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Revision of the Australian Species of the Fish Family Leiognathidae

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Abstract

The Australian species of Leiognathidae are revised and their distinguishing features more clearly defined. Fifteen Australian species are recognized: *Gazza minuta*, *Leiognathus aureus*, *L. bindus*, *L. blochii*, *L. decorus*, *L. elongatus*, *L. equulus*, *L. fasciatus*, *L. leuciscus*, *L. smithursti*, *L. splendens*, *Leiognathus* sp., *Secutor insidiator* and *S. ruconius*. Diagnostic characters for the species are difficult to ascertain as the family tends to be meristically constant. Identification relies principally on a combination of body proportions, distribution of scales, tooth shape and arrangement, and body pigmentation patterns. Species descriptions, figures, abbreviated synonymies and geographic distributions within Australia are presented for all species, and an identification key is given. Incorrect usage in the literature of several species names, including *L. elongatus*, *L. brevirostris* and *L. lineolatus*, is discussed.

Introduction

Members of the family Leiognathidae are small fishes (less than 200 mm in length) characterized by the following features: body moderately to strongly laterally compressed; mouthparts extremely protractile, when extended forming tube directed upwards to downwards, when retracted, dorsal processes of premaxillae lying in groove extending back to supra-occipital; top of head with bony ridges and nuchal crest; scales on body small and smooth, usually thin and easily shed; head naked with exception in some species of scales on suborbital; single dorsal fin with 8 spines and 16 rays, anal fin with 3 spines and 14 rays; first dorsal and anal spines minute, second spines usually longest; gill membranes attached to isthmus; 5 branchiostegal rays; vertebrae 10 + 14; body colour silver, upper half usually with some dusky patterning. All species so far examined also possess a light-producing organ (containing symbiotic luminous bacteria), which surrounds the distal end of the oesophagus (Haneda and Tsuji 1972). Leiognathids are commonly known as slipmouths, silverbellies, dollarfish and ponyfish, the last name referring to the extremely protractile mouthparts, which give the head a horse-like appearance.

Some authors (e.g. Weber and de Beaufort 1931) have included the family Gerreidae with the leiognathids on the basis of their similarity in appearance, and in particular their possession of highly protractile mouthparts. Most recent authors, however, regard the resemblance between the two groups as superficial, and this view is adopted in the present review. Gerreids can easily be distinguished from leiognathids by the presence of large body scales

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that extend well forward onto the head, by the absence of a nuchal crest, by the gill membranes not being attached to the isthmus, and by the presence of six (rather than five) branchiostegal rays.

Estimates of the number of leiognathid species range from about 17 (James 1975) to 30 (Pauly 1977), but the number of species names far exceeds these, and questions of synonymy are prevalent. The original descriptions of many species are scanty and give inadequate or inappropriate information for positive identification of the species. Even in recent publications, lengthy descriptions of species often fail to include diagnostic sets of characters and thereby proliferate confusion in identification and nomenclature. These problems have arisen because leiognathids are very similar in appearance and tend to be meristically constant.

Distribution

Leiognathids are distributed throughout the coastal waters of the tropical and subtropical Indo-Pacific, from the Red Sea and eastern coast of Africa through India, Indonesia, Australia, Japan to the Pacific Islands, as far east as Tahiti and Hawaii. Within Australia, the family is primarily tropical in distribution, although some species extend southwards to Shark Bay in Western Australia and to Sydney in New South Wales.

Some species of leiognathid are known to enter estuaries and freshwater rivers. Lamboeuf and Simmonds (1979) [cited in Pauly and Wade-Pauly (1981)] report that leiognathids are demersal during the day but move to midwater at night.

Biology

Little work has been published on the biology of the leiognathids and most of our current knowledge relates to studies undertaken in India and the Philippines. Dietary studies have been carried out by Kuthalingham (1958), Venkataraman (1960), Balan (1963) and Tiews *et al.* (1968). These studies indicate that leiognathids feed on a variety of zoo- and phytoplankton, although some species also consume substantial quantities of benthic organisms. Copepods are often the predominant dietary component. Leiognathids with upward protracting mouthparts (*Secutor* spp.) apparently feed solely on pelagic organisms (Tiews *et al.* 1968), and the strongly toothed species (*Gazza* spp.) are piscivorous [Tham Ah Kow (1950) and Mangalik (1965), cited in Pauly (1977)]. Blaber's (1980) study of the Trinity Inlet system, Cairns, presents the only published information on the diet of leiognathids in Australia. Of the seven species of leiognathid examined, six were feeding on a mixture of plankton and invertebrate benthos; *Gazza minuta* was feeding on a mixture of fish and invertebrate benthos.

Studies on growth and mortality in leiognathids include papers by Arora (1952), Balan (1963), Beck and Sudrajat (1978), Pauly (1979, 1980*a*, 1980*b*), and Pauly and David (1980); further references are given by Pauly and Wade-Pauly (1981). The available information suggests that leiognathids have a short life-span (possibly 1–2 years) and an extended spawning season.

Fisheries

An estimated 161 184 t of leiognathids were landed commercially during 1982 (Anon. 1984). Leiognathids constitute important commercial catches in the South-east Asian countries where they are used for human consumption, fish meal, manure or livestock feed (Pauly 1977). They are usually taken in demersal trawls, beach seines and lift nets. Although leiognathids are abundant in northern Australian waters, they are of no commercial value and are regarded as a nuisance catch in the prawn fishery in the Gulf of Carpentaria.

Previous Taxonomic Work

James' (1975) revision of the Leiognathidae is the most complete taxonomic coverage of the family to date. However, it falls far short of his claim to have assigned a place to every nominal genus and species, as there are omissions of species from Indonesia (*L. aureus* and *L. hataii* Abe & Haneda, 1972), Thailand (*S. indicius* Monkolprasit, 1973), Japan (*Equula rivulata* Temminck & Schlegel, 1845), and Australia (*E. argentea*, *E. asina*, *E. decora*, *E. dispar*, *E. profunda*, *E. simplex* de Vis, 1884, *L. devisi* Whitley, 1929 and *L. hastatus* Ogilby, 1912). The Australian species that are included in James' revision receive only superficial coverage, and in all cases are regarded either as synonyms or probable synonyms of more widely recognized species. These views are based on species descriptions in the literature rather than on examination of Australian specimens.

Within Australia, very little work has been published on leiognathids. McCulloch (1929) compiled a checklist of fish species recorded from Australia, together with their synonymies, based on a review of the literature; 20 species of leiognathid were included. Weber and de Beaufort (1931) gave identification keys and species descriptions for 28 leiognathids (including species of *Pentaprion* and *Gerres*). Whitley (1932) redescribed the leiognathid species held by the Queensland and Australian Museums, and attempted to classify them into 'recognizable genera'. Nine genera and one subgenus (together representing 14 species) were recognized and a key to their identification was presented. The features used to characterize the genera, however, were loose, and as Whitley himself stated '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'. His proposed nomenclature has not been adopted by subsequent authors. Munro (1960) presented descriptions and figures of 10 Australian species of leiognathid, and Marshall (1964) and Grant (1978) both briefly described some species.

The above literature has not provided an adequate basis for the identification of Australian leiognathids and incorrect and/or inconsistent identifications have been common throughout the literature and the leiognathid collections of the Australian museums. It is the aim of this paper to define and redescribe the leiognathid species of Australia.

Material Examined

This revision is based on examination of fresh leiognathid specimens collected during research cruises conducted by CSIRO Australia between Broome (Western Australia) and Weipa (Queensland) during 1980–1981, and of preserved leiognathid specimens of the major ichthyological collections in Australia.

The fresh material was taken in depths of 10–170 m, using a midwater or more usually a demersal trawl from R.V. *Soela*. In most cases, large series of fresh specimens were examined, although *L. smithursti* was poorly represented. Specimens of less than 20 mm standard length were rarely retained by the net and the descriptions presented in this paper will probably not deal adequately with them.

The leiognathid collections in the Australian Museum, Queensland Museum, Western Australian Museum, Museum of Victoria and CSIRO Marine Laboratories, Cronulla were all examined. In addition to the type material held in Australia, type-specimens from museums in Europe and America were consulted when accounts in the literature were confused. Some leiognathid specimens from Japan, Indonesia and Thailand were made available to the author through the assistance of colleagues in these countries.

Representatives of the species collected by R.V. *Soela* during this study have been lodged with the Australian Museum, Queensland Museum, Western Australian Museum, Northern Territory Museum of Arts and Sciences, and Division of Fisheries Research, CSIRO, Hobart.

The following abbreviations are used when citing institutions:

AMS	Australian Museum, Sydney
ANSP	Academy of Natural Sciences of Philadelphia
BMNH	British Museum (Natural History), London
CSIRO	Ian S. R. Munro Ichthyological Collection, Division of Fisheries Research, CSIRO, Hobart

KMNH	Kitakyushu Museum of Natural History, Kitakyushu, Japan
MNHN	Museum National d'Histoire Naturelle, Paris
MVM	Museum of Victoria, Melbourne
NTMAS	Northern Territory Museum of Arts and Sciences, Fannie Bay, Northern Territory
QM	Queensland Museum, Brisbane
USNM	United States National Museum of Natural History, Washington, D.C.
WAM	Western Australian Museum, Perth
YCM	Yokosuka City Museum, Yokosuka, Japan

Taxonomic Characters

The following characters were examined and assessed for taxonomic value in defining the Australian species of leiognathid.

Meristic characters

Fin spine and ray counts are constant throughout the family (dorsal fin VIII, 16; anal fin III, 14). Vertebral counts (taken from radiographs) are constant (10+14) in all species examined. Gill-raker counts show a large degree of overlap between species although the size and shape of rakers differ to some extent. Lateral line scale counts have been used by some authors to characterize species, but leiognathid scales are small and very easily shed so accurate counts are extremely difficult to obtain.

Table 1. Chest and suborbital squamation patterns of species

Scales present on chest	Scales absent on chest	Scales present on suborbital	Scales absent on suborbital
L. aureus	*G. minuta*	*L. blochii*[A]	*G. minuta*
L. bindus	*L. decorus*	*L. elongatus*[B]	*L. aureus*
L. blochii	*L. equulus*	*L. moretoniensis*	*L. bindus*
L. elongatus	*L. fasciatus*	*S. ruconius*	*L. decorus*
L. leuciscus	*L. smithursti*		*L. equulus*
L. moretoniensis			*L. fasciatus*
L. splendens			*L. leuciscus*
Leiognathus sp.[A]			*L. smithursti*
S. insidiator			*L. splendens*
S. ruconius			*Leiognathus* sp.
			S. insidiator

[A] Partial coverage only. [B] Absent in trawled specimens.

Body colour and pigmentation pattern

Body colour pattern is generally a good taxonomic character in fresh specimens. Preservation in formalin or alcohol results in loss of colour although pigmentation patterns are usually retained to some extent.

Body proportions

Body depth relative to standard length is a useful character for separating many species, but growth in some species is strongly allometric so comparisons of values must be analysed in relation to specimen size. Proportionate lengths of second dorsal and anal fin spines in relation to body depth are also important characters, but care must be taken to ensure that the spines have not been broken.

Distribution of scales

The presence or absence of scales on the suborbital region and the distribution of scales over the chest are important characters for identifying some species (see Table 1). Because scales are so frequently lost

during capture, care must be taken to examine the area for the presence or absence of scale pockets. These can usually be seen by running a probe anteriorly against the lay of the scales so that the pockets are raised. Dampening the area facilitates examination.

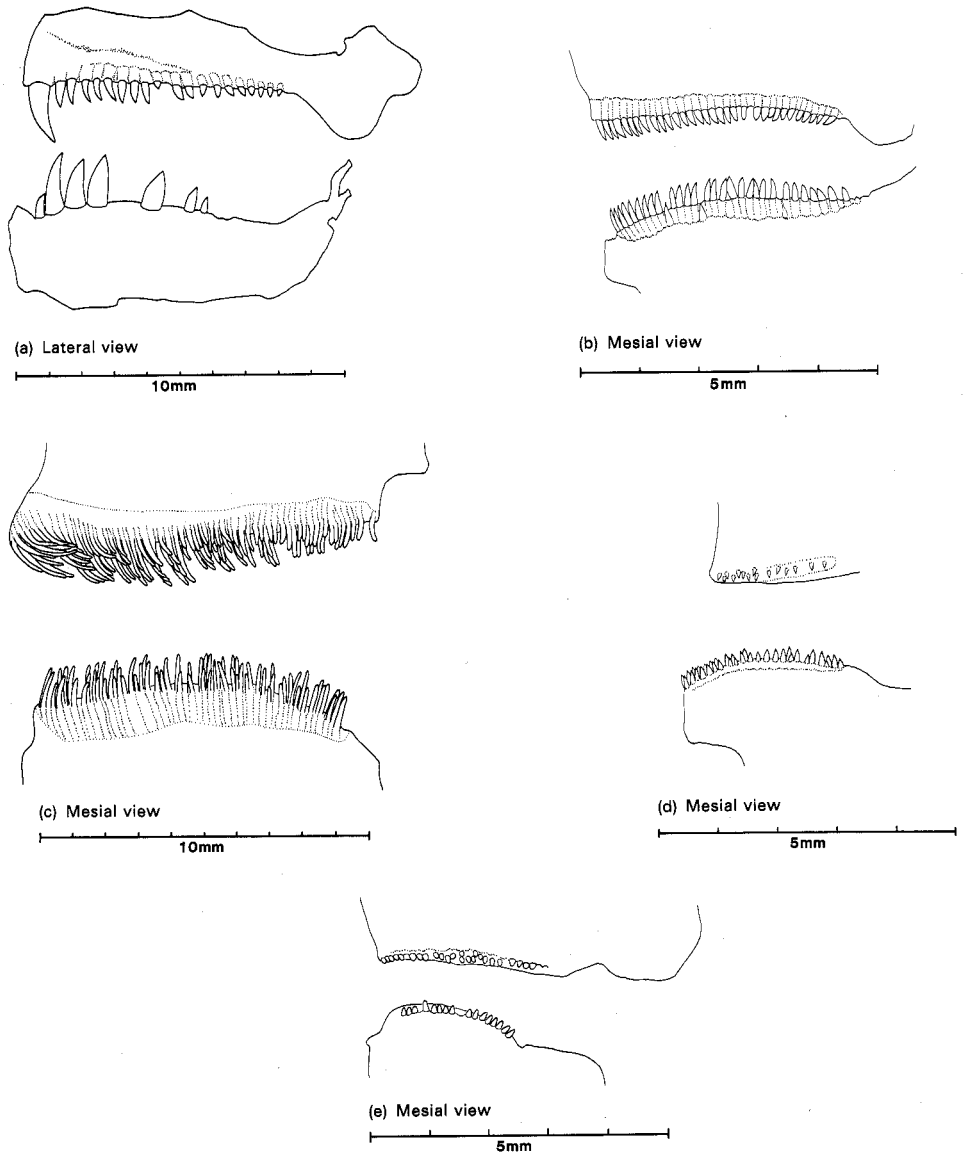


Fig. 1. Half-jaw dentition of species groups (refer to Table 2).

Teeth

Tooth shape has commonly been used to separate members of the genus *Gazza* (which has large canine teeth) from the other leiognathids (which have small weak teeth). Distinctive differences in tooth shape and arrangement, however, are also evident between other groups of species (see Fig. 1 and Table 2).

Microscopic examination of the teeth is usually necessary to detect these differences. Dissection of the jaws may facilitate examination.

Otoliths

Only ill-defined groups of species can be recognized on the basis of sagittal otolith shape and form, although several species possess distinctive features. Fig. 2*a* illustrates the most common otolith type, which is found in the following species: *G. minuta*, *L. aureus*, *L. bindus*, *L. blochii*, *L. elongatus*, *L. leuciscus*, *L. moretoniensis*, *L. splendens* and *S. insidiator*. *S. ruconius* is characterized by an almost circular otolith (Fig. 2*b*) and *L. decorus* is unusual in having striking ornamentation in the form of flanges projecting from the keel of the otolith (Fig. 2*c*). The remaining species (*L. equulus*, *L. fasciatus*, *L. smithursti* and *Leiognathus* sp.) are characterized by elongate otoliths, as illustrated in Fig. 2*d*.

Table 2. Tooth shape and arrangement of species groups

Fig.	Tooth shape and arrangement	Species
1*a*	Teeth arranged in single row in each jaw; pair of symphysial canines in upper jaw; teeth in lower jaw becoming caniniform anteriorly	*G. minuta*
1*b*	Single row of uniform, conical teeth in each jaw	*L. aureus* *L. bindus*
1*c*	Band of villiform teeth in each jaw (young specimens with only single row of teeth laterally)	*L. blochii* *L. decorus* *L. equulus* *L. fasciatus* *L. leuciscus* *L. moretoniensis* *L. smithursti* *L. splendens* *Leiognathus* sp.
1*d*	1-2 rows of small conical teeth anteriorly in each jaw; upper jaw teeth smaller than those in lower jaw	*L. elongatus*
1*e*	Teeth minute (visible only microscopically); blunt coniform, arranged in 1-2 irregular rows in each jaw; upper jaw teeth smaller than those in lower jaw, and concealed behind rim of premaxilla	*S. insidiator* *S. ruconius*

Other characters

Other taxonomic characters commonly cited in the leiognathid literature include the degree of concavity of the lower jaw, shape of the dorsal profile, configuration of head ridges, and degree of serration of the pre-opercle. These are largely subjective characters and do not provide a satisfactory basis for the identification of species. Haneda and Tsuji (1976) have reported morphological differences between the internal light-organ systems of several species of leiognathid. Extension of this research could provide an adjunct to the diagnosis and identification of species.

Fig. 3 illustrates some of the taxonomic characters referred to above and in the identification key.

Measurements and Counts

The following measurements are used throughout this paper:

Standard length (S.L.): the distance from the tip of the snout to the caudal base (hypural joint). The fleshy part of the lips is not included in this measurement because of the difficulty in ensuring that the mouthparts are fully retracted.

Body depth: the maximum vertical dorsoventral measurement of the body, usually taken from the middle of the spinous dorsal fin.

Gill-raker formula: $(x_1 - x_2) + (y_1 - y_2) = A - B$. This refers to the number of rakers (including rudiments) present on the first gill arch. The range of counts on the upper limb is indicated by $(x_1 - x_2)$; lower limb counts are indicated by $(y_1 - y_2)$. Gill rakers that straddle the angle of the arch are included in the count of the lower limb. $A - B$ indicates the most common range of values for the total gill-raker count for the species.

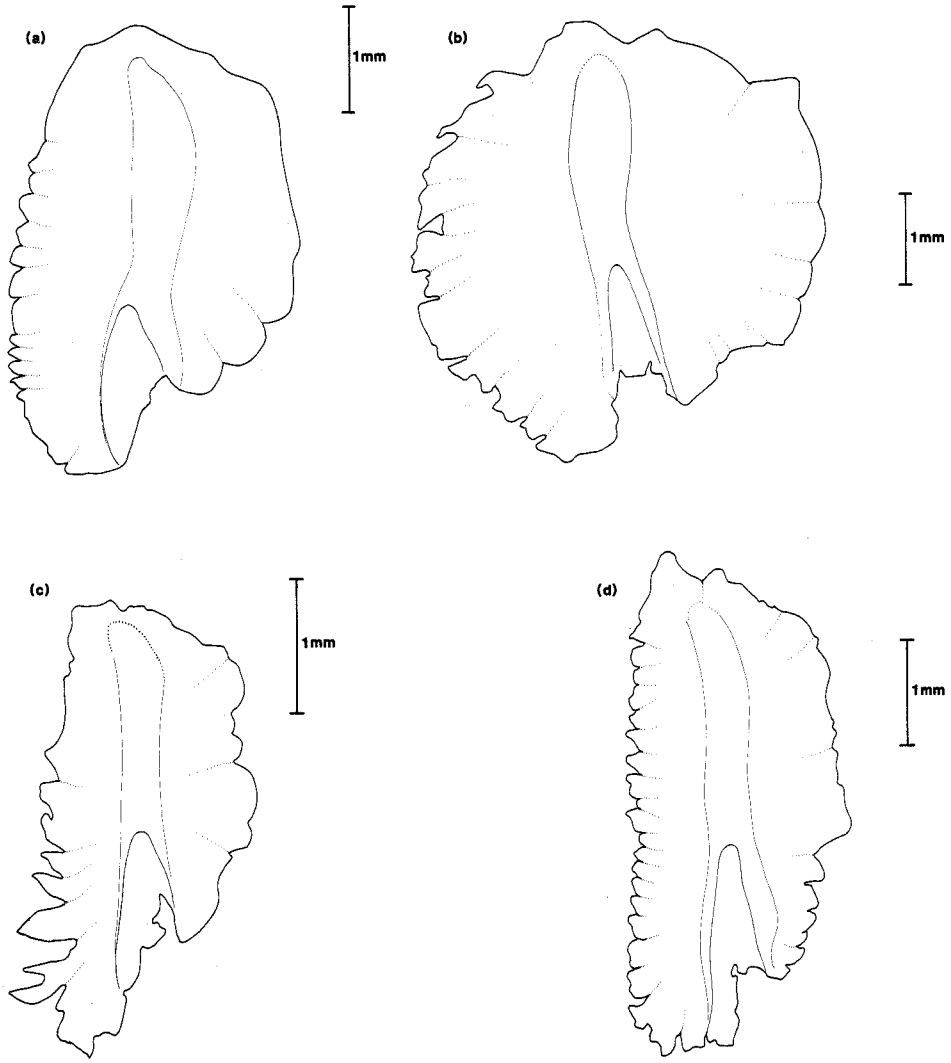


Fig. 2. Proximal view of sagittal otoliths of species groups (refer to p. 563).

Presentation

Abbreviated synonymies are listed for each species; these refer to the Australian and overseas papers dealing with the family and also include reference to type material wherever this was examined. The synonymies do not include *nomina nuda*.

