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Revision of the labrid fish genus *Pseudolabrus* and allied genera

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ABSTRACT. Six labrid genera, *Austrolabrus* Steindachner, *Dotalabrus* Whitley, *Eupetrichthys* Ramsay & Ogilby, *Notolabrus* new genus, *Pictilabrus* Gill, and *Pseudolabrus* Bleeker, are recognised as forming a monophyletic assemblage, here referred to collectively as pseudolabrines. This group comprises 23 species, including two new species described herein: *Dotalabrus alleni* n.sp. and *Pictilabrus viridis* n.sp., both from south-western Australia. The genus *Suezichthys* (= *Suezia*) Smith, previously considered closely related to *Pseudolabrus,* is excluded. Keys, diagnoses and descriptions of the genera and species are given. The pseudolabrines are provisionally placed in the tribe Julidini, and appear to be the plesiomorphic sister group of all other julidines. Within the pseudolabrine group, cladistic analysis supports the separation of *Notolabrus* n.gen., previously included with *Pseudolabrus,* and the inclusion of *Lunolabrus* Whitley as a subgenus of *Pseudolabrus.*

Contents

Introduction

Labrid fishes of the genus *Pseudolabrus* Bleeker (1862a) and allied genera are among the most characteristic fishes of the subtropical and temperate South Pacific. The distribution of the group is centered in the Australia-New Zealand region, with a few species extending eastward across the Pacific as far as Juan Fernandez. A single species, *P. japonicus* (Temminck & Schlegel), occurs in northern temperate waters from southern Japan to Hong Kong.

Previously, 64 nominal species (Table 1) were referable to the genus *Pseudolabrus* and five other nominal genera (*Austrolabrus* Steindachner, 1884; *Dotalabrus* Whitley, 1930; *Eupetrichthys* Ramsay & Ogilby, 1888b; *Lunolabrus* Whitley, 1933; *Pictilabrus* Gill, 1892). Five genera (*Austrolabrus, Dotalabrus, Eupetrichthys, Pictilabrus, Pseudolabrus*) and a new genus (*Notolabrus*) are recognised here as forming a monophyletic assemblage, and are referred to collectively as pseudolabrines. This group comprises 23 species, including two hitherto undescribed species. The genus *Suezichthys* Smith (1957) (= *Suezia* - see Smith, 1958) considered by Smith to be closely related to *Pseudolabrus*, and the monotypic genus *Nelabrichthys* Russell (1983a), also related, are not considered monophyletic with the pseudolabrine group. *Suezichthys gracilis* (Steindachner & Döderlein) and *S. notatus* (Kamohara), and the nominal species *Labrichthys isleanus* Sauvage and *L. lantzii* Sauvage, both junior synonyms of *Nelabrichthys ornatus* (Carmichael), previously were referred to *Pseudolabrus* (Russell, 1983a, 1985).

The pseudolabrines are small to medium-sized fishes (to about 45cm total length [TL]) and usually occur abundantly in shallow inshore rock or coral habitats. Some species are brightly coloured, and in Australia and New Zealand this has led to the common name 'parrot fish' (not to be confused with parrot fish of the family Scaridae). Pscudolabrine fishes were well known to indigenes, and although of little value today, formed an important source of food in prehistoric New Zealand (Leach & Anderson, 1979) and Tasmania (Jones, 1978).

Because many pseudolabrine species lack distinctive meristic and morphometric characters, and as some, if not all, species are protogynous hermaphrodites (Choat, 1965; Doak, 1972; McPherson, 1977; Jones, 1981a, 1981b) and exhibit varying degrees of sexual dichromatism, the group has proved difficult for taxonomists. Failure by some early workers to recognise the significance of colour differences within a single species often led to the same species being redescribed repeatedly.

The present study has three main objectives which are presented in the following order: (1) definition of the genera and species of the pseudolabrine group, (2) hypothesis of their cladistic relationships, and (3) examination of the relationships between the pseudolabrines and other labrid groups.

Table 1. List of nominal taxa that have been referred to the pseudolabrine group, and their present designations. Refer to text discussion under senior synonym for the basis of determination for species assigned to the pseudolabrine group. Refer to Russell (1983a) for discussion of nominal species assigned to *Nelabrichthys;* and Russell (1985) for species assigned to *Suezichthys*.

Species, Author, Publication date	Present identification
Eupetrichthys angustipes Ramsay & Ogilby, 1888b	*Eupetrichthys angustipes* Ramsay & Ogilby
Cheilinus aurantiacus Castelnau, 1872b	*Dotalabrus aurantiacus* (Castelnau)
Labrichthys australis Steindachner, 1866	*Pseudolabrus guentheri* (Bleeker)
Labrichthys biserialis Klunzinger, 1879	*Pseudolabrus biserialis* (Klunzinger)
Hemigymnus Bleasdalei Castelnau, 1875	*?Pictilabrus laticlavius* (Richardson)
Labrichthys Bleekeri Castelnau, 1872a	*Notolabrus tetricus* (Richardson)
Labrichthys Bostockii Castelnau, 1873	*Notolabrus parilus* (Richardson)
Labrus botryocosmus Richardson, 1844-1848 (1846)	*Notolabrus celidotus* (Forster in Bloch & Schneider)
Labrichthys caudovittatus Steindachner, 1898	*Suezichthys caudovittatus* (Steindachner)
Labrus celidotus Forster in Bloch & Schneider, 1801	*Notolabrus celidotus* (Forster in Bloch & Schneider)
Labrichthys ceruleus Saville-Kent, 1897	*Notolabrus tetricus* (Richardson)
Labrichthys cincta Hutton, 1877	*Notolabrus cinctus* (Hutton)
Labrus coccineus Forster, 1844	*Pseudolabrus miles* (Bloch & Schneider)
Labrichthys convexus Castelnau, 1875	*Notolabrus parilus* (Richardson)
Pseudolabrus cossyphoides Steindachner, 1901	*Pseudolabrus miles* (Bloch & Schneider)
Labrichthys cruentatus De Vis, 1885	*Pseudolabrus guentheri* Bleeker
Labrichthys Cuvieri Castelnau, 1873	*Notolabrus tetricus* (Richardson)
Labrichthys cyanogenys Ramsay & Ogilby, 1888a	*Notolabrus tetricus* (Richardson)
Labrus cyprinaceous White, 1790	nomen dubium
Labrus cyprinoides Meyer, 1793	nomen dubium in error for *Labrus cyprinaceous* White
Labrichthys dorsalis Macleay, 1881	*Pseudolabrus guentheri* Bleeker
Labrichthys dux De Vis, 1884	*Pseudolabrus guentheri* Bleeker
Labrichthys edelensis Castelnau, 1873	*Notolabrus parilus* (Richardson)
Labrichthys elegans Steindachner, 1884	*Dotalabrus aurantiacus* (Castelnau)
Labrus eöthinus Richardson, 1846	*Pseudolabrus japonicus* (Houttuyn)
Labrus fucicola Richardson, 1840	*Notolabrus fucicola* (Richardson)
Labrichthys fuentesi Regan, 1913b	*Pseudolabrus fuentesi* (Regan)

Labrichthys tetrica var. *fuscipinnis* Klunzinger, 1872	*Notolabrus tetricus* (Richardson)
Labrus Gayi Valenciennes in Cuvier & Valenciennes, 1839	*Pseudolabrus gayi* (Valenciennes)
Eupetrichthys gloveri Scott in Scott et al., 1974	*Pictilabrus laticlavius* (Richardson)
Labrichthys gracilis Steindachner & Döderlein, 1887	*Suezichthys gracilis* (Steindachner & Döderlein)
Pseudolabrus Güntheri Bleeker, 1862b	*Pseudolabrus guentheri* Bleeker
Labrichthys gymnogenis Günther, 1862	*Notolabrus gymnogenis* (Günther)
Labrus inscriptus vel *Tautauga inscripta* Richardson, 1844-1848 (1848)	*Notolabrus inscriptus* (Richardson)
Labrichthys isleanus Sauvage, 1875	*Nelabrichthys ornatus* (Carmichael)
Labrus Japonicus Houttuyn, 1782	*Pseudolabrus japonicus* (Houttuyn)
Labrichthys labiosa Macleay, 1881	*Pictilabrus laticlavius* (Richardson)
Labrichthys lantzii Sauvage, 1875	*Nelabrichthys ornatus* (Carmichael)
Labrus laticlavius Richardson, 1839	*Pictilabrus laticlavius* (Richardson)
Labrus luculentus vel *Tautoga luculenta* Richardson, 1844-1848 (1846)	*Pseudolabrus luculentus* (Richardson)
Labrichthys macleayi Herzenstein, 1896	*Dotalabrus aurantiacus* (Castelnau)
Labrichthys maculata Macleay, 1881	*Austrolabrus maculatus* (Macleay)
Labrichthys maculatus De Vis, 1885	*Pseudolabrus guentheri* Bleeker
Labrichthys melanura Macleay, 1881	*Pseudolabrus guentheri* Bleeker
Labrus miles Bloch & Schneider, 1801	*Pseudolabrus miles* (Bloch & Schneider)
Labrichthys Mortoni Johnston, 1885	*Pseudolabrus psittaculus* (Richardson)
Labrichthys nigromarginatus Macleay, 1878	*Notolabrus gymnogenis* (Günther)
Julis? notatus Richardson, 1843b	*Notolabrus celidotus* (Forster in Bloch & Schneider)
Pseudolabrus notatus Kamohara, 1958	*Suezichthys notatus* (Kamohara)
Labrichthys nudigena De Vis, 1884	*Halichoeres trimaculatus* (Quoy & Gaimard)
Labrichthys tetrica var. *ocellata* Klunzinger, 1879	*?Notolabrus tetricus* (Richardson)
Labrus ornatus Carmichael, 1818	*Nelabrichthys ornatus* (Carmichael)
Tautoga parila Richardson, 1850	*Notolabrus parilus* (Richardson)
Pseudolabrus pittensis Waite, 1910	*Notolabrus fucicola* (Richardson)
Labrus poecilopleura Valenciennes in Cuvier & Valenciennes, 1839	*Notolabrus celidotus* (Forster in Bloch & Schneider)
Labrus psittacula Richardson, 1840	*Pseudolabrus psittaculus* (Richardson)
Labrichthys punctulata Günther, 1862	*Notolabrus parilus* (Richardson)
Labrichthys rex De Vis, 1885	*Pseudolabrus guentheri* Bleeker
Labrichthys Richardsoni Castelnau, 1872a	*Notolabrus tetricus* (Richardson)
Pseudolabrus Richardsonii Steindachner, 1867	*Pseudolabrus guentheri* Bleeker
Labrichthys roseipunctata Hutton, 1880	*Pseudolabrus miles* (Bloch & Schneider)
Julis? rubecula Richardson, 1843	*Pseudolabrus miles* (Bloch & Schneider)
Labrichthys rubicunda Macleay, 1881	*Pseudolabrus psittaculus* (Richardson)
Julis? rubiginosus Richardson, 1843	*Pseudolabrus miles* (Bloch & Schneider)
Labrus rubiginosus Schlegel in Temminck & Schlegel, 1845	*Pseudolabrus japonicus* (Houttuyn)
Labrichthys rubra Castelnau, 1875	*Notolabrus parilus* (Richardson)
Labrichthys semifasciatus Rendahl, 1921	*Pseudolabrus semifasciatus* (Rendahl)
Labrichthys sexlineatus De Vis, 1885	*Pseudolabrus guentheri* Bleeker
Labrus tetricus Richardson, 1840	*Notolabrus tetricus* (Richardson)
Labrus tetricus var. *tigripinnis* Klunzinger, 1872	*Notolabrus tetricus* (Richardson)
Pseudolabrus torotai Russell & Randall, 1981	*Pseudolabrus torotai* Russell & Randall
Labrichthys unicolor Castelnau, 1875	*Notolabrus parilus* (Richardson)
Labrichthys Vestita Castelnau, 1872a	*Notolabrus tetricus* (Richardson)

Historical Review

Bleeker (1862a) erected *Pseudolabrus* for *Labrus rubiginosus* Temminck & Schlegel (= *Labrus japonicus* Houttuyn), a Japanese species and assigned the genus to a separate subfamily (Pseudolabriformes). Günther (1862) synonymised *Pseudolabrus* under *Labrichthys* Bleeker, stating simply: "Bleeker has established the genus *Labrichthys* for *L. cyanotaenia* and distinguished it from *Pseudolabrus (rubiginosus)* by the single series of teeth in the lower pharyngeal". Perhaps unaware of Günther's actions Bleeker (1862b) dedicated a new species of *Pseudolabrus (P. guentheri)* to Günther and listed 11 additional species in the genus. In the following year Bleeker (1863) wrote: "M. Günther has misunderstood my genus *Labrichthys* which is very different from the genus *Pseudolabrus* and which is distinguished not only by its different pharyngeal teeth but also by a different pattern of squamation on the head and fins, and a different construction of the lower lip. If M. Günther had understood my type-species for the genus *Labrichthys* he would not have fallen into this error. Even though I have precisely detailed characters of the two genera M. Günther has not paid attention ..." (translation from the French). Notwithstanding this, Günther and most subsequent workers continued, erroneously, to refer species of *Pseudolabrus* to the genus *Labrichthys*. Consequently, more pseudolabrine species have been described and reported in *Labrichthys* than in the proper genera (for a review of *Labrichthys* see Randall & Springer, 1973).

Gill (1892) again noted Günther's error and showed the taxonomic confusion that had resulted. Gill listed some 51 nominal species which he referred to four genera (*Pseudolabrus, Pictilabrus, Austrolabrus,* and *Eupetrichthys*) recognising, "It is probable that a considerable number represent variations in color or sexual characters or misapprehensions as to the meaning or significance of previous descriptions". These comments seem to have been directed particularly at Castelnau, De Vis and Macleay, who in their species descriptions, relied largely on colour patterns as distinguishing characters, and frequently described colour variants of the same species as different. The Australian species described by these authors have probably caused the greatest nomenclatural confusion.

McCulloch (1913) revised the Australian pseudolabrines and resolved several taxonomic problems. He recognised three monotypic genera, *Eupetrichthys, Pictilabrus* and *Austrolabrus,* as well as 13 valid and four doubtful species in *Pseudolabrus.* Unfortunately, much of McCulloch's work was a synopsis of the literature, and while he recognised the striking changes in colour and form that accompany growth and sexual differentiation, and guessed at probable synonomies, he was hampered both by a lack of type material and by having only a few preserved non-type specimens. Waite (1911), McCulloch (1921) and Choat (1968) all reviewed the New Zealand species referred to *Pseudolabrus.* The Japanese species were reviewed by Kamohara (1958), and those from south-eastern Oceania were reviewed by Russell & Randall (1981). The present study is the first comprehensive revision of the group.

Methods and Materials

Terminology follows that of Hubbs & Lagler (1958), except for the following: pectoral fin rays are indicated with unbranched rays in lower case Roman numerals, and branched segmented rays in Arabic numerals (the dorsalmost ray in labrids typically is shortened or rudimentry); caudal fin rays are given as a formula comprising the number of dorsal unsegmented rays + dorsal segmented, unbranched rays + branched rays + ventral segmented, unbranched rays + ventral unsegmented rays; vertebral counts are given as the number of precaudal vertebra + number of caudal vertebra, including preterminal and terminal centra. In labrids there is considerable variation in haemal spine development, and the first caudal vertebra was taken as that with a well-developed haemal spine or haemal arch [the use of the term haemal arch here follows Clothier (1950) who distinguished between a small (primary) haemal arch formed by a transverse bridging of the parapophyses, and the formation below this of a usually much larger secondary haemal arch into which the posterior end of the swimbladder extends - see Fig. 23]. The first lateral line scale is the anteriormost pored scale not attached to the upper opercular margin (in some specimens there is difficulty in distinguishing this scale); lateral line scale counts include the enlarged posteriormost pored scale on the caudal fin (this scale is excluded from the count by some authors); in counting scale rows above and below the lateral line, small axillary scales at the base of the dorsal and anal fins were excluded; cheek scale rows behind the eye are the number of scales in a horizontal row extending posteriorly from the midpostorbital margin, and below the eye as the number of scales in a row from the posteroventral margin of the eye to the angle of the preopercle; gill raker counts, including rudiments, were made on the first arch (usually left side) and are expressed as the total number of rakers (because of difficulty in determining which raker lay in the angle of the arch, no attempt was made to differentiate upper and lower limb rakers); body depth was measured immediately anterior to the dorsal fin origin; head length was measured from the snout tip (not including the upper lip) to the posteriormost margin of the opercle; interorbital width is the least bony width of the interorbital; orbital diameter is the horizontal distance between the free orbital rims; suborbital depth is the least distance between the ventral margin of the orbit and the horizontal limb of the premaxilla. In the colour descriptions vertical markings are referred to as bars, horizontal markings as stripes, and oblique, curved or irregular markings as bands.

Measurements in millimetres were taken to the nearest 0.1 mm, and body length was measured as standard length (SL). For new species, a full description is given; for previously described species, a diagnosis and colour description only are included. In the new species descriptions, measurements and counts for the holotype are given first; those for the paratypes, where different from the holotype, appear in parentheses. Material examined but not counted or measured is indicated by an asterisk (*). Synonomies are abbreviated and include references to original descriptions as well as misapplied names, new combinations and misspellings. In some cases misspellings are clear typographical errors, but in other cases the name was sufficiently different to result in confusion, and for the sake of consistency all references to misspelled names are included. Institutional acronyms used to denote the location of specimens follow the standardised list of Leviton *et al.* (1985).

Specimens used for osteological study were cleared and stained using the trypsin digestion method of Taylor (1967). To facilitate rapid maceration, small specimens between 30-90 mm SL were chosen wherever possible. At this size ossification usually is complete and variation in bone structure due to size of specimens is minimal. Cleared and stained specimens were microdissected following the procedure outlined by Paxton (1972), and drawings of bones were made with the aid of a camera-lucida. Paired bones figured are those of the left side. Material also included skeletons (complete and parts) and X-ray plates in the

collection of the Department of Ichthyology, Australian Museum. Osteological nomenclature generally follows that of recent workers (e.g. Springer, 1968; Gomon, 1971, 1979).

Specimens examined osteologically are listed below. Comparative labroid material also examined is listed in Russell (1980). Material is designated as follows: CS – cleared and stained; X – X-radiograph; S – skeleton. Institutional abbreviations and registration numbers are followed (in parentheses) by the number of specimens and where available, standard length(s) to the nearest mm.

Austrolabrus maculatus: CS – AMS I.20219-027 (5:36-91); AMS I.20245-027 (97). *Dotalabrus alleni:* CS – AMS I.20180-067 (5:68-80); AMS I.20223-001 (7:35-97). X – AMS I.19602-036 (3:42-53); AMS I.19628-009 (52); AMS I.20219-006 (2:61-71); AMS I.20220-001 (2:61-85); AMS I.20222-003 (3:65-85); BMNH 1979.4.10.2-3 (2:54-57); BPBM 22586 (2:58-73); USNM 219625 (2:60-76); WAM P.25195-004 (2:64-72); WAM P.25251-018 (6:38-80); WAM P.25252-006 (74). *D. aurantiacus:* CS – AMS I.20180-067 (5:68-80). X – AMS I.17553-013 (107); AMS I.20079-014 (3:77-85); AMS I.20090-001 (5:62-111); AMS I.20092-001 (2:49-74); AMS I.20173-005 (88); AMS I.20220-002 (40); AMS I.20226-006 (37); MNHN A.9059 (92); ZIL 12395 (90); ZIL 12396 (4:44-74). *Eupetrichthys angustipes:* CS – AMS I.16851-029 (72); AMS I.21460-001 (5:41-75). *Notolabrus celidotus:* CS – AMS I.18281-011 (63); AMS I.21459-001 (4:62-72). X – MNHN A.7176 (40). *N. celidotus* x *N. fucicola:* X – NMNZ P.9478 (80); NMNZ P.9479 (239). *N. fucicola:* CS – AMS I.19893-034 (4:80-97). S – AMS I.21467-001 (208); AMS I.21468-001 (210). *N. fucicola* x *N. inscriptus:* X – NMNZ P.9480 (211). *N. gymnogenis:* CS – AMS I.21458-001 (84). S – AMS I.15751-004 (1); AMS I.16250-001 (95); AMS I.16770-001 (195). *N. inscriptus:* CS – AMS I.17356-048 (7:32-59). S – AMS I.15703-001 (320). *N. parilus:* CS – AMS I.19628-010 (97). X – MNHN A.8882 (1 of 3:178). *N. tetricus:* CS – AMS I.16988-007 (50). *Pictilabrus laticlavius:* CS – AMS I.15912-023 (64); AMS I.19942-028 (3:64-87); AMS I.21456-001 (100). *P. viridus:* CS – AMS I.19602-044 (4:68-117); AMS I.20223-004 (69). X – AMS I.20219-005 (3:107-110); AMS I.20220-005 (141); AMS I.20225-002 (100); AMS I.20233-002 (2:76-124); AMS I.20234-003 (3:66-103); AMS I.20236-004 (2:84-89); AMS I.20239-005 (2:92-93); NMV A.546 (2:73-112); WAM P.24859-001 (2:96-121). *Pseudolabrus biserialis:* CS – AMS I.20245-028 (4:58-66). *P. fuentesi:* CS – AMS I.20174-001 (5:48-75). X – BPBM 6718 (17:32-131); BPBM 12781 (132); BPBM 15073 (10:36-134). *P. gayi:* CS – AMS I.20728-002 (2:58-60). X – NRS 10980 (6:41-54). *P. guentheri:* S – AMS I.21471-001 (99). *P. japonicus:* CS – AMS I.21464-001 (2:92-100); AMS I.21464-002 (77). X – MSM 73-488 (97); MSM 75-216 (145); MSM 75-217 (153). *P. luculentus:* CS – AMS I.21457-001 (112); AMS I.21457-002 (78); AMS I.21457-003 (121). S – AMS I.21478-001 (95). *P. miles:* CS – AMS I.19279-001 (2:78-86). *P. psittaculus:* CS – AMS I.19248-002 (80). *P. semifasciatus:* X – BPBM 6717 (222); NRS 10096 (2:202-222). *P. torotai:* X – AMS I.20219-006 (130); BPBM 12836 (139); BPBM 13040 (158); MNHN 1979-6-77 (147); USNM 220915 (152).

Phylogenetic analysis was carried out using David L. Swofford's PAUP (Phylogenetic Analysis Using Parsimony) computer program (version 2.4) running on an IBM-compatible PC. This program uses the principle of maximum parsimony for inferring phylogenies and provides a number of options for computing phylogenetic trees. Options used here were branch and bound (BANDB), which finds the shortest (most parsimonius) tree(s); delayed transformation optimization (DELTRAN), which maximises the ratio of parallel changes to character reversals; and rooting by ANCESTOR, using an OTU designated as the hypothetical ancestor. All characters were polarised and given equal weight.

Biology

Intersexuality. The sexual patterns of only four pseudolabrine species have been studied in any detail. McCann (1953) and Choat (1965), described sexual dimorphism in the New Zealand species *Pseudolabrus* (= *Notolabrus*) *celidotus* and Jones (1980) discussed in detail the pattern of sex change in this species. *Notolabrus celidotus* is protogynous and monandric, and shows a size-specific sex reversal, with sex/colour change occurring at about 150-170mm SL. A similar, monandric pattern is reported also for *N. fucicola* (unpublished data, in Jones, 1981b). McPherson (1977) studied gametogenesis in relation to sex change in *Pseudolabrus* (= *Notolabrus*) *gymnogenis,* and this species also appears to be monandric, with sex/colour change occurring at about 190-200mm SL. Nakazono (1979) studied sex reversal in the Japanese species *Pseudolabrus japonicus,* which is protogynous and monandric with sex/colour change occurring at about 95-135mm SL.

Sexual dichromatism. Many labrid fishes exhibit several distinct, relatively permanent colour patterns, and individuals may undergo rapid, temporary and sometimes radical colour changes (Warner & Robertson, 1978). Frequently, however, there is a recognisable dichotomy in the colour patterns shown by adult fishes with a predictable change from one pattern to the other, often associated with sex reversal. I follow the terminology of Warner & Robertson (1978) and refer to the two adult phases as initial phase (IP) and terminal phase (TP). The IP colour pattern in labrids is characteristic of small adults (female or male), whereas the TP colour pattern is usually characteristic only of the largest males. Two types of dichromatism may occur depending on whether some colour elements are present only in the TP (full dichromatism) or, where the same elements are common to both IP and TP, some are more strongly developed in TP (partial dichromatism) (Warner &

Robertson, 1978). Most pseudolabrine species appear to be either partially or fully sexually dichromatic (often weakly expressed in partially dichromatic species). Individual discussions of sexual dichromatism are given in the species accounts, and colour photographs of most species are presented in Plates 1 to 4. Other works with good colour illustrations of pseudolabrine species include Hutchins (1979), Edgar *et al.* (1982), Hutchins & Thompson (1983), Allen (1985) (Australian species), Doak (1972) (New Zealand species), Russell & Randall (1981) (southern Oceania species), and Masuda *et al.* (1984) (Japanese species).

Courtship and spawning. Descriptions of courtship and spawning behaviour are similar to that of other labrid species (e.g. Warner & Robertson, 1978) with pair and occasional group spawning being reported for *Pseudolabrus* (= *Notolabrus*) *celidotus* (Doak, 1972; Jones, 1981a, 1981b), *P.* (= *Notolabrus*) *fucicola* (Doak, 1972), *P. japonicus* (Nakazono, 1979), *P. luculentus* (Doak, 1972) and *P. miles* (Doak, 1972). Spawning in both *Notolabrus* and *Pseudolabrus* occurs in midwater and eggs are pelagic. Webb's (1973) statement that eggs of *N. celidotus* are demersal is incorrect (Robertson, 1980). Robertson (1975) described eggs of *N. celidotus* and *N. fucicola,* and Mito (1962, 1966) described the eggs and larvae of *P. japonicus*. Crossland (1981) described larvae of *N. celidotus*. Spawning occurs in late winter-spring in *N. celidotus* (Sandager, 1888; Doak, 1972; Robertson, 1980; Jones, 1980; Jones & Thompson, 1980), *N. fucicola* (Doak, 1972; Robertson, 1980), *P. guentheri* (Russell *et al.,* 1977; and unpublished data), *P. luculentus* (Doak, 1972) and *P. miles* (Sandager, 1888; Doak, 1972). Nakazono (1979) reported spawning in *P. japonicus* in October (autumn) in Japan.

Robertson (1973) obtained hybrid yolk-sac larvae from an experimental cross between *N. celidotus* eggs and *N. fucicola* sperm, and Ayling (1980) reported wild hybrid specimens of *Notolabrus (N. celidotus* x *N. fucicola, N. celidotus* x *N. inscriptus, N. fucicola* x *N. inscriptus).* Wild hybrids of *N. fucicola* x *N. tetricus* have also been observed and photographed in New South Wales by R. Kuiter (Plate 2D) and in Tasmania by J.B. Hutchins (personal communication, 1985). The frequency of occurrence of hybrids in nature is low (0.2% of the combined total parent populations for *N. celidotus* x *N. fucicola* – Ayling, 1980), and Ayling (1980) has suggested that hybridisation may result from occasional 'interference spawning' when a male of one species joins in the spawning run of another species. Interference spawning between a large TP *N. fucicola* and a pair of *N. celidotus* has been observed by G.P. Jones (personal communication, 1980).

Food and feeding habits. The pseudolabrines appear to have fairly generalised carnivorous feeding habits. All have well-developed canines in the jaws and robust pharyngeal teeth. With the exception of *Dotalabrus,* in which the anterior canines are forwardly curved, the anterior teeth in the upper and lower jaws are enlarged, recurved canines. These form an effective rake and are used to fossick for small benthic animals and to dislodge food amongst algal holdfasts and rocky substrates (Russell, 1983b). The diet of those species for which data are available consists mainly of small molluscs and crustaceans. The juveniles of two species, *Pseudolabrus luculentus* and *P. miles,* are facultative cleaner symbionts (Ayling & Grace, 1971) and feed on parasitic crustacea picked from the bodies of other fishes.

General behaviour. Like most labrids, pseudolabrines are home ranging or territorial (Russell, 1971; Doak, 1972; Jones, 1981a), and usually inhabit, or are closely associated with, rocky or coral bottoms. One species, *Dotalabrus aurantiacus,* is common also in seagrass beds. All pseudolabrines are diurnal, and seek shelter at night, resting in crevices or in sand hollows (Graham, 1956; Russell, 1971; Doak, 1972; Masuda *et al.,* 1984); however, *Dotalabrus* and *Eupetrichthys* bury in the sand at night (R. Kuiter, personal communication 1982). Two species, *Pseudolabrus* (= *Notolabrus*) *celidotus* and *P.* (= *Notolabrus*) *fucicola* are reported to exude a thick mucuous secretion over the body at night (Russell, 1971; Doak, 1972) similar to that of some other labrids and scarids (e.g. Byrne, 1970; Casimir, 1971), perhaps as a defence against nocturnal predators (Winn & Bardach, 1959). Masuda *et al.* (1984) report *Pseudolabrus japonicus* hibernates in the sand during winter. The retinas of *Pseudolabrus* (= *Notolabrus*) *celidotus, P. pittensis* (= *N. fucicola*) and *P. miles* have an unusually large ratio of rods to cones (Fineran & Nicol, 1975). Such ratios usually occur only in nocturnal or deep-dwelling fishes but in pseudolabrines may be an adaptation for life in shallow turbid waters with low illumination.

Systematics

Key to Genera

1. Branchiostegal rays 5; pectoral rays ii,10; anterior canines of jaws forwardly curved (Figs 1a, 13b) ..... *Dotalabrus* (2 spp)

——Branchiostegal rays 6; pectoral rays ii,11-12 (rarely 10 or 13); anterior canines of jaws backwardly curved (Figs 1b, 13a, 13c-f) 2

2. Dorsal rays IX,11; body depth 2.5-3.9 in SL 3

——Dorsal rays IX,12; body depth 4.5-5.1 in SL ..... *Eupetrichthys* (1 sp)

3. Membrane between dorsal and anal spines not incised nor produced as free points beyond tips of spines (Fig. 1c) 4

——Membrane between dorsal and anal spines incised and produced as free points beyond tips of spines (Fig. 1d) 5

4. Scaly sheath at base of dorsal and anal fins well developed (Fig. 1e) ..... *Austrolabrus* (1 sp)

——Scaly sheath at base of dorsal and anal fins undeveloped (Fig. 1c) ..... *Pictilabrus* (2 spp)

5. Second pair of canines in lower jaw longer than first (anterior) pair (Fig. 13a); posterior canine in angle of upper jaw enlarged; pectoral rays usually ii,11; low scaly sheath at base of dorsal and anal fins (Fig. 1d), or sheath absent (*P. miles* and *P. psittaculus*); free dorsal margin of preopercle reaching to or just below level of ventral margin of orbit ..... *Pseudolabrus* (10 spp)

——Second pair of canines in lower jaw shorter than first (anterior) pair (Fig. 13c); posterior canine in angle of upper jaw reduced or absent; pectoral rays usually ii,12 (except *N. celidotus,* usually ii,11); no scaly sheath at base of dorsal and anal fins; free dorsal margin of preopercle reaching beyond level of middle of orbit ..... *Notolabrus* (7 spp)

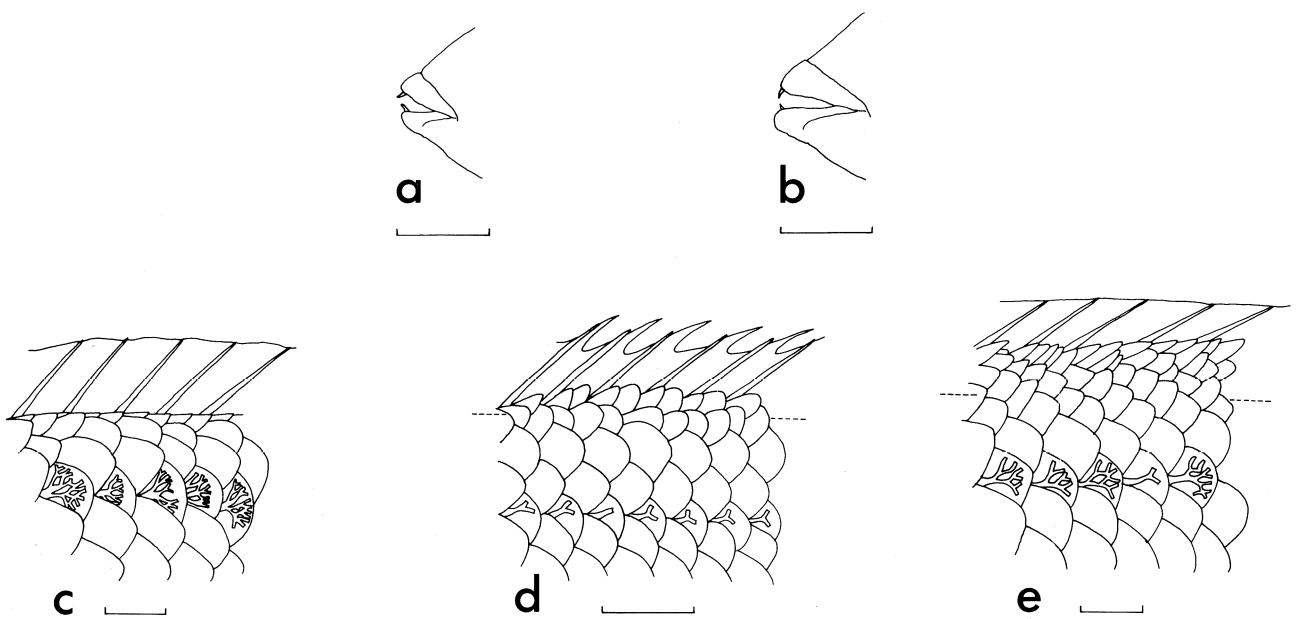

Fig.1. Semi-diagrammatic illustrations showing: a, anterior jaw teeth of *Dotalabrus*; b, anterior jaw teeth of other pseudolabrines; c, continuous dorsal fin and absence of scaly sheath (*Pictilabrus*); d, incised dorsal fin membrane, produced as free points beyond tips of spines, and low scaly sheath at base of fin (*Pseudolabrus*); e, high scaly sheath at base of dorsal fin (*Austrolabrus*). Scale lines represent 5 mm.

Dotalabrus Whitley

Dotalabrus Whitley, 1930: 251. Type species *Cheilinus aurantiacus* Castelnau, 1872, by original designation.

Description. Dorsal rays IX,11 (rarely IX,10 or 12; or X,10); anal rays III,10 (rarely III,11); caudal rays 5-6 (rarely 3) + 2 + 12 + 2 + 5-6 (rarely 4); pectoral rays ii,10 (rarely ii,11); pelvic rays 1,5; lateral line scales 25-26; scale rows above lateral line 3-4; scale rows below lateral line 8-9; predorsal scales 4-6; cheek scale rows behind eye 1; cheek scale rows below eye 2 (rarely 1); vertebrae 9 + 16; infraorbitals 7; pleural ribs ending on ninth vertebra; 2-3 epihaemal ribs (on tenth through eleventh or twelfth vertebra); first caudal vertebra (V10) with haemal spine; gill rakers 13-19; branchiostegal rays 5.

Body depth 2.7-3.9 in SL. Head profile convex, head length 2.8-3.6 in SL; snout length 3.8-6.0 in head; orbital diameter 3.3-4.8 in head; interorbital width 4.4-5.9 in head; suborbital depth 6.1-15.4 in head. Mouth terminal, maxilla just reaching vertical through anterior nostril; lips moderately fleshy, lateral inner surfaces of lips plicate, upper lip with 5-6 longitudinal plicae, lower lip with 1-2 (inner row more fleshy and papillose). Pair of enlarged canines in each jaw, distal halves of these teeth curved strongly forward; lower canines close set and fitting between upper canines; sides of jaws with 6-7 posteriorly progressively smaller blunt canine teeth, 3-5 small blunt canines in inner row behind anteriormost teeth; no canine at posterior end of upper jaw (Fig. 13b). Lower pharyngeal plate broadly Y-shaped; transverse limb with medial posterior patch of enlarged, blunt conical (nearly molariform) teeth and 1-2 rows of smaller conical teeth anterolaterally; anterior median limb relatively broad with row of small asymetrically conical teeth along either side (larger specimens with third row of small, blunt conical teeth medially on anterior shank) (Fig. 18b). Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior margin reaching to between level of midposterior and dorsal margin of orbit, ventral margin free almost to below anterior margin of orbit. Opercular membrane broadly rounded, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales moderately large, in 1 row behind eye and 2 rows (rarely 1) below eye, extending forward to vertical at midventral orbital rim. Opercle naked anteriorly, 8-10 large scales posteriorly, except for naked membranous opercular flap dorsoposteriorly. Subopercle naked. Body scales large, scales on thorax about two-thirds to three-quarters size of other scales. Lateral line complete, bent abruptly downwards below ninth to eleventh dorsal soft rays. Laterosensory canal tube bifurcate (simple, unbranched in smaller specimens). Dorsal and anal fins without scaly sheaths; scales not extending onto caudal fin beyond base. Dorsal fin length 1.6-1.9 in SL; dorsal rays progressively longer posteriorly, first spine 3.7-7.9 in head; ninth spine 1.2-2.8 times length of first; ninth dorsal soft ray usually longest, 0.9-1.7 times length of last dorsal spine, last 2 soft rays subequal. Dorsal and anal spines pungent; membrane between spines incised, produced as free points projecting beyond spines; posterior tip of dorsal and anal fins pointed. Anal fin length 2.6-3.5 in SL; anal rays progressively longer posteriorly, first spine 5.2-9.0 in head, third spine 1.8-2.5 times length of first; segmented rays nearly equal in length, longest anal ray 1.1-1.8 times length of third anal spine, becoming subequal posteriorly. Caudal fin slightly rounded. Pectoral fins rounded to pointed (upper rays longest), moderately long, reaching to or slightly beyond vertical through vent, length 1.2-1.5 in head; pelvic fins short, triangular, not reaching vent, length 1.8-2.3 in head.

Discussion. Whitley (1930) proposed *Dotalabrus* for Castelnau's *Cheilinus aurantiacus* without explanation. The following characters, however, clearly distinguish *Dotalabrus* from other pseudolabrines: anterior pair of canines recurved anteriorly; lateral jaw dentition reduced, only 6-7 lateral jaw teeth, laterosensory canal tube bifurcate (simple, unbranched in juveniles); branchiostegal rays 5 (versus 6); pectoral rays ii,10 (versus ii,11-12).

Etymology. Whitley (1930) did not explain the etymology of *Dotalabrus,* which is obscure. Gender masculine.

Key to species of *Dotalabrus*

(Species accounts are presented in the order of the key)

1. First dorsal spine 3.7-4.9 in head length ..... (Tasmania, Victoria, South Australia, southern Western Australia) *aurantiacus.*

——First dorsal spine 5.1-7.9 in head length ..... (southern Western Australia) *alleni* n.sp.

Dotalabrus aurantiacus (Castelnau, 1872)

(Fig. 2; Pl. 1A, 1B; Table 2)

Cheilinus aurantiacus Castelnau, 1872b: 245 (Gulf of St. Vincent, South Australia).
Labrichthys elegans Steindachner, 1884: 1102, pl. 6, figs 2, 3 (Gulf of St. Vincent, South Australia).
Pseudolabrus elegans.—Gill, 1892: 403.
Labrichthys macleayi Herzenstein, 1896: 10 (Gulf of St. Vincent, South Australia).
Pseudolabrus aurantiacus.—McCulloch & Waite, 1918: 47.
Pseudolabrus macleayi.—Waite, 1921: 131.
Dotalabrus aurantiacus.—Whitley, 1930 : 251.

Material Examined. (36 specimens: 25.5-110.5) TASMANIA – Coles Bay, AMS I.17553-013 (107); Flinders Island, AMS I.20090-001 (5:62-110.5); Goose Island, TMH D.1228 (62); Greens Beach, QVMT 1972.5.465 (77); Rocky Cape, AMS I.20079-014 (3:76.5-85). SOUTH AUSTRALIA – Gulf of Saint Vincent, MNHN A.9059 (92, SYNTYPE of *Cheilinus aurantiacus* Castelnau); NMW 27646-27650

Table 2. Selected measurements of species of *Dotalabrus* (as a percentage of standard length).

