioids, but the humerus and plastral fragments are particularly close to the protostegids. *Cratochelone* appears to come from the same area and horizon as *Notochelone* and the first taxonomic task should be to see if these are different taxa. Unfortunately, the known material of *Cratochelone* is insufficient to resolve this question, although further preparation might help. *Cratochelone* appears to be nearly three times larger than *Notochelone* and on this basis I would advocate restriction of the name to the type specimen until more material is forthcoming.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: Holotype, University of Sydney, Department of Geology, no. 6951 ("Eth. no. 821"). Described and figured by Owen (1882a) as *Notochelys,* a name preoccupied by *Notochelys* Gray, and replaced with *Notochelone* by Lydekker (1889b). Anterior portions of carapace and plastron with some limb elements.

HORIZON: Unknown, but matrix and type of preservation are consistent with the same source as other presumed *Notochelone*; i.e., Toolebuc Limestone.

LOCALITY: Flinders River, Queensland; coll. J. Sutherland (label).

DISCUSSION: Owen originally diagnosed this genus as being a different taxon from other turtles then known because it apparently had a cheloniid-like carapace but the hyoplastra and hypoplastra seemed to be fused to each other in contrast to other cheloniids. Significantly Owen's paper has the

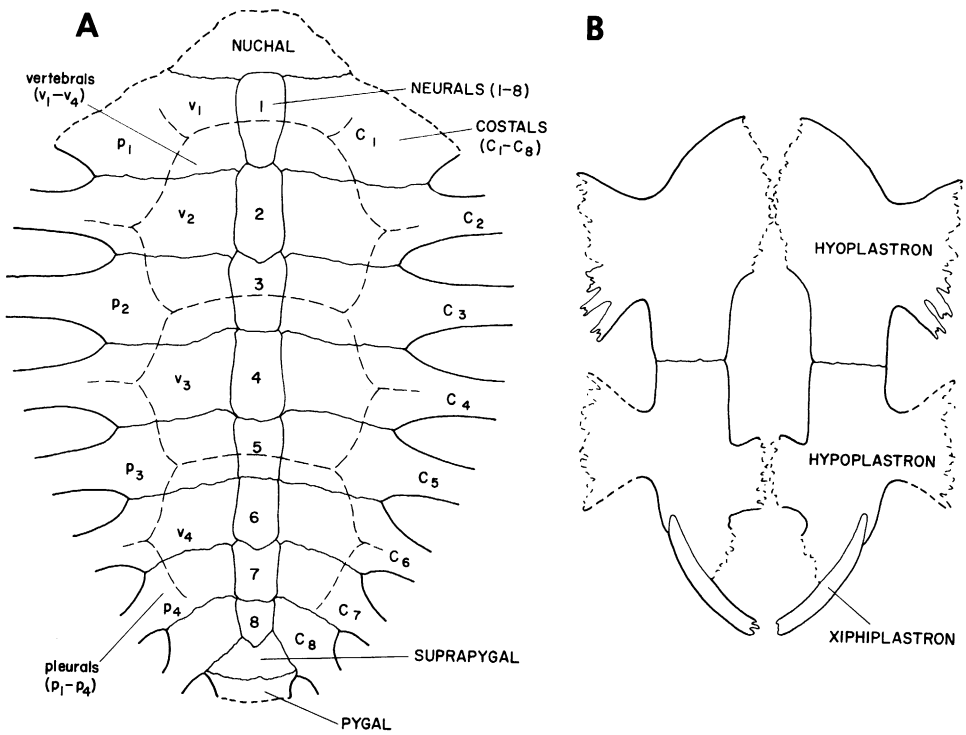

FIG. 4. *Notochelone costata,* Chelonioidea. Tentative restoration based on QM F2249 for carapace and most of plastron, but with information on hyoplastron from the type specimen, University of Sydney, 6951.

following discussion appended to it (1882a, p. 182): "Prof. Seeley regretted that the specimen upon which the paper was founded was not upon the table. It would also have been helpful if the author had attempted a restoration. He pointed out how much the elements of the plastron must have been displaced. He could not help suggesting that the hyo-hyposternal bones were not combined, but that those preserved were the hyosternal bones only. If this were possible, he doubted the propriety of the name *Notochelys,* as, if the above point were not proved, there was nothing to separate the genus from *Chelone.*" From an examination of the specimen it is clear that Seeley was correct and the type consists of right and left hyoplastra rather than fused hyoplastra and hypoplastra. A more complete specimen, QM F2249, that shows the hypoplastra bears this out.

Although I am presenting a tentative restoration of the shell (fig. 4), I am not prepared to diagnose *Notochelone* at present, but I do provisionally accept the taxon as valid. Two skulls and a number of partial shells are available and it should be possible to produce a good reconstruction and comparative description of this form in the future.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F2249, skull, carapace, and partial plastron (fig. 3).

HORIZON: Toolebuc Limestone, Albian, Early Cretaceous (Day, 1969).

LOCALITY: Parish of Hilton, 10 miles SE of Julia Creek. Queensland; donor, Browne, March 1, 1932.

DISCUSSION: The tentative restoration

of *Notochelone* (fig. 4) is based on this specimen for the carapace and most of the plastron, with information on the hyoplastron added from the type, University of Sydney 6951. It should be emphasized that even though QM F2249 is a relatively complete specimen, much of the plastron is missing and preserved portions are displaced and often lack distinct limits. Furthermore, although all the fragments that I have seen labeled *Notochelone* are consistent with one species, it is quite possible that more than one form, smaller than *Cratochelone,* is present. The attempted restoration, then, must be considered in this light. Nonetheless, the association of a skull with a shell in QM F2249 substantiates DeVis's (1911) identification of a skull, QM F6587, as *Notochelone*. Although preparation of both skulls is not complete, they agree closely in presently visible morphology.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM 15 1555, plastral fragment, figured and described by DeVis (1911, pl. 3, fig. 1) as a juvenile skull.

HORIZON: Presumed to be the Toolebuc Limestone, Albian, Early Cretaceous, on the basis of matrix and preservation.

LOCALITY: Presented by F. L. Berney of "Wyangaria," which "is a station in the neighborhood of Richmond and Hughenden . . ." (DeVis, 1911, p. 1) Queensland. Hughenden is near the outcrop of the Toolebuc Limestone (see Day, 1969, for map).

DISCUSSION: Zangerl (1960, p. 309) stated on the basis of DeVis's figure that this specimen was not a skull but part of a plastron and my examination of the specimen confirms this.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F6587, nearly complete skull and jaws with associated cervical and limb elements, figured and described by DeVis (1911, pl. 4), referred to by Gaffney (1975, p. 418).

HORIZON AND LOCALITY: Same as QM 15 1555.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F2174, a right xiphiplastron, central portion of carapace.

HORIZON: Presumably Toolebuc Limestone on basis of locality and matrix, Early Cretaceous.

LOCALITY: "Wyangeria" Station, near Hughenden, Queensland, presented by F. L. Berney (label). Unfortunately, Longman (1935, p. 239) said in regard to this same specimen: "We are indebted to Mr. Ulick Browne for a fairly complete carapace of this chelonian, which was discovered at 'Garomna,' Julia Creek, Northwestern Queensland (F2174)."

DISCUSSION: The xiphiplastron is well preserved and shows discrete limits that have aided in the reconstruction (fig. 4).

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F5469, three distal costal fragments.

HORIZON: Presumably Toolebuc Limestone on the basis of matrix, Early Cretaceous.

LOCALITY: Flinders River, Queensland, J. B. Nuttung, 1898 (label).

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F5793, carapace fragments, with scapula and partial (?) manus. Other uncatalogued carapace and plastron fragments are also in the Queensland Museum from this locality.

HORIZON: Toolebuc Limestone, based on locality and matrix, Early Cretaceous.

LOCALITY: "Boree Park," Moira Paddock, about 10 miles NW of Richmond, Queensland, near 622416 on Richmond 1:250,000 map. Donor: B. H. Graw, May 28, 1964. Associated with *Pachyrhizodus, Belonostomus, Myopterygius,* and *Flindersichthys*.

TAXON: CF. *NOTOCHELONE*

CONSISTS OF: Badly weathered, uncatalogued partial carapace in Queensland Museum.

HORIZON: Toolebuc Limestone, Early Cretaceous.

LOCALITY: "Elizabeth Springs," near Boulia, Queensland.

TAXON: CF. *NOTOCHELONE*

CONSISTS OF: QM F10619, hyoplastron, scapula, vertebral fragments, cervical; in Queensland Museum.

HORIZON: Toolebuc Limestone, Early Cretaceous.

LOCALITY: "Slashers Creek," near Boulia, Queensland.

DISCUSSION: If this specimen proves to be referable to *Notochelone,* then the cervical vertebra will be of interest because it is amphicoelus, a rare but not unknown condition in Chelonioidea.

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F12994, anterior portion of carapace.

HORIZON: Presumably Toolebuc Limestone, Early Cretaceous, on basis of preservation.

LOCALITY: "Base of Walkers Table Mountain, Flinders Range, Queensland" (label).

TAXON: *NOTOCHELONE COSTATA*

CONSISTS OF: QM F24132, anterior portion of carapace.

HORIZON: "Lower Cretaceous (Tambo Formation)" (label). Presumably Toolebuc Limestone.

LOCALITY: "Flinders River, Hughenden district, Queensland" (label).

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: MCZ 1076, 12 shell fragments in matrix.

HORIZON: Presumably Toolebuc Limestone, based on preservation and locality, Early Cretaceous.

LOCALITY: "'Dunraven,' 40 mi. NW of Hughenden, near no. 1 spring Telephone Plains, Queensland" (label), collected by Wright and Schevill, 1932.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: QM 9042, a hyoplastron or hypoplastron fragment showing portion of bridge buttress in dorsal view (fig. 5); turtle specimens were also reported by Jones (1926) and Riek (1952), but this is the only specimen I have been able to find.

HORIZON: Redbank Plains Formation. An overlying basalt has been dated (Green and Stevens, 1975, p. 150) as 46.8 ± 10.0 million years, indicating that the turtle is no younger than Eocene in age.

LOCALITY: "Redbank Plains" (label). Riek (1952) discusses and describes outcrops in this area that yielded turtle material. I presume (see below) that this specimen, QM 9042, is one of the turtle fragments from "Redbank Plains, both at the type locality and at one of similar lithology 1½ miles east . . ." (Riek, 1952, p. 3).

DISCUSSION: This fragment is the oldest Cenozoic turtle from Australia (only the Toolebuc and (?) Merino Cretaceous turtles are older) that has good stratigraphic control. This specimen is presumably the one referred to by Riek (1952, p. 6): "portion of the plastron of a turtle." He also figured some impressions that he questionably identified as turtle skin, but after examination of this material I am unable to corroborate his identification. It may or may not be turtle skin; I have no idea what it is. Molnar (1980b) disputes Riek's identification of "crocodile skin" from the same horizon. This locality yields fishes, insects, plants, and other fossils with some frequency and more collecting may result in the discovery of better turtle skeletons. If the Redbank Plains turtle turns out to be a chelid, which is the most likely identification, it will be one of the oldest known (Wood and Patterson, 1973).

Jones (1926, p. 39) identifies fragments from Redbank Plains as *Chelodina insculpta* DeVis, but this was presumably based on ornament and cannot be validated at present.

TAXON: TRIONYCHIDAE

CONSISTS OF: QM F2324, QM F2326, QM F2566, QM F9035, shell fragments. Figured by Gaffney and Bartholomai (1979, pl. 2).