Line drawings and colour descriptions of fresh specimens are presented for all species. [Colour plates are published in Sainsbury *et al.* (1985).] Body proportion measurements are graphed; other taxonomic characters are described in the text. Species of similar appearance that occur within Australian waters

are identified and their distinguishing features noted. Species distributions within Australian waters are mapped on the basis of museum and CSIRO collection records of specimens examined by the author. Species distributions outside Australian waters have not been included because of uncertainties in the identity of species reported in the literature. Depth ranges (based on collection data from R.V. *Soela*)

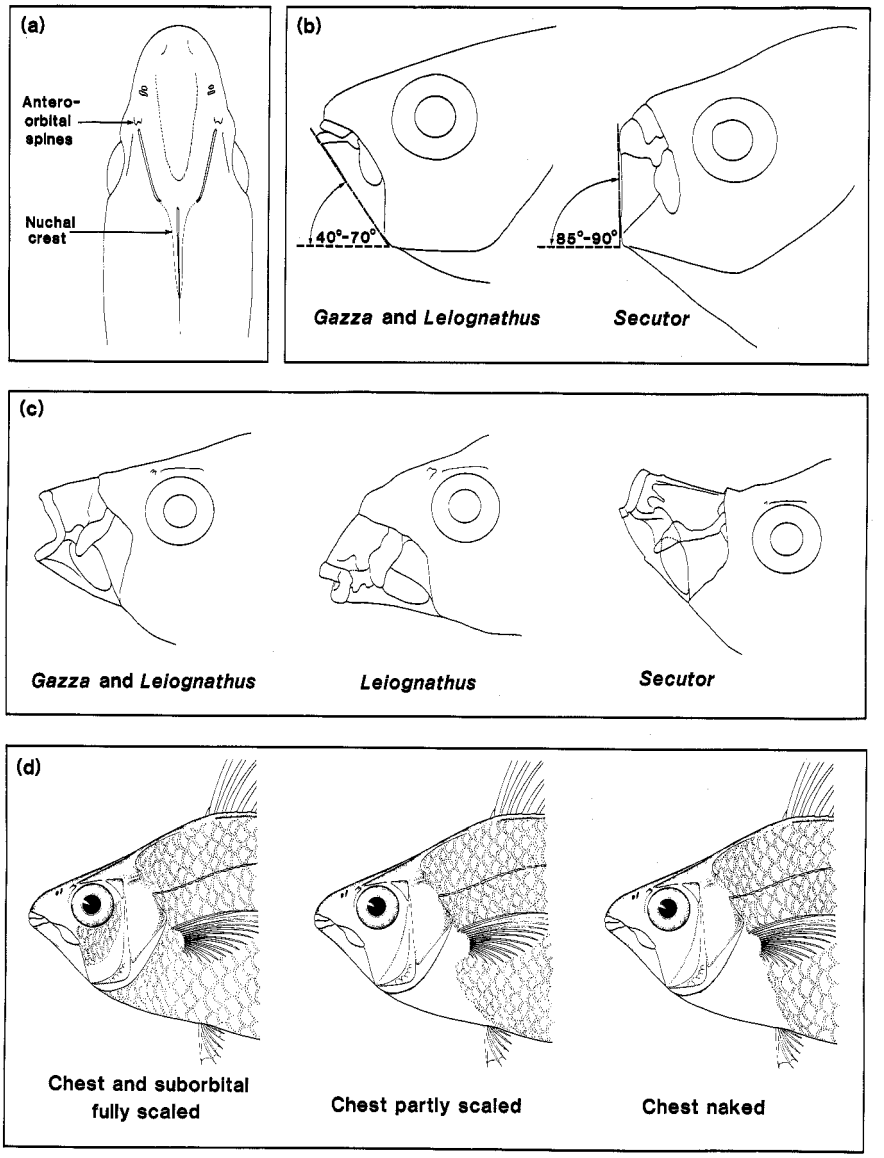


Fig. 3. Some taxonomic characters of leiognathids. (*a*) Dorsal view of head. (*b*) Angle formed by lower jaw. (*c*) Direction of protraction of mouthparts. (*d*) Chest and suborbital squamation.

are presented for all species. These ranges do not reflect occurrences in waters of less than 10 m depth. Each species is discussed in relation to accounts in the literature and to museum reference specimens. Material examined by the author is cited.

Taxonomy

Genera

In his revision of the family, James (1975) recognized three genera: *Leiognathus* Lacepède, 1803, *Secutor* Gistel, 1848 and *Gazza* Rüppell, 1835. Some publications still refer to the genus *Equula* Cuvier, 1817, but *Leiognathus* Lacepède, 1803 has priority.

The genus *Gazza* is universally accepted by recent authors and members of the genus are readily distinguished by their caniniform teeth. Authors differ, however, in separating or uniting *Secutor* with *Leiognathus*. The usual distinction between these genera is the direction of protraction of mouthparts, although authors differ in describing the direction as either upward or forward in *Secutor* and either downward or forward to downward in *Leiognathus*. James (1975) mentions differences in the number of antero-orbital spines between *Secutor* (one spine) and *Leiognathus* (two spines), although Monkolprasit (1973) presents data that are inconsistent with this.

Pauly and Wade-Pauly (1981) suggested that the recently described species *Leiognathus hataii* Abe & Haneda, 1972 and *Leiognathus aureus* Abe & Haneda, 1972 should be assigned to the genus *Secutor*, although they did not present reasons. In a personal communication, Pauly stated that his opinions were based on considerations of body shape and diet (*Leiognathus* species being predominantly benthivores, whereas *Secutor* are zooplanktivores), and he considered the forward rather than downward protraction of the mouthparts further grounds for the inclusion of these species in the genus *Secutor*. On the basis of these criteria, the widely recognized species *Leiognathus bindus* would presumably also be considered a member of *Secutor*, as it is a zooplanktivore and has forward protracting mouthparts.

Several characters were examined during the present study in an attempt to augment present generic definitions. Species could be variously grouped, but most of these associations reflected single characters only (e.g. distribution of scales over the body). The species groups so formed are considered unlikely to reflect natural assemblages — it seems more likely that similar characters have evolved independently several times within the family.

Groups based on dentition conform to some extent to the three commonly recognized genera, with members of *Gazza* and *Secutor* forming distinct groups and most members of *Leiognathus* clustering together (see Table 2). A fourth group, which does not correspond to a recognized genus, consists of *L. bindus* and *L. aureus*, which are both characterized by a single row of distinctive uniform teeth in each jaw. On the basis of dentition and direction of protraction of mouthparts, there appears to be some ground for separating these species from the genus *Leiognathus*. Until a more comprehensive revision of the family is undertaken, however, the present paper recognizes the genera *Gazza*, *Leiognathus* and *Secutor* in accordance with the existing literature.

Key to the Australian Species of the Family Leiognathidae

1. Mouthparts protract upwards (Fig. 3*c*); lower jaw ascends at angle of approx. 85–90° when mouth closed (Fig. 3*b*); ventral profile of body more convex than dorsal profile; upper half of body with pearly blue markings when fresh ..... *Secutor* 3
   Mouthparts protract forwards to downwards; lower jaw ascends at angle of approx. 40–70° when mouth closed; dorsal profile of body either equal to or more convex than ventral profile; upper half of body with dusky markings when fresh 2
2(1). Canine teeth present anteriorly in each jaw (Fig. 1*a*) ..... *Gazza minuta* (p. 569)
   Teeth small and weak, no canines present ..... *Leiognathus* 4
3(1). Body shape disc-like (body depth 57–68% of S.L.); scales present on suborbital*; body scales large, approx. 10–12 rows from pectoral fin base to ventral fin ..... *S. ruconius* (p. 608)

* Microscopic examination necessary.

Body shape variable, from rectangular to almost circular (body depth 39–60% of S.L.); suborbital naked; body scales small, approx. 23–25 rows from pectoral fin base to ventral fin ..... *S. insidiator* (p. 605)

4(2). Brown blotch across nape 5
No brown blotch across nape 6

5(4). Chest fully scaled; upper half of body with irregular brown blotches ..... *L. blochii* (p. 576)
Chest naked; upper half of body with dark brown wavy to zig-zag vertical lines ..... *L. decorus* (p. 578)

6(4). Body very elongate, body depth less than 31% of S.L.; snout sharp, pointed; chest fully scaled ..... *L. elongatus* (p. 581)
Body somewhat elongate or not, body depth more than 33% of S.L. (if less than 33%, scales only partly covering chest — see Fig. 3*d*); snout slightly rounded at tip; chest naked or scaled 7

7(6). Protracted mouthparts point forwards (occasionally slightly downwards); teeth arranged in single row in each jaw (Fig. 1*b*) 8
Protracted mouthparts point downwards; teeth arranged in villiform bands in each jaw (young specimens may have only single row of teeth laterally) (Fig. 1*c*) 9

8(7). Body circular to ovate, body depth 44–58% of S.L.; outer half of spinous dorsal fin yellow-orange in fresh specimens; upper half of body with short irregular wavy markings ..... *L. bindus* (p. 573)
Body elongate, body depth 35–43% of S.L.; fins colourless, upper half of body with irregular blotches and marbling ..... *L. aureus* (p. 571)

9(7). Scales absent anterior to line between pectoral and ventral fins 10
Scales either partly or entirely covering chest (Fig. 3*d*) 13

10(9). Second dorsal spine distinctly elongated (greater than $\frac{2}{3}$ body depth) 11
Second dorsal spine not elongated (approx. equal to or less than half body depth) 12

11(10). Second anal spine elongated (more than 60% of body depth); upper half of body with faint horizontal streaks ..... *L. smithursti* (p. 597)
Second anal spine not distinctly elongated (less than 50% of body depth); upper half of body with faint vertical bars, sometimes breaking into spots laterally ..... *L. fasciatus* (p. 587)

12(10). Upper half of body with close-set narrow vertical bars, sometimes indistinct or scribbled; gill rakers 18–21; body depth 47–65% of S.L. ..... *L. equulus* (p. 584)
Upper half of body with widely spaced wavy to zig-zag vertical bars; gill rakers 21–24; body depth 43–55% of S.L. ..... *L. decorus* (p. 578)

13(9). Scales present on suborbital; irregular markings on back giving way laterally to broken zig-zag lines over lateral line ..... *L. moretoniensis* (p. 593)
Suborbital naked; body patterning other than zig-zag lines 14

14(13). Distinct black blotch on outer half of spinous dorsal fin; second dorsal spine not elongate (less than half body depth); line of closed mouth passes below eye; wavy vertical lines on upper half of body ..... *L. splendens* (p. 599)
No black blotch on dorsal fin; second dorsal spine somewhat elongate (approx. equal to or greater than body depth); line of closed mouth passes through eye; vermicular pattern on upper half of body 15

15(14). Chest fully scaled; fresh specimens with yellow blotches midlaterally; second anal spine of variable length (35–125% of body depth) ..... *L. leuciscus* (p. 590)
Scales partly covering chest (Fig. 3*d*); no yellow blotches midlaterally; second anal spine not elongate (less than 50% body depth) ..... *Leiognathus* sp. (p. 602)

Gazza Rüppell

Gazza Rüppell, 1835, p. 3. Type: *Gazza equulaeformis* Rüppell, 1835, by original designation [= *G. minuta* (Bloch)].

Diagnostic Characters

Mouthparts protract forwards; lower jaw ascends at angle of approx. 55–60° when mouth closed; 2 antero-orbital spines; teeth in each jaw well developed, not concealed by premaxilla, anterior teeth caniniform; dorsal and ventral profiles of body approximately equal.

Gazza minuta (Bloch)

(Fig. 4)

Scomber minutus Bloch, 1797, p. 110, fig. 2 (Malabar, India). No types in existence.
Gazza equulaeformis (Rüppell): Bleeker, 1853, p. 261.
Gazza argentaria (Forster): Bleeker, 1863, p. 242.
Equula dispar de Vis, 1884, p. 542 (Cape York, Queensland). Type in QM.
Gazza minuta: Weber and de Beaufort, 1931, p. 339–41; Munro, 1960, pp. 134–5, #858; Kuhlmorgen-Hille, 1974, Gaz. I; James, 1975, pp. 169–70.
Gazza dispar: Whitley, 1932, pp. 112–13.

Diagnosis

Body depth 38–52% of S.L. in specimens 25–150 mm S.L., percentage increasing slightly with length (Fig. 4*c*); chest and suborbital naked. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point forward; upper jaw with 2 symphysial canines, teeth in lower jaw becoming caniniform anteriorly (Fig. 1*a*); gill rakers approximately equal in length to gill lamellae, $4+(13–15)=17–19$.

Body silver, upper half with bronze vertical wavy lines; spinous dorsal fin with some black speckling, soft dorsal and anal fins with narrow black margins; other fins colourless.

Similar Species

Gazza minuta is the only species representing the genus in Australian waters, although *G. achlamys* Jordan & Starks occurs in Papua New Guinea. *Gazza minuta* can be distinguished from *G. achlamys* by the presence of scales anterior to a line from the front of the soft dorsal fin to the pectoral base in *G. minuta* (naked in *G. achlamys*) and usually by the more elongate body shape, finer serrations on the lower limb of the pre-opercle and larger tooth size (see Jordan and Starks 1917).

Distribution

Common throughout the coastal waters of northern Australia from Exmouth Gulf (W.A.) to Townsville (Qld), in depths of 15–75 m (see Fig. 4*b*).

Discussion

The species as described above is consistent with accounts of *G. minuta* in the literature. The holotype of *Equula dispar* de Vis (QM I.1701 Cape York, Queensland) is in poor condition but still clearly displays the characteristic features of the species and is regarded here as a synonym of *G. minuta*. Specimens identified by Bleeker as *G. equulaeformis* and *G. argentaria* (MVM 46452–3 and 46170–1, respectively) are recognized here as *G. minuta*. However, a specimen identified as *G. minuta* in Bleeker's collection (MVM 46169) represents *G. achlamys*.

Material Examined

Type-specimens: *Equula dispar* de Vis, holotype QM I.1701, Cape York, Qld.

Gazza minuta

AMS: B.8098 Madras, India; B.9964 Hood Lagoon, New Guinea; IA.4899 Somerset, Cape York, Qld; IA.2552 Pellew Group, Gulf of Carpentaria; IA.2656 Pellew Group, Gulf of Carpentaria; IB.143 Bali, Indonesia; IB.3083 Tubridge Ck, W.A.; IB.6566 Townsville, Qld; I.15557-127 16°45′S.,139°22′E.; I.16664-001 Madang Hbr, New Guinea; I.16667-001 Madang Hbr, New Guinea; I.20829-033 Lizard I., Qld; I.20904-020 Cape Ferguson, Qld; I.20907-033 S. Cooktown, Qld; I.20939-007 Eel Rf, Cape York, Qld; I.21611-001 NW. Shelf, W.A.; I.21841-006 11°32′S.,133°13′E.; I.22965-003 15°46′S.,122°50′E.; I.22983-003 14°29′S.,136°06′E.; I.23038-001 14°03′S.,124°05′E.

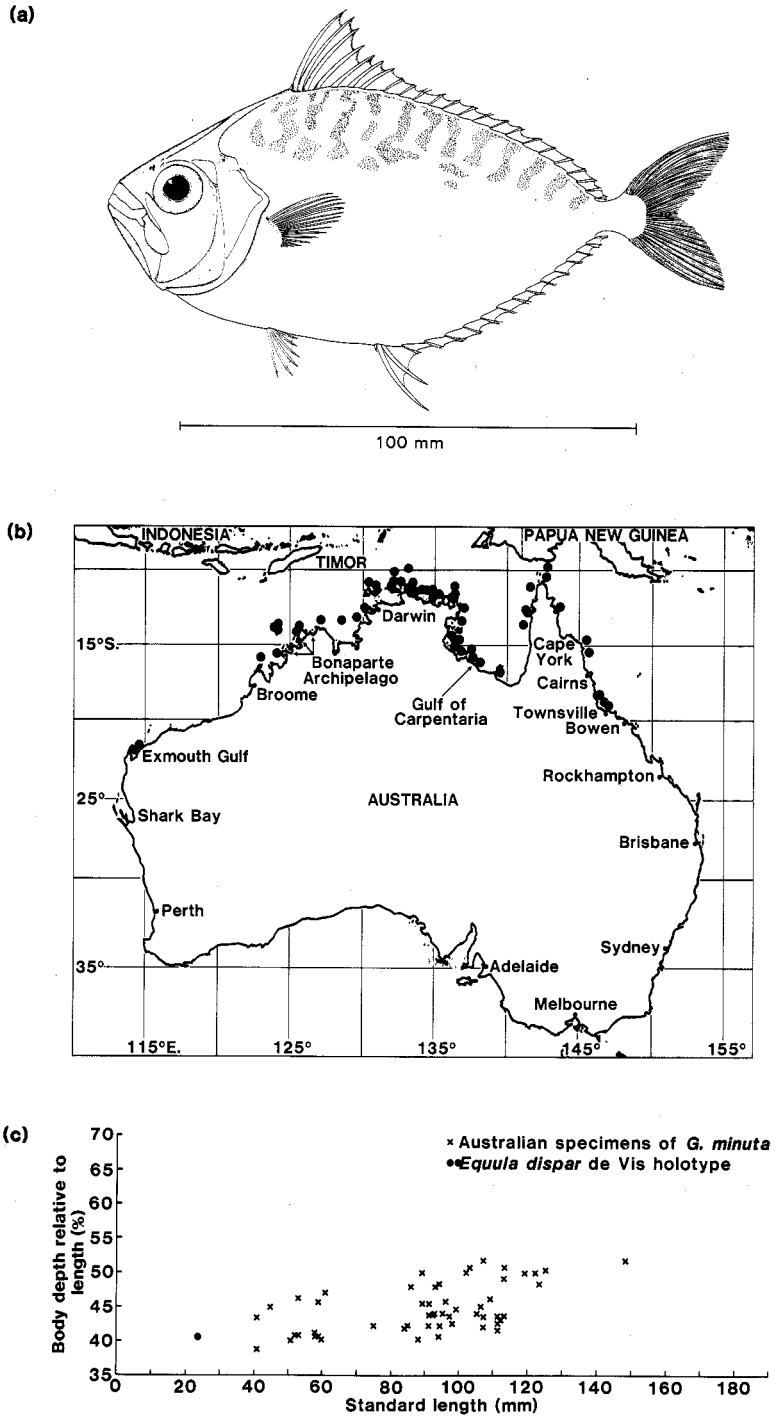


Fig. 4. (*a*) *Gazza minuta*. (*b*) Distribution records of *G. minuta* in Australia. (*c*) Body depth relative to standard length for *G. minuta*.

CSIRO: A.2350 16°59′S.,139°50′E.; A.4070 Bentinck I., Gulf of Carpentaria, Qld; B.304 Flying Fish Pt, Innisfail, Qld; B.2213 14°29′S.,136°06′E.; B.2214 14°03′S.,124°05′E.; C.3267 17°15′S.,139°45′E.; C.3398-3399 16°47′S.,139°51′E.; CA.437-438 16°09′S.,122°33′E.

MVM: 46452-3 E. Indian Archipelago; 46170-1 E. Indian Archipelago.

NTMAS: I.10276 Exmouth Gulf, W.A.; I.10802 Cleveland Bay, Qld; I.10803 Townsville, Qld; I.10804 Magnetic I., Qld; I.10805 Townsville, Qld; I.15605 12°31′S.,143°27′E.; I.15721 18°44′S.,146°31′E.; I.15878 Capt. Billy Ck, Qld; I.17651 Keats Islet, Torres Str., Qld; I.17652 Dalrymple Islet, Torres Str., Qld; I.17653 Aureed I., Torres Str., Qld; I.17654 9°49′S.,142°49′E.; I.17655 Torres Str., Qld.

WAM: P.5345-5346 Exmouth Gulf, W.A.; P.6093-6096 Exmouth Gulf, W.A.; P.12967-12968 Exmouth Gulf, W.A.; P.12970 Exmouth Gulf, W.A.; P.13292 Exmouth Gulf, W.A.

Gazza achlamys

AMS: I.9107 Normandy I., New Guinea.

CSIRO: A.20 Mambare R., New Guinea; A.22 Mambare R., New Guinea; A.173-178 Mambare Bay, New Guinea; A.222-238 Jacquinot Bay, New Britain; C. 797 Mambare R., New Guinea; C.920 Mambare R., New Guinea; C.1531 Jacquinot Bay, New Britain; C.1603 Mambare R., New Guinea.

MVM: 46169 E. Indian Archipelago.

QM: I.17880 Labu estuary, New Guinea.

Leiognathus (Lacepède)

Leiognathus Lacepède, 1803, vol. 4, p. 448. Type: *Leiognathus argenteus* Lacepède, 1803 [=*L. equulus* (Forsskål)], by monotypy.

Equula Cuvier, 1817, p. 323. Type: *Scomber equula* Forsskål, 1775, by original designation.

Leiognathus (*Equulites*) Fowler, 1904, p. 513. Type: *Leiognathus vermiculatus* Fowler, 1904, by original designation.

Leiognathus (*Eubleekeria*) Fowler, 1904, p. 516. Type: *Equula splendens* Cuvier, 1829, by original designation.

Leiognathus (*Aurigequula*) Fowler, 1918, p. 17. Type: *Clupea fasciata* Lacepède, 1803, by original designation.

Macilentichthys Whitley, 1932, pp. 114-15. Type: *Macilentichthys popei* Whitley, 1932, by original designation.

Diagnostic Characters

Mouthparts protract forwards to downwards; lower jaw ascends at angle of approx. 40-70° when mouth closed; 2 antero-orbital spines which may be fused superficially to resemble broad blade; teeth usually arranged in villiform band in each jaw or sometimes in single row of uniform conical teeth; no canines; teeth not concealed by rim of premaxilla; dorsal and ventral profiles of body usually approximately equal, or dorsal profile more convex than ventral.

Leiognathus aureus Abe & Haneda

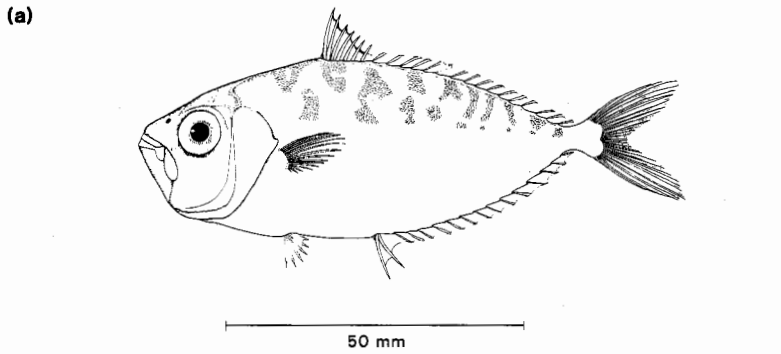
(Fig. 5)

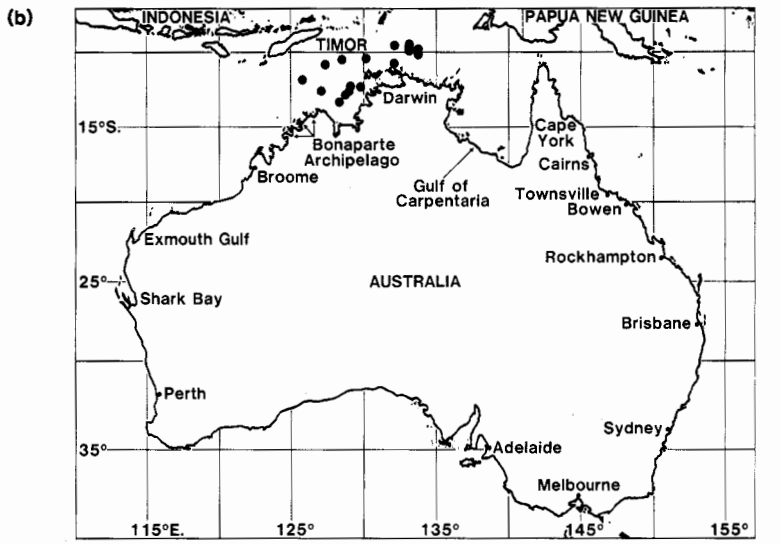
Leiognathus aureus Abe & Haneda, 1972, pp. 3-5 (Ambon, Indonesia). Type in Zool. Inst. Uni. Tokyo.

Diagnosis

Body depth 35-43% of S.L. in specimens 30-80 mm S.L. (Fig. 5*c*); chest fully scaled, suborbital naked. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point forwards; single row of small uniform teeth in each jaw (Fig. 1*b*); gill rakers slender, more than half length of gill lamellae, (4-5)+(14-17)=19-22.

Body silver, upper half with irregular grey-brown blotches and marbling; outer half of spinous dorsal fin pale yellow, margin speckled black; other fins colourless.