	D. aurantiacus (n=21)	*D. alleni* HOLOTYPE	*D. alleni* PARATYPES (n=25)
Standard length (mm)	25.5 – 110.5	74.0	37.7 – 84.5
Body depth	25.3 – 36.8	32.4	28.7 – 32.7
Head length	28.1 – 35.3	31.2	31.1 – 33.3
Snout length	5.6 – 7.9	7.6	6.6 – 8.2
Orbital diameter	6.1 – 9.8	7.7	6.8 – 8.9
Interorbital width	4.9 – 6.5	7.3	6.1 – 7.5
Suborbital depth	2.3 – 4.0	3.2	2.2 – 5.3
Length of dorsal fin base	57.7 – 63.7	57.2	52.1 – 59.2
Length of first dorsal spine	5.8 – 8.3	5.8	3.9 – 6.2
Length of ninth dorsal spine	9.2 – 14.1	12.0	8.8 – 12.5
Length of longest dorsal ray	12.8 – 15.1	13.5	11.6 – 15.2
Length of anal fin base	33.6 – 37.8	35.8	28.2 – 36.1
Length of first anal spine	3.9 – 6.3	4.9	3.5 – 6.0
Length of third anal spine	7.7 – 12.6	11.2	7.7 – 12.0
Length of longest anal ray	11.8 – 15.9	13.1	11.2 – 14.8
Least depth of caudal peduncle	16.1 – 19.1	16.8	14.7 – 17.0
Length of pectoral fin	19.5 – 24.7	23.0	21.4 – 26.3
Length of pelvic fin	12.7 – 16.9	15.1	14.1 – 17.1

(5:41.8-79, SYNTYPES of *Labrichthys elegans* Steindachner)* ; NMW 22798 (2:80-86.7, SYNTYPES of *L. elegans*)*; SAMA F.1349 (3:73.9-88.9, SYNTYPES of *C. aurantiacus*)*; ZIL 12395 (90, LECTOTYPE of *Labrichthys macleayi* Herzenstein)*; ZIL 12396 (4:44-74, PARALECTOTYPES of *L. macleayi*)*; Kangaroo Island, AMS I.20195-004 (62). WESTERN AUSTRALIA – Lucky Bay, Cape Le Grande, AMS I.20220-002 (39.7); Sandy Hook Island, Recherche Archipelago, WAM P.25767-002 (4:25.5-77.5); Esperance Bay, AMS I.20226-006 (36.5); King George Sound, WAM P.4558 (92); Rottnest Island, WAM P.25761-003 (74.5).

Diagnosis. First dorsal spine 3.7-4.9 in head length; pelvic fins greyish; TP colour pattern with broad, dark irregular band on dorsum above lateral line and/or 5 dark, irregular bars on body.

Colour description. Sexually dichromatic. Colour of IP in alcohol pale, with 5 dark, irregular bars, first below anteriormost 3 dorsal spines, last below posteriormost 3 dorsal rays; head with series of dark radiating markings below and behind eye; narrow dark band on opercle anteriorly; bars on body extending onto dorsal fin (bars sometimes faded in alcohol), large black ocellus at base of dorsal fin between posteriormost 3 rays (smaller black ocelli also present in some specimens at base of dorsal fin above third and fourth bars on body); small black ocellus at base of last 3 anal rays; caudal base with dark markings dorsally and ventrally; outer two-thirds of pelvic fin greyish.

Colour of TP in alcohol variable, with 2 patterns. First pattern - ground colour pale with broad, dark band on dorsum above lateral line; head with series of radiating markings around eye; dorsal and anal fins with broken greyish stripe submedially and dark anterior spot and margins, which are narrower anteriorly and broader posteriorly. Caudal fin with broad greyish margin; outer two-thirds of pelvic fin dark. Second pattern - ground colour pale with 5 broad, dark bars, first below anteriormost 3 dorsal spines, extending forward onto nape and downwards to just below lateral line; remaining bars broken by pale midlateral stripe extending below lateral line from opercle to base of caudal fin; interspaces of bars narrow above midlateral stripe, wider below; last bar below posteriormost 3 dorsal rays; dorsal and ventral parts of caudal peduncle dark; head with series of radiating narrow bands around eye, these extending below eye onto upper lip, preopercle and interopercle; narrow dark, oblique band on anterior part of opercle; interorbital region and opercle greyish, with irregular dark markings; markings on fins as for first TP pattern.

Life colours - ground colour of IP greenish or pale red, dark markings on body dark brown or black; bars on dorsal fin reddish brown, darker basally; spinous part of fin edged with reddish brown, this colour extending as narrow submarginal stripe along soft dorsal fin; anal fin with 3 broad reddish brown bars (below posteriormost 3 body bars), spinous part of fin edged with reddish brown, continuing as narrow submarginal stripe along soft anal fin; ocelli on fins edged with white or yellow.

Life colours of TP variable. Colours of individuals with first TP pattern not observed, but Castelnau (1872b) describes the ground colour of his specimens as orange with black dorsal and anal fin markings, and Steindachner (1884) gives the colour of freshly preserved specimens of the first type of pattern as yellow, the darker markings deep violet. Ground colour of individuals with second type of TP pattern highly variable, from pale reddish brown through yellowish brown to bright green, with darker markings brownish or light grey. Some individuals with ground colour whitish or reddish with intense black markings on body and fins; interspaces between dark radiating lines around eye bluish or violet; interspaces between dark markings on fins whitish or reddish.

Remarks. A small species, the largest specimen examined, a male (TP), is 110.5 mm SL. Small individuals of *D. aurantiacus* all have IP colouration.

The largest IP specimen, a female, was 107 mm SL. TP specimens ranged in size from 89-110.5 mm SL, all males. A single transitional colour phase individual (sex indeterminate) measured 84.5 mm SL. Variability in both IP and TP colour patterns appears to be related to habitat distribution. Individuals with the second type of TP colour pattern occur in shallow water; those with paler body markings were collected from seagrass beds, whereas specimens with intense dark body markings were from algal-reef habitats. Specimens with the first type of TP colour pattern were not collected during this study despite extensive diving, and possibly are more typical of deeper water.

Distribution. *D. aurantiacus* is known from eastern and northern Tasmania (D'Entrecasteaux Channel to Rocky Cape, including the Furneaux Group and Kent Group of Islands in Bass Strait), South Australia, and southern Western Australia (Recherche Archipelago to Rottnest Island). This species occurs in seagrass beds and also, less commonly, is associated with algal-covered rocky reefs in shallow water. The deepest collected specimen was taken by scallop dredge in 47 m off Goose Island, Bass Strait.

Discussion. Castelnau's *Cheilinus aurantiacus* was overlooked by most early workers, and McCulloch (1913), in his revision of Australian species of *Pseudolabrus,* treated this species as *Pseudolabrus elegans* (Steindachner), a junior synonymn. Four of Castelnau's syntypes are extant, one in the MNHN and three specimens labelled as "types or co-types" in the SAMA. The MNHN specimen (MNHN A.9059) is here designated as the lectotype of *D. aurantiacus.* Steindachner's syntypes of *Labrichthys elegans* (NMW 27646-50; NMW 22798) are identical with *D. aurantiacus.* Examination of radiographs of five syntypes of *Labrichthys macleayi* Herzenstein (ZIL 12395; ZIL 12396) also confirms the conspecificity of this species with *D. aurantiacus,* and the largest specimen (ZIL 12395) is here designated as the lectotype.

Etymology. The specific name *aurantiacus* is from the New Latin *aurantium*, orange, and Latin, *-acus*, of or pertaining to, apparently in reference to the orange colour of the type specimens of this species.

Dotalabrus alleni n.sp.

(Fig. 2; Pl. 1C, 1D; Table 2)

Type material. HOLOTYPE. WAM P.25252-006, 74 mm SL, male, Western Australia, off Carnac Island, Cockburn Sound (36°16'S, 115°40'E), 8 m, spear, G.R. Allen, 6 Apr 1975. PARATYPES. (25 specimens: 37.7-84.5 mm SL) AMS I.19602-036, 3:41.8-52.5 mm SL, females, Western Australia, Geographe Bay, Eagle Bay (33°34'S, 115°04'E), 4 m, rotenone, D.F. Hoese and party, 21 Oct 1976; AMS I.19628-009, 52.3 mm SL, female, Western Australia, King George Sound, Cheynes Beach (35°06'S, 117°55'E), 1-2 m, rotenone, G.R. Allen, 13 Aug 1975; AMS I.20219-006, 2:61-71 mm SL, females, Western Australia, Recherche Archipelago, Rob Island (34°02'S, 122°14'E), 7-15 m, spear, B.C. Russell and R. Kuiter, 20 Mar 1978; AMS I.20220-001, 2:61-84.5 mm SL, smallest a female, largest a male, Western Australia, Cape Le Grande, Lucky Bay (33°60'S, 122°14'E), 2-10 m, spear, B.C. Russell, 20 Mar 1978; AMS I.20236-005, 76 mm SL, female, Western Australia, Two People Bay, South Point (34°58'S, 118°12'E), 5-8 m, spear, B.C. Russell, 4 Apr 1978; BMNH 1979.4.10.2-3, 2:53.7-56.6 mm SL, smallest a female, largest a male, same data as AMS I.19602-036; BPBM 22586, 2:58-73 mm SL, smallest a female, largest a male, same data as AMS I.19602-036; NMV A.547, 2:64.3-81.2 mm SL, smallest a male, largest a female, Western Australia, Recherche Archipelago, Mondrain Island (34°08'S, 122°15'E), 9 m, spear and rotenone, B.C. Russell and A. Kuiter, 21 Mar 1978; USNM 219625, 2:59.5-75.5 mm SL, smallest a female, largest a male, same data as AMS I.19062-036; WAM P.25195-004, 2:63.8-72.3 mm SL, males, Western Australia, Cape Naturaliste, Bunker Bay (33°32'S, 115°02'E), 1-5 m, spear, G.R. Allen, 16 Dec 1974; WAM P.25251-018, 6:37.7-80 mm SL, 3 largest males, Western Australia, Rottnest Island, off south coast (32°01'S, 115°30'E), 2-10 m, spear, G.R. Allen and J.B. Hutchins, 9 Apr 1975.

Diagnosis. First dorsal spine 5.1-7.9 in head length; pelvic fins hyaline; TP pale with 4 distinctive spots posteriorly on dorsum below soft dorsal fin.

Description. Dorsal rays IX,ll (rarely IX,10); anal rays III,10 (rarely II,11); caudal rays 5 + 2 + 12 + 2+ 5 (5-6 [rarely 3] + 2 +12 + 5-5 [rarely 4]); pectoral rays ii,10; pelvic rays 1,5; lateral line scales 25 (25-26); scale rows above lateral line 3; scale rows below lateral line 9 (8-9); predorsal scales 4 (4-6); cheek scale rows behind eye 1; cheek scale rows below eye 2 (1-2); gill rakers 18 (15-19).

Morphometric dimensions are given in Table 2. Other characters as for genus.

Colour description. Sexually dichromatic. Colour of IP in alcohol pale, with 5 dark irregular bars, first below anteriormost 3 dorsal spines, fifth beginning below posteriormost 3 dorsal rays; bars broader on dorsum, narrower and becoming broken below lateral line; indistinct dark saddle behind dorsal fin on caudal peduncle; head with series of faint, radiating greyish markings around eye, dark spots behind eye and on opercle; bars on body not extending onto dorsal fin, large black spot at base of fin between posteriormost 3 rays; elongate spot at base of anal fin between posteriormost 3-4 rays (small dark spot also present at base of anal fin in some specimens between third and fourth rays); dark markings at dorsal and ventral base of caudal fin; pectoral fins with narrow greyish marking ventrally at base; pelvic fins hyaline.

Colour of TP in alcohol pale with 4 distinctive large dark spots posteriorly, first across lateral line below fifth to seventh dorsal soft rays, second across lateral line below ninth to eleventh soft rays, third as saddle on caudal peduncle, and fourth as smaller spot at scaly dorsal base of caudal fin; interspaces between spots greyish; head with faint radiating greyish markings around eye; dorsal, anal and caudal fins in some

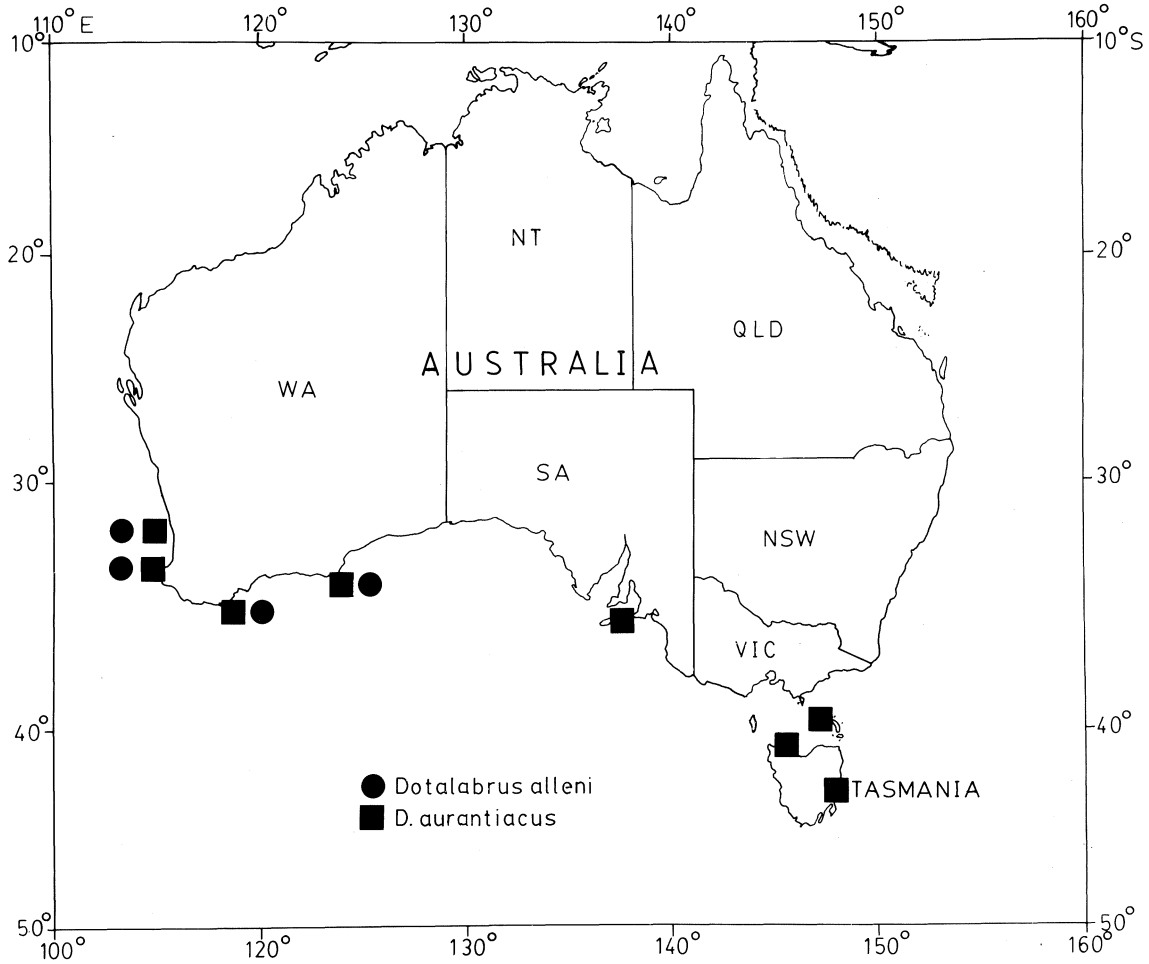

Fig.2. Map of the known distribution of species of *Dotalabrus*.

specimens with faint greyish bands; no spots posteriorly on dorsal or anal fins.

Life colours - ground colour of IP greenish yellow to dark green; darkmarkings on body black; pearly stripe submedially on sides from base of pectoral fin to ventral part of caudal peduncle, arched upwards between second and third bars on body; second, narrow pearly stripe horizontally from ventral base of pectoral fin to above origin of anal fin; subopercle and thoracic region in front of pectoral fin pearly white (variable, in some individuals only a few white patches, in others pearly colour extensive, joining stripes on sides behind pectoral fin); radiating markings on head pale blue to turquoise; dorsal fin pale reddish brown anteriorly, 12-14 narrow oblique red bands on soft dorsal; anal fin yellowish green; spots posteriorly on dorsal and anal fins without coloured margins; caudal fin with 5-6 narrow red bars, outermost bars sometimes broken into series of small spots; pelvic fins pale yellowish green.

Ground colour of TP in life reddish yellow through gold to dark green, dark spots on dorsum black with bright yellow interspaces; stripes on sides and markings on subopercle and thorax, pearly white; radiating markings on head pale blue to turquoise; dorsal and anal fins reddish, some individuals with series of oblique narrow reddish bands posteriorly on fins; caudal fin with 5-6 narrow reddish bars; pelvic fins pale yellowish. Transitional colour phase individuals similar to IP colour pattern, but with dark spots posteriorly. This species has been illustrated also by Hutchins & Thompson (1983: fig. 235) and Allen (1985: figs 304, 305).

Remarks. *D. alleni* is a small species, the largest specimen examined, a male, is 84.5 mm SL. Small individuals of *D. alleni* all have IP colouration. The largest IP specimen, a female, is 81.2 mm SL. TP specimens ranged in size from 56.6-84.5 mm SL, and were all males. Three transitional phase specimens ranged from 60.2-69.1 mm SL.

Distribution. *D. alleni* is known only from southern Western Australia, from the Recherche Archipelago to Rottnest Island. It is common on rocky reefs in shallow water. The greatest depth at which a specimen was collected was 15 m, although the species probably ranges deeper than this.

Discussion. *D. alleni* is most readily separated from its only congener by its shorter first dorsal spine and the absence of grey colour in the pelvic fins. In southern Western Australia both species of *Dotalabrus* are sympatric, although they show some ecological segregation. *D. alleni* occurs mainly on rocky reefs, whereas *D. aurantiacus* occurs mainly in seagrass beds. IP colouration of the two species is similar, but TP colour patterns are quite different.

Etymology. Named for Dr. G.R. Allen who collected the holotype and several paratypes, and drew the author's attention to this new species.

Notolabrus n.gen.

Type species. *Labrus fucicola* Richardson, 1840.

Description. Dorsal rays IX,11 (rarely IX,9 or 10-12); anal rays III,10 (rarely III,9 or 11); caudal rays 5-7 + 2 + 12+ 2 + 5-6; pectoral rays ii,12 (rarely ii, 10-11 or 13; except *N. celidotus* usually with ii,11); pelvic rays, I,5; lateral line scales 25-26 (rarely 24); scale rows above lateral line 3-5; scale rows below lateral line 7-10; predorsal scales 4-12; cheek scale rows behind eye 1-5; cheek scale rows below eye 1-6; vertebrae 9 + 16; infraorbitals 7; pleural ribs ending on ninth vertebra; 2 epihaemal ribs (on tenth and eleventh (rarely twelfth) vertebra); first caudal vertebra (V10) with haemal spine (incompletely fused in *N. celidotus*); gill rakers 12-23; branchiostegal rays 6.

Body depth 2.5-3.6 in SL. Head profile straight or rounded, head length 2.7-3.5 in SL; snout length 2.7-4.9 in head; orbital diameter 3.8-7.8 in head; interorbital width 3.4-6.3 in head; suborbital depth 3.8-11.9 in head. Mouth terminal, small, maxilla reaching to or just beyond vertical through anterior nostril; lips moderately fleshy, upper lip with 5-6 longitudinal plicae, lower lip with 1-2 (inner row more fleshy and papillose). Upper jaw with pair of enlarged canines anteriorly, some species with a second slightly smaller, enlarged canine behind first in each side of jaw; anterior enlarged canines recurved in each side of jaw; lower jaw with 2 pairs of enlarged anterior canines, second pair of canines shorter than first; 8-13 progressively smaller posterior lateral teeth in both jaws, inner row of 3-4 small canines behind anteriormost teeth; posterior canine in angle of upper jaw absent or reduced (Fig. 13c). Lower pharyngeal plate broadly Y-shaped; transverse limb with medial posterior patch of large blunt conical or molariform teeth and 2-3 rows of smaller conical teeth; anterior median limb narrow, with 2-3 irregular rows of small conical teeth, posterior teeth blunter (Fig. 18c) . Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior margin reaching level of middle to dorsal margin of orbit, lower margin free almost to below anterior margin of orbit. Opercular membrane broadly rounded, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales small to moderately large, confined to single row behind eye or extending in 1 or more rows from behind dorsal margin of orbit forward to vertical at midventral orbital margin. Opercle covered with 15-16 large scales, except for naked membranous opercular flap dorsoposteriorly. Subopercle naked.

Body scales large, scales on thorax about one-half to three-quarters size of other scales. Lateral line complete, bent abruptly downwards below ninth to eleventh dorsal soft rays; laterosensory canal tube complex, multiply branched (simple, bifurcate in juveniles). Dorsal and anal fins without scaly sheaths; scales extending onto base of caudal fin in interspaces between rays about half to two-thirds of way along fin. Dorsal fin length 1.5-2.1 in SL; dorsal rays progressively longer posteriorly; first spine 1.9-10.5 in head; ninth spine 1.1-2.9 times length of first; tenth or eleventh soft rays usually longest, 1.0-2.1 times length of ninth spine; dorsal and anal spines pungent; membrane between spines incised, produced as free points projecting beyond spines; posterior tip of dorsal and anal fins pointed or rounded. Anal fin length 2.5-4.4 in SL; anal rays progressively longer posteriorly; first spine 2.9-11.6 in head; third spine 1.2-4.2 times length of first; ninth or tenth soft rays longest, 1.1-2.4 times length of third spine; caudal fin rounded to truncate; pectoral fins rounded or pointed (upper rays longest), not reaching vertical through vent, length 1.3-2.1 in head; pelvic fins short, rounded to triangular, not reaching beyond tips of pectoral fin, length 1.5-2.5 in head.

Discussion. Species of this new genus have previously been included in the genus *Pseudolabrus*. *Notolabrus* is distinct from *Pseudolabrus*, however, in having the following characters: pectoral rays ii,12 (except *N. celidotus* usually with ii,11); no scaly sheath at base of dorsal and anal fins (the sheaths are also absent in *P. miles* and *P. psittaculus*); 2 epihaemal ribs (on tenth and eleventh (rarely twelfth) vertebra); first caudal vertebra with a haemal spine (incompletely fused in *N. celidotus*); lower jaw with second anterior canine shorter than first; posterior canine in angle of upper jaw reduced or absent; laterosensory canal tube generally more complexly branched (simple, bifurcate in juveniles). Species of *Notolabrus* generally grow to a large size (maximum ranging from 253-405 mm SL). Distributed throughout the southern Australia-New Zealand region.

Etymology. *Notolabrus* is from a combination of the Greek *notos,* south, and *labros,* wrasse, in reference to the southern distribution of members of the genus. Gender masculine.

Key to species of the genus *Notolabrus*

(Species accounts are presented in the order of the Key)

1. Cheek scale rows behind eye 1, cheek scale rows below eye 1-3 (rarely 4) ..... 2.

——Cheek scale rows behind eye 2, cheek scale rows below eye 3-6 ..... 4.

2. 1-3 dark bars on body, or bars absent ..... 3.

——4-5 dark bars on body ..... (South Australia, southern Western Australia) *parilus*.

3. Cheek scale rows below eye 1; IP colour reddish brown with white spots on sides, faint radiating greyish lines around eye; TP colour brownish, broad pale bar (crimson in life) on posterior half of body below middle 4 dorsal soft rays; first 3 pelvic rays black; caudal peduncle and base of fin dark; chin and throat pale ... . (southern Queensland, New South Wales, Lord Howe Island) *gymnogenis*.

——Cheek scale rows below eye 2-3(rarely 1 or 4); IP colour pattern pale greenish or reddish brown with broad indefinite greyish bar on body below spinous dorsal fin, 2-3 narrow indistinct greyish bars below soft dorsal fin (larger individuals with first bar darker and more distinct); TP colour brownish (greenish blue or reddish orange in life, cheeks and lips yellow), pale bar (whitish in life) on body below first 2-3 dorsal soft rays; pelvic fins yellowish; caudal peduncle and base of caudal fin pale; chin and throat dark (blue in life) .... (southern New South Wales, Victoria, Tasmania, South Australia) *tetricus*.

4. Pectoral rays usually ii,11 (rarely ii,12); cheek scale rows behind eye 2, cheek scale rows below eye 4-6; dark blotch (broken in large individuals) on side of body below anterior dorsal soft rays ..... (New Zealand) *celidotus*.

——Pectoral rays usually ii,12 (rarely ii,11 or 13); cheek scale rows behind eye 2-5, cheek scale rows below eye 3-6; no dark blotch on sides of body ..... 5.

5. Ground colour pale brownish or grey (whitish in life), broad greyish transverse band (black in life) on body from below posterior dorsal spines to in front of anal fin origin ..... (southern New Zealand) *cinctus*.

——Ground colour dark, no transverse band on body ..... 6.

6. Ground colour greyish (purple or greenish brown in life); 4 pale yellowish saddles on dorsum above lateral line and extending onto dorsal fin, fifth saddle on caudal peduncle behind base of dorsal fin; 6 indistinct dark bars on body ..... (New Zealand, southern New South Wales, Victoria, Tasmania, South Australia) *fucicola*.

——Ground colour brownish; IP with white spots or scribblings on body, these forming horizontal rows or lines in some individuals; 4 indistinct dark bars on sides; dark blotch between first 3 dorsal spines; TP uniform brown or greyish (dark green or slate blue in life, with gold specklings on scales); dorsal and anal fins pale or dark (whitish in life) ..... (north-eastern New Zealand, Kermadec Islands, Norfolk Island, Lord Howe Island, New South Wales) *inscriptus*.

Notolabrus parilus (Richardson, 1850)

(Fig. 3; Pl. 1E, 1F; Table 3)

?*Labrus cyprinoides*.—Labillardiere, 1800: 419 (nomen nudum, not *Labrus cyprinoides* Meyer, 1793).

Tautoga parila Richardson, 1850: 70 (King George Sound, Western Australia).

?*Labrichthys tetrica*.—Günther, 1862: 112 (in part, not *Labrus tetricus* Richardson, 1840).

Labrichthys parila.—Günther, 1862: 117.

Labrichthys punctulata Günther, 1862: 118 (Swan River, Western Australia).

Labrichthys edelensis Castelnau, 1873: 137 (Fremantle, Western Australia).

Labrichthys Bostockii Castelnau, 1873: 137 (Fremantle, Western Australia).

Labrichthys unicolor Castelnau, 1875: 37 (Western Australia).

Labrichthys rubra Castelnau, 1875: 37 (Swan River, Western Australia).

Labrichthys convexus Castelnau, 1875: 38 (Swan River, Western Australia).

Labrichthys gymnogenis.—Klunzinger, 1879: 403 (not *Labrichthys gymnogenis* Günther, 1862).

Pseudolabrus parila.—Gill, 1892: 401.

Pseudolabrus punctulatus.—Gill, 1892: 401.

Pseudolabrus bostockii.—Gill, 1892: 402.

Pseudolabrus edelensis.—Gill, 1892: 402.

Pseudolabrus unicolor.—Gill, 1892: 402.

Pseudolabrus ruber.—Gill, 1892: 402.

Pseudolabrus convexus.—Gill, 1892: 402.

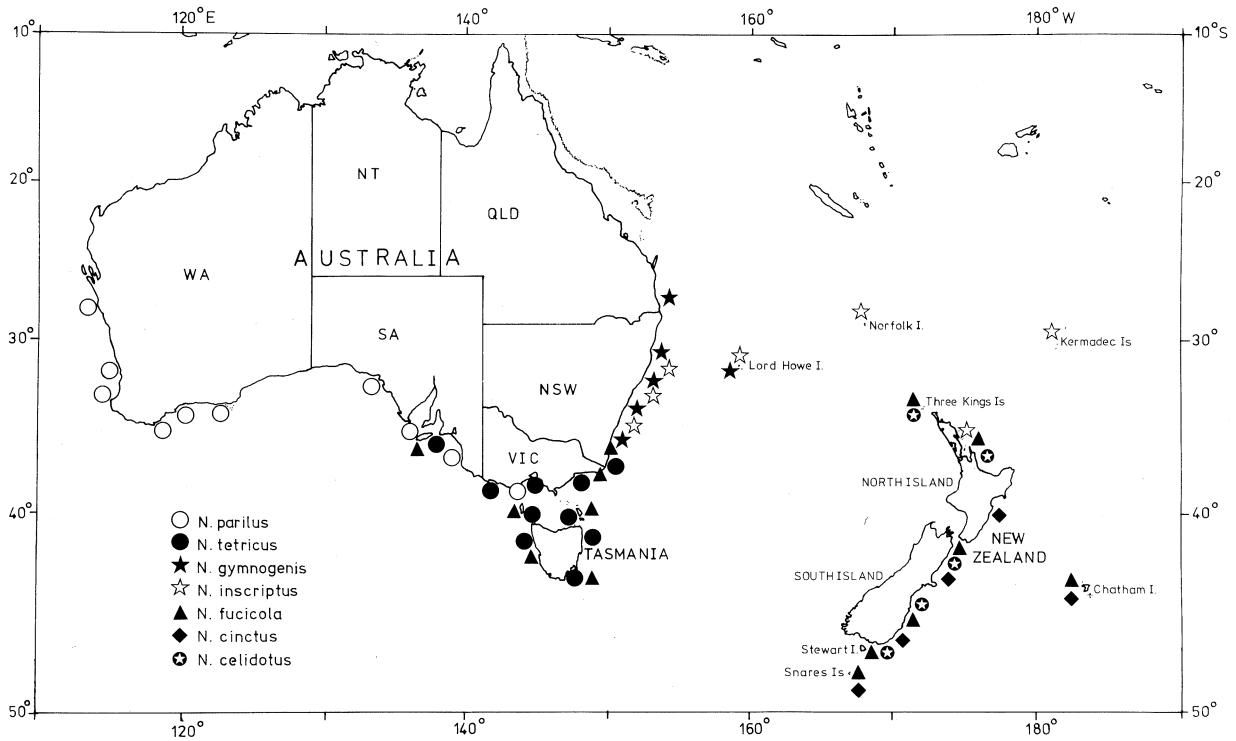

Fig.3. Map of the known distribution of species of *Notolabrus*.

Material examined. (34 specimens: 69-312 mm SL) VICTORIA – Queenscliffe, NMV 13 (310), NMV R.10953 (312). SOUTH AUSTRALIA – Robe, AMS I.18470-006 (3:104.5-164.5); Kangaroo Island, AMS I.20195-005 (99.5); Spencer Gulf, NMV A.85 (190), NMV A.86 (174), NMV R.13295 (288), NMV R.13296 (252); Ceduna, AMS I.15729-006 (219); West Island, Nuyts Archipelago, AMS I.16186-001 (212.5). WESTERN AUSTRALIA – Mondrain Island, Recherche Archipelago, AMS I.20222-022 (2:100.3-146.5); Lucky Bay, Cape Le Grande, AMS I.20225-005 (161); Two People Bay, AMS I.20236-001 (113); Albany, AMS I.10628-007 (90.5); King George Sound, BMNH 1846.1.31.75 (232, HOLOTYPE of *Tautoga parila* Richardson); Hardy Inlet. WAM P.25275-003 (69); Cape Clairault, WAM P.25255-002) (101); Canal Rocks, Cape Naturaliste, AMS I.20233-005 (97.5); Geographe Bay, WAM P.25607-002 (258); Cockburn Sound, AMS I.20229-009 (2:99.5-106.5); Swan River, BMNH 1847.6.17.49-50 (2:270-299, SYNTYPES of *Labrichthys punctulata* Günther), MNHN A.8882 (3.165.5-184, SYNTYPES of *Labrichthys rubra* Castelnau), NMV 60130 (198, ?SYNTYPE of *L. rubra* Castelnau); Rottnest Island, AMS I.20239-003 (2:96.5-180); Beacon Island, Abrolhos Island, WAM P.25307-007 (127); Kalbarri, WAM P.15851 (74).

Diagnosis. Cheek scale rows behind eye 1, cheek scale rows below eye 1-2 (rarely 3); sexually dichromatic; IP pale brownish or greenish, 4-5 indistinct dark bars on body; TP brownish with 5 indistinct dark bars on body; pale irregular band below lateral line; body scales with gold, brownish or white centres, giving marbled or spotted appearance in some individuals.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale; 5 indefinite, evenly spaced, greyish bars on dorsum between dorsal fin and lateral line; 4 indefinite greyish bars below lateral line in interspaces between upper bars; indistinct zig-zag band joining upper and lower bars along lateral line; faint greyish markings on base and dorsal part of caudal peduncle, series of greyish radiating lines around eye, extending onto cheeks below eye; dorsal part of preopercle and opercle with greyish markings; dorsal fin with dark blotch between first 2 spines, greyish markings on body extending onto dorsal fin; faint greyish markings on anal fin; base of pectoral fin with faint greyish bar.

Ground colour of TP in alcohol light brown; 5 indistinct dark bars above lateral line below dorsal fin; indefinite broad pale band along body below lateral line; lower part of body with 4 indistinct bars; bars on body spotted with darker brown markings; dark brown markings on dorsal surface of head and snout; dark brown radiating markings around eye, extending onto cheeks, preopercle and opercle; dorsal and anal fins with dark brown markings; outer part of caudal fin greyish; dark brown mark on dorsal and midbase of pectoral fin.

Life colours - ground colour of IP pale brownish or greenish; some body scales with lighter centres; dark markings on body and fins brownish or black; anal and pelvic fins with reddish tinge; caudal fin and pectoral fins translucent pale yellow.

Table 3. Selected measurements of species of *Notolabrus* (as a percentage of standard length).

	N. parilus (n=34)	*N. gymnogenis* (n=23)	*N. tetricus* (n=43)	*N. celidotus* (n=43)
Standard length (mm)	69.0 – 312.0	58.0 – 230.0	85.5 – 405.0	18.0 – 239.0
Body depth	29.8 – 38.3	31.3 – 37.7	30.9 – 39.4	28.2 – 36.4
Head length	30.0 – 34.9	31.7 – 35.3	29.1 – 36.3	30.3 – 35.8
Snout length	7.2 – 9.7	7.4 – 10.2	7.5 – 11.5	8.0 – 12.0
Orbital diameter	4.5 – 8.3	5.1 – 8.5	4.3 – 7.4	5.6 – 9.0
Interorbital width	5.3 – 7.1	5.9 – 8.4	5.9 – 8.3	5.5 – 8.4
Suborbital depth	3.7 – 7.7	3.4 – 7.4	4.6 – 8.8	3.3 – 8.1
Length of dorsal fin base	55.9 – 62.7	56.3 – 65.2	52.2 – 62.6	52.0 – 61.6
Length of first dorsal spine	4.9 – 8.1	4.3 – 7.8	4.8 – 7.8	6.1 – 8.8
Length of ninth dorsal spine	8.0 – 11.6	6.3 – 11.0	7.2 – 12.2	9.3 – 13.5
Length of longest dorsal ray	11.8 – 14.2	11.6 – 14.3	12.4 – 14.6	9.6 – 17.8
Length of anal fin base	28.1 – 40.1	26.3 – 32.7	25.4 – 32.3	25.7 – 31.0
Length of first anal spine	3.2 – 5.6	3.0 – 5.7	3.8 – 5.4	3.5 – 7.2
Length of third anal spine	7.2 – 10.3	6.8 – 11.6	8.1 – 10.4	7.9 – 12.7
Length of longest anal ray	11.6 – 14.1	12.1 – 15.5	12.1 – 15.5	10.9 – 18.2
Least depth of caudal peduncle	14.9 – 17.9	13.3 – 17.5	13.4 – 17.1	12.3 – 16.1
Length of pectoral fin	18.1 – 24.6	21.2 – 26.2	18.8 – 23.9	19.8 – 25.9
Length of pelvic fin	12.5 – 20.2	11.3 – 19.3	14.4 – 19.5	12.6 – 18.1

	N. cinctus (n=26)	*N. fucicola* (n=65)	*N. inscriptus* (n=18)
Standard length (mm)	147.0 – 299.0	55.6 – 365.0	60.3 – 325.0
Body depth	29.2 – 35.9	29.8 – 36.6	29.9 – 37.0
Head length	28.2 – 32.4	29.8 – 35.9	29.2 – 36.9
Snout length	7.8 – 10.2	6.9 – 11.1	8.0 – 13.0
Orbital diameter	5.1 – 7.7	4.7 – 7.6	4.4 – 8.1
Interorbital width	7.0 – 9.2	6.1 – 9.4	6.4 – 8.9
Suborbital depth	3.7 – 6.7	2.7 – 7.7	3.8 – 8.6
Length of dorsal fin base	47.6 – 58.6	52.8 – 59.5	53.2 – 62.2
Length of first dorsal spine	3.0 – 5.9	4.8 – 8.0	4.1 – 7.9
Length of ninth dorsal spine	6.9 – 9.9	6.6 – 12.5	7.7 – 13.1
Length of longest dorsal ray	9.4 – 12.1	9.1 – 16.2	12.1 – 15.7
Length of anal fin base	24.3 – 29.2	22.6 – 30.2	23.8 – 32.1
Length of first anal spine	3.1 – 4.8	3.2 – 8.0	2.9 – 6.8
Length of third anal spine	7.1 – 9.4	7.1 – 14.0	7.0 – 12.6
Length of longest anal ray	9.7 – 11.0	10.4 – 16.8	13.5 – 16.5
Least depth of caudal peduncle	13.0 – 16.6	14.3 – 18.3	14.6 – 16.5
Length of pectoral fin	14.4 – 21.1	20.4 – 25.4	18.9 – 24.2
Length of pelvic fin	12.9 – 21.3	13.1 – 17.0	14.9 – 21.2

Ground colour of TP dark reddish brown or chocolate brown; broken whitish band along body below lateral line, from behind posterior tip of pectoral fin to base of caudal fin; ventral surface of body behind pelvic fins whitish; body scales with gold, brownish or white centres, giving marbled or spotted appearance in some individuals; head and thoracic region brownish; ventral part of cheeks and throat whitish; dark brown markings on head and around eye variable, almost absent in some individuals; fins greyish or reddish brown; dorsal and anal fins with dark spots and markings; dark bar on dorsal base of pectoral fin.

Remarks. *N. parilus* is a large species, the largest specimen, a male (TP), was 312 mm SL. Sexual transformation, accompanied by a change from IP to TP colour pattern, appears to occur at about 175-200 mm SL.

Distribution. *N. parilus* occurs in Victoria (recorded from Queenscliffe), South Australia and southern Western Australia, but is uncommon in the first two states. A record of this species from Tasmania (Scott, 1970) is based on a misidentification of *Pictilabrus laticlavius*. *N. parilus* inhabits shallow rocky reef areas, and was collected down to 12 m, but was observed at depths to 20 m in Western Australia.

Discussion. Several names have been applied incorrectly to this species. *Labrus cyprinoides* Labillardiere is a nomen nudum, apparently based on *Labrus cyprinoides* Meyer. *L. cyprinoides* is an erroneous transliteration of *Labrus cyprinaceous* White, described from Port Jackson (Sydney) and here regarded as a nomen dubium (see discussion of *Notolabrus gymnogenis*). Another name of historical interest is Archibald Menzies' unpublished ms. description of *Sparus guttatus* from King George Sound, Western Australia, which Whitley (1956) identified as *N. parilus*. Specimens from the Swan River referred to by Günther (1862) as *Labrichthys tetrica* appear to be *N. parilus*. A specimen from King George Sound identified as *Labrichthys gymnogenis* by Klunzinger (1879) is a misidentification of *N. parilus*.

The type of *Tautoga parila* Richardson (BMNH 1846.1.31.75) is preserved as a dried skin. Two syntypes of *Labrichthys punctulata* Günther (BMNH 1847.6.17.49-50) also are preserved as dried skins, and represent the TP form of *N. parilus*. Three syntypes of *Labrichthys rubra* Castelnau (MNHN A.8882) also represent the TP form of *N. parilus*. What appears to be a fourth, and previously unreported syntype of *L. rubra*, was located in the Museum of Victoria (NMV 60130). This specimen, labelled 'from Count Castelnau', has the same dark body colour with pearly body scales, that appears to be an artifact of preservation, and is characteristic also of one of the MNHN specimens. The type specimens of *Labrichthys edelensis* Castelnau, *L. unicolor* Castelnau, and *L. convexus* Castelnau are not in the MNHN (Bauchot, 1963) and are presumed lost. From the original descriptions, however, there is little doubt that these species are junior synonymns of *N. parilus*. Reasons for including *Labrichthys bostockii* Castelnau as a junior synonymn of *N. parilus* are discussed elsewhere (see discussion of *Pseudolabrus biserialis*). *P. bostockii* of most authors is referable to *P. biserialis*.

Etymology. The specific name *parilus* is from the aboriginal 'Paril', the name given this species by the natives of King George Sound (Richardson, 1850).

Notolabrus gymnogenis (Günther, 1862)

(Fig. 3; Pl. 1G, 1H; Table 3)

Labrichthys gymnogenis Günther, 1862: 117, 507 (Sydney, Australia).

Labrichthys nigromarginatus Macleay, 1878: 35, pl.iii, fig. 3 (Port Jackson, Sydney).

Labrichthys parila.—Castelnau, 1879: 389 (not *Tautoga parila* Richardson, 1850).

Pseudolabrus gymnogenis.—Gill, 1892: 401.

Pseudolabrus nigromarginatus.—Gill, 1892: 402.

Pseudolabrus cyprinaceous.—Whitley, 1931: 155 (based on *Labrus cyprinaceous* White, 1790 - a nomen dubium).

