

Memoirs of the Queensland Museum.

VOL. X, PART II.

Issued 30th March, 1932.

EDITED BY THE DIRECTOR, HEBER A. LONGMAN, F.L.S., C.M.Z.S.



ISSUED BY THE AUTHORITY OF THE CHIEF SECRETARY FOR
QUEENSLAND, THE HON. A. E. MOORE.

CONTENTS.

	PAGE.
A New Cretaceous Fish—Plates X-XI, Text-figures 1-3 - Heber A. Longman, F.L.S., C.M.Z.S. -	89-97
Restoration of <i>Kronosaurus queenslandicus</i> —Plate XII - - Heber A. Longman, F.L.S., C.M.Z.S. -	98
Some Fishes of the Family Leiognathidæ—Plates XIII-XIV, Gilbert P. Whitley - - - - with Text-figure - - - - -	99-116
Some Wasps of the genus <i>Zoyphium</i> - - - - - Professor T. D. A. Cockerell - -	117-118
Acridiodes aus dem Queensland Museum zu Brisbane - - Yngve Sjöstedt - - - -	119-121
Barnacles from Magnetic Island, North Queensland - - Thomas H. Withers, F.G.S., F.Z.S. -	122-124
Some Earthworms from Queensland—Text-figures 1-2 - - W. Boardman - - - -	125-130

A NEW CRETACEOUS FISH.

BY HEBER A. LONGMAN, F.L.S., C.M.Z.S., DIRECTOR, QUEENSLAND MUSEUM.

(Plates X-XI, Text-figures 1-3.)

THE remains of vertebrates as yet described from the Lower Cretaceous deposits of Queensland are so few that considerable interest is attached to a large fossil fish presented to the Queensland Museum in August, 1931, by Mr. H. W. Denmead. This specimen was discovered one mile east of the township of Richmond, on the Flinders River, North-western Queensland. It not only adds another genus and species to the few Cretaceous fishes recorded for Australia, but, although very incomplete, it appears to exhibit certain combinations of characters which may be deemed significant to specialists in phylogenetic studies elucidating the classification of fishes.

FLINDERSICHTHYS DENMEADI, genus and species new.

Material.—The fossil consists of the head of a large teleost, with fourteen vertebrae, remains of the pectoral girdle, and a fragment of a pectoral fin. (Reg. No. F. 2210.) The specimen is nineteen inches (483 mm.) in length, ten and a-half inches (266 mm.) in height, and was approximately five inches thick (126 mm.) when received. The left side, which is considerably abraded in places, was fairly clear of superficial matrix when received, but the whole of the right side was heavily invested with a buff-coloured, fine-grained calcareous mudstone. Although much of the matrix was fairly soft, the exposure of the roof of the skull and the deeper elements, especially the basioccipital region, necessitated many hours of work. Several fragments of the common Lower Cretaceous shell, *Aucellina gryphaoides* (J. de C. Sow.) were found in the matrix.

Principal Characters.—Head large, laterally compressed. Breadth of cranial roof relatively narrow, with longitudinal depression in posterior region; supraoccipital and epiotic feebly developed, but squamosal prominent; cheek bones massive. Opercular apparatus and hyomandibular well developed; gape wide, but not extending below orbital region; upper jaw formed mainly by maxillae. Jaws massive, well equipped with multiserial, villiform teeth; cleithrum well developed. Centra of vertebrae completely ossified symmetrical cylinders, much deeper than long, marked with longitudinal striations between rims; isospondylous. The external cranial bones are invested with ganoiné.

The fossil denotes a large fish of robust proportions, provided with powerful fins (judging from the rudiment preserved of the pectoral). It was probably about four feet in total length, and in life may have weighed from 70 to 80 lb.

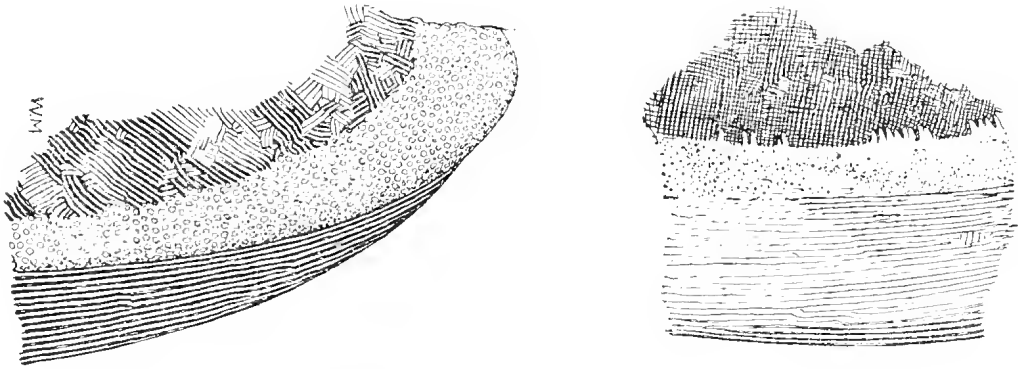
Detailed description—Cranium.—The specimen has been subjected to considerable distortion, especially on the right side, the roof of the skull having been obliquely crushed down, several of the elements have been displaced, and most of the bones are more or less abraded. (Plate XI, fig. 1). The supraoccipital is relatively very small, and is scarcely raised above the plane of the posterior border. Although the region is obscure, the parietals are considered to be small elements not separated by the supraoccipital, but its anterior small flange apparently underlies them slightly. The epiotic is feebly developed. The cranial roof, in its posterior region, exhibits a wide, quadrangular, median longitudinal depression, but this has probably been much exaggerated by strong pressure during fossilisation. It may be noted that a deep quadrangular pit in the cranial roof is a marked feature of species of *Thrissopater*, a genus of the Cretaceous Elopidae from Cretaceous deposits in England. On the right side, a prominent feature is the large squamosal or pterotic bone, 110 mm. in length. The anterior portion of this bone has been forced upwards. The surface is distinctly marked with about eight smooth oblique furrows. Only a small posterior fragment of the left bone is preserved. In the anterior region of the right squamosal, the sphenotic or postfrontal forms a laterally projecting process (largely obscured on the left-hand side), which has an oblique trough in its median surface which passes downwards and backwards. This massive structure evidently formed a remarkable feature in the supraorbital region, perhaps as distinctive as that of the giant *Xiphactinus*, as described by Alban Stewart from the Upper Cretaceous of Kansas (1900). The roof of the skull is so much disrupted in places, however, that *Flindersichthys* may well have been preyed upon by one of the huge marine reptiles such as *Kronosaurus*, and it is difficult to interpret precisely its structure.

Between the orbital region and the occipital border, the roof, mainly comprised of frontals, appears to have been parallel-sided. The width at the occipital border was at least 75 mm., and it was apparently quite as wide between the orbits. Anteriorly, the cranium is distinctly narrower. The premaxillæ have been displaced. The most anterior element present in the roof is the unpaired mesethmoid, which is a stout bone with a median projecting process. On the left side the mesethmoid is in contact with an inwardly curved process, much abraded, of the maxilla. Fragments of the nasals with contiguous prefrontals are present. The vomer is apparently hidden in the cemented material in the upper part of the gape, and some of the many small teeth here present probably came from it. The bones in the roof of the skull in the prefrontal region are relatively thick, attaining about 8 mm.

As the result of long-continued work on the matrix on the right-hand side, portions of the basioccipital, exoccipital, and opisthotic are partly exposed, but the area is too obscure to permit of significant description.

Mandibles.—The massive character of the left mandible is shown on Plate X, but its anterior portion is incomplete. The right unit has been considerably displaced, and the whole bone has been thrust some 45 mm. backwards. Its anterior portion has been tilted up and now lies partly above the incomplete left unit. There is

evidence of a tumid extension in the anterior part of the symphysis. On the left mandible much of the lateral surface has been abraded, exposing an extensive area representing Meckel's cartilage. Fortunately the right mandible has been preserved, as exposed from the matrix, and it is no less than 230 mm. in length. It is relatively slender in its anterior portion, the lateral surface of which is prominently convex. The dentigerous area, as exposed, is a broad platform extending backwards for at least half the length of the bone. Anteriorly this area extends on a prominent wing-like process over the lateral border of the dentary. Numerous multiserial villiform teeth are preserved, many of which are *in situ*, but for the most part they are represented by a close-set mosaic of circular bases. Although most of the teeth were villiform, there is evidence of slightly larger units, which may be described as conical with somewhat curved tips, but all of these teeth are relatively very small. (Text-figures 1 and 2.)



Text-figures 1 and 2.—*Flindersichthys denmeadi*. Sections of mandible showing bases of villiform teeth exposed from matrix (partly diagrammatic).

The coronoid elevation is incomplete on the left side, but it is evident that it was prominent and in keeping with the massive proportions of the mandible. The preserved portion gives the left mandible a depth of 62 mm. in this region. The right coronoid is hidden in matrix. The area of the articular on the lateral surface is considered to be confined to the posterior fifth of the mandible, but the junction of the two elements is obscured. On the left side the actual articulating surface for the condyle of the quadrate is incomplete, and the right ramus shows that the posterior portion is curved upwards behind the actual fossa.

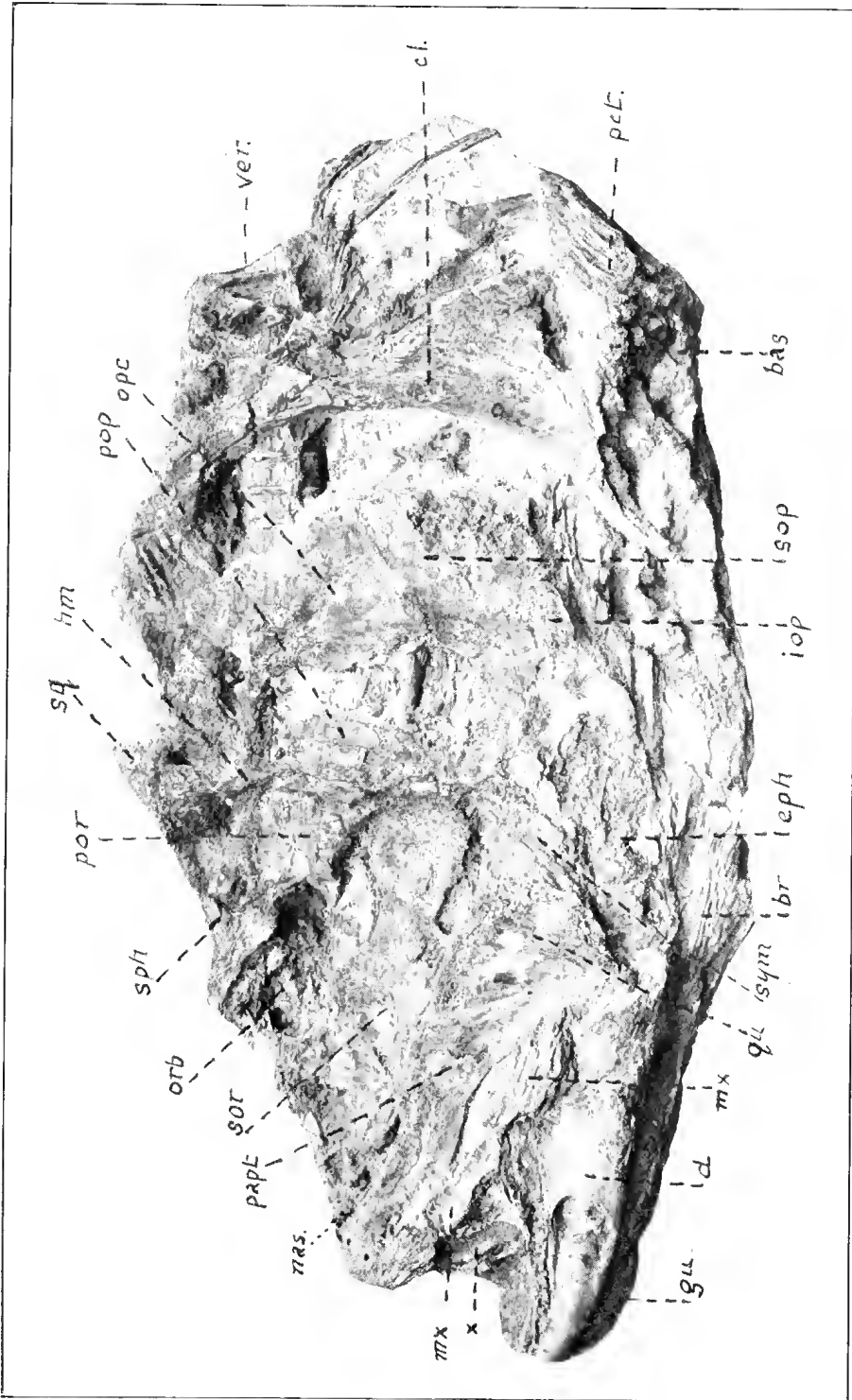
Within the gape is a displaced fragment from the upper jaw, 40 mm. in length, which exhibits a dentigerous area, slightly convex in transverse section, containing the bases of villiform teeth similar to those of the mandible. This fragment is almost certainly a portion of the left premaxilla. Judging from the dimensions of the mandible and the maxillæ, the premaxillæ were relatively small, curved elements, such as are characteristically found in Lower Cretaceous fishes.

Maxilla.—The left maxilla is very incomplete and much abraded. Anteriorly it shows a prominent, inwardly-directed process, apparently terminating at its junction with the unpaired mesethmoid. The region above the maxilla, overlying the palato-quadrate bar, is so abraded that it cannot be stated whether supplementary or supra-maxillary bones were present. On the right side, exposed under deep matrix, the maxilla has been forced downwards and inwards on to the margin of the mandible. The length, as exposed in the matrix, is fully 188 mm., and the depth is approximately 25 mm. The anterior portion gives evidence of a pronounced inward and upward curve. The bone is gently curved throughout its length, and is somewhat convex on its lateral surface in transverse section. The depth is fairly uniform, but the bone was evidently thicker anteriorly. On the superior border there is a small elongated channel, which may have been associated with the bases of supramaxillary bones. Unfortunately the matrix on the oral border is extremely hard, and the bone cannot be further exposed. There is evidence of a close-set series of tiny conical teeth, which may be seen in the matrix. Within the anterior portion of the gape, the matrix is very hard, being evidently composed of the cemented detritus of disrupted bone, but numerous remains of villiform or minute conical teeth are more or less exposed.

Quadrate and Symplectic.—These two conjoined bones form a massive triangular plate. At the condyle the quadrate is no less than 20 mm. thick, thus forming a powerful hinge for the mandible. The right quadrate has been forced backwards and inwards, but its condyle is still in the articulating surface of the mandible. The condyle, as shown on the left side, has a pronounced inwardly-directed process, apparently as in *Oligopleurus rectensis*, as described by Smith Woodward (1890, p. 347.). The symplectic is closely associated with the quadrate on its supero-posterior border. The posterior edge of the symplectic passes beneath the lower portion of the hyomandibular, which partly overlaps it.

Palatine.—Articulating obliquely with the anterior border of the quadrate, and in the same lateral plane, is an elongated, curved bone, much abraded, which evidently represents the palatine with a pterygoid element closely adpressed. It terminates in the ethmoid region in juxtaposition with the maxilla. It may be mentioned that in *Arapaima*, according to Ridewood (1904, p. 73), the ectopterygoid is fused with the palatine. Inside this palato-ptyergoid arch and below the suborbital plate a small portion of a mesopterygoid bone is exposed.

Orbital region.—Immediately above the quadrate and the palato-ptyergo-quadrate arch, a massive plate of bone extends from the hyomandibular to the preorbital region. The natural surfaces are somewhat abraded, but it appears to consist of a single bone, extending to the lower border of the orbit. This plate is very thick and convex near the quadrate, but it shelves inwards in consonance with the narrowing of the cranium in its upper portion. The diameter of the orbit appears to have been about 40 mm. The actual region is partly filled with cemented detritus.



FLINDERSICHTHYS DENMEADI.

(Approximately three-fifths natural size).

Explanation.—*bas*, basals of pectorals; *br*, branchiostegals; *cl*, cleithrum; *d*, dentary; *eph*, epihyal; *gt*, gular plate; *hm*, hyomandibular; *iop*, interopercular; *mc*, maxilla; *mas*, nasal; *opc*, opercular; *orb*, orbit; *papf*, palato-ptyergoid arch; *pop*, preopercular; *por*, postorbital; *ql*, quadrate; *sor*, suborbital; *sop*, subopercular; *sph*, sphenotic; *sq*, squamosal; *sym*, symplectic; *ver*, vertebrae; *x*, displaced dentigerous fragment.

Photograph, W. J. Sanderson.