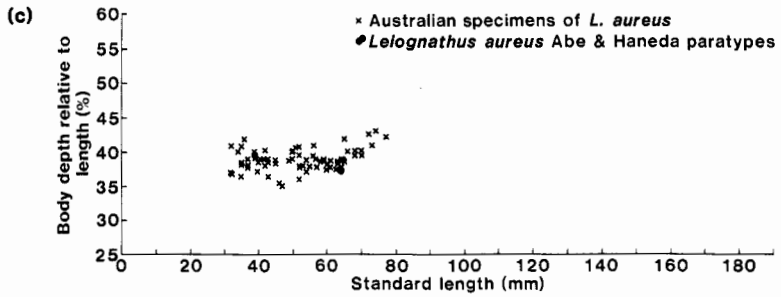


Fig. 5. (*a*) *Leiognathus aureus*. (*b*) Distribution records of *L. aureus* in Australia. (*c*) Body depth relative to standard length for *L. aureus*.

Similar Species

L. aureus closely resembles young specimens of *G. minuta* in general body form, but can readily be distinguished from them by the absence of canine teeth.

Distribution

Restricted to an area off north-western Australia between the Bonaparte Archipelago (W.A.) and the Wessel Islands (N.T.), extending seawards towards Timor (see Fig. 5*b*). Depth records for the species range from 70 to 140 m.

Discussion

The species as described above is consistent with Abe and Haneda's (1972) account of *L. aureus*, and examination of representatives from their collection confirms the identity of the Australian specimens. However, the colour description by Abe and Haneda (body with 'about a dozen wavy dark vertical lines on the back') could better be given for the Australian specimens as upper half of body with irregular blotches and marbling. In addition, the short black line at the base of the caudal fin, which the authors stress is very distinct, is obscure in fresh specimens and is only sometimes apparent in preserved material.

Although the gill rakers of the first arch are described by Abe and Haneda as being 'short, much shorter than the gill lamellae', they are still somewhat longer than half the length of the lamellae, and therefore longer than in many species of leiognathid. Similarly, the teeth are described as being 'well separated', and although the teeth in *L. aureus* form a single row of clearly defined teeth (rather than the crowded villiform series of most leiognathids), the teeth are actually closely adjacent.

Material Examined

Type-specimens: *Leiognathus aureus* Abe & Haneda, paratypes YCM-HLP 305 (two specimens) Ambon, Indonesia.

Leiognathus aureus

AMS: I.12836-003 10°53′S.,132°02′E.; I.23034-001 13°16′S.,128°21′E.; I.23045-001 9°56′S.,133°56′E.
CSIRO: B.2150 10°15′S.,130°02′E.; B.2211 11°55′S.,125°58′E.; B.2212 9°21′S.,133°12′E.
NTMAS: S.10520-001 9°56′S.,133°56′E.

Leiognathus bindus (Valenciennes)

(Fig. 6)

Equula bindus Valenciennes, in Cuvier and Valenciennes, 1835, p. 78 (described from an account and figure in Russell, 1803, pl. 64). No types in existence.
Equula brevirostris Valenciennes, in Cuvier and Valenciennes, 1835, p. 83 (Malabar, India). Types in MNHN.
Equula lineolata Valenciennes, in Cuvier and Valenciennes, 1835, p. 86 (Java, Indonesia). Types in MNHN.
Leiognathus virgatus Fowler, 1904, p. 515, pl. 15 (Padang, Sumatra). Type in ANSP.
Equulites virgatus: Whitley, 1932, pp. 108–9.
Leiognathus bindus: Weber and de Beaufort, 1931, pp. 334–5; Kuhlmorgen-Hille, 1974, Leiog. 1; James, 1975, pp. 153–4.
Equulites bindus: Munro, 1960, p. 137, #867.

Diagnosis

Body depth 44–58% of S.L. in specimens 20–100 mm S.L., percentage increasing slightly with length (Fig. 6*c*); chest fully scaled, suborbital naked. Second spines of dorsal and anal

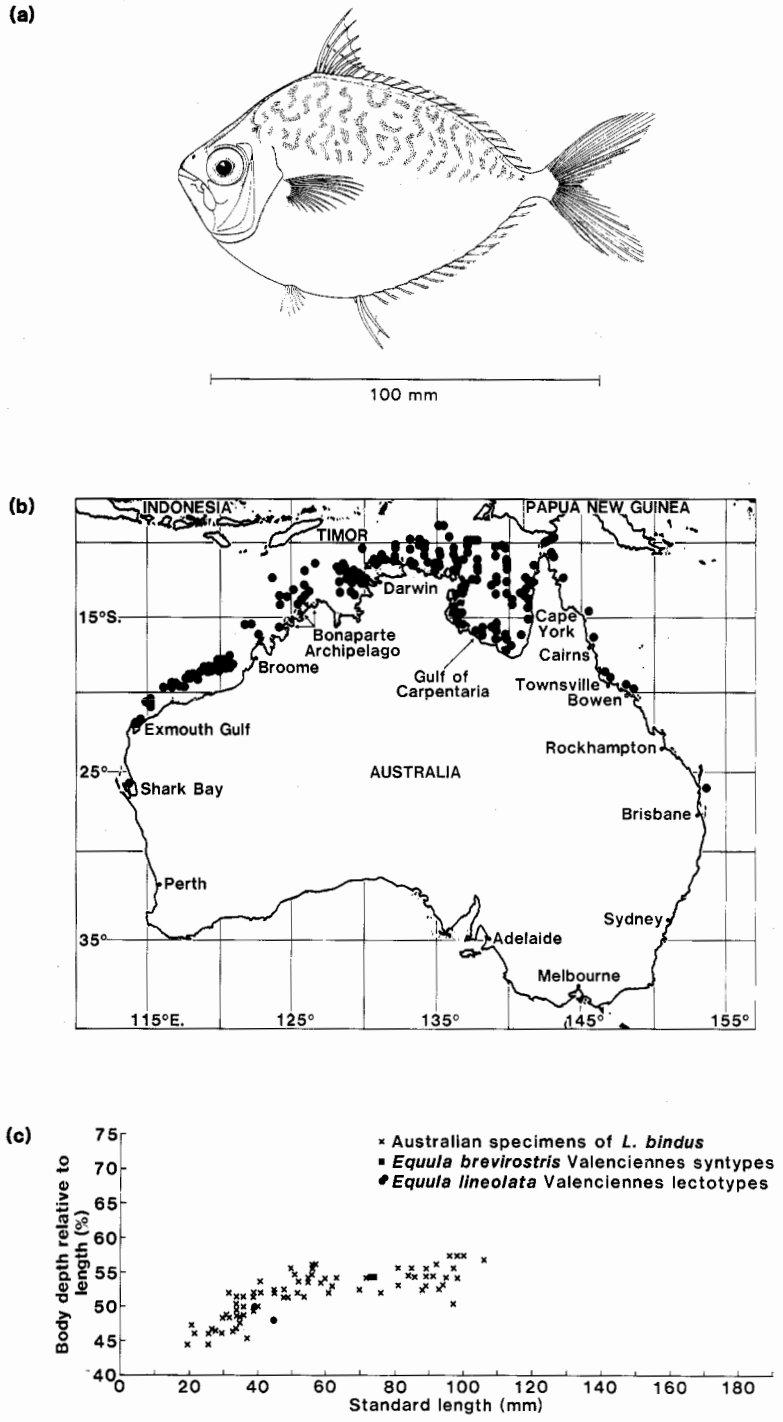


Fig. 6. (*a*) *Leiognathus bindus*. (*b*) Distribution records of *L. bindus* in Australia. (*c*) Body depth relative to standard length for *L. bindus*.

fins not elongate. Protracted mouthparts point forward to slightly downward; single row of uniform conical teeth in each jaw (Fig. 1*b*); gill rakers long and slender, approx. equal in length to gill lamellae, (5–6) + (15–19) = 20–25.

Body silver, upper half with short irregular grey-brown wavy lines; outer half of spinous dorsal fin pale yellow to bright orange; some yellow-orange colour occasionally present on spinous anal fin; other fins colourless.

Similar Species

The orange blotch on the dorsal fin is unique to *L. bindus*, but is not always evident as fin membranes are often damaged during capture and colour is lost on preservation. *L. bindus* sometimes resembles *S. ruconius* in general body shape, but can readily be distinguished from it by having forward (rather than upward) protracting mouthparts, two (rather than one) antero-orbital spines, and suborbital without scales. *L. aureus* resembles *L. bindus* in having forward protracting mouthparts and a single row of small uniform teeth in each jaw. However, differences in body proportions provide a simple means of distinguishing these species.

Distribution

Very common throughout northern Australian waters from Shark Bay (W.A.) to Bundaberg (Qld), in depths of 10–160 m (see Fig. 6*b*).

Discussion

The species as described above is consistent with accounts of *L. bindus* in the literature, although the colour of the dorsal fin in the Australian specimens is somewhat variable, ranging from the distinct orange blotch usually referred to in the literature to pale yellow.

Of the Australian species, only *L. bindus* and *L. aureus* are characterized by dentition consisting of a single row of small, even teeth. This distinctive feature has generally been overlooked.

Valenciennes' original description of *Equula bindus* was based on a figure and description given by Russell (1803) of his Zeus Bindoo-karah. Although no type-specimens exist, there can be little doubt concerning the identity of the species as it is portrayed as having an orange tip on the dorsal fin, and forward protracting mouthparts.

I have examined the syntypes of Valenciennes' *Equula brevirostris* and find them to be consistent with *L. bindus*. The two specimens (MNHN A.6763) are in good condition. They both measure 74 mm S.L. and have a body depth of 54% of S.L. The body pigmentation pattern is somewhat faded, but irregular short wavy lines are still visible on the upper half of the body. The mouthparts protract forward to slightly downward and the small conical teeth are arranged in a single row in each jaw. The chest region is fully scaled.

Accounts of *L. brevirostris* in the literature [including Weber and de Beaufort (1931), James (1975), Kuhlmorgen-Hille (1974), and others] do not refer to this species (see discussion p. 580).

Examination of the type series of Valenciennes' *Equula lineolata* (collected by Quoy and Gaimard from Java) reveals that a mixture of species is represented: MNHN 6739 consists of one specimen of *L. elongatus* (S.L. 31 mm, body depth 25% of S.L., specimen in poor condition), two specimens of *Gazza minuta* (S.L. 26 mm in both specimens, body depth 35 and 36% of S.L., specimens in fair condition) and one badly damaged specimen that could not be identified (S.L. 28 mm, body depth 33% of S.L.); MNHN 6738 consists of two specimens in fair condition, which represent *L. bindus*. These specimens measure 40 and 46 mm S.L.; their body depths are 51 and 48% of S.L., respectively. The mouthparts of both specimens are damaged, but the presence of a single row of uniform conical teeth in both jaws can still be readily seen. I therefore designate the two specimens registered as

MNHN 6738 as lectotypes of *E. lineolata* and regard this species then as a junior synonym of *L. bindus*.

Material Examined

Type-specimens: *Equula lineolata* Valenciennes, syntypes MNHN A.6738 (two specimens) Java, Indonesia; MNHN A.6739 (four specimens) Java, Indonesia. *Equula brevirostris* Valenciennes, syntypes MNHN A.6763 (two specimens) Malabar, India.

Leiognathus bindus

AMS: E.2529 Bowen, Qld; E.2717–2718 Bowen, Qld; E.2947 Double Island Pt, Qld; IA.4907 Bowen, Qld; I.15557-128 16°45′S.,140°03′E.; I.16014-004 north Qld; I.19294-005 Arafura Sea, N.T.; I.20402-046 Bonaparte Archipelago, N.T.; I.20826-016 Palm Islands, Qld; I.20828-013 Turtle Head I., Qld; I.20829-014 Lizard I., Qld; I.20923-016 Cape York, Qld; I.20939-006 Eel Rf, Cape York, Qld; I.21837-007 Arafura Sea, N.T.; I.22964-001 20°21′S.,114°58′E.; I.22977-001 18°40′S.,119°27′E.; I.22989-001 18°41′S.,119°27′E.; I.23036-001 12°20′S.,137°48′E.; I.23041-001 11°11′S.,136°23′E.

CSIRO: A.2227 17°25′S.,140°42′E.; A.2229 17°25′S.,140°42′E.; A.2284–2285 17°15′S.,140°29′E.; A.2336 17°02′S.,140°17′E.; A.2359 16°57′S.,139°40′E.; A.2447 16°39′S.,140°05′E.; A.2470–2472 16°57′S.,139°24′E.; A.2718 Melville Bay, N.T.; A.2783 NW. coast, W.A.; A.2856 17°07′S.,140°45′E.; A.2890–2891 17°26′S.,140°36′E.; A.3110 Red Scar Bay, Papua; A.3195 16°54′S.,140°40′E.; A.3198 16°51′S.,140°40′E.; A.3254 17°08′S.,140°21′E.; A.4072 Fairway Buoy, Gulf of Carpentaria, Qld; B.2203 20°21′S.,114°58′E.; B.2204 12°37′S.,129°48′E.; C.4153 17 mile NE. Robinson R., Gulf of Carpentaria, N.T.; C.4209 30 miles W. Lakes I., Gulf of Carpentaria, N.T.; CA.212 20°45′S., 115°15′E.; CA.742 York I., Torres Str., Qld; CA.1072 11°02′S.,130°54′E.; CA.1078–1079 18°43′S.,119°25′E.

MVM: A.2015 10°27′S.,132°12′E.

NTMAS: S.10502-001 18°41′S.,119°27′E.; S.10506-001 12°37′S., 129°48′E.; S.10514-001 12°20′S., 137°48′E.

QM: I.11231 Magnetic I., Qld; I.15724 18°44′S.,146°31′E.; I.15753 16°10′S.,145°28′E.; I.15956 Princess Charlotte Bay, Qld; I.16154 10°55′S.,142°45′E.; I.16205 14°50′S.,145°17′E.; I.17681 Aureed I., Torres Str., Qld; I.17682 S. Caldbeck Rf, Torres Str., Qld; I.17683 Keats Islet, Torres Str., Qld; I.17684 9°39′S.,143°00′E.; I.17685 9°44′S.,142°51′E.; I.17686 9°51′S.,142°49′E.; I.17687 9°55′S., 142°42′E.; I.17688 9°58′S.,142°43′E.; I.18123 16°25′S.,145°31′E.; I.18152 12°35′S.,143°26′E.

WAM: P.6098 Exmouth Gulf, W.A.; P.12972 Albatross Bay, Qld; P.13282 Exmouth Gulf, W.A.; P.13294 Exmouth Gulf, W.A.; P.13387 Gulf of Carpentaria, N.T.; P.13405–13406 Gulf of Carpentaria, N.T.

Leiognathus blochii (Valenciennes)

(Fig. 7)

Equula blochii Valenciennes, in Cuvier and Valenciennes, 1835, p. 84 (Malabar, India). Types in MNHN.

Equula blochii: Day, 1976, p. 241.

Leiognathus blochi: Weber and de Beaufort, 1931, pp. 328–30.

Leiognathus blochii: James, 1975, pp. 157–9.

Diagnosis

Body depth 31–47% of S.L. in specimens 20–70 mm S.L., percentage increasing with length (Fig. 7*c*); chest fully scaled; distinctive wrinkled skin below and behind eye; thin scales sometimes present on suborbital below crenulation. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers slender, more than half length of gill lamellae, (5–6) + (11–13) = 16–19.

Body silver, upper half with irregular brown blotches, distinct brown blotch across nape (persistent in preserved material); spinous dorsal and anal fins with yellow streak at midheight, continued along margins of rays; other fins colourless.

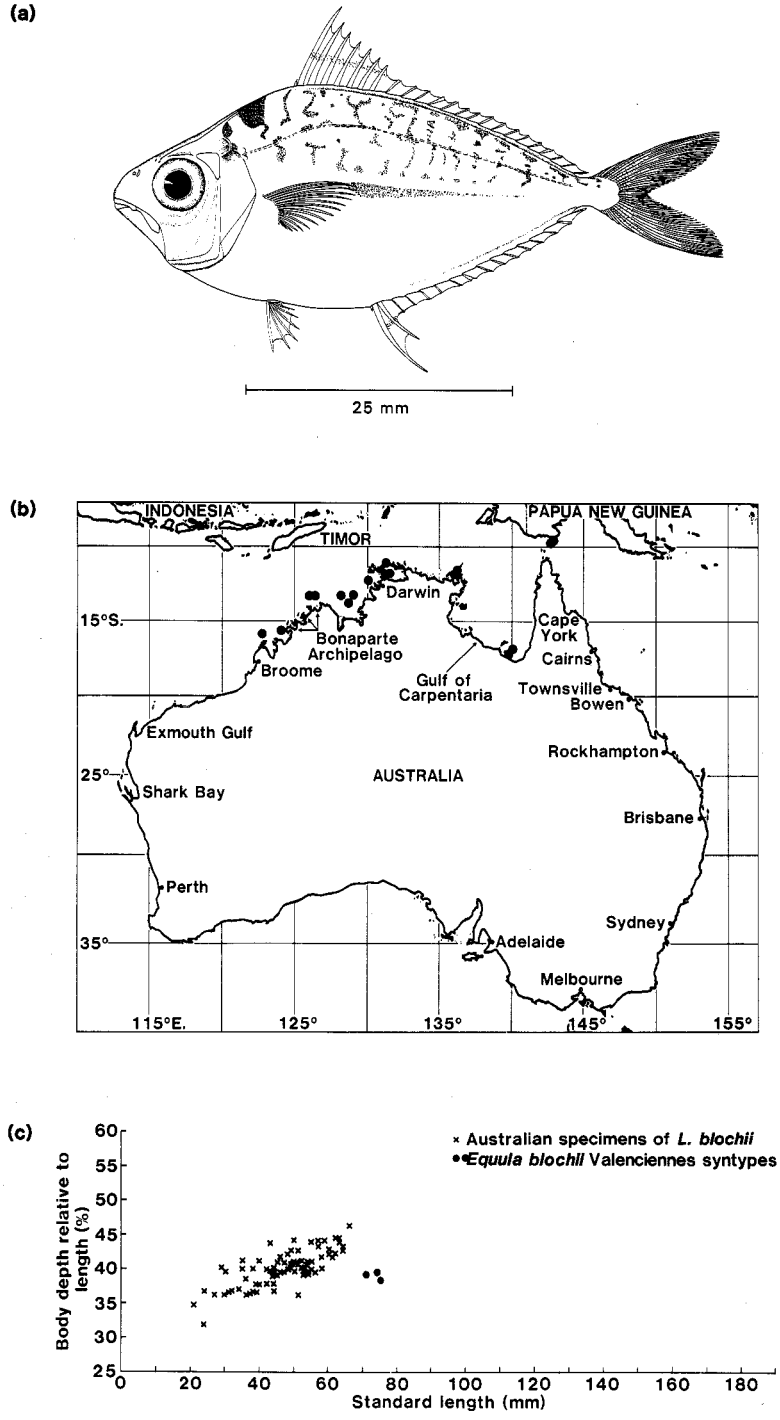


Fig. 7. (*a*) *Leiognathus blochii.* (*b*) Distribution records of *L. blochii* in Australia. (*c*) Body depth relative to standard length for *L. blochii.*

Similar Species

This species resembles *L. decorus* in general body form and in having a brown blotch across the nape, but can easily be distinguished from it by the presence of scales on the chest.

Distribution

Sparsely distributed in northern Australian waters from Broome (W.A.) to Torres Strait (Qld), in depths of 10–90 m (see Fig. 7*b*).

Discussion

The species as described above differs in some respects from accounts of *L. blochii* in the literature. Day (1876) and James (1975), for instance, describe *L. blochii* as having a distinct black blotch on the spinous dorsal fin, whereas in the Australian specimens the dorsal fin is colourless except for a yellow streak at midheight. [Day also describes the breast of *L. blochii* as naked, although Weber and de Beaufort (1931) state that an example from Day's collection has a fully scaled breast.] In addition, the Australian specimens are characterized by crenulation of the skin below and behind the eye, and usually by the presence of a few thin scales on the lower portion of the suborbital. Neither of these characters is mentioned in the literature.

The type-specimens of *Equula blochii* are slightly larger and proportionately more elongate than specimens from Australian waters attributed to this species; body depth as a percentage of S.L. of the three syntypes (measuring 69–74 mm S.L.) ranges from 37 to 39%. The body pigmentation pattern of these specimens has mostly faded, although the dark blotch across the nape is still clearly visible. The chest regions of the specimens are scaled, although, unlike the Australian specimens, the suborbital appears smooth and naked. These differences, however, are not considered sufficient, at this stage, to warrant recognition of the Australian form as a separate species.

Material Examined

Type-specimens: *Equula blochii* Valenciennes, syntypes MNHN A.6757 (one specimen) Malabar, India; MNHN A.6759 (two specimens) Mahe, India.

Leiognathus blochii

AMS: I.22965-002 15°46′S.,122°50′E.; I.22966-001 15°30′S.,124°01′E.; I.23031-001 13°16′S., 128°21′E.; I.23032-001 13°18′S.,124°01′E.

CSIRO: A.2180–2183 17°15′S.,139°45′E.; A.2211 17°21′S.,139°35′E.; A.2286 17°15′S.,149°29′E.; A.2337 17°02′S.,140°17′E.; A.2440–2445 16°47′S.,139°51′E.; A.2705–2708 no locality, N.T.; A.4059–4066 Bountiful I., Gulf of Carpentaria, Qld; B.2179 14°20′S.,136°10′E.; B.2217 15°31′S.,124°02′E.; CA.441 16°09′S.,122°33′E.

NTMAS: S.10517-001 17°01′S.,139°58′E.

QM: I.17661 9°24′S.,142°54′E.; I.17662 9°26′S.,142°54′E.; I.17663 9°32′S.,142°47′E.; I.17663 9°32′S.,142°47′E.; I.17664 9°53′S.,142°45′E.

Leiognathus decorus (de Vis)

(Fig. 8)

Equula argentea de Vis, 1884, p. 542 (Cape York, Queensland). Type in QM. (Pre-occupied by *Leiognathus argenteus* Lacepède, 1803.)

Equula decora de Vis, 1884, p. 543 (Cape York, Queensland). Type in QM. Whitley, 1932, pp. 104–5.

Leiognathus devisi Whitley, 1929, p. 113. (New name for *Equula argentea* de Vis.)

Equula nuchalis: Munro, 1960, pp. 135–6, #862. (Not *E. nuchalis* Temminck & Schlegel.)

Leiognathus sp.: Kuhlmorgen-Hille, 1974, Leiog. 7.

Leiognathus brevirostris: James, 1975, pp. 159–61. (Not *Equula brevirostris* Valenciennes.)