Material examined. (25 specimens: 58-230 mm SL) AUSTRALIA – BMNH 1848.10.25.47-48 (2:185-192, SYNTYPES of *Labrichthys gymnogenis* Günther)*. QUEENSLAND – Point Cartwright, QM I.8971 (203); Caloundra, QM I.17323 (110); Moreton Bay, QM I.139 (186.5); Stradbroke Island, QM I.9741 (185.5). NEW SOUTH WALES – Byron Bay, AMS IB.2582 (230); off Yamba, AMS IB.7516 (95.5); Minnie Water, AMS IB.7835 (230); Seal Rocks, AMS I.15896-017 (87.8); Broken Bay, AMS I.19942-012 (2:89.5-139.5); Long Reef, Collaroy, AMS I.16236-001 (215); Port Jackson (Sydney), AMS I.16368-001 (215, HOLOTYPE of *Labrichthys nigromarginatus* Macleay); Cape Solander, AMS I.11159 (222), AMS I.11349 (173); off Port Hacking, AMS I.14946 (182); Jervis Bay, AMS I.15330-030 (3:58-64.5); Bingi Bingi Point, AMS I.18561-001 (96). LORD HOWE ISLAND – AMS I.6042 (230).

Diagnosis. Cheek scale rows behind eye 1, cheek scale rows below eye 1; sexually dichromatic; IP reddish brown with white spots on body; TP brownish, broad pale bar (crimson in life) on body below middle 4 dorsal soft rays; first 3 rays of pelvic fin black.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale brownish; some body scales with white centres, forming irregular spots; snout and dorsal surface of head greyish; dark smudge at tip of snout, faint radiating greyish lines around eye; fins pale, dorsal and anal fins with narrow greyish margins and 2-3 rows of greyish spots; base of pectoral fin with greyish bar.

Ground colour of TP in alcohol greyish; broad pale bar on posterior half of body below middle 4 dorsal soft rays; head greyish, paler below; fins whitish; dorsal, anal and caudal fins with narrow black margins; first 3 rays of pelvic fin black; dorsal margin and dorsoposterior part of pectoral fin black; base of pectoral fin with broad blackish bar.

Life colours - ground colour of IP dark reddish brown; body with numerous large white spots; head light reddish brown; throat and thoracic region whitish; white scribblings on nape and cheeks; 3-4 dark reddish brown lines radiating from eye; dorsal, anal and caudal fins reddish brown; dorsal and anal fins with narrow blue or greyish margins, spotted with white, and with median dark band; pelvic fins whitish, reddish brown near base; pectoral fin translucent reddish brown, greyish bar at base.

Ground colour in life of TP greyish; greyish brown on dorsal surface of head and anterior half of body; red suffused behind pectoral fin; broad crimson bar on posterior half of body between dorsal and anal fins, this bar with indistinct greyish edge posteriorly; caudal peduncle and base of caudal fin white; ventral part of head below eyes whitish; thoracic region dusky grey; dorsal and anal fins crimson; outer half of caudal fin yellowish; pelvic fins crimson, inner rays black; pectoral fin pale yellowish, dorsal margin and posterodorsal part of fin greyish; broad blackish bar at base of pectoral fin.

Remarks. *N. gymnogenis* is a moderately large species, the largest specimen, a male (TP), was 230 mm SL. Sex reversal in *N. gymnogenis* occurs at about 190-200 mm SL and is accompanied by a change in colour from IP to TP pattern; mature females range in size from 130-200 mm SL; mature males range in size from 193-283 mm SL (McPherson, 1977).

Distribution. *N. gymnogenis* is known only from southern Queensland and New South Wales, with a single record also from Lord Howe Island (Allen *et al.*, 1976). *N. gymnogenis* is a common coastal reef fish, inhabiting rocky bottoms in shallow water. The deepest collected specimen was from 15 m, although it probably ranges much deeper than this.

Discussion. Whitley (1931) resurrected *Labrus cyprinaceous* White as an older name for *N. gymnogenis*, stating that the former is "evidently based on an old faded specimen of the crimson-banded or white-spotted parrotfish of New South Wales, as the dark marks, radiating from the eye, as shown in White's figure, are often characteristic of this common and variable Sydney species". White's (1790)

description, however, is very brief and it is by no means clear from his poor accompanying figure that the fish is *N. gymnogenis*. Since White's original type has been lost, the name *Labrus cyprinaceous* must be regarded as a nomen dubium. *Labrus cyprinoides* Meyer (1793) is based on White's description of *L. cyprinaceous* and appears to be an erroneous transliteration of the latter. Günther's syntypes of *Labrichthys gymnogenis* (BMNH 1848.10.25.47-48) represent the IP colour form of *N. gymnogenis*. The holotype of *Labrichthys nigromarginatus* Macleay (AMS I.16368-001) represents the TP form of *N. gymnogenis*. Steindachner's (1867) queried identification of a specimen of *Labrichthys gymnogenis* from China (NMW 27660) is incorrect according to Klunzinger (1879), but re-examination of the specimen in the NMW confirms Steindachner's identification and the locality 'China' undoubtedly is a mistake. Klunzinger's (1879) own identification of a specimen (SMNS 2570) from King George Sound, Western Australia, as *L. gymnogenis* is erroneous and is a misidentification of the IP form of *N. parilus*. Other authors also have confused *N. parilus* from Western Australia with *N. gymnogenis*, and specimens recorded as *Labrichthys parila* from Port Jackson (Sydney) by Castelnau (1879) and others can be referred to *N. gymnogenis*.

Etymology. The specific name *gymnogenis* is a combination of the Greek *gymnos*, bare, and *genys*, cheek, in reference to the almost naked cheeks, with only a single row of scales, of this species.

Notolabrus tetricus (Richardson, 1840)
(Fig. 3; Pl. 1I, 1J; Table 3)

Labrus tetricus Richardson, 1840: 25 (Port Arthur, Tasmania).
Labrus tetricus, vel *Tautoga tetrica*.—Richardson, 1844-48 (1848): 126.
Tautoga tetrica.—Bleeker, 1855: 13.
Pseudolabrus tetricus.—Bleeker, 1862b: 131.
Labrichthys ephippium.—Günther, 1862: 116 (not *Labrus ephippium* Valenciennes *in* Cuvier & Valenciennes, 1839).
Labrichthys tetrica var. *fuscipinnis* Klunzinger, 1872: 37 (Port Phillip, Melbourne).
Labrichthys tetrica var. *tigripinnis* Klunzinger, 1872: 37 (Hobson's Bay, Melbourne).
Labrichthys Bleekeri Castelnau, 1872a: 148 (Melbourne fish market).
Labrichthys Richardsoni Castelnau, 1872a: 150 (Melbourne fish market) (not *Pseudolabrus richardsonii* Steindachner, 1867).
Labrichthys Vestita Castelnau, 1872a: 151 (Melbourne fish market).
Labrichthys Cuvieri Castelnau, 1873: 53 (Hobart, Tasmania).
?*Labrichthys tetrica* var. *ocellata* Klunzinger, 1879: 402 (Murray River, South Australia).
?*Labrichthys bothryocosmus*.—Johnston, 1883: 123 (not *Labrichthys botryocosmus* Richardson, 1844-48 [1846]).
Labrichthys cyanogenys Ramsay & Ogilby, 1888a: 242 (Broken Bay, New South Wales).
Labrichthys cerulieus.—Saville-Kent, 1888: 47 (nomen nudum in error for *Labrichthys cyanogenys* Ramsay & Ogilby, 1888a, fide McCulloch, 1923).
Cossyphus cerulaeus.—Johnston, 1891: 35.
Pseudolabrus ephippium.—Gill, 1892: 401.
Pseudolabrus tetricus var. *tigripinnis*.—Gill, 1892: 402.
Pseudolabrus tetricus var. *fuscipinnis*.—Gill, 1892: 402.
Pseudolabrus bleekeri.—Gill, 1892: 402.
Pseudolabrus richardsonii.—Gill, 1892: 402.
Pseudolabrus vestitus.—Gill, 1892: 402.
Pseudolabrus cyanogenys.—Gill, 1892: 403.
Labricthys ceruleus Saville-Kent, 1897: 174, pl. 28, fig. 17 (Tasmania).

Material examined. (52 specimens: 85.5-405 mm SL) NEW SOUTH WALES – Broken Bay, AMS I.1245 (405, HOLOTYPE of *Labrichthys cyanogenys* Ramsay & Ogilby); Ulladulla, AMS IB.7278 (305); Batemans Bay, AMS I.15748-001 (290); Eden, AMS IB.8202 (340). VICTORIA – Western Port Bay, NMV R.10945 (199), NMV R.10946 (145); Melbourne fish market, MNHN 77.432 (3:266-400, SYNTYPES of *Labrichthys vestita* Castelnau)*, MNHN 77.435 (185.5, SYNTYPE of *Labrichthys bleekeri* Castelnau)*, MNHN 77.436 (273, HOLOTYPE of *Labrichthys richardsoni* Castelnau)*; Hobson's Bay, NMV 60136 (315), SMNS 1659 (2:219-243, SYNTYPES of *Labrichthys tetricus* var. *tigripinnis Klunzinger*)*, NMW 27667 (232.3), ?SYNTYPE of *L. tigripinnis*)*; Port Phillip Bay, NMV R.10952 (196), NMV R.13297 (193); Queenscliffe, NMV R.10947 (325), NMV R.10948 (335), NMV R.10949 (255), NMV R.10951 (213); Bell's Beach, AMS I.16980-005 (126.5). TASMANIA– Flinders Island, AMS I.20092-002 (83), NMV 60137 (267), QVMT 1974.5.7 (375); Greens Beach, QVMT 1972.5.657 (3.115-124); Tamar River, QVMT 1972.5.502 (247); Stoney Head, QVMT 1974.5.97 (290); Bicheno, QVMT 1977.5.45 (253); Rocky Hills, TMH D.554 (156); Swansea. TMH D.549 (193); Hobart, BMNH 1855.9.19.914 (220, HOLOTYPE of *Labrus tetricus* Richardson)*; Bruny Island, AMS I.20092 002 (183); Emu Bay, TMH D.989 (230); Rocky Cape, AMS I.20079-012 (3:129.5-142.5); King Island, AMS I.22074-002 (3:85.5-156). SOUTH AUSTRALIA – Murray River, SMNL 2333 (161.5), HOLOTYPE of *Labrichthys tetrica* var. *ocellata* Klunzinger)*; Kangaroo Island, AMS I.20175-001 (3:132-168), AMS I.20188-002 (159.5); Spencer Gulf, NMV A.83 (253), NMV R.13297 (193), NMV R.13298 (200), NMV R.13299 (227), NMV R.13300 (287).

Diagnosis. Cheek scale rows behind eye 1, cheek scale rows below eye 2-3 (rarely 1 or 4); sexually dichromatic; IP pale greenish or reddish brown; broad indefinite greyish bar below spinous dorsal fin, 2-3 narrow indistinct bars below soft dorsal fin; TP brownish (in life greenish blue or reddish orange, lips yellow); pale bar (whitish in life) on body below anteriormost 2-3 dorsal soft rays; caudal peduncle and base of caudal fin pale; chin and throat dark (blue in life).

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale; broad greyish bar with indefinite edges extending from below spinous dorsal fin to behind pectoral fin; 2-3 narrow indistinct greyish bars below soft dorsal fin; 1-2 dark patches on caudal peduncle (large individuals, 250-350 mm SL, with posterior body markings indefinite or lost; broad dark bar below spinous dorsal fin more distinct and

extending down body almost to midventral line in front of anal fin origin); nape and dorsal surface of head greyish; 6-7 dark radiating markings around eye; dorsal part of opercle with indistinct dark markings; dorsal rays with greyish markings; caudal and anal fin with faint greyish markings; base of pectoral fin with dark bar.

Ground colour of TP in alcohol uniform dark brown; pale bar between anterior dorsal soft rays and anterior part of anal fin (indistinct or lacking in some specimens); posterodorsal part of opercle with black blotch; chin and throat greyish; dorsal and anal fins greyish; base of pectoral fin with broad dark bar, pectoral axis black.

Life colours - ground colour of IP greenish or reddish brown, darker on dorsum; body scales with whitish centres; ventral surface of body white; bars on body greyish (single bar on body in larger individuals, black); dorsal surface of head greyish, dark radiating marks around eye; ventral part of cheeks and throat greenish or light reddish brown, with white scribblings; dorsal, anal and pelvic fins pale reddish brown (dorsal and anal fins greyish in some larger individuals); caudal and pectoral fins pale yellowish; dorsal, anal and caudal fins with 5-6 rows of small white spots; dorsal rays with some greyish markings; broad greyish bar at base of pectoral fin.

Life colours of TP greenish blue to reddish orange; broad whitebar between anterior dorsal soft rays and anterior anal rays; caudal peduncle and base of caudal fin white; head dusky grey, cheeks and thoracic region pale grey; lips yellowish; posterodorsal part of opercle with dark blotch, ventral margin of opercle greyish; chin and throat dark blue; dorsal and anal soft rays greyish, margins of fins bluish; outer margin of caudal fin yellowish, innermost part of fin greyish; pectoral and pelvic fins yellow; base of pectoral fin and pectoral axis black.

Remarks. *N. tetricus* is a large species, the largest specimen examined, a male (TP), was 405 mm SL. Sexual transformation, accompanied by a change in colour to TP, occurs at about 230 - 250 mm SL. Hybrid specimens of *N. fucicola* x *N. tetricus* have been observed and photographed in New South Wales by R. Kuiter (Plate 2D) and in Tasmania by J.B. Hutchins (personal communication, 1985). *N. tetricus* feeds principally on small crustaceans and molluscs (Parry 1982, and personal communication 1982).

Distribution. *N. tetricus* is restricted to south-eastern Australia, including southern New South Wales, Victoria, Tasmania and South Australia. *N. tetricus* is a common reef fish, inhabiting rocky bottoms in shallow water, and has been collected as deep as 18 m, although it probably ranges deeper than this.

Discussion. *N. tetricus* has had a confused nomenclatural history with different names being proposed for colour variants. The type of *Labrus tetricus* Richardson (BMNH 1855.9.19.914) represents the TP colour form. Klunzinger's (1872) type(s) of *Labrichthys tetrica* var. *fuscipinnis* could not be located in the SMNS, but it is apparent from the original description that this species is clearly a colour variant of *N. tetricus*. Two syntypes of *L. tetrica* var. *tigripinnis* Klunzinger (SMNS 1659) and a third specimen, apparently also a syntype of *L. tigripinnis* (NMW 27667), are identifiable as IP *N. tetricus*. The type of *Labrichthys tetrica* var. *ocellata* Klunzinger (SMNS 2333), from the Murray River, also appears to be the IP form of *N. tetricus*. Castelnau's (1872a) types of *Labrichthys bleekeri* (syntype, MNHN 77-435), *L. richardsoni* (holotype, MNHN 77-436) and *L. vestita* (3 syntypes, MNHN 77-432) represent the IP colour form of *N. tetricus*. The type of *L. cuvieri* Castlenau apparently is lost (Bauchot, 1963) but from the original description it is clearly a TP *N. tetricus*. The type of *Labrichthys cyanogenys* Ramsay and Ogilby (AMS I.1245) represents the TP form of *N. tetricus*. According to McCulloch (1923) the nomen nudum, *Labrichthys cerulieus*, credited to Ogilby by Saville-Kent (1888), and changed to *Cossyphus cerulaeus* by Johnston (1891), is based on *L. cyanogenys*. Saville-Kent's (1897) use of *Labricthys* (sic) *ceruleus* for a photograph of a TP specimen constitutes the first available usage of this name for *N. tetricus*.

Etymology. The specific name *tetricus* is from the Latin *tetricus*, grim, seemingly in reference to the rather forbidding appearance of large TP individuals of this species. Richardson (1844) refers to it as the 'grim wrasse'.

Notolabrus celidotus (Bloch & Schneider, 1801)
(Fig. 3; Pl. 2A, 2B; Table 3)

Labrus celidotus Bloch & Schneider, 1801: 265, ex Forster ms. *Labrus celidotus* (New Zealand).
Labrus poecilopleura Valenciennes *in* Cuvier & Valenciennes, 1839: 95 (New Zealand).
Julis celidotus.—Richardson, 1843a: 218.
Julis notatus.—Richardson, 1843a: 218, nomen nudum ex Solander ms. *Sparus notatus*.
Julis? notatus Richardson, 1843b: 425, ex Solander ms. *Sparus notatus* (Tolaga Bay, New Zealand).
Labrus botryocosmus Richardson, 1844-48 (1846): 53, pl. xxi, fig. 6-10 ('Coasts of South Australia and Van Dieman's Land' [Tasmania]).
Pseudolabrus celidotus.—Bleeker, 1862b: 131.
Pseudolabrus botryocosmus.—Bleeker, 1862b: 131.
Labrichthys celidota.—Günther, 1862: 113.
Labrichthys bothryocosmus.—Günther, 1862: 114.
Pseudolabrus bothryocosmus.—Gill, 1892: 400.
Pseudolabrus (Lunolabrus) celidotus.—Whitley, 1933: 87.

Material examined. (53 specimens: 18-253 mm SL) NEW ZEALAND – MNHN A.7176 (140, HOLOTYPE of *Labrus poecilopleura* Valenciennes). Stewart Island, NMNZ 5631 (7:18-62.2); Cape Saunders, AMS I.19672-002 (3:170-239); Portobello, AMS I.14764 (159); Oamaru, CMC 960 (2:161-170); Queen Charlotte Sound, NMNZ 6554 (4:114.5-123.5); Lyall Bay, Wellington, NMNZ 1090 (8:38-102.3); Pitt Head, Tasman Bay, NMNZ 4909 (2:190.5-198.3); Otaki, NMNZ 5512 (104.8); Lottin Point, NMNZ 3234 (56.6); Mayor Island, NMNZ 4111 (2:53.8-115.5); Goat Island, Leigh,

AMS I.18281-001 (2:61-184), AMS I.18282-001 (2:187-215); Poor Knights Islands, AMS I.19279-002 (161); Orokawa Bay, Bay of Islands, NMNZ 6119 (103); Putahataha Island, Deepwater Cove, NMNZ 6104 (108); Whangaroa Harbour, NMNZ 6094 (179.5); Cavalli Island, NMNZ 1370 (3:140.5-203.5).

[Doubtful records from AUSTRALIA – BMNH 1845.5.10.15 (132, SYNTYPE of *Labrus botryocosmus* Richardson)*, BMNH 1855.9.19.965.6 (187.1, SYNTYPE of *L. botryocosmus*)*, BMNH 1847.5.10.10 (146.5)*; 'Port Essington', BMNH 1848.3.19.16 (141)*; 'Botany Bay', BMNH 1848.3.19.21-23 (4:56.5-104.5)*; 'Port Jackson', RMNH 2171 (2:108-253)*].

Diagnosis. Pectoral rays ii,11 (rarely ii,12); cheek scale rows behind eye 2, cheek scale rows below eye 4-6; dark blotch (broken in large individuals) on side of body below anterior dorsal soft rays.

Colour description. Sexually dichromatic. Colour of IP in alcohol pale, head and dorsum greyish; large dark blotch on dorsum below seventh to ninth dorsal spines and anteriormost 2-3 dorsal soft rays, extending 1 scale row above and 2 rows below lateral line; thorax and ventral surface of body pearly white; narrow pale ring around eye; 2 narrow dark bands (sometimes broken) behind eye, upper band extending from dorsal margin of orbit to vertical through posterior margin of preopercle, lower band extending from ventral margin of orbit onto preopercle and opercle (more diffuse and sometimes indistinct on opercle); margin of spinous dorsal fin greyish; anal fin with 2 blotches, first between anteriormost 3 rays and second between sixth to ninth rays.

Colour of TP in alcohol similar to IP, but head and dorsum less greyish, dark markings behind eye and on anal fin lacking, and dark blotch on upper part of sides broken into series of black dots clustered just above lateral line from below sixth dorsal spine to second dorsal soft ray.

Life colours - ground colour of IP ranging from pale whitish grey to yellowish green; greyish on dorsum and dorsal surface of head; thorax and ventral surface of body whitish to pale yellow, sometimes tinged with red; blotch on side black; small individuals (<100 mm SL) with 4-5 more or less evenly spaced greyish transverse bands on body, first (sometimes lacking) just behind pectoral fin, second below blotch on side, third and fourth below soft dorsal fin, and fifth on caudal peduncle; lines behind eye black; dorsal fin pale to greyish, groups of small dark spots medially along fin; anal fins yellow to orange with two prominent black spots; caudal fin and pectoral fin hyaline or pale translucent yellow; pelvic fins pale yellow to orange.

Ground colour of TP in life similar to that of IP but lighter on dorsum and dorsal surface of head; cluster of spots above lateral line black, spots coalesced in some individuals; body scales each marked with blue; ventral surface of body with reddish orange tint; eye encircled by narrow blue ring; brilliant blue line (sometimes broken) running upwards from corner of mouth to anteroventral margin of orbit, thence below eye to posterior margin of preopercle; second blue line horizontally from corner of mouth to just above angle of preopercle; 2 lines joined by series of blue spots down posterior margin of preopercle; second series of blue spots behind first, on anterior margin of opercle; opercle with scattered blue spots; dorsal and anal fins yellowish with pale orange-brown medial stripe on fins; caudal and pelvic fins yellowish; pectoral fins hyaline.

Remarks. *Notolabrus celidotus* is a moderately large species, the largest specimen, a male (TP), was 239 mm SL. McCann (1953), Choat (1965) and Jones (1980) described sexual dichromatism in *N. celidotus*, and Jones (1980) has discussed growth and reproduction. *N. celidotus* is monandric and sexual maturity is reached at about 100-110 mm SL, with sex/colour reversal occurring at about 150-170 mm SL. Spawning occurs from late July until the end of October (Sandager, 1888; Doak, 1972; Jones, 1980). Robertson (1975) described eggs of *N. celidotus* and Crossland (1981) described larvae. Ayling (1980) reported hybridisation between *N. celidotus* and congenors. Two *N. celidotus* x *N. fucicola* hybrids (a TP male, 263 mm SL, and an IP female, 153 mm SL) were collected by Ayling, and he observed a suspected hybrid of *N. celidotus* x *N. inscriptus* underwater. Two further *N. celidotus* x *N. fucicola* hybrids were collected by G.P. Jones. These specimens have colour patterns intermediate between those of the parent species (Ayling, 1980: Figs 1B, 2B), and morphological characters that are intermediate or a mixture of the parents characters. Meristic data for these hybrids are intermediate between their parent species (Table 4). Food of adult *N. celidotus* comprises mainly small bivalves, grapsid crabs and hermit crabs (Thomson, 1891; Graham, 1939; McCann, 1953; Thompson & Jones, 1983; Russell, 1983b).

Distribution. *N. celidotus* occurs throughout New Zealand, including Stewart Island, but has not been collected at the Snares Islands, (Horning, 1976; Hardy, 1986), Chatham Islands (Young, 1929; Moreland, 1957) or the Three Kings Islands (Choat & Ayling, 1987). This species is one of the most abundant fishes inhabiting inshore rocky reefs and estuaries in New Zealand. It occurs mainly in shallow water, but has been recorded to depths of 80 fathoms (145 m) (Graham, 1938).

Discussion. The type of *Labrus celidotus* Bloch & Schneider is not in the ZMB (H.J. Paepke personal communication, 1977), and is apparently lost. The original description, however, clearly distinguishes this species from other members of the genus. The holotype of *Labrus poecilopleura* Valenciennes (MNHN A.7176) is readily identifiable as *N. celidotus*. Richardson's (1843b) description of *Julis? notatus* is based on Solander's manuscript and drawing of '*Sparus notatus*' and is clearly *N. celidotus* (see Whitehead, 1968: pl.25). The syntypes of *Labrus botryocosmus* Richardson (BMNH 1845.5.10.15; 1855.9.19.965.6)

represent the TP form of *N. celidotus*.

N. celidotus occurs only in New Zealand, and early records of this species from Australia are almost certainly erroneous: Richardson (1844-48 [1846]) gave the distribution of *Labrus celidotus* as "Seas of New Zealand and Australia; Southern Island of New Zealand (Forster); Woosung, North of China (Sir Everard Home)", and of *Labrus botryocosmus* as "Coasts of South Australia and Van Dieman's Land". Günther (1862) similarly recorded *Labrichthys celidotus* from "Coasts of New Zealand and Australia", and *Labrichthys botryocosmus* from "Coasts of South Australia and Tasmania". Specimens mentioned by Günther, and labelled 'Australia' (BMNH 1847.5.10.10), 'Port Essington' (BMNH 1848.3.19.16) and 'Botany Bay' (BMNH 1848.3.19.21-23) were examined and are clearly *N. celidotus*. Choat (1968), however, has cast doubt on the accuracy of the locality data of these specimens and it is most likely that they represent mislabelled New Zealand material. Bleeker (1863) also recorded *N. celidotus* from Port Jackson (Sydney), and a re-examination of his two specimens (RMNH 2171) confirms his identification. The specimens are labelled 'don. Mus. Sydney 1863', but no record of this transaction could be traced either in the Register of Fishes or in early correspondence files of the Australian Museum. Because the specimens were sent from Sydney, it seems likely that Port Jackson was assumed to be the collection locality, but they probably originated from New Zealand. Johnston's (1883) record of *Labrichthys bothryocosmus* from Tasmania probably refers to the IP form of *N. tetricus* which has a dark bar on the side of the body.

Etymology. The specific name *celidotus* is from a combination of the Greek, *kelidos*, stain or spot, and *otos*, ear, in reference to the dark markings behind the eyes (Graham, 1956).

Notolabrus cinctus (Hutton, 1877)
(Figs 3, 4; Table 3)

Labrichthys cincta Hutton, 1877: 354 ('Coasts of Otago', New Zealand).

Pseudolabrus cinctus.—Gill, 1892: 402.

Material examined. (26 specimens: 147-299 mm SL) NEW ZEALAND – Betsy Island, Boat Group, NMNZ 5663 (5:212-276); Kundy Island, NMNZ 1923 (261); Solander Island, NMNZ 1925 (231); Tow Rock, AMS I.19673-001 (299); Cape Saunders, AMS I.14755 (285), AMS I.14756 (275), AMS I.14757 (211), AMS I.19672-002 (8:147-224); Portobello, AMS I.14758 (210), I.14759 (216); 'Coasts of Otago', OM unregistered (254, ?HOLOTYPE of *L. cincta* Hutton); 'Canterbury', CMC 955 (222); Makara, NMNZ 1169 (216); Napier Wharf, CMC 954 (2:196-236).

Diagnosis. Cheek scale rows behind eye 5; cheek scale rows below eye 5-6; ground colour pale brownish or grey, broad greyish transverse band on body from below posterior dorsal spines to in front of anal fin.

Colour description. Sexually monochromatic. Ground colour in alcohol pale brownish, darker on dorsum; greyish transverse band on body behind pectoral fin, extending from below fifth to eighth dorsal spines to ventral surface between tip of pelvic fin and origin of anal fin; chin and throat region whitish; dorsal, anal, caudal and pelvic fins greyish; dorsal base of pectoral fin with black mark.

Life colours - ground colour pale grey, darker on dorsum and paling to whitish on ventral surface; body scales speckled with small pearly spots which extend onto unpaired fins (small individuals lack pearly spots, instead inner third of each scale pinkish); transverse band on body black; small blackish patch above orbit extending onto dorsal part of eye; lower lip, chin and throat region whitish; dorsal, anal, caudal and pelvic fins greyish; pectoral fins translucent with reddish tint (paler in some larger individuals); pectoral axis black,

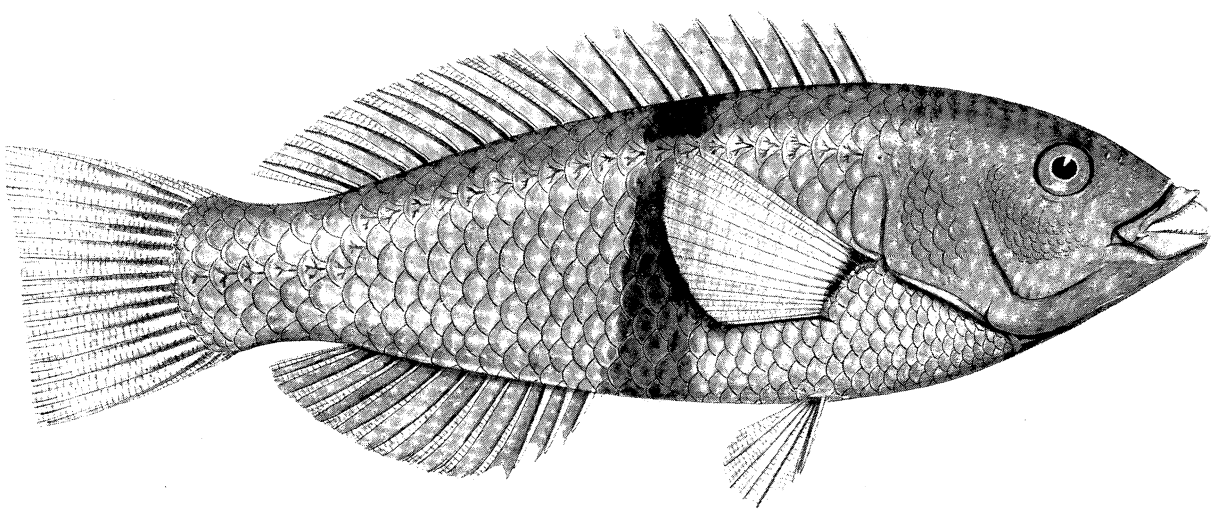

Fig.4. *Notolabrus cinctus* (from Waite, 1911).

dorsal base of pectoral fin with broad black bar, extending down base of fin as narrow bar. Small specimens are olive green or brownish and lack a distinct transverse band on the side of the body.

Remarks. *N. cinctus* is a moderately large species, the largest specimen examined, a male, was 299 mm SL. This species does not exhibit any marked sexual dichromatism. Sexual transformation occurs at about 200 mm SL: the largest female examined was 261 mm SL, while males ranged in size from 209-299 mm SL. *N. cinctus* appears to be a summer spawner and ripe female specimens in museum collections were noted to have been collected in February (Stewart Island) and March (Dunedin); females collected in May (Foveaux Strait) had spent gonads. Graham (1939) reported *N. cinctus* feeds on molluscs and small crustacea.

Distribution. *N. cinctus* is largely restricted to the South Island of New Zealand, Chatham Islands (Moreland, 1957), Stewart Island, and the Snares Islands (Horning, 1976; Hardy, 1986). Although recorded also from Makara, near Wellington, and Napier, it appears to be rare at these localities and probably does not occur much farther northwards in the North Island. *N. cinctus* is common over its range. Specimens were collected as deep as 40 m, although it is recorded as deep as 50 fathoms (91 m) (Graham, 1938).

Discussion. A dried and stuffed specimen corresponding in size to Hutton's type, and labelled 'Coasts of Otago' was located at the OM, Dunedin, and is probably the holotype.

Etymology. The specific name *cinctus* is from the Latin *cinctum*, girdle, in reference to the broad black transverse bar on the body.

Notolabrus fucicola (Richardson, 1840)
(Fig. 3; Pl. 2C; Table 3)

Labrus fucicola Richardson, 1840: 26 (Port Arthur, Tasmania).
Pseudolabrus fucicola.—Bleeker, 1862b: 131.
Labrichthys fucicola.—Günther, 1862: 112 (in footnote).
Labrichthys bothryocosmus.—Hutton, 1872: pl. viii, fig. 68 (misidentification of figure, not *Labrus bothryocosmus* Richardson, 1844-48 [1846] – fide Hutton, 1890).
Labrichthys fucicolor.—Hutton, 1890: 281.
Pseudolabrus fuscicola.—Waite, 1907: 22.
Pseudolabrus pittensis Waite, 1910: 26 (Pitt Island, Chatham Islands, New Zealand).

Material examined. (65 specimens: 55.6-365 mm SL) NEW ZEALAND – Port Pegasus, Stewart Island, NMNZ 5885 (245); Solander Island, NMNZ 1926 (264); Open Bay, NMNZ 2684 (284); Cape Saunders, AMS I.10672-001 (4:162-239), AMS I.19675-001 (300); Kaikoura, CMC 959 (4:143-165); Pitt Island, Chatham Islands, CMC 242 (216, HOLOTYPE of *Pseudolabrus pittensis* Waite); Chatham Islands, NMNZ 775 (365); Wellington, NMNZ 1148 (271); Island Bay, Wellington, NMNZ 5802 (297); Goat Island, Leigh, AMS I.18281-020 (2:190-290); Poor Knights Islands, AMS I.19279-003 (161.5), NMNZ 6259 (177); Bay of Islands, NMNZ 1001 (2:256-286); Cavalli Islands, NMNZ 1379 (299); Great King Island, Three Kings Island, NMNZ 6088 (153). AUSTRALIA – NEW SOUTH WALES – Bermagui, AMS I.15398-001 (211); Nadgee, AMS I.16722-001 (205). VICTORIA – Walkerville South, AMS I.16979-007 (5:95.5-161); Bell's Beach, AMS I.16980-001 (3:55.6-144.7). TASMANIA – Flinders Island, AMS I.20090-003 (94), AMS I.20092-013 (167.5); Tamar River, QVMT 1973.5.46 (290); Stony Head, QVMT 1974.5.87 (245); Croppies Point, QVMT 1974.5.24 (265); Swimcart Beach, QVMT 1972.5.654 (330); Bluestone Bay, AMS I.20087-004 (2:140-152); Spring Beach, AMS I.20096-007 (199); Bruny Island, AMS I.20085-001 (207); Trial Harbour, AMS I.20081-008 (7:201-260); West Point, AMS I.20080-001 (5:84.5-207); Rocky Cape, AMS I.20079-013 (152.5); Albatross Island, QVMT 1973.5.37 (207); King Island, AMS I.20074-001 (4:83-225). SOUTH AUSTRALIA – Kangaroo Island, AMS I.20176-001 (168.5), AMS I.20187-001 (2:160-169.5).

Diagnosis. Cheek scale rows behind eye 2-3, cheek scale rows below eye 3-4; ground colour greyish (purple or greenish brown in life); 4 pale yellowish saddles on dorsum above lateral line, extending onto dorsal fin; fifth saddle on caudal peduncle; 6 indistinct dark bars on body.

Colour description. Sexually monochromatic. Ground colour in alcohol greyish, paler below; 4 light yellowish saddles on dorsum, extending onto dorsal fin; fins greyish, pectoral fin pale; diffuse greyish bar at base of pectoral fin.

Life colours - ground colour purple to greenish brown, darker on dorsal surface of head and dorsum; 4 yellowish saddles on dorsum above lateral line, extending onto dorsal fin as lighter bars; fifth saddle behind dorsal fin on caudal peduncle; sides of body with 6 indistinct dark bars; head without distinctive markings (smaller individuals with irregular whitish line from dorsal margin of orbit to posterodorsal margin of preopercle; sometimes second broken line horizontally from ventral margin of orbit to margin of preopercle, and lighter marks on cheeks; some lighter body scales, giving mottled appearance); fins purple to greenish brown; dorsal fin with 4 pale yellowish bars; anal fin with 2 pale yellowish bars; base of pectoral fin with diffuse greyish bar.

Remarks. *N. fucicola* is a large species, the largest specimen examined, a male, was 365 mm SL. This species does not show any marked sexual dichromatism, although Doak (1972) states that sexual transformation from female to male is accompanied by a change in colour from brownish to purple and an intensification of the light saddles and darker bars on the body. In the specimens I examined there was more or less complete overlap in sizes of females and males: the largest ripe female was 300 mm SL, and mature males ranged from 164-365 mm SL. Doak (1972) reported spawning in *N. fucicola* from August to December, and specimens in the NMNZ collected from Wellington in September and December had ripe gonads. Robertson (1975) described the eggs of this species. Ayling (1980) reported hybridisation of New Zealand specimens of *N. fucicola* with *N. celidotus* and *N. inscriptus*. Hybrid specimens of *N. celidotus* x *N.*

fucicola and a *N. fucicola* x *N. inscriptus* specimen collected by G.P. Jones are compared meristically with their parent species in Table 4. Hybrid specimens of *N. fucicola* x *N. tetricus* also have been observed and photographed in New South Wales by R. Kuiter (Plate 2D) and in Tasmania by J.B. Hutchins (personal communication, 1985). Food of *N. fucicola* consists of crabs, hermit crabs, limpets and gastropods (Thomson, 1891; Thomson & Anderton, 1921; Graham, 1939; Parry, 1982; Russell, 1983b).

Distribution. *N. fucicola* occurs throughout New Zealand, including the Snares Islands (Horning, 1976; Hardy, 1986), Stewart Island, Chatham Islands (Waite, 1910) and the Three Kings Islands (Choat & Ayling, 1987), as well as south-eastern Australia, including southern New South Wales, Victoria, Tasmania and South Australia. *N. fucicola* is a common and wide ranging species. Graham (1938) reports that it occurs to depths of 50 fathoms (91 m).

Discussion. The type of *Labrus fucicola* Richardson is mentioned only as a footnote in Günther's (1862) Catalogue, and apparently is lost. Richardson's original description, however, clearly distinguishes this species from other members of the genus. In New Zealand, the name *Pseudolabrus pittensis* Waite has also been used for *N. fucicola*. The holotype of *P. pittensis* (CMC 242), however, is identical with specimens of *N. fucicola*.

Etymology. The specific name *fucicola* is a combination of the Latin *fucus*, a seaweed, and *-cola*, dweller, in reference to the seaweed-dwelling habits of this fish.

Notolabrus inscriptus (Richardson, 1844-48 [1848]) (Fig. 3; Pl. 2E, 2F; Table 3)

Labrus inscriptus, vel *Tautoga inscripta* Richardson, 1844-48 (1848): 134 (Norfolk Island).
Tautoga inscripta.—Bleeker, 1855: 13.
Pseudolabrus inscriptus.—Bleeker, 1862b: 131.
Labrichthys inscripta.—Günther, 1862: 115.

Material examined. (19 specimens: 60.3-325 mm SL) NEW ZEALAND – Poor Knights Islands, AMS I.19279-006 (308). KERMADEC ISLANDS – Raoul Island, CMC 697 (208), CMC 958 (157), NMNZ P.7662 (325); Macauley Island, NMNZ P.7660 (173.4). NORFOLK ISLAND – AMS I.6007 (211.8); BMNH 1848.3.18.163 (216.2, HOLOTYPE of *Labrus inscriptus* Richardson)*; Emily Bay, AMS I.18497-017 (138); Point Hunter, AMS I.20268-020 (2:109.8-135); Sydney Bay, AMS I.20271-019. LORD HOWE ISLAND – NMV 60142 (273); Middle Beach, AMS I.17368-029 (2:60.3-119.7); Rabbit Island, AMS I.17373-016 (273.3); Philip Point, AMS I.17393-007 (318). AUSTRALIA – NEW SOUTH WALES – Clovelly Pool, AMS I.19358-331 (123.7); Boat Harbour, AMS I.20475-001 (273); Montague Island, CSIRO CA.189 (241); Eden, AMS I.15938-001 (295).

Diagnosis. Cheek scale rows behind eye 2-5, cheek scale rows below eye 4-6; sexually dichromatic; IP brownish with white spots or scribblings on body, forming horizontal rows or lines in some individuals; dark blotch between first 3 dorsal spines; TP uniform brown or greyish (dark green or slate blue in life, with gold specklings on scales); dorsal and anal fins pale or dark (whitish in life).

Colour description. Sexually dichromatic. Colour of IP in alcohol pale brown or greyish; 4 indefinite faint greyish bars on body (larger specimens with faint greyish lines along each row of body scales); head greyish, faint dark lines on snout and around eye; greyish smudge horizontally from corner of mouth to posterior margin of preopercle; dorsal, anal, caudal and pectoral fins somewhat greyish; dark blotch between first 3 dorsal spines; pectoral fin pale whitish; base of pectoral fin with dark bar.

Colour of TP in alcohol uniform dark brown or greyish; fins dark brown or greyish, some specimens with dorsal and anal fins paler; broad dark bar at base of pectoral fin.

Life colours - ground colour of IP reddish brown (larger individuals grey brown); 4 indistinct dark bars on body of smaller individuals; body scales each with white centre, forming longitudinal rows of lines or spots (larger individuals develop more scribbled markings on body scales); head greenish brown, throat and thoracic region pale whitish; dorsal surface of head, cheeks and opercle with numerous small white spots and scribbled markings; smaller individuals with brown stripe from snout to anterior margin of orbit, these continuing as single broad stripe behind eye to posterodorsal margin of opercle; narrow horizontal brown stripe from corner of mouth to posterior margin of opercle; fins reddish brown; unpaired fins with 3-5 rows of small white spots; dark blotch between first 3 dorsal spines; base of pectoral fin with dark bar.

Life colours of TP dark green or slate blue; body scales each with narrow gold-edged posterior margin and speckled with small gold spots; dorsal and anal fins whitish with narrow blue margins; dark bar at base of pectoral fin.

Remarks. *N. inscriptus* is a large species, the largest specimen examined, a male (TP), was 325 mm SL. Sexual transformation, accompanied by a change from IP to TP colours, occurs at about 200 mm SL. Ayling (1980) reported hybridisation between *N. fucicola* and *N. inscriptus*. A hybrid *N. fucicola* x *N. inscriptus* specimen collected by G.P. Jones, is compared meristically with its parent species in Table 4. *N. inscriptus* feeds on small molluscs and crustaceans (Russell 1983b).