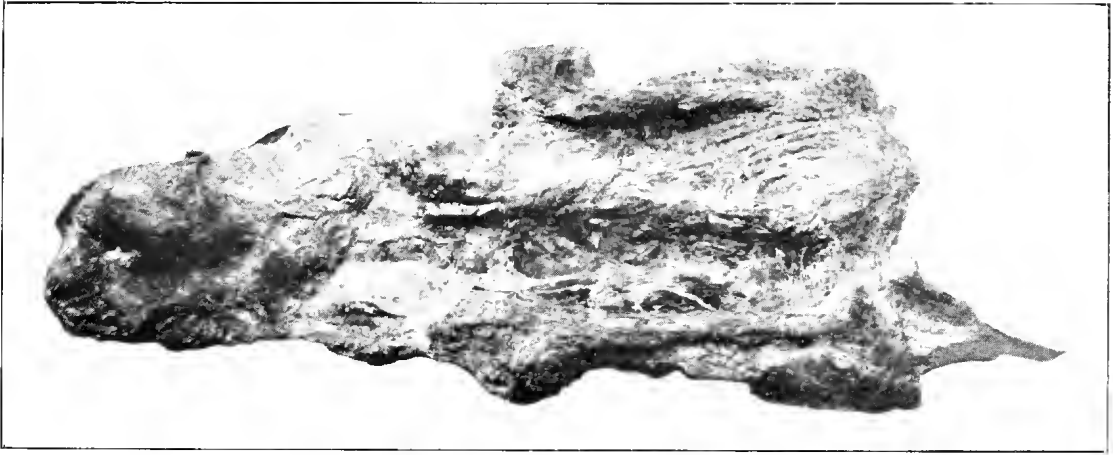


Figure 1.—*Flindersichthys denmeadi*.
Upper aspect of distorted cranium, as exposed from matrix.
(Approximately one-half natural size.)

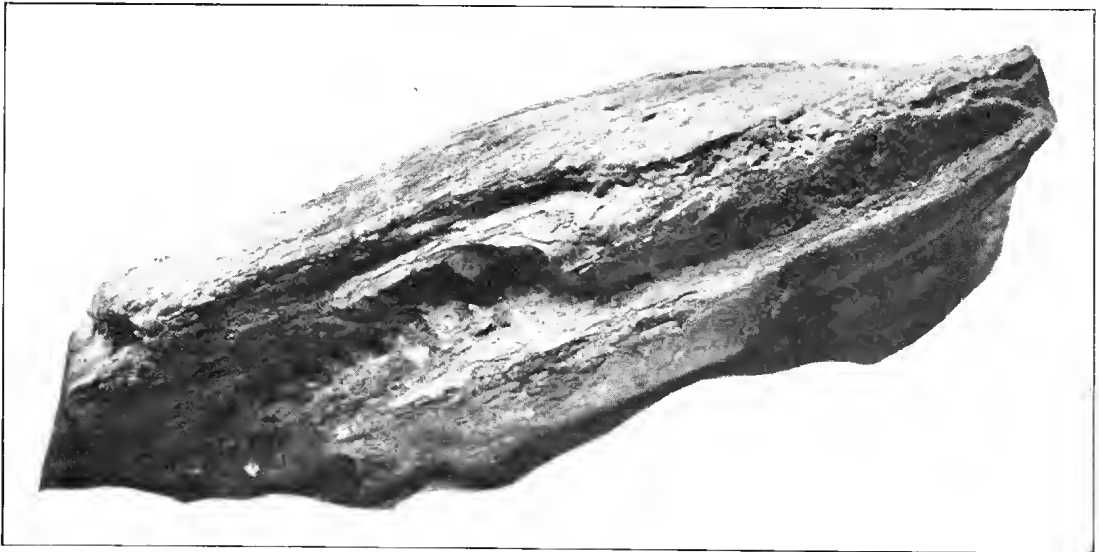


Figure 2.—*Flindersichthys denmeadi*.
Lower aspect of mandible showing gular plate, anteriorly, and remains of branchiostegals.
(Approximately five-ninths natural size).

There is also an abraded plate in the post-orbital region, filling the space between the anterior branch of the hyomandibular and the lower sub-orbital plate.

Ganoine.—There is a distinct film of ganoine on most of the bones of the cranial roof, and there are small patches remaining on the other external cheek-bones, showing that these were enamelled. Where the ganoine is well preserved it gives a shining brown appearance to the fossil, and here and there are small patches with a bluish or opalescent tint similar to that on the large scales of our specimens of *Belonostomus*. (Ganoine is here used for a "layer of successive lamellæ of enamel-like, cell-less substance," as defined by E. S. Goodrich (1909, p. 218).)

Hyomandibular.—The vertical head, articulating with the pterotic region, is somewhat massive, and is much larger than the anterior head, which projects forwards to the sphenotic, some 50 mm. from the median line of the bone. The abraded outline of the bone is well marked on Plate X, and it will be seen that there is a more slender branch passing posteriorly to the operculum. Below the anterior and posterior branches, the lengthy median portion of the hyomandibular extends to the symplectic, and this portion forms almost a right angle to the series of vertebræ. Although this left-hand bone is much abraded, a displaced fragment of the right component, exposed from deep matrix, shows that the lateral surfaces of this large and complex bone were prominently flanged on the axes of the branches and that a thin plate of bone extended between the anterior and vertical heads.

Opercular Bones.—The posterior margin of the operculum is incomplete, but there is no evidence of radial furrows or striations or of a serrated border. The portion preserved is an extensive plate, considerably deeper than wide. There is an oblique suture between it and the suboperculum, which is very incomplete, but this and the interoperculum, represented by fragments, were evidently extensive plates. Only a small portion of the anterior plate of the preoperculum is preserved, and this abuts on the median part of the hyomandibular. The exposed area between the hyomandibular and the operculum is now filled with white matrix and disrupted bones.

Gular Plate.—Between the mandibular rami in their anterior half is an extensive tongue of bone, which represents a gular plate. (Plate XI, figure 2.) This element was evidently paired, but owing to the displacement of the rami the area is somewhat obscure. The gular plate projects from the infero-lateral surfaces of the mandible and extends for about half the length of the rami, but it is much less robust posteriorly. In the anterior part of the symphyseal region there is evidence of a tumid extension of the mandible, which is now much abraded.

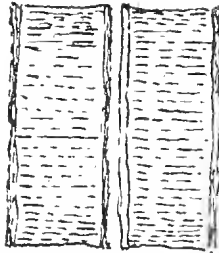
Branchiostegals.—Below the posterior third of the mandibles are the disrupted remains of large branchiostegal rays, and there are fragments of at least eight large rays present on each side. Behind these and below the quadrate there is a compressed cylindrical bone, which apparently represents the cerato-hyal and epihyal, with a well-marked suture between the two.

Pectoral Girdle.—The remains of the pectoral girdle form an extensive curved plate, about 50 mm. behind the opercular apparatus (Plate X). Unfortunately the

upper elements have been subjected to so much pressure that their articulations with the cleithrum cannot be defined. There is evidence, however, of a thin plate (supra- or post-temporal) that almost links the pectoral arch with the posterior margin of the cranium. Probably the whole arch has been forced posteriorly. The cleithrum (following the terminology of most modern systematists) is a very extensive bone, which carries the pectoral arch downwards and inwards. Although somewhat disrupted, this bone has a broad posterior flange in its central region, whilst the anterior margin is here very convex in section.

The remains of a large pectoral fin are present (Plate X), and at least six rays are preserved. These are bony and spine-like and are not segmented as in typical rays of Teleosts. In the matrix, near the base of the rays, are two large actinosts, which are somewhat constricted centrally, and, judging from their size, these supports would be few in number. Jordan (1905, p. 1) notes that in the Teleosts "the actinosts are few (four or six) in number," but they may remain numerous in the "Ganoids."

On the right-hand side, deep down in the matrix, a portion of the right pectoral girdle is present. The presence of a mesoacoracoid cannot be determined.



Text-figure 3.—*Flindersichthys denmeadi*. Centra of vertebrae, natural size.

Vertebrae.—Probably fourteen vertebrae are present, but five of the series are hidden beneath the opercular and the scapular arches. The last two are only represented by the right-hand moieties of the centra. The vertebrae are completely ossified and symmetrically cylindrical (Text-figure 3). There is no evidence of even a minute perforation for a persistent notochord. The centra are deeply amphicoelous. They are more than twice as deep as long (30 mm. x 11). There are fine transverse striations between the anterior and posterior rims, which are thickened, the vertebrae being somewhat similar to those of *Oligopleurus rectensis*, as described and figured by Smith Woodward. Remains of the neural arches can be obscurely seen in the matrix over some of the centra, but these appear to have been relatively small. There is no precise evidence of actual ankylosis with the centra. The neural spines on the anterior vertebrae are well developed, attaining at least 80 mm.

This series of contiguous vertebrae has been pushed over somewhat to the left side of the fossil. The most anterior vertebra is close to the basioccipital region, which has been located in the matrix on the right side. This vertebra, which is almost certainly the first of the series, presents no evidence of division or of special

structure, and the whole series as preserved is isospondylous. Lateral pits do not appear to have been present.

Remains of ribs are adpressed to the vertebræ exposed behind the opercular, and these are attached just below the median line of the centra. Other remains of lengthy ribs are to be seen in the matrix below the last two vertebræ. The surfaces of some of the fragments, which have an enamelled appearance, are channeled. The actual method of their attachment is obscured.

The vertebræ are very distinct from those from Queensland concisely described and figured, but unnamed, by Smith Woodward (1894, p. 447.)

Classification.—In view of the special interest attached to the osteology of Lower Cretaceous fishes, a fairly full description of this Flinders River fossil has been attempted, although the condition of some of the bones has made this difficult. It is with considerable diffidence that the writer records tentative views as to its actual classification. The cranium of *Flindersichthys denmeadi* agrees in some respects with the general characters of the primitive Actinopterygii at the dawn of the Cretaceous era, as outlined by Smith Woodward in his introduction to Vol. IV of his great "Catalogue of Fossil Fishes." It affords another example of the difficulty of separating "Ganoid" and "Teleostean" groups. Unfortunately certain salient features used in diagnostic keys, such as those by Smith Woodward (1901, Part IV), and Tate Regan (1909 and 1929), cannot be verified in the fossil, and its affinities can only be suggested on the evidence of the complex of characters available. The status of the Order Isospondyli has been recently criticised by W. Garstang (1931) in his interesting study of phyletic classification, and Goodrich (1909, p. 370) writes that "the group can no longer be fitted into any phylogenetic scheme." It is convenient, however, to place *Flindersichthys* with its completely ossified, symmetrical vertebræ, in this assemblage, as the term Isospondyli is in such general use. Although the fossil cannot be positively allocated to any of the families of the Isospondyli with which comparisons have been made, it is tentatively placed in the Family Elopidae. So far as the evidence is available, its complex of characters agrees fairly well with this group. W. G. Ridewood (1904, p. 54) has expressed the opinion that "the Elopidae are the most archaic of existing Teleosteans," but adds that some of the extinct forms would seem to be more specialised than the living *Elops* and *Megalops*.

The presence of a gular plate in *Flindersichthys* is probably significant, but this is also characteristic of the Amiidae, and other Amioidei. The massive structure of the sub-orbital bones do not suggest close affinities with the *Oligopleuridae*, although the vertebræ are very similar. On the other hand the undoubted presence of ganoinic is an anomalous condition for the Elopidae. *Flindersichthys* does not appear to be closely related to the Leptolepidae, so well represented in Jurassic deposits in Australia, in which the persistent notochord is evident in the centra. It appears to possess both Holostean and Teleostean characters. The Lower Cretaceous was evidently a period of rapid evolution for bony fishes.

Smith Woodward records (1912, p. 253) that some Cretaceous genera combine "features which are characteristic even of separate families in the existing fauna."

Among the Euguathidæ he records *Neorhombolepis* and *Otomilla* as having vertebral centra as completely developed as those of *Amia*.

In view of the distinctiveness of the reptilian fauna of our Lower Cretaceous (dealt with by the writer in several papers in these Memoirs), it would not be surprising if this large Teleost has no close affinities with species found elsewhere, although the writer regrets that he has been unable to consult the full literature of the subject.

Smith Woodward has pointed out (1901, p. IX) "that stoutness of bones indicates a life in shallow water or at the surface of the ocean during the Cretaceous period."

It is obvious that *Flindersichthys denmeadi* was well equipped with broad bands bearing thousands of tiny teeth, and its diet was evidently very distinct from that of its contemporaries *Porthcus* and *Ichthyodectes*, with their large, strong teeth, or from that of the slender-snouted *Aspidorhynchus* and *Leionostomus*, described from the same deposits by Smith Woodward and R. Etheridge.

R. T. Wade (1930) has given a valuable review of the Fossil Fishes of the Australian Mesozoic Rocks, in which the literature of the subject is fully stated.

Associated Fossils.—Dr. F. W. Whitehouse, whose papers on our ammonite fauna are a notable contribution to Australian paleontology, has made the following note regarding the bivalve *Aucellina gryphoides* (J. de C. Sow.) :—"A cosmopolitan species with a range of Upper Albian to Lower Cenomanian, which has been found in Australia only in the Upper Albian beds of the Tambo Series of the Great Artesian Basin and the Point Charles Beds of the Northern Territory."

A series of much-abraded vertebræ, twenty-two in all, received from Mr. Robert Poole, Alderley *via* Hughenden, probably belongs to *Flindersichthys denmeadi*. (Reg. No. F. 986.)

Acknowledgments.—It is my pleasant duty to record keen appreciation of Mr. H. W. Denmead's action in securing this fossil at Richmond, bringing it to Brisbane and presenting it to the Queensland Museum. Two text-figures have been drawn by Mr. Wilfrid Morden. I must also thank the Director of the Australian Museum (Dr. C. Anderson) for the loan of a publication unobtainable in Brisbane, Mr. L. C. Ball, Chief Government Geologist for a volume from the Library of the Queensland Geological Survey, and the Queensland University Librarian, Miss E. K. McIver, for another volume.

PLATE X.

FLINDERSICHTHYS DENMEADI.

Explanation.—*bas*, basals of pectorals; *br*, branchiostegals; *cl*, cleithrum; *d*, dentary; *cph*, epiphyal; *gu*, gular plate; *hm*, hyomandibular; *iop*, interopercular; *mx*, maxilla; *nas*, nasal; *opc*, opercular; *orb*, orbit; *papl*, palato-ptyergoid arch; *pop*, preopercular; *por*, postorbital; *qu*, quadrate; *sor*, suborbital; *sop*, subopercular; *sph*, sphenotic; *sq*, squamosal; *sym*, symplectic; *ver*, vertebræ; *v*, displaced dentigerous fragment.

PLATE XI.

Figure 1.—*Flindersichthys denmeadi*,

Upper aspect of distorted cranium, as exposed from matrix.

Figure 2.—*Flindersichthys denmeadi*.

Lower aspect of mandible showing gular plate, anteriorly, and remains of branchiostegals.

LITERATURE CONSULTED.

1895. Boulenger, G. A., Catal. Perciform Fishes, Brit. Mus. I.
 1904. Boulenger, G. A., and Bridge, T. W., Camb. Nat. Hist., vii, Fishes.
 1918. Chapman, F., Cretaceous and Tertiary Fish Remains of New Zealand, Pal. Bull. No. 7, N.Z. Geol. Survey.
 1887. Davis, J. W., Fossil Fishes of the Chalk of Mount Lebanon, Trans. Roy. Dublin Soc., vol. iii.
 1850. Dixon, F., Geology and Fossils of Sussex. Cretaceous Fishes.
 1917. Eastman, C. R., Fossil Fishes of the U. S. Nat. Mus., Proc. U. S. Nat. Mus., vol. 52.
 1892. Etheridge, R., and Woodward, A. Smith (*Belonostomus*). Trans. Roy. Soc. Vic., vol. ii, pt. 2.
 1905. Etheridge, R. (*Ichthyodectes*). Rec. Aus. Mus., vi, pp. 5-8. Plates 1-11.
 1931. Garstang, Walter, The Phyletic Classification of Teleostei, Proc. Leeds Phil. Lit. Soc., ii.
 1909. Goodrich, E. S., Treat. Zool., part ix, Vert. Craniata.
 1880. Gunther, A. C. L. G., Intro. Study of Fishes.
 1895. Hay, O. P., On the Structure and Development of the Vertebral Column of *Amia*, Field. Col. Mus. Zool. Ser., vol. i.
 1903. Hay, O. P., North American Cretaceous Actinopteroous Fishes, Bull. Amer. Mus. Nat. Hist., vol. xix.
 1917. Kingsley, J. S., Comp. Anat. Vert.
 1913. Longman, H. A., (*Portheus*) Mem. Qld. Mus., vol. ii, p. 94.
 1905. Jordan, D. Starr, A Guide to the Study of Fishes.
 1866. Owen, Richard, Anatomy of Vertebrates, vol. i.
 1873. Parker, W. K., Development of the Skull in the Salmon, Phil. Trans., vol. 163.
 1909. Regan, C. Tate, The Classification of Teleostean Fishes, Ann. Mag. Nat. Hist. (8) iii, p. 75-86.
 1929. Regan, C. Tate, Fishes, Encyclopaedia Britannica, 14th edition.
 1913. Reynolds, S. H., The Vertebrate Skeleton, Cambridge.
 1904. Ridewood, W. G., Osteology of the Elopidae and Albulidae, P.Z.S., pt. 2.
 1901. Starks, E. C., Synonymy of the Fish Skeleton, Proc. Wash. Acad. Sci., iii, 1901.
 1904. Starks, E. C., Osteology of Some Berycoid Fishes, Proc. U. S. Nat. Mus., vol. xxvii.
 1900. Stewart, Alban, Teleosts of the Upper Cretaceous, Univ. Geol. Sur. Kansas, vol. vi.
 1930. Wade, R. T., Fossil Fishes of Australian Mesozoic Rocks, Jr. and Pr. Roy. Soc., N.S.W., lxiv.
 1926. Whitehouse, F. W., The Cretaceous Anomonoidea of Eastern Australia. Mem. Qld. Mus., vol. viii, part 3.
 1889-1901. Woodward, A. Smith, Catal. Foss. Fish. Brit. Mus., parts i-iv.
 1890. Woodward, A. Smith (*Oligopleurus*, etc.) Proc. Zool. Soc., pp. 346-353.
 1894. Woodward, A. Smith (*Portheus* and *Cludocycclus*). Ann. Mag. Nat. Hist., (6) vol. xiv.
 1902-1912. Woodward, A. Smith, Fossil Fishes of the English Chalk. Pal. Soc.
 Woodward, A. Smith, British Museum Guide, Foss. Rept. Amph. Fishes.
 1902. Zittel, K. A. V., Text-book of Palaeontology, vol. ii. (trans. C. R. Eastman).