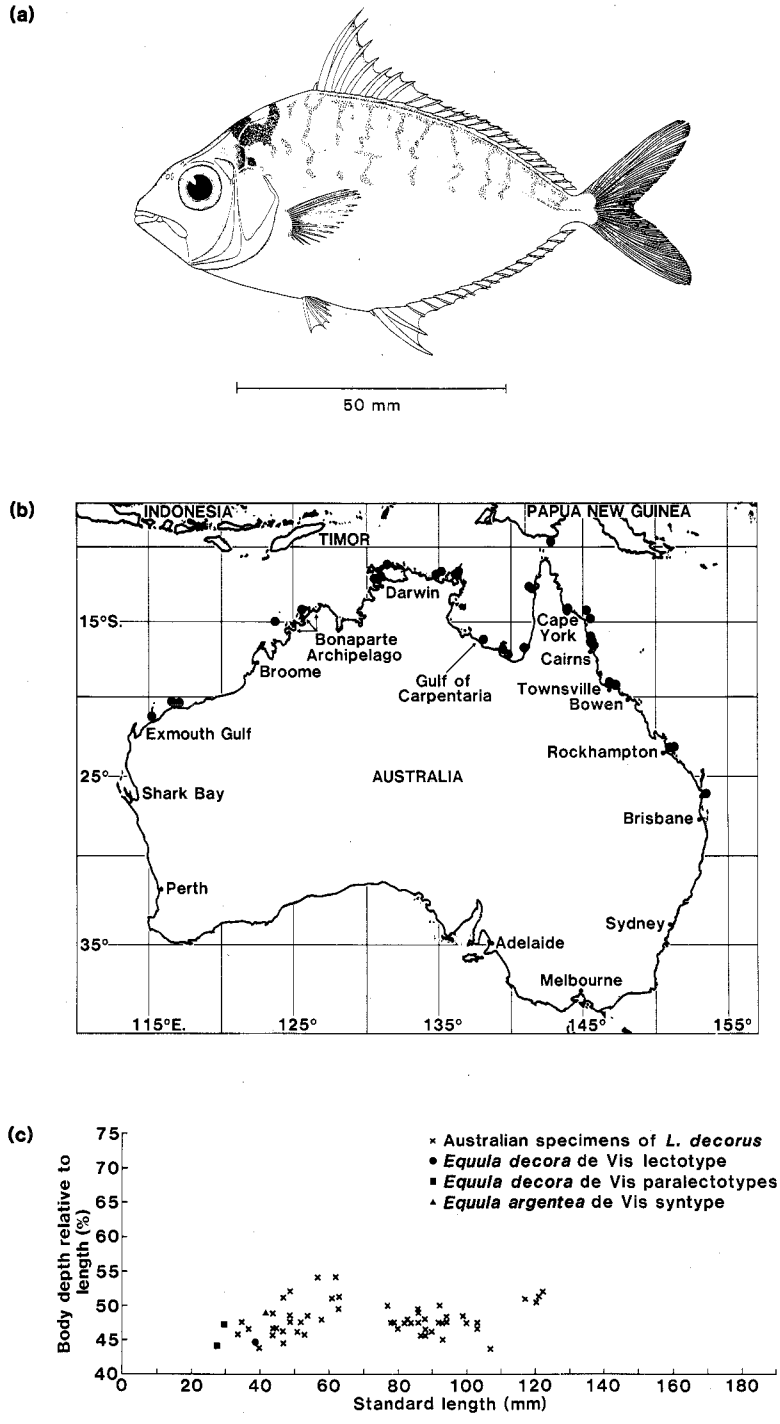


Fig. 8. (*a*) *Leiognathus decorus*. (*b*) Distribution records of *L. decorus* in Australia. (*c*) Body depth relative to standard length for *L. decorus*.

Diagnosis

Body depth 43–55% of S.L. in specimens 25–125 mm S.L. (Fig. 8*c*); chest and suborbital naked. Second spines of dorsal and anal fins not elongate (second dorsal spine approx. half body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers slightly less than half length of gill lamellae, (5–6) + (16–18) = 21–24.

Body silver, upper half with irregular dark brown wavy to zig-zag vertical lines; brown blotch across nape (blotch fading in preserved material), outer half of spinous dorsal and anal fins yellow, colour continued along margins of rays, caudal fin with dusky yellow margin; other fins colourless.

Similar Species

This species resembles *L. blochii* in general body form and in having a brown blotch across the nape, but can be distinguished from it by the absence of scales on the chest. Preserved specimens of *L. decorus* that have lost the nuchal blotch may resemble *L. equulus*, but can usually be distinguished from them by a combination of the differences in body proportions and gill-raker formulae.

Distribution

Moderately common throughout the coastal waters of northern Australia from Exmouth Gulf (W.A.) to Maryborough (Qld), in depths of 10–30 m (see Fig. 8*b*).

Discussion

There are several accounts in the literature of leiognathids that are characterized by a dark blotch on the nape, viz *Leiognathus brevirostris* (Kuhlmorgen-Hille 1974; James 1975), *Leiognathus* sp. (Leiog. 7) of Kuhlmorgen-Hille (1974), *Equula nuchalis* [Munro 1960; Bleeker (in Lamme 1975)] and *Leiognathus blochii* (James 1975). Examination of syntypes of Valenciennes' *Equula brevirostris* reveals that these specimens are quite different from the accounts of *L. brevirostris* in the literature. For example, James (1975) states that *L. brevirostris* has a naked chest and teeth arranged in villiform bands, whereas the syntypes of the species have a fully scaled chest, and teeth arranged in a single row in each jaw. Similarly, Kuhlmorgen-Hille's figure of *L. brevirostris* indicates a more elongate species (body depth approx. 40% of S.L.) than indicated by the syntypes (body depth 54% of S.L. in both specimens). In addition, the pigmentation pattern on the syntypes (which consists of short wavy lines and blotches) is inconsistent with either of the above authors' descriptions of the species. *Equula brevirostris* is recognized here as a junior synonym of *L. bindus* (Valenciennes).

The descriptions given by James (1975) for *L. brevirostris* and by Kuhlmorgen-Hille (1974) for *Leiognathus* sp. nov. (Leiog. 7) appear to refer to the one species. (The latter was 'to be shortly described by Kuhlmorgen-Hille' in 1974 but a description has not appeared.) These accounts are generally consistent with the Australian species recognized as *L. decorus*. The body patterning illustrated in Kuhlmorgen-Hille's figure of *Leiognathus* sp. corresponds well with that of *L. decorus* (with the exception that the Australian specimens do not have a yellow spot on the flanks), and the relative length of the second dorsal spine in body depth is also comparable.

Kuhlmorgen-Hille's account of *L. brevirostris* appears to refer to yet another species of *Leiognathus*. I have been unable to trace the specimens upon which this description was based, and there is a possibility that the description could refer to *L. blochii* (which has been recorded from this region by James) or to *L. nuchalis* (Temminck & Schlegel).

Specimens identified as *Equula nuchalis* from the Kitakyushu Museum, Japan, which I examined, are characterized by a dark blotch on the nape, a relatively short second dorsal

spine (approx. one-third body depth), a naked chest, and a distinct black blotch on the outer half of the spinous dorsal fin. Specimens of *L. nuchalis* held by AMS (I.13711) are consistent with the above material. This species is recognized as being distinct from *L. decorus*.

Specimens identified by Munro (1960) as *E. nuchalis* are examples of *L. decorus*.

Equula decora de Vis was originally described from six specimens collected from Cape York, Queensland. All pigmentation has been lost from the type material, but the species was originally described as having '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'. Although no mention is made of a nuchal blotch, this pigmentation often fades on preservation, leaving only the more persistent vertical bands across the back. The body proportions of the type-specimens are consistent with the species as described above. *Leiognathus devisi* Whitley, 1929 (a new name given to de Vis' *Equula argentea*, due to preoccupation of the name by Lacepède's *L. argenteus*) was regarded by Whitley (1932) as a synonym of *E. decora*. The type material of de Vis' *E. argentea* is in poor condition, but appears to be consistent with specimens of *E. decora* and is here also regarded as a synonym of *L. decorus*.

Material Examined

Type-specimens: *Equula decora* de Vis, lectotype QM I.1698 Cape York, Queensland; paralectotypes QM I.4877 Cape York, Queensland. *Equula argentea* de Vis, holotype QM I.1699 Cape York, Queensland.

Leiognathus decorus

AMS: IA.7502–7503 Lindeman I., Qld.; IB.1244–1245 Fitzroy R., Qld.; IB.1257 Fitzroy R., Qld.; IB.3000 Exmouth Gulf, WA; IB.7241 Keppel Group, Qld.; I.397 10°42′S.,153°01′E.; I.15704 14°13′S.,144°07′E.; I.20402-043 Bonaparte Archipelago, W.A.; I.20829-019 Lizard I., Qld.; I.21957-006 Arafura Sea, N.T.; I.22990-002 17°01′S.,139°58′E.; I.23040-001 11°55′S.,131°36′E.

CSIRO: A.1227 Proserpine, Qld; A.1899 Moreton Bay, Qld; A.2236 17°25′S.,140°42′E.; A.2237 16°53′S.,140°55′E.; A.2250 17°36′S.,140°16′E.; A.2500–2501 16°53′S.,139°21′E.; A.2587 Northern Territory; A2592 Northern Territory; A.2704 Northern Territory; A2719 Melville Bay, N.T.; A.2800 17°21′S.,140°24′E.; A.4096 Fairway Buoy, Gulf of Carpentaria, Qld; A4098–4099 Fairway Buoy, Gulf of Carpentaria, Qld; C.2796 Exmouth Gulf, W.A.; C.3266 17°00′S.,139°45′E.; C.3426–3427 16°57′S.,139°24′E.; C.3638 16°56′S.,140°41′E.; C.3644–3645 16°56′S.,140°41′E.; C.4027 16°54′S.,140°44′E.; CA.2694 14°20′S.,136°10′E.; CA.2674–2675 N. of Groote Eylandt, N.T.; CA.2935–2937 17°01′S.,139°58′E.

NTMAS: S.10517-002 17°01′S.,139°58′E.

QM: I.3517–3518 Bundaberg, Qld; I.5591 Cleveland Bay, Qld; I.8517 mouth of Barron R., NE. Qld; I.11868 Karumba, Qld; I.12209 Karumba, Qld; I.13688 Nickol Bay, W.A.; I.14240 Dampier, W.A.; I.14254 Dampier, W.A.; I.15956 Princess Charlotte Bay, Qld; I.16207 14°50′S.,145°17′E.; I.16525 Murray R., Hinchinbrook I., Qld; I.16534 Murray R., Hinchinbrook I., Qld; I.17650 9°32′S.,142°47′E.

WAM: P.13296 Ashburton area, Onslow, W.A.; P.14412 Darwin, N.T.

Leiognathus nuchalis

AMS: I.13711–I.13712 Japan.

KMNH: 2 unregistered specimens, Nagasaki, Japan.

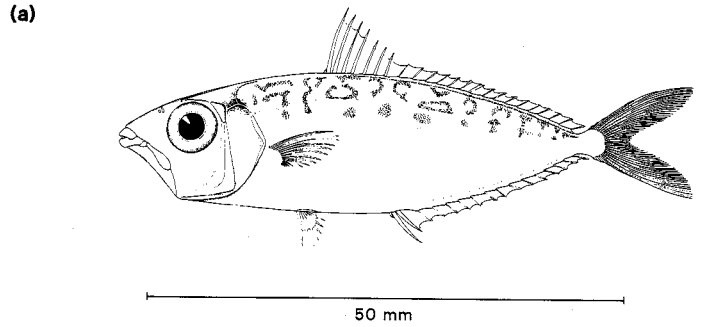
Leiognathus elongatus (Günther)

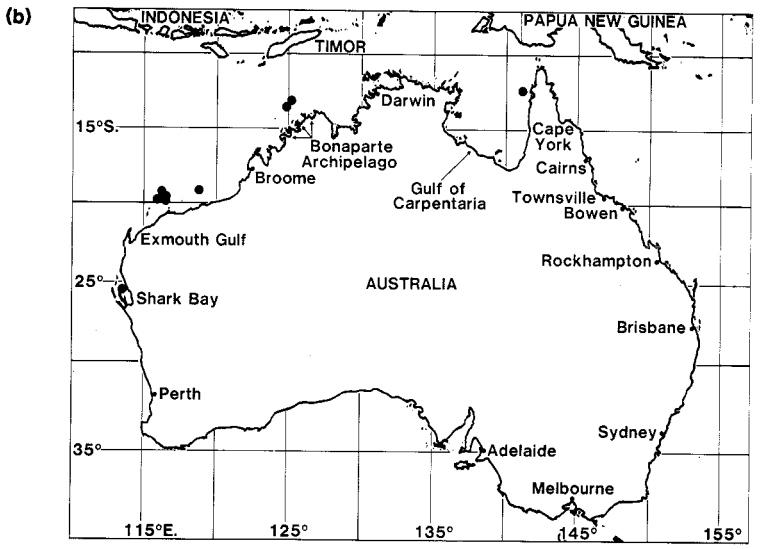
(Fig. 9)

Equula elongata Günther, 1874, p. 369 (N. Celebes). Type in BMNH.

Leiognathus elongatus Smith and Pope, 1906, p. 466 (Kagoshima, Japan). Type in USNM. (Name pre-occupied by *Equula elongata* Günther.)

Macilentichthys popei Whitley, 1932, pp. 114–15. (New name for *Leiognathus elongatus* Smith & Pope.)





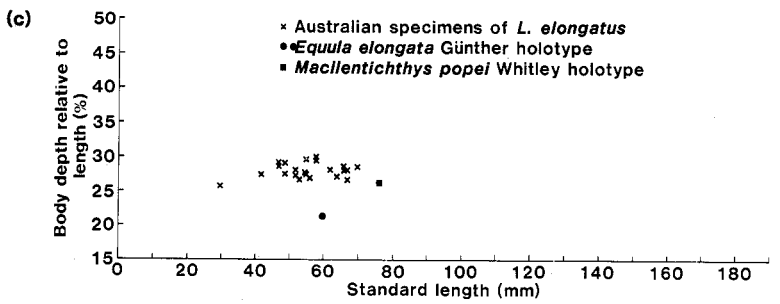


Fig. 9. (*a*) *Leiognathus elongatus*. (*b*) Distribution records of *L. elongatus* in Australia. (*c*) Body depth relative to standard length for *L. elongatus*.

Diagnosis

Body depth 25–31% of S.L. in specimens 30–90 mm S.L. (Fig. 9*c*); scales large, chest fully scaled, suborbital apparently naked. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point downward; narrow band of small peg-like teeth in each jaw (Fig. 1*d*); gill rakers more than half length of gill lamellae, (5–6) + (14–15) = 19–21.

Body silver, upper half with irregular brown marbling; fins colourless.

Similar Species

Juveniles of *Leiognathus* sp. closely resemble this species, but *L. elongatus* can be distinguished by having a fully (rather than partly) scaled chest, and a sharp, pointed snout, rather than slightly rounded snout. Outside Australian waters, two species, *L. elongatus* (Günther) and *L. stercorarius* Evermann & Seale, are being confused under the name of *L. elongatus* (see Discussion).

Distribution

Sparsely distributed in northern Australian waters from Exmouth Gulf (W.A.) to Torres Strait (Qld), in depths of 31–130 m (see Fig. 9*b*).

Discussion

James (1975), following Weber and de Beaufort (1931), regarded *Equula elongata* Günther, 1874, its homonym *Leiognathus elongatus* Smith & Pope, 1906, and *Leiognathus stercorarius* Evermann & Seale, 1907, as synonyms. James distinguished this 'species' by its elongate body shape (depth in S.L. greater than 3) and by the presence of scales on the suborbital. All three species were originally described as being very elongate, and *L. elongatus* Smith & Pope and *L. stercorarius* were also described as having scales on the suborbital.

Günther's description of *Equula elongata* does not mention scales on the suborbital and the poor condition of the holotype (BMNH 1872.4.6:108, N. Celebes) makes it impossible to determine whether scales ever were present there. The holotype measures 60 mm S.L. and has a body depth of 21% of S.L. Examination of the holotype of *L. elongatus* Smith & Pope (USNM 55613, Japan) reveals no evidence of scale pockets on the suborbital, although scale pockets are clearly discernible over the rest of the body. The holotype measures 76 mm S.L. and has a body depth of 27% of S.L. The paratypes of *L. stercorarius* Evermann & Seale (USNM 55920, Philippines) possess scale pockets on the suborbital as originally described. The specimens measure 85 and 89 mm S.L. and have body depths of 31 and 33% of S.L., respectively.

The elongate species encountered in Australian waters is in all respects identical to the holotype of *L. elongatus* Smith & Pope. The holotype of *Equula elongata* Günther is somewhat more elongate than the Australian specimens (body depth 21% of S.L. compared with 25–31% of S.L.), but this difference is not considered significant as specimens from the Philippines (LACM 43636) demonstrate body proportions that span this difference (body depth of 10 specimens 20–27% of S.L.). *L. elongatus* Smith & Pope is therefore regarded as a junior synonym of *Equula elongata* Günther. Representatives of *L. elongatus* from Japan, Philippines, and the Persian Gulf have been examined.

None of the fresh trawled or preserved museum specimens of *L. elongatus* that I have examined displayed any evidence of scales or scale pockets on the suborbital. However, Paul Dunlap (Cornell University, New York) has observed suborbital scales on fresh specimens of *L. elongatus* collected by hand seining, although he notes that the scales are extremely deciduous and do not usually leave any evidence of scale pockets on the specimens (Dunlap, personal communication).

L. stercorarius is regarded as a separate species from *L. elongatus* based on the presence of persistent scale pockets on the suborbital, slightly deeper body proportions and finer body pigmentation patterns as described and illustrated in Evermann and Seale's (1907) original account of the species. Preserved male specimens of *L. stercorarius* are characterized by a dark horizontal splash along the flanks. Representatives of *L. stercorarius* from Indonesia and Papua New Guinea have been examined.

Material Examined

Type specimens: *Equula elongata* Günther, holotype BMNH 1872.4.6:108, N. Celebes. *Leiognathus elongatus* Smith & Pope, holotype USNM Cat. No. 55613, Kagoshima, Japan. *Leiognathus stercorarius* Evermann & Seale, paratypes (two specimens) USNM Cat. No. 55920. Luzon, Philippines.

Leiognathus elongatus

AMS: I.21597-001 N. of Port Hedland, W.A.; I.23043-001 19°39′S.,116°13′E.
BMNH: BMNH 1970.10.2.62-79 Khor Fakkan, Trucial States.
CSIRO: B.1962 20°04′S.,116°18′E.; B.2202 12°37′S.,129°48′E.
LACM: 43636-1 Philippines.
NTMAS: S.10506-002 12°37′S.,129°48′E.
WAM: P.13293 W. of Koks I., Shark Bay, W.A.; P.26186-011 20°22′S.,115°06′E.; P.26197-009 20°05′S.,117°05′E.; P.26210-004 19°33′S.,118°19′E.
Unregistered specimens: One specimen from Japan, two specimens from Indonesia.

Leiognathus stercorarius

Unregistered specimens: One specimen from Papua New Guinea; one specimen from Indonesia.

Leiognathus equulus (Forsskål)

(Fig. 10)

Scomber equula Forsskål, 1775, p. 75 (Red Sea). Type in Zool. Mus. Copenhagen.
Leiognathus edentulus (Bloch): Bleeker, 1863, p. 235.
Leiognathus equulus: Weber and de Beaufort, 1931, pp. 322–4; Kuhlmorgen-Hille, 1974, Leiog. 5; James, 1975, pp. 145–7.
Equula equula: Munro, 1960, p. 135, #860.

Diagnosis

Body depth 47–65% of S.L. in specimens 20–190 mm S.L. (Fig. 10*c*); chest and suborbital naked. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers short and fleshy, less than half length of gill lamellae, (4–6) + (13–16) = 18–21.

Body silver, upper half with close-set faint grey-brown vertical lines (some specimens with markings irregular and scribbled); anal fin sometimes with pale yellow margin; caudal fin sometimes with pale yellow blotch on lower lobe; other fins colourless.

Similar Species

This species resembles *L. fasciatus* in general body form and patterning but can be distinguished from it by the lack of elongation of the second dorsal spine, and by the more numerous and narrower bands (*L. fasciatus* has less than 15 vertical bars). Specimens with the scribbled pattern sometimes resemble *L. splendens*, but can be distinguished from it by the absence of scales on the chest and the lack of black coloration on the spinous dorsal fin.

Distribution

Moderately common throughout the coastal waters of northern Australia from Broome (W.A.) to Gladstone (Qld), in depths of 10–70 m (see Fig. 10*b*).

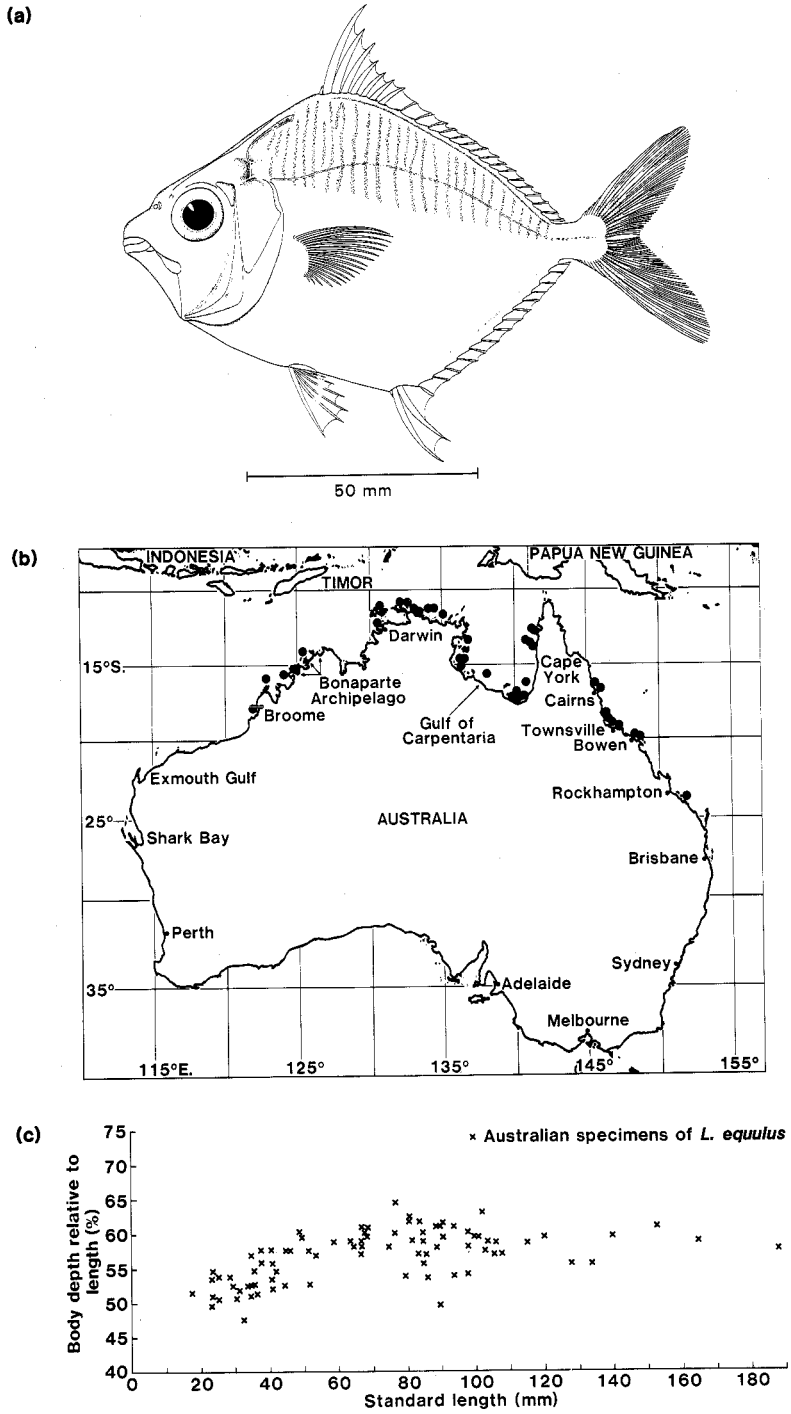


Fig. 10. (*a*) *Leiognathus equulus*. (*b*) Distribution records of *L. equulus* in Australia. (*c*) Body depth relative to standard length for *L. equulus*.