Distribution. *N. inscriptus* is known from north-eastern New Zealand, Kermadec Islands, Norfolk Island, Lord Howe Island, and New South Wales. This species is moderately common at the Kermadec Islands, Norfolk Island and Lord Howe Island, but seems to be rare at other localities. *N. inscriptus* inhabits shallow rocky reef areas and is frequently associated with kelp (*Ecklonia*) beds. Specimens were collected from as deep as 17 m.

Table 4. Comparison of selected meristic counts of *Notolabrus celidotus* x *N. fucicola* and *N. fucicola* x *N. inscriptus* hybrids, and their parent species.

	N. celidotus x *N. fucicola* NMNZ P.9478	*N. celidotus* x *N. fucicola* NMNZ P.9479	*N. fucicola* x *N. inscriptus* NMNZ P.9480	*N. celidotus* (n=43)	*N. fucicola* (n=65)	*N. inscriptus* (n=18)
Standard length (mm)	79.5	239.0	211.0	18.0-329.0	55.6-365.0	60.3-325.0
Dorsal fin rays	IX,II	IX,II	IX,II	IX,II	IX,II	IX,II
Anal fin rays	III,10	III,10	III,10	III,10	III,10	III,10
Pectoral fin rays	ii,12	ii,12	ii,12	ii,11	ii,12	ii,12
Scale rows above lateral line	3	4	3	3-4	3-4	3
Scale rows below lateral line	9	9	9	8-9	7-9	8-9
Predorsal scales	8	8	7	6-8	5-8	5-8
Cheek scale rows behind eye	2	2	2	2	2-3	2-5
Cheek scale rows below eye	5	5	5	4-6	3-5	4-6
Gill rakers	16	19	19	15-20	15-19	16-19

Discussion. The holotype of *Labrus inscriptus* Richardson (BMNH 1848.3.18.163) is a TP specimen from Norfolk Island. Kendall & Radcliffe (1912) misidentified *Pseudolabrus fuentesi* from Easter Island as *P.* (= *Notolabrus*) *inscriptus*, leading to considerable confusion in the literature. *N. inscriptus*, however, is restricted to the south-western Pacific, and references to this species from the south-eastern Pacific by Fowler (1928, 1931), Adam (1945), Randall (1976b) and Randall & Sinoto (1978) properly refer to *P. fuentesi.*

Etymology. The specific name *inscriptus* is from the Latin word for written or inscribed, in reference to the scribble-like body markings of this species.

Pseudolabrus Bleeker

Pseudolabrus Bleeker, 1862a: 102. Type species *Labrus rubiginosus* Temminck & Schlegel [= *Labrus japonicus* Houttuyn], by original designation).

Lunolabrus Whitley, 1933: 86, as subgenus. Type species *Labrus miles* Bloch & Schneider, by original designation).

Description. Dorsal rays IX,11 (rarely IX,10); anal rays III,10 (rarely I,10); caudal rays 5-7 + 2 + 12 + 2 + 5-6; pectoral rays ii,11 (rarely ii,10 or 12); pelvic rays I,5; lateral line scales 25-26 (rarely 24); scale rows above lateral line 3-5; scale rows below lateral line 6-9; predorsal scales 4-11; cheek scale rows behind eye 2-6; cheek scale rows below eye 2-8; vertebrae 9 + 16; infraorbitals 7; pleural ribs ending on ninth vertebra; 4-6 epihaemal ribs (on tenth through thirteenth to fifteenth vertebra); first caudal vertebra (V10) with secondary haemal arch; gill rakers 15-24; branchiostegal rays 6.

Body depth 2.6-3.9 in SL; head profile nearly straight or slightly convex, head length 2.6-3.7 in SL; snout length 3.0-5.5 in head; orbital diameter 2.3-6.6 in head; interorbital width 3.8-6.1 in head; suborbital depth 4.0-11.3 in head. Mouth terminal, small, maxilla reaching to or just beyond vertical through anterior nostril; lips moderately fleshy; lateral inner surfaces of lips plicate, upper lip with 5-6 longitudinal plicae, lower lip with 1-2 (inner row more fleshy and papillose); upper jaw with enlarged pair of canines anteriorly, some species with second, slightly smaller, enlarged canine behind first; anterior enlarged canines recurved; 11-14 progressively smaller posterior lateral canine teeth; inner row of 5-8 small canines behind anteriormost teeth; 1 (sometimes 2) pair of enlarged canine(s) at posterior end of upper jaw; lower jaw with 2 pairs of enlarged anterior canines, second pair equal to or longer than first; 12-14 smaller lateral canines; inner row of 4-6 small canines behind anteriormost teeth (Fig. 13a). Lower pharyngeal plate broadly Y-shaped; transverse limb with medial posterior patch of large, blunt conical or molariform teeth and 2-3 rows of small conical teeth anterolaterally; anterior median limb narrow, with 2-3 irregular rows of small conical teeth, posterior teeth blunter (Fig. 18a). Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior margin reaching to or just above ventral margin of orbit, ventral margin free almost to below anterior margin of orbit. Opercular membrane broadly rounded, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales small to moderately large, extending in 2 or more rows from behind dorsal margin of orbit to vertical at midventral margin of orbit. Opercle covered with 15-16 large scales, except for naked membranous opercular flap dorsoposteriorly. Subopercle naked.

Body scales large, scales on thorax about one-half to three-quarters size of other scales. Lateral line complete, bent abruptly downwards below ninth to eleventh dorsal soft rays. Laterosensory canal tube bifurcate or biserially branched (subgenus *Pseudolabrus*), or multiply branched (subgenus *Lunolabrus*); simple, unbranched in juveniles. Dorsal and anal fins with low scaly sheath at base of fins (except *P. miles* and *P. psittaculus*); scales extending beyond base of caudal fin in interspaces between rays about one-half to two-thirds of way along fin. Dorsal

fin length 1.5-2.0 in SL; dorsal fin rays progressively longer posteriorly, first spine 2.2-9.8 in head; ninth spine 1.2-2.7 times length of first; tenth or eleventh soft rays usually longest, 1.1-1.7 times length of ninth spine; dorsal and anal spines pungent; membranes between spines incised, produced as free points projecting beyond spines; posterior tip of dorsal and anal fins pointed or rounded; anal fin length 2.7-3.9 in SL; anal fin rays progressively longer posteriorly, first spine 4.4-12.7 in head; third spine 1.4-3.6 times length of first; ninth or tenth soft rays longest, 1.1-1.8 times length of third spine. Caudal fin rounded to truncate (TP with upper rays slightly produced, or upper and lower rays produced); pectoral fins rounded or pointed (upper rays longest), not reaching vertical through vent, length 1.2-1.8 in head; pelvic fin short, rounded to triangular, not reaching beyond tips of pectoral fins, length 1.3-2.8 in head.

Discussion. Bleeker (1862a) erected the genus *Pseudolabrus* for *Labrus rubiginosus* Temminck & Schlegel (= *P. japonicus* Houttuyn), and distinguished it from other labrids on the basis of differences in jaw and pharyngeal dentition, pattern of squamation on the head and fins, and structure of the lips. Bleeker (1862b) later included 12 species in *Pseudolabrus*, but Günther (1862) and most subsequent authors did not recognise the genus and mistakenly referred species to the unrelated *Labrichthys*. Gill (1892) corrected this error and referred some 48 nominal species to *Pseudolabrus*.

Whitley (1933) proposed the subgenus *Lunolabrus* for *P. miles* (Bloch & Schneider) and *P. celidotus* (Bloch & Schneider), which he distinguished from *Pseudolabrus* by "the comparatively larger scales, which are less than thirty transverse rows on the body. Cheek-scales in five or more rows. Profile of head convex. Three anal spines. In the type-species, the caudal is markedly lunate, not rounded as in *Pseudolabrus,* s. str.". Unfortunately, none of these characters adequately distinguish either *P. miles* or *P. celidotus* from other species of *Pseudolabrus*, and cannot be regarded as sufficient for erecting a subgenus. Nonetheless, a number of differences are shown by *P. miles* and the closely related *P. psittaculus* (Richardson) that distinguish them from other congeners, and which warrant retaining *Lunolabrus* as a subgenus. *P. celidotus*, however, is included in the separate new genus *Notolabrus*. Diagnostic characters for the subgenera *Pseudolabrus* sensu stricto and *Lunolabrus* are given below, preceding the species accounts of each.

Etymology. *Pseudolabrus* is from a combination of the Greek *pseudos*, false, and *Labrus*, a genus of wrasse to which these fishes were mistakenly referred by early authors.

Key to Subgenera and Species of *Pseudolabrus*

(Species accounts are presented in the order of the Key)

1. Low scaly sheath at base of dorsal and anal fins ..... (subgenus *Pseudolabrus*)2.

——No scaly sheath at base of dorsal and anal fins ..... (subgenus *Lunolabrus*)9.

2. Cheek scale rows behind eye 2, cheek scale rows below eye 2 ..... (southern Western Australia) *biserialis*.

——Cheek scale rows behind eye 2-4, cheek scale rows below eye 3-8 ..... 3.

3. Body with 7 distinct dark bars ..... 4.

——Body without bars, or bars indistinct ..... 5.

4. Broad bars extending ventrally to or almost to midventral line; cheek scale rows behind eye 2 ..... (Rapa) *torotai.*

——Wedge-shaped bars extending ventrally to or just below lateral line, not reaching midventral line; cheek scale rows behind eye 3-4 . (Easter Island) *semifasciatus.*

5. Dark spot on dorsal fin between first 3 spines, or spot lacking ..... 6.

——Dark spot on dorsal fin between third and sixth spines ..... (southern Japan, South Korea, southern China, Taiwan, Hong Kong) *japonicus.*

6. Greyish bar extending about halfway down base of pectoral fin; pectoral and pelvic fins yellowish; cheek scale rows below eye 3-4 ..... (Islas Juan-Fernandez, Isla San Felix) *gayi.*

——Greyish bar completely traversing base of pectoral fin; pectoral and pelvic fins transparent reddish brown or greenish tinged; cheek scale rows below eye 4-7 ..... 7.

7. Distinct black spot between first 2-3 dorsal spines; IP with series of small black spots in clusters on dorsum below dorsal fin; TP without spots or saddles on dorsum ..... 8.

——No distinct black spot between first 2-3 spines, outer membrane of dorsal fin greyish; IP without spots on dorsum; TP usually with 3 dark spots or saddles on scaly base of soft fin (lacking in Kermadec Islands specimens) .... (north-eastern New Zealand, Kermadec Islands, Norfolk Island, Lord Howe Island, New South Wales) *luculentus*.

8. Base of pectoral fin with wedge-shaped bar; greyish stripe from corner of mouth to base of pectoral fin; TP with dark spot between first 2-3 dorsal spines; TP without whitish spots on head or body .... (southern Queensland, New South Wales) *guentheri*.

——Base of pectoral fin with broad bar, narrowing only slightly below; no greyish stripe from corner of mouth to base of pectoral fin; TP lacking dark spot between first 2-3 dorsal spines; TP with numerous small whitish spots on head and body . ..... (Easter Island, Pitcairn Island, Rapa, Austral Islands) *fuentesi*.

9. Cheek scale rows behind eye 3, cheek scale rows below eye 3-4; upper lobe of caudal fin not produced in adults, lower lobe not or only slightly produced, fin rounded or truncate; base of caudal fin without dark bar; dark saddle on peduncle immediately behind dorsal fin .... (New South Wales, Victoria, Tasmania, South Australia) *psittaculus*.

——Cheek scale rows behind eye 5-6, cheek scale rows below eye 5-8; upper and lower lobe of caudal fin produced in adults, fin lunate; dark bar at base of caudal fin; no dark saddle on peduncle ..... (New Zealand) *miles*.

Subgenus *Pseudolabrus* Bleeker

Type species. *Labrus rubiginosus* Schlegel in Temminck & Schlegel (= *L. japonicus* Houttuyn).

Diagnosis. Subgenus of *Pseudolabrus* with low scaly sheath at base of dorsal and anal fins; laterosensory canal tube bifurcate or biserially branched; upper rays of caudal fin not produced or only slightly produced; V10 with broad secondary haemal arch.

Pseudolabrus japonicus (Houttuyn, 1782)

(Fig. 5; Pl. 2G, 2H; Table 5)

Labrus Japonicus Houttuyn, 1782: 113 (Japan).
Labrus rubiginosus Schlegel in Temminck & Schlegel, 1845: 165, pl. 86, fig. 1 (Nagasaki, Japan) (Preoccupied by *Julis rubiginosus* (= *P. miles*) Richardson, 1843a).
Labrus eöthinus Richardson, 1846: 255 (Canton, China).
Pseudolabrus eöthinus.—Bleeker, 1862b: 130.
Pseudolabrus rubiginosus.—Bleeker, 1862b: 130.
Labrichthys rubiginosa.—Günther, 1862: 114.
Labrichthys gymnogenis.—Steindachner, 1867: 342 (not *Labrichthys gymnogenis* Günther, 1862).
Labrichthys rubiginosus.—Steindachner & Döderlein, 1887: 272.
Labrichthys affinis.—Döderlein in Steindachner & Döderlein, 1887: 272 (name in synonomy).
Labrichthys coccineus rubiginosus.—Gill, 1892: 400 (new combination).
Pseudolabrus japonicus.—Jordan & Snyder, 1902: 625.
Pseudolabrus miles.—Kamohara, 1958: 7 (not *Labrus miles* Bloch & Schneider, 1801).

Material examined. (19 specimens: 75-210 mm SL) JAPAN – RMNH 1219 (187, LECTOTYPE of *Labrus rubiginosus* Schlegel), RMNH 2172 (3:75-135, PARALECTOTYPES of *L. rubiginosus*); Sagami Bay, AMS 1.18498-001 (2:140.5-151.5); Futami, AMS I.20031-001 (6:89-126); Wakanoura, ANSP 26059-60 (2:169-176.5); Suraga Bay, MSM 75-216 (144.5); Kochi, BSKU 2210 (111)*. SOUTH KOREA – FMNH 55787 (126.5). CHINA – BMNH 1980.1.29.1 (201, HOLOTYPE of *Labrus eöthinus* Richardson)*. HONG KONG – ANSP 76552 (143).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 5-6; dark spot on dorsal fin between third and sixth spines.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol greyish; five narrow stripes, one scale row apart, along body; first stripe extending also onto base of dorsal fin; second and third stripes as long as first; fourth and fifth stripes shorter, extending to or just beyond tip of pectoral fin; some scales on dorsum and upper part of body whitish, forming irregular spots; dorsal surface of head greyish; 3-4 narrow, dark irregular lines behind eye; uppermost line (sometimes absent) above eye, extending just onto nape; second line from dorsal margin of orbit to nape; third line from posteromedial margin of orbit onto opercle, joining with third stripe on body; fourth line from ventral margin of orbit onto opercle, branching posteriorly to join lower two stripes on body; dorsal fin with black blotch basally between third to sixth spines, and 1-2 faint greyish spots posteriorly on fin; outer two thirds of dorsal fin greyish; anal fin with narrow longitudinal

Table 5. Selected measurements of species of *Pseudolabrus* (as a percentage of standard length).

	P. japonicus (n=17)	*P. gayi* (n=19)	*P. luculentus* (n=45)	*P. biserialis* (n=17)	*P. guentheri* (n=26)
Standard length (mm)	75.0 – 187.0	28.3 – 103.0	29.0 – 170.0	63.3 – 172.0	64.5 – 147.5
Body depth	28.0 – 37.2	25.4 – 29.3	27.0 – 36.8	27.2 – 37.2	29.8 – 35.1
Head length	28.3 – 33.4	27.2 – 31.5	29.5 – 37.9	31.7 – 36.1	30.5 – 36.1
Snout length	7.5 – 10.7	7.1 – 8.3	6.9 – 9.7	7.7 – 10.6	7.5 – 10.5
Orbital diameter	5.9 – 8.3	6.4 – 8.7	5.9 – 10.8	6.1 – 8.3	5.2 – 14.1
Interorbital width	6.1 – 8.3	5.5 – 6.8	5.5 – 7.9	5.3 – 8.1	6.2 – 8.0
Suborbital depth	4.9 – 6.9	3.1 – 4.5	2.9 – 6.1	4.1 – 7.0	4.9 – 7.5
Length of dorsal fin base	56.2 – 64.8	56.6 – 62.5	55.1 – 66.5	56.7 – 65.0	50.2 – 62.8
Length of first dorsal spine	4.8 – 6.7	4.9 – 6.9	3.5 – 8.4	4.3 – 5.8	4.6 – 6.4
Length of ninth dorsal spine	8.1 – 11.8	7.8 – 11.9	7.7 – 14.6	6.9 – 11.3	8.2 – 11.2
Length of longest dorsal ray	11.1 – 15.6	9.9 – 16.2	11.3 – 15.9	10.9 – 14.7	11.5 – 15.8
Length of anal fin base	29.5 – 33.4	30.0 – 34.6	27.7 – 37.0	29.2 – 35.0	26.8 – 34.1
Length of first anal spine	3.8 – 5.1	3.6 – 6.0	2.7 – 5.4	3.0 – 6.0	3.4 – 6.3
Length of third anal spine	7.9 – 9.3	7.2 – 11.6	6.3 – 11.2	7.3 – 10.5	7.6 – 11.6
Length of longest anal ray	11.3 – 13.6	8.7 – 13.3	10.9 – 15.2	11.5 – 13.6	11.4 – 16.0
Least depth of caudal peduncle	9.8 – 17.8	12.4 – 14.6	12.9 – 17.5	8.7 – 16.3	15.3 – 18.2
Length of pectoral fin	18.8 – 24.6	18.0 – 21.9	20.7 – 23.4	20.4 – 24.5	19.1 – 23.3
Length of pelvic fin	12.9 – 17.4	12.6 – 16.0	12.3 – 26.6	14.7 – 17.3	15.6 – 20.6

	P. fuentesi (n=36)	*P. semifasciatus* (n=3)	*P. torotai* (n=5)	*P. psittaculus* (n=29)	*P. miles* (n=25)
Standard length (mm)	31.6 – 134.0	202.0 – 222.0	129.5 – 158.0	55.0 – 200.0	76.0 – 272.0
Body depth	26.7 – 35.4	31.2 – 33.3	33.5 – 34.9	27.6 – 34.4	29.0 – 37.9
Head length	30.8 – 35.9	31.4 – 33.8	35.2 – 37.8	30.8 – 36.1	27.8 – 34.7
Snout length	7.6 – 10.8	10.1 – 11.2	11.2 – 12.2	7.6 – 11.7	7.3 – 11.4
Orbital diameter	5.5 – 14.0	5.1 – 5.5	6.9 – 7.4	5.6 – 9.7	5.5 – 8.3
Interorbital width	5.1 – 7.3	5.6 – 6.4	6.5 – 6.6	6.4 – 8.9	5.8 – 8.1
Suborbital depth	4.1 – 6.7	6.1 – 7.3	6.5 – 7.7	3.2 – 7.5	3.2 – 8.3
Length of dorsal fin base	55.9 – 64.7	53.5 – 57.7	54.6 – 56.9	56.7 – 66.3	57.0 – 60.8
Length of first dorsal spine	5.5 – 8.7	5.4 – 5.7	4.7 – 5.7	5.0 – 7.6	4.4 – 7.7
Length of ninth dorsal spine	9.8 – 14.4	7.9 – 9.3	9.4 – 12.0	7.6 – 12.7	7.9 – 11.5
Length of longest dorsal ray	11.9 – 17.4	11.2 – 12.3	13.0 – 15.3	11.4 – 14.9	11.8 – 13.9
Length of anal fin base	25.8 – 32.3	28.4 – 30.7	27.8 – 30.3	26.5 – 35.0	29.4 – 33.2
Length of first anal spine	3.7 – 8.0	4.4 – 5.2	3.4 – 4.8	2.7 – 6.0	3.4 – 6.3
Length of third anal spine	8.1 – 12.8	8.1 – 9.3	9.0 – 10.9	7.7 – 10.8	6.8 – 9.7
Length of longest anal ray	11.9 – 16.1	11.4 – 12.1	11.5 – 15.2	9.8 – 13.5	11.1 – 12.7
Least depth of caudal peduncle	14.6 – 17.0	15.1 – 15.7	14.6 – 15.6	12.5 – 16.9	9.0 – 17.7
Length of pectoral fin	18.4 – 22.6	17.8 – 21.2	21.5 – 24.1	19.4 – 25.5	19.2 – 24.9
Length of pelvic fin	13.5 – 17.2	12.8 – 15.1	14.3 – 16.0	12.9 – 16.7	13.7 – 14.5

dark lines; pectoral fin with dark wedge-shaped bar extending about halfway down base.

Ground colour of TP in alcohol pale, darker on dorsum above lateral line; two diffuse dark stripes on snout, uppermost stripe on either side joining across snout and running back to anteromedial margin of orbit, lower stripe running from middle of upper lip to margin of orbit, thence behind eye onto opercle; dorsal surface of head with series of dark lines forming reticulate pattern; dark V-shaped mark anteriorly on upper lip; dorsal fin with dark blotch basally between third and sixth spines and two rows of small black dots along lower half of fin; pectoral fin with greyish wedge-shaped bar extending about halfway down base.

Life colours - ground colour of IP reddish brown to greenish brown; greyish on dorsum and dorsal surface of head; lines on head and body black; 6-7 whitish spots in alternating rows between first and second stripes, and second and third stripes along dorsum; several indistinct whitish spots on sides; cheeks pale orange; throat with greenish or reddish vermiculating lines; dorsal fin narrowly edged with blue posteriorly; reddish submarginal stripe and longitudinal reddish stripe midlaterally on fin, reddish markings between rays in interspaces between stripes on dorsal fin; black blotch between third and sixth dorsal spines, and five faint greyish blotches evenly spaced along rest of fin; anal fin with narrow blue margin and three narrow reddish longitudinal stripes; caudal and pelvic fins greenish or reddish; pectoral fins transparent, with black wedge-shaped bar at base of fin.

Life colours of TP reddish brown to yellowish green, darker on dorsum and dorsal surface of head; throat, thoracic region and ventral part of body pale; scales on ventral part of body from behind pectoral fin to above middle of anal fin, with narrow white margins; lines on

head greyish brown; dorsal fin pale yellowish brown, blotch and spots greyish; anal fin yellow, with three narrow longitudinal reddish stripes; caudal, pelvic and pectoral fins transparent; greyish wedge-shaped bar at base of pectoral fin.

Remarks. *P. japonicus* is a small species, the largest specimen examined, a male, was 187 mm SL. Sexual maturity is attained at about 70 mm SL and sexual transformation and change in colour from IP to TP pattern occurs between 95-135 mm SL (Nakazono, 1979). Masuda *et al.* (1984) reported populations of *P. japonicus* inhabiting protected, shallow rocky reefs mature at a smaller size, and also differ in colouration from populations that inhabit deep rocky reefs on the open coast, the latter usually being more reddish. Spawning in *P. japonicus* occurs in October (Nakazono, 1979), and eggs and larvae are described by Mito (1962, 1966). Suyehiro (1942) reported food consists mainly of small crustaceans, molluscs and polychete worms; Yamaoka (1978) reported food as comprising sponges, coral polyps and small crustaceans.

Distribution. *P. japonicus* occurs in southern Japan, South Korea, southern China, Taiwan and Hong Kong. It is a common inhabitant of shallow rocky reefs.

Discussion. The type of *Labrus japonicus* Houttuyn is lost, but the original description is sufficient to distinguish this species from other members of the genus. Schlegel's types of *Labrus rubiginosus* (lectotype RMNH 1219; paralectotypes RMNH 1215-1218, 2172 - Boeseman, 1947) are identical with *P. japonicus*, and his figured specimen (pl.86, fig.1) represents a TP specimen. Richardson based his description of *Labrus eöthinus* on a stuffed and dried specimen (BMNH 1980.1.29) and a watercolour by John Reeves (Reeves drawing No.197 - Whitehead, 1969) that is readily identifiable as an IP specimen of *P. japonicus*. Kamohara's (1958) record of *Pseudolabrus miles* from Japan is a misidentification, and examination of the specimen (BSKU 2210) shows it to be the IP colour form of *P. japonicus*.

Etymology. The specific name *japonicus* refers to the country of origin of Houttuyn's type specimens.

Pseudolabrus gayi (Valenciennes in Cuvier & Valenciennes, 1839)

(Figs 5, 6; Table 5)

Labrus Gayi Valenciennes in Cuvier & Valenciennes, 1839: 97 (Islas Juan Fernandez).
Pseudolabrus gayi.—Bleeker, 1862b: 131.
Labrichthys gayi.—Günther, 1862: 115.

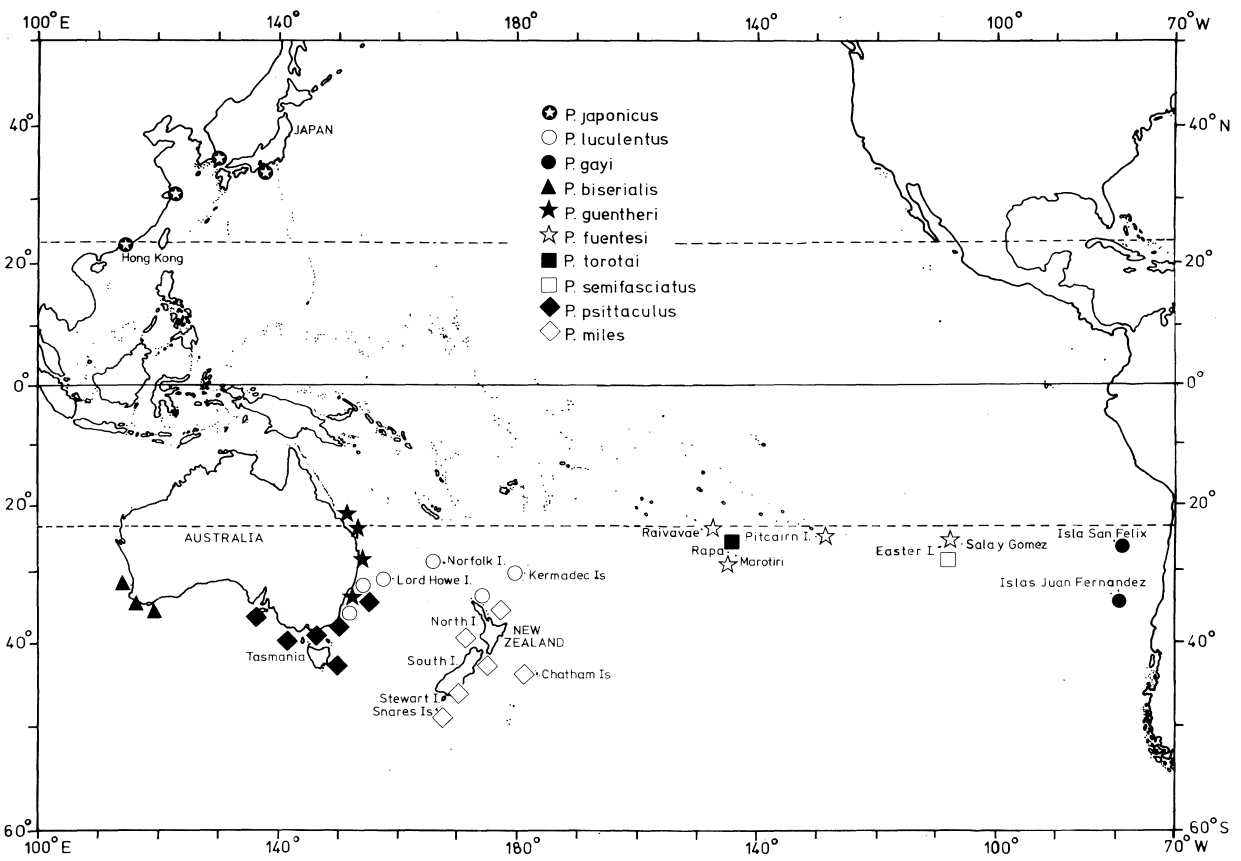

Fig.5. Map of the known distribution of species of *Pseudolabrus*.

Material examined. (36 specimens: 28.3-103 mm SL) ISLAS JUAN FERNANDEZ – Isla Robinson Crusoe, AMS I.20728-001 (17:41.2-97.3)*, BPBM 15082 (103), MNHN A.3672 (2:72-81.5, SYNTYPES of *Labrus gayi* Valenciennes), NRS 10980 (6:41.3-53.5). ISLA SAN FELIX – AMS I.20729-001 (10:28.3-80.4).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 3-4; no dark spot anteriorly on dorsal fin; greyish bar extending only about halfway down base of pectoral fin; pectoral and pelvic fins yellowish.

Colour description. Sexually monochromatic? Colour in alcohol brownish, greyish on dorsal surface of head and dorsum above lateral line; dorsal and anal fins greyish, with narrow whitish margins; caudal fin greyish; pectoral and pelvic fins yellowish or whitish; dark wedge-shaped bar extending about halfway down base of pectoral fin.

Life colours (from Guichenot, 1848) - reddish brown; pectorals and pelvic fins yellow, other fins dark brown. This species is figured in colour by Gay (1854: Ictyologia, pl. 8, fig. 1).

Remarks. *P. gayi* is a small species, the largest specimen examined, a female, was 103 mm SL. Although there is some overlap in sizes, males generally appear to be larger than females. A sample of 17 specimens from Cumberland Bay, Isla Juan Fernandez (AMS I.202728-001) comprised five males ranging in size from 73.4-97.3 mm SL, 11 females ranging from 58.1-73.8 mm SL (these specimens with ripe gonads, collected in December), and one immature specimen, 41.2 mm SL. *P. gayi* does not appear to be sexually dichromatic.

Distribution. *P. gayi* is known only from Islas Juan Fernandez and Isla San Felix.

Etymology. The specific name *gayi* is after Claudio Gay who collected the type specimens.

Pseudolabrus luculentus (Richardson, 1844-48 [1848]) (Fig. 5; Pl. 2I, 2J; Table 5)

Labrus luculentus, vel *Tautoga luculenta* Richardson, 1844-48 (1848): 130 (eastern and western coasts of Australia, Norfolk Island).
Tautoga luculenta.—Bleeker, 1855: 13.
Pseudolabrus luculentus.—Bleeker, 1862b: 131.
Labrichthys luculenta.—Günther, 1862: 116.

Material examined. (57 specimens: 29-170 mm SL) NEW ZEALAND – Poor Knights Islands, NMNZ 6253 (2:127-170), NMNZ 6255 (2:96-129), NMNZ 6256 (3:97-138), NMNZ 6257 (124). KERMADEC ISLANDS – Raoul Island, CMC 961 (13:29-82), Boat Cove, NMNZ P.17859 (3:101.4-132)*, NMNZ P.17861 (4:76.3-145.4)*. NORFOLK ISLAND – BMNH 1848.3.18.121 (3:120.5-127, SYNTYPES of *Labrus luculentus* Richardson)*, BMNH 1855.9.19.976 (123.7, SYNTYPE of *L. luculentus*)*, BMNH 1860.3.19.724 (115, SYNTYPE of *L. luculentus*)*; Emily Bay, AMS I.20267-003 (105.2) LORD HOWE ISLAND – reef between Erscott's Passage and Rabbit Island, AMS I.17374-006 (9:40-113). AUSTRALIA – NEW SOUTH WALES – South Solitary Island, AMS I.19685-003 (106.3); Sydney Harbour, AMS I.19103-036 (57); Cape Solander, AMS I.11348 (122); Nadgee, AMS I.19893-021 (87).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 4-7; greyish bar at base of pectoral fin; outer membrane between first 2-3 dorsal spines greyish, no distinct dark spot; IP without clusters of small spots on dorsum; TP usually with 3 dark spots or saddles on scaly base of soft dorsal fin (spots or saddles lacking in Kermadec Islands specimens).

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale; head with 2 narrow dark broken lines; first from tip of snout to anteromedial margin of orbit; second from about middle of upper lip to ventral margin of orbit, and extending to about posterior margin of preopercle; small dark mark behind posteromedial margin of orbit; series of small

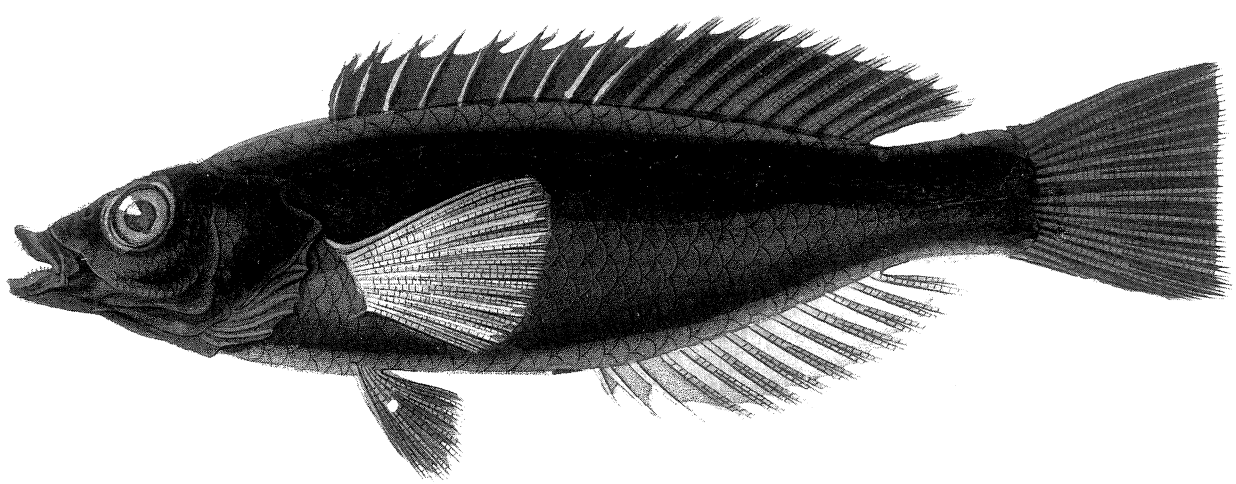

Fig.6. *Pseudolabrus gayi* (from Gay, 1854).

dark spots above and behind eye and on opercle; dorsal surface of head greyish; membrane between first 2-3 dorsal spines greyish; base of pectoral fin with narrow greyish bar (faint in smaller specimens).

Ground colour of TP in alcohol similar to IP, but body scales with dark posterior margins; 3-4 dark spots or saddles, more or less evenly spaced, below soft dorsal fin and extending onto scaly base of fin; dark saddles progressively smaller posteriorly, anteriormost saddle largest, about 3-4 times larger than posteriormost saddle (specimens from Kermadec Islands lacking dark saddles or spots on dorsum); head with faint greyish line from just below middle of upper lip to ventral margin of orbit, and extending behind eye to posterior margin of opercle; 3-5 dark spots above and behind eye, and on dorsal part of opercle; dorsal and anal fins with narrow greyish margins; outer two-thirds of dorsal fin with 2 rows of faint greyish spots; base of pectoral fin with dark wedge-shaped bar.

Life colours - ground colour of IP pale greenish or reddish; scales of ventral part of body from behind pectoral fin to above middle of anal fin with white margins; dark lines and markings on head black or greenish brown; ventral part of head and thoracic region whitish; 3 broad reddish stripes extending from ventral part of head across thorax; first stripe widest, extending from posterior part of upper lip across ventral part of cheek to base of pectoral fin; second stripe about half as wide, extending from below mouth to below base of pectoral fin; third stripe slightly narrower than second, extending from below anteroventral margin of preopercle to just above pelvic fins; dorsal and anal fins yellowish, with narrow blue margins and narrow red submarginal stripe; outermost membrane between first 2-3 dorsal spines greyish; caudal fin pale reddish; pectoral and pelvic fins hyaline or pale reddish; base of pectoral fin with greyish wedge-shaped bar, narrower below.

Life colours of TP variable, greenish brown to deep red; body scales with greyish posterior margins; white spot preceding first black saddle, behind last saddle on dorsum, and in interspaces between saddles; dorsal surface of head greyish, snout and ventral part of head paler; greyish markings on head and opercle as for preserved specimens; series of small brownish or reddish brown spots on chin and throat; dorsal, anal and caudal fins coloured same as ground colour; dorsal and anal fins with narrow blue margin, slightly wider reddish submarginal stripe, and broader reddish midlateral stripe; base of anal fin also with reddish stripe; soft part of dorsal and anal fin between submarginal and medial stripes, flecked with blue; pectoral and pelvic fins hyaline or translucent reddish or bluish; base of pectoral fin with narrow black or dark blue wedge-shaped bar. TP individuals similar to IP colour pattern, but with 3 reddish brown saddles at base of soft dorsal fin.

Remarks. *P. luculentus* is a small species, the largest specimen examined, a male (TP), was 170 mm SL. Sexual transformation, accompanied by a change from IP to TP colour pattern, occurs at about 130 mm SL. Doak (1972) reported spawning in *P. luculentus* in May and August in New Zealand. Juveniles of this species are facultative cleaner symbionts (Ayling & Grace, 1971).

Distribution. *P. luculentus* is widely distributed. It is very common at the Kermadec Islands, Norfolk Island, Lord Howe Island, and offshore islands of north-eastern New Zealand (Russell & Ayling, 1976), but is much less common at coastal localities in New Zealand and Australia (New South Wales). *P. luculentus* occurs to depths of at least 50 m.

Etymology. The specific name *luculentus* is from the Latin word for splendid, apparently in reference to the bright colours of this fish.

Pseudolabrus biserialis (Klunzinger, 1879)

(Fig. 5; Pl. 3A, 3B; Table 5)

?*Labrichthys tetrica*.—Günther, 1862: 112 (in part, not *Labrus tetricus* Richardson, 1840).

Labrichthys biserialis Klunzinger, 1879: 402 (King George Sound, Western Australia).

Pseudolabrus biserialis.—Gill, 1892: 402.

Pseudolabrus tetricus.—Waite, 1905: 70 (not *Labrus* [= *Notolabrus*] *tetricus* Richardson, 1840).

?*Pseudolabrus guentheri*.—Waite, 1905: 70 (not *Pseudolabrus guentheri* Bleeker, 1863a).

Pseudolabrus bostockii.—McCulloch, 1912: 14 (not *Labrichthys bostockii* Castelnau, 1873 [= *Notolabrus parilus*]).

Material examined. (20 specimens: 63.3-172 mm SL) WESTERN AUSTRALIA – Rob Island, Recherche Archipelago, AMS I.20219-007 (7:63.3-166.5); Two People Bay, AMS I.20236-002 (2:111-128); King George Sound, SMNS 2682 (3:152-162, SYNTYPES of *Labrichthys biserialis* Klunzinger)*, WAM P.24855 (86); Chatham Island, WAM P.5697 (158); Stanley Island, WAM P.5698 (145); Cape Naturaliste, AMS I.20233-003 (66.5); Geographe Bay, AMS I.20234-004 (70); Mandurah, NMV 7041 (172); Rottnest Island, AMS I.20239-002 (2:92.7-139).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 2; greyish stripe on lateral midline of body; white scalloped band below greyish midlateral band.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale yellowish orange; 5-6 clusters of small dark spots, more or less evenly spaced, on dorsum below dorsal fin from origin of fin to caudal peduncle; broad, faint greyish stripe on lateral midline of body from above pectoral base to caudal peduncle; narrower, white scalloped band below greyish midlateral stripe; ventral surface of body pale orange; dorsal surface of head greyish; darker greyish band across snout, extending back to ventral margin of orbit, and continuing behind eye to posterior margin of opercle; fins translucent; narrow greyish margin to dorsal and anal fins; dorsal base of pectoral fin with broad greyish wedge-shaped bar, narrower below.

Colour of TP in alcohol similar to IP, but spots on

dorsum and greyish band on ventral part of head lacking; larger TP specimens with broad greyish stripe along basal half of dorsal fin.

Life colours - ground colour of IP reddish orange; snout greyish; white band extending from below snout to margin of preopercle, thence branching into 2; upper band extending on lateral midline of body, its margin scalloped; lower band extending obliquely backwards below pectoral fin onto ventral surface of body; spots on dorsum black; fins pale yellowish orange; dorsal and anal fins blue edged; greyish wedge-shaped bar at base of pectoral fin.

Life colours of TP similar to IP, but without spots on dorsum; dorsal surface of head and dorsum greyish; dorsal and caudal fins bright yellow, basal halves of fins greyish; anal, pectorals and pelvic fins deep red.

Remarks. *P. biserialis* is a small species, the largest specimen examined, a male (TP), was 172 mm SL. Sexual dichromatism is not as marked in *P. biserialis* as some other members of the genus. Change from IP to TP colour pattern occurs at about 140 mm SL, and involves mainly loss of the spots on the dorsum and a general intensification of colour, with the dorsal and anal fins becoming greyish basally.

Distribution. *P. biserialis* is known only from southern Western Australia, from the Recherche Archipelago to Rottnest Island. It is common over its range of distribution, associated with rocky, algal-covered reefs, particularly at offshore localities. Specimens were collected from as deep as 15 m, although it probably occurs deeper.