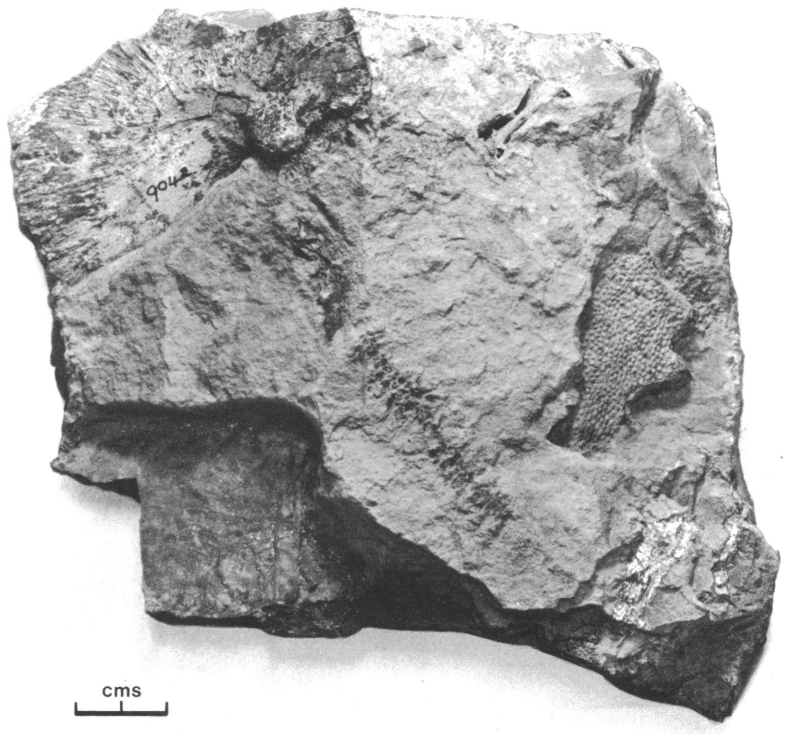

FIG. 5. Testudines indet., QM 9042, a hyoplastron or hypoplastron from Redbank Plains Formation, Redbank Plains, Queensland, Eocene. Specimen is in upper left portion of rock with plastral fragment exposed in dorsal view. Lower center area of rock is occupied by a fish skeleton, whereas the right edge has a nodular imprint previously identified as "reptile skin." I cannot substantiate this identification.

HORIZON: Oakdale Sandstone, Tertiary, possibly older than 22 million years (see Gaffney and Bartholomai, 1979).

LOCALITY: Boat Mountain, near Murgon. Map reference 507747, Gympie 1:250,000 sheet (Murphy et al., 1976).

DISCUSSION: The probably Tertiary age of this material is significant in extending the range of the Australian trionychids. See Gaffney and Bartholomai (1979) for more information.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Shell fragments (not seen) in Bureau of Mineral Resources, Canberra (R. Tedford, personal commun.).

HORIZON: Carl Creek Limestone, Riversleigh Fauna, Miocene (see Tedford, 1968, for sections and associated fauna).

LOCALITY: Four miles north of "Riversleigh" Homestead (see Tedford, 1968, for map) between Gregory River and Verdon Creek.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: QM 9041, carapace fragment, possibly a nuchal bone.

HORIZON: Corinda Formation, Tertiary (Houston, 1967, p. 26).

LOCALITY: From a well at a level of 45 feet on Efimoff's (or Epimoff) property, Runcorn, near Brisbane, Queensland (Houston, 1967, p. 85). "232741 Beenleigh 1 ml. mil. map, D. W. Epimoff, 10.7.58" (label).

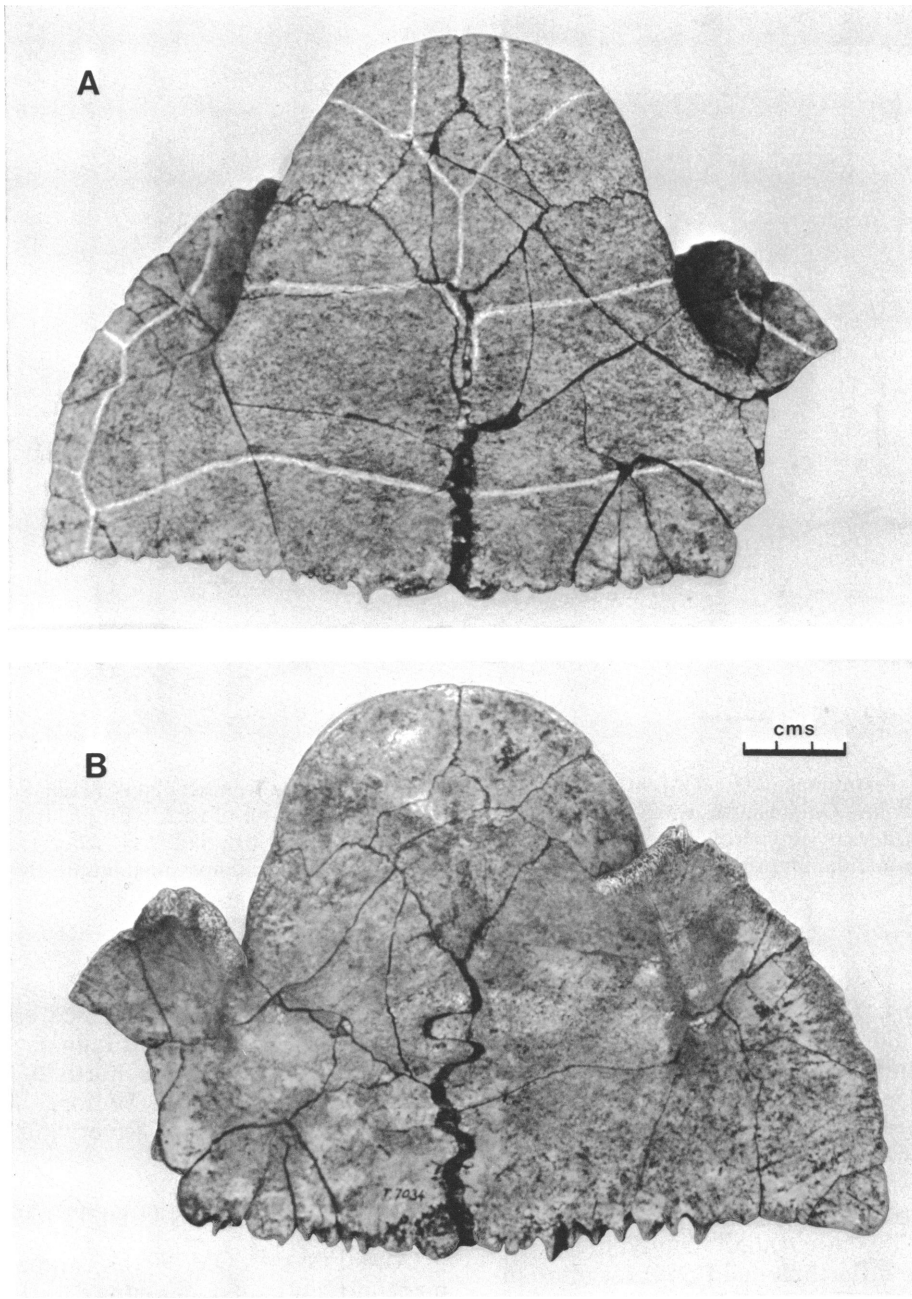

FIG. 6. *Emydura* sp., anterior half of plastron, QM F7034, Chinchilla Sand, Pliocene, Chinchilla Rifle Range, Queensland. A. Ventral view. B. Dorsal view.

DISCUSSION: Unfortunately, this well-documented specimen is so incomplete that I am not sure what part of the shell it came from. If it is a nuchal, then a cervical scute is pres-

ent, but this is found widely among turtles, including chelids.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Shell fragments (not seen).

HORIZON: Allingham Formation, Early Pliocene (Archer and Wade, 1976).

LOCALITY: Allingham Creek (lat. 19°43'S, long. 145°36'E), north Queensland.

DISCUSSION: Although Archer and Wade (1976) identified a shell fragment (QM F7796) as (?) *Chelodina,* they did so on the basis of comparing shell ornamentation with DeVis's (1894, 1897) papers. As I have suggested elsewhere, this feature is insufficient to identify chelid genera.

TAXON: TRIONYCHIDAE

CONSISTS OF: QM F9037, shell fragment illustrated by Gaffney and Bartholomai (1979, pl. 2).

HORIZON: Presumably the Pliocene Chinchilla Sand (Woods, 1960, p. 396; Bartholomai and Woods, 1976).

LOCALITY: Fairymeadow, southwest of Chinchilla, Queensland.

DISCUSSION: See Gaffney and Bartholomai (1979).

TAXON: *EMYDURA* SP.

CONSISTS OF: QM F7035, anterior half of shell.

HORIZON: Chinchilla Sand, Pliocene (see Bartholomai and Woods, 1976).

LOCALITY: Chinchilla, Queensland, collector A. Bartholomai, May 12, 1973.

DISCUSSION: Although this partial shell is poorly preserved, enough is present to allow identification as *Emydura* in the broad sense. The plastron has a small intergular (although the gular area is not preserved), and the first vertebral scute is not much wider than the second vertebral scute. Neural bones are absent.

TAXON: *EMYDURA* SP.

CONSISTS OF: QM F7034, anterior half of plastron (fig. 6), collected by C. Limpus, April 21, 1973.

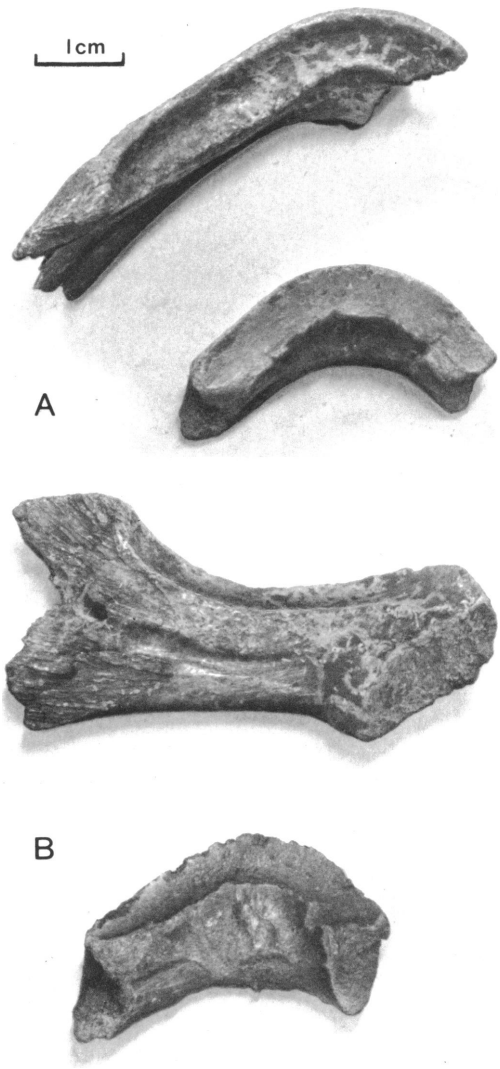

FIG. 7. *Emydura* sp., two lower jaw fragments, QM F9039, a left dentary (upper specimen in both figures) and QM F9038, a symphyseal region (lower specimen). Pliocene Chinchilla Sand, Darling Downs, Queensland. A. Dorsal view. B. Internal view.

HORIZON: Chinchilla Sand, Pliocene (see Bartholomai and Woods, 1976).

LOCALITY: Chinchilla and Condamine River, Chinchilla Rifle Range No. 78, immediately at the end of the Middle Gully Sys-

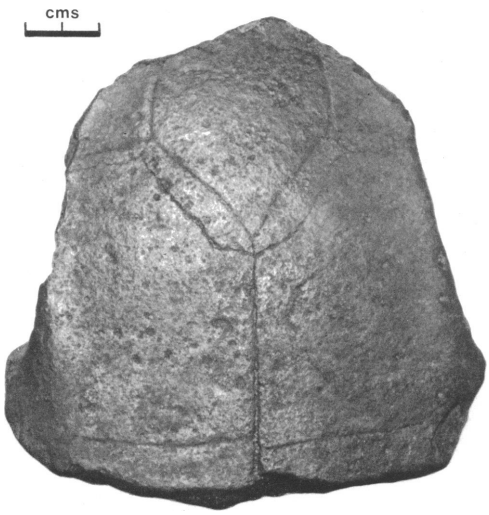

FIG. 8. *Chelodina* sp., ventral view of anterior lobe of plastron, QM F1510, Pliocene, Tara Creek, Queensland.

tem, adjacent to the type section (A. Bartholomai, personal commun.), Queensland.

DISCUSSION: The gular-intergular morphology allows identification of this partial plastron as *Emydura*.

TAXON: *EMYDURA* SP.

CONSISTS OF: Two lower jaw fragments (fig. 7); QM F9038, symphyseal region; QM F9039, left dentary.

HORIZON AND LOCALITY: Chinchilla Sand, Pliocene, on basis of preservation and material associated in collection (A. Bartholomai, personal commun.).

DISCUSSION: These lower jaws are assigned to *Emydura* because they are relatively massive, have relatively wide triturating surfaces, and a slightly developed symphyseal hook. All other Recent chelids have lighter jaws with narrower triturating surfaces and no trace of a symphyseal hook. Elsewhere I conclude (Gaffney, 1977, p. 5) that these features are synapomorphous for *Emydura* although there is an alternative argument that they are plesiomorphous at the level of Chelidae.

TAXON: CHELIDAE

CONSISTS OF: MCZ 4771, a right xiphiplaston, MCZ 4772, 12 shell fragments.