Discussion

L. equulus is usually described in the literature as having a regular series of pale dusky stripes descending from the dorsal profile to about midheight (Munro 1967; Kuhlmorgen-Hille 1974; and others). In his key to the leiognathids, James (1975) used the character 'no vertical bands on back' as a necessary step in the identification of *L. equulus*, but this was later contradicted in the text where the species was described as having 'grey vertical bands descend(ing) from back to about mid-height'. Most of the fresh specimens examined during the present study were characterized by a regular series of narrow vertical bars on the back, which tended to become indistinct in larger specimens. In some cases the patterning was irregular, with the vertical bars becoming very fine and scribbled with interspersed broken lines and dots. This variation in patterning did not appear to be related to the size or sex of the specimens. Rau and Rau (1980) depict a fish of similar appearance to this scribbled form of *L. equulus*, although they regard it as a distinct species from *L. equulus*. They do not give reasons for this.

Descriptions of the dorsal profile of *L. equulus* in the literature vary from 'profile rises gently from the occipital region' (James 1975) to 'dorsal profile strongly arched (almost angular)' (Kuhlmorgen-Hille 1974), and Munro (1960) states 'the profile is concave above the eyes and humped at the nape'. The dorsal profile of the specimens examined during the present study varied considerably between individuals, with some specimens being consistent with each of the above descriptions.

James' (1975) description of the gill rakers of *L. equulus* as 'long with sharp tips' appears to be inconsistent with the short fleshy rakers (less than half length of gill lamellae) recorded for the Australian specimens. However, James gave no indication of the relative size of the gill rakers, and the descriptions cannot be satisfactorily compared.

There has been some confusion in the literature regarding the presence and absence of scales on the chest of *L. equulus*; Weber and de Beaufort (1931), for instance, stated there were 'diaphanous thin plates on the breast, wanting only on a triangular space above pectorals', whereas Day (1889), Munro (1967) and others stated that the chest was naked. James (1975) described the scales of *L. equulus* as 'small, all over the body except on breast' (implying that the chest was naked) but later in the discussion stated 'while the chest is certainly covered by diaphanous scales, their absence in a small area below pectoral is difficult to detect'. In a personal communication, James has confirmed that his specimens of *L. equulus* do not have scales on the chest.

During examination of specimens in the Ian S. R. Munro Ichthyological Collection (CSIRO), several specimens resembling *L. equulus* from New Hanover and New Britain (northern islands of Papua New Guinea) were found to have scales that extended well forward onto the chest below the pectoral fin, leaving only a small naked area on the chest anteroventrally. It therefore seems possible that there may be more than one species being referred to as *L. equulus*, or alternatively that this character may be more variable in waters outside Australia. These questions warrant further attention.

A specimen from Bleeker's collection identified as *L. edentulus* (MVM A.863) appears consistent in all respects with *L. equulus* as described above.

Material Examined

Leiognathus equulus

AMS: E.2515–2519 Bowen, Qld; E.2675–2677 Bowen, Qld; IA.4903 Bowen, Qld; IA.4926 Bowen, Qld; I.15557-125 Gulf of Carpentaria, Qld; I.20826-017 Palm I., Qld; I.20850-001 Victoria R., N.T.; I.21841-003 Arafura Sea, N.T.; I.22965-001 15°46′S.,122°50′E.; I.22979-002 11°35′S.,133°15′E.; I.22982-001 15°38′S.,138°00′E.; I.22985-001 16°11′S.,138°05′E.; I.22988-002 11°10′S.,130°30′E.; I.22990-001 17°01′S.,139°58′E.

CSIRO: A.1309 Tubridge Ck, W.A.; A.2198–2199 16°34′S.,141°04′E.; A.2200 16°34′S.,141°04′E.; A.2789 Melville Bay, N.T.; A.3191 16°49′S.,140°39′E.; A.3617 Norman R., Karumba, Qld; A.3826

Norman R., Karumba, Qld; A.3830 Norman R., Karumba, Qld; A.3851-3853 Norman R., Karumba, Qld; A.4090 Fairway Buoy, Gulf of Carpentaria, Qld; A.4106 Fairway Buoy, Gulf of Carpentaria, Qld; B.6 Cape Cleveland, Qld; B.7 Cairns, Qld; B.8 Mary R., Qld; C.4074 6 miles N. of NR Islet, Gulf of Carpentaria, Qld; C.4192 17 miles NE. Robinson R., Gulf of Carpentaria, N.T.; CA.2679-2680 N. of Groote Eylandt, Gulf of Carpentaria, N.T.; CA.2931-2932 11°35′S.,133°15′E.; CA.2933-2934 11°10′S.,130°30′E.

MVM: A.863 E. Indian Archipelago.

NTMAS: S.10512-001 11°29′S.,134°23′E.; S.10516-001 15°38′S.,138°00′E.; S.10517-003 17°01′S., 139°58′E.

QM: I.1990-1993 Cape Bowling Green, Qld; I.5659 Townsville, Qld; I.6133 Cleveland Bay, Qld; I.6912 Magnetic I., Qld; I.11359 Cleveland Bay, Qld; I.15725 18°44′S.,146°31′E.; I.16526 Murray R., Hinchinbrook I., Qld; I.16533 Murray R., Hinchinbrook I., Qld; I.16561 Hinchinbrook I., Qld; I.16722 Hinchinbrook I., Qld; I.17843 Townsville, Qld.

WAM: P.12960 Broome, W.A.; P.25038-004 Prince Regents R., Kimberley, W.A.; P.26957-001 16°15′S.,145°20′E.

?L. equulus

CSIRO: C.486 New Hanover; C.571 New Britain.

Leiognathus fasciatus (Lacepède)

(Fig. 11)

Clupea fasciata Lacepède, 1803, vol. 5, pp. 460, 463 (Mauritius). Type in MNHN.

Equula serrulifera Richardson, 1848, p. 137 (Sydney, Australia — probably in error). Types in BMNH.

Equula asina de Vis, 1884, p. 544 (Cape York, Australia). Types in QM.

Aurigequula longispinis (Valenciennes): Whitley, 1932, pp. 101-3 (in part).

Equula fasciata: Munro, 1960, p. 135, #861.

Leiognathus fasciatus: Weber and de Beaufort, 1931, pp. 320-2; Kuhlmorgen-Hille, 1974, Leiog. 6; James, 1975, pp. 144-5.

Diagnosis

Body depth 49-63% of S.L. in specimens 35-190 mm S.L. (Fig. 11*c*); chest and suborbital naked. Second dorsal spine elongate (70-110% of body depth); second anal spine slightly elongate or not (28-50% of body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers short and fleshy, less than half length of gill lamellae, (4-6) + (14-16) = 18-21.

Body silver, upper half with faint grey-brown vertical bars, sometimes breaking into spots laterally; variable number of faint to conspicuous yellow blotches along flank below lateral line; spinous anal fin with some faint yellow colouring, continued as margin along rays; soft dorsal fin sometimes with pale yellow margin; other fins colourless.

Similar Species

This species resembles *L. smithursti* in general body shape and in having an elongate second dorsal spine, but is distinguished from it by the second anal spine not being elongate (second anal spine more than 60% of body depth in *L. smithursti*), and in body pattern, by the presence of 10-15 vertical bars in *L. fasciatus*.

Distribution

Moderately common in northern Australian waters from Exmouth Gulf (W.A.) to Townsville (Qld), in depths of 30-120 m (see Fig. 11*b*).

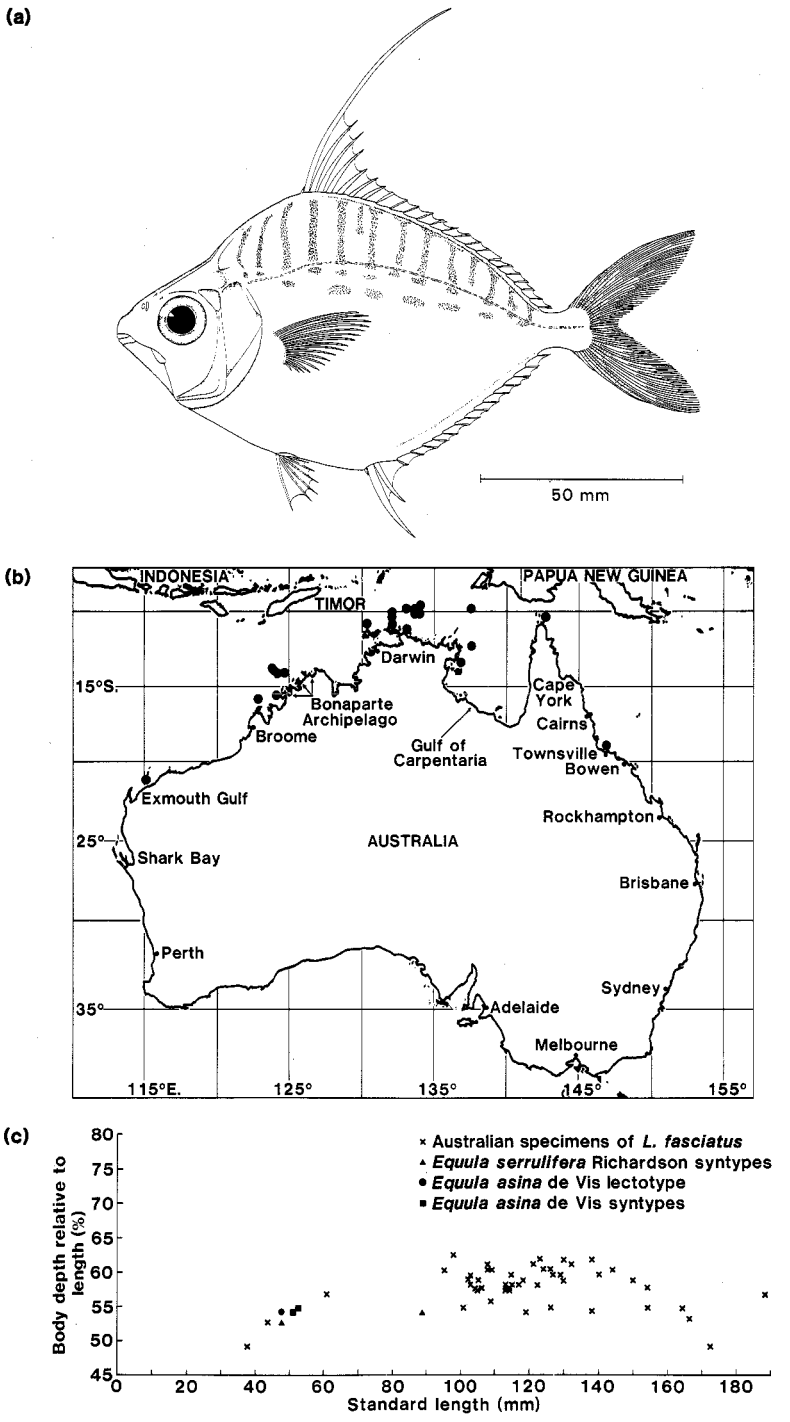


Fig. 11. (*a*) *Leiognathus fasciatus*. (*b*) Distribution records of *L. fasciatus* in Australia. (*c*) Body depth relative to standard length for *L. fasciatus*.

Discussion

The species as described above is generally consistent with accounts of *L. fasciatus* in the literature, with the exception of the following points: Weber and de Beaufort (1931) and Kuhlmorgen-Hille (1974) stated that scales are present on the chest of *L. fasciatus* although very thin and diaphanous. In contrast, James (1975) stated that the chest of *L. fasciatus* is naked, which is consistent with the specimens examined during the present study. Day (1889), Weber and de Beaufort (1931) and Munro (1967) stated that the teeth in the upper jaw of *L. fasciatus* are in a single row, whereas those in the lower jaw are in villiform bands. The specimens examined during the present study are all characterized by villiform bands of teeth in each jaw.

The shape of the occipital and dorsal profiles is used by several authors (e.g. Weber and de Beaufort 1931; Munro 1960; James 1975) as a means of separating *L. fasciatus* from other species. However, descriptions vary between authors and, on the basis of the present study, it seems that individual specimens also vary considerably. Consequently, this character is not considered taxonomically reliable.

The lectotype of *Equula asina* de Vis (QM I.1700 Cape York, Queensland) measures 48 mm S.L.; its body depth is 55% of S.L. Although the second dorsal spine is broken, it is still distinctly elongate (63% of body depth); the second anal spine (which is complete) is 33% of body depth. No pigmentation pattern is discernible on the specimen. The syntypes are in very poor condition, but are consistent with the above specimen. *E. asina* is regarded as a junior synonym of *L. fasciatus*.

Equula serrulifera Richardson is regarded as a synonym of *L. fasciatus* rather than *L. equulus* as suggested by James (1975) and Weber and de Beaufort (1931). The original description of *E. serrulifera* states that the second dorsal spine exceeds half the height of the body, and that 9–10 vertical bars are apparent on the upper half of the body. These characters are more consistent with alignment of the species with *L. fasciatus* than with *L. equulus*. Although the type-specimens of *Equula serrulifera* are in very poor condition, some pigmentation pattern is still discernible on one specimen and this patterning is consistent with that of *L. fasciatus*. The type locality of *E. serrulifera* was given as Sydney, N.S.W., but this is unlikely to be correct as only one species of leiognathid (*L. moretoniensis*) has since been recorded from New South Wales.

Whitley (1932) regarded *Equula smithursti* Ramsay & Ogilby as a junior synonym of *Aurigequula longispinis* (Valenciennes) (= *L. fasciatus*) but these species are recognized here as being distinct (see p. 597).

Equula longispina de Vis, 1884 was listed by Weber and de Beaufort (1931) and James (1975) as a synonym of *L. fasciatus*. However, de Vis' species (which was renamed *L. hastatus* Ogilby, 1912 due to pre-occupation of the name by Valenciennes' *Equula longispinis*) has body proportions that are inconsistent with a deep-bodied fish such as *L. fasciatus*, and moreover has scales on the chest. Examination of the holotype of *L. hastatus* indicates that this species should be regarded as a junior synonym of *L. leuciscus*.

Material Examined

Type-specimens: *Equula asina* de Vis, lectotype QM I.1700 Cape York, Qld; syntypes (two specimens) QM I.9809 Cape York, Qld. *Equula serrulifera* Richardson, syntypes (three specimens) BMNH 1848.3.18: 168–70 Sydney, Australia.

Leiognathus fasciatus

AMS: IA.1506 Gulf of Carpentaria; IA.1538 Darwin, N.T.; I.21845-002 Arafura Sea, N.T.; I.23035-001 10°30′S.,132°03′E.; I.23038-002 14°03′S.,124°05′E.; I.23039-001 14°03′S.,124°05′E.

CSIRO: A.3300–3301 Ashburton R. area, W.A.; A.3328–3331 Ashburton R. area, W.A.; A.3337 Ashburton R. area, W.A.; A.3343 Ashburton R. area, W.A.; C.3820–3821 Mangrove Passage, W.A.; C.3835 Ashburton R. area, W.A.; C.3849 Ashburton R. area, W.A.; CA.2938–2941 15°46′S.,122°50′E.

NTMAS: S.10509-002 14°03'S.,124°05'E.
QM: I.12092 Cape York, Qld; I.17649 Caldbeck Rf, Torres Str, Qld.
WAM: P.26645-001 13°58'S.,123°55'E.

Leiognathus leuciscus (Günther)

(Fig. 12)

Equula leuciscus Günther, 1860, p. 503 (Amboyna, Indonesia). Type in BMNH.
Equula novaehollandiae Steindachner, 1879, p. 11 (Townsville, Australia). Type in Stuttgart Museum.
Equula longispina de Vis, 1884, p. 542 (Cape York, Australia). Type in QM. (Name pre-occupied by *Equula longispinis* Valenciennes.)
Leiognathus vermiculatus Fowler, 1904, pp. 513–15, pl. XV (Padang, Sumatra). Type in ANSP.
Leiognathus edwardsi Evermann and Seale, 1907, pp. 68–9 (San Fabian, Philippines). Type in USNM.
Leiognathus hastatus Ogilby, 1912, pp. 58–60. (New name for *E. longispina* de Vis.)
Equulites hastatus: Whitley, 1932, p. 107 (in part).
Equulites novaehollandiae: Munro, 1960, p. 136, #866.
Leiognathus leuciscus: Weber and de Beaufort, 1931, pp. 327–8; Kuhlmorgen-Hille, 1974, Leiog. 8; James, 1975, pp. 156–7.

Diagnosis

Body depth 32–51% of S.L. in specimens 35–120 mm S.L., percentage increasing with length (Fig. 12*c*); chest fully scaled, suborbital naked. Second dorsal spine elongate (90–167% of body depth); second anal spine of variable length (25–125% of body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers approximately half length of gill lamellae, (5–6) + (12–14) = 18–20.

Body silver, upper half with irregular grey-brown vermiculations; fresh specimens with broken line of yellow blotches along flank below lateral line; males often with non-silvery triangular patch on flanks; yellow bar across top of eye sometimes present; spinous dorsal fin with yellow streak at midheight from fourth spine back, continued along margin of rays; soft anal fin with yellow margin; other fins colourless.

Similar Species

This species closely resembles *Leiognathus* sp. in general body form, coloration and elongation of the second dorsal spine, but can be distinguished from that species by its fully (rather than partly) scaled chest. Although the second anal spine in *L. leuciscus* is of variable length, it is never greatly elongated in *Leiognathus* sp. (29–42% of body depth). Fresh specimens of *L. leuciscus* can readily be distinguished from *Leiognathus* sp. by the presence of yellow blotches below the lateral line. *L. leuciscus* also resembles *L. moretoniensis*, but can be distinguished from it by the absence of scales on the suborbital.

Distribution

Common throughout the coastal waters of northern Australia from Shark Bay (W.A.) to Mackay (Qld), in depths of 15–50 m (see Fig. 12*b*).

Discussion

The species as described above is consistent with the accounts of *L. leuciscus* given by Kuhlmorgen-Hille (1974) and James (1975). Kuhlmorgen-Hille's (1968) illustrated field key, however, describes the pattern on the back as 'greenish fish-bone pattern', which does not accord well with the above, and Tiews and Caces-Borja (1965) describe the pattern in *L. leuciscus* as 'vertical bands', which again is not consistent with other authors' descriptions.

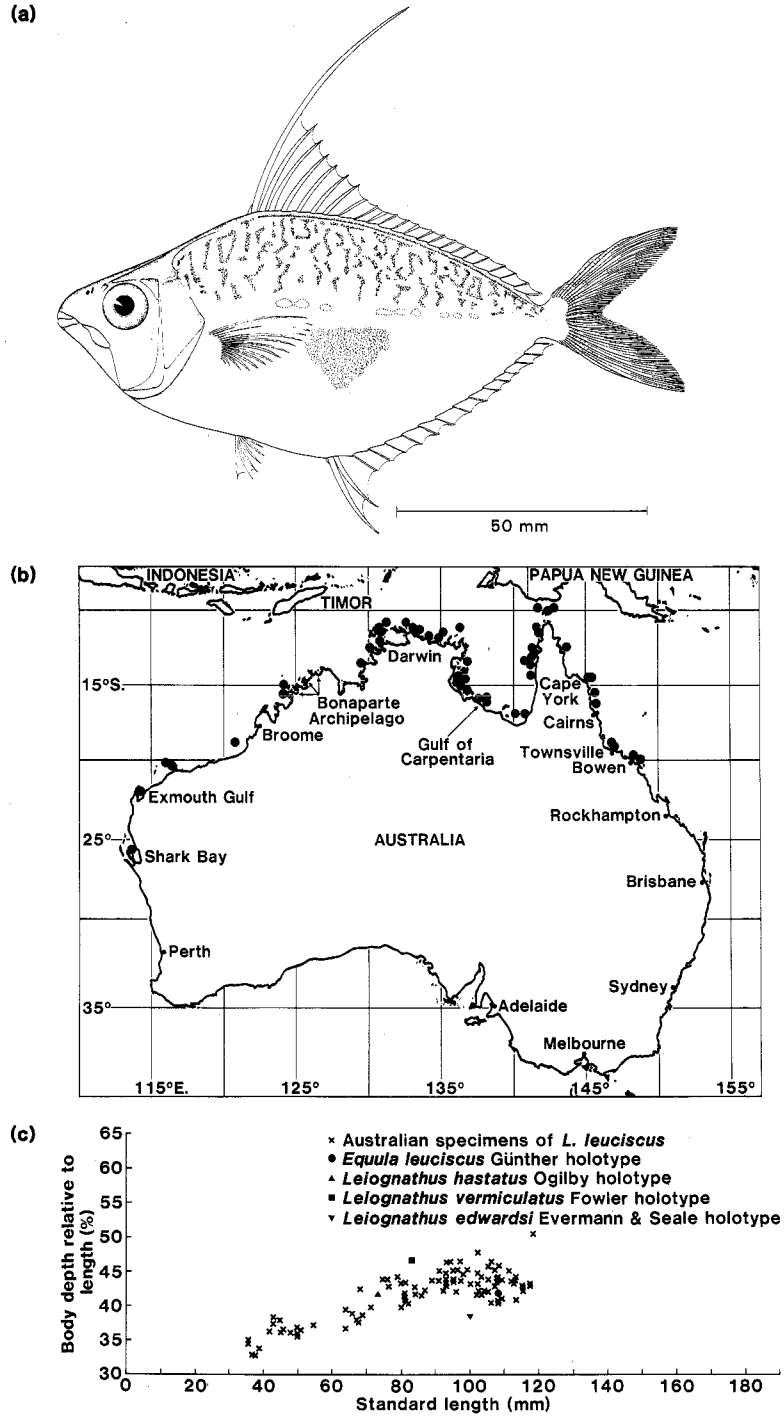


Fig. 12. (*a*) *Leiognathus leuciscus*. Triangular blotch on flank is characteristic of males only. (*b*) Distribution records of *L. leuciscus* in Australia. (*c*) Body depth relative to standard length for *L. leuciscus*.

The holotype of Günther's *Equula leuciscus* is in poor condition, but appears to be consistent with the species as described above. It measures 108 mm S.L. and its body depth is 42% of S.L. All body pigmentation has been lost; the second spines of the dorsal and anal fins are broken, although the second anal spine is still somewhat elongate; the chest is fully scaled and the suborbital is naked.

Steindachner (1879) described *Equula novaehollandiae* from a small and damaged specimen collected from Cleveland Bay, Queensland. The specimen was described as being closely related to Günther's *E. leuciscus*, differing mainly in its proportionately longer head, the presence of a spine over the eye, and a somewhat shorter second dorsal spine. I was not able to examine the holotype of *E. novaehollandiae*, but on the basis of Steindachner's account it seems probable that the two species are synonymous. *Equula longispina* de Vis (=*L. hastatus* Ogilby) was described from a single specimen collected from Cape York, Queensland. The holotype (QM I.878) is in poor condition, but the body proportions and squamation are consistent with those of *L. leuciscus*, and the two species are here considered synonymous. Some confusion regarding the identity of the holotype of *L. hastatus* was introduced by Whitley (1932), who referred to an Australian Museum specimen (I.465) as the holotype of the species. The Australian Museum's records of 1886 do not list this specimen as a type, and there seems no reason to doubt the Queensland Museum specimen I.878 as the true holotype of *L. hastatus*.

Examination of the museum specimens that Whitley referred to as *Equulites hastatus* revealed that several of these jars consisted of a mixture of species (mainly the northern form of *L. moretoniensis* and *L. leuciscus*). This raises the possibility that Whitley may not have discriminated between these two species, a possibility that is strengthened by the fact that none of his other species descriptions appears to represent *L. leuciscus*.