RESTORATION OF KRONOSAURUS QUEENSLANDICUS.

(Plate XII.)

IN order to make more attractive the fragments of *Kronosaurus queenslandicus* exhibited in the Queensland Museum, a painting which suggests the appearance of this gigantic Cretaceous Pliosaur in a natural environment has been placed beside them. Plate XII is a much reduced illustration of this painting, but owing to the absence of colour it does not do justice to the original.

Owing to the incompleteness of our material, this restoration has been largely based on the skeleton of *Peloneustes philarchus*, as given by C. W. Andrews in his Catalogue of the Marine Reptiles of the Oxford Clay, published by the British Museum, part 2, 1913.

Although no claims for precise accuracy should be made for restorations of this kind, it is considered that the approximate contours are represented, and I wish to pay a tribute to the care and skill exercised by Mr. Wilfrid Morden, after making many preliminary sketches, in completing this work.

Kronosaurus queenslandicus was first described in 1924 (Mem. Qld. Mus., VIII, pt. I) from a fragment of a lower jaw from Hughenden, presented by Mr. Andrew Crombie. Supplementary material was received in 1929 from the same district through Messrs. H. A. Craig, W. Charles, and N. E. Anderson, and this was described in 1930 (Mem. Qld. Mus., X, pt. I).

HEBER A. LONGMAN.



Wilfrid Morden
1931

RESTORATION OF *KROKOSUCHUS QUEENSLANDICUS*.

SOME FISHES OF THE FAMILY LEIOGNATHIDÆ.

BY GILBERT P. WHITLEY, ICHTHYOLOGIST, THE AUSTRALIAN MUSEUM, SYDNEY.

(By permission of the Trustees of The Australian Museum).

(Plates XIII-XIV and one Text-figure).

In the present paper, several hitherto little-known species of Pony Fishes (Leiognathidæ) are redescribed and figured from their types or from authentic specimens, and an attempt has been made to classify them into recognizable genera. This has been possible mainly through the kind help of Mr. H. A. Longman, who forwarded me practically the entire collection of Leiognathidæ in the Queensland Museum for study and comparison with the Australian Museum and "Endeavour" collections in Sydney. I am also under obligation to Miss Joyce K. Allan, of the Australian Museum, for most of the illustrations, which render the species easily determinable.

The family Leiognathidæ, as understood here, is substantially the same as that indicated in Jordan's "Classification of Fishes." and may be defined as follows:—

Five to six branchiostegal rays; pseudobranchiæ present; eyes large, on the sides of the head; mouth remarkably protractile; suborbitals not or but feebly ossified, no subocular shelf; lower edge of preoperculum generally serrated; gill-membranes narrowly joined to isthmus; body compressed, generally elevated; air-bladder terminating anteriorly in two horns, pyloric appendages few; scales small, cycloid; dorsal continuous, with eight spines (normally) and from fifteen to seventeen rays; anal with three spines and thirteen or fourteen rays; a procumbent spine before dorsal and anal fins and a row of not very prominent bucklers along bases of soft dorsal and anal fins; colouration generally silvery, darker above, with or without dusky or black markings.

KEY TO THE GENERA.

- A. Mouth protractile horizontally; mandible vertical *Secutor*.
- AA. Mouth protractile downwards; mandible oblique.
 - B. Second dorsal spine more than twice as long as third. (Second anal spine also produced. Supraorbital smooth; teeth villiform; body very deep; breast naked) *Aurigequula*.
 - BB. Second dorsal spine not so produced.
 - C. Seven dorsal spines and more than 18 rays *Argylepes*.
 - CC. Eight (abnormally 9) dorsal spines; less than 18 rays.
 - D. Body elongate, its depth 3 or more in standard length *Macilentichthys*, new genus.
 - DD. Body deep, depth generally about 2-2½ in length.
 - E. Strong hooked teeth in jaws *Gazza*.
 - EE. Teeth weak, small.

- F. Breast naked. (Lateral line complete; teeth minute; supraorbital denticulated) *Equula*.
- FF. Breast scaly.
- G. Teeth fine, small, weak, brush-like; supraorbital entire. (Spinous dorsal generally plain; snout with a dark blotch; lateral line incomplete) *Equulites*.
- GG. Teeth in a single row in each jaw; supraorbital serrated. (Snout plain, lateral line extending almost to root of caudal fin).
- H. No dark mark on dorsal fin (or on nape) *Leiognathus*.
- HH. A dark mark or black blotch on spinous dorsal.
- I. Depth about 2 or less in length; no dark mark on nape *Eubleekeria*.
- II. Depth more than 2 in length, a dark mark on nape *Nuchequula*, new subgenus of *Eubleekeria*.

The characters given in this artificial key are apparently constant in species of Leiognathidae, but the combinations of characters given for each genus do not always hold good. The genera are closely related and are easier to distinguish by facies when one is familiar with them than can be expressed in conventional key form.

Genus **ARGYLEPES** Swainson, 1839.

Argylepes Swainson, Nat. Hist. Classif. Fish. Amphib. Rept. ii., July 1839, p. 247. Haplotype, *A. indica* Swainson.

Argyrolepis Agassiz, Nomencl. Zool., 1846, Index Univ., p. 33. Emendation for *Argylepes* Swainson. Not *Argyrolepis* Agassiz, *ibid.*, a genus of Lepidoptera.

A monotypic genus, of whose relationships little appears to be known.

ARGYLEPES INDICA Swainson.

Argylepes indica Swainson, Nat. Hist. Class. Fish. Amphib. Rept. ii., July, 1839, p. 247. Based on "Mitta parah" Russell, Fish. Vizag., 1803, p. 41, pl. clvi., in genus *Scomber*. Vizagapatam, India.

Russell's figure of the type shows a fish of carangoid facies with D. vii./21 and 2 anal spines. Jaws toothed; maxillary of the Leiognathid form; scales either rubbed off or never present; form elongate ovate; lateral line complete, and curving downwards (unless a median ridge of the body has been mistaken for the lateral line).

This species may not belong to the Leiognathidae, and seems to approach *Psenes javanicus* Cuv. & Val., as figured in Day's "Fishes of India." Jordan regarded *Argylepes* as a synonym of *Leiognathus*.

Genus **AURIGEUULA** Fowler, 1918.

"*Halex*" Lacépède, Hist. Nat. Poiss. v., 1803, pp. 460 and 462, footnote 9. *Ex* Commerson MS. polynomial name: "*Halex corpore late*" &c. = *Clupea fasciata* Lacépède. Name without generic status.

"*Clupei*" Cuvier & Valenciennes, Hist. Nat. Poiss. x., Sept. 1835, p. 96. *Ex* Commerson MS. Name without generic status applied to the species called *Clupea fasciata* by Lacépède.

Aurigequula Fowler, Proc. Acad. Nat. Sci. Philad. lxx., June 4, 1918, p. 17. Orthotype, *Clupea fasciata* Lacépède.

Breast and lower part of belly naked; lateral line complete; second dorsal spine at least twice as long as third, conspicuously produced like a whip in adults; second anal spine also elongate.

AURIGEUULA LONGISPINIS (Cuvier & Valenciennes).

(Plate XIII., figs. 1 and 2.)

- Equula longispinis* Cuvier & Valenciennes, Hist. Nat. Poiss. x., Sept. 1835, p. 94. Waigiou. Not *Equula longispina* De Vis, which is a species of *Equulites*.
- Equula asina* De Vis, Proc. Linn. Soc. N. S. Wales ix. 3, Nov. 29, 1884, p. 544. Cape York, Queensland. Lectotype and cotypes in Queensland and Australian Museums examined. *Id.* Saville-Kent, Prelim. Rept. Food-Fish, Qld. 1889, p. 10 and Gt. Barr. Reef, 1893, p. 369 (listed only).
- Equula fasciata* Schmeltz, Mus. Godef. Cat. iv., May 1869, p. 18 (Samoa and Fiji). *Id.* Saville-Kent, Prelim. Rept. Food-Fish Qld., 1889, p. 10 and Gt. Barrier Reef, 1893, p. 369 (Queensland—Saville-Kent's Qld. Mus. specimens seen). Not *Clupea fasciata* Lacépède, 1803, from Mauritius.
- Equula smithursti* Ramsay & Ogilby, Proc. Linn. Soc. N. S. Wales (2) i., May 25, 1886, p. 11. Hood Lagoon, New Guinea. Holotype in Aust. Mus. examined.
- Leiognathus fasciatus* Jordan & Seale, Bull. U. S. Bur. Fish. xxv., 1906, p. 273. (Samoa; one of their specimens in Aust. Mus. examined.) *Id.* Starks, Stanf. Univ. Publ., Univ. Ser., v., 1911, p. 9 *et ibid.* Biol. Sci., iv., 3, 1926, p. 235 (cranium of Samoan specimen). *Id.* Fowler, Mem. Bish. Mus. x., 1928, p. 153. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213 (Queensland, &c.). Not *Clupea fasciata* Lacépède, 1803.
- Leiognathus smithursti* Jordan & Seale, Bull. U. S. Bur. Fish. xxv., 1906, p. 273. *Ex* Ramsay & Ogilby. *Id.* Jordan & Dickerson, Proc. U. S. Nat. Mus. xxxiv., 1908, p. 610. (Suva, Fiji). *Id.* Fowler, Mem. Bish. Mus. x., 1928, p. 153.
- Leiognathus asinus* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Ex* De Vis. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213.
- Leiognathus (Aurigequula) fasciatus* Whitley, Journ. Pan-Pacif. Res. Inst. ii., I, 1927, p. 5, No. 127. Fiji.

Description of Lectotype of Equula asina De Vis.

D. viii./16; A. iii./13; P. 20; V. i./5; C. ?; L. lat *circa* 60. Head (16 mm.) 3, depth (28) 1.7 in length to hypural joint (48.5); eye (6) greater than postorbital portion of the head (5.6), snout (5.2), and interorbital (5.6); second dorsal spine (at least 16 mm., tip broken) longer than head; second anal spine (9) longer than third (6.5) and subequal to third dorsal spine (8.6).

Head naked, about as long as high, upper profile steeper than lower; snout roundly convex; eye large, about as deep as its distance to the lower preopercular margin, which is strongly serrated; antorbital spines divergent; supraorbital smooth, maxillary reaching to below anterior fourth of eye; bands of fine, movable, setiform teeth in jaws; gill-rakers pointed, about a millimeter long, at least fifteen on lower limb of first gill-arch.

Body deep, fairly evenly rounded in outline, the upper profile rather more convex than the lower. The type is now almost denuded of scales, but the anterior part of the thorax was evidently naked originally; lateral line complete; axillary scale almost as long as ventral spine; a long procumbent spine before dorsal and anal fins; First erect dorsal and anal spines minute, the second, produced, apparently broken in the type; third dorsal and anal spines with fine flexible points; the bases of the

second and third dorsal and the third anal spines with strong serrations anteriorly; a few incipient serrations at base of second anal spine; pectoral rounded, fourth and fifth rays longest; ventrals reaching about half-way along procumbent anal spine when adpressed; caudal damaged in type.

The colours have now faded, and De Vis merely stated "silvery with the back brownish silvery."

This species was originally described from two examples, but there are two specimens in the Australian Museum and three specimens in the Queensland Museum marked TYPE. The fins of all the Queensland Museum ones are damaged, but I have selected the smallest specimen of that series as lectotype as it is the least damaged; the others do not differ in character.

Described from the lectotype of *Equula asina* De Vis, a poor specimen measuring 49 mm. to base of caudal, or about $2\frac{1}{4}$ inches in total length. Queensland Museum Registered No. I. 13/1700—smallest specimen. The two specimens in the Australian Museum (I. 355-356) show the elongate fin-spines better, and the larger (I. 355) is here figured.

Locality.—Cape York, North Queensland; collected by Kendall Broadbent.

Equula asina De Vis is evidently the young of the species called *Equula smithursti* by Ramsay & Ogilby, and both forms are evidently conspecific with *Equula longispinis* Cuv. & Val., but appear to differ from the original figure of the allied *Aurigequula filigera* (Cuv. & Val.) from the Moluccas.

Description of holotype of Equula smithursti Ramsay & Ogilby.

D. viii./16; A. iii./14; P. 20; V. i./5; C. 15 branched rays. L. lat *circa* 63. Head (43 mm.) 3.5 in length to hypural joint (151); depth, measured between bases of long dorsal and anal spines (88), 1.7, or, measured vertically below origin of dorsal (81), 1.8 in same; postorbital portion of head equal to eye and to interorbital (15) and greater than snout (14); second anal spine (39 mm. or more, tip apparently broken) not nearly so long as second dorsal spine (94) which is half the total length of the fish (188); third dorsal spine (19.5), 2.2, and third anal spine (14), 3 in head.

Head about as long as high, profile concave above the eyes; outline of eyelid broadly pyriform; orbit almost circular, not so deep as cheek; interorbital smooth; two minute antorbital spines; supraorbitals smooth; lower preopercular margin with inconspicuous serrations; a band of fine, small, villiform teeth in each jaw; none on root of mouth; entire head and nape naked; about fifteen short, pointed, pectinate gill-rakers on lower limb of first gill-arch.

Body very deep, the upper profile gibbous and the lower forming an obtuse angle; an irregular area on each side of the supraoccipital and the procumbent dorsal spine naked; scapula, breast, and most of thorax in advance of a line joining pectorals and ventrals naked; remainder of body covered with small, imbricate, deciduous, cycloid scales of round or oval shape; tubes of lateral line large anteriorly and

decreasing in size posteriorly ; lateral line complete, dipping a little before following its fairly even and gently curved course below the dorsal fin, and terminating a trifle in advance of the root of the caudal ; axillary ventral scale almost as long as ventral spine.

Dorsal preceded by a large proeumbent spine ; first true dorsal spine very small ; the second much produced and curved proximally ; the third nearly one-seventh the length of the second, and the posterior spines rapidly decreasing in height ; base of soft dorsal fin equal to that of soft anal ; scaly sheaths protect the bases of the dorsal and anal spines, and rows of spines, which hardly break the skin, flank the bases of the rays : first anal spine very small, situated on a vertical with the first dorsal ray ; second anal spine produced, nearly three times as long as the third ; third dorsal and anal spines weakly serrated ; pectorals rounded, fourth rays longest ; ventrals reaching, when adpressed, a short distance along the long procumbent anal spine ; vent large, with two openings ; caudal strongly forked, the lobes subequal to head.

The colours have now faded but were originally described as " silvery, washed with blue on the back ; sides of the head tinged with gold ; snout, and a band from the upper angle of the eye to the opercle, black."

Described and figured from the holotype of *Equula smithursti* Ramsay & Ogilby, a specimen 151 mm. in standard length or $7\frac{1}{2}$ inches in total length, with the mouth extended. Museum Registered No. B. 9962.

Locality.—Hood Lagoon, South-eastern New Guinea ; purchased from Mr. Harry Smithurst.

In the old collection of the Queensland Museum, there are four small specimens labelled "*Leiognathus fasciatus*" from Cape York, Queensland. These agree with Ramsay & Ogilby's type, but the elongated dorsal spine does not extend so far backwards, doubtless owing to their immaturity. Saville-Kent recorded "*Equula fasciata*" from Queensland and these are almost certainly the specimens upon which his record was based. These specimens are intermediate in size between the types of *Equula asina* and *E. smithursti* and demonstrate that the two are conspecific and, in my opinion, synonyms of *Aurigequula longispinis* (Cuv. & Val.).

Specimens in the Australian Museum labelled *Leiognathus fasciatus* from Samoa (U. S. Bur. Fisheries collection) and Malekula, New Hebrides (Cummins & Stevens) also belong to this species.

Genus **EQUULA** Cuvier, 1816.