Discussion. *P. biserialis* has been treated under the specific name *bostockii* Castelnau by most authors. Castelnau's type specimen is not in the MNHN (Bauchot, 1963) and must be presumed lost. However, from the original description, it is clear that *Labrichthys bostockii* is not synonymous with *Labrichthys biserialis* Klunzinger. Castelnau specifically compared *bostockii* with Richardson's (1840) description of *Labrus* (= *Notolabrus*) *tetricus*, stating " ... the colour of the ventral fins is described in *Tetricus* as having a fine blackish edge, and the pectorals as having a black spot over their base; neither of these exist in the new species." From this description it appears that Castelnau was dealing with a specimen of *N. parilus*, and *Labrichthys bostockii* accordingly is placed in the synonomy of that species. *Labrichthys tetrica*, recorded by Günther (1862) from King George Sound, and *Pseudolabrus tetricus*, recorded by Waite (1905) from Mandurah, are misidentifications of *P. biserialis* (one of Waite's specimens [ex AMS I.7041] is now in the Museum of Victoria [NMV 7041], sent on exchange, 20 June 1912). It seems likely that Waite's record of *P. guentheri* in the same paper also is a misidentification of *P. biserialis*, although the specimen(s) could not be found.

Etymology. The specific name *biserialis* is from the Latin *bi*, two, and *series*, row, apparently in reference to the two rows of cheek scales that characterise this species.

Pseudolabrus guentheri Bleeker, 1862
(Fig. 5; Pl. 3C, 3D; Table 5)

Pseudolabrus Güntheri Bleeker, 1862b: 131 (Australia).
Labrichthys güntheri.—Günther, 1862: 507.
Labrichthys australis Steindachner, 1866: 476 ('South Seas').
Pseudolabrus Richardsonii Steindachner, 1867: 330 (Port Jackson, New South Wales).
Labrichthys dorsalis Macleay, 1881: 87 (Port Jackson, New South Wales).
Labrichthys melanura Macleay, 1881: 89 (Port Jackson, New South Wales).
Labrichthys dux De Vis, 1884: 287 (Moreton Bay, Queensland).
Labrichthys cruentatus De Vis, 1885: 879 (Moreton Bay, Queensland).
Labrichthys sexlineatus De Vis, 1885: 880 (Great Barrier Reef, Queensland).
Labrichthys rex De Vis, 1885: 880 (Moreton Bay, Queensland).
Labrichthys maculatus De Vis, 1885: 881 (Moreton Bay, Queensland) (preoccupied by *Labrichthys* [= *Austrolabrus*] *maculata* Macleay, 1881).
Pseudolabrus dorsalis.—Waite, 1904: 39.
Pseudolabrus melanurus.—Waite, 1904: 39.

Material examined. (33 specimens: 64.5-147.5 mm SL) 'AUSTRALIA' – RMNH 2170 (129, SYNTYPE of *Pseudolabrus guentheri* Bleeker)*, RMNH 2173 (68.5, SYNTYPE of *P. guentheri* Bleeker). 'SOUTH SEAS' – NMW 27624 (101, HOLOTYPE of *Labrichthys australis* Steindachner). QUEENSLAND – 'Barrier Reef', QM I.140 (81.5, HOLOTYPE of *Labrichthys sexlineatus* De Vis)*; Lindeman Island, AMS IA.6465 (85), QM I.5363 (96); Gillet Cay, AMS IB.6113 (79.5); Heron Island, AMS I.15455-001 (65.4); One Tree Island, AMS I.15626-001 (64.5); Masthead Island, AMS I.7145 (96); Port Curtis, AMS IA.4218 (102); Hervey Bay, QM I.14762 (100); Noosa, QM I.13775 (120.5); Caloundra, QM I.12587 (131); Moreton Bay, AMS I.9505 (143.5), QM I.123, (148, ?HOLOTYPE of *Labrichthys dux* De Vis)*, QM I.124 (138, ?HOLOTYPE of *Labrichthys cruentatus* De Vis)*, QM I.125, (142)*, QM I.126 (119)*, QM I.9867, (99, ?HOLOTYPE of *Labrichthys rex* De Vis)*, QM I.9868 (113). NEW SOUTH WALES – Tweed Heads, QM I.379 (135); Byron Bay, AMS I.18064-014 (85); South Solitary Island, AMS I.19696-006, (88.5); Broughton Island, AMS I.20541-001 (94.5); Swansea, AMS IB.4282 (75); Port Jackson (Sydney), AMS I.16365-001 (3:112-125.5, SYNTYPES of *Labrichthys melanura* Macleay), AMS I.16366-001 (147.5, HOLOTYPE of *Labrichthys dorsalis* Macleay), AMS I.18335-003 (122.5); Cape Solander, AMS I.11350 (2:85.5-134.5).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 4-6; broad greyish bar traversing entire base of pectoral fin; distinct dark spot between first 2-3 dorsal spines present in IP and TP; IP with series of clusters of small black spots below dorsal fin, TP lacking spots on dorsum.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale, greyish on dorsal surface of head and dorsum; 5 clusters of 1-3 small black spots more or less evenly spaced along dorsum from below posterior dorsal spines to caudal peduncle; 5-7 faint greyish bars on body (wanting in some specimens); 2

narrow pale horizontal stripes from behind eye to about halfway along body; first extending from dorsoposterior margin of orbit to below lateral line, second from midventral margin of orbit to above pectoral fin; 3 narrow dark lines on head; first meeting on either side across snout and running back to anteromedial margin of orbit; second running from middle of upper lip to ventral margin of orbit; third running from corner of mouth, through angle of preopercle, to posterior margin of opercle; 3 broader greyish bands behind eye, bordering margins of pale stripes which extend onto body; fins transparent; dorsal fin with dark blotch between first 3 or second and third spines; base of pectoral fin with dark wedge-shaped bar, narrower below.

Colour of TP in alcohol similar to IP, but spots on dorsum lacking.

Life colours - ground colour of IP reddish brown to green, bars on sides, if present, darker; head darker above, paler below; lines on head pale orange to red, interspaces reddish brown to green; spots on dorsum black; fins reddish orange, anterior part of anal fin sometimes greenish; dark spot anteriorly on dorsal fin black with bright red margin to fin above spot; 3 faint narrow reddish stripes on soft part of dorsal and anal fins; first stripe along margin of fin, second midlaterally, and third at base of fin; dark wedge-shaped bar at base of pectoral fin.

Ground colour of TP usually dark green, lines on head and anterior part of body reddish brown; fins reddish.

Remarks. *P. guentheri* is a small species, the largest specimen examined, a male (TP), was 147.5 mm SL. Sexual dichromatism in this species is not as marked as in some other members of the genus. Transformation from IP to TP colour pattern occurs at about 70-100 mm SL, and is accompanied mainly by a loss of spots on the dorsum and a general intensification of colour. *P. guentheri* appears to be a winter spawner, and newly-settled juveniles were reported in August-December at One Tree Reef, Capricorn Bunker Group, Queensland (Russell *et al.*, 1977). Choat (1969) reported food comprises mainly small crustaceans (xanthid crabs, isopods, amphipods).

Distribution. *P. guentheri* is known only from subtropical eastern Australia, occurring in Queensland as far north as Lindeman Island, and in New South Wales as far south as Botany Bay. It is common throughout its range, and occurs on rocky and coral reefs generally in shallow water, in depths to 20 m.

Discussion. *P. guentheri* was confused by early workers, and it is unfortunate that so many names were published almost contemporaneously for mere colour variants of this species. Fowler (1928) placed *Labrichthys australis* Steindachner in the synonomy of *Labrichthys cyanotaenia* Bleeker (= *unilineatus* Guichenot), but from Steindachner's original description and from examination of the type (NMW 27624), there is no doubt that *L. australis* is identical with *P. guentheri*. Steindachner (1867) proposed *P. richardsonii* as an alternative new name for a specimen from Port Jackson (Sydney) which, although tentatively identified as *P. luculentus* Richardson, he recognised differed from Günther's (1862) description of the latter. The type of *P. richardsonii* could not be found in the NMW, but from Steindachner's description this species clearly is identical with *P. guentheri*. The holotype of *Labrichthys dorsalis* Macleay (1881) (AMS I.16366-001) and three syntypes of *L. melanura* Macleay (AMS I.16365-001) also are identical with *P. guentheri*. Specimens of *Labrichthys dux, L. cruentatus, L. sexlineatus,* and *L. rex* in the Queensland Museum are presumed to be De Vis' types, and are identical with *P. guentheri*. Two specimens of *Labrichthys dux* (QM I.123; I.125) are both labelled 'type', but De Vis referred only to one specimen, 7 inches long. Since I.123 is about 7 inches total length (TL), but I.125 is only about 6 inches TL, it is probable that the former is the holotype. Two specimens of *Labrichthys cruentatus* (QM I.124; I.126) also are labelled 'type', but I.126 more closely approximates the length of De Vis' described specimen (7 inches). A single specimen of *Labrichthys sexlineatus* (QM I.140) is about 3 ¾ inches TL and corresponds well with De Vis' type specimen (4 inches). Two specimens of *Labrichthys rex* (QM I.9867, I.9868) are both labelled 'type'. De Vis gave the length of his type specimen as 5 inches. One specimen (QM I.9868) is about 5 inches and the other (QM I.9867) is about 4 ¾ inches TL, suggesting the latter is most probably the holotype. The holotype of *Labrichthys maculatus* De Vis could not be found in the Queensland Museum and is presumed lost, but from the original description also is clearly identical to *P. guentheri*.

Etymology. The specific name *guentheri* is after Albert Günther, Ichthyologist at the British Museum (Natural History), London, at the time Bleeker described this species.

Pseudolabrus fuentesi (Regan, 1913)

(Figs 5, 7; Pl. 3E, 3F; Table 5)

Pseudolabrus inscriptus.—Kendall & Radcliffe, 1912: 137 (not *Labrus* vel *Tautoga* [= *Notolabrus*] *inscriptus* Richardson, 1844-48 [1846]).

Labrichthys fuentesi Regan, 1913b: 371 (Easter Island).

Pseudolabus fuentesi.—Randall, 1976a: 58.

Material examined. (36 specimens: 31.6-135 mm SL) EASTER ISLAND – BMNH 1913.12.7.11 (130.5, HOLOTYPE of *Labrichthys fuentesi* Regan), BPBM 6718 (17:31.6-131), NRS 10995 (113.4). PITCAIRN ISLAND – BMNH 15073 (10:35.6-134). AUSTRAL ISLANDS – Raivavae, BPBM 12781 (132); Marotiri (Ilots de Bass), BPBM 13311 (6:36-71).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 4-5 (rarely 6); broad dark bar at base of pectoral fin; IP with dark spot between first 2-3 dorsal spines and series of small black spots in clusters

on dorsum below dorsal fin (both these characters lacking in TP); TP with numerous small white spots on head and body.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale yellowish; 6-7 clusters of small dark spots evenly spaced along dorsum from below origin of dorsal fin to caudal peduncle; 5-6 faint broad greyish bars on body; first behind pectoral fin, last on caudal peduncle; dorsal surface of head greyish; dark blotch at front of upper lip; narrow dark stripe on either side joining across snout and extending to anteromedial margin of orbit; second, fainter stripe from middle of upper lip to ventral margin of orbit; fins translucent, dorsal fin with dark blotch between first 2-3 spines; broad greyish bar at base of pectoral fin.

Ground colour of TP in alcohol greyish; 7-8 indistinct darker bars on body; first behind pectoral fin, last at base of caudal fin; body scales each with 5-6 small, indistinct whitish spots; head greyish; tip of snout and front of upper lip with dark blotch; cheeks, opercle and throat with numerous whitish spots and irregular lines; unpaired fins and pelvic fins greyish; dorsal and anal fins with irregular rows of small whitish spots; dark blotch between first 3 dorsal spines (absent in some larger specimens); pectoral fins whitish, base of fin with broad dark wedge-shaped bar, narrower below.

Life colours - life colours of IP not known.

Ground colour of TP brownish red or dark green; dorsum and bars on body darker; body scales speckled with white; head, throat, cheeks and opercle with numerous whitish spots and irregular lines; snout greyish; greyish stripe from snout to anteromedial margin of orbit; second greyish stripe from middle of upper lip to margin of orbit; unpaired fins and pelvic fins same colour as body (posterior margin of caudal fin of green coloured individuals broadly edged with red); dorsal, anal and caudal fins with numerous small white spots; soft part of dorsal and anal fins with narrow blue margin; base of pectoral fin with broad greyish wedge-shaped bar.

Remarks. *P. fuentesi* is a small species, the largest specimen examined, a male (TP), was 134 mm SL. Colour transformation from IP to TP occurs at about 100 mm SL: the largest female (IP) specimen examined was 90 mm SL; male (TP) specimens ranged from 110-134 mm SL.

Distribution. *P. fuentesi* is known from Easter Island, Pitcairn Island, Rapa (Randall, 1976a) and the Austral Islands. It is common in shallow water, and has been collected as deep as 14 m.

Discussion. Kendall & Radcliffe's (1912) misidentification of this fish as *Pseudolabrus* (=*Notolabrus*) *inscriptus* (Richardson) has led to some confusion in the literature, and subsequent references to '*P. inscriptus*' from southern Oceania (Fowler, 1928, 1931; Adam, 1945; Randall, 1976b; Randall & Sinoto, 1978) apply to *P. fuentesi.* De Buen (1963) included *P. semifasciatus* as a queried synonymn of *P. fuentesi,* but the two species are clearly distinct (Russell & Randall, 1981).

Etymology. The specific name *fuentesi* is after Professor Francisco Fuentes who first collected this fish at Easter Island.

Pseudolabrus semifasciatus Rendahl, 1921
(Fig. 5; Pl. 3G; Table 5)

Labrichthys semifasciatus Rendahl, 1921: 65 (Easter Island).
Pseudolabrus semifasciatus.—Randall, 1976a: 58.

Material examined. (3 specimens: 202-222 mm SL) EASTER ISLAND – BPBM 6714 (222), NRS 10096 (2:202-222, larger specimen HOLOTYPE of *Labrichthys semifasciatus* Rendahl).

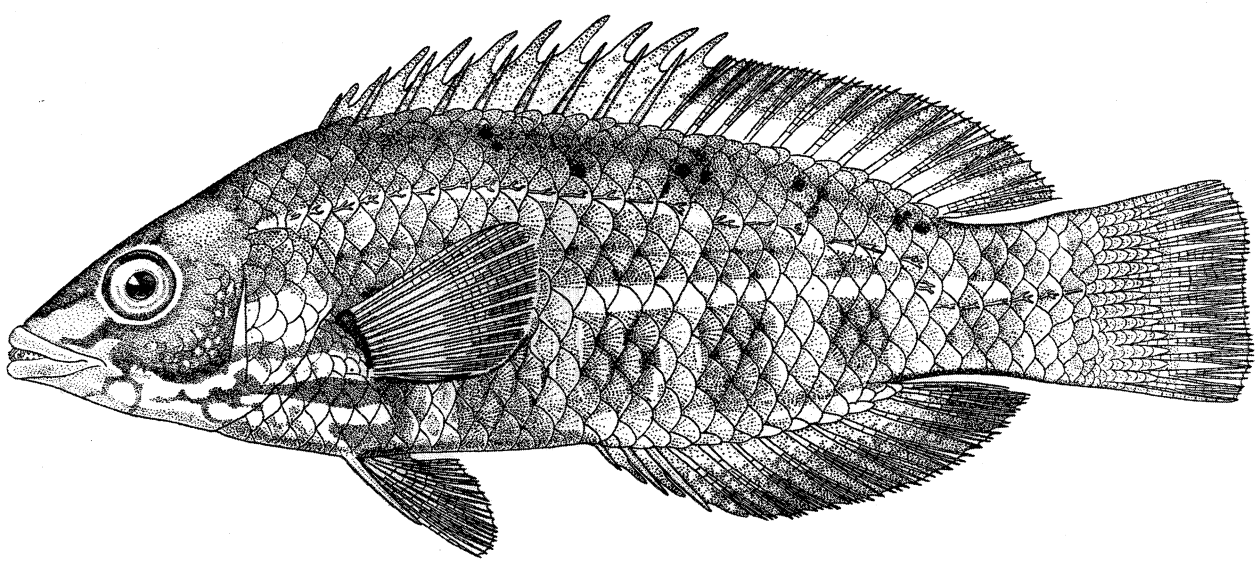

Fig.7. *Pseudolabrus fuentesi* IP (from Kendall & Radcliffe, 1912).

Diagnosis. Cheek scale rows behind eye 3-4, cheek scale rows below eye 7-8; 7 distinct wedge-shaped bars on body, extending ventrally to or just below lateral line, not reaching midventral line.

Colour description. Sexually monochromatic. Ground colour in alcohol pale yellowish, darker on head; sides of body with 7 dark wedge-shaped bars; first bar pale brownish, extending from nape to below pectoral fin; other bars dark brown; second bar extending from dorsal fin to about level of ventral margin of pectoral fin; third bar slightly shorter than second; fourth and fifth bars extending to just below lateral line; seventh bar at base of caudal fin; dorsal surface of head and snout greyish; 2 diffuse bands on snout, first extending from tip of snout to anteromedial margin of orbit, second extending from middle of upper lip to ventral margin of orbit, thence across cheek onto opercle; series of narrower, more distinct lines extending from above and behind eye onto nape and dorsal part of opercle, these lines more broken posteriorly; fins translucent; dorsal fin speckled with small dark spots, dark blotch between first 2-3 dorsal spines; pectoral fin with greyish wedge-shaped bar extending about halfway down base of fin.

Life colours - ground colour pale yellowish, head darker; first bar on body greyish, remaining bars black; lines and markings on head brownish; dorsal fin pale yellowish anteriorly, deep scarlet posteriorly, spot between first 2-3 spines greyish; anal fin deep scarlet; caudal fin reddish; pelvic fins pale yellowish; pectoral fins translucent, bar at base of fin greyish.

Remarks. *P. semifasciatus* is a moderately large species. Of the three specimens examined, the two largest were males, and the smaller specimen was apparently a female. This species does not appear to be sexually dichromatic.

Distribution. *P. semifasciatus* is known only from Easter Island. It occurs in deeper water, the only specimen with collection data (BPBM 6714) being caught by handline in 250 m.

Discussion. *P. semifasciatus* is very similar in colour pattern to *P. torotai* from Rapa, but differs in having bars which do not extend onto the ventral surface of the body.

Etymology. The specific name *semifasciatus* is a combination of the Latin *semi,* half, and *fasciatus*, barred, in reference to the half-barred colour pattern of this species.

Pseudolabrus torotai Russell & Randall, 1981
(Fig. 5; Pl. 3H; Table 5)

Pseudolabrus torotai Russell & Randall, 1981: 437 (Rapa).

Material examined. (5 specimens: 129.5-158 mm SL) RAPA – AMS I.20219-006 (129.5, PARATYPE of *Pseudolabrus torotai*), BPBM 12836 (139, PARATYPE of *P. torotai*), BPBM 13040 (158, HOLOTYPE of *P. torotai*), MNHN 1979.6.77 (147, PARATYPE of *P. torotai*), USNM 220915 (152, PARATYPE of *P. torotai*).

Diagnosis. Cheek scale rows behind eye 2, cheek scale rows below eye 6-7; 7 distinct dark bars on body, extending to or almost to midventral line.

Colour description. Sexually monochromatic. Ground colour in alcohol pale yellowish; body with 7 broad brownish bars; first bar wedge-shaped, extending from nape to below base of pectoral fin; other bars more or less vertical, their widths greater than interspaces; second bar not quite extending to ventral surface, third to sixth bars reaching midventral line, seventh bar at base of caudal fin; dorsal surface of head and snout greyish; 2 diffuse dark bands on snout; first extending from tip of snout to anteromedial margin of orbit, second from middle of upper lip to ventral margin of orbit, thence across cheek onto opercle; series of narrower, more distinct lines extending from above and behind eye onto nape and dorsal part of opercle; several brownish spots on preopercle and opercle; fins translucent, outer halves of dorsal and anal fins greyish, speckled with 2-3 rows of small brown spots; dorsal fin with dark blotch between first 3 spines; pectoral fin with narrow dark wedge-shaped bar extending one-half to two-thirds down base of fin.

Life colours - ground colour orange, paling to yellow on ventral surface; bars on body dark green; head pinkish, bands and spots dark green; dorsal fin dark red, its median part speckled with 2-3 rows of small black spots, black blotch between first 3 spines; soft dorsal and anal fins narrowly edged with blue; anal and caudal fins reddish basally, outer half of fins yellowish green; pelvic fins suffused with pale pink; pectoral fins translucent; basal wedge-shaped bar dark green.

Remarks. *P. torotai* is a small species, the largest specimen examined, apparently a male, was 158 mm SL. None of the specimens had ripe gonads and were therefore difficult to sex. Small individuals have the same colour pattern as adults, and this species does not appear to be sexually dichromatic.

Distribution. *P. torotai* is known only from the island of Rapa. It is a moderately deepwater species, and was collected in depths of 15-24 m.

Discussion. This species is very similar to *P. semifasciatus* from Easter Island, and differs in having bars which extend fully to the ventral surface of the body.

Etymology. The specific name *torotai* is from the native Rapan name for this species (Randall & Sinoto, 1978).

Subgenus ***Lunolabrus*** Whitley

Type species. *Labrus miles* Bloch & Schneider, 1801.

Diagnosis. Subgenus of *Pseudolabrus* lacking low scaly sheath at base of dorsal and anal fins; laterosensory canal tube complex, multiply branched; upper rays of caudal fin strongly produced, or upper and lower rays strongly produced; V10 with narrow secondary haemal arch.

Pseudolabrus (Lunolabrus) psittaculus
(Richardson, 1840)
(Fig. 5; Pl. 3I; Table 5)

Labrus psittacula Richardson, 1840: 26 (Port Arthur, Tasmania).
Tautoga psittacula.—Bleeker, 1855: 13.
Pseudolabrus psittaculus.—Bleeker, 1862b:131.
Labrichthys psittaculus.—Günther, 1862: 114.
Labrichthys rubicunda Macleay, 1881: 89 (King George Sound, Western Australia).
Labrichthys Mortoni Johnston, 1885: 256 (Derwent River, Tasmania).
Pseudolabrus rubicundus.—Gill, 1892: 402.
Pseudolabrus mortonii.—Gill, 1892: 403.
Pseudolabrus miles.—McCulloch, 1913: 372 (in part, not *Labrus miles* Bloch & Schneider, 1801).

Material examined. (29 specimens: 55-200 mm SL) NEW SOUTH WALES – off Dee Why, AMS IB.1162 (177); Moses Rock, Jervis Bay Peninsula, AMS I.18709-004 (55). VICTORIA – off Lakes Entrance, NMV A.508 (140); Western Port Bay, NMV 60139 (181); Portsea, AMS I.19210-001 (154), AMS I.19248-002 (76.7); Hobson's Bay,NMV 60140 (172); Lady Julia Percy Island, NMV A.509 (183). TASMANIA – Flinders Island, AMS I.10018 (159), AMS I.10192 (172); Bicheno, QVMT 1974.5.65 (3:183-200); Oyster Bay, AMS I.10255 (170); Oyster Cove, TMH D.555 (190); Rocky Cape, AMS I.20079-015 (6:97.3- 105); Otway Banks, TMH D.922 (189). SOUTH AUSTRALIA – Kangaroo Island, AMS I.20176-002 (123.5); Great Australian Bight, AMS I.12333 (118), AMS I.18709-004 (5:72-112.5).

Diagnosis. Cheek scale rows behind eye 3-4, cheek scale rows below eye 3-4 (rarely 5); predorsal scales 4-7 (rarely 8); upper lobe of caudal fin produced, lower lobe not produced or only slightly produced; dark saddle on dorsum below last 3 dorsal soft rays.

Colour description. Sexually monochromatic. Ground colour in alcohol pale brown, lighter below; head without markings; faint greyish saddle on dorsum at base of dorsal fin below last 3 soft rays; dorsal and anal fins with faint brownish spots.

Life colours - ground colour reddish; ventral part of body whitish; throat and thoracic region whitish; black saddle on dorsum at base of dorsal fin below last 3 dorsal rays; small white spot behind black saddle; 2 rows of small red spots midlaterally along dorsal and anal fins.

Remarks. *P. psittaculus* is a moderately large species, the largest specimen examined, a female, was 200 mm SL. This species does not show any marked sexual dichromatism, and male and female specimens are of similar sizes.

Distribution. *P. psittaculus* occurs throughout southern Australia, including New South Wales, Victoria, Tasmania and South Australia. The only record from Western Australia is Macleay's type of *Labrichthys rubicunda*, from King George Sound. *P. psittaculus* is a deeper water species, collected as shallow as 2 m but more common offshore in depths down to 218 m.

Discussion. The type specimen of *Labrus psittaculus* Richardson is not in the BMNH and must be presumed lost. The types of the other two nominal species referable to *P. psittaculus, Labrichthys rubicunda* Macleay and *Labrichthys mortoni* Johnston, could not be located in any Australian museum, and must also be presumed lost. From the original descriptions, however, both *L. rubicunda* and *L. mortoni* are clearly identical with *P. psittaculus*. This species has in the past been confused with *P. miles* from New Zealand, and records of *P. miles* from Australia by McCulloch (1913) and others can be referred to *P. psittaculus*.

Etymology. The specific name *psittaculus* is from the Latin *psittacus*, parrot, in reference to the local (Tasmanian) name 'parrot fish'. Richardson (1844) refers to this species as the 'lory wrasse' (lory - short for lorikeet, a small parrot).

Pseudolabrus (Lunolabrus) miles
(Bloch & Schneider, 1801)
(Fig. 5; Pl. 3J; Table 5)

Labrus miles Bloch & Schneider, 1801: 264, ex Forster ms. *Labrus coccineus* (New Zealand).
Julis? rubiginosus.—Richardson, 1843a: 218, nomen nudum ex Solander ms. *Sparus rubiginosus*.
Julis miles.—Richardson, 1843a: 218.
Julis prasiopthalmus.—Richardson, 1843a: 218, nomen nudum ex Solander ms. *Sparus prasiopthalmus*.
Julis? rubecula Richardson, 1843b: 423, ex Solander ms. *Sparus rubecula* (Queen Charlotte Sound and Cape Kidnappers, New Zealand).
Julis? rubiginosus Richardson, 1843b: 425, ex Solander ms. *Sparus rubiginosus* (Cape Kidnappers, New Zealand).
Labrus coccineus Forster, 1844: 131 (New Zealand).
Labrichthys psittacula.—Hutton, 1872: 43 (not *Labrus psittaculus* Richardson, 1840).
Labrichthys coccinea.—Hutton, 1877: 354.
Labrichthys roseipunctata Hutton, 1880: 45 (Dunedin, New Zealand).
Pseudolabrus roseipunctatus.—Gill, 1892: 402.
Pseudolabrus miles.—Gill, 1893a: 98, 117.
Pseudolabrus cossyphoides Steindachner, 1901: 503, pl. 2, fig. 1 (New Zealand).
Labrichthys miles.—Rendahl, 1925: 3.
Pseudolabrus (Lunolabrus) miles.—Whitley, 1933: 86.

Material examined. (25 specimens: 76-272 mm SL) NEW ZEALAND – Stewart Island, NMNZ 5621 (2:220-272); Betsy Island, Boat Group, NMNZ 5622 (2:237-246); Kundy Island, NMNZ 1924 (2:222-236); Tow Rock, AMS I.19673-002 (239); Cape Saunders, AMS I.14752 (236) AMS I.14753 (237), AMS I.14754 (179), AMS I.19674-001 (263); Open Bay, NMNZ 2683 (236); Caswell Sound, NMNZ 1004 (2:252-263); 'Canberbury', CMC 957 (260); Pencarrow Head, NMNZ 740 (251); Cape Lambert, NMNZ 937 (2:251-269); Goat Island, Leigh, AMS I.18281-012 (2:180-186); Poor Knights Islands, AMS I.19279-001 (2:76-82.7), NMNZ 6260 (78); Bay of Islands, CMC 956 (200); Three Kings Islands, NMNZ 5575 (182).

Diagnosis. Cheek scale rows behind eye 6, cheek scale rows below 5-8; predorsal scales 8-11 (rarely 7);

upper and lower lobes of caudal fin strongly produced, tail lunate; dark bar at base of caudal fin.

Colour description. Sexually monochromatic. Ground colour in alcohol pale, scales on dorsum and sides of large specimens with greyish margins; head without markings; dorsal and anal fins with narrow greyish margin, outer two-thirds of fins with 5-6 irregular longitudinal rows of small greyish spots (absent on anal fin of small specimens); base of caudal fin with broad greyish bar.

Life colours - ground colour reddish yellow; small individuals with dorsum yellowish, scales with reddish margins; ventral part of body whitish, with 5-6 pale reddish, narrow longitudinal stripes; head and nape reddish; lower lip, chin, throat and thoracic region white; fins pale yellowish; dorsal and anal fins narrowly edged with blue; outer two-thirds of dorsal fin with 5-6 irregular longitudinal rows of small red spots; base of caudal fin with broad wedge-shaped black bar, narrower below. Larger individuals with dorsum more uniformly red and ventral part of body yellowish, scales edged with red; outer two-thirds of anal fin with 5-6 rows of small red spots.

Remarks. *P. miles* is a moderately large species, the largest specimen examined, a male, was 272 mm SL. This species does not show any marked sexual dichromatism. Sexual transformation appears to occur at about 200 mm SL and is accompanied mainly by a general darkening of the body colours and appearance of spots on the anal fin. Females and males show almost complete overlap in size: the largest female examined was 269 mm SL; male specimens ranged in size from 200-272 mm SL. Spawning in *P. miles* occurs in late winter-spring (Sandager, 1888; Doak, 1972). Food comprises mainly hermit crabs, crabs and ophiuroids (Graham, 1939; Russell, 1983b). Juveniles of *P. miles* are facultative cleaner symbionts (Ayling & Grace, 1971).

Distribution. *P. miles* is wide ranging throughout New Zealand, including the Snares Islands (Horning, 1976; Hardy, 1986), Stewart Island, Chatham Islands (Waite, 1910; Young 1929) and the Three Kings Islands (Choat & Ayling, 1987). It is a moderately deepwater species, collected as shallow as 4 m, but more common in depths of 10-40 m.

Discussion. *P. miles* has had a confused nomenclatural history, with proliferation, particularly by Richardson, of a number of names and nomina nuda. Bloch & Schneider (1801) based their description of *Labrus miles* on Forster's ms. description of *Labrus coccineus* (Forster's description was not published until after his death, in 1844). Richardson (1843b) based his descriptions of *Julis? rubecula* and *Julis? rubiginosus* on the ms. names and drawings of Solander (the original drawing of the latter species is reproduced in Whitehead, 1968). None of Forster's or Solander's specimens appear to have survived, and Bloch and Schneider's type of *Labrus miles* could not be found in the ZMB (H.J. Paepke personal communication, 1977). The type of *Labrichthys roseipunctata* Hutton is not in the OM. The type of *Pseudolabrus cossyphoides* Steindachner could not be found in the NMW, and must also be presumed lost. Despite the lack of type specimens of all of the foregoing nominal species, it is clear from the original descriptions that all are conspecific with *P. miles*.

A record of *P. miles* from Japan (Kamohara, 1958) is based on a misidentification of *P. japonicus*. *P. miles* is known only from New Zealand, and records of this species from Australia refer to *P. psittaculus*. *P. miles* and *P. psittaculus* appear to be closely related but are easily separated by the characters given in the key.

Etymology. The specific name *miles* is from the Latin word for soldier, apparently in reference to the scarlet body colour resembling the colour of nineteenth century soldier's uniforms.

Pictilabrus Gill

Pictilabrus Gill, 1892: 403. Type species *Labrus laticlavius* Richardson, 1839 by original designation).

Description. Dorsal rays IX,11 (rarely IX,12); anal rays III,10 (rarely III, 8-9 or 11); caudal rays 6-7 + 2 + 12 + 2 + 5-6; pectoral rays ii,11 (rarely ii,10 or 12); pelvic rays I,5; lateral line scales 25-26 (rarely 24 or 27); scale rows above lateral line 3-4; scale rows below lateral line 7-9; predorsal scales 4-6; cheek scale rows behind eye 1 (rarely 2); cheek scale rows below eye 1-3; vertebrae 9 + 16; infraorbitals 6 (infraorbitals 2 and 3 fused); pleural ribs ending on ninth vertebra; 4-6 epihaemal ribs (on tenth through thirteenth to fifteenth vertebra); first caudal vertebra (V10) with narrow secondary haemal arch; gill rakers 13-20; branchiostegal rays 6.

Body depth 3.0-3.9 in SL. Head profile convex, head 2.9-3.8 in SL; snout length 3.0-6.3 in head; orbital diameter 3.7-6.1 in head; interorbital width 4.2-5.1 in head; suborbital depth 5.0-9.1 in head. Mouth terminal, maxilla reaching to or just beyond vertical through anterior nostril; lips moderately fleshy, upper lip with 5-6 longitudinal plicae, lower lip with 1-2 (inner row more fleshy and papillose); upper jaw with enlarged pair of recurved canines anteriorly; lower jaw with 2 pairs of enlarged anterior canines, second pair shorter than first; 10-12 progressively smaller lateral canines in both jaws; inner row of 3-5 small canines behind anteriormost jaw teeth; enlarged posterior canine (sometimes 2) in angle of upper jaw (Fig. 13d). Lower pharyngeal plate broadly Y-shaped; transverse limb with medial posterior patch of large, blunt conical or molariform teeth, and 2-3 rows of smaller conical teeth about one-third to one-half size of large teeth; anterior median limb narrow, with 2-3 irregular rows of pointed conical teeth (Fig. 18d). Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior

margin reaching to or just above level of ventral margin of orbit, ventral margin free almost to below anterior margin of orbit. Opercular membrane broadly rounded, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales small, extending forward to vertical at midventral margin of orbit. Opercle naked anteriorly, 8-10 large scales posteriorly, except for naked membranous opercular flap dorsoposteriorly. Subopercle naked.

Body scales large, scales on thorax about one-half to three-quarters size of other scales. Lateral line complete, bent abruptly downwards below ninth to eleventh dorsal soft rays; laterosensory canal tube complex, with multiple branches (small specimens with simple, bifurcate canal tube); canal pores terminal (subterminal pores also in *P. laticlavius*). Dorsal and anal fins without scaly basal sheath; scales extending beyond base of caudal fin in interspaces between rays about two-thirds of way along fin. Dorsal fin length 1.5-1.8 in SL; dorsal fin rays progressively longer posteriorly; first spine 2.2-7.4 in head; ninth spine 1.3-2.6 times length of first; tenth or eleventh soft ray usually longest, 1.0-1.8 times length of ninth spine. Dorsal and anal spines pungent, interspinous membrane continuous, not incised and without free tips projecting beyond spines; posterior tip of dorsal and anal fins pointed. Anal fin length 2.8-3.7 in SL; anal fin rays progressively longer posteriorly; first spine 6.4-11.1 in head; third spine 1.6-2.6 times length of first; ninth or tenth soft rays longest, 1.1-2.2 times length of third spine; caudal fin rounded to truncate; pectoral fins rounded or pointed (upper rays longest), not reaching vertical through vent, length 1.3-1.9 in head; pelvic fins short, rounded or pointed, not reaching level of tip of pectoral fin, length 1.8-3.0 in head.

Discussion. The genus *Pictilabrus* was proposed by Gill (1892) to separate *Labrus laticlavius* Richardson from species of *Pseudolabrus*. Gill distinguished *Pictilabrus laticlavius* by the absence of free points projecting beyond the tips of the dorsal and anal spines, and by its smaller head. *Pictilabrus* shows greatest affinity with *Pseudolabrus* and *Austrolabrus,* in having 4-6 epihaemal ribs (on the tenth through thirteenth to fifteenth vertebra), and the first caudal vertebra with a narrow secondary haemal arch. It differs from *Pseudolabrus* in having the second canine in the lower jaw shorter than the first; the interspinous membrane of the dorsal and anal fin continuous, not incised or produced as free points beyond the tips of the spines; the laterosensory canal tube complex, with multiple branches (subterminal as well as terminal pores in *P. laticlavius*); and the dorsal and anal fins lacking a scaly sheath. *Pictilabrus* differs from *Austrolabrus* in lacking a scaly sheath at the base of the dorsal and anal fins, in having an incompletely scaled opercle, and subterminal as well as terminal laterosensory canal tube pores (except *P. viridis*).

Etymology. *Pictilabrus* is a combination of the Latin *pictilus*, painted, and *Labrus*, wrasse, in reference to the gaudy colours of the type species.

Key to species of the genus *Pictilabrus*

(Species accounts are presented in the order of the Key)

1. Middle rays of pectoral fin longest; lateral line scales with subterminal pores in canal tube; distinctive dark, wedge-shaped bar behind tip of pectoral fin; no dark bar or indistinct dark bar at base of pectoral fin ..... (New South Wales, Victoria, Tasmania, South Australia, southern Western Australia) *laticlavius*.

——Upper rays of pectoral fin longest; lateral line scales without subterminal pores in canal tube; no dark wedge-shaped bar behind tip of pectoral fin; distinct dark bar at base of pectoral fin ..... (southern Western Australia) *viridis* n.sp.

Pictilabrus laticlavius (Richardson, 1839)

(Fig. 8; Pl. 4A, 4B, 4C; Table 6)

Labrus laticlavius Richardson, 1839: 99 (Port Arthur, Tasmania).

Labrus laticlavius, vel *Tautoga laticlavia*.—Richardson, 1844-48 (1848): 128.

Tautoga laticlavia.—Bleeker, 1855: 3.

Pseudolabrus laticlavius.—Bleeker, 1862b: 131.

Labrichthys laticlavius.—Günther, 1862: 115, 507.

?*Hemigymnus Bleasdalei* Castelnau, 1875: 38 (Adelaide, South Australia).

Labrichthys labiosa Macleay, 1881: 88 (Port Jackson, New South Wales).

Pictilabrus laticlavius.—Gill, 1892: 403.

?*Austrolabrus maculatus*.—Scott, 1942: 50 (not *Labrichthys maculata* Macleay, 1881).

?*Pseudolabrus parilus*.—Scott, 1970: 47 (not *Tautoga parila* Richardson, 1850).

Eupetrichthys gloveri Scott in Scott *et al.*, 1974: 303 (South Australia).

Material examined. (53 specimens: 31-230 mm SL) NEW SOUTH WALES – Seal Rocks, AMS I.15896-016 (88); Broughton Island, AMS I.19848-004 (118.5); Port Jackson (Sydney), AMS I.16361-001 (144.5, HOLOTYPE of *Labrichthys labiosa* Macleay); Jervis Bay, AMS I.15330-026

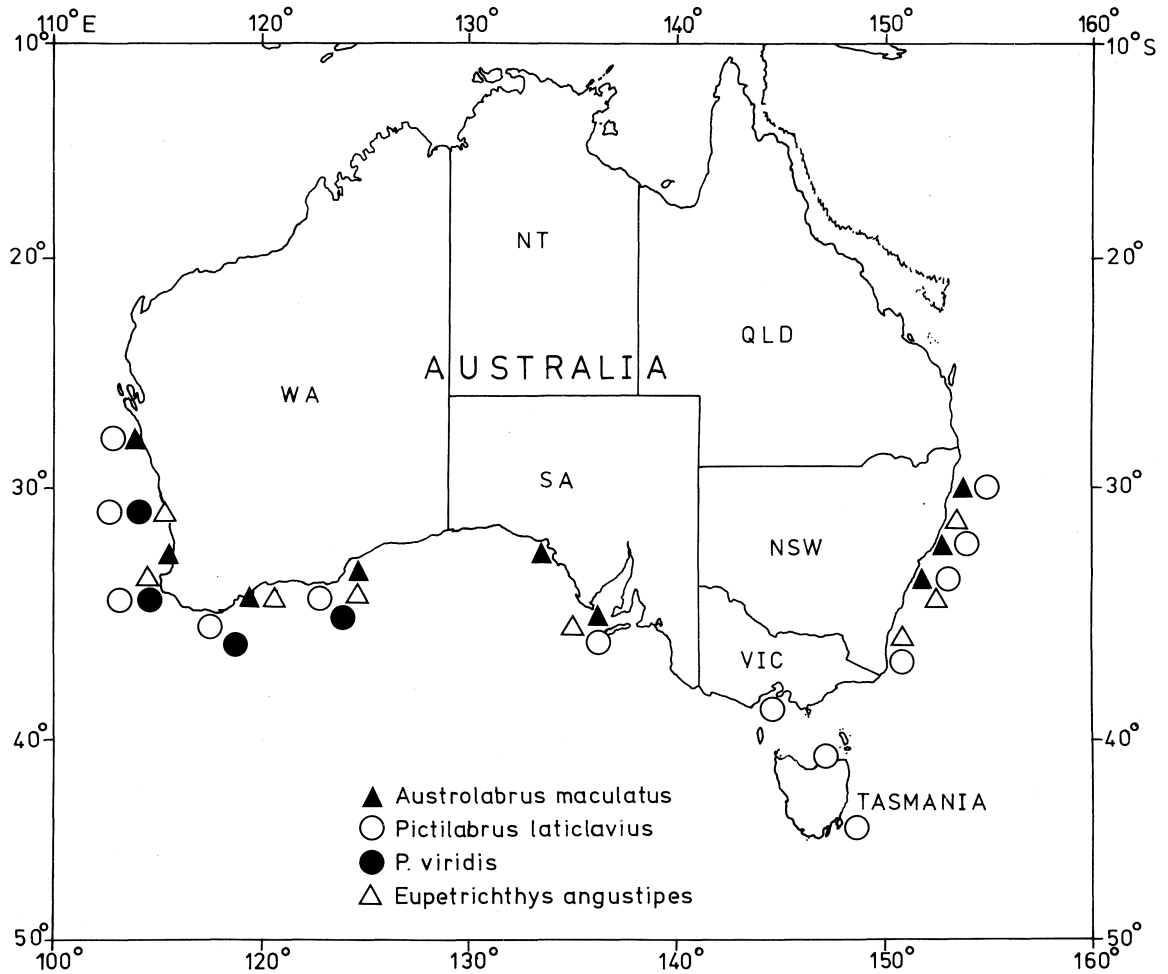

Fig.8. Map of the known distribution of species of *Pictilabrus, Austrolabrus* and *Eupetrichthys*.