HORIZON: Presumably Chinchilla Sand, based on preservation and locality, late Pliocene.

LOCALITY: "Condamine R., near Dalby, Queensland" (label). Collected by Harvard-Australian Expedition, T. Jack and W. Schevill, February 1932.

TAXON: *CHELODINA* SP.

CONSISTS OF: QM F1510 (fig. 8), anterior half of plastron, presumably that mentioned by Longman (1924, p. 26) as *Chelodina insculpta,* catalogue number also includes other chelid material that is not necessarily associated with the above specimen.

HORIZON AND LOCALITY: Dr. Alan Bartholomai has kindly supplied the following information about this specimen:

> This material was collected from the head of Tara Creek, a tributary to the Clarke River, by Maryvale Creek, N.Q. according to our register, donated by Mr. J. R. Chisholm through the then Governor of Queensland, Sir Matthew Nathan in 1923. It was associated with ?nototherian fragments and the crocodile *Crocodilus nathani*. A check of our old letter files shows that a Mr. Albert Lyall disputed the collection data and indicated he had found the material which subsequently came to us. In his letter he states 'all collected from E. side of the basalt tongue between Maryvale Creek and the Clarke River (presumably in error for Tara Creek—my comment) at a place called Sams Spring, about 4 mls. W. of Niall Station.' This puts the site near the above junction at MR317563 Clarke River 1:250,000 sheet. Geological mapping of this area indicates cover of the Nulla Basalt, a Pliocene unit. The recently described Allingham Formation with Pliocene vertebrates (including a wide range of mammals) occurs just south of this area presumably in a similar situation with respect to the Nulla (see Archer and Wade, 1976). Perhaps we have more than one unit in that area tied down by minimal age determinations on the basalt.

At the present time, then, the best age determination for this specimen would be Pliocene.

FIG. 9. Testudines indet., QM F9040 (for nuchal and anterior peripherals see fig. 10) and QM F1104 (group number of remaining fragments), dorsal view of carapace fragments that are part of syntype material of "*Chelymys uberrima*" DeVis, 1897, Darling Downs, Queensland, Pliocene-Pleistocene.

DISCUSSION: The partial plastron figured here (fig. 8) has an intergular scute that is large and enclosed anteriorly by the gular scutes, diagnostic features of *Chelodina*. The seven specimens included in this number are all labeled "*Chelodina insculpta*" but

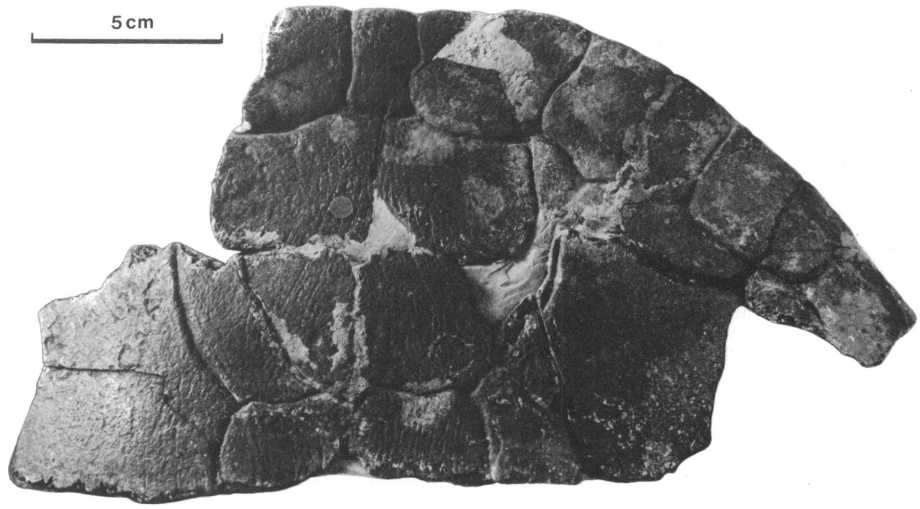

FIG. 10. Chelidae, QM F9040, dorsal view of nuchal, first three right peripherals, and first pair of costals, lectotype of "*Chelymys uberrima*" DeVis 1897, Darling Downs, Queensland, Pliocene-Pleistocene.

only the plastron can be identified as pertaining to this genus, the other material cannot be identified beyond Chelidae. The *Chelodina* plastron differs from Recent *Chelodina* (at least from the ones I have seen) in completely lacking surface ornament and in having a much greater bone thickness. The ornament may have been eroded away but the sulci grooves are distinct and this does not seem likely.

TAXON: CHELIDAE

CONSISTS OF: QM F9040, nuchal, first three right peripherals, and first pair of costals; QM F1104, carapace fragments (figs. 9 and 10), and QM F1105, plastral fragments described as "*Chelymys uberrima*" by DeVis (1897).

HORIZON: Plio-Pleistocene.

LOCALITY: "Darling Downs" (DeVis, 1897, p. 4), Queensland.

DISCUSSION: In 1897, C. W. DeVis described five new fossil chelid taxa from Queensland, the only extinct taxa of chelids described so far from Australia. Unfortunately, the specimens do not provide enough characters to allow the differentiation of these taxa from Recent chelids, and I conclude that DeVis's taxa are all indeterminant at some supraspecific level.

DeVis's material consists of shell fragments and disarticulated bones, very few of which can be objectively associated as belonging to one individual. DeVis, however, did associate various elements as pertaining to particular species and used the accumulated characteristics to diagnose his new taxa. However, examination of the material that he studied leads me to the conclusion that DeVis relied almost entirely on shell textural features to make the initial groupings, and, in my opinion, these features are inadequate to diagnose these new taxa.

DeVis did not identify particular specimens as holotype and, in fact, did not use the words "type" or "typical" so I have delimited certain of his groupings as syntypes and chosen lectotypes from them. In each case, the syntype I consider to be the material figured by DeVis in his 1897 paper, which is also the material labeled in the Queensland Museum as types. In my choice

of lectotypes, I have either followed indications in DeVis's descriptions, or if such indications are lacking, chosen identifiable specimens, or, if these are also lacking, made a random choice.

I consider the material figured in plates I and II (DeVis, 1897) to be the syntypes for the taxon "*Chelymys uberrima.*" With regard to this species, DeVis said (1897, p. 3): "It is founded primarily on the only example of some few plates in their natural connection, which have occurred among the whole of the turtle remains, to show the precise form of the part whence they came: in this case the anterior region of the carapace." This specimen (fig. 10) consists of the nuchal bone, most of the first right and left costals, the right peripherals 1–3, all of which articulate, as DeVis indicated, and belong to one individual. This specimen, QM F9040, I designate as the lecotypte following DeVis's intentions quoted above. The remaining syntype material is QM F1104 (carapace fragments) and QM F1105 (plastron fragments).

Although the lectotype of "*C. uberrima*" is more complete than the other DeVis specimens, it cannot be distinguished from Recent *Emydura*. There is, therefore, no basis for diagnosing it as a new taxon. Furthermore, the lectotype materials really do not allow identification beyond Chelidae. Among the syntype materials, that is, those specimens figured by DeVis (1897, plates I and II), there is an entoplastron and a left epiplastron (part of QM F1105) that can be identified as *Emydura,* but there is no reason to suppose that they, or any of the other syntype materials, were from the same individual as the lectotype.

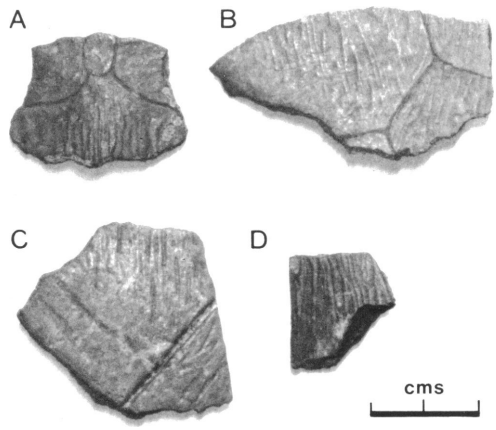

FIG. 11. Testudines indet., dorsal view of carapace fragments comprising syntype of "*Chelymys antiqua*" DeVis 1897, Darling Downs, Queensland, Pliocene-Pleistocene. For ease of comparison specimens are lettered as in DeVis (1897, pl. 3). A. QM F16-1106A, nuchal bone, lectotype; B. QM F16-1106B, costal; C. QM F16-1106C, costal fragment; D. QM F16-1106D, costal fragment.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: QM F16 1106A–D, four carapace fragments (fig. 11), described by DeVis (1897) as "*Chelymys antiqua.*"

HORIZON: Plio-Pleistocene.

LOCALITY: "Darling Downs" (DeVis, 1897, p. 5), Queensland.

DISCUSSION: DeVis did not designate any one specimen as being more "typical" than the others so I have chosen a nuchal bone, QM F16 1106A (DeVis, 1897, plate III, A) as lectotype. The syntype material consists of all four fragments in plate III (*ibid.*), QM F16 1106A–D.

DeVis relied on carapace sulci differences to diagnose "*C. antiqua*" but in view of the lack of association of the four fragments and the presence of nearly identical sulci patterns in Recent *Emydura,* I suspect that he used shell ornament as his actual criterion. These four fragments differ from DeVis's other specimens primarily in having low longitudinal ridges covering the bone. This ornament pattern does occur on some shells of Recent *Emydura* but it does not seem to have systematic significance. Strictly speaking, none of the "*C. antiqua*" specimens allow identification even as Pleurodira, and the lectotype nuchal must be considered Testudines indeterminant.

TAXON: CHELIDAE

CONSISTS OF: Six carapace fragments (fig. 12), two are QM F16 1100, four are QM F16

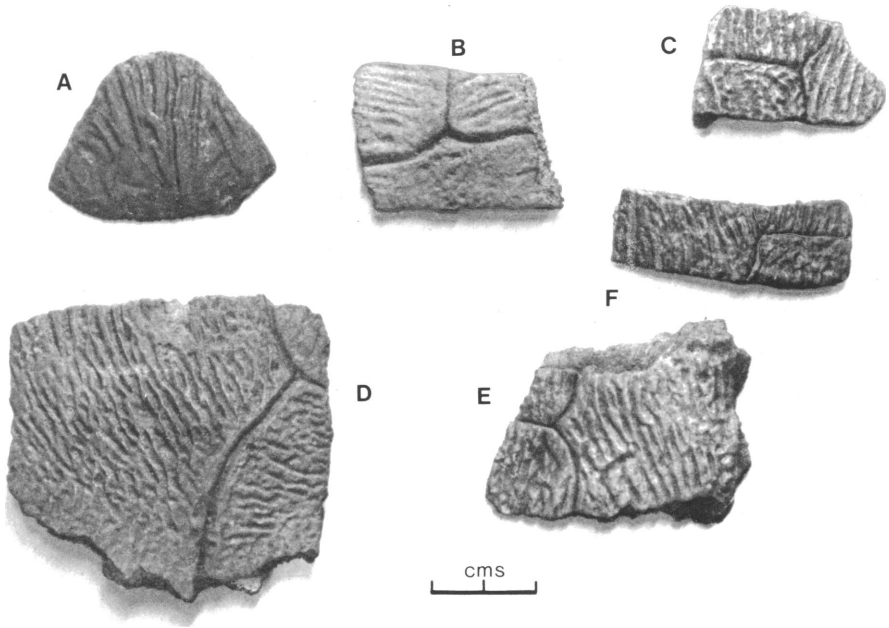

FIG. 12. Chelidae, syntype material of "*Chelymys arata*" DeVis 1897. A. QM F16 1099, pygal, DeVis (1897, pl. 4, fig. E); B. QM F16 1099, costal fragment, DeVis (1897, pl. 4, fig. C); C. QM F16 1100F, costal fragment, DeVis (1897, pl. 4, fig. F); D. QM F16 1100A, first costal, DeVis (1897, pl. 4, fig. A); E. QM F16 1100B, costal fragment, DeVis (1897, pl. 4, fig. B). This specimen is chosen as the lectotype.

1099, all described by DeVis as "*Chelymys arata.*"

HORIZON: Plio-Pleistocene.

LOCALITY: The syntype material, i.e., that figured by DeVis (1897, plate IV) consists of material from Warburton River as well as Darling Downs (DeVis, 1897, p. 5). The Warburton River material may be among the turtle specimens mentioned by Etheridge (1894, p. 21) as having been collected by Brown along a 40-mile stretch of the Warburton River and sent to DeVis for study. The Darling Downs material is catalogued as QM F16 1099 and is B, C, D, and E in plate IV of DeVis, 1897. The two Warburton River specimens are QM F16 1100 A and F. The lectotype, then, is a Darling Downs specimen.