Equula Cuvier, Mem. Mus. d'Hist. Nat., Paris, i., " 1815 " = March 1816, pp. 463 and 466. Tautotype, *Scomber equula* (Forsk.) [= Bonmaterre]. Date of publication *vide* Sherborn, Ann. Mag. Nat. Hist. (8), xiii., 1914, p. 365. *Id.* Cuvier, Règne Anim. ed. 1, ii., " 1817 " = before 7 Dec. 1816, p. 323. Date of publication *vide* Mathews, Novit. Zool. xviii., 1911, p. 18. *Id.* Cuvier, Règne Anim. ed. 2, ii., April 1829, p. 212. Orthotype, *Scomber equula*, designated. Not *Equula* Guichenot, Dict. pitt. d'Hist. Nat. viii., 1839, p. 335. Orthotype, *Equula ensifera* Cuvier ; and Valenciennes, Dict. Univ. d'Hist. Nat. v., 1861, p. 382. Orthotype, *E. ensifera* Cuv., which are strictly referable to the genus *Leiognathus*.

Head about one-third of standard length ; lower limb of preoperculum serrated ; mouth protractile obliquely downwards ; second dorsal spine not produced ; eight

dorsal spines ; depth about half the length of the fish ; a band of curved, bristle-like teeth in each jaw ; breast and thorax naked ; lateral line ceasing just before root of caudal ; supraorbital finely denticulated ; no conspicuous colour-markings.

EQUULA DECORA De Vis.

(Text-figure 1).

- Equula decora* De Vis, Proc. Linn. Soc. N. S. Wales, ix., 3, Nov. 29, 1884, p. 543. Cape York, Queensland. Queensland Museum cotypes (No. I. 13/1698) examined. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10 and Gt. Barrier Reef, 1893, p. 369 (listed only).
- Equula argentea* De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 542. Cape York, Queensland. Queensland Museum lectotype (No. I. 13/1699) examined. Not *Centrogaster argentatus* Houttuyn 1782, and not *Leiognathus argenteus* Lacépède, 1802. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, as *argentea* ; Gt. Barrier Reef, 1893, p. 369 (listed only).
- Equula spiniceps* Saville-Kent, Prelim. Rept. Food-Fishes Qld., 1889, p. 10 and Gt. Barrier Reef, 1893, p. 369. *Nomen nudum*. Queensland. Chirotype (Austr. Mus. No. I. 382) from Johnstone River, Queensland, examined.
- Leiognathus spiniceps* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Ex* Saville-Kent, Queensland.
- Leiognathus decorus* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Ex* De Vis, Queensland. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213.
- Leiognathus argenteus* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Ex* De Vis, 1884, non Lacépède, 1802. Queensland.
- Leiognathus devisi* Whitley, Rec. Austr. Mus. xvii., 3, June 27, 1929, p. 113 (fig. 2). New name for *Equula argentea* De Vis, not *Leiognathus argenteus* Lacépède ; based on De Vis' type, Cape York, Queensland. Holotype (Qld. Mus. No. I. 13. 1699) re-examined. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 214.

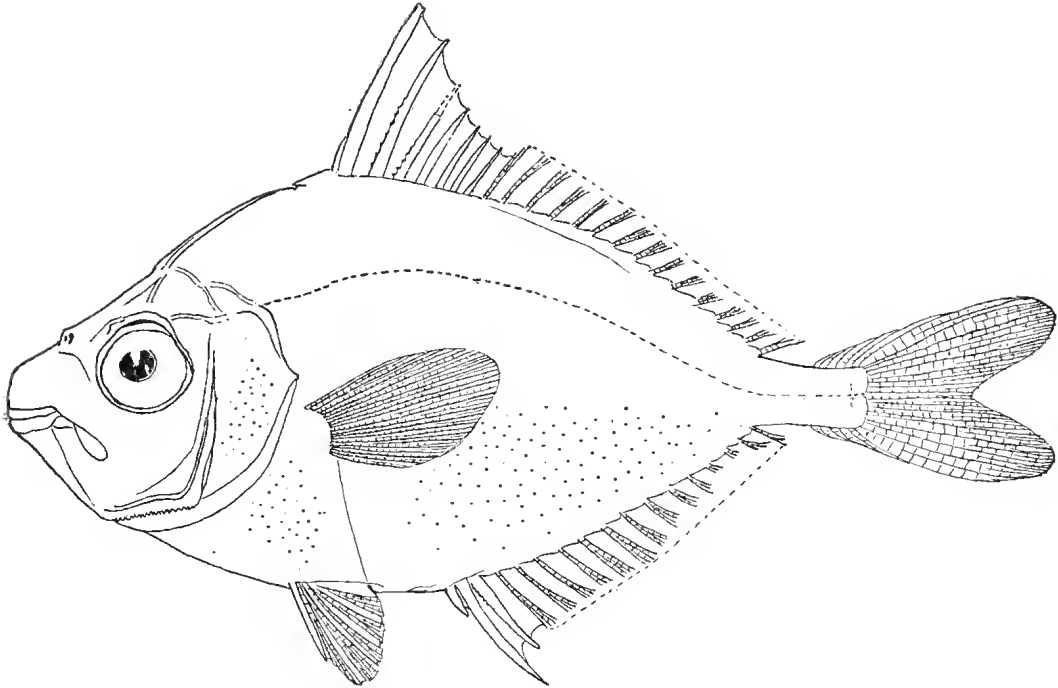
Description of the lectotype of Equula decora De Vis.

D. viii./16 ; A. iii./14 ; P. 21 ; V. i./5 ; C. 16. L. lat. 50 + ? Head (10 mm.) 2.9, and depth (14) 2.07 in length to hypural joint (29) ; eye (3.6) rather greater than postorbital portion of head (3.3) and interorbital (3.1) which is equal to snout (3.1). As the types are young specimens and the heads slightly shrunken in preservation, it is probable that the eye would normally be subequal to these other dimensions in this species. Second dorsal spine (5.5) 1.8, and second anal spine (5) 2 in the head, and shorter than the pectoral fin (6).

Agrees in general details with my description of the holotype of *Equula argentea* De Vis — *Leiognathus devisi* Whitley, published in 1929, and agrees exactly when the type-specimens are compared.

Supraorbital ridge very slightly rugose posteriorly ; inner antorbital spines largest ; gill-rakers slender, pointed, pectinate ; a bony peg protrudes into the branchial aperture before the pectoral base ; the scales are now rubbed off the types of *Equula decora* and it is impossible to observe whether the breast was naked or scaly ; lateral line complete, continuous to caudal, but the tubes are small on the caudal peduncle ; no trace of a black dorsal blotch ; second to fourth dorsal, and second and third anal spines with strong serrations anteriorly along the proximal halves ; these serrations are less conspicuous in the type of *Leiognathus devisi* ; upper caudal lobe longer than head without snout.

The colours have now faded, but De Vis describes them as "Colour silvery, with a pink tinge on the back. Three dark lines, terminating very obscure bands, across the back, at the base of the soft dorsal and one on the edge of the caudal peduncle."



Text-figure 1. *Equula decora* De Vis.

Lectotype of *Equula argentea* De Vis = Holotype of *Leiognathus devisi* Whitley.

Loc. Cape York, Queensland.

G. P. Whitley del.

Described from the lectotype of *Equula decora* De Vis, the smallest of three specimens which have been utilised in making the description, 29 mm. or slightly more in standard length or about $1\frac{3}{8}$ inches in total length.

Six cotypes are recorded by De Vis, but only three are in the Queensland Museum consignment, and there are none in the Australian Museum.

Locality.—Cape York, North Queensland; coll. Kendall Broadbent.

Lectotype of *Equula argentea* De Vis = Holotype of *Leiognathus devisi* Whitley.

The type-specimen, though now almost denuded of scales, has one or two left on the sides of the thorax; lateral line complete; two small antorbital spines; about fifteen pointed gill-rakers on lower limb of first gill-arch; teeth weak, movable, spaced, pointed, arranged in a narrow strip (almost a single series) in each jaw; no black blotch on dorsal fin or on snout; depth 2 in length.

Chirotype of Equula spiniceps Saville-Kent.

A specimen is labelled *Equula spiniceps* in the Australian Museum (No. I. 382) and may be regarded as the chirotype of that species. It is $2\frac{3}{4}$ inches long and agrees with the specimens described above in detail.

Locality.—Johnstone River, Queensland: received by exchange from the Queensland Museum in 1886.

Genus **EQUULITES** Fowler, 1904.

Equulites Fowler, Journ. Acad. Nat. Sci. Philad. (2), xii., 4, June 10, 1904, p. 513. Orthotype, *Leiognathus vermiculatus* Fowler.

This genus has the lateral line ceasing well before the caudal fin, and the breast and thorax scaly. The dark wavy marks on the back, slender fin-spines, and graceful form of body are useful recognition marks.

EQUULITES NOVÆHOLLANDIÆ (Steindachner).

Equula novæhollandiæ Steindachner, Denkschr. Akad. Wien xli., 1, 1879, p. 11. Townsville, Queensland (Müller). Type in Stuttgart Museum. *Id.* Klunzinger, Sitzb. Akad. Wiss. Wien lxxx., i., 1879, p. 379 (listed only).

Leiognathus novæhollandiæ McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 212.

D. viii./16; A. iii./14; L. lat. *circa* 60. Head almost 4.4, depth somewhat more than 3 in total length (nearly 90 mm.): eye and snout about 3, interorbital slightly less than 3 in head; snout conical, somewhat compressed; antorbital spines present; lower border of lower jaw straight; lower margin of preoperculum extremely finely denticulated; the angle slightly more than a right angle.

Body elongate oval: the dorsal profile ascends more strongly in the nuchal region than the corresponding anterior ventral profile; the upper profile of the head rises without any curve to the beginning of the weakly curved occipital slope; body-scales very small, only the pierced ones of the lateral line, of which there are about 60 to the base of the caudal, are moderately large in proportion, and easily deciduous; lateral line very weakly curved to the base of the short, low, caudal peduncle, on which it is horizontal.

First dorsal spine very short; second dorsal and anal spines strongly produced, compressed and flexible; the first as long as the head, the last more than $1\frac{1}{3}$ in the head. When adpressed, the second dorsal spine reaches the middle of the dorsal base. Third dorsal spine more slender, a little longer than the second anal spine, and shorter than the head by somewhat more than half the length of the snout; the pectoral is at least $\frac{2}{3}$ and the ventral about $\frac{2}{3}$ of the head; caudal forked, slightly longer than the head.

Colour (in spirits)—Upper half of body washed with clear reddish-violet, lower half silvery with some speckles; undulating, curved, small, dark stripes on the upper half of the body; sides of snout blackish-brown; dorsal with a black spot on the spinous portion.

The above description has been compiled from a translation of the original account given by Steindachner, who noted that his species was near *Equula leuciscus* Günther, but had the head relatively longer and second dorsal spine shorter.

I have not been able to recognise this species in the series of Queensland fishes which I have studied, and regard its present generic identification as tentative only.

EQUULITES HASTATUS (Ogilby).

(Plate XIV., fig. 1.)

Equula longispina De Vis, Proc. Linn. Soc. N. S. Wales, ix., 3, Nov. 29, 1884, p. 542. Cape York, Queensland. Holotype (Austr. Mus. No. I. 465) examined. Name preoccupied by *E. longispinis* Cuv. & Val., 1835, a species of *Aurigequula*.

Equula lineolata De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 545. Cape York. De Vis' specimen seen. Not *Equula lineolata* Cuv. & Val.

Leiognathus hastatus Ogilby, Mem. Qld. Mus. i., 1, Nov. 27, 1912, p. 58. New name for *Equula longispina* De Vis, preoccupied. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 214.

D. viii./16 ; A. iii./14 ; P. 18 ; V. i./5 ; C. 15 branched rays. L. lat. circa 45. Head (19 mm.) 3.5, depth (30) 2.2 in length to hypural joint (67) : eye (7) subequal to interorbital (7) and postorbital portion of head (7) and longer than snout (6) ; second dorsal spine (14.5 mm. + ?) and second anal spine (c. 15 mm.) unfortunately broken, but Ogilby stated they were 1.7 and 3.4 in length of body respectively, so the dorsal spine must have been about 39 mm. in length originally.

A narrow strip of long, slender, movable teeth in each jaw ; supraorbital very slightly irregular to the touch, but smooth to the sight ; lower preopercular margin feebly serrated ; antorbital spines small ; gill-rakers slender, pointed, pectinate.

Skin pitted. Most of the scales have been rubbed off, but breast evidently originally scaly ; second and third dorsal and third anal spines serrated ; spines and rays of dorsal and anal fins comparatively longer than in most species of Leiognathidæ : the last dorsal spine looks rather like a ray, which may account for De Vis' formula, D. 7/16.

The general characters are as described by Ogilby.

Colour (after long preservation)—Uniform silvery, brownish on back with some irregular grey markings which are now difficult to discern ; a dark mark on snout ; apparently no black blotch on spinous dorsal.

Described and figured from the holotype of *Equula longispina* De Vis and *Leiognathus hastatus* Ogilby, a specimen 67 mm. in standard length or little over 3¼ inches in total length. Australian Museum Registered No. I. 465.

Locality.—Cape York, Queensland ; received by exchange from the Queensland Museum in 1886.

This species is distinguished from its congeners by its elongate fin-spines and deep body. It is allied to *Equulites moretoniensis* (Ogilby), of which it seems to be a northern form. The "Endeavour" trawled twenty-five specimens of *E. hastatus* in 19-35 fathoms, N.E. of Gloucester Head, Queensland, in August 1910 (Austr. Mus. Nos. IA, 4909, 4910, 4919 ; E. 2775, 2776).

EQUULITES MORETONIENSIS (Ogilby).

(Plate XIV., Fig. 2.)

Leiognathus moretoniensis Ogilby, Mem. Qld. Mus. i., 1, Nov. 27, 1912, p. 59. Bulwer, Moreton Bay, Queensland (type: Qld. Mus. No. 1 1583) and off Moreton Island, 9 fathoms ("Endeavour" coll.). *Id.* Paradise & Whitley, Mem. Qld. Mus. ix., 1927, p. 84 (Pellew Group, Gulf of Carpentaria). *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 214.

A co-type of *Leiognathus moretoniensis* Ogilby is in the Australian Museum (No. I. 12590) from Moreton Bay, Queensland. It is 57.5 mm. in standard length or nearly 3 inches in total length, and is the smaller of the two types from Bulwer. The species has been described in detail by Ogilby, but the following characters are noteworthy.

D. viii./16 (last divided); A. iii./14; P. 17; V. i./5; C. 15 branched rays. L. lat. less than 40, becoming obsolete below last dorsal ray.

Head (17 mm.) 3.3 and depth (25) 2.3 in standard length (57.5); eye (6.5) greater than interorbital (5), snout (5.5), and postorbital portion of head (5.8); second dorsal spine (10 mm. ? incomplete) and second anal spine (10) 1.7 in head; dorsal and anal spines and rays attenuate; top of head pitted; supraorbital rugose; a narrow strip of minute teeth in each jaw; breast scaly.

Snout dusky, no black blotch on dorsal fin: greyish marks on upper part of body and a more or less distinct dark stripe along posterior part of sides, as shown in the accompanying figure; a conspicuous dark band below the base of the soft dorsal fin.

Specimens from Port Darwin and the Pellew Group, North Australia, in the Australian Museum may represent a new variety of this species, as in these the lateral dark stripe is broken up into speckles which extend over the lower parts of the posterior portion of the sides.*

EQUULITES VIRGATUS (Fowler).

- ? "*Bindoo karah*" Russell, Fish. Vizag. 1803, p. 50, pl. lxiv., in genus *Zeus*. Vizagapatam.
- ? *Equula bindus* Cuvier & Valenciennes, Hist. Nat. Poiss. x., Sept. 1835, p. 78. Based on Russell, pl. 64. Vizagapatam. *Id.* Cantor, Journ. Asiat. Soc. Bengal xviii., 1850, p. 1130; Cat. Malay. Fish. 1850, p. 148 (Sea of Pinang and Coromandel). *Id.* Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 497. *Id.* Day, Fish. India. 1876, p. 240.
- ? *Equula bindoides* Bleeker, Nat. Tijdschr. Ned. Ind. i., 1851, pp. 344 and 372. Batavia. *Id.* Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 501.
- Leiognathus virgatus* Fowler, Journ. Acad. Nat. Sci. Philad. (2) xii., 4, June 10, 1904, p. 515, pl. xv., lower figure to right. Padang, Sumatra. *Id.* Evermann & Seale, Bull. U. S. Bur. Fish. xxvi., 1907, p. 67. (Bulan, Philippine Is.). *Id.* Fowler & Bean, Proc. U. S. Nat. Mus. lxii., 1922, p. 22 (Formosa).
- Leiognathus bindus* Ogilby, Ann. Rept. Amat. Fish. Assoc. Qld., 1910-11 (July 1911), p. 11. Queensland. Ogilby's specimens in "Endeavour" coll. examined. ? Not *Equula bindus* Cuv. & Val.

* Mr. Melbourne Ward has recently collected specimens of *Equulites moretoniensis* at Pittwater, Broken Bay (Austr. Mus. Regd. Nos. IA. 5428-9). New record for New South Wales.—G. P. W., Feb. 1932.