The holotype of Fowler's *L. vermiculatus* (ANSP 27525) from Padang, Sumatra, is in fair condition. The specimen measures 83 mm S.L.; its body depth is 47% of S.L. The body patterning is still clearly visible and is consistent with that of Australian specimens of *L. leuciscus*. The second spines of the dorsal and anal fins are both broken; the chest region is fully scaled and the suborbital is naked. This species is regarded as a junior synonym of *L. leuciscus*.

James (1975) listed Munro's (1960) *Equulites novaehollandiae* as a synonym of *L. lineolatus*, although even from his own descriptions it appears more consistent with *L. leuciscus*. Examination of specimens in the Ian S. R. Munro Ichthyological Collection (CSIRO), identified by Munro as *E. novaehollandiae*, revealed that these specimens are referable to *L. leuciscus*.

The holotype of *Leiognathus edwardsi* Evermann & Seale (USNM 55904, Philippines) is generally consistent with *L. leuciscus* as described above. The holotype measures 100 mm S.L.; its body depth is 39% of S.L. The second dorsal spine is broken, but Evermann and Seale described the first dorsal spine (presumably in error of the second spine) as being filamentous. The second anal spine is slightly elongate (50% of body depth). All body pigmentation has been lost, but the authors originally described the patterning on the back as being 'more or less marbled and vermiculated'. Contrary to Evermann and Seale's description of the chest as being naked, however, this region in the holotype is clearly scaled. *L. edwardsi* is regarded as a junior synonym of *L. leuciscus*.

Material Examined

Type-specimens: *Equula leuciscus* Günther, holotype BMNH 1858.4.21:243 Amboyna, Indonesia. *Leiognathus hastatus* Ogilby, holotype QM 1.878 Cape York, Queensland. *Leiognathus vermiculatus* Fowler, holotype ANSP 27525. *Leiognathus edwardsi* Evermann & Seale, holotype USNM 55904 San Fabian, Luzon, Philippine Is.

Leiognathus leuciscus

AMS: I.20829-018 Lizard I., Qld; I.20907-044 Cooktown, Qld; I.20939 W. of Eel Rf, Cape York, Qld; I.21841-008 Arafura Sea, N.T.; I.22967-001 13°00′S.,141°00′E.; I.22978-004 12°43′S.,130°00′E.; I.22983-002 14°29′S.,136°06′E.

CSIRO: A.2194-2195 16°34′S.,141°04′E.; A.2196-2197 16°34′S.,141°04′E.; A.2454 16°53′S., 139°53′E.; A.3364 Exmouth Gulf, W.A.; A.4003-4007 Bountiful I., Gulf of Carpentaria, Qld; B.2205 16°11′S.,138°05′E.; B.2206 12°43′S.,130°00′E.; C.2672 Exmouth Gulf, W.A.; CA.2677-2678 N. of Groote Eylandt, Gulf of Carpentaria, N.T.

NTMAS: S.10515-001 14°29′S.,136°06′E.; S.10518-001 13°00′S.,141°00′E.

QM: I.3569 Qld coast; I.6143-6144 Cape Cleveland, Qld; I.10593 Townsville, Qld; I.10643 Townsville, Qld; I.12454 far N. Qld; I.15603 12°31′S.,143°27′E.; I.15756 16°10′S.,145°28′E.; I.16106 mouth of Escape R., Cape York, Qld; I.16206 14°50′S.,145°17′E.; I.17690 SE. Sabai I., Torres Str., Qld; I.17693 S. of Caldbeck Rf, Torres Str., Qld.; I.17694 Keats Islet, Torres Str., Qld; I.17699 9°57′S.,141°39′E.; I.18122 16°25′S.,145°32′E.

WAM: P.12969 Exmouth Gulf, W.A.; P.13284-13285 Shark Bay, W.A.; P.14522 23 miles N. of Darwin, N.T.

Leiognathus moretoniensis Ogilby

(Figs 13 and 14)

Leiognathus moretoniensis Ogilby, 1912, p. 59 (Moreton Bay, Queensland). Type in QM.
Equulites hastatus: Whitley, 1932, p. 107 (in part); Munro, 1960, p. 136, #865.
Equulites moretoniensis: Whitley, 1932, p. 108; Munro, 1960, p. 136, #864.

Diagnosis

Body depth 33-50% of S.L. in specimens 25-90 mm S.L., percentage increasing with length (Fig. 14*a*); chest and suborbital scaled. Second dorsal spine of variable length (40-100% of body depth), but spines weak and usually broken in trawled specimens; second anal spine slightly elongate or not (27-55% of body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers approximately half length of gill lamellae, (4-5) + (11-13) = 15-17.

Body silver, coppery sheen on back when fresh, irregular grey-brown markings on back giving way laterally to non-silvery serially arranged broken zig-zag lines over lateral line; row of small opalescent yellow-grey spots (becoming dark on preservation) extending backwards from pectoral fin; sometimes additional row of yellow spots above this; fins either colourless, or sometimes spinous dorsal fin with yellow streak at midheight, continued along margins of rays; anal fin sometimes with yellow margin.

Similar Species

This species closely resembles *L. leuciscus* and *Leiognathus* sp., but can be distinguished from them by the presence of scales on the suborbital.

Distribution

Widely distributed throughout northern Australian waters, extending southwards in coastal waters to Shark Bay (W.A.) and Sydney (N.S.W.) (see Fig. 13*c*). Depth records for the species range from 10 to 105 m.

Discussion

L. moretoniensis is one of the few Australian species of leiognathid that possess scales on the suborbital (see Table 1). This character was not mentioned by Ogilby in his original description of the species, and has apparently been overlooked by subsequent authors. In addition, Ogilby stated in his original description of *L. moretoniensis* that the breast was naked. This was evidently an error, as the syntype (QM I.1583) has a fully scaled chest.

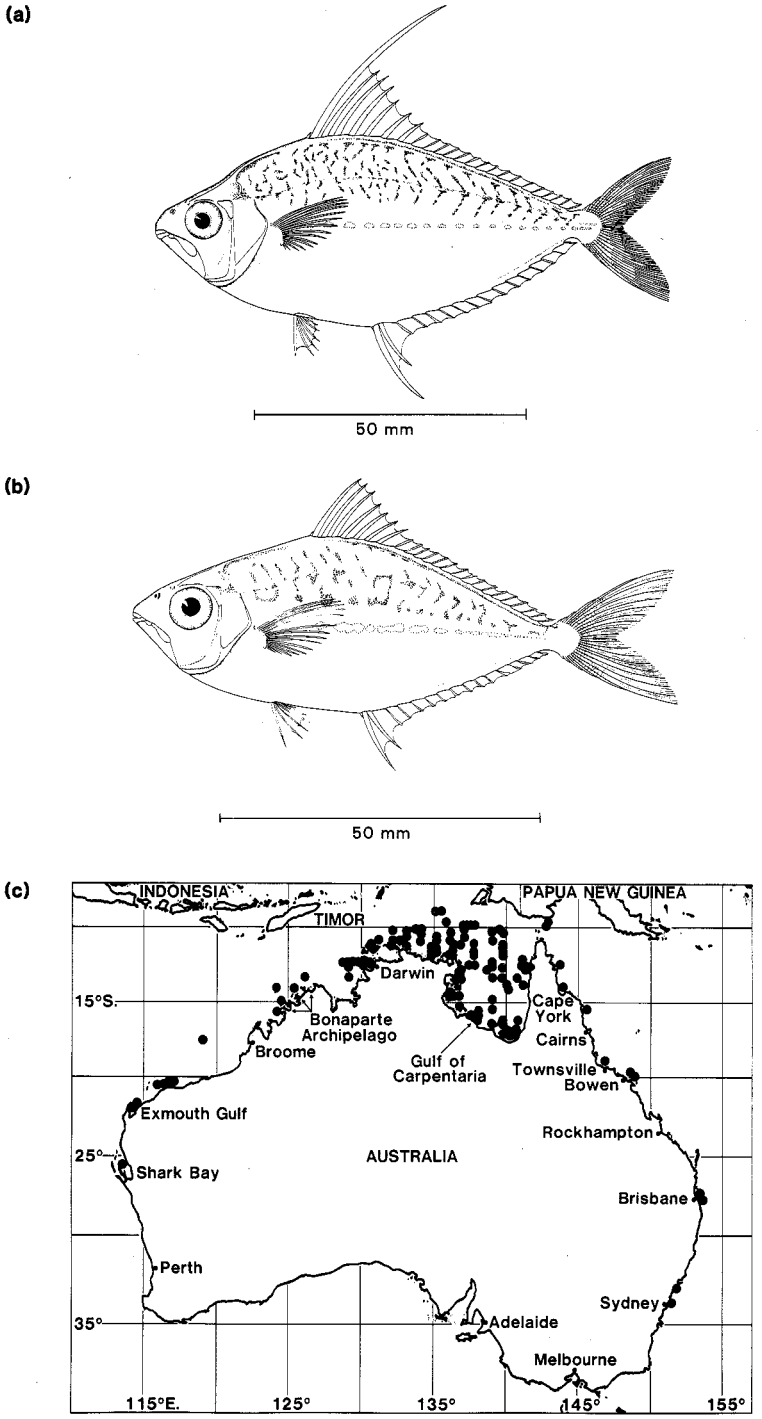


Fig. 13. (*a*) *Leiognathus moretoniensis* (northern form). (*b*) *Leiognathus moretoniensis* (southern form). (*c*) Distribution records of *L. moretoniensis* in Australia.

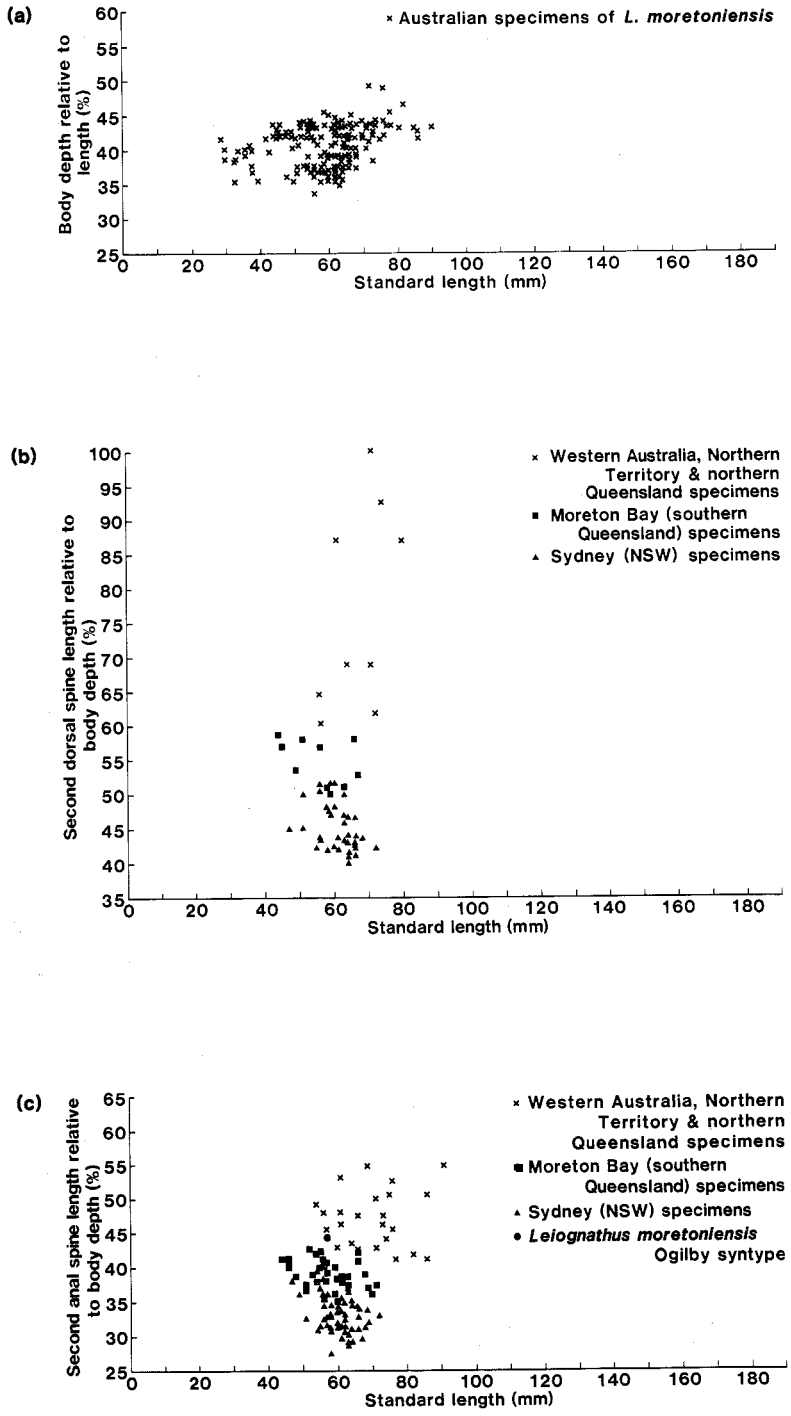


Fig. 14. (*a*) Body depth relative to standard length for *L. moretoniensis*. (*b*) Second dorsal spine length relative to body depth for different regional populations of *L. moretoniensis*. (*c*) Second anal spine length relative to body depth for different regional populations of *L. moretoniensis*.

L. moretoniensis has a wide geographical range within Australian waters, and is the only species recorded from as far south as Sydney. There are some morphological differences between the regional populations, and specimens from northern Australia, for instance, develop elongate second dorsal and anal spines, whereas those from Sydney do not (see Figs 14*b* and 14*c*). Specimens from Brisbane (the type locality) appear to be intermediate in this character. Similarly, the body patterning of the northern form tends to be finer than that of Sydney specimens (see Figs 13*a* and 13*b*). Because of these apparent gradations in character between the northern and southern forms, these populations are regarded as conspecific variants rather than strict subspecies (Mayr 1969).

As discussed on p. 592, Whitley did not distinguish the northern form of *L. moretoniensis* from *L. leuciscus*, and referred to both species under the name *Equulites hastatus* (Ogilby). He considered this 'species' to be closely allied to *E. moretoniensis*, of which it appeared to be a northern form. Examination of specimens in the Ian S. R. Munro Ichthyological Collection (CSIRO) indicates that in line with Whitley's descriptions, Munro (1960) referred to the northern form of *L. moretoniensis* as *L. hastatus*, whereas specimens from the Sydney region were labelled *L. moretoniensis*.

James (1975) listed *L. moretoniensis* as a possible synonym of *L. berbis* (Valenciennes). Both species apparently share similar body proportions and a pattern of interrupted zig-zag lines on the upper half of the body. However, in a personal communication, James has confirmed that his specimens do not possess scales on the suborbital, and the two species are consequently regarded here as being distinct.

Material Examined

Type-specimens: *Leiognathus moretoniensis* Ogilby, syntype QM I.1583 Moreton Bay, Qld.

Leiognathus moretoniensis

AMS: E.2917 Moreton Bay, Qld; IA.5428 Pittwater, Sydney, N.S.W.; IB.286 Port Hacking, Sydney, N.S.W.; IB.2988 Exmouth Gulf, W.A.; IB.3030 Exmouth Gulf, W.A.; IB.3084 Tubridge Ck, Exmouth Gulf, W.A.; I.13746 Redcliffe, Qld; I.17761-001 Rose Bay, Sydney Hbr, N.S.W.; I.18231-002 Port Hacking, Sydney, N.S.W.; I.18233-001 Port Hacking, Sydney, N.S.W.; I.18235-001 Port Hacking, Sydney, N.S.W.; I.20323-001 Manly Cove, Sydney, N.S.W.; I.21625-012 NW. Shelf, W.A.; I.21700-001 Rose Bay, Sydney, N.S.W.; I.21943-008 Arafura Sea, N.T.; I.22971-004 12°25′S.,129°56′E.; I.22975-001 12°30′S.,130°05′E.; I.22978-003 12°43′S.,130°00′E.; I.22983-001 14°29′S.,136°00′E.; I.22986-001 11°04′S.,130°37′E.; I.22991-001 12°44′S.,139°59′E.; I.22993-001 13°29′S.,129°01′E.; I.23037-001 9°53′S.,137°37′E.

CSIRO: A.846-851 Lake Macquarie, N.S.W.; A.2085-2087 Lake Macquarie, N.S.W.; A.1262-1264 Shark Bay, W.A.; A.1282-1283 Exmouth Gulf, W.A.; A.1310-1317 Tubridge Ck, W.A.; A.1401 Shark Bay, W.A.; A.1468 Dampier Arch., W.A.; A.1485 Exmouth Gulf, W.A.; A.1502-1504 Exmouth Gulf, W.A.; A.1514-1518 Exmouth Gulf, W.A.; A.2233-2235 17°25′S.,104°42′E.; A.2299 17°07′S.,140°35′E.; A.2318-2319 16°56′S.,140°23′E.; A.2338 17°02′S.,140°17′E.; A.2383-2384 16°58′S.,140°41′E.; A.2434-2439 16°47′S.,139°51′E.; A.2455 16°53′S.,139°53′E.; A.2882-2883 16°36′S.,140°42′E.; A.3172 16°55′S.,140°40′E.; A.3196 16°54′S.,140°40′E.; A.3211 16°56′S.,140°41′E.; A.3248-3249 17°08′S.,140°21′E.; A.3336 Ashburton R. area, W.A.; A.3344 Ashburton R. area, W.A.; A.3347-3348 Ashburton R. area, W.A.; A.3354-3355 Ashburton R. area, W.A.; A.3360-3361 Ashburton R. area, W.A.; A.3370 Exmouth Gulf, W.A.; A.4055 Bountiful I., Gulf of Carpentaria, Qld; B.10 Exmouth Gulf, W.A.; B.2209 Rose Bay, Sydney; B.2210 14°03′S.,124°05′E.; B.2218 11°02′S.,130°54′E.; B.2219 14°29′S.,136°06′E.; B.2220 13°00′S.,136°49′E.; C.4210 30 miles W. Lakes I., Gulf of Carpentaria, N.T.; C.4225 17 miles NE. Robinson R., Gulf of Carpentaria, N.T.; CA.440 16°09′S.,122°33′E.

NTMAS: S.10503-001 14°03′S.,124°05′E.; S.10508-001 10°50′S.,131°07′E.; S.10515-002 14°29′S., 136°06′E.; S.10519-001 15°59′S.,138°03′E.

QM: I.5 Moreton Bay, Qld; I.2929 Moreton Bay, Qld.; I.10898 Gulf of Carpentaria, N.T.; I.11209-11210 Deception Bay, Qld; I.11603 Karumba, Qld; I.12929 Moreton Bay, Qld; I.13007 Redcliffe, Qld; I.13026 Moreton Bay, Qld; I.13107 Moreton Bay, Qld; I.13626 Redcliffe, Qld; I.13690 Nickol Bay, W.A.; I.13746 Redcliffe, Qld; I.14192 Redcliffe, Qld; I.15958 Princess Charlotte Bay, Qld;

I.17700 Aureed I., Torres Str., Qld; I.17701 Caldbeck Rf, Torres Str., Qld; I.17702 Aeroplane Sandbank, Torres Str., Qld; I.17703 9°26′S.,142°58′E.; I.17704 9°44′S.,142°51′E.; I.18153 12°35′S., 143°26′E.

WAM: P.4277 Shark Bay, W.A.; P.13286-13287 Shark Bay, W.A.; P.13295 Exmouth Gulf, W.A.; P.13386 Gulf of Carpentaria, N.T.; P.13467 Shark Bay, W.A.; P.13772 Shark Bay, W.A.; P.23744 Exmouth Gulf, W.A.; P.23790 Exmouth Gulf, W.A.; P.23818 Exmouth Gulf, W.A.; P.23857 Exmouth Gulf, W.A.; P.25095-010 Exmouth Gulf, W.A.; P.25396-013 Rowley Shoals, W.A.; P.25737-010 Moreton Bay, Qld.

Leiognathus smithursti (Ramsay & Ogilby)

(Fig. 15)

Equula smithursti Ramsay and Ogilby, 1886, p. 11 (Hood Lagoon, Papua New Guinea). Type in AMS.

Leiognathus smithursti: Kuhlmorgen-Hille, 1974, Leiog. 9; James, 1975, pp. 147–8.

Diagnosis

Body depth 50–57% of S.L. in specimens 85–155 mm S.L. (Fig. 15*c*); chest and suborbital naked. Second spines of dorsal and anal fins greatly elongated (second dorsal spine 77–200% of body depth, second anal spines 60–100% of body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers short and fleshy, less than half length of gill lamellae, (5–7) + (14–15) = 19–22.

Body silver, upper half with faint horizontal grey-brown streaks, and variable number of yellow blotches along flank below lateral line; soft anal fin yellow; margin of soft dorsal fin yellow; distal portions of caudal fin lobes sometimes yellow; other fins colourless.

Similar Species

This species resembles *L. fasciatus* — refer to comments under that description.

Distribution

Sparsely distributed in northern Australian waters from Exmouth Gulf (W.A.) to Townsville (Qld), in depths of 15–80 m (see Fig. 15*b*).

Discussion

There has been some confusion concerning the status of *L. smithursti*, and several authors (e.g. Whitley 1932; Munro 1960) have regarded it as a junior synonym of *L. fasciatus* (=*Aurigequula longispinis* of Whitley 1932). The accounts given by those authors who recognize the two species as distinct tend to be imprecise, and James (1975), for instance, used differences in the degree of concavity of the lower jaw and in the relative lengths of the dorsal spines, although the data presented clearly demonstrate an overlap in these values. James used the character 'breast with prominent scales' as a necessary step in his identification key to *L. smithursti* although this is evidently an error and is contradicted in the text.