DISCUSSION: "The pleural plate, probably the fourth of the left side, figured on plate IV, Fig. B. shows the characteristic sculpture almost in its pristine strength . . ." (DeVis, 1897, p. 5). Following this suggestion I choose QM F16 1099B, the costal fragment referred to above by DeVis, as the lectotype.

DeVis's diagnostic criterion for this taxon is the rugose ornament but, once again, this seems to me insufficient to objectively diagnose species of *Emydura* or other chelids, at least at the present time. The lectotype is a medial portion of a costal showing the sutural area for a neural spine indicating that neural bones were absent. The lectotype can be provisionally identified as a chelid. The remaining syntype material is no more diagnostic than the lectotype.

TAXON: *CHELODINA*

CONSISTS OF: Sixteen carapace fragments, QM F1107, and six plastral fragments, QM F1109 (including an entoplastron shown in fig. 13), described by DeVis (1897, pls. 5 and 6) as "*Chelodina insculpta.*"

HORIZON: The locality data indicates rocks that vary from Miocene (and possibly older) to Pleistocene in age.

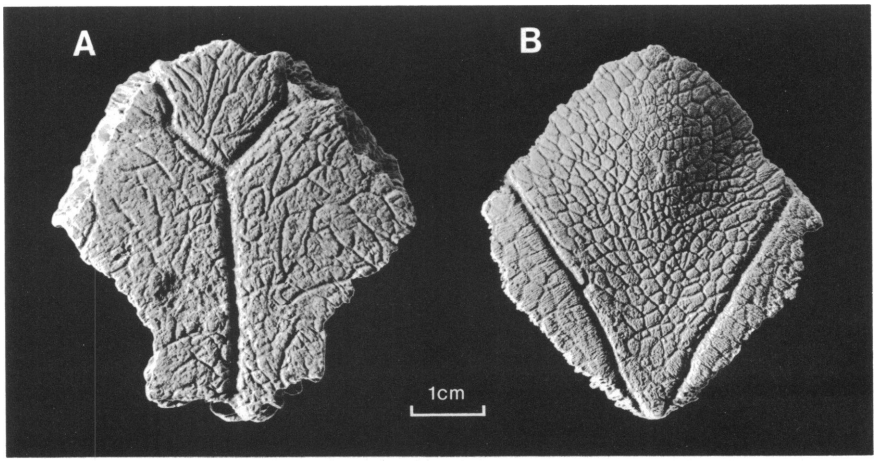

FIG. 13. Ventral view of entoplastra. A. *Emydura* sp., QM 1105A, lectotype of "*Chelymys uberrima*" DeVis 1897, Darling Downs, Queensland, Pliocene-Pleistocene; B. *Chelodina* sp., QM 1109A, lectotype of "*Chelodina insculpta*" DeVis 1897, Queensland, Cenozoic.

LOCALITY: "Darling Downs: Eight-mile plains, near Brisbane; Warburton River" (DeVis, 1897, p. 6). Unfortunately DeVis did not indicate which of his fragments came from which of the above localities, which are widely scattered. The Warburton River material may be among the turtle specimens mentioned by Etheridge (1894, p. 21) as being collected by Brown along a 40-mile stretch of the Warburton River and sent to DeVis for study.

DISCUSSION: DeVis did not refer to any particular fragment as being typical of this taxon although he did describe the carapace first. I have nonetheless chosen the entoplastron (DeVis, 1897, plate 6), part of QM F1109, as lectotype solely because it is the only element among the syntype material that can be identified below family. The syntype material is that figured by DeVis (1897) in pl. 5: carapace, QM F1107, and pl. 6: plastron, QM F1109.

The entoplastron of QM F1109 (fig. 13) was chosen as lectotype because it shows the large intergular scute diagnostic of *Chelodina* and *Pseudemydura*. It is possible to argue that the entoplastron is *Chelodina* because the entoplastron in living species of *Pseudemydura* is distinctly smaller than the fossil entoplastron, but this may be of dubious significance. The other carapace and plastron elements are not identifiable beyond Chelidae or Pleurodira. The plastron fragments figured by DeVis (1897, pl. VI) are correctly placed, the articulated hypoplastron and xiphiplastra do belong to one individual, whereas the remaining elements are from other individuals. The lectotype entoplastron does not articulate with any other elements. Although the plastral fragments bear the more common type of reticulate grooves, many of the carapace pieces are quite rugose, unlike the ornament in Recent chelids I do not, however, attach any systematic significance to this feature.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Four carapace fragments, QM F1102 (fig. 14), and four plastral fragments, QM F1103, described by DeVis (1897) as "*Pelocomastes ampla.*"

HORIZON: Plio-Pleistocene.

LOCALITY: "Darling Downs" (DeVis, 1897, p. 7) Queensland.

DISCUSSION: As syntype I recognize all the material in plates VII and VIII of DeVis (1897, QM F1102 and QM F1102D) and for

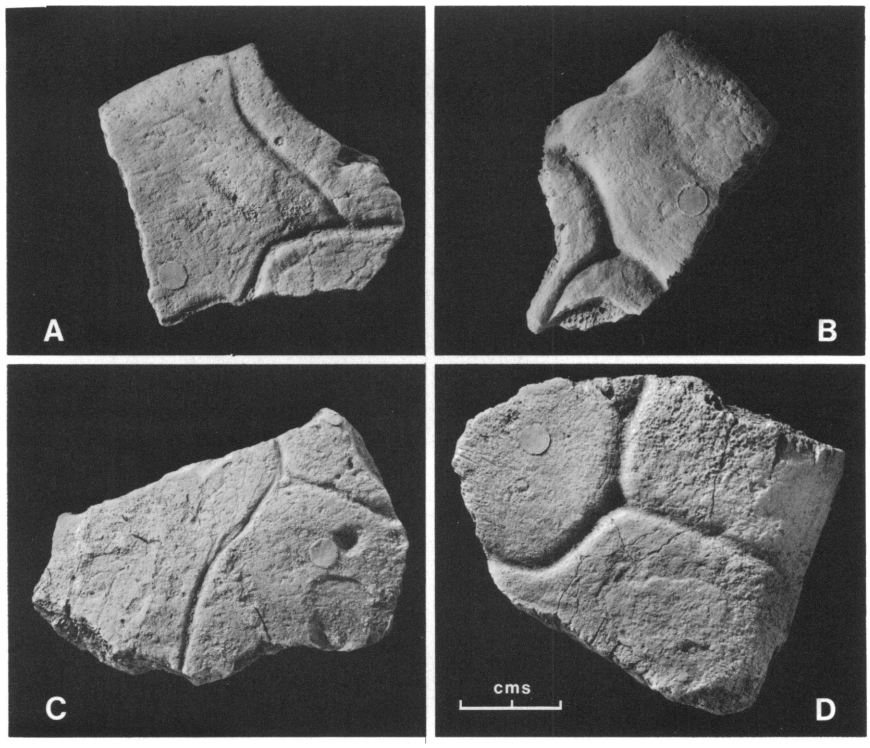

FIG. 14. Testudines indet., dorsal views of carapace fragments comprising part of syntype of "*Pelocomastes ampla*" DeVis 1897, Darling Downs, Queensland, Pliocene-Pleistocene. A. QM F1102C, peripheral; B. QM F1102D, peripheral; C. QM F1102B, costal; D. QM F1102A, peripheral, lectotype.

a lectotype I have chosen the first right peripheral (QM F1102D) figured in plate VII and labeled "a." None of the material is diagnostic even to Chelidae and as DeVis did not suggest any fragments as being "typical," my choice of lectotype is arbitrary.

From the available material I conclude that DeVis's primary criterion was "test smooth," nearly all the fragments illustrated by him bear no ornament pattern. Most of the other characters mentioned in his generic diagnosis (1897, p. 6) either occur in Recent chelids or are characters that are not preserved in the syntype material. The syntype material can only be identifed as turtle. However, if we assume that the lectotype (and the other carapace fragments—the plastron fragments are not as well preserved) come from a chelid, then it is true that no living Australian chelid has such deeply incised sulci with a smooth surface texture between them. Furthermore, the relatively large size of the bones suggest an animal with a shell more than 60 cm long. If the smooth surface texture does turn out to be correlated with systematically significant features, then *Pelocomastes* may be resurrected, but at present it must be Testudines indeterminant.

TAXON: TRIONYCHIDAE

CONSISTS OF: Seven carapace fragments, QM F1101 A–G, described by DeVis (1894, figs. A–G) as "*Trionyx australiensis*." Also figured in Gaffney and Bartholomai (1979, pl. 1).

HORIZON: Plio-Pleistocene.

LOCALITY: "Darling Downs. One of the

specimens was obtained by W. Hanns's Northern Expedition in a locality unrecorded" (DeVis, 1894, p. 127).

DISCUSSION: These specimens and the trionychid fragments referred to elsewhere are described in Gaffney and Bartholomai (1979). Darlington (1957) doubted DeVis's identification and suggested that, if true, it would probably pertain to a recent extension of the Papuan trionychid *Pelochelys*. On the basis of the morphology of the eighth costal bone, Gaffney and Bartholomai (1979) concluded that the Australian trionychids are not referable to *Pelochelys*.

TAXON: *MEIOLANIA OWENI*

CONSISTS OF: BMNH R391, type specimen, a partial skull described and figured by Owen (1881, pls. 37 and 38) as *Varanus (Megalania) priscus*. A referred specimen, BMNH R392, consisting of a tail club and a single tail ring were also described (Owen, 1882b, pls. 64 and 65, figs. 1–4) as *Megalania prisca*.

HORIZON: Pleistocene (Bartholomai, 1976).

LOCALITY: "King's Creek, part of Clifton Run. . . ." (Owen, 1881, p. 1041), a branch of the Condamine River, east of Darling Downs, Queensland.

DISCUSSION: *Meiolania* is one of the most bizarre and enigmatic turtles known, living or extinct. When first described by Owen in 1881, he identified it as a giant horned lizard, *Megalania*. Huxley in 1887 correctly identified it as a turtle and began a controversy about its relationships (see Simpson, 1938, for a review). I am currently making a thorough study of this animal and provide here only a brief guide to the literature and the geologic and geographic distribution.

Three species of *Meiolania* have been named (see table 1): *M. oweni* Smith Woodward, 1888, from the Pleistocene of Queensland; *M. platyceps* Owen, 1886b, from the Pleistocene of Lord Howe Island; and *M. mackayi* Anderson, 1925, from the Pleistocene of Walpole Island.

The three species differ in size, *Meiolania oweni* is the largest and *M. mackayi* is the smallest. Although *Meiolania oweni* differs distinctly from *M. platyceps* in the morphology of the tail club and horn core position and size, *M. mackayi* differs from *M. platyceps* in size only. Until more extensive revisionary work is finished, however, I will consider all three valid.

TAXON: MEIOLANIIDAE

CONSISTS OF: QM F2553, three peripherals and a ? limb fragment.

HORIZON AND LOCALITY: "Sandhurst Ck., 3 mls. N.E. from Fernlees Rlwy. Stn., at a broken mill; don: J. M. Garvey, 9-8-1937" (label), Queensland.

DISCUSSION: The identification of these peripherals is based on their large size and serrations. The Lord Howe Island *Meiolania platyceps* has a well-developed serration pattern on the posterior peripherals which is similar to that seen in the Queensland fragments. The Queensland fragments differ primarily in their relatively large size and greater bone thickness, features to be expected in an animal that was about twice the size of *Meiolania platyceps*. The only other known Australian turtle with well-developed serrations is *Elseya dentata* and this form is distinguishable by its much smaller size and relatively flat peripherals which lack the sharp, proximal upturn seen in *Meiolania*.

TAXON: MEIOLANIIDAE

CONSISTS OF: QM 9034, a caudal vertebra.

HORIZON: Probably Chinchilla Sands, Pliocene, on basis of locality.

LOCALITY: "Armour" Station, Condamine River, Macalister, Queensland. Collected by Mr. G. Ross, May 23, 1963.

DISCUSSION: This caudal is nearly identical with those of *Meiolania platyceps* from Lord Howe Island (see Owen, 1881, plate 35) except that it is larger in size. The stout, well-developed haemal arch and procoelus articulation is characteristic.

TAXON: TRIONYCHIDAE

CONSISTS OF: Three carapace fragments in the Queensland Museum, one of which can be identified as a first costal.

HORIZON: Not known, mapped as undifferentiated Quaternary alluvium.