The F.I.V. "Endeavour" trawled thirty-five specimens of this small-headed deep-bodied, "Orange-tip Pony Fish," off Bowen, Queensland. These were identified as *Leiognathus bindus* by Ogilby, but differ from Russell's figure in their proportions and in having longer fin-spines. They agree fairly well with Fowler's description of *Leiognathus virgatus*, but have the supraorbital rugose and no dark bar on spinous dorsal. Possibly this species should be made the type of a new subgenus, intermediate in some respects between *Eubleekeria* and *Equulites*, but distinct from both in others.

D. viii./16; A. iii./14; P. ii./14. Head 3.4-3.6 and depth 1.5-1.8 in standard length: a single row of fine teeth in each jaw; supraorbital with a band of rugosities: lower preopercular margin with small serrations: lateral line ceasing below soft dorsal fin; curved branches ascend the shoulder-region and cross the upper part of the cheek; breast scaly: thorax very deep; ventral profile more convex than that of dorsal; dorsal and anal spines not nearly as long as head, the fins with dense scaly sheaths: ventrals subequal in length to eye.

After long preservation in formalin, the colour has faded to brown, with spaced punctulations on lower part of body and head and inside the mouth. A large dark blotch on operculum and a smaller one on each side of the snout anteriorly; an interrupted fuscous band along each side of the dorsal base; upper part of body with vermiculate greyish markings; a brown blotch on spinous dorsal; inner surface of pectoral base and of gill-opening with dark spots.

Locality.—Seven miles N.N.E. of Bowen, Queensland; 16 fathoms, August, 1910. Trawled by the F.I.V. "Endeavour." Austr. Mus. Reg. Nos. E. 252^o-2529, 2717-2718; IA. 4905-4907, and 4923.

New record for Australia.

Genus **EUBLEEKERIA** Fowler, 1904.

Eubleekeria Fowler, Journ. Acad. Nat. Sci. Philad. (2) xii., 4, June 10, 1904, p. 516. Orthotype, *Equula splendens* Cuvier.

This genus, characterised by having the breast scaly and the lateral line complete, is closely allied to *Leiognathus, sensu stricto*. The species fall into two groups, which may be differentiated into those having the depth less than, or about, 2 in length with no dark mark on nape (subgenus *Eubleekeria*) and those with depth more than 2 in length and having a dark nuchal mark. For the latter, I propose the new subgeneric name **NUCHEQUULA**, with *Equula blochii* Cuv. & Val. as orthotype.

EUBLEEKERIA OVALIS (De Vis).

Equula ovalis De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 543. Cape York, Queensland. Types (No. 1. 1703) in Queensland Museum. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, and Gt. Barrier Reef, 1893, p. 369 (listed only).

Equula simplex De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 544. Cape York, Queensland. Types (No. 1. 1702) in Queensland Museum. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, and Gt. Barrier Reef, 1893, p. 369 (listed only).

Leiognathus ovalis McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213.

Leiognathus simplex McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 212.

Leiognathus splendens Ogilby, Ann. Rept. Amat. Fish. Assn. Qld., 1910-11, (July 11) p. 11. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. Not *Equula splendens* Cuvier.

D. viii./16; A. iii./14; V. i. 5; P. 18; C. 16. L. lat. ? Head (11.4 mm.) 2.9 in length to hypural joint (34) or 3.7 in total length (43); depth (15.5) nearly 2.2 in length to hypural joint; eye (4) and interorbital (4) equal to postorbital portion of head (4) and greater than snout (3); second dorsal spine (7) 1.6, and second anal spine (4.5) 2.5 in head.

Head longer than high and broadest just behind the eyes, its upper profile not so convex as the lower; vertical and horizontal diameters of eye equal to one another and to the distance across cheek from eye to the strongly serrated lower preopercular margin; two antorbital spines and a series of serræ on the supraorbital; two large nostrils on each side; interorbital sunken, bounded on each side by strong ridges which are widely separated anteriorly but flank, and later join, the median occipital ridge posteriorly; some well-marked radiating striæ at the anterior root of the occipital ridge and others on upper part of operculum; a minute opercular spine; preopercular stay prominent, with a few coarse serræ at its angle; mouth slightly oblique, its gape not extending to below eye; a band of well-developed, hooked, setiform teeth in each jaw; a branch of the lateral line system runs around the posterior margin of the eye and crosses the upper part of the cheek obliquely to ascend the anterior margin of the preorbital, where it vanishes before reaching the snout.

Body subovate, compressed, its profiles of about equal convexity. The type is now almost completely denuded of scales, but those remaining are large, round, cycloid, and with a simple tube on each of the lateral line scales. The lateral line is now damaged, but was apparently originally complete; a row of strong, backwardly directed spines along each side of the base of the dorsal and anal fins; a long alar scale at the base of each ventral fin; a ridge extends from the base of the last pectoral ray to near the alar scale and on a level with the origin of the spinous dorsal fin; in advance of this ridge the breast and thorax are scaly.

Dorsal preceded by a procumbent spine; first erect spine small, the second long and strong, with slightly rugose anterior edge, and followed by the third and fourth spines with prominent serrations on their anterior edges, which are directed to the left and right side respectively; the remaining spines are not serrated and decrease in size posteriorly; the rays of the dorsal, anal, pectoral, and caudal fins are damaged in the type; anal spines without serrations, the second erect spine longest and strongest; ventral spine strong, reaching, when adpressed, to tip of procumbent anal spine; caudal apparently forked.

General colour, after long preservation in formalin, straw-brownish, with dark brown punctulations on snout, extensive membrane of mouth, cheeks, opercles, thorax, and flanks; upper parts of body plain; a black blotch on spinous dorsal membrane.

Described from the lectotype of *Equula ovalis* De Vis, a specimen 43 mm. in total length, selected from ten cotypes, 37 to 45 mm. long.

Locality.—Cape York, Queensland; collected by Kendall Broadbent. Queensland Museum Reg. No. I. 1703.

Synonymy.—On comparing the types of *Equula simplex* with those of *E. ovalis*, I find no characters to maintain the two as distinct species. The middle-sized of three specimens labelled type in the Queensland Museum (No. I. 13/1702) is hereby designated lectotype of *Equula simplex*. This specimen has D. viii./16; A. iii./14. Head (11.5 mm.) 3, depth (17) 2 in length to hypural joint (35.5); eye (4) equal to postorbital portion of head (4) and a little greater than snout or interorbital (3.7); second dorsal spine (7) 1.6 and second anal spine (6) 1.9 in head; total length $1\frac{1}{2}$ inches. Otherwise agreeing exactly with the description of *E. ovalis* given above. The types of both species were collected at Cape York by Broadbent at the same time.

Affinities.—*Eubleekeria ovalis* is closely allied to *E. splendens* (Cuvier) from India, but is plumper in build, with the mouth terminal instead of overhung by snout, and has depth 1.9 to 2.2 in standard length instead of 1.7 to 1.9 as in Madras specimens of the latter species examined by me. The anterior portion of the lateral line dips downwards slightly in *E. ovalis* whereas it is evenly curved throughout its length in *E. splendens* and the latter species has the upper profile of the head steeper.

Besides the types of *Equula ovalis* and *simplex* from Cape York, I have examined specimens identified as *Leiognathus splendens* by Ogilby in the "Endeavour" collection from off Gloucester Head and Bowen and in the Queensland Museum from Cape Bowling Green, collected by Dr. R. Hamlyn-Harris. Reg. Nos. Qld. Mus. I. 1981-1984 and 1987-1988; Austr. Mus. LA. 4908, 4917-4918, 4920, 4924; "Endeavour" Nos. E. 2520-2524, 2721, and 2780-2781.

EUBLEEKERIA (NUCHEQUULA) NUCHALIS (Temminck & Schlegel).

Centrogaster argentatus Houttuyn, Verh. Holl. Maat. Weet. Haarlem xx., 2, 1782, p. 334 (*vide* Sherborn, Index Anim.). Japan. Not *Leiognathus argenteus* Lacépède, 1802, from India; not *Equula argentea* De Vis, 1884, from Queensland.

Equula nuchalis Temminck & Schlegel, Faun. Japon. (Poiss., 1845), p. 126, pl. Ixvii. (fig. 1). Nagasaki, Japan. *Id.* Richardson, Rept. 15th meet. Brit. Assn. Adv. Sci., 1845 (1846), p. 276 (Canton). *Id.* Bleeker, Verh. Bat. Gen. xxv., 1853, Japan, p. 38 (Nagasaki; described). *Id.* Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 500. *Id.* De Vis, Proc. Linn. Soc. N. S. Wales ix., 1884, p. 545 (Queensland, *i.e.*, Cape York; De Vis' specimens seen). *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, and Gt. Barrier Reef, 1893, p. 369.

Leiognathus nuchalis Bleeker, Ned. Tijdschr. Dierk. iv., 1873, p. 132 and Verh. Akad. Amsterdam xviii., 1879, p. 16 (*vide* Weber & Beaufort, 1911). *Id.* Jordan & Hubbs, Mem. Carnegie Mus. x., 1925, p. 225. *Id.* McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213 (Queensland, &c.).

Equula gerreoides De Vis, Proc. Linn. Soc. N. S. Wales ix., 1884, p. 545. Cape York, Queensland; De Vis' specimens seen. Not *E. gerreoides* Bleeker, 1851, from Batavia. Spelt *E. geneoides* by Saville-Kent.

Leiognathus argentatum Jordan & Snyder, Proc. U. S. Nat. Mus. xxiii., 1901, p. 747. *Ex* Houttuyn. Japan.

Leiognathus argentium (sic) Snyder, Proc. U. S. Nat. Mus. xlii., 1912, p. 412 (Suruga Market, Japan).

Leiognathus argenteus Jordan & Metz, Mem. Carnegie Mus. vi., 1913, p. 29 (Fusan). Not *L. argenteus* Lacépède, 1802, from India.

Leiognathus gerreoides McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 212.

Four Japanese specimens (Nos. I. 13711-2) in the Australian Museum, presented by Mr. S. Nagakami, have the following characters :—

D. viii./16 ; A. iii./14 ; L. lat. 58-62. Head 3.3 and depth 2.1 in standard length ; supraorbital denticulated ; a band of small bristle-like teeth in each jaw ; form ovate, with general characteristics as shown in Temminck and Schlegel's figure ; lateral line complete ; skin of flanks pitted ; breast and thorax naked ; a subtriangular dark blotch on each side of nape ; spinous dorsal membrane with a broad dark brown margin ; a few irregular wavy marks on upper part of body and a fuscous band along each side of the bases of the dorsal fins ; snout dusky, with spaced dots above.

Day (Fish. India, 1876, p. 241) remarks that the type-specimen of *Equula nuchalis* has a naked chest. I have not seen Houttuyn's account of this species but, if his name be binomial, it must take precedence over Temminck and Schlegel's.

The specimens from Cape York, Queensland, which were listed as *Equula nuchalis* by De Vis, are preserved in the "old collection" of the Queensland Museum. They agree with my Japanese specimens but have the head (13-18 mm.) 3.2 and the depth (21-29) 2 in standard length (42-58). Three other specimens in the Queensland Museum (Nos. I. 3491, 3517, 3518) from Bundaberg, Queensland, presented by Mr. L. H. Maynard.

I have examined the series of small specimens recorded from Queensland as *Equula gerreoides* by De Vis and regard them as young forms of *Eubleekeria* (*Nuchequula*) *nuchalis*.

Genus **GAZZA** Rüppell, 1835.

Gazza Rüppell, Neue Wirbelth. Abyssin., Fische, 1835, p. 3. Haplotype, *G. equulæformis* Rüppell. *Id.* Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 506. *Id.* Klunzinger, Fische Rothen Meeres, 1884, p. 107. *Id.* Regan, Ann. Mag. Nat. Hist. (8), xii., 1913, p. 122.

Mouth protractile obliquely downwards, armed with a series of well developed curved teeth, largest anteriorly ; gill-rakers elongate ; lower margin of preoperculum serrated ; supraorbital smooth, or with only minute serræ ; depth 2 or more in length ; breast naked ; lateral line ceasing on anterior part of caudal peduncle ; dorsal and anal spines not produced ; no dark blotches on head, body, or fins.

This genus includes *Gazza equulæformis* Rüppell, whose figure of the type agrees fairly well with Queensland specimens thus identified by De Vis, and upon which the above definition of the genus is based. *Gazza minuta* (Bloch), of which *Equula dentex* Cuv. & Val. is a synonym, *G. achlamys* Jordan and Starks, *G. tapeinosoma* Bleeker and its ally *G. dispar* De Vis, and *G. argentaria* (Bloch & Schneider), with *Sparus scombroides* and *Chromis scombroides* Günther as synonyms.

GAZZA DISPAR (De Vis).

Equula dispar De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 542. Cape York, Queensland. Holotype (No. I. 13/1701) in Queensland Museum examined. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, and Gt. Barrier Reef, 1893, p. 369 (listed only).

Leiognathus dispar McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 212 (listed only).

D. viii. ?/17 : A. iii./14 : P. 18 : V. i./5 ; C. 16. Head (8.5 mm.) 3, depth (10) 2.6 in length to hypural joint (26) : eye (3.1) 2.7, interorbital (2.5) 3.4, snout (2.1) 4 in head : second anal spine (4) 2.1 in head ; dorsal spines damaged in type.

The type-specimen of *Equula dispar* is a small specimen, 33 mm. in total length. The spinous dorsal fin, jaws, and opercles are damaged, so that accurate description is difficult and figuring impracticable.

Head deep, the upper profile much less steep than the lower ; interorbital with a median ridge, separate from the supraoccipital ridge and flanked on each side by two smooth supraorbital ridges ; two antorbital spines ; eye large, circular, not so deep as cheek below it : lower preopercular margin irregularly serrated ; maxillary reaching to below anterior fourth of eye ; jaws armed with a single series of strong, rather close-set, slightly curved teeth which are of fairly even height except near the symphysis, where larger teeth occur ; gill-rakers elongate, pointed, the longest about 1 mm. ; thirteen on lower limb of first gill-arch.

Body compressed, deepest anteriorly, the lower profile more convex than the upper. The type is now almost denuded of scales. The lateral line follows the curve of the back but is now indistinguishable from below the soft dorsal fin. De Vis, however, remarked that it was "continued to the caudal peduncle."

A procumbent dorsal and anal spine ; some raised serrations on the anterior surfaces of the bases of some of the erect dorsal and anal spines ; a small axillary ventral scale ; a slight ridge extending from below pectoral base to near ventral fin ; caudal bilobed.

Colour now faded to straw-yellowish with spaced brown punctulations on lower parts of head and sides and along base of soft dorsal fin. De Vis described the colours as "silvery-brown on the back with a series of blotches below the base of the dorsals."

Described from the holotype of *Equula dispar* De Vis, a specimen 26 mm. in standard length or about 1¼ inches long. Queensland Museum Reg. No. I. 13/1701.

This species is perhaps merely based on a young specimen of *Gazza tapernosoma* Bleeker, but as the latter was originally described from Batavia, I hesitate to relegate the Queensland form to its synonymy without critical comparison of specimens. *Gazza dispar* has a more attenuate form than the so-called *G. equula-formis* Rüppell from Queensland, and seems to have fewer teeth than the extralimital *G. argentaria* (Bloch & Schneider).

Genus **LEIOGNATHUS** Lacépède, 1802.

Leiognathus Lacépède, Hist. Nat. Poiss. iv., 1802, p. 448. Haplotype, *L. argenteus* Lacépède = *Scomber edentulus* Bloch. *Id.* Jordan, Proc. Acad. Nat. Sci. Philad. 1918 (1919), p. 336 (not synonymy).

Leiognathus Agassiz, Nomencl. Zool., 1846, Index Univ., pp. 203 and 212. Emendation for *Leiognathus* Lacépède. Logotype, *Leiognathus argenteus* Lacépède, by present designation. *Id.* Regan, Proc. Zool. Soc. Lond., 1903, ii., Oct. 1903, p. 63. *Id.* Regan, Ann. Mag. Nat. Hist. (8) xii., 1913, p. 122.

Authors who have regarded the *Equula edentula* of Day's "Fishes of India" as the type of this genus instead of the original *Scomber edentulus* of Bloch (which Day seems to have misidentified as *Equula lincolata* Cuv. & Val.), appear to have been misled into applying the name *Leiognathus* to the group of species which I have here restricted to *Equula*. The true *Leiognathus edentulus* (Bloch) apparently has scaly breast, dorsal dusky, bars on body, supraorbital serrated, snout plain, and lateral line complete, a group of characters which entitles it to generic separation from *Equula*.

LEIOGNATHUS SERRULIFER (Richardson).

Equula serrulifera Richardson, Zool. Voy. Erebus and Terror, Fish. 1848, p. 137, pl. lix., figs. 12-14. Sydney, New South Wales. Type in British Museum. *Id.* Bleeker, Verh. Akad. Amsterd. ii., 1855, p. 11.

Equula edentula Günther, Intr. Stud. Fish., 1880, p. 450, fig. 200. Australia. Copied from Richardson. Not *Scomber edentulus* Bloch.