(2:114-131); Nadgee, AMS I.19893-002 (4:31-34.9). VICTORIA – Western Port Bay, NMV R.10955 (183); Hobson's Bay, NMV 45695 (230), NMV 45696 (182), NMV R.10954 (198); Queenscliffe, NMV 60132 (209). TASMANIA – Erith Island, AMS I.17905-003 (190); Flinders Island, NMV 60134 (193), QMV 1974.5.13 (185); Green's Beach, QVMT 1976.5.79 (111); QVMT 1977.5.46 (127.5); Low Head, QVMT 1963.5.11 (198), QVMT 1965.5.30 (107); Croppies Point, QVMT 1974.5.156 (164); Swansea, QVMT 1974.5.29 (218); Coles Bay, QVMT 1972.5.8 (2:208); Port Arthur, BMNH 1855.9.19.914 (161.7, HOLOTYPE of *Labrus laticlavius* Richardson)*; Rocky Cape, AMS I.20079-001 (3:100.5-175). SOUTH AUSTRALIA – Kangaroo Island, AMS I.20176-003 (126); Thistle Island, SAMA F.3164 (118, HOLOTYPE of *Eupetrichthys gloveri* Scott; 3:93-125, PARATYPES). WESTERN AUSTRALIA – Mondrain Island, Recherche Archipelago, AMS I.20222-004 (2:89-126); Lucky Bay, Cape Le Grande, AMS I.20225-001 (2:75-85.7); Two People Bay, AMS I.20236-003 (4:89.5-165); Geographe Bay, AMS I.20234-002 (9:40.5-96.5); Cockburn Sound, AMS I.20231-012 (151); Rottnest Island, AMS I.20245-002 (86.1); Wallaby Group, Abrolhos Islands, WAM P.25318 (123).

Diagnosis. Middle rays of pectoral fin longest; lateral line scales with subterminal pores in canal tube; dark wedge-shaped bar behind tip of pectoral fin; dark bar at base of pectoral fin indistinct or lacking.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale; single row of irregularly spaced dark spots on dorsum above lateral line; 4-5 faint greyish bars on ventral part of body below midlateral line; dorsal surface of head and nape greyish; 2 dark spots on dorsal fin, first between anteriormost 3 dorsal rays and second between posteriormost 2 dorsal rays; smaller dark spot at base of dorsal fin between each ray; 2-3 rows of small greyish spots on outer half of dorsal and caudal fins; anal fin with broad greyish margin; dark spot at base of each anal ray (sometimes wanting); no greyish bar at base of pectoral fin.

Ground colour of TP in alcohol greyish; 2 dark stripes along body, first along lateral line beginning above upper margin of pectoral fin, second beginning just behind posterior margin of uppermost pectoral rays and extending midlaterally along body; dark wedge-shaped bar extending downwards from lower stripe, behind pectoral fin; upper and lower stripes

Table 6. Selected measurements of species of *Pictilabrus* (as a percentage of standard length).

	P. laticlavius (n=52)	*P. viridis* HOLOTYPE	*P. viridis* PARATYPES (n=25)
Standard length (mm)	31.0 – 230.0	140.5	66.4 – 124.4
Body depth	25.5 – 31.9	32.4	27.7 – 33.0
Head length	26.2 – 34.4	30.0	29.5 – 33.6
Snout length	5.1 – 8.8	7.4	7.0 – 9.8
Orbital diameter	4.8 – 9.4	6.0	5.9 – 7.7
Interorbital distance	5.0 – 7.3	7.6	6.0 – 7.5
Suborbital distance	3.8 – 6.3	5.0	4.1 – 5.3
Length of dorsal fin base	56.8 – 65.8	61.1	54.3 – 63.1
Length of first dorsal spine	4.3 – 6.5	4.7	4.6 – 6.5
Length of ninth dorsal spine	5.1 – 11.4	8.5	7.2 – 9.8
Length of longest dorsal ray	11.1 – 15.0	13.5	11.2 – 13.8
Length of anal fin base	29.9 – 36.3	30.7	26.9 – 33.4
Length of first anal spine	3.0 – 4.8	2.9	2.9 – 4.4
Length of third anal spine	6.6 – 11.1	7.2	6.1 – 8.9
Length of longest anal ray	10.7 – 14.7	11.7	10.1 – 12.7
Least depth of caudal peduncle	15.6 – 20.3	18.4	15.9 – 19.0
Length of pectoral fin	18.9 – 22.7	20.4	17.1 – 22.3
Length of pelvic fin	11.6 – 17.3	12.9	10.7 – 14.1

joined below posterior end of dorsal fin, and continuing as broad dark stripe above lateral line onto caudal peduncle and base of caudal fin; indistinct (sometimes broken) greyish band on ventral part of body, beginning above fourth or fifth anal ray and extending onto base of caudal fin; head greyish, without lines or other markings; dorsal and anal fins pale greenish, outer margin of fins with narrow pale edge, fins with narrow dark submarginal line; dark spot between first 3 dorsal spines; caudal fin greyish green with paler outer margin; 4-5 rows of small dark spots submarginally; pectoral and pelvic fins pale; pectoral axis dusky.

Life colours - ground colour of IP reddish brown or greenish; markings on body and fins greyish.

Ground colour of TP in life deep green; dark stripes on body reddish or dark violet; upper and midlateral stripes pale mauve anteriorly, darker posteriorly; upper stripe extending onto head as narrow line behind eye; pale midlateral stripe extending forward to posterior margin of opercle; interspaces between dark stripes on body pale yellow; head deep green, 5-6 pale mauve radiating lines around eye (wanting in larger individuals); fins reddish green or deep bluish violet; dorsal, anal and caudal fins with paler blue margins; inner halves of dorsal and anal fins pale mauve or greenish; dorsal, anal and caudal fins spotted with blue; dark spot between first 3 dorsal rays; base of pectoral fin without dark basal bar (indistinct greyish bar in some individuals).

Remarks. *P. laticlavius* is a moderately large species, the largest specimen examined, a male (TP), was 230 mm SL. Sexual transformation, accompanied by a change from IP to TP colour pattern, occurs at about 130 mm SL. An unusual red TP colour form of *P. laticlavius* (Pl. 4C) was photographed at a depth of 10 m at Pope's Eye, Port Phillip Bay, Victoria, by R. Kuiter. This individual was deep red overall, the dark stripes on the body present only as pale traces. This colour form appears to be associated with red alga (R. Kuiter, personal communication 1981).

Distribution. *P. laticlavius* is widely distributed throughout temperate Australia, including New South Wales, Victoria, Tasmania, South Australia and southern Western Australia. Record of this species from New Zealand (Hector, 1884) is almost certainly a misidentification, and no specimens of *P. laticlavius* from New Zealand were found in museums or collected during this study. This species occurs as deep as 40 m.

Discussion. The holotype of *Labrus laticlavius* Richardson (BMNH 1855.9.19.914) is a TP specimen. The types of *Hemigymnus bleasdalei* Castelnau are not in the MNHN (Bauchot, 1963) and must be presumed lost. From Castelnau's description, however, this species appears to be identical with the TP of *P. laticlavius* and is included here as a queried synonymn. The holotype of *Labrichthys labiosa* Macleay (AMS I.16371-001) represents the TP form of *P. laticlavius*. The holotype of *Eupetrichthys gloveri* Scott (SAMA 3164) is a TP specimen of *P. laticlavius*.

Etymology. The specific name *laticlavius* alludes to the ornamental blue spots on the fins, resembling the clavi on the borders of the Roman patrician dress (Richardson, 1844). Hence the common name 'patrician wrasse' (Richardson, 1844) or senator wrasse.

Pictilabrus viridis n.sp.

(Fig. 8; Pl. 4E, 4F; Table 6)

Type material. HOLOTYPE. AMS I.20220-005, 140.5 mm SL, male, Lucky Bay, Cape Le Grande (33°60'S, 122°14'E), Western Australia, 2-10 m, spear, B.C. Russell, 20 Mar 1978. PARATYPES. (25 specimens: 66.4-140.5) AMS I.20219-005, 3:107-110 mm SL, Rob Island, Recherche Archipelago (34°02'S, 122°14'E), Western Australia, 7-15 m, spear, B.C. Russell and R. Kuiter, 20 Mar 1978; AMS I.20225-002, 99.5

mm SL, Lucky Bay, Cape Le Grande, Western Australia, 12-15 m, spear, B.C. Russell and R. Kuiter, 22 Mar 1978; AMS I.20233-002, 2:76.3-124.4 mm SL, Canal Rocks, Cape Naturaliste (33°40'S, 115°00'E), Western Australia, 1 m, spear, B.C. Russell, 1 Apr 1978; AMS I.20234-003, 3:66.4-103 mm SL, Eagle Bay, Geographe Bay (33°33'S, 115°04'E), Western Australia, 1-5 m, spear, B.C. Russell, 1 Apr 1978; AMS I.30326-004, 2:83.5-88.8 mm SL, South Point, Two People Bay (34°58'S, 118°12'E), Western Australia, 5-8 m, spear, B.C. Russell, 4 Apr 1978; AMS I.20239-005, 2:91-92.5 mm SL, Salmon Bay, Rottnest Island (32°01'S, 115°26'E), Western Australia, 1-10 m, spear, B.C. Russell, 10 Apr 1978; BMNH 1979.4.10.1, 110 mm SL, same data as holotype; BPBM 22587, 2:80-106.5 mm SL, Rob Island, Recherche Archipelago, Western Australia, 7-5 m, spear, B.C. Russell and R. Kuiter, 20 Mar 1978; NMV A.546, 2:73.1-112 mm SL, same data as preceding specimens; USNM 219624, 3:96-98 mm SL, Canal Rocks, Cape Naturaliste, Western Australia, 1 m, spear, B.C. Russell, 1 Apr 1978; WAM P.24859, 2:95.5-120.5 mm SL, near Middleton Beach, King George Sound (34°53'S, 118°23'E), Western Australia, 1-5 m, rotenone, G.R. Allen, 23 July 1974; WAM P.25178-004, 2:75.2-79.5 mm SL, Rottnest Island, Western Australia, 6 m, rotenone, J.B. Hutchins, 6 Mar 1975.

Diagnosis. Upper rays of pectoral fins longest; lateral line scales without subterminal pores in canal tube; no dark wedge-shaped bar behind tip of pectoral fin; distinct dark bar at base of pectoral fin.

Description. Dorsal rays, IX,11 (rarely IX,10-12, or X,10); anal rays III,10 (rarely II,10 or III,9); pectoral rays ii,11 (rarely ii,10); pelvic rays I,5; lateral line scales 25 (25-26, rarely 27); scale rows above lateral line 4 (3-4); scale rows below lateral line 8 (8-9, rarely 10); predorsal scales 5 (4-6); cheek scale rows behind eye 1; cheek scale rows below eye 2 (2-3, rarely 1); gill rakers 17 (15-20).

Morphometric dimensions are given in Table 6. Other characters as for genus.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale; series of light greyish blotches along lateral line and lower part of body; darker spots and blotches behind head between lateral line and pectoral fin; 5-6 greyish lines radiating from behind and below eye, and head and nape with greyish spots and lines, these extending onto cheeks and opercle; dorsal fin with narrow greyish submarginal stripe; dark spot between first 3 dorsal spines and last 3 soft rays; series of faint greyish diagonal lines on dorsal fin, and greyish spots at base of dorsal rays; anal fin with narrow greyish submarginal stripe and 2 rows of faint greyish spots on outer half of fin; caudal fin with narrow, faint greyish submarginal line; pectoral fin with dusky bar at base, dusky colour extending onto upper margin of fin.

Ground colour of TP in alcohol similar to IP; 5 indistinct brownish saddles on dorsum extending to just below lateral line; series of brown blotches midlaterally below saddles; irregular series of brownish blotches posteroventrally on body from above middle of anal fin to caudal peduncle; scales on body each with 3-4 minute brown spots, giving speckled appearance; dorsal surface of head light greyish brown; 2 narrow, oblique brown lines behind eye; series of paler brown lines radiating from below eye, these extending onto cheeks; dark brown mark at top and middle of opercle; dorsal, anal and caudal fins pale with narrow greyish submarginal stripe, outer half of fins with 3-4 rows of greyish spots; dark spot on dorsal fin between first 3 or second and third rays; posterior spot on dorsal fin indistinct or absent; pectoral fin with dusky bar at base, dusky colour extending onto upper margin of fin.

Life colours - ground colour of IP pale green; pale reddish band extending from behind head along lateral line to base of caudal fin; second reddish band midlaterally from above base of pectoral fin, joining upper band below posterior end of dorsal fin; third, narrower reddish band posteriorly on lower part of body, beginning above middle of anal fin and extending to base of caudal fin; upper and lower edges of bands marked with narrow broken green lines; head green; snout, cheeks and opercle reddish brown; series of 5-6 narrow blue lines from below eye crossing snout, cheeks and preopercle; dorsal and anal fins reddish with narrow green margin; green spot between first 3 or second and third dorsal spines, and greyish spot between last 2-3 soft rays; series of narrow diagonal lines on inner two-thirds of dorsal fin; caudal fin dusky red; pelvic fins greenish; pectoral fin translucent yellow, narrow black bar at base of fin.

Life colours of TP similar to IP, but colours generally more intense; posterior spot on dorsal fin faint or absent; anal fin suffused with blue, basal portion reddish. This species also has been illustrated in colour by Hutchins & Thompson (1983: fig. 238) and Allen (1985: fig. 308).

Remarks. *P. viridis* is a small species, the largest specimen examined, a male (TP), was 140.5 mm SL. *P. viridis* does not appear to show as marked sexual dichromatism as *P. laticlavius*. Transformation from IP to TP colour pattern occurs at about 100-130 mm SL, and involves mainly an intensification of colour and loss of the posterior spot on the dorsal fin.

Distribution. *P. viridis* is restricted to southern Western Australia, from the Recherche Archipelago to Rottnest Island. It inhabits similar rocky reef-algal habitats to *P. laticlavius*, but the two species show some ecological segregation: *P. viridis* is more common in the shallow surge zone (to 5 m depth), whereas *P. laticlavius* is more common in deeper water (>5 m). This species has been collected from as deep as 15 m.

Discussion. This new species is very similar both in form and colour pattern to *P. laticlavius*. *P. viridis* may be distinguished, however, by its more pointed pectoral fin, absence of subterminal pores in canal tubes of lateral-line scales, and colour pattern.

Etymology. The specific name *viridis* is from the Latin word for green, in reference to the predominantly green body colour of this new species.

Austrolabrus Steindachner

Austrolabrus Steindachner, 1884: 1102, as subgenus. Type species *Labrichthys maculata* Macleay, by original designation.

Description. Dorsal rays IX,11 (rarely VII,11; rarely IX,12); anal rays III,10 (rarely II,10); caudal rays 5-6 + 2 + 12 + 2 + 5-6; pectoral rays ii,11 (rarely ii,12); pelvic rays I,5; lateral line scale rows 25 (rarely 26); scale rows above lateral line 2-3 (plus 7-8 small sheath scales); scale rows below lateral line 6-8 (plus 4-6 small sheath scales); predorsal scales 5-9; cheek scale rows behind eye 2; cheek scale rows below eye 3; vertebrae 9 + 16; infraorbitals 6 (infraorbitals 2 and 3 fused); pleural ribs ending on ninth vertebra; 5 epihaemal ribs (on tenth through fourteenth vertebra); first caudal vertebra (V10) with narrow secondary haemal arch; gill rakers 15-17; branchiostegal rays 6.

Body depth 2.9-3.9 in SL. Head profile somewhat convex, head length 2.7-3.4 in SL; snout length 2.9-6.6 in head; orbital diameter 3.1-5.1 in head; interorbital width 4.5-7.3 in head; suborbital depth 4.7-9.9 in head; mouth terminal, maxilla reaching to or just beyond vertical through anterior nostril; lips moderately fleshy, upper lip with 5-6 longitudinal plicae, lower lip with 1-2 (inner row more fleshy and papillose); upper jaw with pair of enlarged, recurved canines anteriorly; 10-12 progressively smaller canines laterally; inner row of 3-5 small canines behind anteriormost teeth; 1 (sometimes 2) enlarged canine(s) at posterior end of upper jaw; lower jaw with 2 pairs of enlarged anterior canines, second pair shorter than first; 12 smaller lateral canines; inner row of 4 small canines behind anteriormost teeth (Fig. 13e). Lower pharyngeal plate broadly Y-shaped; transverse limb with medial posterior patch of large, blunt conical or molariform teeth and 2-3 rows of smaller conical teeth about one-third to one-half size of large teeth; anterior median limb narrow, with 2-3 irregular rows of small conical teeth, posterior teeth blunter (Fig. 18e). Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior margin extending to between level of corner of mouth to middle of orbit, ventral margin free almost to below anterior margin of orbit. Opercular membrane broadly rounded, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales small, extending from behind dorsal margin of orbit forward below eye to vertical at midventral margin of orbit. Opercle covered with 15-16 large scales, except for naked membranous flap dorsoposteriorly. Subopercle naked.

Body scales large, scales on thorax about one-quarter to one-half size of other scales. Lateral line complete, bent abruptly downwards below ninth to eleventh dorsal soft rays; laterosensory canal tube complex, with multiple branches. Dorsal and anal fins with well-developed scaly sheaths, covering proximal half of fins; scales extending onto caudal fin beyond base about two-thirds of way along fin. Dorsal fin length 1.6-1.8 in SL; dorsal fin rays progressively longer posteriorly; first spine 4.6-9.7 in head; ninth spine 1.5-3.3 times length of first; tenth or eleventh soft ray longest, 1.1-2.9 times length of ninth spine; dorsal and anal spines pungent; membrane between spines continuous, not incised or produced beyond tips of spines as free points; posterior tips of dorsal and anal fins rounded (IP) or pointed, posterior rays elongate (TP). Anal fin length 2.7-3.3 in SL; anal fin rays progressively longer posteriorly; first spine 6.9-10.4 in head; third spine 1.7-3.0 times length of first; ninth or tenth soft rays longest, 1.1-2.8 times length of third spine; caudal fin rounded; pectoral fins rounded (IP) or pointed, upper rays longest (TP), not reaching vertical through vent, length 1.5-2.0 in head; pelvic fins short, pointed, reaching to or just beyond level of tips of pectoral fins, length 1.8-2.8 in head.

Discussion. The name *Austrolabrus* was originally proposed by Steindachner as a subgenus for *Labrichthys maculata* MacLeay. Gill (1892) recognised *Austrolabrus* as a distinct genus, a decision which has been followed by all subsequent authors and is concurred with here. *Austrolabrus* shows closest affinity to *Pseudolabrus* and *Pictilabrus* in having 5 epihaemal ribs (on the tenth through fourteenth vertebra), first caudal vertebra with a narrow secondary haemal arch, and pectoral rays ii,11. It differs from *Pseudolabrus* in having the second canine in the lower jaw shorter than the first, and in having the interspinous membrane of the dorsal and anal fins continous, not incised or produced beyond tips of spines. *Austrolabrus* also differs from both *Pseudolabrus* and *Pictilabrus* in having a distinctive, well-developed scaly sheath covering the proximal half of the dorsal and anal fins. The IP and TP colour patterns also are distinctive and unlike those of other pseudolabrines.

Etymology. *Austrolabrus* is a combination of the Latin *austral*, south, and *Labrus*, wrasse, in reference to the Australian distribution of this monotypic genus.

Austrolabrus maculatus (Macleay, 1881)

(Fig. 8; Pl. 4D; Table 7)

Labrichthys maculata Macleay, 1881: 89 (King George Sound, Western Australia).

Labrichthys (Austrolabrus) maculata.—Steindachner, 1884: 1100.

Austrolabrus maculatus.—Gill, 1892: 404.

Material examined. (23 specimens, 21.5-125.5 mm SL) NEW SOUTH WALES – Seal Rocks, AMS I.18297-004 (22); Port Stephens, AMS I.19252-001 (48); Sydney Harbour, AMS I.18243-001 (77.5). SOUTH AUSTRALIA – Kangaroo Island, AMS I.20195-003 (60.4); Point Sinclair, AMS I.17782-001 (53). WESTERN AUSTRALIA – Lucky Bay, Cape Le Grande, AMS I.20223-007 (101.5); King George Sound, AMS IA.642 (125.5), AMS I.16367-001 (78, HOLOTYPE of *Labrichthys maculata* Macleay), WAM P.6290 (96.5); Cape Naturaliste, AMS I.20223-005 (3:21.5-45.6); Geographe

Table 7. Selected measurements of *Austrolabrus maculatus* and *Eupetrichthys angustipes* (as a percentage of standard length).

	A. maculatus (n=23)	*E. angustipes* (n=25)
Standard length (mm)	21.5 – 125.5	28.4 – 124.0
Body depth	25.7 – 34.7	19.5 – 22.2
Head length	29.6 – 37.2	23.5 – 28.1
Snout length	5.4 – 12.3	5.2 – 7.1
Orbital diameter	5.9 – 12.1	5.2 – 6.7
Interorbital distance	4.5 – 7.2	3.4 – 4.4
Suborbital distance	3.6 – 6.7	2.5 – 3.9
Length of dorsal fin base	56.3 – 64.3	63.7 – 70.0
Length of first dorsal spine	3.3 – 7.7	4.6 – 8.0
Length of ninth dorsal spine	5.6 – 13.6	8.0 – 11.1
Length of longest dorsal ray	10.9 – 17.1	12.4 – 18.5
Length of anal fin base	30.6 – 37.5	34.3 – 43.8
Length of first anal spine	3.0 – 5.3	2.9 – 4.8
Length of third anal spine	5.5 – 13.0	5.4 – 9.3
Lenght of longest anal ray	10.9 – 17.9	10.7 – 20.4
Least depth of caudal peduncle	14.9 – 20.9	14.3 – 16.7
Length of pectoral fin	15.0 – 23.7	15.6 – 19.0
Length of pelvic fin	12.3 – 16.8	12.5 – 21.3

Bay, AMS I.19602-006 (2:65.5-70.5); Cockburn Sound, AMS I.20229-003 (4:76.5-122.5); Rottnest Island, AMS I.20239-006 (3:76.5-87); Beacon Island, Abrolhos Islands, WAM P.25307-009 (44); Long Island, Abrolhos Islands, WAM P.25316-002 (58).

Diagnosis. High scaly sheath at base of dorsal and anal fins; interspinous membrane of dorsal and anal fins continuous, not incised or produced beyond spines as free tips.

Colour description. Sexually dichromatic. Ground colour of IP in alcohol pale, dorsum greyish; dorsal part of body with numerous dark spots, those above lateral line larger; dark saddle on dorsal part of caudal peduncle; head greyish; 2 greyish bars on snout; 3 faint greyish lines from upper lip to anterior margin of orbit; series of small dark spots behind eye, extending onto dorsal part of preopercle and opercle; dorsal and anal fins greyish, with 2 narrow dark submarginal lines; caudal fin with 3-4 concentric greyish submarginal lines.

Ground colour of TP in alcohol similar to IP, but colours darker, and lacks dark saddle on caudal peduncle.

Life colours - ground colour of IP reddish or reddish brown; cheeks and ventral part of body whitish or pale yellow; spots on head and dorsal part of body black; pale spot anterior and posterior to black saddle on caudal peduncle; dorsal, anal and caudal fins dusky red with narrow blue margins; pelvic and pectoral fins translucent.

TP colours similar to IP, but lacks black saddle on caudal peduncle; lines on head reddish brown; series of 5-7 narrow, concentric bluish lines on caudal fin.

Remarks. *A. maculatus* is a small species, the largest specimen examined, a male (TP), was 125.5 mm SL. Sexual dichromatism in *A. maculatus* is not very marked. Transformation from IP to TP colour pattern occurs at about 60-80 mm SL and involves mainly an intensification of body colours and loss of the dark saddle on the caudal peduncle.

Distribution. *A. maculatus* is reliably recorded only from New South Wales, South Australia and Western Australia. It has not been recorded from Victoria, and a single record of this species from Tasmania (Scott, 1942) appears to be a misidentification of *Pictilabrus laticlavius*. This species is common in shallow water in Western Australia, but tends to inhabit deeper water (10-40 m) elsewhere.

Etymology. The specific name *maculatus* is from the Latin *macula*, spot, in reference to the dark spots on the body of this fish.

Eupetrichthys Ramsay & Ogilby

Eupetrichthys Ramsay & Ogilby, 1888b: 631. Type species *Eupetrichthys angustipes* Ramsay & Ogilby, by monotypy.

Description. Dorsal rays IX,12 (rarely IX,11); anal rays III,10 (rarely III,11); caudal rays 6 (rarely 4) + 2 +12 + 2 + 5 (rarely 4); pectoral rays ii,11; pelvic rays I,5; lateral-line scales 25 (rarely 26); scale rows above lateral line 2 (plus 2 small axillary scales); scale rows below lateral line 7-8; predorsal scales 3-5; cheek scale rows behind eye 1 (rarely 2); cheek scale rows below eye 2; vertebrae 9 + 16; infraorbitals 7; pleural ribs ending on ninth vertebra; 6 epihaemal ribs (on tenth through fifteenth vertebra); first caudal vertebra (V10) with narrow secondary haemal arch; gill rakers 16-21; branchiostegal rays 6.

Body depth 4.5-5.1 in SL. Head profile convex, head length 3.6-4.3 in SL; snout 3.7-5.0 in head; orbital diameter 4.0-5.0 in head; interorbital width 5.6-8.2 in head. Mouth terminal, maxilla just reaching beyond vertical through anterior nostril; lips moderately

fleshy, lateral inner surfaces plicate, upper lip with 5 longitudinal plicae, lower lip with 2 (inner row more fleshy and papillose); single pair of enlarged, recurved anterior canines in both jaws; anterior canine of lower jaw only slightly larger than second tooth; 8-12 progressively smaller lateral canines in both jaws; prominent, large posterior canine in upper jaw (reduced or absent in smaller specimens) (Fig. 13f). Lower pharyngeal plate broadly Y-shaped; tranverse limb with single large molariform tooth posteromedially, adjacent teeth conical, blunt, in 2-3 irregular rows; medial limb with 2 irregular rows of pointed conical teeth (Fig. 18f). Nostrils small, anterior nostril terminating in short membranous tube, posterior nostril without flap or marginal ridge. Gill membranes not attached to isthmus, forming deep free fold posteriorly. Preopercle entire, free posterior margin reaching to or just above level of ventral margin of orbit, free ventral margin reaching to about level of midventral margin of orbit; opercular membrane rounded to triangular, extending posterior to pectoral base. Forehead, snout and ventral surface of head naked; cheek scales moderately large, extending forward to vertical at midventral margin of orbit; opercle with anterior part naked, 8-10 large scales posteriorly, except for naked membranous flap dorsoposteriorly. Subopercle naked.

Body scales large, scales on thorax about one-half size of other scales. Lateral line complete, bent abruptly downwards below ninth to twelfth soft rays; laterosensory canal tube with multiple branches (simple, bifurcate in small specimens); canal tube pores terminal and subterminal. Dorsal and anal fins without scaly sheaths; scales on caudal fin extending beyond base about halfway along fin. Dorsal fin length 1.4-1.6 in SL; dorsal fin rays progressively longer posteriorly; first spine 3.5-5.8 in head; ninth spine 1.3-2.0 times length of first; eleventh or twelfth ray usually longest, 1.3-2.2 times length of ninth spine; dorsal and anal spines pungent; interspinous membrane not incised, continuous, extending unsupported about one-third of height of fins beyond tips of spines; posterior tip of dorsal and anal spines pointed (very elongate in TP). Anal fin length 2.3-2.9 in SL; anal fin rays progressively longer posteriorly; first spine 5.7-9.3 in head; third spine 1.6-2.6 times length of first; ninth or tenth soft rays usually longest, 1.4-3.1 times length of third spine; caudal fin rounded; pectoral fins rounded, not reaching vertical through vent, length 1.3-1.7 in head. Pelvic fins long, triangular, reaching beyond pectoral fins (TP with first 2 rays greatly elongate, but not reaching vent), length 1.2-2.2 in head.

Discussion. *Eupetrichthys* is distinguishable from all other pseudolabrines in having a more elongate body, only a rudimentry supraoccipital crest, IX,12 dorsal rays, and the membrane of the dorsal and anal fin continuous and extending unsupported about one-third of the height of the fins beyond the tips of the rays.

Etymology. The generic name *Eupetricthys* is a combination of the Greek *Eu*, beautiful, *petro*, rock, and *ichthys*, fish, in reference to the beautiful colour pattern of the type species.

Eupetrichthys angustipes Ramsay & Ogilby
(Fig. 8; Pl. 4G, 4H; Table 7)

Eupetrichthys angustipes Ramsay & Ogilby, 1888b: 631 (Port Jackson, New South Wales).

Material examined. (25 specimens: 28.4-124 mm SL) NEW SOUTH WALES – Seal Rocks, AMS I.18297-005 (128.4); Long Reef, Collaroy, AMS I.16237-010 (79.5); Port Jackson (Sydney), AMS IB.8389 (124), Jervis Bay, AMS I.16851-029 (2:74-79.8). SOUTH AUSTRALIA – Kangaroo Island, AMS I.20195-001 (4:84.1-99.5). WESTERN AUSTRALIA – Mondrain Island, Recherche Archipelago, AMS I.20224-001 (2:68-100.5); Lucky Bay, Cape Le Grande, AMS I.20220-004 (3:97-103.5); Esperance Bay, AMS I.20226-001 (111); Two People Bay, AMS I.20236-006 (100.5); King George Sound, WAM P.5696 (114.5), Geographe Bay, AMS I.20235-001 (70); Cockburn Sound, AMS I.20229-005 (4:75.7-97); Rottnest Island, AMS I.20242-003 (3:62-97.5).

Diagnosis. Dorsal rays IX,12; body elongate, depth 4.5-5.1 in SL; membrane of dorsal fin continuous, extending unsupported about one-third of height of fin beyond rays.

Colour description. Sexually monochromatic. Ground colour in alcohol pale, darker on dorsum; body with 5 broad dark bands, first band nearly vertical, those behind becoming more oblique and slanted anteroventrally; colour of bands blackish on dorsum, paler below midlateral line; interspaces between bands on dorsum light brown, sharply differentiated from paler interspaces below; head with greyish spots and markings around eye, cheeks and throat; dorsal and anal fins with greyish spots and lines on outer halves of fins; dark blotch between first 2-3 dorsal spines; caudal fin with faint greyish lines; pelvic fins greyish near base; pectoral fins hyaline.

Life colours - ground colour greyish or brownish through to dark green; ventral half of body whitish or yellowish; bands on dorsum black, those on ventral half of body brownish or mauve; dorsal surface of head yellowish brown; cheeks and throat paler, spots and markings black or brownish; dorsal and anal fins brownish or yellowish basally, outer half with series of narrow, transverse pale bluish stripes; margin of fins narrowly edged with pale blue; black spot between first 2-3 dorsal spines; caudal fin with 6-10 narrow brownish bands; pelvic fins yellowish or whitish, reddish brown basally; pectoral fins transparent.

Temporary male sexual colours assumed during courtship displays are much more intense (Pl. 4H). Ground colour red suffused throughout, or some specimens with reddish head and dark dorsum, ventral part of body whitish, bands reddish; spaces between spots and markings on head blue or violet; unpaired fins suffused with pink; outer half of dorsal fin with intense blue transverse lines or rows of dots; anterior

spot on dorsal fin brilliant blue, surrounded by black; anal and caudal fin with intense blue lines along outer half of fins; basal half of pelvic fins red.

Remarks. *E. angustipes* is a small species, the largest specimen examined was 124 mm SL.

Distribution. *E. angustipes* is widespread across southern Australia, occurring in New South Wales, South Australia and southern Western Australia. R. Kuiter (personal communication, 1981) has observed this species at Portsea Hole, Port Phillip Bay, Victoria, and recorded it also from the Kent Group in Bass Strait (Kuiter, 1982). This species usually occurs in sandy areas on the periphery of reefs. The deepest collected specimen was from a depth of 17 m.

Discussion. The holotype of *Eupetrichthys angustipes* Ramsay & Ogilby was registered in the Australian Museum (AMS I.1418), but it could not be found.

Etymology. The specific name *angustipes* is from the Latin *angustus*, slender, and *stipes*, trunk, in reference to the elongate body of this species.

Osteology

The literature on osteology of labrid fishes is scattered and deals either in detail with specific structures (Kner, 1860; Prince, 1893; Delsman, 1925; Yamaoka, 1978; Van Hasselt, 1978, 1979) or is cursory, forming part of a wider study (Gregory, 1933; Ford, 1937; Clothier, 1950; Takahashi, 1962; Quignard, 1966; Nelson, 1967; McAllister, 1968: Monod, 1968; Randall & Springer, 1973; Kusaka, 1974; Liem & Greenwood, 1981; Kaufman & Liem, 1982). Notable exceptions are work by Rognes (1973), Van Hasselt (1979) and Tedman (1980) on the head skeleton of various labrid genera, and unpublished studies by Gomon on the comparative osteology of Western Atlantic species of *Halichoeres* (Gomon, 1971) and of the labrid tribe Hypsigenyini (Gomon, 1979).

The following description summarises the osteological characteristics of species of the pseudolabrine group and forms a basis for comparison with other labrids. In many cases bone structure within the pseudolabrine group is virtually identical, and except where variation occurs, only a typical example of the individual element or series of bones is illustrated. A key to abbreviations used in labelling the illustrations is given in Table 8.

Table 8. Abbreviations used in figures 9-24.

an	– angular	met	– metapterygoid
ara	– anal ray	mex	– medial extrascapular
art	– articular	mx	– maxilla
asp	– anal spine	n	– nasal
boc	– basioccipital	npz	– neural prezygopophysis
bpt	– basipterygium	nsp	– neural spine
br	– branchiostegal ray	o	– opercle
bso	– basisphenotic	pa	– parapophysis
ch	– ceratohyal	pah	– parhypural
cl	– cleithrum	pal	– palatine
cor	– coracoid	par	– parietal
d	– dentary	pc	– postcleithrum
dh	– dorsal hypohyal	pcr	– procurrent caudal ray
dra	– dorsal ray	pd	– predorsal
dso	– dermosphenotic	per	– pectoral ray
dsp	– dorsal spine	plr	– pelvic ray
e	– ethmoid	pm	– premaxilla
ect	– ectopterygoid	po	– preopercle
eh	– epihyal	pr	– pleural rib
ehr	– epihaemal rib	pri	– principal caudal ray
ent	– entopterygoid	pro	– prootic
eoc	– exoccipital	pso	– parasphenoid
ep	– epibranchial	pt	– posttemporal
epo	– epioccipital	pto	– pterotic
epr	– epipleural rib	pts	– pterosphenotic
epu	– epural	ptp	– pterygiophore
f	– frontal	q	– quadrate
ha	– haemal arch	ra	– radial
hm	– hyomandibular	s	– symplectic
hp	– haemapophysis	sc	– scapula
hyp	– hypural	scl	– supracleithrum
ih	– interhyal	so	– subopercle
io	– infraorbital	soc	– supraoccipital
iop	– interopercle	spo	– sphenotic
iph	– infrapharyngobranchial	up	– upper pharyngeal
la	– lacrymal	v	– vertebra
le	– lateral ethmoid	vh	– ventral hypohyal
lex	– lateral extrascapular	vo	– vomer

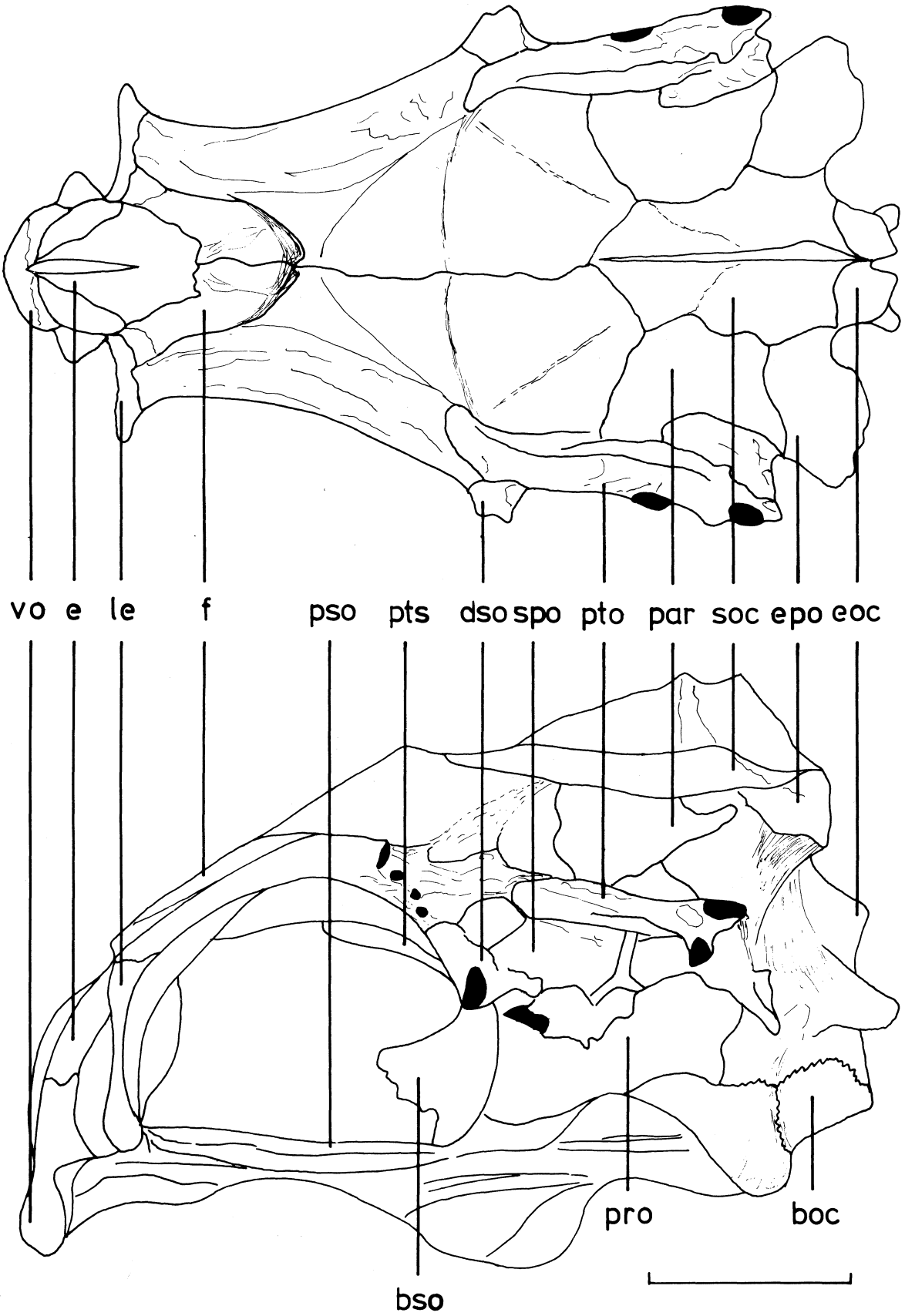

Fig.9. Neurocranium (dorsal and lateral view) of *Pseudolabrus luculentus*, 112 mm SL. Scale represents 5 mm.

NEUROCRANIUM (Figs 9, 10). The neurocranium is robust and compact, as wide as deep, and about 1.5 times as long as deep. The vomer is toothless and projects anteroventrally from the front of the neurocranium. Viewed dorsally, the vomer is a concave, spoon-shaped bone with a low, knob-like, posterolaterally directed process on each of the lateral margins of its anterior face. These processes form anterior articular surfaces for the leading edge of the respective palatines. A thin vertical septum connects the posteroventral surface of the vomer with the horizontal shaft formed by the vomer and adjoining parasphenoid. A low medial ridge (reduced or absent in some species) arises about halfway up the anterior face of the vomer and is continued dorsally on the median ethmoid.

The lateral ethmoids are paired bones enclosing the median ethmoid on either side. Anteriorly, each has a ventrolaterally projecting wing-like process that forms the anterior rim of the orbit. The free tip of each lateral process forms a syndesmotic joint with the proximal process of its respective lacrymal (first infraorbital). The junction of the wing-like process and the vertical face of the lateral ethmoid forms a broad notch which cradles the dorsoposterior edge of its respective palatine. An olfactory foramen opens mesoposteriorly through the lateral ethmoid about halfway up the anterior face and just lateral to the suture with the median ethmoid. A foramen for the superficial opthalmic nerve opens mesoposteriorly just anterior to the lateral ethmoid-frontal joint.