TABLE 1
The Species and Distribution of Meiolaniidae

	Niolamia argentina	*Crossochelys corniger*	Undetermined meiolaniid
1. Geographic Distribution	Argentina	Argentina	Lakes Pinpa, Ngapakaldi, and Pitikanta, South Australia
2. Age	Pre-Oligocene, Post-Jurassic	Eocene	middle Miocene
3. Available Material	One skull and tail ring	One partial skull	Manus, caudal vertebrae, cervical ribs, shell fragments
4. Cranial Horn Cores	Flat horns, developed into frill	Flat horns, developed into frill	Unknown
5. Tail Club	Unknown, but tail ring similar to *M. platyceps*	Unknown	Unknown
6. Estimated Relative Size (*M. platyceps* = 1.0)	1.0	0.5–0.3	1.0–0.7

LOCALITY: Twenty miles east of Emerald, 3½ to 4 miles north of Nogoa River, Queensland. Approximately 148° E long., 23° S lat. Donated by G. MacDonald, 1936, who owned Wyguna Station, which is just about at the locality described above. See Gaffney and Bartholomai (1979).

TAXON: TRIONYCHIDAE

CONSISTS OF: QM F9036, two plastral fragments.

HORIZON: Plio-Pleistocene.

LOCALITY: "Leichhardt River" (label). This is presumably from one of the localities described by DeVis (1907) in the vicinity of Floraville Crossing, Queensland. See Gaffney and Bartholomai (1979) for further discussion.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: BMNH R616, a peripheral bone and BMNH R617, a right humerus, both identified as *Chelodina longicollis* by Lydekker (1889a, p. 168).

LOCALITY AND HORIZON: "Pleistocene of Eton Vale, Darling Downs, South Queensland" (*ibid.*). Presented by Dr. George Bennett, 1885.

DISCUSSION: This material cannot be objectively identified beyond Testudines.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: BMNH 48473, a nuchal fragment identified as *Chelodina longicollis* by Lydekker (1889a, p. 168).

LOCALITY AND HORIZON: "from the Pleistocene of Westbrook, a tributary of Oakey Creek, which runs into the Condamine River, Queensland" (*ibid.*). Presented by Dr. George Bennett.

DISCUSSION: Although a cervical (nuchal) scute is present on this fragment, and while this feature is characteristic of chelids, it is also widespread among cryptodires and insufficient for familial identification.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: A peripheral and two costal fragments in the Queensland Museum.

HORIZON: Undated, but presumed Cenozoic beds, penetrated by Queensland Geological Survey bore number 2, Rockhamp-

TABLE 1—(*Continued*)

Undetermined meiolaniid	*Meiolania platyceps*	*Meiolania mackayi*	*Meiolania oweni*
Gulgong, New South Wales	Lord Howe Island	Walpole Island, New Caledonia	Darling Downs, Queensland, and Coolah, New South Wales
? Miocene	Pleistocene	Pleistocene	Pleistocene
Horn core, quadrate lower jaw symphysis, dermal ossicles, shell fragments, tail ring and club fragments, vertebral fragments	Hundreds of separate elements, including 3 partial skeletons and 6 skulls	Cranial horn cores and miscellaneous fragments	One skull and tail club (Q), and tail club fragments, New South Wales
Cowlike horns, but small	Cowlike horns, without frill	Cowlike horns	Flat horns, developed into frill
Probably long and narrow, based on fragments	Long, narrow	Unknown	Short, squat
1.0–0.7	1.0	0.7	1.5–2.0

ton. The fragments were found at 50.30 m., 190.47 m. and 208.08 m. below the surface.

LOCALITY: Rockhampton, Queensland.

DISCUSSION: The fragments have the ornament pattern of many chelids and the peripheral is slightly guttered as in many chelids but these features are inadequate for identification.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Seven shell fragments reported by DeVis (1907), not seen by the author.

HORIZON: Plio-Pleistocene.

LOCALITY: Leichhardt River, Queensland. The specimens are apparently from three sites: "the top crossing of the river, 7 miles below Augustus Station; . . . Floraville Post Office; . . . the river bed and conglomerate on the banks at Floraville Crossing" (DeVis, 1907, p. 3).

DISCUSSION: DeVis identified this series of fragments as "*Chelymys arata,*" "*Chelymys granulata,*" and "*Pelocomastes ampla.*" I have been unable to locate these specimens (they were "collected under the auspices of the Department of Agriculture by Mr. Stock Inspector Buhot") and in the absence of any figures or description, I cannot corroborate the identification even to Chelidae. That they are chelonian, however, is likely. "*Chelymys arata*" and "*Pelocomastes ampla*" were described by DeVis (1897) and are discussed above, but, as far as I can determine, "*Chelymys granulata*" was never described or named and must be considered a *nomen nudem.*

A trionychid specimen in the Queensland Museum (QM 9036) bears the label "Leichhardt River" and presumably comes from the area described above. This specimen bears a number 4 on it, and may be one of the turtles DeVis referred to. However, DeVis was quite able to identify trionychid fragments (DeVis, 1894) so this possibility is probably incorrect.

TAXON: CHELIDAE

CONSISTS OF: QM F10569, a right xiphiplastral fragment.

HORIZON: Pleistocene.

LOCALITY: King's Creek, near Clifton, eastern Darling Downs. Map coordinate, Clifton 1:250,000 sheet 039454, Queensland.

FIG. 15. *Emydura* sp., Chelidae. Plastron restored from isolated elements found together in the same quarry but not from the same individual (it is possible, however, that the epiplastron or entoplastron is from the same individual as the hypoplastron/xiphiplastron, but this cannot be determined). Turtle Quarry, V5762, Lake Palankarinna, South Australia, Etadunna Formation, Miocene. These specimens are from the same quarry that has yielded the *Emydura* skulls described in Gaffney (1979a).

Abbreviations: ento, entoplastron; epi, epiplastron; hyo, hyoplastron; hypo, hypoplastron; xiphi, xiphiplastron.

Collected on May 2, 1980, by R. Molnar, A. Bartholomai, and E. Gaffney.

DISCUSSION: The pubic scar on this xiphiplastral fragment is sufficient to identify this specimen as a pleurodire and, assuming that there are no pelomedusids in Australia, a chelid.

SOUTH AUSTRALIA

TAXON: *EMYDURA* SP.

CONSISTS OF: UCMP 57253 and UCMP 78229, partial skull, as well as other disarticulated cranial elements, described and figured in Gaffney (1979a) and numerous disarticulated shell bones (fig. 15) in the UCMP collections.

HORIZON: Etadunna Formation, medial Miocene (see Gaffney, 1979a, for discussion).

LOCALITY: UCMP V5762, Turtle Quarry, southwestern edge of Lake Palankarinna, South Australia (see Gaffney, 1979a, for more information).

DISCUSSION: These specimens were the first skull elements of chelids to be described from the fossil record and remain as the best specimens known to date. The basis of identifying the skulls as *Emydura* is dealt with at length in Gaffney (1979a) but can be summarized here. The only feature unique to *Emydura* (including *Elseya*) that is not primitive for the Chelidae, is the relatively heavy lower jaws with a moderate symphyseal "hook," but this character also occurs in the sister group of chelids, the pelomedusids, and may be primitive for chelids. Furthermore, the V5762 collection contains no lower jaws. However, the Etadunna specimens have an anterior frontal process, a derived character of the subfamily Chelinae (see Gaffney, 1977) but they lack the derived features of the infrafamily Chelodd. *Emydura* is the only taxon that occupies this phylogenetic position in my hypothesis (Gaffney, 1977, p. 1, fig. 10) and in the absence of any diagnostic differences between the Etadunna skulls and Recent *Emydura,* I identify the fossil forms with this taxon. The conditional nature of this identification, however, must be kept in mind and future work could easily require an alteration.

TAXON: *EMYDURA* SP.

CONSISTS OF: UCMP 77348 and UCMP 72492, nearly complete shell (the latter with an articulated hind limb) described and figured in Gaffney (1979a).

HORIZON: Wiparjiri Formation, medial Miocene (Stirton, Tedford, and Woodburne, 1968; Woodburne et al., in press).

LOCALITY: UCMP V6213, Leaf Locality, eastern shore of Lake Ngapakaldi (see Gaffney, 1979a, and Stirton, Tedford, and Woodburne, 1967, for more information).

DISCUSSION: These shells are the most complete chelid shells from Australia and together with the more fragmentary material figured in the present paper, will provide a basis for further comparisons and discoveries. I have identified these shells in the same way that I have identified the V5762 skull material, by using what can be interpreted as primitive characters. The shell of Recent *Emydura* approximates the primitive morphotype of the Chelidae with regard to the characters I have used (Gaffney, 1977) to test a phylogenetic hypothesis of that family; that is, presence of a nuchal scute, absence of neural bones, and a relatively small intergular scute that entirely separates the gular scutes and a portion of the pectoral scutes. Future work may show that these features delimit a paraphyletic taxon that can be best replaced by monophyletic groups.

TAXON: TESTUDINES

CONSISTS OF: "Chelonian plates . . ." (Tate, 1886a, p. 54) and "part of the bony carapace of the turtle" (Tate, 1886b, p. 203); not seen by author.

HORIZON: Not known, area includes Miocene to Pleistocene rocks.

LOCALITY: "Mr. Debney obtained fossils from the escarpment of a table-hill, between the Warburton and the Cooper, on the east side of Lake Eyre, in the midst of the sandhill country" (Tate, 1886a, p. 54).

DISCUSSION: This is the region of the later

collections by University of California-South Australian Museum parties that resulted in the discovery of complete shells and good skull material of Miocene chelids (Gaffney, 1979a).

TAXON: MEIOLANIIDAE

CONSISTS OF: UCMP 61018, cervical rib, portion of right manus, articular region of lower jaw, caudal vertebrae, and shell fragments.

HORIZON: Etadunna Formation, Ngapakaldi Fauna, Unit 2, medial Miocene (see Stirton, Tedford, and Miller, 1961, for sections; Woodburne et al., in press, for age discussion).

LOCALITY: UCMP V5857, Lake Pitikanta, South Australia (see Stirton, Tedford, and Miller, 1961, fig. 2, for map).

DISCUSSION: The free cervical rib and caudal vertebrae are the most diagnostic elements but the manus bones are nearly identical with manus material of *Meiolania platyceps* from Lord Howe Island (see table 1).

TAXON: *EMYDURA* SP.

CONSISTS OF: UCMP 78239, both dentaries (fig. 16).

HORIZON: Wipajiri Formation, medial Miocene (Woodburne et al., in press; Stirton, Tedford, and Woodburne, 1967).

LOCALITY: Lake Ngapakaldi, Leaf Locality, UCMP V6213 (see Stirton, Tedford, and Woodburne, 1967, for maps and associated fauna).

DISCUSSION: These dentaries are somewhat waterworn with the posterior edges broken or eroded and the labial ridge worn down slightly. They agree closely with the dentaries of Recent *Emydura* and with the Darling Downs specimens described above and shown in figure 7.

The identification of these specimens as *Emydura* is based on my hypothesis that the following features are derived for *Emydura*: relatively heavy lower jaw with comparatively wide triturating surfaces and slightly developed symphyseal hook. All other chelids have relatively light jaws with narrow triturating surfaces and no trace of a symphyseal hook. The fused rami of the jaws are a primitive feature for turtles but some chelids (infrafamily Chelodd of Gaffney, 1977, consisting of all chelids except *Pseudemydura* and *Emydura*) have the rami separated by a symphyseal suture. The Wipajiri jaws have fused rami, substantiating their identification with a taxon outside the Chelodd.

TAXON: MEIOLANIIDAE

CONSISTS OF: UCMP 84682, a free cervical rib.

HORIZON: Wipajiri Formation, medial Miocene (Woodburne et al., in press)

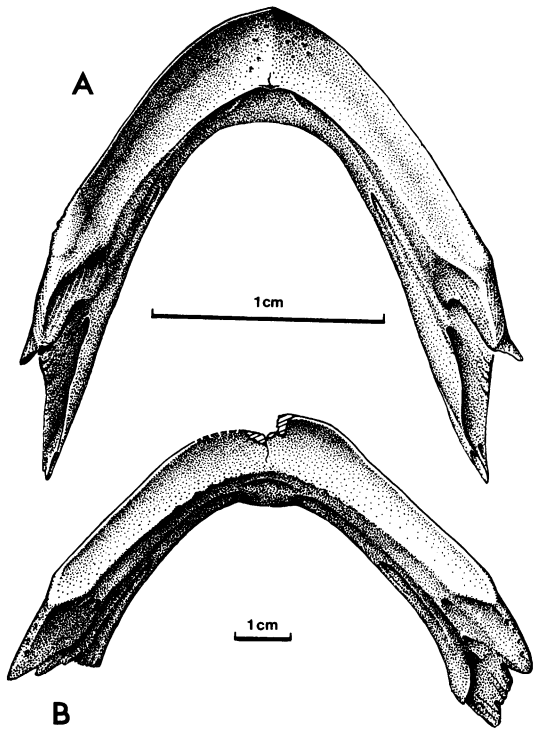

FIG. 16. Dorsal view of *Emydura* dentaries. A. AMNH (Herpetology) 108956, *Emydura* sp., Recent, no data. B. *Emydura* sp., UCMP 78239, V6213, Lake Ngapakaldi, South Australia, Wipajiri Formation, Miocene.