Equula edentata (sic) Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 5, pl. x., fig. 33; *E. edentula* on p. 10 and on plate, which is copied from Richardson. *Id.* Saville-Kent, Gt. Barrier Reef, 1893, p. 290, and as *E. edentula* on p. 369.

Leiognathus serrulifer McCulloch, Austr. Mus. Mem. v., 1929, p. 212.

Richardson's fish may have been wrongly localised as no member of the family Leiognathidae has yet been reported from New South Wales.* Saville-Kent's Queensland record is unsatisfactory and probably refers to a species of *Equula*. The elongated and strongly serrated dorsal spines should enable this species to be identified without difficulty.

LEIOGNATHUS NOVEMACULEATUS (Klunzinger).

Equula splendens var. *novemaculeatus* Klunzinger, Sitzb. Akad. Wiss. Wien lxxx., 1, 1879, p. 55. Port Denison, Queensland. Type in Stuttgart Museum.

D. ix./16; A. iii./13-14. Height $2\frac{3}{4}$, head $4\frac{1}{5}$ in length. Second dorsal spine $1\frac{1}{2}$ in head; no black blotch on dorsal fin (Klunzinger).

This may be a species of *Eubleckeria*, but a re-examination of the type is much to be desired.

MACILENTICHTHYS, new genus.

Orthotype, **MACILENTICHTHYS POPEI**, new species.

Mouth protractile downwards; teeth small; head subequal to depth of body. D. viii./16; A. iii./14; fin-spines slender, not greatly produced; breast scaly;

* Since writing this, I have received specimens of *Equulites moretoniensis* (q.v.) from Pittwater, near Sydney.—G. P. W., Feb. 1932.

lateral line complete ; body elongate, its depth more than 3 in standard length, with irregular dark markings. This genus includes five species from the East Indies, Philippine Islands, Japan, and Formosa, as follows :—

Leiognathus elongatus Smith & Pope = *Macilentichthys popei* Whitley.

Equula elongata Günther = *Macilentichthys elongatus* (Günther).

Leiognathus stercorarius Evermann and Seale = *Macilentichthys stercorarius* (E. and S.).

Equula leuciscus Günther = *Macilentichthys leuciscus* (Günther).

Leiognathus edwardsi Evermann and Seale = *Macilentichthys edwardsi* (E. and S.).

MACILENTICHTHYS POPEI, new species.

Leiognathus elongatus Smith & Pope, Proc. U. S. Nat. Mus. xxxi., Sept. 24, 1906, p. 467. Kagoshima, Japan. Name anticipated by *Equula elongata* Günther, Ann. Mag. Nat. Hist. (4) xiv., Nov. 1, 1874, p. 369, from the Celebes, which is apparently congeneric.

Smith and Pope's species, characterised by having the head equal to the depth and 3.75 in standard length, eye less than postorbital portion of head, and lower preopercular margin finely serrated, evidently requires a new name, as it has a much more elongate body than *Leiognathus* and the specific name has been anticipated by Günther.

Genus **SECUTOR** Gistel, 1848.

Secutor Gistel, Handb. Nat. Thier. hoh. Schul., 1848, p. ix. Haplotype, *Equula insidiator* (Bloch).
Id. Jordan, Proc. Acad. Nat. Sci. Philad. 1918 (1919), p. 336.

Devezimentum Fowler, Journ. Acad. Nat. Sci. Philad. (2) xii., 4, June 10, 1904, p. 517. Orthotype, *Zeus insidiator* Bloch.

Equula Jordan & Seale, Bull. U. S. Fish. Comm. xxv., 1906, p. 272. Not *Equula* Cuvier, 1816. J. & S. regard *Zeus insidiator* as type of *Equula* but "*Scomber equula* Forskaal" has prior claim as tautotype.

Easily distinguished from the other genera of Leiognathidæ by having the mouth practically vertical and protractile horizontally.

SECUTOR PROFUNDUS (De Vis).

Equula profunda De Vis, Proc. Linn. Soc. N. S. Wales ix., 3, Nov. 29, 1884, p. 544. Queensland coast. Holotype (without registered number) in the Queensland Museum examined. *Id.* Saville-Kent, Prelim. Rept. Food-Fish. Qld., 1889, p. 10, and Gt. Barrier Reef, 1893, p. 369 (listed only).

Leiognathus profundus McCulloch & Whitley, Mem. Qld. Mus. viii., 1925, p. 145. *Id.* McCulloch, Austr. Mus. Mem. v., 1929, p. 213.

D. viii./16 ; A. iii./14 ; P. ? ; V. i./5 ; C. 16. L. lat. ? Head (c. 10 mm.) 3.7, and depth (23) 1.6 in length to hypural joint (37) ; eye (4) subequal to interorbital (4) and greater than snout (2.9) and postorbital portion of head (3.1) ; second dorsal spine (5) 2 and second anal spine (4) 2.5 in head.

Head elevated, naked, rather shrunken in the type which also has the jaws protracted so that exact measurement of the head is difficult ; eye large, as deep as the cheek below it and equal in length to second anal spine ; nostrils large, the posterior ones twice the size of the anterior ; two upstanding antorbital spines on each side ; supraorbital serrated ; opercles entire, except the convex lower margin of the preoperculum, which is regularly serrated ; mouth protractile in a horizontal direction ;

maxillaries subvertical when retracted ; jaws weak, apparently toothless, though the mandibular symphysis feels rough ; gill-rakers very slender, over 1 mm. long and strongly pectinate : sixteen on lower limb of first gill-arch.

Body very deep and much compressed ; ventral profile deeper and more convex than the dorsal profile, which is more evenly rounded. The type-specimen is denuded of scales, but there are traces anteriorly of a lateral line, which becomes obsolete below the soft dorsal fin, and some rather large scale-pockets on the thorax. De Vis noted the scales as " minutely granular." Anterior portion of breast apparently naked.

Dorsal and anal fins each preceded by a large procumbent spine : third dorsal and anal spines with some inconspicuous serrations ; base of anal fins less than that of both dorsals ; pectorals damaged, but with the second ray thickened ; ventral spine 2 mm. long, rest of fin damaged ; caudal damaged, apparently forked.

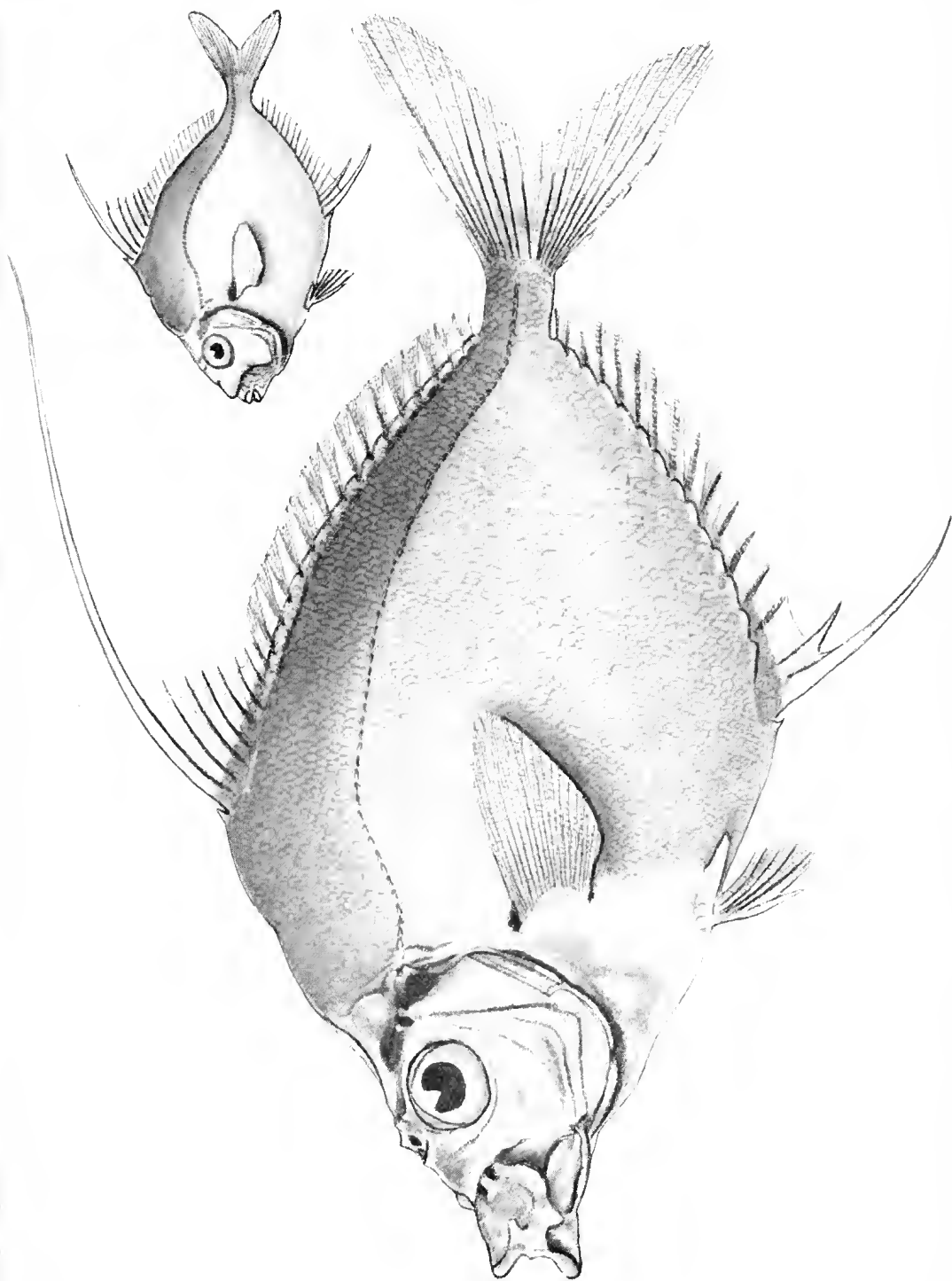
The colour has now faded to brown with widely spaced dots on head and lower part of body : a row of these dots corresponds to the underlying interhæmals of the anal rays. De Vis described the colours as : " Colour above the vertical line silvery grey, above it a median black longitudinal streak ; between this and the dorsal numerous oblique streaks descending backwards and on its lower side backwardly ascending streaks from a lower longitudinal stripe defining the vertebral line above." Apparently no black blotch on dorsal fin.

Described from the holotype of *Equula profunda* De Vis, a damaged and semi-macerated specimen, 37 mm. in standard length or about $1\frac{3}{4}$ inch. in total length. The dorsal spines have become detached, and the specimen is in such poor condition that it has not been figured.

Locality.—Cape York, North Queensland.

Relationships.—*Secutor profundus* is apparently a valid species distinct from *S. ruconius* (Buchanan-Hamilton) and *S. insidiator* (Bloch), with Indian specimens of which, from Day's collection, I have compared it. Australian specimens identified as *Equula interrupta* Cuv. & Val. may be *Secutor profundus*.

Forty-four specimens (Austr. Mus. Nos. IA. 4911-4915, 4921-4922 ; E. 2525-2527, 2673-2674), trawled off Bowen, Queensland, by the " Endeavour," are apparently referable to this species.



Figures 1 and 2.—*Auringequada longispinis* (Cuv. and Val.).

Large figure: Holotype of *Equula smithursti* Ramsay & Ogilby. Hood Lagoon, New Guinea.

Small figure: A cotype of *Equula asina* De Vis. Cape York, North Queensland.

Joyce K. Allan del.

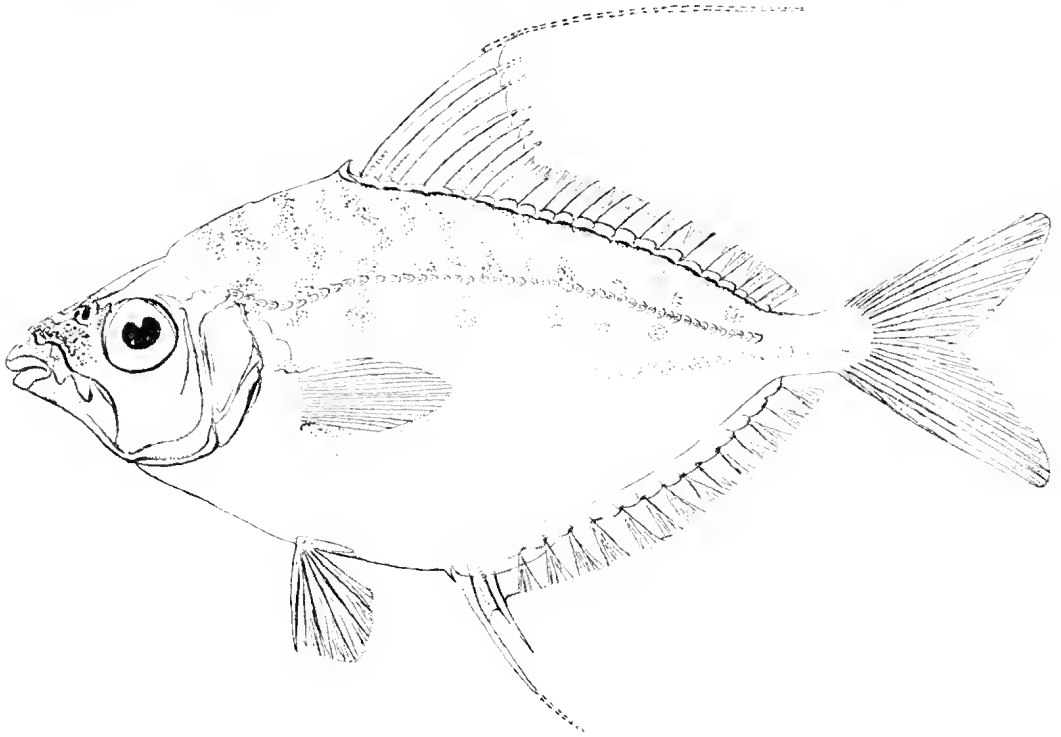


Figure 1.—*Equulites hastatus* (Ogilby)

Holotype of *Equula longispina* De Vis, and of *Leiognathus hastatus* Ogilby, Cape York, Queensland.

Joyce K. Allan, del.

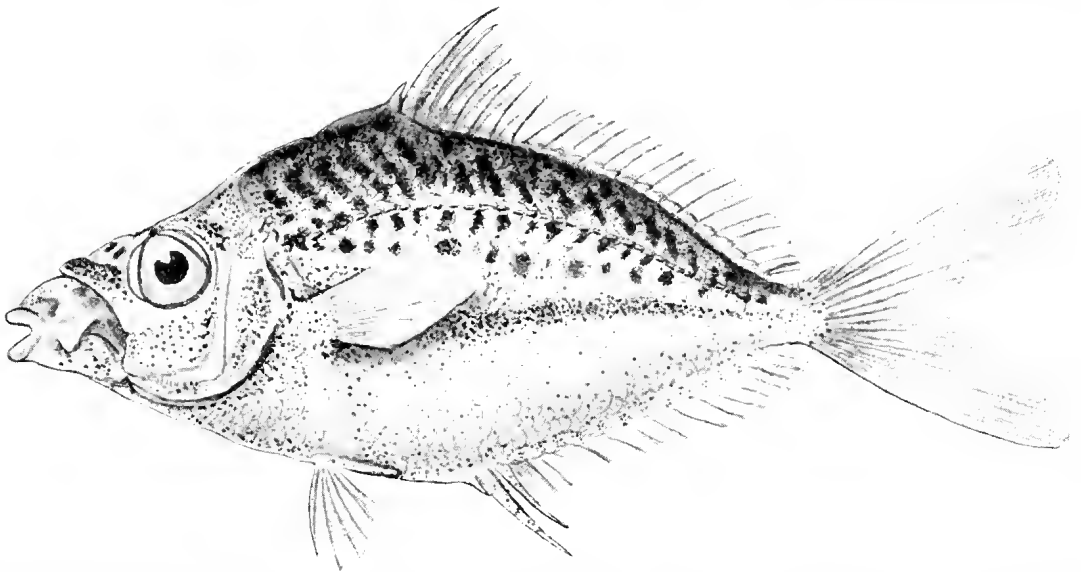


Figure 2.—*Equulites moretoniensis* (Ogilby).

A cotype of *Leiognathus moretoniensis* (Ogilby) Moreton Bay, Queensland.

Joyce K. Allan, del.

SOME WASPS OF THE GENUS ZOYPHIUM.

BY T. D. A. COCKERELL.

WHEN I visited Brisbane in 1928, Mr. H. Hacker handed me for description two species of *Zoyphium* which he had already determined as new. They are described herewith, and I take the opportunity to add some comments on the characters of the genus.

ZOYPHIUM HACKERI n. sp.