The paired frontals are relatively long, and taper anteriorly. The mesial margins of the frontals overlap unevenly along the top of the neurocranium. The curved distal edges of the frontals, which form the dorsal margin of the orbit on either side, enclose the supraorbital sensory canals. These open to the epidermal surface through one or more dorsal pores in the frontals, and terminate anteriorly in one or more pores near the frontal-lateral ethmoid joint. A feature of the anterodorsal surface of the neurocranium is a strong mesial depression of the anterior frontals. This recess partially encloses the distal ends of the ascending process of the premaxillae, and forms the ascending process fossa. In some species the posterodorsal surface of the frontals has a low transverse crest extending across the skull from the anterodorsal margin of the pterotic on either side, and enclosing the supratemporal fossa. The supraoccipital bears a low to moderately high mid-dorsal crest along its length.

The epioccipitals are bilaterally paired bones at the dorsoposterior corners of the neurocranium. Each extends laterally as a horizontally directed wing-like process, the upper surface of which is flattened or slightly concave and articulates with the ventral surface of the anterodorsal prong of its respective posttemporal. The posterior edge of the lateral face of the parietal forms the anterior wall of the posttemporal fossa. A triangular, cartilaginous or thinly ossified cranial hiatus, bordered by the parietal, epioccipital and pterotic, lies on each side of the skull just anterior to the posttemporal fossa. The pterotic consists of a basal portion, forming part of the lateral neurocranium, and a superficial supratemporal-intertemporal portion of dermal origin (Rognes, 1973) which encloses the postorbital laterosensory canal. The dermosphenotic (seventh infraorbital) is firmly attached to the anterolateral edge of its respective sphenotic. A ventrolaterally produced arm of the anterior surface of the sphenotic provides a surface for insertion of the levator palatini muscle. A notch in the midventral surface of the sphenotic forms the anterior articular fossa of the hyomandibular. The intercalar (opisthotic) appears to be fused with the pterotic and is difficult to differentiate. The orbitosphenotic is absent. The bilaterally paired pterosphenotics form the anteroventral wall of the cranial case, and join the basisphenoid ventrally. The basisphenoid has a thin medial crest of variable shape that extends into the interorbital space and forms a well-developed interorbital septum. The prootic is a large bone that encloses the myodome laterally and with the exoccipitals forms the lateral floor of the cranial cavity. Anterolaterally, the prootic is pierced by the anterior and posterior openings of the pars jugularis of the trigeminofascialis chamber. Posterodorsally, the prootic is indented to form part of the subtemporal fossa. The exoccipitals enclose the posterior portion of the neurocranium and enclose dorsally and laterally the large posterior foramen magnum. The posteroventrally produced exoccipitals form the dorsal portions of a triangular articular condyle and articulate by way of a syndesmotic joint with the respective anterolateral condylar surface of the first vertebra.

The basioccipital is a small bone lying at the posteromedial end of the neurocranium. The circular posterior end of the basioccipital is flared to form the large disc-shaped portion of the tripartite condyle that articulates with the centrum of the first vertebra. The parasphenoid is a long narrow bone bridging the ventral neurocranium. Posteriorly, the parasphenoid possesses a low to moderately deep, narrow ventral keel which originates on the midline beneath the posterior portion of the orbit. A short, laterally thickened second keel, situated in front of the basioccipital, is flanked on either side by the ventrally domed productions of the parasphenoid. These ventrally projecting domes of bone form an attachment site for the ligaments to the upper pharyngeals. The otoliths consist of a large sagitta, a moderately sized lapillus, and a tiny asteriscus. The sagitta (Fig. 11) is a laterally flattened, ovoid-shaped bone. Along its convex mesial surface just above the anteroposterior midline is a shallow sulcus, which terminates anteriorly in a slight notch. Laterally the sagitta is slightly concave and bears no grooves or markings.

SUPERFICIAL DERMAL BONES (Fig. 12). The superficial dermal bones are represented by the infraorbitals (circumorbitals of some authors) and

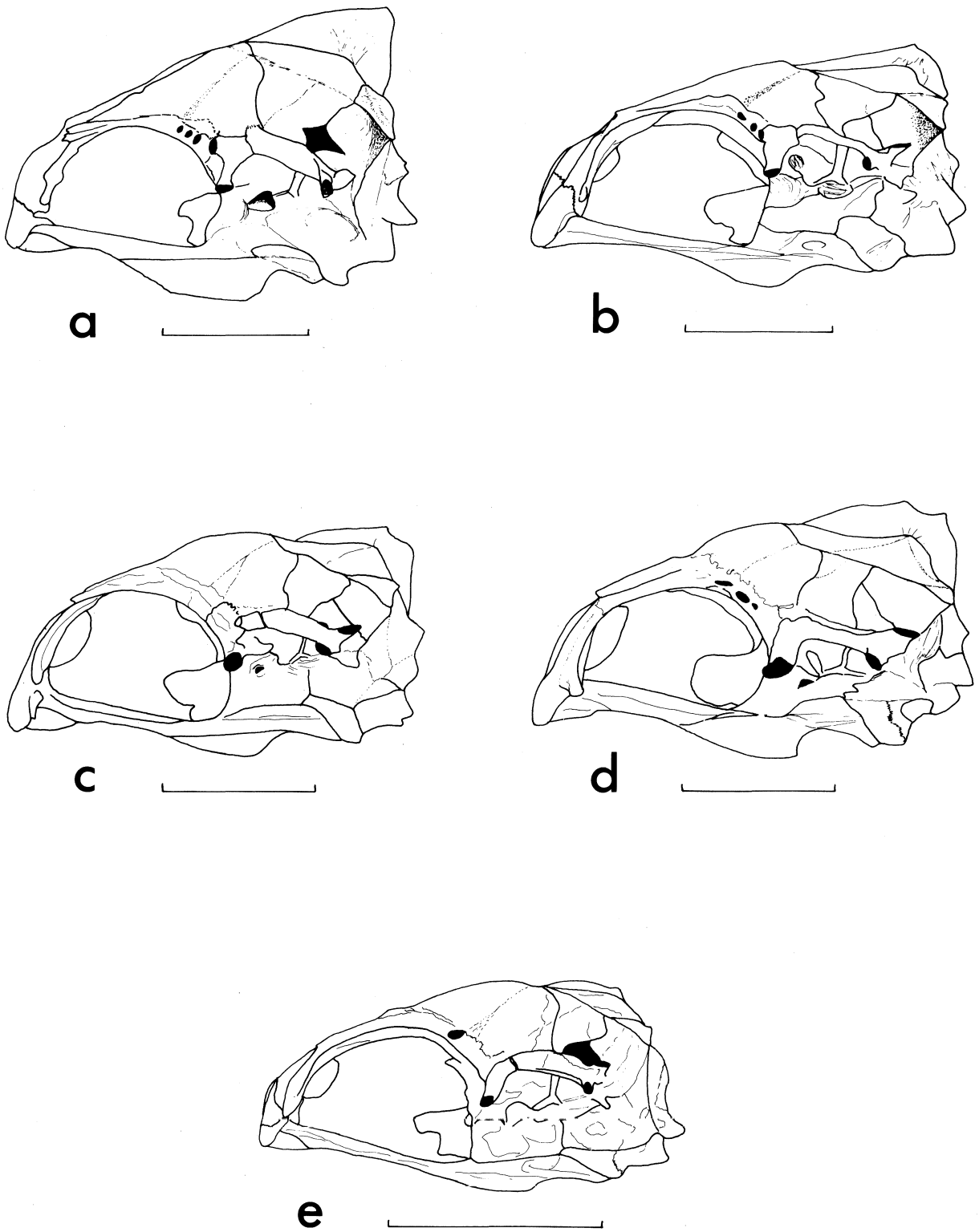

Fig.10. Neurocranium (lateral view): a, *Dotalabrus alleni,* 70 mm SL; b, *Notolabrus fucicola,* 80 mm SL; c, *Pictilabrus viridis,* 69 mm SL; d, *Austrolabrus maculatus,* 75 mm SL; e, *Eupetrichthys angustipes,* 48.5 mm SL. Scale line represents 5 mm.

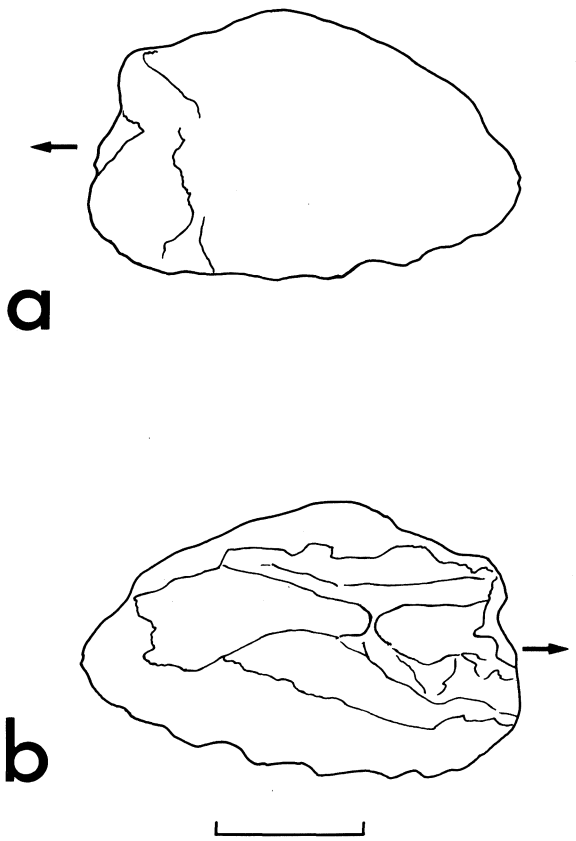

Fig.11. Otolith (sagitta) of *Pseudolabrus luculentus*, 119 mm SL: a, lateral view; b, mesial view. Arrow indicates anterior direction. Scale represents 1 mm.

nasals. No supraorbitals are present. Seven infraorbitals, including the lacrymal and dermosphenotic, are present (except for *Austrolabrus* and *Pictilabrus* which usually have the second and third infraorbitals fused). The lacrymal (first infraorbital) is a large, flattened, and anteroventrally-expanded bone situated at the anterior ventral margin of the orbit, and encloses the anterior portion of the suborbital laterosensory canal. This canal opens on the lacrymal through three to four pores situated somewhat anterodorsally, anteroventrally and mesoventrally, and is continued posteriorly by the second infraorbital. The second through fifth infraorbitals are simple, narrow, or ventrally expanded bones forming the ventral and posterior margins of the orbit. Each infraorbital is overlapped posterodorsally by its successor, and the suborbital cephalic laterosensory canal is continuous throughout the series. The enclosed suborbital laterosensory canal opens ventrolaterally in each infraorbital through one to three pores which vary in shape and size. In some species they are irregular slit-like openings, while in others they are simple, rounded pores; where the infraorbitals are expanded ventrally, the pores open through a ventral extension of the laterosensory canal. The dermosphenotic (seventh infraorbital) is fused to the anterolateral surface of the sphenotic and encloses the portion of the suborbital laterosensory canal that joins dorsally with the supraorbital and postorbital canals of the frontal and pterotic respectively.

The nasals are simple, bilaterally paired bones, attached posteriorly on either side to the lateral leading edge of the frontals. The nasals enclose the forward, terminal extension of the supraorbital cephalic laterosensory canal. This canal opens to the surface at both ends of the nasal and also through one to two small pores in the dorsal surface of the bone.

MANDIBULAR ARCH (Fig. 13). The paired premaxillae are joined anteriorly along the ventromedial edges of their ascending processes. The ascending process is relatively long and narrow and is received dorsally by the ascending process fossa of the frontals. The horizontal alveolar process is somewhat shorter and thicker and forms an angle of about 60° with the ascending process. The posterior end of the alveolar process is curved ventrally and contacts the ventral tip of its respective maxilla. The premaxilla possesses a large, recurved canine (forwardly pointed in *Dotalabrus*) at its anteroventral corner, and a single row of progressively smaller canine teeth along its ventral edge. A second row of small canine teeth (absent in *Dotalabrus*) lie mesially behind the anteriormost outer canines, and in some species an enlarged, forwardly pointing canine (sometimes two) projects from the posterior end of the alveolar process.

The maxilla is an elongate, laterally compressed bone consisting of a nearly vertical shaft with an anteriorly recurved arm directed mesoventrally from its upper tip. The mesial arm and upper portion of the maxilla form a vertical groove that articulates with the midposterior edge of its respective ascending premaxillary process. The maxilla is attached dorsally by ligaments to the tip of its respective palatine. Posteroventrally, the maxilla is expanded and is attached by ligaments to the dorsoposterior corner of its respective dentary.

The dentary is an anteriorly directed V-shaped bone. The opposing pair of dentaries abut smoothly or are joined anteroventrally by a weakly interdigitating suture. Posteriorly, the broad notch formed by the upper and lower limbs of the dentary, receive and partly overlap the anterior process of the articular. The dentary bears an enlarged, backwardly curved canine (forwardly curved in *Dotalabrus*) at its anterior tip, and an outer row of progressively smaller lateral canines (second canine larger than first in *Pseudolabrus*). A second row of small canine teeth (absent in *Dotalabrus*) lie immediately inside of the anteriormost outer canines.

The articular is produced anteriorly as a semiconical process that articulates with the posterior notch on the dentary. Posteriorly, the articular has a short, tapered dorsal process. Ventrally, the posterior base of the articular is relatively broad and is notched ventroposteriorly to receive its respective angular. The angular is a small rectangular bone firmly attached to

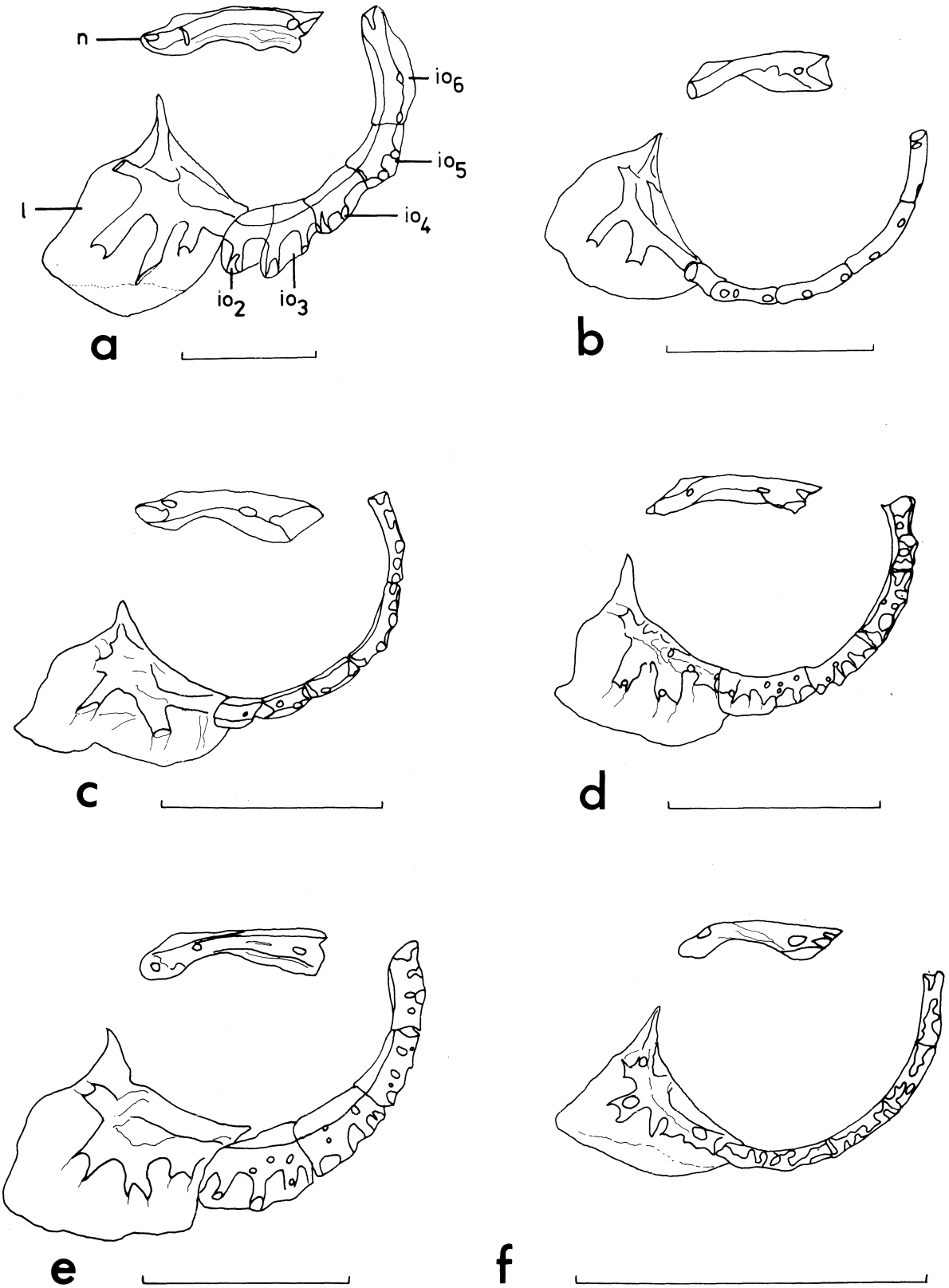

Fig.12. Superficial dermal bones (dorsal view of nasal, lateral view of infraorbital series): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys augustipes,* 48.5 mm SL. Scale lines represent 5 mm.

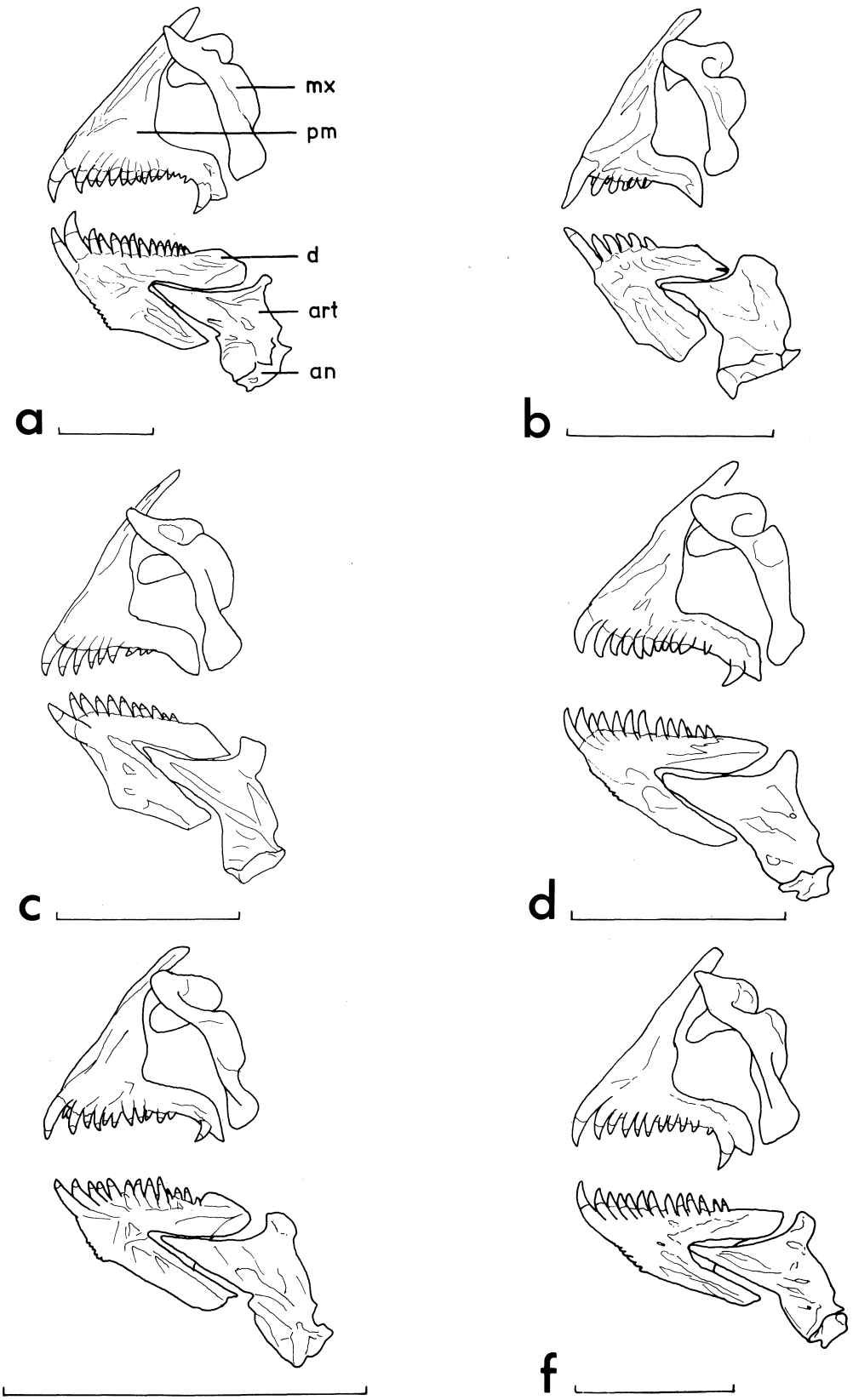

Fig.13. Bones of mandibular arch (lateral view): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

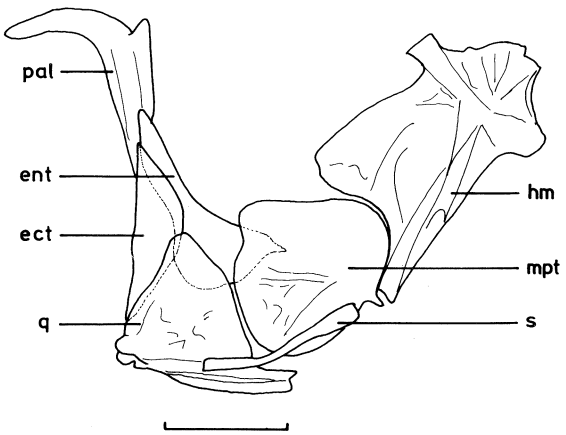

Fig.14. Palatine arch (lateral view) of *Pseudolabrus luculentus*, 112 mm SL. Scale represent 5 mm.

the articular. The angular and posteroventral tip of the articular together articulate with their respective quadrate.

. PALATINE ARCH (Fig. 14). The palatine is a slender, laterally compressed bone. A well-developed anterodorsal process is attached by ligaments to the anterior tip of the nasal and to the dorsal end of the maxilla. A small dorsoposterior stump along with the anterior process of the palatine forms a dorsal notch that articulates with the vertical face of its respective lateral ethmoid. The palatine is attached ligamentously to the anterodorsal surface of its respective ectopterygoid and overlaps the forward tip of the entopterygoid. The ectopterygoid and entopterygoid are elongate, mesolaterally flattened bones that are overlapped at their lower ends by the quadrate. The quadrate, metapterygoid, symplectic, and hyomandibular are well developed and only loosely united. None of the bones of the palatine arch bear teeth.

HYOID ARCH (Figs 15, 16). The ceratohyal and epihyal are joined and sutured (McAllister, 1968) mesolaterally. The interhyal is a short, mesially compressed bone that articulates with the tip of the posterior symplectic and ventral tip of the hyomandibular, and ventrally with the dorsomesial surface of the posterior end of the epihyal. The dorsal hypohyal and ventral hypohyal are firmly attached to the ceratohyal. The ceratohyal lacks a so-called "beryciform" foramen. The branchiostegal rays are narrow, curved, laterally compressed, and are suspended from the ventrolateral surface of the epihyal-ceratohyal-hypohyal complex. There are six branchiostegals (except in *Dotalabrus* which has five), the first two rays narrower and weaker, and the succeeding four rays progressively longer. The basihyal is a rectangular bone lying dorsally overlapping the anterior end of the first basibranchial.

The urohyal (Fig. 16) is a thin, laterally compressed, triangular-shaped bone suspended between the two epihyal-ceratohyal-hypohyal complexes. The dorsal surface is extended upwards just behind the anterior tip to form a distally thickened surface that attaches ligamentously to the lower surface of the first basibranchial. The anterior tip of the urohyal also is expanded to receive ligaments from the ventral hypohyals. The dorsoposterior and anteroventral edges of the urohyal are slightly thickened and laterally expanded. The posterovental tip of the urohyal lacks a ventral spike, typical of some labrids (e.g. *Halichoeres*).

BRANCHIAL ARCHES (Figs 17, 18). There are four branchial arches. Gill rakers are small and well developed. Three paired hypobranchials are present at the bases of the anterior three ceratobranchials. Three medial basibranchials are arranged along the basal midline of the branchial basket. The paired lower pharyngeals (fifth ceratobranchials) (Fig. 18) are fused mesially to form a broad Y- shaped bone, which is covered on its dorsal surface by small conical teeth anteriorly and by blunt molariform teeth posteriorly. Two pairs of pharyngobranchials extend mesially from the upper tips of the epibranchials. The anterior pair are attached ligamentously to the opposing tips of the first and second epibranchials, to the upper anteromedial corner of the second pharyngobranchial, and the posteroventral surface of the overlying parasphenoid. The second pair of pharyngobranchials each comprise two to three ankylosed pharyngobranchials and form the upper pharyngeals. The upper pharyngeals are covered on their ventral surface by conical and molariform teeth that oppose those of the lower pharyngeal. The lateral edge of the upper pharyngeal is attached by ligaments to the flattened mesial tips of the third and fourth epibranchials. The two opposing upper pharyngeals are ligamentously attached to one another mesially and to the posteroventral surface of the parasphenoid dorsally.

PECTORAL GIRDLE (Fig. 19). The pectoral girdle is robust and well developed. The cleithrum is an elongate, ventrally-tapered bone that is attached ligamentously to the scapula and anterodorsal portion of the coracoid. The opposing cleithra are joined mesoventrally. The coracoid possesses a long anteroventrally curved shaft-like projection, the tip of which does not overlap with and is free from the cleithrum. The first pectoral ray is rudimentry (well developed in many other labrids) and articulates directly with the posterodorsal portion of the scapula. The remaining 11 to 14 rays are supported by four laterally compressed radials. The first pectoral ray is unsegmented, the second is segmented and unbranched, and the remaining rays are segmented and branched.

The supracleithrum is an elongate spatulate bone with a thin dorsoposterior rectangular portion. The lower shaft of the bone overlaps and is attached to its respective cleithrum. Anterodorsally, there is a concave socket for reception of the posteroventral

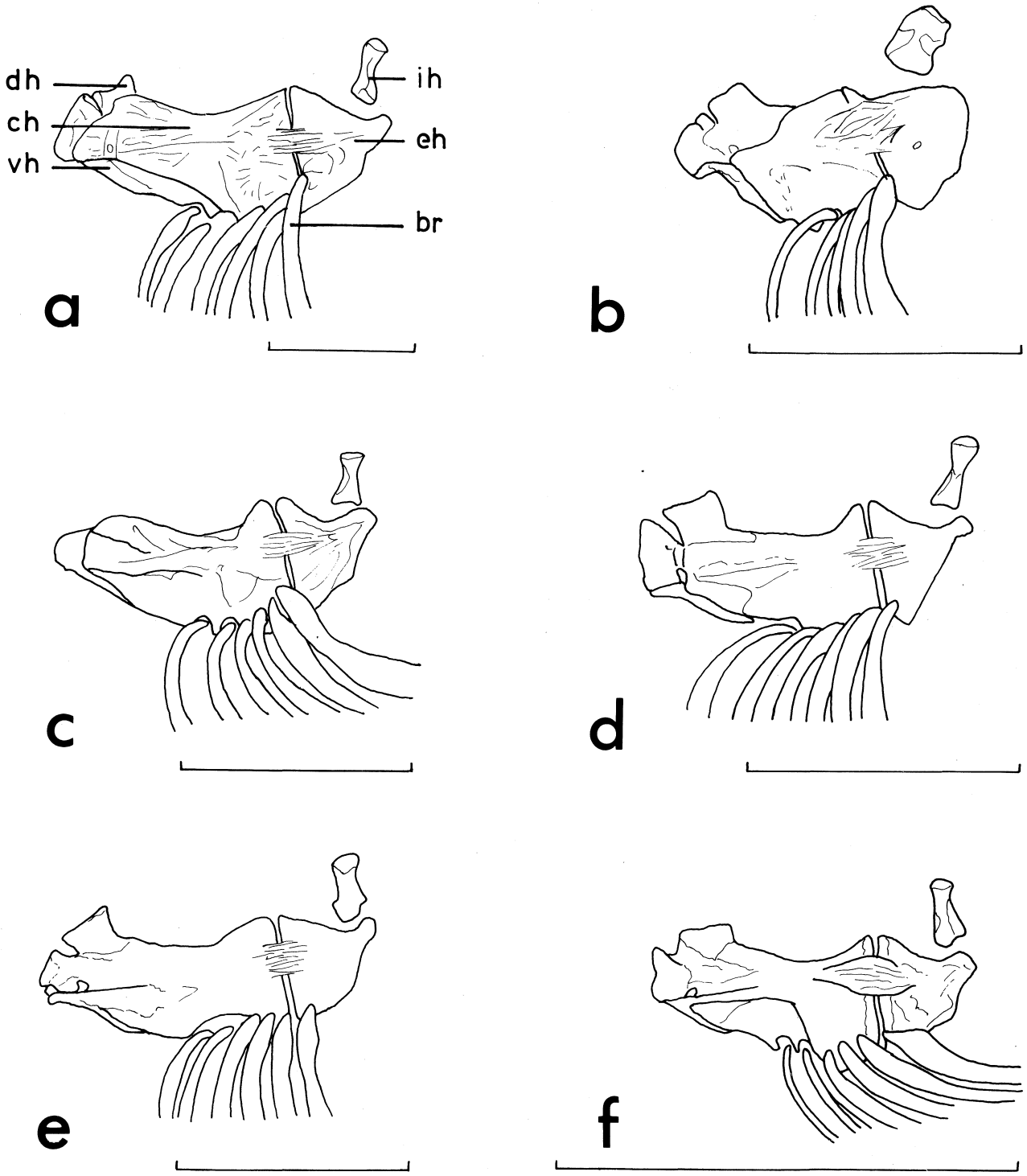

Fig.15. Bones of hyoid arch (lateral view): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

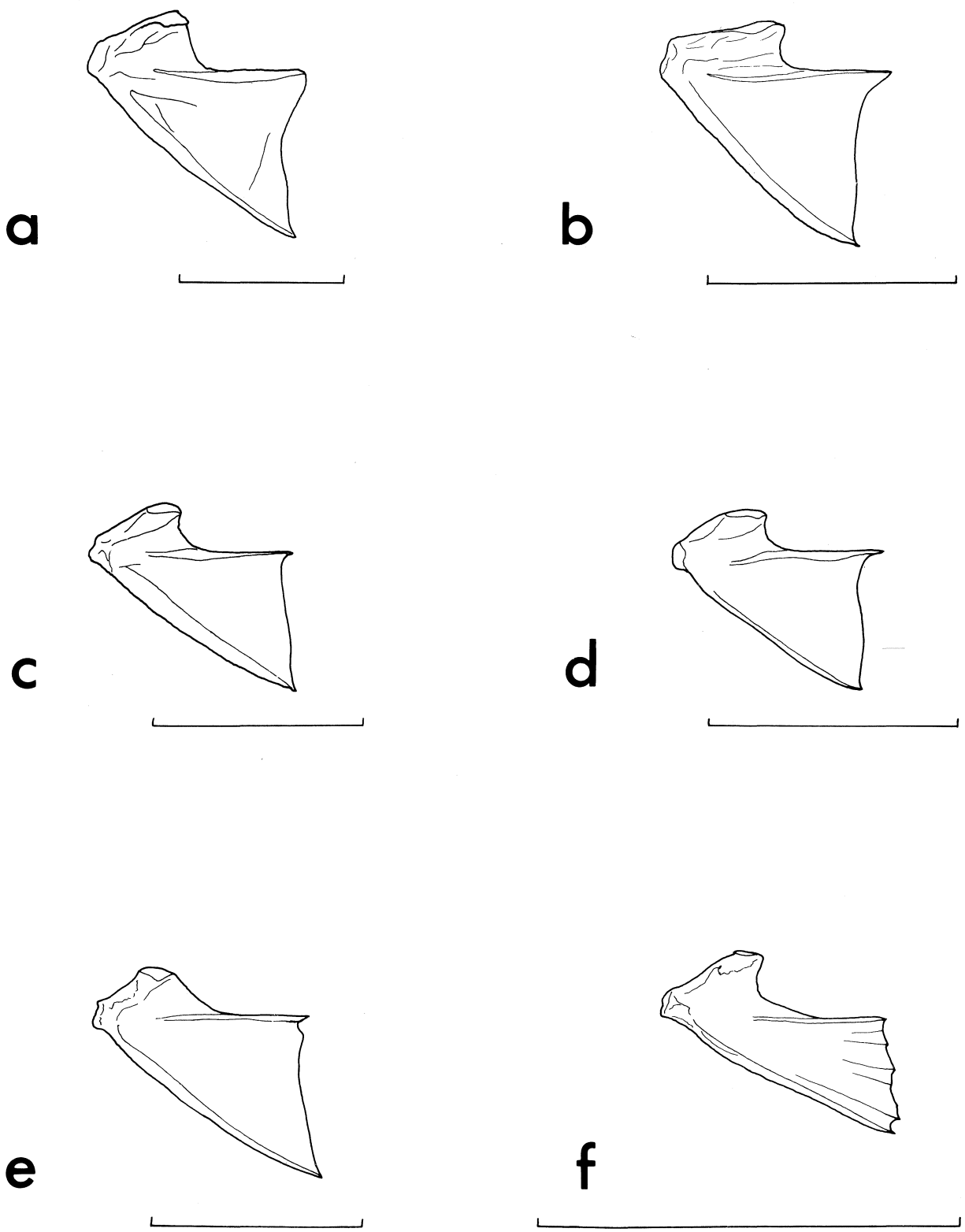

Fig.16. Urohyal (lateral view): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

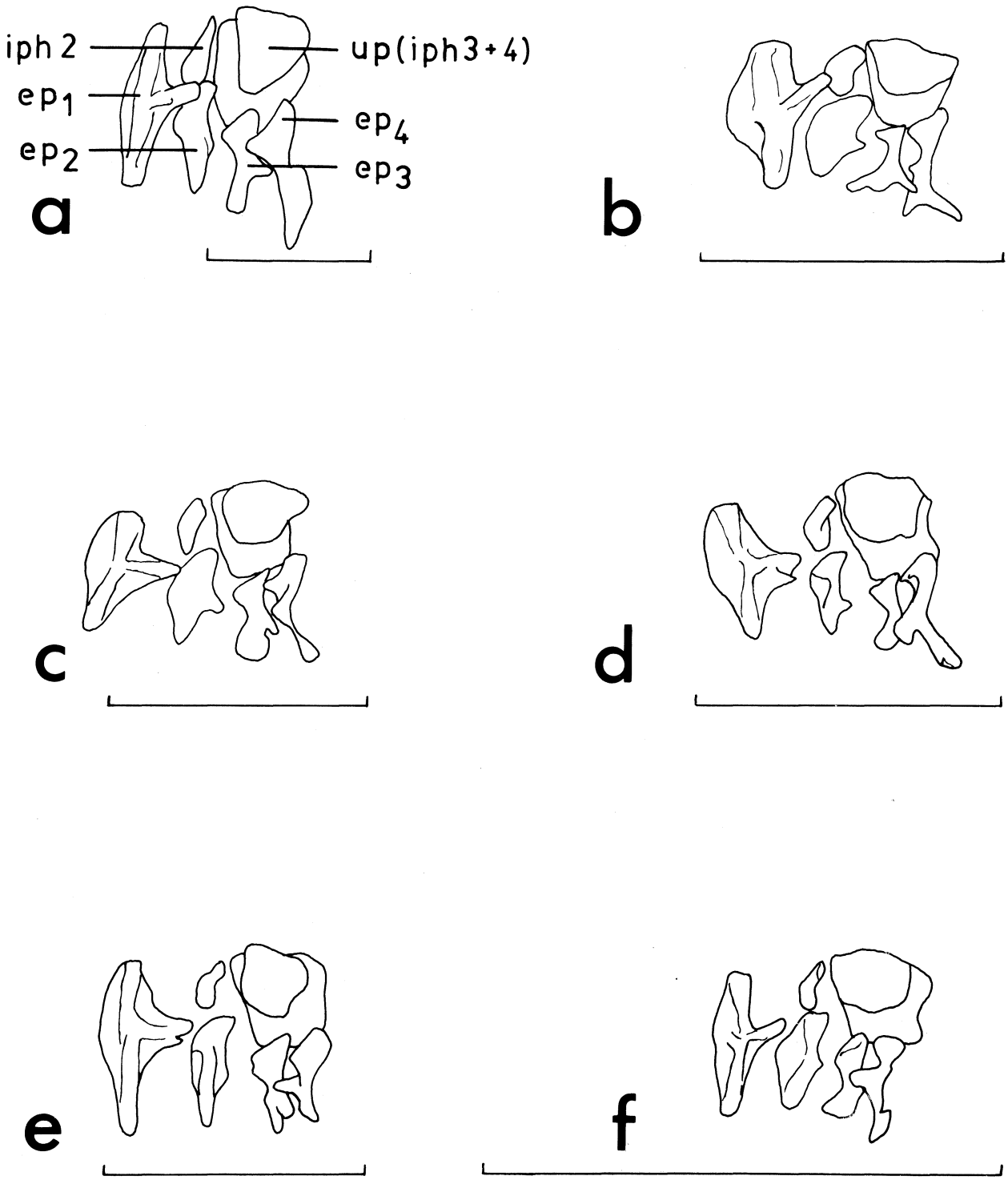

Fig.17. Dorsal branchial bones (dorsal view of left side only, anterior to left): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

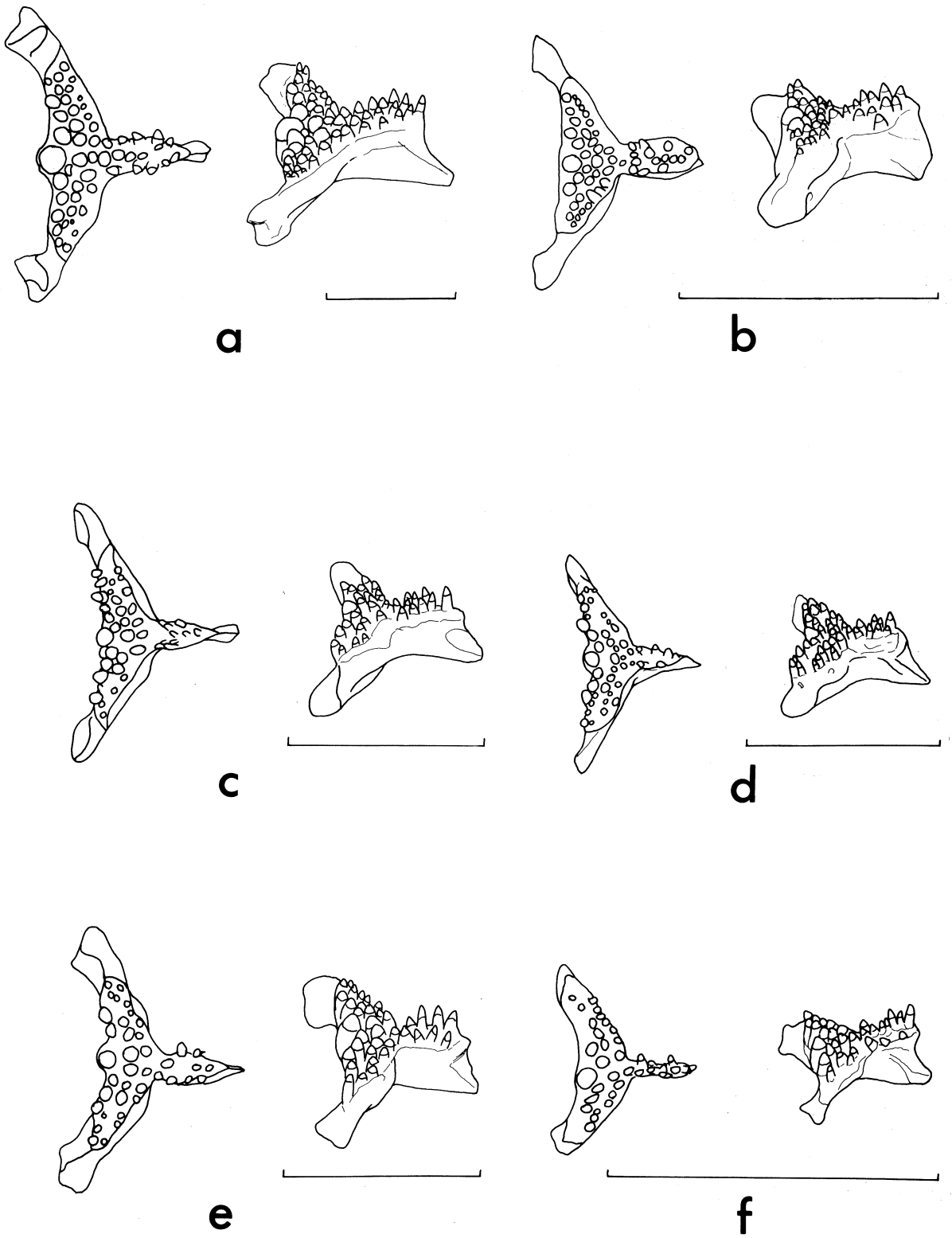

Fig.18. Lower pharyngeal bones (dorsal and dorsolateral views): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

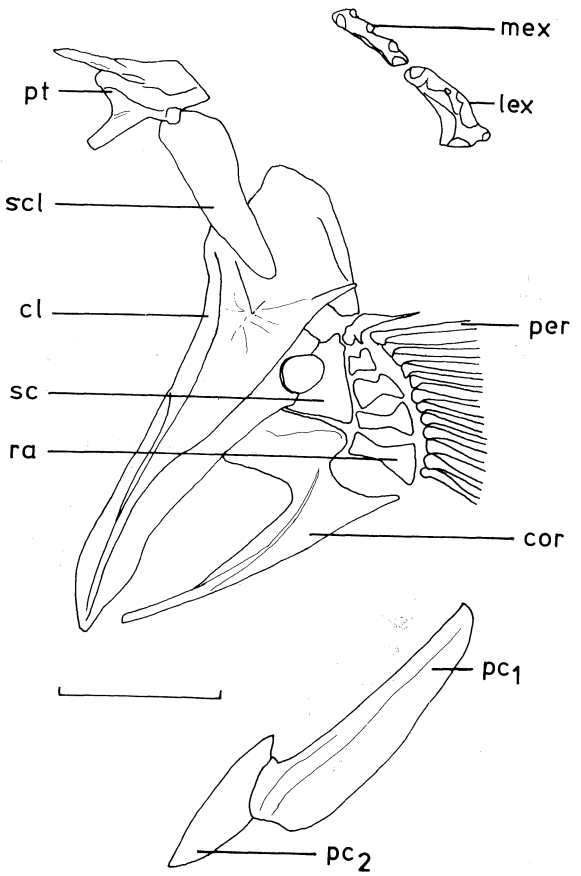

Fig.19. Pectoral girdle (lateral biew) of *Pseudolabrus luculentus,* 112 mm SL. Scale represents 5 mm.

condylar process of the respective posttemporal. The posttemporal is attached to the tip of the epioccipital wing by an anterodorsally directed process, and to the pterotic by an anteroventrally directed process. The lateral extrascapular is a ventrally forked tubular bone that encloses the lower portion of the cephalic laterosensory canal of the supratemporal commissure. Dorsally, this canal is continued through the medial extrascapular, and posteroventrally through the posttemporal. The cephalic laterosensory canal opens through two to three pores in the medial extrascapular. Two overlapping postcleithra lie just inside the base of the pectoral fins.