LOCALITY: UCMP V6213, Leaf Locality, Lake Ngapakaldi (see Stirton, Tedford, and Woodburne, 1967, for maps).

DISCUSSION: The free, bicipital cervical ribs of *Meiolania* are quite distinctive and readily allow identification.

TAXON: CHELIDAE

CONSISTS OF: Left xiphiplastron, AMNH 12114; a left costal, AMNH 12115; right (?) hyoplastron, AMNH 12112.

HORIZON: Ericmas Fauna, Namba Formation, middle Miocene (see Callen and Tedford, 1976; and Tedford et al., 1977, for sections, associated fauna and other data).

LOCALITY: Lake Namba, Lake Frome region (see Tedford et al., 1977 for map).

DISCUSSION: The xiphiplastron (AMNH 12114) shows pelvic attachment scars, the costal (AMNH 12115) shows the absence of neural bones, and the plastral material (AMNH 12112) indicates that mesoplastra are absent; a combination diagnostic of the Chelidae. However, these elements do not necessarily come from one individual.

TAXON: MEIOLANIIDAE

CONSISTS OF: AMNH 12133, two caudal vertebrae, ilium, anterior margin of plastron, shell fragments, and various dermal bones.

HORIZON: Namba Formation, Pinpa Fauna, medial Miocene (Callen and Tedford, 1976; Tedford et al., 1977).

LOCALITY: Lake Pinpa, Site D, South Australia (see Tedford et al., 1977, for map).

DISCUSSION: The caudal vertebrae of *Meiolania* (see Owen, 1888, plate 35) are characteristic and the basis of this identification.

TAXON: *EMYDURA* SP.

CONSISTS OF: AMNH 12100, partial shell with nuchal, some costals, epiplastra, right hypo- and hyoplastra, and left xiphiplastron; AMNH 12103, third or fourth cervical vertebrae; AMNH 12135, basisphenoid; AMNH 12201, entoplastron; AMNH 12202, left opisthotic.

HORIZON: Pinpa Fauna, Namba Formation, middle Miocene (see Callen and Tedford, 1976; Tedford et al., 1977, for sections, associated fauna and other data).

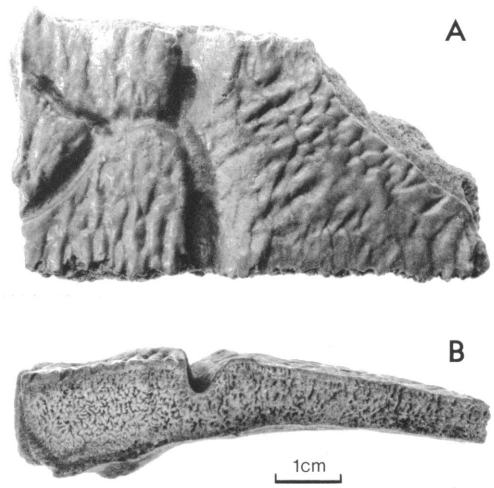

FIG. 17. Chelidae, proximal costal fragment, UCMP 56995, from the Pleistocene Katipiri Formation, Lake Kanunka, South Australia.

LOCALITY: Lake Pinpa, Lake Frome region (see Tedford et al., 1977, for map).

DISCUSSION: The partial shell, AMNH 12100, is too poorly preserved to figure but enough is present to identify it as *Emydura* in the sense used in this paper (i.e., that of Gaffney, 1977). Fused shell and pelvis, mesoplastra absent, and cervical scute present make it a chelid, while the laterally placed gular scutes and narrow intergular reaching the anterior edge of the plastron identify it as *Emydura* sp.

An entoplastron (AMNH 12201) from Lake Pinpa has a large intergular scute separating the gular scutes entirely and the humeral scutes partially, diagnostic features of *Emydura* in the sense used here. The cervical vertebra (AMNH 12103) is readily identified using the criteria discussed in Gaffney (1979a). The two cranial elements (AMNH 12135, basisphenoid; AMNH 12202, left opisthotic) compare very closely with the material described from the Etadunna Formation of Lake Palankarinna (Gaffney, 1979a).

TAXON: CHELIDAE

CONSISTS OF: AMNH 12105, left xiphiplastron (fig. 18B); AMNH 12198, left pelvis; AMNH 12102, nuchal, suprapygal, peripheral.

HORIZON AND LOCALITY: Same as AMNH 12100.

TAXON: CHELIDAE

CONSISTS OF: UCMP 79950, a left xiphiplastron (fig. 18C).

HORIZON: (?) Pliocene.

LOCALITY: Lake Palankarinna (pickup 3, UCMP V67249), South Australia.

DISCUSSION: I have chosen this xiphiplastron to illustrate the ornament pattern and pelvic sutures for comparison with other xiphiplastra shown in figures 15 and 18. I do not think that the ornament or suture pattern shown here is necessarily of systematic significance but the existence of such variation should be documented. Fry (1915) illustrates a good example of Recent chelid ornament.

TAXON: CHELIDAE

CONSISTS OF: UCMP 56995, the number refers to nine shell fragments, one of which is figured here (fig. 17) and discussed below.

HORIZON: Katipiri Formation, Pleistocene; see Stirton, Tedford, and Miller (1961) for sections and map.

LOCALITY: Lake Kanunka, site 1 (UCMP V5772), South Australia.

DISCUSSION: The figured specimen is a proximal costal fragment showing the absence of a neural bone by having a neural arch suture on its ventral surface. I have figured it because it exhibits a very distinctive ornament pattern in which the sulci are very deeply incised, a condition I have not seen in any Recent chelids. Nonetheless, this is insufficient to diagnose a new taxon; it could easily have been due to injury or individual variation.

TAXON: CHELIDAE

CONSISTS OF: UCMP 60798, a right hypoplastron and xiphiplastron (fig. 18A).

HORIZON: Katipiri Formation, Pleistocene.

LOCALITY: Lake Kanunka, site 2 (UCMP V5773), South Australia.

DISCUSSION: This specimen can be identified as a chelid because of the presence of a fused pelvis and the absence of mesoplastra (seen in the straight anterior edge of the hypoplastron).

TAXON: *CHELODINA* SP.

CONSISTS OF: Uncatalogued cervical in the South Australian Museum.

HORIZON: (?) Pleistocene.

LOCALITY: "Cooper Creek, Pres. H. Y. L. Brown, Esq., 1903" (label).

DISCUSSION: As I have noted elsewhere (Gaffney, 1979a, p. 20), chelid vertebrae have a distinctive centrum articulation pattern. Furthermore, among Australian chelids, *Chelodina* cervicals are relatively elongate and this allows identification of this cervical. The biconvex central articulations indicate that the vertebra is a fifth or an eighth cervical.

TAXON: *CHELODINA* SP.

CONSISTS OF: SAM P18272, a left xiphiplastron and entoplastron; and SAM P19294, a right hyoplastron; also right and left uncatalogued epiplastra.

HORIZON: Late Pleistocene cave deposits, at least 32,000 years B.P. (N. Pledge, personal commun.). See Tyler (1977) for other references concerning the fauna.

LOCALITY: Henschke's Quarry Cave, Naracoorte, South Australia.

DISCUSSION: The large intergular scute enclosed anteriorly by medially meeting gular scutes is diagnostic for *Chelodina* and can be seen in these specimens. The size of the Naracoorte *Chelodina* is closer to *C. expansa* than to *C. longicollis*.

NEW SOUTH WALES

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Proximal portion of left femur (incorrectly identified in Molnar, 1980a,

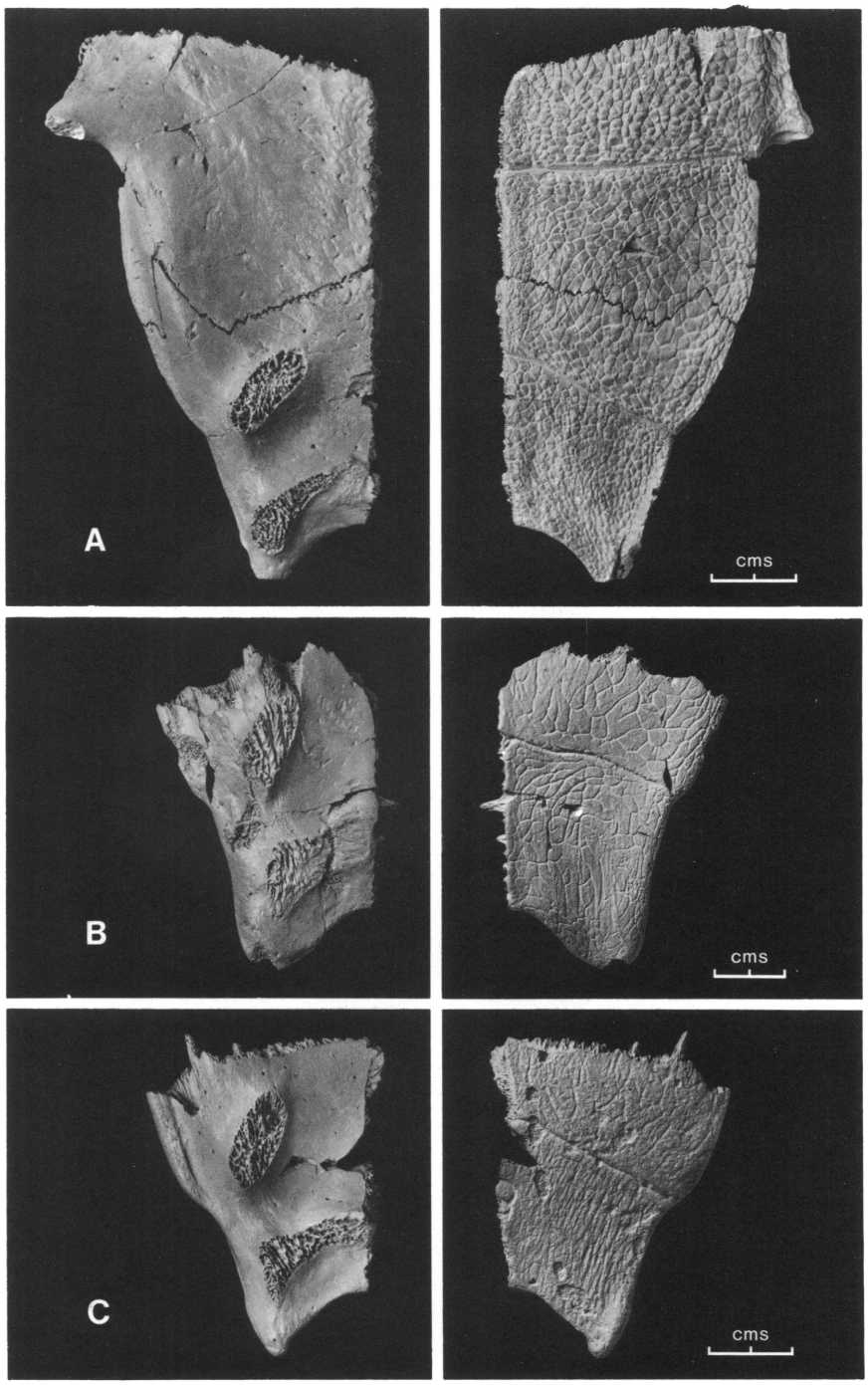

FIG. 18. A. Chelidae, UCMP 60798, right hypoplastron and xiphiplastron (reversed for ease of comparison with other specimens figured here), V 5773, Lake Kanunka, South Australia, Katipiri Formation, Pleistocene. B. Chelidae, AMNH 12105, left xiphiplastron, Lake Pinpa, South Australia, Namba Formation, Miocene. C. Chelidae, UCMP 79950, left xiphiplastron, V67249, Lake Palankarinna, South Australia. These specimens show variation in external surface texture patterns and the pelvic suture areas.

fig. 7, as a humerus, but correctly called a femur in the text, p. 135), original in collection of Mr. Ron Smith. Casts are in the Australian Museum, Queensland Museum (QM F10225), and the American Museum of Natural History (AMNH 16238).