♀ Length about 7.5 mm.; rather robust, with dull surface; head black, with oral region red; thorax and legs entirely terra-cotta red; abdomen with the first segment red, the tergite with a broad whitish hind margin, the remaining segments black; orbits diverging below; a little appressed silvery pubescence in the region of the antennæ; antennæ red, with the flagellum, except basally, strongly infuscated above; clypeus clear red, quite pale, minutely and closely punctured, the margin with a pair of small rounded tubercles, very close together, at each extreme side; labrum broadly rounded, with outstanding golden hairs; mandibles robust, pale red, black at apex, and with a strong tubercle beneath near base; front dull, minutely rugulose; mesothorax bare, very minutely and closely (microscopically) punctured; scutellum prominent, the sutures before and behind it incised; pulvilli immense, as usual in the genus; hind tibiæ with very short spires posteriorly; abdomen with pale golden pubescence on apical tergite; tegular clear red; wings hyaline, a little dusky at apex, stigma and nervures ferruginous; basal nervure falling a little short of nervulus, which has a slight double curve, but is essentially in a straight line with lower part of basal nervure (the wing here more like *Sericophorus* than the type of *Zoyphium*); second cubital cell very broad below, narrowed to a point above, receiving second recurrent nervure nearer its end than first to end of first cubital; marginal cell ending practically on costa, not appendiculate.

Kuranda, Queensland (H. J. Carter). Owing to the red mesonotum it recalls *Z. rufonigrum* Turner, but that is much smaller and has no lateral tubercles or clypeus.

ZOYPHIUM HUMILE n. sp.

♀ Length about 5.2 mm.; rather slender, but with large broad head; black, the head dull, but the thorax and abdomen moderately shining; face and front covered with beautiful silvery hair; antennæ black; orbits diverging below; mandibles strongly curved, testaceous with black tips; labrum dark; clypeus without lateral tubercles; prothorax black, not emarginate; mesothorax minutely, more or less transversely, rugose, with very short and sparse silvery hairs; tegulæ dull testaceous; wings hyaline, the small stigma dusky testaceous, the nervures very pale; basal nervure going a short distance basad of nervulus (style of typical

Zoyphium): second cubital cell of the usual triangular form, but with a face on marginal, nearly as long as lower side beyond second recurrent nervure: first recurrent ending a considerable distance from end of first cubital; marginal cell pointed, but not quite on costa, and not distinctly appendiculate; knees, tibiae (hind pair with a dusky suffusion behind) and tarsi red; abdomen polished, with thin silvery white hair at sides; apical plate narrow.

Bribie Island, Queensland, Nov., 1918 (*H. Hacker*). Runs in the table near *Z. argyreum* Hacker & Ckll., or possibly *Z. iridipenne* Turner, but very distinct from both. *Z. argyreum* has a pale clypeus.

Turner remarked (1914) that *Zoyphium* could only be separated from *Sericophorus* by the absence of an appendix to the marginal cell. He questioned whether the genera should be kept apart. In *Sphodrotes* the marginal cell is obliquely truncate, with the apex far from costa, and appendiculate. In *Sericophorus* this truncation is smaller, the tip more nearly approaching the costa. The truncation is very narrow indeed in *S. bicolor* Sm., yet it is there, and a long appendicular nervure is present. In *Zoyphium* the tip has moved almost to the costa, and the appendicular nervure has disappeared, or is represented by the nearest stump. Thus the character, though rather insignificant, does serve to distinguish the genera without fail. It is possible that microscopic studies of the mouth-parts and genitalia will eventually indicate that there has been parallel evolution, some species of *Sericophorus* and *Zoyphium* being more nearly related to one another than to their ostensible congeners. If we take only the type species of the two genera, the differences appear more numerous. Thus, in *Sericophorus* (*S. chalybeus* Sm.) the anal lobe of hind wing is larger: in *Zoyphium* (*Z. sericeum* Kohl) it is small. In *S.*, the basal nervure falls short of the nervulus; in *Z.* it goes beyond (basad of) it. In *S.* the second cubital cell receives the recurrent nervure far beyond the middle: in *Z.*, at the middle. In *S.* the third discoidal hardly bulges outward apically; in *Z.* it distinctly bulges. Unfortunately these characters are not constant within the genera. Thus in *Sericophorus bicolor* Sm. the basal nervure goes basad of the nervulus, while in *S. viridis* Sauss. it falls a little short of it. In *Zoyphium crassicornis* Ckll. the basal nervure goes far basad of the nervulus, and the second cubital cell receives the second recurrent nervure far beyond the middle. In *Z. affine* H. & C., the basal nervure goes a moderate distance basad of nervulus, and the second cubital receives the recurrent only slightly beyond the middle, thus approaching much more nearly the venation of the genotype. In *Z. splendidum* H. & C., the second recurrent is far beyond middle of second cubital, in this respect resembling *Sericophorus*.

It remains to be learned whether the habits of the two genera differ appreciably. It is a striking example of the influence of convention or custom that genera so nearly allied as *Sericophorus* and *Zoyphium* are separated, while the characteristic Australian *Acanthostethus*, with many species, is treated as a subgenus of *Nysson*. I suggest that *Acanthostethus* should be promoted to generic rank.

ACRIDIODEA AUS DEM QUEENSLAND MUSEUM
ZU BRISBANE.

VON YNGVE SJÖSTEDT, Stockholm.

Family TETTIGIDÆ.

- Peraxelpa monstrosa* Sjöst. n. gen. et n. sp. Mt. Tambourine (H. Hacker).*
- Loxilobus pulcher* Bol. Brisbane (Hacker), Mai, Juli, Sept, Nov., Caloundra (Hacker). Okt.
- Coptotettix planus* Bol. National Park, Queensland (Hacker). Nov.
- Paratettix amplus* Sjöst. Brisbane (Hacker). Feb., April.
- Paratettix nigrescens* Sjöst. Healesville Dist. Vict. (Eland Shaw), Febr., April, Sept., Brisbane (Hacker) April.
- Paratettix histricus* Stål. Blackall Range (Wild) April.
- Paratettix femoralis* Bol. Brisbane (Hacker) Jan., März, Juli, Sept., Okt., Nov. Healesville Distr. Vict. (Shaw) April, Nov., Gold Creek (Hacker) Nov., Caloundra (Hacker) Okt. (zahlreich.).
- Paratettix fluctuans* Bol. Brisbane (Hacker) Febr., April, Juli.
- Paratettix argillaceus* Erich. Healesville Distr. Vict. (Shaw) März, April, Sept., Nov. (zahlreich.) Brisbane (Hacker) Juni.
- Paratettix inalatus* n. sp. Black's Spuv.
- Paratettix dunkensis* n. sp. Dunk Isl.
- Paratettix quinquecarinatus* n. sp. Brisbane (Hacker).
- Vinselina trituberculata* n. sp. Mt. Tambourine (Hacker).

TRUXALIDÆ.

- Callitala major* Sjöst. Brisbane (Hacker) Febr., Mai.
- Acrida tarrita* Lin. Brisbane (Hacker), Healesville Distr. Vict. (Shaw).
- Froggattia australis* Walk. Brisbane u. Caloundra (Hacker u. Shaw) Jan., Okt. (gemein!).
- Austrobothrus ustatus* Sjöst. Mt. Yole, Healesville Distr. Vict. Febr. (alac basi in vivo flavae!).
- Cryptobothrus chrysophorus* Rehn. Tooloom. N. S. W. (Hacker) Jan., Brisbane (Hacker) Jan. Cham Creek. Dec.
- Cryptobothrus pulcher* n. sp. Healesville Distr. Vict. (Eland Shaw).
- Schizobothrus flavovittatus* Sjöst. Healesville Distr. Vict. (Shaw) April (gemein!).
- Rapsilla fusca* Sjöst. Brisbane (Hacker) März, Mai.
- Calodia propinqua* Walk. Brisbane (Hacker) Jan., Mai., Okt., Bribie Is. (gemein!).

*The new genera and species in this list are described in Arkiv för Zoologi (Stockholm), Band 23 A. No. 11, 1931.—Ed.

Calataria terminifera Walk. Healesville Distr. Viet. (Shaw).

Calataria terminifera var. *elegans* Sjöst. Healesville Distr. Viet. (Shaw).

Chortoicetes vulgaris Sjöst. Australia.

Aiolopus tamulus Fabr. Brisbane (Hacker), Mt. Tambourine (Hacker).
Cunnamulla (Wild), Healesville Distr. Viet. (Shaw), Febr., Mai, Okt.

OEDIPODIDÆ.

Gastrimargus musicus Fabr. Healesville Distr. Viet. (Shaw) Jan., März.

Oedaleus australis Sauss. var. *plana* Sjöst. Ark. Zool. Bd. 22 A. N-7 p. 2
(1931), Healesville Distr. Viet. (Shaw), April, Brisbane (Hacker). März.

Heteropternis obscurella Blanch. Q. M. Blackall Range (Wild) 2. V. 11,
Stradbroke Is. n. Brisbane (Hacker), Mai, Sept., Oct., Dec.

Pycnostictus seriatus Sauss. Brisbane (Hacker), Mai, Sept., Stradbroke Isl.
(Hacker), Sept., Oct., Dec. Mt. Tambourine (Hacker) April, Brisbane Distr. (Shaw)
Gemein.

PYRGOMORPHIDÆ.

Atractomorpha crenaticeps Blanch. Brisbane (Hacker) Jan., Mai, N. Pine
River, Juli, Blackall Range Q. M. (Wild) April.

Monistria concinna Walk. Healesville Distr. Viet. (Shaw).

ACRIDIDÆ.

Gesonia recticercus Sjöst. Brisbane (Hacker) April.

Oxya velox Fabr. Brisbane (Hacker) April, Stradbroke Is. (Hacker) Dec.

Bermiella acuta Stål. Brisbane Distr. (Shaw).

Bermius Stali Sjöst. Brisbane (Hacker) April.

Methiola geniculata Stål. Brisbane (Hacker).

Betisca pedestris Er. Healesville Distr. Viet. (Shaw).

Cervidia lobipes Stål. Lr. Burdekin Distr. N. Q. (L. Kelly).

Coryphistes longipennis Sjöst. Brisbane (Hacker) Jan.

Adreppus brevirostris Sjöst. Brisbane et Stradbroke Is. ; Caloundra (Hacker).

Adreppus rotundoalatus Sjöst. Brisbane (Hacker).

Goniwa australasiae Leach. Stradbroke Isl. (Hacker) Dec.

Goniwa fusca Tepp. Mt. Yule, Healesville Distr. Viet., Brisbane (Hacker) Jan.,
Febr., April.

Goniwa maculicornis Stål. Brisbane u. Stradbroke Isl. (Hacker), Brisbane
T. C. Marshall), Blackall Range Q. M. (gemein) Mai, Sept.-Dec. Etwas kleiner als die
ebenfalls von Queensland stammenden Typen: o Deckfl. 24-26, o 41-43 mm. Auch
dicht fein dunkel gefleckte Ex. kommen vor.

Goniwa rugulosa Stål. Brisbane u. Stradbroke Isl. (Hacker), Birkdale, Febr.,
April, Dec.

- Gonicea vitripennis* Sjöst. Daly River N. T. (C. G. L.).
Pardillana limbata Stål. Brisbane (Hacker) Febr., April.
Goniceoidea biforma Sjöst. Daly River N. T. (C. G. L.).
Cirphula soror Sjöst. Stradbroke Isl. (Hacker) Okt.
Macrolopholia tuberculata Walk. Sine patria indicata (Brisbane ?).
Epallia exigua Sjöst. Brisbane (Hacker) Okt.
Phaulacridium gemini Sjöst. Stradbroke Isl. (Hacker), Firnshaw, Mai, 1911.
Eumacrotona securiformis Sjöst. Healesville Distr. Vict. (Shaw).
Cedarinia vermiculata Stål. Brisbane.
Tasmaniacris tasmaniensis Bol. Tasmania : Mt. Wellington.
Tasmaniacris micropteryx n. sp. Tasmania : Cam River.
Macrazelota flavipennis n. sp. Brisbane et Stradbroke Isl.
Valanga maculicollis Walk. Brisbane (Hacker).
Valanga maculicollis var. *vittata* Sjöst. Sine patria indicata (Brisbane ?).
Valanga irregularis Walk. et var. *signata* Sjöst. Brisbane (Hacker u. Shaw) Mai.
 (tres sine patria indicata).
Austacris proxima proxima Walk. Brisbane (Hacker) Palm Isl. N. Q., Mai, Aug.
Austacris guttulosa guttulosa Walk. (locality ?).
Carlippia rubripes Sjöst. Brisbane et Stradbroke Isl. (Hacker), Firnshaw :
 Mars, Nov., Dec.
Catantops angustifrons Walk. Stradbroke Isl. (Hacker) Dec.

BARNACLES FROM MAGNETIC ISLAND, NORTH QUEENSLAND.

BY THOMAS H. WITHERS, F.G.S., F.Z.S.

Published by permission of the Trustees of the British Museum.

(Text-figs. 1, 2.)

Two pieces of limestone containing remains of barnacles were submitted to me for examination and report by Mr. H. A. Longman, Director of the Queensland Museum, in 1930.

These barnacles he thought belonged (*see* Longman, *Abstr. Proc. Roy. Soc. Queensland*, 1930 (1929), p. x.) apparently to *Coronula*, a form found living attached to whales.

The pieces of limestone were found by Miss Marian Rowland among rocks considerably above high-water mark on Magnetic Island, North Queensland. Evidently they represent a comparatively recent deposit, possibly of Pleistocene age, and both pieces were apparently originally attached to a pink biotite granite, for fragments of such a rock can be detected on the under surface of each.

One piece (F. 2026) is composed almost entirely of a mass of *Serpula* tubes which have grown over a number of barnacles. Now that it has been removed from its original attachment, only the bases of the barnacles can be seen. Among the barnacles is a single specimen of *Tetraclita* with its typical cellular walls, but the *four* compartments can only be seen on the inner side of the sheath. There are also five examples of *Octomeris*, in which the *eight* compartments are clearly shown, and seven examples of *Chthamalus*, showing their *six* compartments.

The second specimen consists mainly of the remains of barnacles, apparently all belonging to *Octomeris*, but so encrusted with calcareous matter that only in a few instances is it at all possible to see the form of the shell. Both pieces of limestone are somewhat waterworn, and the bases of the barnacles are worn down.

Three genera of barnacles are therefore represented, namely, *Tetraclita*, *Octomeris*, and *Chthamalus*, and all three inhabit the littoral zone. So far *Octomeris* has not been recorded from Australasian waters.

Family BALANIDÆ.

Genus TETRACLITA, Schumacher, 1817.

TETRACLITA sp.

The single shell shows only the base, and it is not possible from this to determine more than the genus. It possibly represents one of the varieties of *Tetraclita squamosa* (Bruguère). The shell has a rostro-carinal length of 26 mm.

Family CHTHAMALIDÆ.

Genus CHTHAMALUS, Ranzani, 1817.

CHTHAMALUS sp.

There are seven examples on specimen F. 2026, all showing only the base of the shell, and one has the inner surface of the opercular valves exposed. The walls of the shell are thick, although after due allowance has been made for the fact that they have been worn down by erosion, they are probably no thicker than in the Australasian species *C. antennatus* Darwin (1854, p. 460, pl. xviii., fig. 2). They may even belong to that species, but the apparent toothed edges of the radii, and the sinuous basal margin of the scutum, does not allow one to be at all confident. Largest shell with a rostro-earinal length of 7 mm.

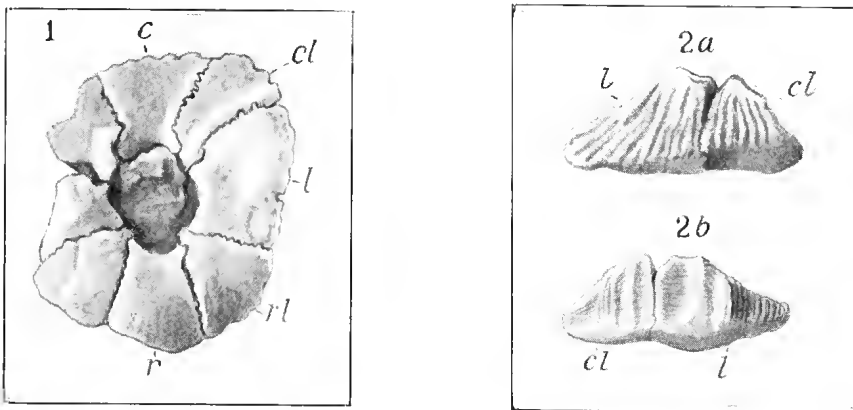
Genus OCTOMERIS, G. B. Sowerby, 1825.

So far this genus is known only by *O. angulosa* G. B. Sowerby (1825, p. 244, pl. xii. Suppl.) from South Africa, by *O. brunnea* Darwin (1854, p. 484, pl. xx., figs. 3a, b; Nilsson-Cantell, 1921, p. 299, text-figs 58, 59, pl. iii, fig. 7; 1926, p. 1; 1930, p. 10) from the Philippine Archipelago, Sumatra, Java, and Pisang Island, S.W. of New Guinea, and by *O. intermedia* Nilsson-Cantell (1921, p. 303, text-figs. 60-61, pl. iii. fig. 8; 1926, p. 1) from Java.

OCTOMERIS CRASSA sp. n.

(Text-figs. 1, 2).

Diagnosis.—Shell brownish coloured, depressed, closely but not so regularly ribbed radially as in *O. brunnea*, with numerous interlocking ribs along the natural edges; walls extremely thick.



OCTOMERIS CRASSA n. sp.