L. smithursti as described above is consistent with Kuhlmorgen-Hille's (1974) description and figure of the species. The principal characters used by Kuhlmorgen-Hille to distinguish *L. smithursti* from *L. fasciatus* are the elongate second anal spine and the absence of dark vertical stripes in *L. smithursti*, although Tiews and Caces-Borja (1965) and James (1975) stated that faint bands are present in *L. smithursti*. Body pigmentation has been lost from the holotype of *L. smithursti* and the original colour notes recorded by Ramsay and Ogilby are not sufficient to enable positive identification of the species and merely state 'silver colour 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'. Kuhlmorgen-Hille (1974) described the

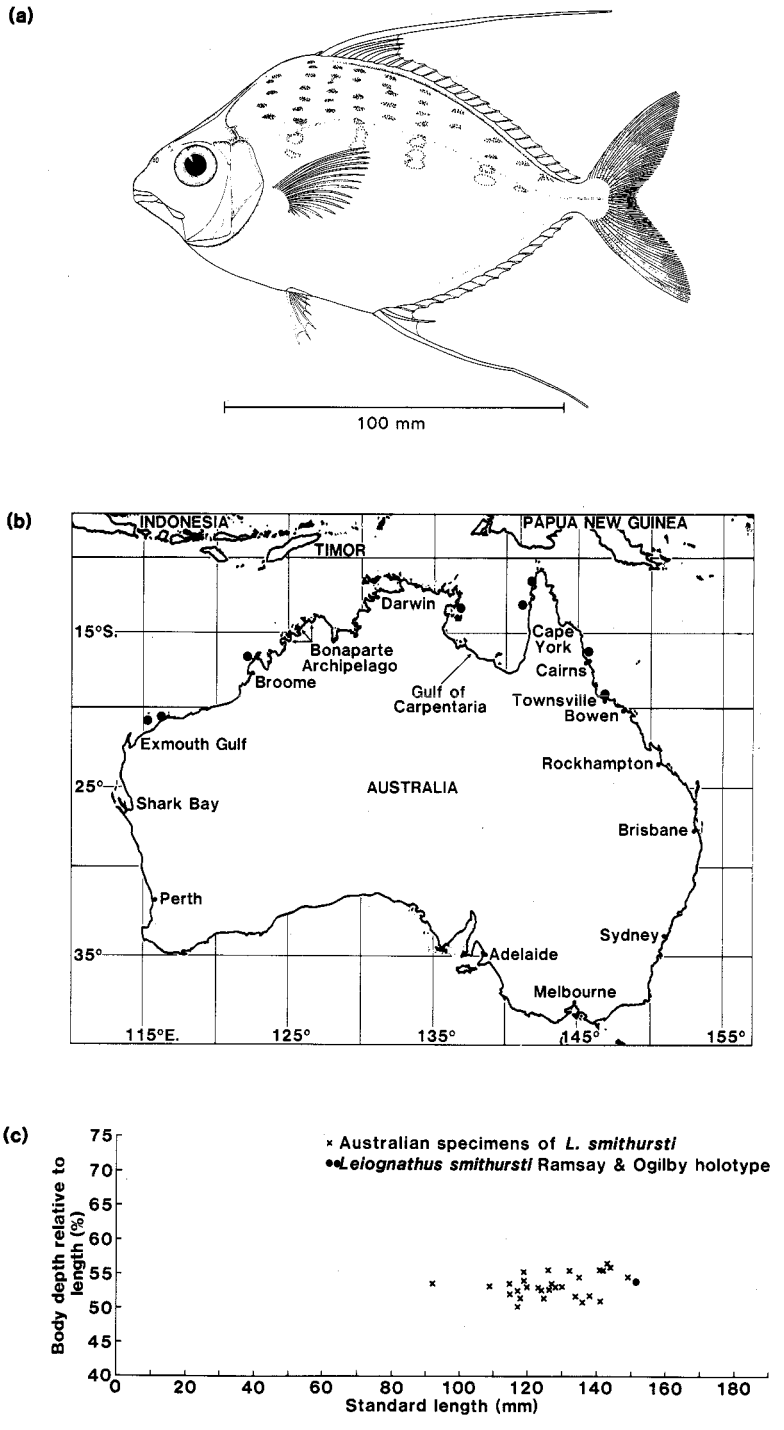


Fig. 15. (*a*) *Leiognathus smithursti*. (*b*) Distribution records of *L. smithursti* in Australia. (*c*) Body depth relative to standard length for *L. smithursti*.

second anal spine of *L. smithursti* as 'greatly elongated, sometimes reaching to caudal fin', although the original description of the species states the anal spine is only 'as long as head' (a condition that is sometimes almost met by specimens of *L. fasciatus*). The second anal spine of the holotype is broken, but its length still approximates the length of the head of the specimen. It therefore seems likely that the original description of the species was based on an already broken spine, which would render the above descriptions compatible.

Few fresh specimens of *L. smithursti* were available for examination during the present study, but there did seem to be some variation in body patterning from the usual faint horizontal streaks, e.g. one specimen had large circles along the dorsum, and three widely spaced vertical bands laterally. The body patterning of this specimen is consistent with Tiews and Caces-Borja's (1965) and James' (1975) reports of *L. smithursti* being characterized by faint washed bands on the upper half of the body.

The overall similarity in appearance of *L. smithursti* and *L. fasciatus*, coupled with their infraspecific plasticity in body patterning, suggests that further studies (possibly involving electrophoretic techniques) are needed to resolve these relationships beyond question.

Material Examined

Type-specimens: *Equula smithursti* Ramsay & Ogilby, holotype AMS B.9962 Hood Lagoon, New Guinea.

Leiognathus smithursti

AMS: I.20907-036 S. of Cooktown, Qld; I.22974-001 11°26′S.,133°09′E.; I.22981-001 13°27′S., 136°51′E.; I.23044-001 11°26′S.,133°10′E.
CSIRO: CA.306 20°39′S.,116°15′E.; CA.2942-2943 13°27′S.,136°51′E.
NTMAS: ♀S.10510-001 10°30′S.,132°03′E.
QM: I.7497 Magnetic I., Qld; I.15755 16°10′S.,145°28′E.
WAM: P.26185-005 20°52′S.,115°10′E.

Leiognathus splendens (Cuvier)

(Fig. 16)

Equula splendens Cuvier, 1829, p. 212 (described from an account and figure in Russell, 1803, pl. 61). No types in existence.
Leiognathus gomorah (Valenciennes): Bleeker, 1863, p. 235.
Equula ovalis de Vis, 1884, p. 543 (Cape York, Queensland). Type in QM.
Equula simplex de Vis, 1884, p. 544 (Cape York, Queensland). Type in QM.
Eubleekeria ovalis: Whitley, 1932, pp. 109–11.
Leiognathus splendens: Weber and de Beaufort, 1931, pp. 324–6; Munro, 1960, p. 136, #863; Kuhlmorgen-Hille, 1974, Leiog. 10; James, 1975, pp. 148–9.
Leiognathus jonesi James, 1969, pp. 316–19. Types in Reference Collections of the Central Marine Fisheries Research Institute, Mandapam Camp, India.

Diagnosis

Body depth 42–56% of S.L. in specimens 25–115 mm S.L. (Fig. 16*c*); chest fully scaled; suborbital naked. Second spines of dorsal and anal spines not elongate. Snout very blunt, line of closed mouth passes below eye. Protracted mouthparts point downwards; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers approximately equal in length to gill lamellae, (3–4) + (22–23) = 26–27.

Body silver with short wavy grey-brown vertical lines descending from dorsum; spinous dorsal fin with conspicuous jet black blotch on outer half; thin yellow margin along dorsal rays; spinous anal fin pale yellow; other fins colourless.

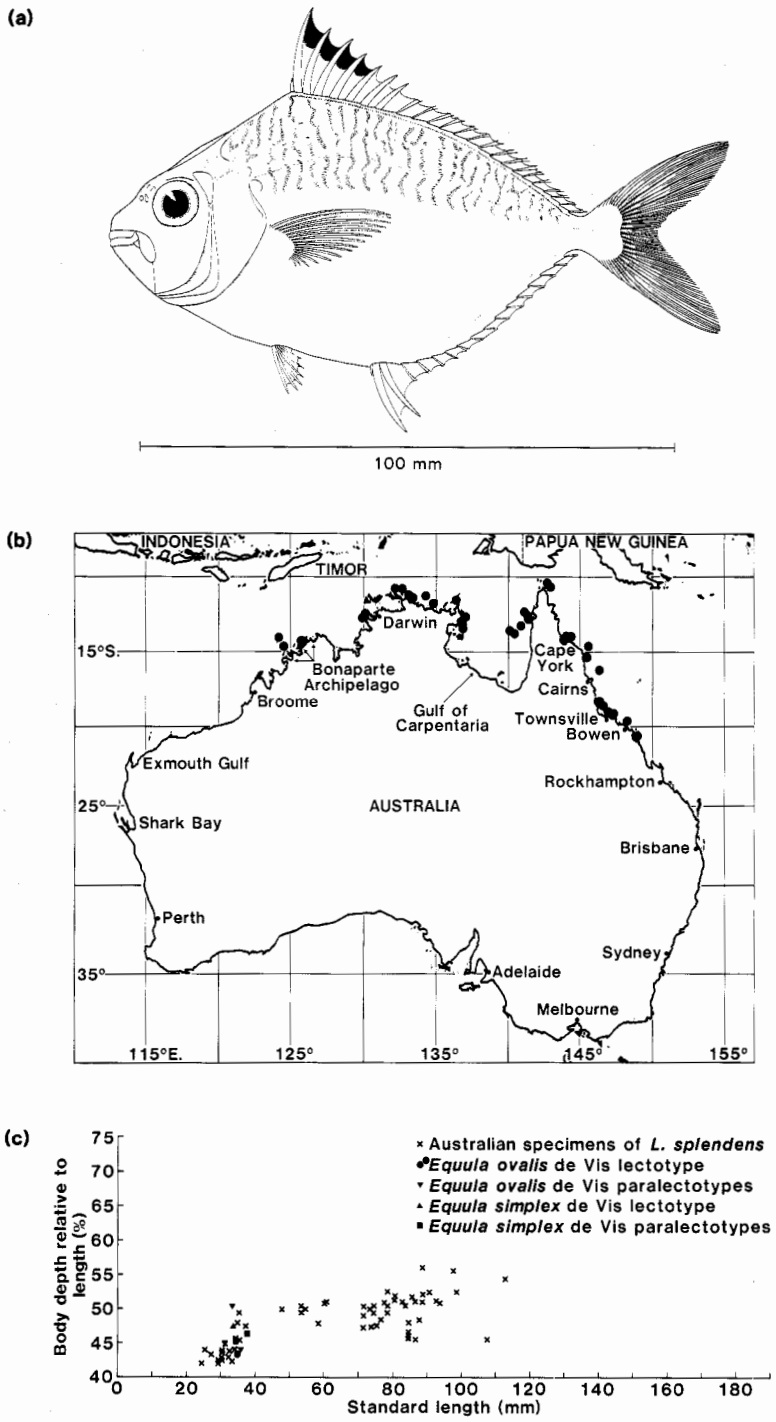


Fig. 16. (*a*) *Leiognathus splendens*. (*b*) Distribution records of *L. splendens* in Australia. (*c*) Body depth relative to standard length for *L. splendens*.

Similar Species

This species can be distinguished from most members of the family by a combination of the characters: conspicuous black blotch on dorsal fin, chest fully scaled, line of mouth passing below eye. It is distinguished from *L. rapsoni* Munro, 1964 (which occurs in Papua New Guinea) by the absence of scales on the suborbital.

Distribution

Common throughout the coastal waters of northern Australia, from Broome (W.A.) to Mackay (Qld), in depths of 15–65 m (see Fig. 16*b*).

Discussion

The species as described above is generally consistent with accounts of *L. splendens* in the literature. Some descriptions, however, state that the scales of the lateral line, the bases of the pectoral fins, and the margins of the dorsal and anal fins are bright yellow (e.g. Tiews and Caces-Borja 1965; Kuhlmorgen-Hille 1974), whereas these areas in the Australian specimens are colourless or, at most, pale cream. Similarly, Kuhlmorgen-Hille (1974) stated that the black blotch on the upper third of the spinous dorsal fins was only sometimes present, although James (1975) and Munro (1967) used this coloration as a diagnostic character in their keys to the species. All specimens of *L. splendens* examined during the present study were characterized by the black marking on the spinous dorsal fin.

Other taxonomic characters mentioned in the literature include the relative length of the pelvic fin to pelvic–anal distance (Kuhlmorgen-Hille 1968) and the shape of the lateral line (Tiews and Caces-Borja 1965). On the basis of the present study, neither of these characters appears to be taxonomically reliable.

Whitley (1932) regarded *E. simplex* and *E. ovalis* as synonymous, but considered the species to be distinct from *L. splendens*. Munro (1960), however, synonymized the species (a decision with which I concur), although he erroneously described *L. splendens* as having a naked chest. The description, however, was amended in his more recent publication (Munro 1967).

A specimen from Bleeker's collection labelled '*L. gomorah*' (MVM 6185) is consistent with *L. splendens* as described above.

L. jonesi, a species very similar to *L. splendens*, was described from the Indian seas by James (1969). On the basis of the data presented in his paper, however, there appears little justification for the recognition of *L. jonesi* as a distinct species. Apart from subjective differences in the degree of pigmentation of the spinous dorsal fin ('grey' *v.* 'black'), and the relative strength of the dorsal and anal spines ('weak' and 'strong'), the only differences cited by James between *L. jonesi* and *L. splendens* are the relative lengths of the first and second dorsal and anal spines. The values given for these proportions, however, show an almost complete overlap in the ranges for the two species ('D_1 big, 4·6–7·0 in D_2' for *L. jonesi* compared with 'D_1 small, 3·3–8·0 in D_2' for *L. splendens*). Similarly, the values of the proportion A_1 in A_2 are given as 'big, 3·1–6·0' for *L. jonesi* compared with 'small, 2·5–4·5' for *L. splendens*. In the absence of further evidence, the recognition of *L. jonesi* is considered unwarranted.

Material Examined

Type-specimens: *Equula ovalis* de Vis, lectotype QM I.1703 Cape York, Qld; paralectotypes QM I.9810 Cape York, Qld. *Equula simplex* de Vis, lectotype QM I.1702 Cape York, Qld; paralectotypes QM I.9811 Cape York, Qld. *Leiognathus rapsoni* Munro, holotype CSIRO A.2137 off Redscar Bay, Papua; paratypes CSIRO A.3087–3089 off Redscar Bay, Papua.

Leiognathus splendens

AMS: E.2520–2524 Bowen, Qld; E.2720–2721 Bowen, Qld; E.2780–2811 Gloucester Hds, Qld; IA.4900 Cape York, Qld; IA.4980 Bowen, Qld; IA.4917–4918 Gloucester Hds, Qld; IA.4920 Bowen, Qld; IA.4924 Gloucester Hds, Qld; IB.5899 Townsville, Qld; IB.5906 Townsville, Qld; IB.6560 Townsville, Qld; IB.6787–6789 Townsville, Qld; I.15421–15424 Townsville, Qld; I.15557-126 16°57′S.,139°24′E.; I.20778-006 Lizard I., Qld; I.20402-045 Bonaparte Archipelago, W.A.; I.20826-019 Palm I., Qld; I.20904-036 Cape Ferguson, Qld; I.20904-037 Cape Ferguson, Qld; I.21841-004 Arafura Sea, N.T.; I.21959-004 Arafura Sea, N.T.; I.22972-001 11°34′S.,133°12′E.; I.23042-001 11°43′S.,136°20′E.

CSIRO: A.790–791 Magnetic I., Qld; A.1226 Proserpine, Qld; A.2176-2179 17°15′S.,139°45′E.; A.2348–2349 16°59′S.,139°50′E.; A.2716 Melville Is, N.T.; A.3992 Bountiful I., Gulf of Carpentaria, Qld; A.3994–3996 Bountiful I., Gulf of Carpentaria, Qld; B.9 Flying Fish Pt, Innisfail, Qld; B.18 Magnetic I., Qld; B.2215 11°34′S.,133°12′E.; C.3424–3425 16°57′S.,139°24′E.; CA.2690 N. of Groote Eylandt, Gulf of Carpentaria, N.T.

MVM: 6185 E. Indian Archipelago.

NTMAS: S.10511-001 11°34′S.,133°12′E.

QM: I.4 Cape Gloucester, Qld; I.1981–1984 Cape Bowling Green, Qld; I.1987–1988 Cape Bowling Green, Qld; I.7283–7288 Magnetic I., Qld; I.11213 Mornington I., Qld; I.11214 Townsville, Qld; I.11215 Cleveland Bay, Qld; I.15723 18°44′S.,146°31′E.; I.15754 16°10′S.,145°28′E.; I.15826 16°10′S.,145°28′E.; I.15957 Princess Charlotte Bay, Qld; I.16181 Townsville, Qld; I.17656 Caldbeck Rf, Torres Str., Qld; I.17657 Aureed I., Qld; I.17658 York I., Torres Str., Qld; I.17659 Torres Str., Qld; I.18021 15°59′S.,145°32′E.; I.18060 14°07′S.,144°26′E.; I.18077 14°11′S.,144°25′E.; I.18136 14°09′S.,144°24′E.; I.18271 14°10′S.,144°09′E.; I.18282 14°10′S.,144°09′E.; I.18289 14°11′S.,144°09′E.; I.18297 14°11′S.,144°02′E.; I.18306 14°10′S.,144°01′E.; I.18336 14°12′S.,144°06′E.; I.18351 14°10′S.,144°02′E.; I.18361 14°11′S.,144°02′E.

WAM: P.13297 Weipa, Qld; P.24241–24242 Napier, Broome Bay, W.A.

Leiognathus sp.

(Fig. 17)

?Leiognathus lineolatus: Weber and de Beaufort, 1931, pp. 337–8; James, 1975, pp. 163–5. (Not *Equula lineolata* Valenciennes.)

Diagnosis

Body depth 30–43% of S.L. in specimens 35–130 mm S.L., percentage increasing with length (Fig. 17*c*); anterior region of chest naked, but scales extending forward onto chest below pectoral fin (Fig. 1*d*); suborbital naked. Second dorsal spine elongate (77–125% of body depth) but often broken in trawled specimens; second anal spine not elongate (29–42% of body depth). Protracted mouthparts point downward; narrow band of villiform teeth in each jaw (Fig. 1*c*); gill rakers approximately half length of gill lamellae, (5–6) + (13–15) = 20–21.

Body silver, upper half with irregular close-set grey-brown vermiculations and spots (markings with greenish sheen when fresh); males often with non-silvery triangular patch on flanks; yellow bar across top of eye sometimes present; outer half of spinous anal fin yellow, margins of soft dorsal and anal fins yellow; other fins colourless.

Similar Species

This species closely resembles *L. leuciscus* — see comments under that description. *Leiognathus* sp. also resembles *L. moretoniensis* in general body shape, but can be distinguished from it by the absence of scales on the suborbital. Juveniles of *Leiognathus* sp. may be confused with *L. elongatus* but can be distinguished from it by having a partly (rather than fully) scaled chest and by the snout being slightly rounded at the tip rather than sharp and pointed.

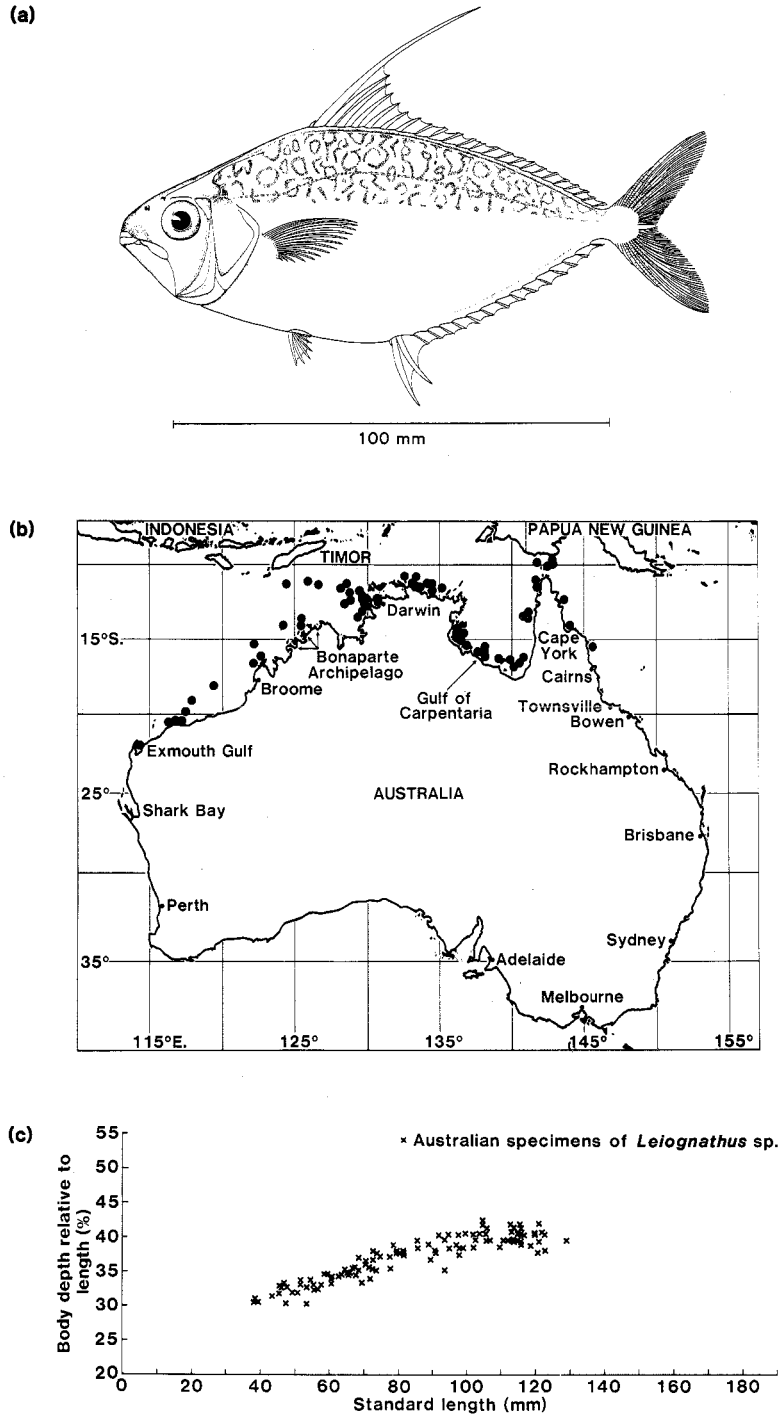


Fig. 17. (*a*) *Leiognathus* sp. (*b*) Distribution records of *Leiognathus* sp. in Australia. (*c*) Body depth relative to standard length for *Leiognathus* sp.

Distribution

Common throughout the coastal waters of northern Australia from Exmouth Gulf (W.A.) to Cairns (Qld), in depths of 15–170 m (see Fig. 17*b*).

Discussion

The body proportions and patterning of the species described above are similar to accounts of *L. lineolatus* given by Weber and de Beaufort (1931) and James (1975). These descriptions, however, are at variance with each other in some respects, and James, for instance, stated that *L. lineolatus* has small scales 'all over the body including the breast where they are large', whereas Weber and de Beaufort described scales as 'of medium size . . . . covering . . . . the breast'. Similarly, some aspects of James' account of the species are internally inconsistent, e.g. in the key to species, *L. lineolatus* is separated from *L. leuciscus* by the character 'D_2 not longer than half height of body', yet in his discussion of *L. lineolatus*, James stated 'in the present study, it (the second dorsal spine) is found to be much more than half the height of the body'.

Specimens of Bleeker's *L. lineolatus* (MVM 46323–4) do not represent the same species as *Leiognathus* sp. described above. Bleeker's specimens have similar body proportions to *Leiognathus* sp. (body depth 38 and 41% of S.L. in specimens of 72 and 61 mm S.L., respectively) but the chest regions of both specimens are fully scaled. (The body patterning of Bleeker's specimens is indistinct; the second dorsal and anal spines of both specimens are broken.) Similarly, a specimen identified as *Equula lineolata* in Day's collection (AMS B.8103) has a fully scaled chest and is therefore recognized as being distinct from *Leiognathus* sp. James (1975), however, stated that Day's *E. lineolata* is referable to *L. dussumieri* (Valenciennes).

Examination of the syntypes of *Equula lineolata* Valenciennes reveals that this species is being incorrectly portrayed in the current literature. As discussed on p. 575 of this paper, *E. lineolata* is regarded here as a junior synonym of *L. bindus*.

Although I have been unable to ascribe a name to the species discussed above, I am reluctant to assume it is an undescribed species until a more geographically comprehensive revision of the family is undertaken.

Material Examined

Leiognathus sp.

AMS: E.2892 Platypus Bay, Qld; I.20771-029 Cpt. Billy Ck, Cape York, Qld; I.21623-002 NW. Shelf, W.A.; I.21841-009 Arafura Sea, N.T.; I.21849-004 Arafura Sea, N.T.; I.22971-001 12°25′S.,129°56′E.; I.22971-002 12°25′S.,129°56′E.; I.22971-003 12°25′S.,129°56′E.; I.22976-001 12°37′S.,129°48′E.; I.22978-001 12°43′S.,130°00′E.; I.22978-002 12°43′S.,130°00′E.; I.22980-001 15°59′S.,138°03′E.