HORIZON: Griman Creek Formation, Albian, Early Cretaceous. See Molnar (1980b) for further geologic information.

LOCALITY: Bald Hill, Lightning Ridge, New South Wales.

DISCUSSION: The femur is turtle, as identified by Molnar (1980a) but a more precise determination is not possible.

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: A right lower jaw ramus, original in collection of Mr. K. Barlow of Grafton, New South Wales. Casts are in the Australian Museum, Queensland Museum (QM F10226), and the American Museum of Natural History (AMNH 16239). Figured in Molnar, 1980a, figure 7.

HORIZON: Griman Creek Formation, Albian, Early Cretaceous. See Molnar (1980b) for further geologic information.

LOCALITY: Lightning Ridge, New South Wales (Molnar, 1980a).

DISCUSSION: Although I have not seen the original specimen, the casts seem to exhibit most of the morphologic features of the specimen. The jaw agrees closely with that of *Plesiochelys* (Gaffney, 1976, figs. 43–49) but it is also similar to *Plesiobaena,* and I do not see any features necessarily barring it from the Pleurodira, although it is most likely a cryptodire. Until better material comes to light, it is best to leave the specimen as an indeterminant turtle.

TAXON: (?)TESTUDINES

CONSISTS OF: AM F18631, a cervical vertebra (cast is AMNH 7293).

HORIZON: Griman Creek Formation, Albian, Early Cretaceous. See Molnar (1980b) for further geologic information.

LOCALITY: Lightning Ridge, New South Wales.

DISCUSSION: The high neural spines and medially placed zygapophyses of this vertebra are features in common with such forms as the cryptodire *Glyptops,* leading me to tentatively identify this vertebra as a turtle. The centrum is opisthocoelus and there is a distinct capitulum and tuberculum which may have born a cervical rib. If it is a turtle, it would be very important to obtain more complete specimens, because cervical ribs are quite limited among turtles.

Do these three Lightning Ridge turtle fragments belong to the same taxon? At the present time it is impossible to answer this question affirmatively but the size range is consistent with one animal. The jaw and femur could be from one taxon, for example, *Plesiochelys,* but the presumed cervical is not precisely identical with any turtle that I am familar with.

TAXON: MEIOLANIIDAE

CONSISTS OF: A number of fragments in the Mining Museum, Sydney, including four figured by Etheridge (1889a), MM F13841 (pl. 26, fig. 4), a cranial horn core; MM F13842 (pl. 26, fig. 3), a fragment of tail ring or club; MM F3843 (pl. 25, fig. 3; pl. 26, fig. 2), a posterior caudal vertebra; and MM F13889 (pl. 25, fig. 2), a fragment of tail ring or club. Two other skull fragments are particularly significant, MM F13855, a right quadrate, and MM F13898, a lower jaw symphysis.

HORIZON: The sediments containing these bones were deposited in pre-Miocene valleys and karsts. Dulhunty (1971) has dated basalt flows that overlie some of these sediments ("deep leads") as middle Miocene (14.8 ± 1.2 and 13.8 ± 1.1 million years) and concludes that the bone bearing gravels were "probably deposited between late-lower and early-middle Miocene time" (Dulhunty, 1971, p. 44). However, the geologic situation is fairly complex and it is likely that some of the sediments may be Pleistocene. The *Meiolania* specimens come from Canadian Lead (see Jones, 1940, for maps and more detailed geology) which is about 6 miles southeast of Gulgong and on the west side of Home Rule (Wyaldra). Canadian Lead is not overlain by basalt and the nearest dated basalt (K8 of

Dulhunty, 1971) is about 7 miles northwest of Canadian Lead and on the other side of a drainage divide. Furthermore, Pleistocene vertebrates (*Diprotodon* and *Macropus*) are reported by Wilkinson (1877) from Magpie Lead, a valley deposit that is in the same drainage system as Dalhunty's K8 locality and only three or four miles from his locality. However, the Canadian Lead vertebrates, although fragmentary, do not include any definitely Pleistocene forms. The dromornithid is described by Rich (1979, p. 57) as "not the Pleistocene *Genyornis*"; the echidnas are considered by Dun (1895) to be distinct from Pleistocene species; and the fragmentary macropod specimens are also not typically Pleistocene forms (R. H. Tedford, personal commun.). Brown's report of *Diprotodon* (in Jones, 1940, p. 86) from Canadian Lead has not been confirmed as far as I am aware. It is, of course, quite possible that Canadian Lead itself contained sediments of various ages from pre-Miocene to Pleistocene and that an objective determination of a date for the meiolaniid specimens is no longer possible. At present, however, the early Miocene age seems to be the best estimate but it can only be considered as tentative.

LOCALITY: "The Canadian Lead . . . about four and a-half miles from Gulgong near Mudgee" (Etheridge, 1889a, p. 152). Presented by Mr. Philip Snayse of Gulgong. See Jones (1940) for maps.

Unfortunately, only the four Etheridge figured specimens have definitive locality data. The other material, from at least MM F13823 to 13978 is mixed Gulgong and Lord Howe Island and I have resorted to identifying the specimens on preservation. There is little ambiguity in this because the Gulgong bones are white with clay matrix and occasionally limonite stains, whereas the Lord Howe Island bones are cream with calcarenite matrix. Nonetheless, the data must be considered questionable.

DISCUSSION: The extremely limited material available indicates a taxon allied to *Meiolania platyceps* because of the "cow-like" cranial horn but differing from the Lord Howe Island species in the low and thin shape of the horn (see table 1). Also, the lower jaw fragment and tail club fragments differ in various ways from *M. platyceps*. However, the specimens are not adequate to diagnose a new taxon at present. Further work on this material is in progress by the author.

In a footnote, Etheridge (1889a, p. 151) refers to a cervical "imperfect . . . a fair-sized bone . . . would appear to be the fifth in the series" that he received from Mr. A. G. Hamilton of the Public School, Mount Kembla. MM F13856 and MM F13857 are both meiolaniid cervicals that appear to be from Gulgong and could include the Hamilton cervical.

TAXON: *EMYDURA DENTATA* OR *LATISTERNUM* (*ELSEYA SENSU* BURBIDGE, KIRSCH, AND MAIN, 1974).

CONSISTS OF: MM F13979–14040, including five nuchal bones and three epiplastra (fig. 19) plus many other shell fragments. This material is referred to by Etheridge (1889a, p. 152) and questionably identified by him as *Chelodina sulcifera*.

HORIZON: (?) Miocene (see above discussion).

LOCALITY: "Canadian Lead, Gulgong" (label); "Pliocene Deep Lead at Canadian, near Gulgong (Etheridge, 1889a, p. 149). Presented by Philip Snayse, Aug. 31, 1887 (label).

DISCUSSION: The *Elseya* of Burbidge, Kirsch, and Main (1974) and Cogger (1975) is characterized by the frequent absence of the cervical scute (also called the nuchal scute). Five nuchal bones (fig. 19) in the Mining Museum in Sydney from the same locality lack a nuchal scute and may, at least tentatively, be identified as *Elseya,* or in the terminology I used in this paper, as *Emydura dentata* or *Emydura latisternum*. Associated with these nuchals are three epiplastra, MM F14003–14005 (fig. 19), which show relatively large intergular scutes separating small gular scutes as in *Emydura*. Nearly all the shell elements are represented among the 60 or so disarticulated fragments. All are relatively small in size, identical in preservation and texture, and presumably belong to the same

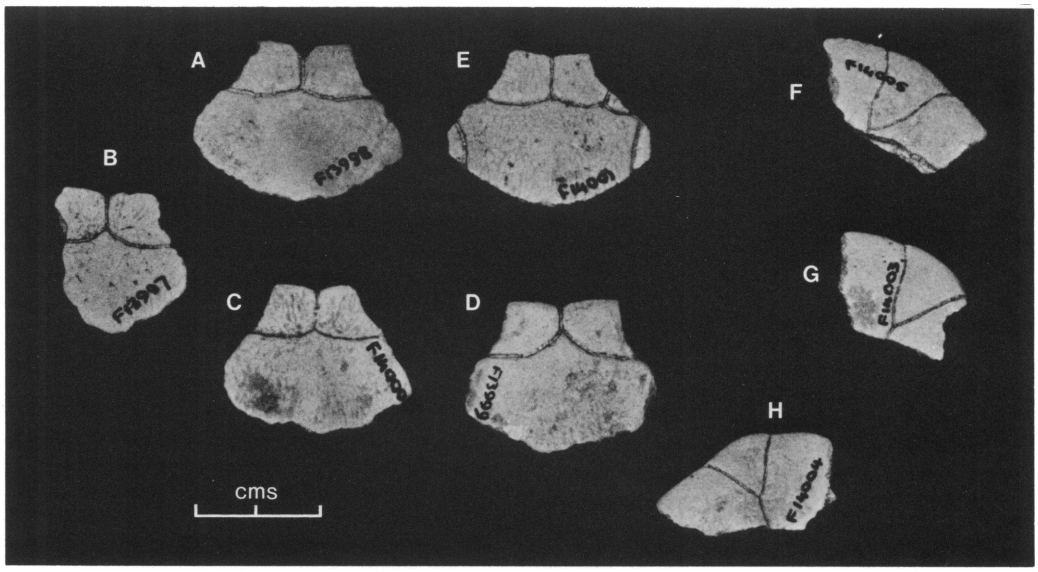

FIG. 19. *Emydura* (*Elseya*) *dentata* or *latisternum*, (?) Miocene, Canadian Lead, Gulgong, New South Wales. Nuchal bones: A. MM F13998; B. MM F13997; C. MM F14000; D. MM F13999; E. MM F14001. F. Left epiplastron, MM F14005; G. Left epiplastron, MM F14003; H. Right epiplastron, MM F14004.

taxon, although this hypothesis must be considered tentative. I was able to find some contacts among broken elements but was unable to articulate any two elements.

TAXON: *EMYDURA DENTATA* OR *LATISTERNUM* (*ELSEYA* OF BURBIDGE, KIRSCH, AND MAIN, 1974).

CONSISTS OF: Three uncatalogued nuchals in the Australian Museum, Sydney.

HORIZON: Presumed Cenozoic.

LOCALITY: "Nannama (presumably Namina) nr. Wellington, NSW" (label).

DISCUSSION: Three nuchals in a small collection of turtle bones from Namina lack cervical scutes and are virtually identical in size, shape, and surface texture to the Gulgong *Emydura* (*Elseya*). Along with these nuchals from the same locality are four hypoplastra and two hyoplastra that may possibly be *Emydura* (*Elseya*) because they agree in size and surface texture with the nuchals.

TAXON: TESTUDINES

CONSISTS OF: AM F18662, shell fragment, collected by G. H. Truman, 1926; AM F320, distal limb bone, exchange with Department of Mines, 1935.

HORIZON: Pleistocene (see Marcus, 1976, p. 130; Frank, 1971).

LOCALITY: Wellington Caves, New South Wales (label).

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Specimen referred to by Krefft (1871, p. 723), not seen by author, whereabouts unknown.

HORIZON: Presumed Pleistocene.

LOCALITY: Wellington Caves, New South Wales.

DISCUSSION: "Fossil Chelonia. The carapace of a fresh water species was found at the Caves of Wellington. It was broken in

removing it, and measured about 8 inches in length" (Krefft, 1871, p. 723). This specimen is also referred to by Etheridge (1878, p. 178).

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: BMNH R1593, a peripheral bone identified as *Emydura macquarrii* by Lydekker (1889a, p. 169).

HORIZON AND LOCALITY: "Pleistocene cave deposits of New South Wales . . ." (*ibid.*), but label says "(?) N.S. Wales."

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: BMNH R42684, a peripheral bone identified as *Emydura macquarrii* by Lydekker (1889a, p. 169).

HORIZON AND LOCALITY: "from the Pleistocene cave deposits of the Wellington Valley, New South Wales" (*ibid.*).

DISCUSSION: Neither this specimen nor the preceding one allow definitive identification.

TAXON: *MEIOLANIA OWENI*

CONSISTS OF: AM F1346a, two tail club bosses (Etheridge, 1893), presented by Mr. J. McMaster of Coolah.

HORIZON: "the superficial deposits near Coolah" (Etheridge, 1893, p. 39); (?) Pleistocene. Etheridge (*ibid.*) indicates that *Diprotodon, Phascolonus,* and *Procoptodon* bones were all given to the museum together with the *Meiolania* fragments, but the bones were not necessarily found associated.