Fig. 1.—Shell, viewed from the base.

Fig. 2.—Lateral and carino-lateral compartments, attached. (a) Outer view; (b) inner view.

Holotype.—A shell with its base only exposed (fig. 1) on slab F. 2026, in the Queensland Museum. Four other shells are on the same slab, all showing their bases. On another slab are remains of numerous individuals, mostly broken, including one poorly exposing the outer surface, and from this slab were obtained the two attached compartments (figs. 2*a*, *b*).

Locality.—Magnetic Island, North Queensland.

Description.—Shell circular, depressed, with eight compartments, the carino-lateral compartments narrower than the lateral. Basis membranous. Radii comparatively narrow, toothed, the teeth representing the upper part of the ribs on the sutural edges of the compartments (fig. 3). Walls, even after allowing for the wearing down of the base by erosion, extremely thick. Largest shell with a rostro-carinal length of 20 mm.

Comparison with other species.—*O. crassa* is readily distinguished from *O. angulosa*, which has the shell steeply conical and the surface extremely rugged, for the radiating ribs are irregular and stand out quite sharply with extremely deep intervening depressions.

O. brunnea agrees with *O. crassa* in the close-set radial ribs, but the ribs are finer and more regular; the main difference from *O. crassa*, however, lies in the very thin walls.

O. intermedius has a shell less flattened than in *O. brunnea* and *O. crassa*, but not so steep as in *O. angulosa*; it has ribs like *O. angulosa*, although a little weaker, and the sutures have distinct teeth which are fewer and larger than in *O. angulosa*, and much fewer than in *O. crassa*. The walls of the shell of *O. intermedius* are not so thick as in *O. crassa*.

LITERATURE REFERRED TO.

- Darwin, C. R., 1854. A Monograph on the Sub-class Cirripedia with figures of all the Species. The Balanidæ, &c., viii., 684 pp., 30 plates. London: Ray Soc.
- Nilsson-Cantell, C. A., 1921. Cirripeden-Studien, Zur kenntnis der Biologie, Anatomie und Systematik dieser Gruppe. *Zool. Bidrag Uppsala*, VII., pp. ix, 75-394, plates i.-iii., 89 text-figs.
- Nilsson-Cantell, C. A., 1926 (Feb.). Neue und wenig bekannte Cirripeden aus den Museen zu Stockholm und zu Upsala. *Ark. Zool.*, XVIII*a*, No. 3, pp. 1-46, plate i., 15 text-figs.
- Nilsson-Cantell, C. A., 1930. Résultats Scientifiques du Voyage aux Indes Orientales Néerlandaises. Cirripedes. *Mém. Mus. Roy. Hist. Nat. Belg.*, III., Fasc. iii., pp. 1-24, 7 text-figs.
- Sowerby, G. B., 1825 (July). On a New Genus of Cirripedes. *Zool. Journ.*, II., pt. 6, pp. 244-5, plate xii., (Suppl.).

SOME EARTHWORMS FROM QUEENSLAND.

BY W. BOARDMAN, ASSISTANT ZOOLOGIST. THE AUSTRALIAN MUSEUM.

(By permission of the Trustees of The Australian Museum).

(Text-figures 1-2).

Family MEGASCOLECIDÆ.

Subfamily MEGASCOLECINÆ.

Genus DIGASTER E. Perrier.

DIGASTER LONGMANI. sp. nov.

External Characters.—Length about 520 mm. ; diameter behind the clitellum about 18 mm, in front 20 mm., but dimensions difficult to determine accurately owing to distortion and swelling of the specimen. Colour in formalin: Behind the clitellum light mole-brown, in front deeper mole-brown ; clitellum very dark brown. Number of segments about 315 ; segments v.-xiii. biannular, iii. and iv. faintly so ; vii.-xiii. have also an additional less well-defined annulus between the main one and the posterior furrow ; iii.-vii. show more or less faintly defined annular rings, one in front of, one behind, the principal annulus.

Prostomium proepilobous.

Dorsal pores begin in furrow 5/6.

Setæ widely paired. In front of the clitellum $ab = \frac{1}{4} aa = \frac{1}{3} bc = \frac{2}{7} cd$; behind the clitellum $ab = \frac{1}{5} aa = \frac{1}{5} bc = \frac{2}{7} cd$; at midbody $ab = \frac{1}{3} aa = < \frac{1}{2} bc = \frac{7}{10} cd$; ddl is greater than half the circumference. The setæ are very difficult to discern on the pre-clitellar region except on a couple of segments immediately preceding the clitellum.

The clitellum is well developed, complete all round, and embraces segments xiv.-xviii. (= 5). The intersegmental furrows are visible, dorsal pores absent, setæ (except a and b on xviii.) present.

Male pores paired on xviii., in form of transverse slits lying within, and almost as long as ab ; lips tumid, cream in colour. The left pore is eccentrically placed on a somewhat ovate papilla with uncertain boundaries which extends a little beyond ab dorsally and ventrally, placed rather nearer the ventral and posterior boundaries.

The right pore is placed at the ventral-most corner and slightly nearer the posterior than the anterior edge of a somewhat diamond-shaped, flattened, glandular area which extends from just ventral of *a* to a distance beyond *b* about equal to *ab*. Between the two papillæ there is a well-defined groove which bifurcates at the papillæ to include about a half or less of them in the fork so formed. The posterior limb of each bifurcation is the continuation of a deeper, narrower groove which forms the posterior portion of the main one.

The female pores are paired and close together on xiv., anterior of the setæ ring.

The spermathecal pores are two pairs situated at the anterior edge of viii. and ix. in grooves 7/8 and 8/9. The setæ are not visible on these segments, but the pores seem to be about in line with, or just dorsal of, *a*.

On the ventral surface of segments viii.-xii. there is a glandular strip posteriorly bounded by the segment edge, anteriorly just clear of the central annulation furrow, and extending beyond *b* on each side to about half way between *b* and *c*. These strips have a definite deep pink colour.

Internal Anatomy.—Septum 6/7 muscular and thick ; 7/8 somewhat thicker ; 8/9 considerably thicker than 7/8 but only about half as thick as 9/10 ; 11/12 enormously thickened ; 10/11 and 12/13 less stout but still very thick, 12/13 being the stouter ; 9/10 a little thinner than 10/11 ; 13/14 about the same as 8/9.

Gizzards well developed and bulbous in vi. and vii.

Large intestine commences in xviii. There is in xi. a structure which looks like and probably is a calciferous gland ; it is unpaired and placed saddle-wise on the intestine of which it embraces about two-thirds. Vascular swellings present in xii.-xv.

Last heart in xiii.

The excretory system is micronephric with numerous micronephridia in each segment, which are particularly plentiful in the segments in front of xix. ; in xix. and from thence backwards micronephridia less numerous and tend to be aggregated in a transverse band in the middle of the segment.

Testes and funnels paired and free in xi. There is a single pair of large, loosely granular seminal vesicles in xii. attached to the anterior septum of the segment and approximated above the intestine.

Prostates paired in xviii., flattened, tongue-shaped ; they are comparatively small and lie on the floor of the segment. The duct is short and slender and joins the gland at the level of the inner surface of the body wall.

Penial setæ absent.

Ovaries and funnels paired in xiii.

(Text-figure 1.)

Figure 1. *Digaster longmani*, sp. nov. Spermatheca from holotype.

The spermathecae are two pairs normally occurring in viii. and ix., but the left one of the anterior pair has become displaced forward into vii. General shape of spermatheca tubular; ampulla ovoidal, half as broad as long, slightly less than half the total length of the organ. The duct is about one-third as broad as long; has one or two conspicuous, obliquely placed sacculations about half way from the ectal end, if two, they are on opposite sides and converge ectally. Diverticulum small, transversely elongate, ovoidal structure obliquely placed near the opening of the duct; extends almost across the flattened side of the duct, sessile. Within the diverticulum there are visible several iridescent clumps of sperm.

Remarks.—The species *Digaster longmani* seems to be most closely related to *D. brunneus* Spencer, from which, however, it differs in several characters, notably in the spermatheca. These two species are unique within the genus in being metandric.

Locality.—Tambourine Mountain, Southern Queensland. One complete specimen (the holotype) and four fragments including a head end. Donated by C. Colquhoun, and registered G. 684.

Genus WOODWARDIELLA Stephenson.

WOODWARDIELLA TRYONI (Fletcher).

1890. *Cryptodrilus Tryoni*, Fletcher, Proc. Linn. Soc. N.S.W., iv. (2), pt. 3, p. 994.

1916. *Woodwardia (?) Tryoni*, Michaelsen, Kungl. Sven. Vet.-Akad. Hand. 52, No. 13 (Mjöberg's Austral. Expd.), p. 62.

A single specimen from Brisbane, 580 mm. long, soft and poorly preserved, is referred to Fletcher's *Cryptodrilus tryoni*, although it differs in some points from the original description.

The nephridiopores are in furrows 1/2, 2/3, 5/6, and thence in alternate furrows in *d*; in 3/4, 4/5, and thence in alternate furrows to 10/11 in *c*, further back in *b*.

Fletcher describes the spermathecae as "three pairs, each of them with two caeca." This would seem to indicate that the caeca or diverticula are simple. In the specimen before me the ampulla is somewhat tubular, bloated a little in its proximal half and at the widest portion one-third to a half as broad as long; the duct short, about two and a half times as long as broad, the length less than half the length of the ampulla. The two diverticula are attached close together on the anterior face of

the duet about half-way down; the form of the diverticulum is very variable; it may be a short, simple, club-shaped structure scarcely extending to the junction of the ampulla and duet or it may be composed of a cluster of from two to four tubules of varied lengths, sometimes somewhat convoluted and anastomosed (varying from slightly to almost completely) from the base distally. The component tubules of a compound diverticulum may be sufficiently long to extend well beyond the junction of the ampulla and the duet.

The prostates are small, narrow, tongue-shaped bodies confined to xviii., finely granular; the duet is very short, traversing only the body wall. Although not sectioned the external appearance of the prostate leaves little doubt that the glandular part has a branched canal system.

Penial setæ present but seemingly all with the tip missing and too damaged for examination.

Locality.—Brisbane, Queensland. Donated by W. E. Weatherill and registered Don. 14373.

WOODWARDIELLA YOUNGI. sp. nov.

External Characters.—Length 360 mm., diameter 9–10 mm. In alcohol the colour is mole-grey dorsally, with a greenish tinge on the head end as far back as and including the clitellar segments; brownish-cream ventrally. Number of segments 225.

Prostomium proepilobous.

Dorsal pores commence in furrow 6, 7.

Setæ widely paired in regular lines. In front of the clitellum $ab = \frac{2}{7}$ $aa = > \frac{3}{4}$ $bc = \frac{2}{7}$ cd ; behind the clitellum $ab = \frac{7}{15}$ $aa = \frac{2}{3}$ $bc = \frac{1}{4}$ cd ; at midbody $ab = \frac{2}{7}$ $aa = \frac{3}{4}$ $bc = \frac{3}{11}$ cd ; dd is less than half the circumference.

The clitellum embraces segments xiv.– $\frac{2}{3}$ xviii. ($= 4\frac{2}{3}$) and also encroaches slightly on xiii.; the three anterior segments are complete all round; on xvii. extends to the dorsal limit of the genital pits on each side and then across the ventral portion of the segment as a strip immediately anterior of the genital pits; on xviii. cut away like a saddle. Setæ present, dorsal pores absent, intersegmental furrows visible.

Ventral surface of xviii. glandular generally; seta *a* on each side absent; seta *b* surrounded by a darkened, somewhat circular halo of slightly swollen epidermis about equal to *ab* in diameter; from these halos the pigmentation not so deep continues ventrally and finally fades out just beyond *a*. Male pores could not be discerned from an external examination; dissection demonstrates that they are paired and open in the immediate vicinity of *b*.

The female pores are distinct and paired on xiv.; they lie one at each end of a comparatively wide V-shaped groove just anterior of the setæ ring.

The spermathecal pores are three pairs in furrows 6/7, 7/8, and 8/9, slightly dorsal of *b*.

On the ventral surface of x. and xi. there is on each side a brownish, oval, glandular patch somewhat less than twice as long as broad; the posterior curve extends just beyond the setæ ring, anteriorly well clear of the intersegmental furrow; the dorsal limit is just beyond *b* and the ventral limit rather more beyond *a*. On xvii. there is a pair of transversely elongate "pits" each about three-fifths as wide as long with tumid, glandular lips: the posterior lip of each groove which is wide includes setæ *a* and *b*: the structures extend ventrally and dorsally a little beyond *a* and *b* respectively. On xix. there is a pair of raised, flattened, glandular cushions about twice as long as broad, somewhat rectangular in general shape with the angles rounded; setæ *a* and *b* are included in the posterior edge: ventrally and dorsally these areas extend a little beyond *a* and *b* respectively. On the right side of xx. there is what appears to be a similar but rudimentary cushion; it is much smaller, extends less distance beyond *a* and not quite to *b*.

Internal Anatomy.—Septa 5/6-9/10 progressively thickened; 10/11 and 11/12 very stout; 12/13 about the same as 8/9; 13/14 and 14/15 about the same as 6/7 and 5/6 respectively; 15/16 almost as thin as the normal ones further back.

Gizzard in v. large and bulbous.

Calciferous glands are five pairs in segments ix.-xiii.; they are attached ventrolaterally to the intestine by a broad base; large intestine commences in xvi.

Last heart in xiii.

Excretory system meganephric.

Testes and funnels paired and free in x. and xi. Seminal vesicles, two pairs, in ix. and xii., small; the anterior pair the smaller, attached rather high up to the front face of the septum: the posterior pair attached to the posterior face of the septum and situated lateral of the œsophagus.

Prostates paired in xviii., kidney-shaped; duct short, straight, and slender. Penial setæ absent.

Ovaries and funnels paired in xiii.

(Text-figure 2.)

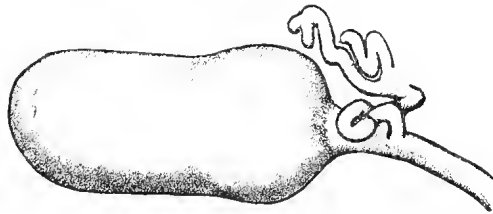


Figure 2. *Woolwardiella youngi*, sp. nov. Spermatheca from holotype.

The spermathecae are three pairs in vii., viii., and ix. The duct is slender and slightly curved, above the diverticulum gradually expands towards the base of the ampulla; about two thirds as long as the ampulla. Ampulla generally cylindrical,

sometimes the proximal half is a little bloated, end rounded; width slightly less than half the length. Diverticulum or diverticula anteriorly attached to, and originating at a point about two-thirds along from the opening of, the duct; slender, tubular, iridescent, and much contorted. The diverticulum may be simple but at a point nearer or further from the junction with the duct generally bifurcated; usually one of the branches shows a secondary bifurcation. In the spermatheca from vii. (left) there are three diverticula which originate from the duct as a trifurcate bunch of simple tubes arranged very close together and transversely. The spermatheca from ix. (left) has an unbranched diverticulum terminating in a rather hard bulb (probably due to disease or a vagary of the preservation) having a diameter about four times that of the diverticulum.

Paratype.—The single paratype differs in some details from the holotype: it is ca. 260 mm. long and has 194 segments. The five segments immediately preceding the clitellum distinctly biannulate, the two in front of these faintly so. It differs from the holotype in having the prostomium epilobous $\frac{1}{3}$ (tongue cut off behind), and the dorsal pores commencing in 5/6. The clitellum encroaches very slightly on xiii. and does not extend further back than $\frac{1}{3}$ xviii. On xviii. setæ *a* and *b* absent. The male pores which are very difficult to discern seem to be a little anterior and slightly ventral of *b*. Copulatory cushions absent from xi. and "pits" not developed on xvii.; there is a pair of cushions on xx. and a less well-developed one on the left side of xxi.

Two spermathecae were dissected, one from the left side of vii. and viii. respectively. The first has four diverticula, one of which is bifurcated; they are arranged transversely across the duct and originate very close together. The second has two diverticula similarly originating close together, both of which are bifurcated for most of their length. In the paratype the diverticula are relatively longer than in the holotype. The vas deferens joins the prostatic duct at its union with the gland.

Locality.—Sherwood, Brisbane, Queensland; June, 1925. Two specimens donated by J. E. Young and registered G. 783.

Genus **PLUTELLUS** E. Perrier; subgenus **PLUTELLUS** Michaelsen.

Plutellus (Plutellus) unicus (Fletcher) subsp. **fasciatus** (Fletcher).

1890. *Cryptodrilus (?) fasciatus*, Fletcher, Proc. Linn. Soc. N.S.W., iv. (2), pt. 3, p. 988.

Three specimens which agree with Fletcher's description of his *Cryptodrilus (?) fasciatus* are identified as this subspecies.

Locality.—Queensland National Park, Macpherson Range, Southern Queensland: two specimens collected by H. Hacker, December 1919; one specimen collected by H. A. Longman, September 1931.

My thanks are due to Mr. H. A. Longman, Director of the Queensland Museum, for permission to examine the material which forms the basis of this contribution. All the specimens are housed in the Queensland Museum, Brisbane.