CSIRO: A.2152 16°34′S.,139°56′E.; A.2165 16°30′S.,140°09′E.; A.2268–2269 16°48′S.,140°50′E.; A.2287 17°15′S.,140°29′E.; B.2207 12°25′S.,129°56′E.; B.2207 12°25′S.,129°56′E.; B.2208 12°43′S.,130°00′E.; C.3262 16°29′S.,140°09′E.; C.3997 17 miles NE. Robinson R., Gulf of Carpentaria, N.T.; CA.304 20°39′S.,116°15′E.

NTMAS: S.10507-001 12°43′S.,130°00′E.; S.10515-003 14°29′S.,136°06′E.

QM: I.12284 16°40′S.,140°28′E.; I.15650 12°31′S.,143°27′E.; I.15959 Princess Charlotte Bay, Qld; I.17660 Aureed I., Torres Str., Qld; I.17695 9°35′S.,142°51′E.; I.17696 9°44′S.,142°51′E. Torres Str., Qld; I.17697 9°55′S.,142°42′E.; I.17698 9°57′S.,142°50′E.

WAM: P.26190-21 20°35′S.,116°15′E.

Type-specimens: *Equula lineolata* Valenciennes, syntypes MNHN A.6738, A.6739 Java, Indonesia.

'*Equula lineolata*' (det. Day)

AMS: B.8103 Madras, India.

'*Leiognathus lineolatus*' (det. Bleeker)

MVM: 46323–4 E. Indian Archipelago.

Secutor Gistel

Secutor Gistel, 1848, p. 9. Type: *Zeus insidiator* Bloch, 1787, by original designation.
Deveximentum Fowler, 1904, p. 517. Type-species: *Zeus insidiator* Bloch, 1787, by original designation.

Diagnostic Characters

Mouthparts protract upwards; lower jaw ascends at angle of approx. 85–90° when mouth closed; 1 antero-orbital spine; teeth minute, arranged in 1–2 irregular rows; teeth of upper jaw concealed behind rim of premaxilla; ventral profile of body more convex than dorsal profile.

Secutor insidiator (Bloch)

(Fig. 18)

Zeus insidiator Bloch, 1787, Part 8, pp. 41–2 (Suratte, India). No types in existence.
Equula insidiatrix: Cuvier and Valenciennes, 1835, p. 98.
Leiognathus insidiator: Bleeker, 1865, p. 290; Weber and de Beaufort, 1931, p. 316.
Secutor profundus: Whitley, 1932, pp. 115–16. (Not *Equula profunda* de Vis.)
Secutor insidiator: Kuhlmorgen-Hille, 1974, Sec. 1; James, 1975, pp. 167–8.

Diagnosis

Body depth 39–60% of S.L. in specimens 30–100 mm S.L., percentage increasing with length (Fig. 18*c*); scales small (approximately 23–25 rows from pectoral to ventral fin base), chest fully scaled; suborbital naked. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point upwards; teeth minute (visible only microscopically), blunt, coniform, arranged in 1–2 irregular rows in each jaw, upper jaw teeth smaller than those of lower jaw and concealed behind rim of premaxilla (Fig. 1*e*); gill rakers long and slender, approximately equal in length to gill lamellae, (5–7) + (17–19) = 23–25.

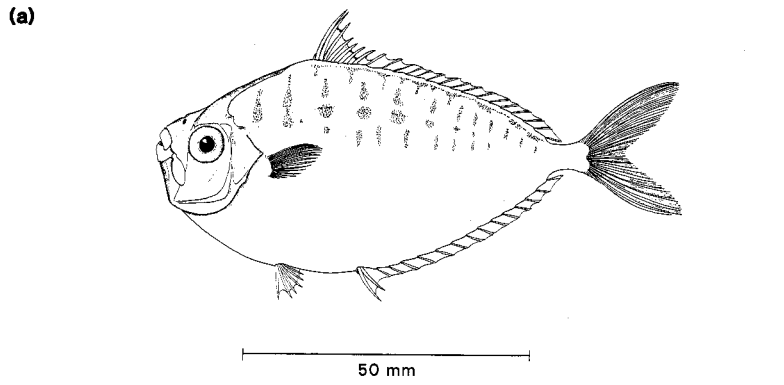
Body silver, upper half with pearly blue spots when fresh, becoming grey-brown on preservation; margin of spinous dorsal fin speckled black; other fins colourless.

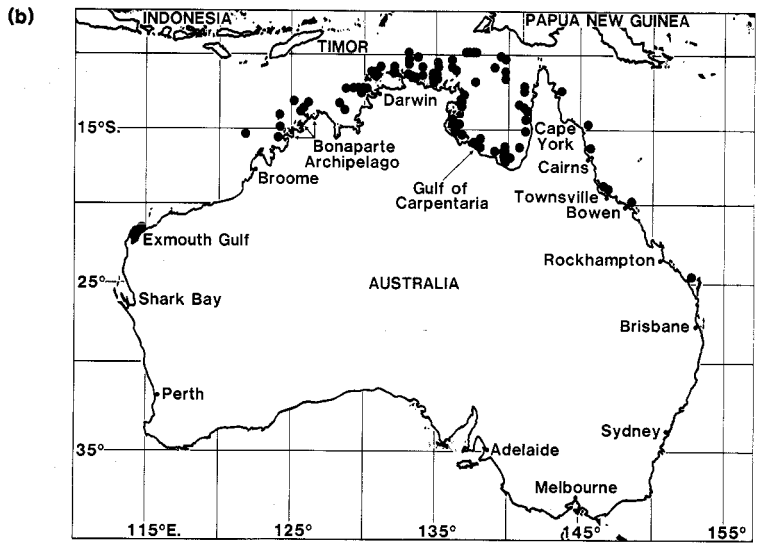
Similar Species

This species resembles *S. ruconius* in having upward protracting mouthparts and similar coloration, but can be distinguished by its more elongate body shape (body depth 39–60% of S.L. compared with 57–68% in *S. ruconius*) and by the absence of scales on the suborbital.

Distribution

Common throughout northern Australian waters from Exmouth Gulf (W.A.) to Bundaberg (Qld), in depths of 10–105 m (see Fig. 18*b*).





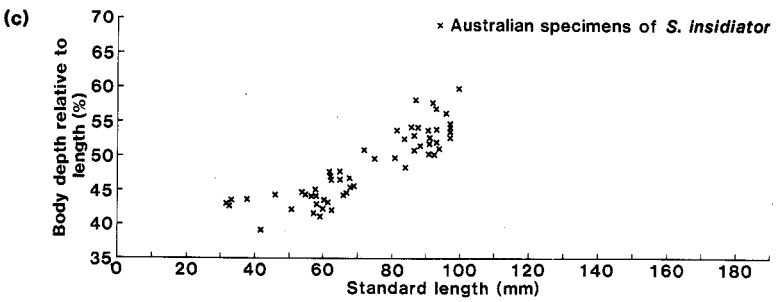


Fig. 18. (*a*) *Secutor insidiator*. (*b*) Distribution records of *S. insidiator* in Australia. (*c*) Body depth relative to standard length for *S. insidiator*.

Discussion

The species as described above is generally consistent with accounts of *S. insidiator* in the literature although the Australian specimens exhibit a wider range in the proportional value of body depth as a percentage of S.L. than recorded by others [39–60% in Australian specimens compared with 45–53% (James 1975) and 50–56% (Monkolprasit 1973)]. James (1975) described the teeth of both *Secutor ruconius* and *S. insidiator* as 'numerous, in a villiform band', but in personal communication has confirmed that the tooth shape and arrangement of his specimens are consistent with those of the Australian specimens, and that his earlier descriptions need revision.

Specimens identified by Cuvier as *Equula insidiatrix* (MNHN A.6731, A.6733) are in good condition, and in all respects appear consistent with the species as described above. Similarly, a specimen identified as *Leiognathus insidiator* from Bleeker's collection (MVM 46327) is regarded as belonging to the same species. Specimens that Whitley (1932) stated were referable to *S. profundus* consist mainly of *S. insidiator*, although one specimen (AM A.4915) belongs to *S. ruconius*.

Monkolprasit (1973) described a new species, *Secutor indicius*, from Thailand. This species was described as being closest to *E. insidiator*. Monkolprasit presented a table comparing various characters of the three species of *Secutor*, although many of these characters are constant throughout the genus. Of those that indicate some difference between *S. insidiator* and *S. indicius*, several display considerable overlap between the species, and other characters are subjective and hence provide poor diagnostic features. Values or value ranges for some of the characters that give good separation of the two species do not agree well with values recorded for *S. insidiator* in the literature or in the present study, as will be discussed later.

I have examined specimens identified by Monkolprasit as *S. insidiator* and *S. indicius* from the Gulf of Thailand. Adults of Monkolprasit's *S. insidiator* closely resemble the Australian species identified here as *S. insidiator*. It is noted, however, that the juvenile specimens (25–30 mm S.L.) from the Gulf of Thailand do not differ appreciably in their body proportions from the adult specimens, whereas similar sized specimens from Australia tend to be relatively more elongate than the adults. (Body depth as a percentage of S.L. of specimens of *S. insidiator* from the Gulf of Thailand ranges from 28% in specimens of 25 mm S.L. to 46% in specimens of 66 mm S.L.)

Adult *S. indicius* and *S. insidiator* from the Gulf of Thailand differ most noticeably in their body pigmentation pattern, *S. indicius* being characterized by narrow broken vertical bars on the upper half of the body and *S. insidiator* having round to oval spots on the upper body. Differences in body patterning between the two species are not clear in juvenile specimens, and identification then appears to rely heavily on differences in body shape, which are quite pronounced in small specimens. (Depth as a percentage of S.L. in specimens of *S. indicius* that I examined ranged from 39% in specimens of 30 mm S.L. to 46% in a specimen of 72 mm S.L.)

The large differences in lateral line scale counts reported by Monkolprasit between *S. insidiator* and *S. indicius* could not be satisfactorily confirmed in the specimens I examined. This was due to the difficulty in establishing where the lateral line terminated, as scales were missing from the posterior regions of the specimens.

The range of values reported by Monkolprasit for pectoral fin rays, gill rakers and body proportions for *S. insidiator* and *S. indicius* appear to demonstrate a good separation of the two species. However, the values of these characters recorded in the present study for Australian specimens of *S. insidiator* show considerable overlap between the ranges presented by Monkolprasit for *S. insidiator* and *S. indicius* (see Table 3). Similarly, Monkolprasit described *S. insidiator* as having two antero-orbital spines and *S. indicius* as having only one such spine. This seemingly important difference between the two species raises some problems with respect to the current literature, as *S. insidiator* is usually

described as having only one antero-orbital spine (e.g. James 1975). Examination of specimens identified by Cuvier as *Equula insidiatrix* (a species listed by Monkolprasit as a synonym of *S. insidiator*) reveals that they possess only one antero-orbital spine. This discrepancy between accounts can be attributed to Monkolprasit's specimens of *S. insidiator* being characterized by a pronounced fork in the antero-orbital spine. This forking is not apparent in Australian specimens of *S. insidiator*.

Specimens of *Secutor* that I examined from Papua New Guinea were more elongate than Australian *S. insidiator* (body depth 33–37% of S.L. in Papua New Guinea specimens of 25–45 mm S.L.). The gill-raker counts (26–27) were somewhat higher than those of the Australian specimens, but the ranges in pectoral fin ray counts were similar (17–18).

From the above discussion, it is clear that more detailed work needs to be undertaken in order to define *S. indicius* satisfactorily.

Table 3. Comparison of body proportion and meristic data for *S. insidiator* (Bloch) and *S. indicius* Monkolprasit

Species	Body depth ÷ S.L. (%)	Pectoral fin rays	Gill rakers	Antero-orbital spine(s)	Reference
S. insidiator	39–60	17–18	23–25	1	This study
S. insidiator	50–56	16–17	23–24	2	Monkolprasit (1973)
S. indicius	39–46	17–18	26–29	1	Monkolprasit (1973)

Material Examined

Secutor insidiator

AMS: B.8067–8068 Madras, India; E.2525–2527 Bowen, Qld; E.2673–2674 Bowen, Qld; IA.4911–4915 Bowen, Qld; IB.3014 Exmouth Gulf, W.A.; IB.5907 Townsville, Qld; IB.8352 Magnetic I., Qld; I.63 Madras, India; I.20826-15 Palm I., Qld; I.20904-035 Cape Ferguson, Qld; I.21609-002 NW. Shelf, W.A.; I.21841-005 Arafura Sea, N.T.; I.21959-002 Arafura Sea, N.T.; I.22973-001 12°23′S.,129°21′E.; I.22983-004 14°29′S.,136°06′E.; I.22984-001 13°00′S.,136°49′E.; I.22987-001 11°50′S.,134°48′E.; I.22988-001 11°10′S.,130°30′E.

CSIRO: A.2159–2162 16°51′S.,139°46′E.; A.2282–2283 17°15′S.,140°29′E.; A.2347 16°42′S., 140°47′E.; A.2401 16°46′S.,140°40′E.; A.2452–2453 16°53′S.,139°53′S.; A.2887 16°43′S.,140°41′E.; A.3187 16°49′S.,140°39′E.; A.3188–3190 16°49′S.,140°39′E.; A.3317 Ashburton R. area, W.A.; A.3349 Ashburton R. area, W.A.; A.4052–4058 6 miles S. Bountiful I., Gulf of Carpentaria, Qld; C.4154 17 miles NE. Robinson R., Gulf of Carpentaria, N.T.; CA.1154–1155 13°06′S.,125°03′E.

MNHN: A.6731, A.6733 Pondicherry, India.

MVM: 46327 E. Indian Archipelago.

NTMAS: S.10513-001 11°50′S.,134°48′E.; S.10515-005 14°29′S.,136°06′E.

QM: I.3514–3515 Bundaberg, Qld; I.12680 Exmouth Gulf, W.A.; I.15604 12°31′S.,143°27′E.; I.15757 16°10′S.,145°28′E.; I.17871 18°33′S.,146°31′E.

WAM: P.6097 Exmouth Gulf, W.A.; P.12963–12966 Exmouth Gulf, W.A.

Unregistered specimens: Five specimens Gulf of Thailand (det. Monkolprasit); six specimens Papua New Guinea.

Secutor indicius

Unregistered specimens: Five specimens Gulf of Thailand (det. Monkolprasit).

Secutor ruconius (Hamilton-Buchanan)

(Fig. 19)

Chanda ruconius Hamilton-Buchanan, 1822, pp. 106, 371, pl. 12 (Ganges R., India). No types in existence.

Equula interrupta Valenciennes, in Cuvier and Valenciennes, 1835, p. 102 (Pondicherry, India). Types in MNHN.

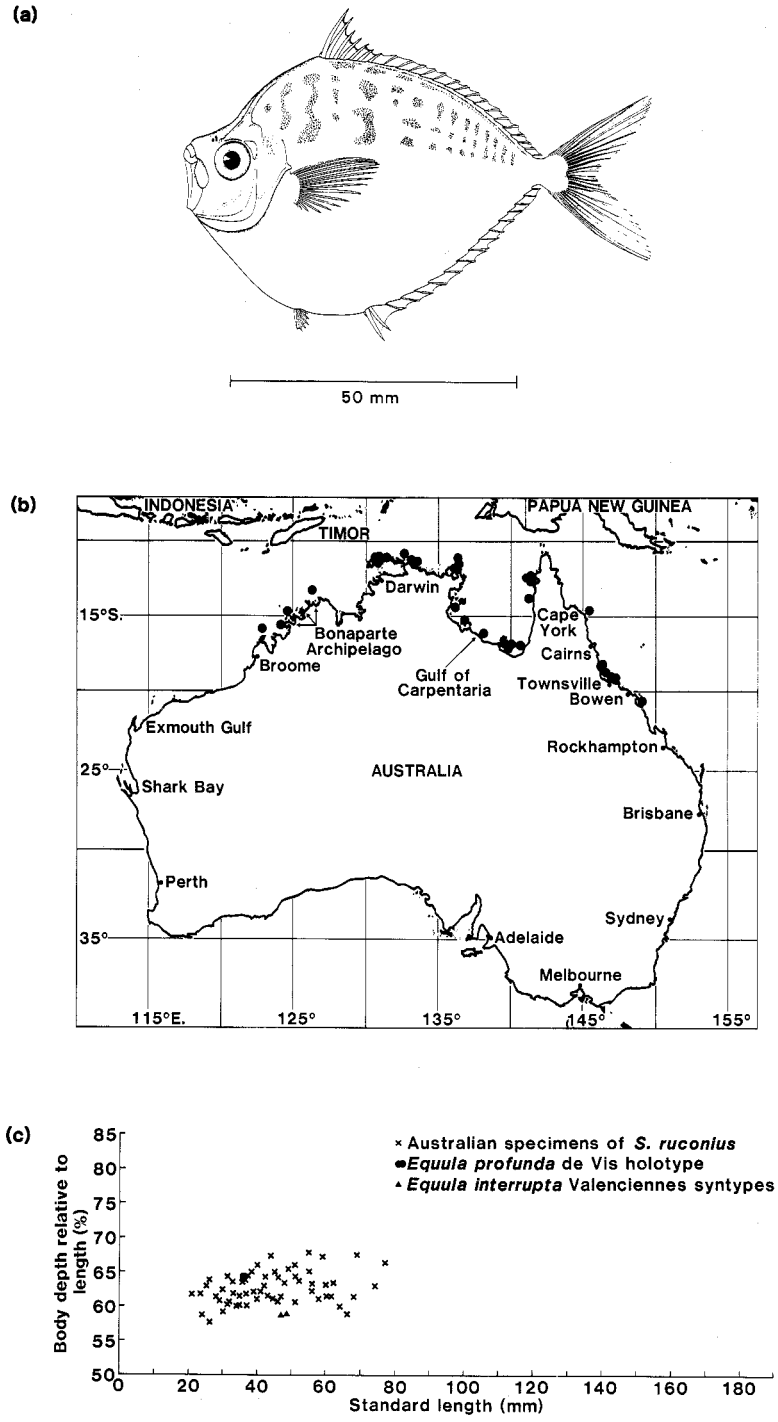


Fig. 19. (*a*) *Secutor ruconius*. (*b*) Distribution records of *S. ruconius* in Australia. (*c*) Body depth relative to standard length for *S. ruconius*.

Equula profunda de Vis, 1884, p. 544 (Queensland coast). Type in QM.
Leiognathus ruconius: Weber and de Beaufort, 1931, p. 316.
Secutor ruconius: Munro, 1960, p. 135, #859; Kuhlmorgen-Hille, 1974, Sec. 2; James, 1975, pp. 165–7.

Diagnosis

Body depth 57–68% of S.L. in specimens 20–80 mm S.L. (Fig. 19*c*); scales large (approx. 10–12 rows from pectoral base to ventral fin); chest and suborbital scaled. Second spines of dorsal and anal fins not elongate. Protracted mouthparts point upward; teeth minute (visible only microscopically), blunt, coniform, arranged in 1–2 irregular rows in each jaw, upper jaw teeth smaller than those of lower jaw and concealed behind rim of premaxilla (Fig. 1*e*); gill rakers long and slender, approximately equal in length to gill lamellae, (5–6) + (16–17) = 22–23.

Body silver, upper half with pearly blue spots when fresh, becoming grey-brown on preservation; margin of spinous dorsal fin speckled black; other fins colourless.

Similar Species

This species resembles *S. insidiator* — refer to comments under that species.

Distribution

Moderately common in the coastal waters of northern Australia from Broome (W.A.) to Mackay (Qld), in depths of 10–65 m (see Fig. 19*b*).

Discussion

The species as described above is generally consistent with accounts of *S. ruconius* in the literature, with the exception that scales were detected on the suborbital of the Australian specimens. This character is rarely referred to in descriptions of *S. ruconius*, but Monkolprasit (1973) clearly stated that the head of *S. ruconius* was naked, and James (1975) also implied this was the case when he described *L. elongatus* as the only member of the family to possess scales on the cheeks. If these accounts were correct, this character difference could warrant recognition of the Australian species as distinct from *S. ruconius*, in which case it should be referred to as *S. profundus* (de Vis).

The presence or absence of scales on the suborbital of *Chanda ruconius* Hamilton-Buchanan cannot be ascertained directly, as no type material was left (Whitehead 1967). However, examination of the syntypes of Valenciennes' *Equula interrupta* (a species that is generally regarded as synonymous with *S. ruconius*) reveals that they also possess scale pockets on the suborbital. It therefore seems likely that this character has simply been overlooked by previous authors, and that *S. ruconius* is normally characterized by scales on the suborbital.

The figure of *Chanda ruconius* in Hamilton-Buchanan's (1822) paper indicates that the mouthparts protract slightly downwards, rather than in the usual upwards direction. This is presumed to be an error.

James (1975) described the teeth of *S. ruconius* as being 'numerous, in a villiform band', but this is evidently an error as discussed under *S. insidiator*.

Equula profunda de Vis was described from a specimen collected from Cape York, Queensland. The holotype of *E. profunda* is in extremely poor condition with sections of the dorsum and mouthparts missing. Nonetheless, the distinctive body shape of the specimen is typical of only one Australian species, and there seems little doubt that the species belongs to *S. ruconius*.

Material Examined

Type-specimens: *Equula interrupta* Valenciennes, syntypes (two specimens) MNHN A.6763 Pondicherry, India. *Equula profunda* de Vis, holotype QM I.9818 Cape York, Queensland.

Secutor ruconius

AMS: B.8134 Madras, India; IB.6444-6445 Weipa, Qld; I.15557-124 16°52′S.,139°25′E.; I.19355-008 Balikpapan Hbr, Borneo; I.20402-044 Bonaparte Archipelago, W.A.; I.20826-015 Palm I., Qld; I.20829-017 Lizard I., Qld; I.21841-007 Arafura Sea, N.T.

CSIRO: A.2155–2158 16°51′S.,139°46′E.; A.2226 17°25′S.,140°42′E.; A.2228 17°25′S.,140°42′E.; A.2230–2232 17°25′S.,140°42′E.; A.2281 17°15′S.,140°29′E.; A.2545 no locality, N.T.; A.2892–2893 17°26′S.,140°36′E.; A.4036–4040 17.4 miles NW. Fairway Buoy, Gulf of Carpentaria, Qld; B.2216 15°30′S.,124°01′E.

NTMAS: S.10504-001 11°35′S.,133°15′E.; S.10505-001 13°42′S.,125°45′E.

QM: I.1985 Cape Bowling Green, Qld; I.10465 Townsville, Qld; I.11227 Townsville, Qld; I.11616 Karumba, Qld; I.13503 Prosperine R., Qld; I.15722 18°44′S.,146°31′E.; I.16183 Townsville, Qld; I.16204 14°50′S.,145°17′E.; I.16559 Hinchinbrook Passage, Qld; I.17881 Labu estuary, New Guinea; I.22966-002 15°30′S.,124°01′E.; I.22979-001 11°35′S.,133°15′E.; I.22992-001 13°46′S.,128°14′E.

WAM: P.12971 Albatross Bay, Weipa, Qld.

Note added in proof:

Paul V. Dunlap and Margaret J. McFall-Ngai have recently published [*Copeia* 1984 (4), 884–92] further data supporting the recognition of *L. elongatus* (Gunther) and *L. stercorarius* Evermann & Seale as separate species.

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