LOCALITY: "new channel of the Oaky Creek, branch of the main Weetalabah Creek, and in another branch known as Binnia Creek. The Weetalabah flows into the Castlereagh River, . . . about twenty-two miles north-west of Coolah" (Etheridge, 1893, p. 39).

DISCUSSION: Etheridge (1893) very astutely identifies these two conical bone fragments as part of the tail club of *Meiolania*. He thought that due to certain differences, particularly the acute tips in the Oaky Creek specimens in contrast to the blunt tips on the Queensland club, a new taxon might be represented. My own comparison of this material, however, reveals a very strong similarity and I have no qualms about identifying the Oaky Creek fragments as the only *Meiolania oweni* identifiable to that species other than the King's Creek skull and tail club described by Owen (1881). The tail ring and club material from Gulgong and Lord Howe Island have much less pronounced bosses and a more elongate and acuminate profile, as well as being three to four times smaller (see table 1).

TAXON: TESTUDINES

CONSISTS OF: Eleven shell fragments in the Mining Museum, Sydney.

HORIZON: (?) Pleistocene (*fide* Marcus, 1976).

LOCALITY: (?) Bingara, New South Wales (see Marcus, 1976, for maps and further information). Label reads "Chelonian (?) Bingara."

DISCUSSION: Although this material is dubiously recorded from Bingara, the fact that Marcus (1976) did not report any turtles in his monographic review of the Bingara vertebrates makes it of potential significance. I do not know why the label identification is questioned, but presumably, it was made on the basis of preservation. In any case, it must be considered dubious, but it is still the only record of turtles at Bingara.

TAXON: CHELIDAE

CONSISTS OF: QM F16-1108, seven costal fragments.

HORIZON AND LOCALITY: Warburton River (label), presumably Cenozoic.

DISCUSSION: Two of these costal fragments show the absence of neurals, a feature that I am tentatively accepting as sufficient for identification as Chelidae. These specimens may be among those referred to by Etheridge (1894, p. 21) as having been collected by Brown along the Warburton and sent to DeVis for study.

TAXON: CHELIDAE

CONSISTS OF: "Plastron and carapace fragments" (Marshall, 1973, p. 165) in the National Museum of Victoria, Melbourne; not seen by author.

HORIZON: Lake Victoria Sands, late Pleistocene-Holocene (Marshall, 1973).

LOCALITY: Sites 7–9 of Marshall (1973, fig. 1), near Lake Victoria, southwest New South Wales.

DISCUSSION: The identification is repeated from Marshall (1973).

TAXON: *EMYDURA* SP.

CONSISTS OF: NMV P30775, a carapace and plastron; not seen by author.

HORIZON: Moorna Formation, late Pliocene or early Pleistocene, Fisherman's Cliff Local Fauna (Marshall, 1973).

LOCALITY: Site 13 of Marshall (1973, fig. 1), near Lake Victoria, southwest New South Wales.

DISCUSSION: "A relatively complete, associated carapace and plastron (P30775) agrees well with the living species of *Emydura macquarrii* (identified by Professor J. W. Warren)" (Marshall, 1973, p. 155).

TAXON: CHELIDAE

CONSISTS OF: "numerous plastron and carapace fragments" (Marshall, 1973, p. 159) in the National Museum of Victoria, Melbourne; not seen by author.

HORIZON: Blanchetown Clay, Bone Gulch Local Fauna, late Pliocene or early Pleistocene (Marshall, 1973).

LOCALITY: Site 12 of Marshall (1973, fig. 1), near Lake Victoria, southwest New South Wales.

DISCUSSION: The identification is repeated from Marshall (1973).

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Shell fragment (not seen by author), collected by J. Hope, July 1978 (personal commun.).

HORIZON: Tandou Sand, late Pleistocene.

LOCALITY: *Diprotodon* Site, Lake Tandou, New South Wales.

TAXON: *MEIOLANIA PLATYCEPS*

CONSISTS OF: BMNH R675, type specimen, a partial skull figured and described by Owen (1886b, plate 30, fig. 1; plate 31, fig. 1). Many specimens of *Meiolania* have been collected from Lord Howe Island, the BMNH material is listed in Lydekker (1889a) but the largest collection is in the Australian Museum in Sydney. Figures of Lord Howe *Meiolania* may be found in Owen (1886b, 1888); Etheridge (1889a); Anderson (1925, 1930); and Gaffney (1979b).

HORIZON: Ned's Beach Calcarenite, older than 20,700 ± 700 years (Squires, 1963, p. 412); presumably Pleistocene. Other geology and maps can be found in Etheridge (1889b), Anderson (1925), and Standard (1963).

LOCALITY: Lord Howe Island, New South Wales. Anderson (1925) gives the only map of *Meiolania* occurrences on Lord Howe Island. Fletcher (1960), Sutherland and Ritchie (1974), and Ritchie (1978) are popular accounts of Lord Howe *Meiolania* discoveries which give useful data and photographs.

DISCUSSION: I am currently making a complete study of the Meiolaniidae. See table 1 for a summary of meiolaniid localities.

WESTERN AUSTRALIA

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Shell fragments in the Bureau of Mineral Resources, Canberra, CPC 17116–17118, described by Gorter and Nicoll (1978).

HORIZON: Late Cenozoic.

LOCALITY: Windjana Gorge along Lennard River.

DISCUSSION: Gorter and Nicoll (1978) have identified *Carettochelys* and ?*Chelodina* from the Windjana Gorge site. They have kindly sent me casts of the figured specimens but the illustrations (Gorter and Nicoll, 1978, fig. 4) are quite accurate. On the basis of my own comparisons I would hesitate to identify these three fragments beyond Testudines. The costal features used to identify CPC 17116 and CPC 17117 as ?*Chelodina* are not restricted to that form and the surface texture seen in CPC 17118, identified as *Car-*

ettochelys, is commonly seen in chelids (for example, fig. 18); *Carettochelys* does have a distinctive surface texture but CPC 17118 does not have it. The occurrence of *Carettochelys* on the Australian mainland in the Recent fauna (Cogger, 1970) does suggest that it might be expected as a fossil, but so far I have seen no recognizable specimens.

The Windjana Gorge site is the first and, to date, the only record of fossil turtles from Western Australia.

TASMANIA

TAXON: *EMYDURA* SP.

CONSISTS OF: UT 59374, carapace and plastron lacking anterior portions (figured by Warren, 1969a, fig. 2); UT 86978, carapace (figured by Warren, 1969a, fig. 1); UT 89168, posterior section of carapace; MU 1204, portion of plastron; MU 3384, shell fragments; MU 3385, shell fragments; MU 3387, peripheral fragments.

HORIZON: Unnamed formation, probably Oligocene or Miocene in age (Warren, 1969a).

LOCALITY: "Beach 100 yards north of Taroona High School, Taroona, Tasmania (520 yards E, 713 yards N: Tasmania State Map, Int. Ref. SK/55-8)" (Warren, 1969a, p. 179).

DISCUSSION: I can add nothing to Warren's (1969a) description and identification of this material from Tasmania. It fits in what I am calling *Emydura,* and I can corroborate his description and figures of the specimens.

VICTORIA

TAXON: *CHELYCARAPOOKUS ARCUATUS*

CONSISTS OF: Holotype, NMV P13160, and internal cast of the shell, figured and described by Chapman (1919) and Warren (1969b).

HORIZON AND LOCALITY: "The holotype was collected by Mr. J. W. Macpherson at Carapook, Victoria. The exact provenance was not recorded at the time of collection but it seems certain due to the limonitic nature of the matrix, that the specimen came from a known ironstone horizon in the Merino Group, which is of lower Cretaceous age" (Warren, 1969b, p. 26).

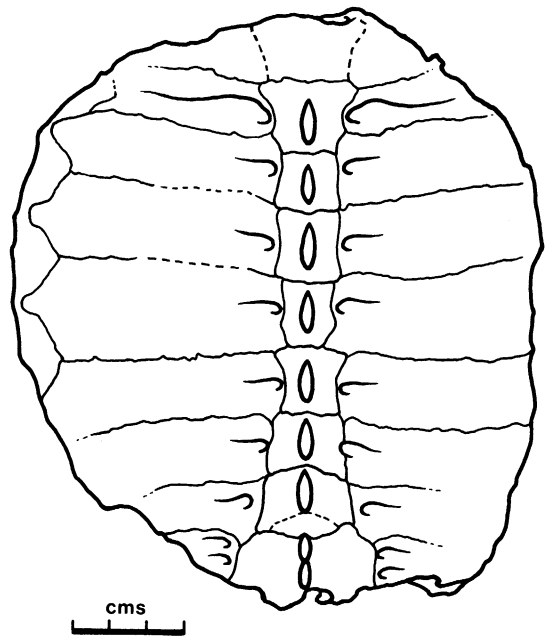

FIG. 20. *Chelycarapookus arcuatus,* Cryptodira indet., Carapook, Victoria (?). Merino Group, Early Cretaceous. Dorsal view of a natural internal mold (NMV P13160). See also Warren (1969b) for other figures.

DISCUSSION: This specimen is represented only by a steinkern which is notoriously difficult to use in comparing with other fossil turtles. Although the external morphology of the shell is the most commonly described morphologic region, the interior shell morphology is rarely described. I agree with Warren's (1969b) conclusion that *Chelycarapookus* has a different combination of characters than any other turtle, but this may be due in part to our ignorance of internal shell morphology. Warren (*ibid.*) believes that there is not enough preserved to determine the presence or absence of a fused pelvis. It is a speculative question, but I would say that there may be enough preserved to at least suggest the absence of a fused pelvis. The iliac suture area on the carapace of a pleurodire is almost always in close prox-

imity to the last (sacral) shell vertebrae and costal rib heads. In *Chelycarapookus* enough of this surface area around these rib heads is preserved to show that a normal pleurodiran position for a fused pelvis is absent. Nonetheless, one could still be present with only a slight variation from known taxa. The systematic position of this form must remain Testudines indeterminant.

NORTHERN TERRITORY

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: A reference by Stirton et al. (1968, p. 9) to "Chelonia." Not seen by author.

HORIZON: Oligocene or Miocene (Stirton et al., 1968, p. 9).

LOCALITY: Two mi. northeast of Kangaroo Well, Deep Well Station, southern Northern Territory (*ibid.*).

TAXON: TESTUDINES INDETERMINANT

CONSISTS OF: Uncatalogued shell fragment in South Australian Museum.

HORIZON: Waite Formation, late Miocene.

LOCALITY: Four mi. southwest of Alcoota Station Homestead, Northern Territory (see Woodburne, 1967, for maps, geology, and associated fauna).

PAPUA NEW GUINEA

TAXON: "*CHELONE MURUA*"

CONSISTS OF: Holotype, QM F13/337, a left humerus, described and figured by DeVis (1905, pl. 12).

HORIZON: Presumably Cenozoic on the basis of an apparently associated dugong (*ibid.*).

LOCALITY: "from Busai in Murua, an island otherwise known as Woodlark Island" (DeVis, 1905, p. 26), New Guinea.

DISCUSSION: As remarked by DeVis (1905, p. 30), this humerus is similar to that in living cheloniids and can be referred tentatively to the family Cheloniidae.

TAXON: *CARETTOCHELYS* SP.

CONSISTS OF: An external mold and fragment of the nuchal bone, AM F39 826–7, described and figured by Glaessner (1942).

HORIZON: "mollusca, corals and foraminifera occur in the same beds the age of which is upper Miocene" (Glaessner, 1942, p. 106).

LOCALITY: Quarry, 800 feet E 7°S from the mouth of Mariana Creek, Vailala River, Papua.

DISCUSSION: The ornament and the shape of the nuchal bone are sufficently diagnostic to identify *Carettochelys* and I can corroborate Glaessner's record. *Carettochelys* occurs in Papua New Guinea and northern Australia in the Recent fauna (Cogger, 1970), but the Western Australian fossil record (Gorter and Nicoll, 1978) is erroneous.

WALPOLE ISLAND, NEW CALEDONIA

TAXON: *MEIOLANIA MACKAYI*

CONSISTS OF: Type specimen, AM F17720, left horn core, figured and described by Anderson (1925, pl. 32, figs. 5 and 6), as well as other material described by Anderson (1925) in the Australian Museum.

HORIZON: The material occurs in guano deposits in coral rock. As far as I am aware neither the coral nor the guano has been dated, but the guano is presumed to be Pleistocene or even Holocene.

LOCALITY: Walpole Island, about 100 mi. southeast of New Caledonia.

DISCUSSION: Although the material of *M. mackayi* is very limited, its small size and elongate horn core do differentiate it from *M. platyceps*, and I am considering it valid (see table 1).

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