OPERCULAR SERIES (Fig. 20a). The opercular elements comprise a crescent-shaped preopercle, a broad ovoid opercle, an elongate subopercle, and a broad, anteriorly tapering interopercle. A segment of the cephalic laterosensory canal extends the length of the preopercle, exiting through a series of ventral and posteroventral pores. Dorsally, the preopercular sensory canal is confluent with the postorbital laterosensory canal of the pterotic, and anteroventrally joins with the mandibular sensory canal of the articular. None of the opercular bones is serrate or spinous.

PELVIC GIRDLE (Fig. 20b). The pelvic girdle consists of bilaterally paired basipterygia that support the basal elements of the pelvic fin posteriorly. The basipterygia are tapered bones, joined mesially at their anterior and posterior ends. One spinous and five segmented branched rays articulate posteriorly with each basipterygium.

AXIAL SKELETON (Figs 21, 22, 23). The vertebral column consists of 25 vertebrae. The centra are amphicoelous, constricted midlaterally, and are pierced at their axial centre by a notochordal canal. Each centrum typically has a short neural arch bearing an anteriorly grooved neural spine dorsomedially. Ventrally, the anterior (precaudal) centra bear a pair of parapophyses while the posterior (caudal) centra bear a haemal spine or (anteriorly) a well-developed secondary haemal arch. The anterior part of the vertebral column comprises nine precaudal vertebra that are characterised by the absence of a pleural (ventral) spine. The centrum of the first precaudal vertebra articulates anteriorly with the basioccipital. The first centrum has a well-developed, autogenous neural arch with a short neural spine. The parapophyses of the first centrum are dorsally located on the anterior base of the neural arch and articulate with the exoccipital condyles. The first pair of epipleural ribs articulate on either side with the anterolateral margin of the neural arch. The second centrum bears a well-developed neural spine and a pair of rudimentry neural prezygopophyses which extend anterodorsally on either side of the base of the neural arch. The parapophyses of the second centrum are located anterolaterally close to the dorsal surface of the

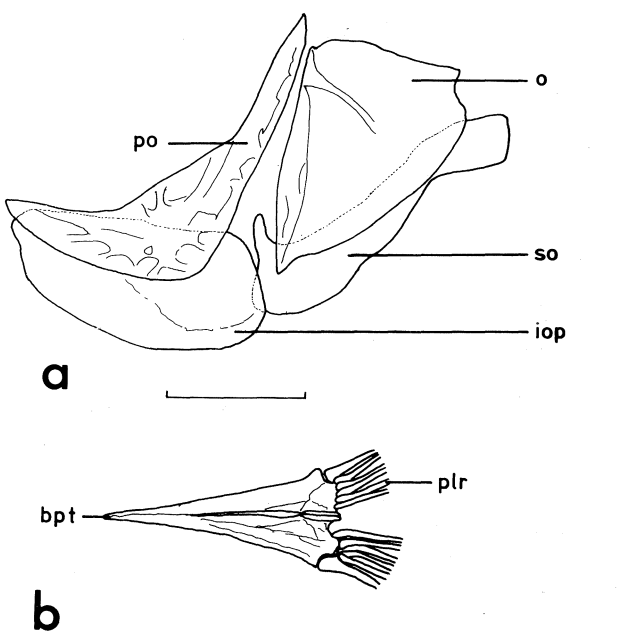

Fig.20. a, opercular bones (lateral view) of *Pseudolabrus luculentus,* 112 mm SL; b, pelvic bones (dorsal view) of *P. luculentus,* 112 mm SL. Scale lines represent 5 mm.

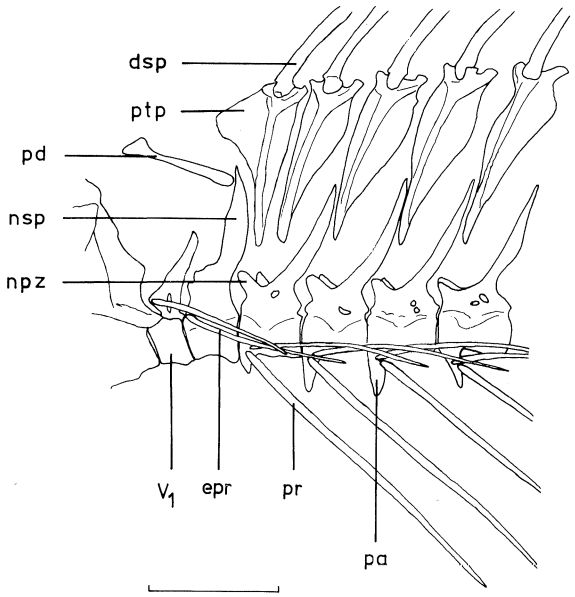

Fig.21. Anterior axial skeleton (lateral view) of *Pseudolabrus luculentus*, 78 mm SL. Scale represents 5 mm.

centrum and bear the second epipleural ribs. The third through ninth vertebrae all have well-developed neural prezygopophyses on either side at the base of the neural arch. The parapophyses are successively more elongate and are located anterolaterally near the ventral surface of the centrum. As well as bearing an epipleural rib, each parapophysis bears an autogenous pleural rib on its posterior edge. The parapophyses of the posterior 1-5 precaudal vertebrae usually are joined by a narrow transverse bridge of bone which encloses a small (primary) haemal arch. These bridged parapophyses have been termed haemapophyses (Clothier, 1950; Takahashi, 1962).

The posterior part of the vertebral column comprises 16 caudal vertebra (including the preterminal and terminal centra). The first (tenth) caudal vertebra typically has a completely, or nearly completely, fused haemal spine (*Dotalabrus, Notolabrus*) or a well-developed secondary haemal arch (*Pseudolabrus, Austrolabrus, Pictilabrus, Eupetrichthys*). The eleventh and subsequent vertebrae have a completely fused haemal spine. The caudal vertebrae show a progressive reduction in size of the neural and haemal spines and in development of the neural prezygopophyses. The epipleural ribs of the precaudal vertebrae are continued on the caudal vertebrae as epihaemal ribs which attach laterally to the base of their respective secondary haemal arch or haemal spine, and are associated with the tenth and eleventh or twelfth vertebra (*Dotalabrus, Notolabrus*), or tenth through thirteenth to fifteenth vertebra (*Pseudolabrus, Austrolabrus, Pictilabrus, Eupetrichthys*).

DORSAL FIN (Figs 21, 22). A narrow club-shaped or hooked predorsal (supraneural) extends anterodorsally from in front of the tip of the second neural spine, its distal end lying below the epidermal surface of the nape posterior to the supraoccipital crest. Twenty (21 in *Eupetrichthys*) dorsal pterygiophores support the nine spinous and 11 (12 in *Eupetrichthys*) branched, bilaterally paired, segmented rays of the dorsal fin (the last two rays are closely apposed basally and counted as a single unit). The base of the first two pterygiophores are located between the second and third neural spines, while the remaining pterygiophores are situated separately between succeeding pairs of spines. The anterior nine pterygiophores each has a long, narrow, spike-like shaft bordered anteriorly and posteriorly by a broad ventrally tapered medial bony plate. Each dorsal spine is attached by a ring joint to its own pterygiophore. The first eight pterygiophores each has a short dorsoposterior projection. On the ninth pterygiophore this projection is laterally compressed and expanded and forms the basal articulation for the first dorsal ray. The remaining pterygiophores lack an anterior blade, and the posteroventral expanded portion of each articulates with the proximal radial of the dorsal ray behind it. The last pterygiophore is reduced to a rudiment and lies directly beneath the bases of the last two rays.

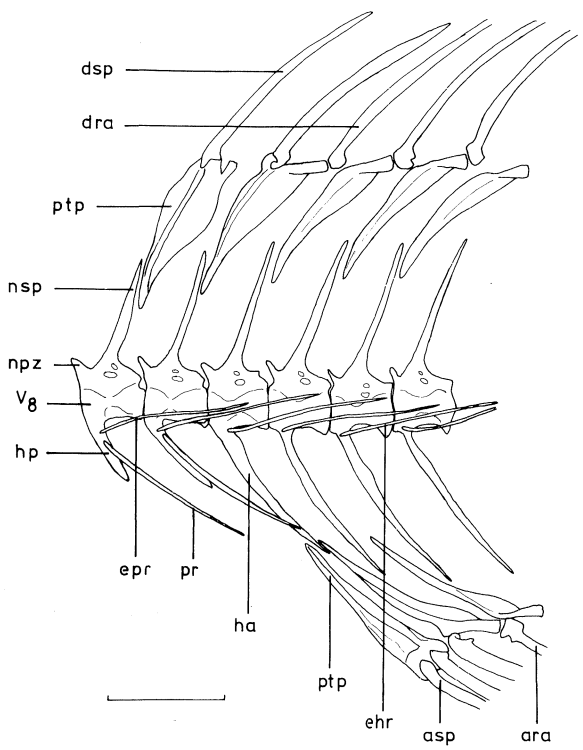

Fig.22. Middle axial skeleton (lateral view) of *Pseudolabrus luculentus*, 78 mm SL, showing posterior precaudal vertebrae (V 8-9) and anterior caudal vertebrae (V 10-13). Scale represents 5 mm.

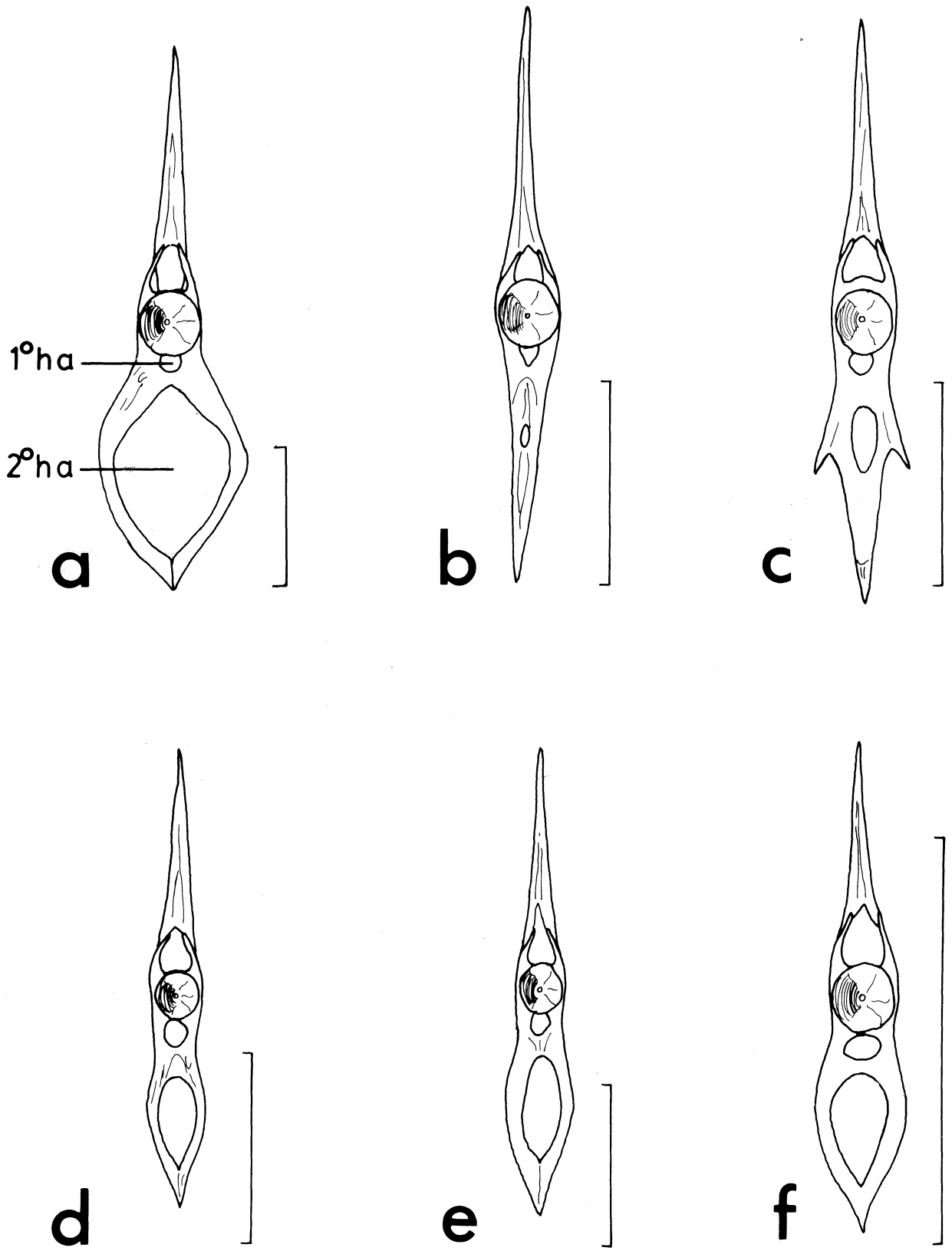

Fig.23. First caudal vertebra (V 10) showing haemal arch or haemal spine development (anterior sectional view): a, *Pseudolabrus luculentus,* 112 mm SL; b, *Dotalabrus alleni,* 70 mm SL; c, *Notolabrus fucicola,* 80 mm SL; d, *Pictilabrus viridis,* 69 mm SL; e, *Austrolabrus maculatus,* 75 mm SL; f, *Eupetrichthys angustipes,* 48.5 mm SL. Scale lines represent 5 mm.

ANAL FIN (Fig. 22). Twelve anal pterygiophores support the three spinous and ten branched, bilaterally paired, segmented rays of the anal fin (the last two rays are closely apposed basally and counted as one). The first pterygiophore inserts in front of the secondary haemal arch or spine of the tenth vertebra. Posteriorly, each of the remaining pterygiophores is positioned separately between successive pairs of haemal spines. The first pterygiophore appears to comprise the fused elements of what probably were once separate pterygiophores, and receives the two spinous rays in a tandem pair of ring joints on its ventral edge. The first spine is robust, about half as long as the second. The second anal pterygiophore bears the third anal spine midventrally, and possesses a laterally compressed, posterior projection ventrally which forms the point of articulation with the first segmented ray. The remaining pterygiophores and associated segmented rays resemble the corresponding structures of the posterior dorsal fin. The terminal anal pterygiophore is reduced to a rudiment.

CAUDAL SKELETON (Fig. 24). The caudal skeleton comprises a modified 24th (preterminal) and 25th (terminal) centrum and associated dermal bones. The neural and haemal spines of the preterminal centrum are autogenous (in larger specimens the haemal spine is fused to the base of the centrum) and have laterally compressed bony crests along their anterior margins. The terminal centrum is fused dorsoposteriorly to the uroneural and to the ankylosed upper neural plate which comprises hypurals 3 and 4 (Nybelin, 1963). A small fifth hypural (Nybelin, 1963) is located above the posterodorsal portion of the upper hypural plate, and an elongate epural lies along the posteroventral margin of the preterminal neural spine. The ventral hypural plate is composed of the ankylosed hypurals 1 and 2 and is fused to the posteroventral surface of the terminal centrum. A slender parhypural, with a laterally compressed anterior crest is attached to the anteroventral surface of the terminal centrum. The caudal rays usually comprise 5 to 7 small procurrent, unsegmented, unbranched rays between the tip of the neural spine of the 23rd vertebra and the tip of the epural; two segmented unbranched rays, plus six segmented branched rays between the epural and lower corner of the dorsal hypural; six segmented branched rays, plus two segmented unbranched rays between the upper corner of the ventral hypural and the tip of the parhypural; 5 to 6 small procurrent unsegmented unbranched rays between the parhypural and haemal spine of the 23rd vertebra.

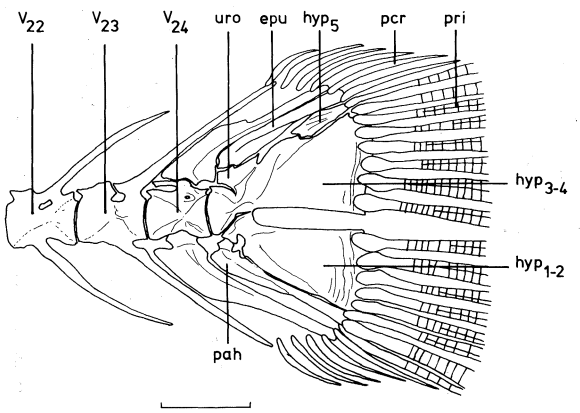

Fig.24. Caudal skeleton (lateral view) of *Pseudolabrus luculentus*, 112 mm SL. Scale represents 5 mm.

Labrid classification and relationships

Previous classifications of the family Labridae, and indeed the suborder Labroidei as a whole, have been based largely on superficial characters (e.g. number of dorsal and anal-fin rays, lateral-line scales etc.) and are generally unsatisfactory. The earliest formal classification was that of Günther (1861) who recognised a single family, Labridae, in which he included six subfamilial groups: Labrina, Hypsigenina, Julidina, Pseudodacina, Scarina and Odacina. *Labrichthys* (including *Pseudolabrus*) was assigned by Günther to the Julidina. Almost contemporaneously, Bleeker (1862a) proposed an alternative classification, removing the scarids and recognising ten groups of genera within the family Labridae: Cheiliniformes, Pseudodaciformes, Cheilioniformes, Pseudolabriformes, Novaculaeformes, Labrichthyformes, Cossyphiformes, Labriformes, Odaciformes and Clepticiformes.

Bleeker (1862a) defined the Pseudolabriformes (type genus *Pseudolabrus*) by the following combination of characters: body oblong or elongate, compressed; scales large to small (26 to more than 120 in lateral line); scales behind caudal base not larger than others; head without ridges, pointed; jaw teeth in a single row, conical; lower pharyngeal triangular, teeth conical or molar like, in one or many rows; preopercle without serrations; dorsal spines 8 or 9; membrane between each spine not incised nor protruding (sic); branchiostegal rays 6. Included by Bleeker in his Pseudolabriformes were the nominal genera *Gomphosus, Julis* (= *Thalassoma*), *Hologymnosus, Pseudocoris, Coris, Anampses, Hemicoris* (= *Coris*), *Platyglossus* (= *Halichoeres*), *Halichoeres, Pseudojulis* (= *Halichoeres*), *Leptojulis, Macropharyngodon, Stethojulis, Guentheria* (= *Halichoeres*), *Hemitautoga* (= *Halichoeres*), *Ophthalmolepis, Hemigymnus, Pseudolabrus, Doratonotus, Novaculichthys* and *Cymolutes*.

Gill (1893b) also recognised the pseudolabrines as distinct, including the group among 11 subfamilies in the Labridae: Labrinae, Cheilioninae, Choeropinae, Xyrichthyinae, Coridinae, Gomphosinae, Anampsinae, Cheilininae, Pseudolabrinae, Clepticinae and Pseudodacinae.

Jordan & Snyder (1902), however, introduced a new

subfamily, Thalassominae, in which they included *Pseudolabrus* along with the nominal genera *Thalassoma, Duymaeria, Anampses, Stethojulis, Hemigymnus, Guentheria, Halichoeres, Coris, Julis, Cheilio* and *Gomphosus*.

Regan (1913a), in his classification of percoid fishes, recognised nine labrid subfamilies (Julidinae, Xyrichthyinae, Cheilininae, Epibulinae, Clepticinae, Harpinae, Pseudodacinae, Labrinae and Malacopterinae) placing *Pseudolabrus* in the Julidinae. Jordan (1923) separated the labrids into three families (Labridae, Coridae and Neolabridae) and included *Pseudolabrus* in the Coridae.

Norman (1966), with some minor name changes, largely adhered to Regan's earlier classification, and the only work to depart significantly from Regan's or Norman's basic classification was that of Fowler (1957) who recognised three subfamilies (Bodianinae, Corinae and Cheilininae) and placed *Pseudolabrus* in the tribe Pseudolabridi within the Corinae.

There is little agreement between any of the foregoing classifications, and with the exception perhaps of Bleeker's, Regan's and Norman's subfamilies, which were based at least partly on osteological characters (mainly jaw dentition and structure of the lower pharyngeal), none of the taxa seem to approach what might be considered monophyletic groups.

Relationships to Other Labroidei

Greenwood *et al.* (1967) included the Labridae, together with the Odacidae and Scaridae, in the perciform suborder Labroidei. Synapomorphies uniting these three families include: (1) fifth ceratobranchials fused mesially to form a lower pharyngeal jaw (Regan, 1913a; Nelson, 1967); (2) first pharyngobranchial cartilaginous or absent (Regan, 1913a; Nelson, 1967); (4) third and fourth pharyngobranchials fused and bearing upper pharyngeal tooth plates (Regan, 1913a; Nelson, 1967); (3) no subocular shelf (Regan, 1913a); (4) 3 gills (Regan, 1913a); (5) diarthrosis between the upper pharyngeal jaws and the basicranium (Yamaoka, 1978; Liem & Greenwood, 1981); (6) levator posterior muscle (LP) the dominant muscle of the lower pharyngeal jaw (Yamaoka, 1978; Liem & Greenwood, 1981); (7) articulation of the lower pharyngeal jaw with the cleithrum by means of a pharyngocleithral joint (Liem & Greenwood, 1981), and (8) hypertrophy of the adductor branchialis muscles (Liem & Greenwood, 1981).

Liem & Greenwood (1981) additionally included the Cichlidae and Embiotocidae in the Labroidei, based on two further synapomorphies: (9) insertion of the fourth levator externus (LE4) and LP muscles on the lower pharyngeal jaw, and (10) functional specialisation of the pharyngeal bite, with the LE4 together with the LP and pharyngocleithrus externus muscles forming the two components of a force couple acting on the lower pharyngeal jaws. These specialisations are not shared by any other teleostean group.

Kaufman & Liem (1982) further suggested the inclusion of the Pomacentridae, based on an additional synapomorphy: (11) the presence of a sphincter oesophagi muscle as a continuous sheet, with no dorsal subdivision. These authors also suggested that the Scaridae and Odacidae be united within the Labridae, and postulated the Embiotocidae to be the sister-group of the Labridae. They considered the Pomacentridae to be the primitive sister-group of other Labroidei.

Independent supporting evidence for Kaufman & Liem's (1982) arrangement and composition of the Labroidei is somewhat equivocal. Morris (1982), in a study of osteology of the Embiotocidae, suggested a sister-group relationship between the embiotocids and pomacentrids based on two proposed synapomorphies: an oblique parietal crest formed by fusion of the extrascapulars with the parietals, and the presence of (1-9) epihaemal ribs. However, the first character is found in at least some labrids, while the second character state (presence of many epihaemal ribs) is here hypothesised as plesiomorphic, and therefore a possible embiotocid-labrid sister-group relationship cannot be ruled out. Richards & Leis (1984) summarised early life history (ELH) characters of the families included by Kaufman & Liem (1982) in the Labroidei, and found at least four synapomorphies (almost total lack of head spination; long, rugose, straight gut which loops relatively late in development; compressed, elongate body; and reduction in principal caudal ray number from the typical percoid complement of 98) shared by larvae of labrids, scarids and odacids. However, they were unable to find any synapomorphies to unite the primitive 'percoid' larval type of pomacentrids and cichlids with the labrid type of larvae. While the lack of synapomorphies uniting pomacentrid and cichlid larvae with those of labrids, scarids or odacids does not falsify Kaufman & Liem's (1982) labroid phylogeny, Richards & Leis (1984) found at least 2 ELH characters of labrids are shared with pseudochromids and they suggested a labrid-pseudochromid relationship should be investigated as an alternative to Kaufman & Liem's proposed phylogeny.

Kaufman & Liem's (1982) composition of the Labridae has been questioned by more recent authors. Richards & Leis (1984) have pointed out that in spite of similarities uniting the three families, there are enough differences between their known larvae to suggest the labrids, scarids and odacids should not be combined into one family at this time. Choat & Randall (1986) have similarly rejected Kaufman & Liem's combination of the Labridae and Scaridae within the same family, arguing that the scarids form a natural grouping both taxonomically and ecologically. Unfortunately, since Kaufman and Liem presented no data to support their recognition of a single family,

Labridae, it is difficult to evaluate the validity of their action. Nonetheless, it is evident from examination of a wide range of labroid genera that the generally accepted concept of the Labroidei (sensu Greenwood *et al.,* 1966) is largely unsatisfactory. Cursory examination of a number of scarid genera, for example, indicates that several characters generally considered to be diagnostic for the family (e.g. jaw teeth fused, predorsal bone absent) are not present in all members of the group. Furthermore, the presence of several specialised scarid-like characters (fused jaw teeth, plate-like pharyngeal teeth, anteriormost haemal spines modified) in the monotypic labrid genus *Pseudodax* suggest a possible sister-group relationship between this taxon and the scarids (Gomon, 1979). Similarly, the odacids have many typically labrid-like features (Gomon & Paxton, 1986), and there is evidence that the odacids, together with the monotypic labrid genus *Cheilio,* might best be regarded as a tribe, Odacini, within the Labridae (Gomon & Russell, unpublished 1981). These interpretations, if correct, underline the paraphyletic nature of the Labridae, Scaridae and Odacidae as generally recognised, and emphasise the need for major revision of the labroid fishes at the family-subfamily level. Pending such a review, however, Norman's (1966) nomenclature for subfamilial groups is retained and I here recognise the family name Labridae for that group which includes the pseudolabrines.

Character Analysis and Out-group Comparison

Character polarity was established following the methodology of Maddison *et al.* (1984). Because of the apparent paraphyletic nature of the Labridae, Odacidae and Scaridae, the immediate sister-group of the labrids within the Labroidei (sensu Greenwood *et al.,* 1966) is unclear. Out-group comparison was therefore made with the Embiotocidae, which was hypothesised by Kaufman & Liem (1982) to be the sister-group of the Labridae including the odacids and scarids. In the following analysis of characters, hypothesised apomorphic (derived) versus plesiomorphic (primitive) character states were determined by comparison with the Embiotocidae, based mainly on published work (Tarp, 1952; Morris & Gaudin, 1976, 1982; Morris, 1982). In most cases the plesiomorphic state was hypothesised to be that shared by all members of the out-group. However, for a few characters that varied or were clearly apomorphic within the Embiotocidae, the plesiomorphic state was determined by additional comparison with the Cichlidae and Pomacentridae, hypothesised by Kaufman & Liem (1982) as the second and third out-groups, respectively, of their Labridae.

The characters in the following list were used to determine the cladistic relationships of the pseudolabrines to other labrid genera (Fig. 25) and within the pseudolabrine group (Fig. 26). Characters are numbered as they appear in the cladograms, and

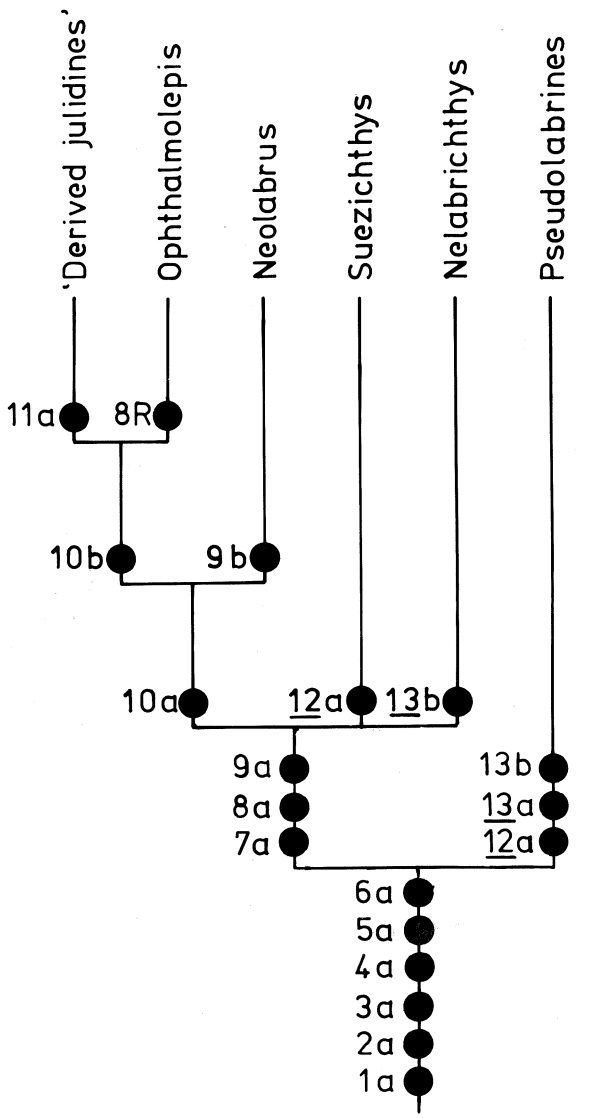

Fig.25. Hypothesised relationships of the pseudolabrines and other julidine genera. Numbers refer to characters discussed in the text, and are located on the branch which possesses the derived state. Homoplasous characters are underlined. Note that in *Ophthalmolepis* character 8 appears as a reversal (R), and that character state **13b** is found in all pseudolabrines except *Dotalabrus*, which possesses character state **13a**.

derived or apomorphic character states are indicated in the text in boldface.

(1) Frontal recess on neurocanium well developed – embiotocids have a rather flat anterior dorsal surface of the neurocranium that lacks a well-developed frontal recess (Morris & Gaudin, 1976), a condition common to many generalised perciforms (Gregory, 1933) and which is hypothesised as plesiomorphic for the Labridae. Gomon (1979) considered the presence of a frontal recess in the anterodorsal surface of the neurocranium of some labrids (**1a**) to be a specialisation in response to elongation of the

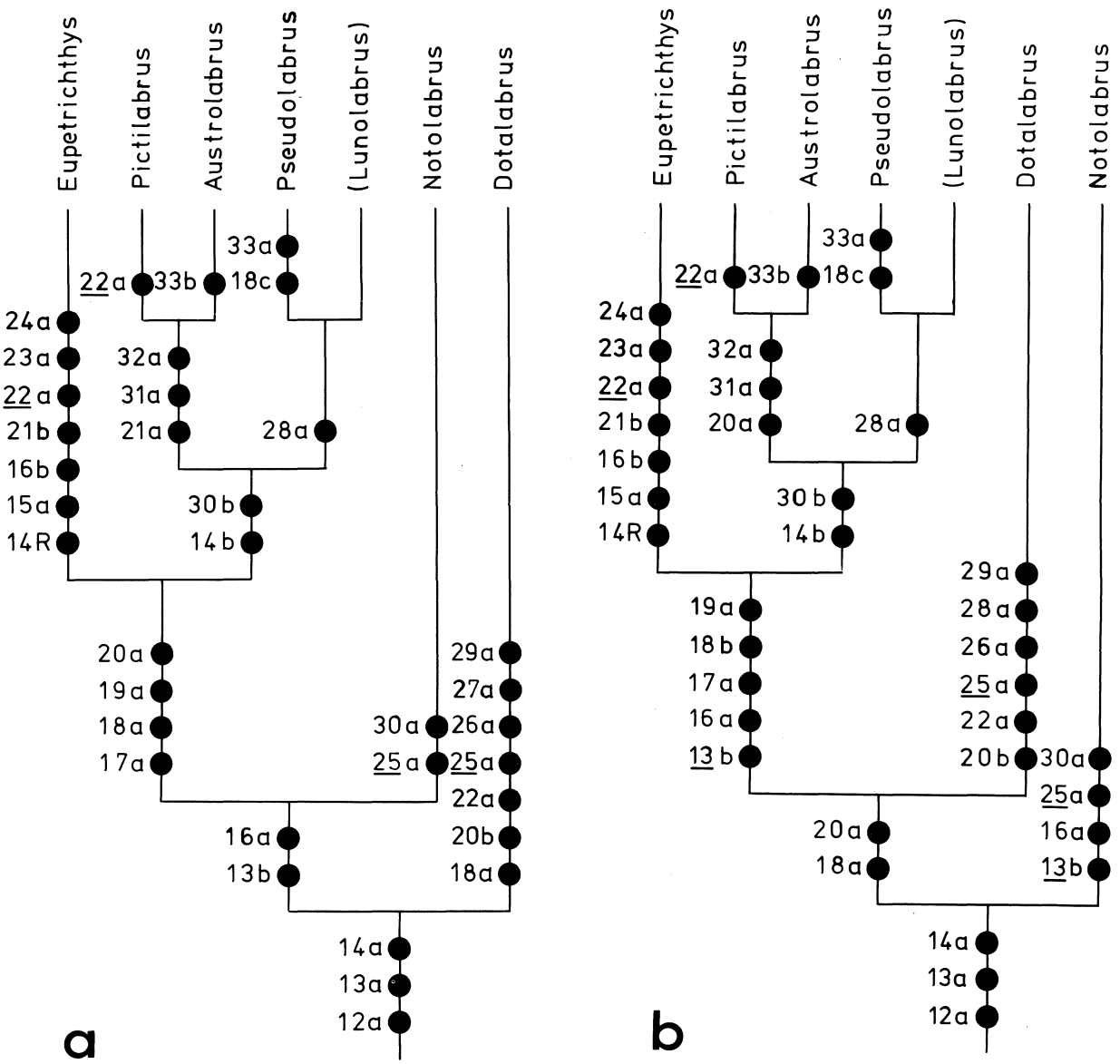

Fig.26. Hypothesised relationships of the pseudolabrine genera: cladograms a and b represent two alternative, equally parsimonius phylogenies. Numbers refer to characters discussed in the text, and are located on the branch which possesses the derived state. Homoplasous characters are underlined. Note that in *Eupetrichthys* character state **15a** is hypothesised to have been secondarily derived, and character 14 appears as a reversal (R).

ascending process of the premaxilla.

(2) Posterior margin of preopercle entire – embiotocids, cichlids and most labrids have a preopercle with an entire posterior margin that does not bear serrations. In most pomacentrids, however, the posterior preopercle margin is serrate, and in some labrid species (e.g. *Hemigymnus*) the preopercle is serrate in juveniles and larvae but becomes entire in adults. On the basis of this ontogenetic change, and the presence of a serrate preopercle margin in at least one of the hypothesised out-groups, I interpret an entire preopercle in labrids as apomorphic (**2a**). The occurrences of this character state in embiotocids and cichlids are seen as homoplasies.

(3) First pectoral ray rudimentry – in embiotocids and the other out-groups the first pectoral ray is moderately elongate, one-fifth to one-half the length of the second ray. Its reduction in size to a mere rudiment in some labrids is considered to be derived (**3a**).

(4) First neural spine reduced or rudimentry – the first neural spine in embiotocids and the other out-groups typically is well developed (Ford, 1937; Clothier, 1950; Takahashi, 1962) and its reduction in some labrids is considered to be derived (**4a**).

(5) Fifth hypural reduced – the primitive perciform caudal skeleton has a well-developed fifth hypural

(Nybelin, 1963). In embiotocids and the other out-groups the fifth hypural is well developed, and this character state is hypothesised as plesiomorphic for the Labridae. Reduction of the fifth hypural in a number of labrid genera is considered to be a derived modification (**5a**) perhaps related to increased reliance on the pectoral fins for locomotion ('labroid swimming').

(6) Lateral line bent abruptly downwards beneath soft dorsal fin – a smoothly curved lateral line occurs in some labrids, embiotocids and pomacentrids as well as most perciforms, and is hypothesised as plesiomorphic. In labrids an abruptly bent lateral line is considered to be derived (**6a**).

(7) Neural prezygopophyses of precaudal vertebrae fused mesially, the anteriormost prezygopophyses dorsoventrally expanded, plate like – in embiotocids and the other out-groups the neural prezygopophyses on the precaudal vertebrae are short, unfused structures (Clothier, 1950; Takahashi, 1962) and this condition is hypothesised as plesiomorphic for the Labridae. Fusion and dorsoventral expansion of the neural prezygopophyses appear to be the derived condition (**7a**) and are modifications which probably serve to strengthen the alignment between vertebrae, thereby reducing vertical distortion in the vertebral column (Gosline, 1971).

(8) Urohyal with posteroventral spike – the shape of the urohyal in embiotocids and the other out-groups is roughly triangular in profile (Kusaka 1974; Morris & Gaudin, 1976) and this shape is hypothesised as the plesiomorphic condition in the Labridae. The development of a posteroventral spike in some labrids is considered to be derived (**8a**).

(9) Dorsal and anal spines slender or flexible – in embiotocids and the other out-groups the dorsal and anal fin spines are well developed, robust and pungent, and this condition is hypothesised as plesiomorphic for the Labridae. A general reduction in size and robustness of the spines (**9a**), or the first anal spine very reduced or rudimentary (**9b**) are considered to be successively derived character states.

(10) Cheeks and opercle naked – in embiotocids and the other out-groups the head is extensively covered with scales, and this state is considered to be plesiomorphic for the Labridae. A reduction of head squamation, with scales confined to a small patch on the cheeks and opercle (**10a**), or scales absent on the cheeks and opercle (**10b**) are considered to represent successively derived states in the labrids.

(11) Gill membranes joined at isthmus – the primitive condition in fishes is for the gill membranes to be separate and free from the isthmus (McAllister, 1968). In embiotocids, the gill membranes are united and free from the isthmus or are joined narrowly to it (McAllister, 1968), the former condition being considered more primitive (Tarp, 1952). For labrids, the hypothesised plesiomorphic state is for the gill membranes to be united but free from the isthmus, and the derived condition is for the gill membranes to be united and joined broadly to the isthmus (**11a**).

(12) Anal fin rays reduced (III,10) – the usual number of anal spines in perciforms is III (Johnson, 1984) with a variable number of soft rays. In the Embiotocidae the number of anal fin rays ranges from III,15 to III,35 (Tarp, 1952) and in the Labridae ranges from III,10 to III,21. The most common number of anal fin rays for labrids is III,15 and Gomon (1979) has hypothesised that this number is plesiomorphic for the Labridae. A reduction in the number of anal fin rays (to <15) is considered here to be derived, with a further reduction to ten rays representing the most derived state (**12a**).

(13) Laterosensory canal tube branched – a simple, unbranched, lateral line canal tube appears to be usual in embiotocids and the other out-groups, and this character state is hypothesised as plesiomorphic for the Labridae. The presence of a bifurcate canal tube (**13a**), or a more complexly branched canal tube (**13b**) in some labrids are considered to be successively derived character states.

(14) Infraorbital sensory canal enclosed and opening through lateral pores or ventrally extended tubes – the infraorbital sensory canal in embioticids is simple with slit-like lateral openings to the surface (Morris, 1981), and this condition is hypothesised as plesiomorphic for the Labridae. Derived states in labrids are for the infraorbital sensory canal to be enclosed and opening to the surface through lateral pores (**14a**) or ventrally extended tubes (**14b**).

(15) Dorsal fin ray elements 20 – in the Embiotocidae the number of dorsal fin ray elements ranges from 22-38 (Tarp, 1952), and Gomon (1979) has hypothesised that the primitive number of dorsal fin ray elements in the Labridae is 22. A reduction in this number to 20 is here considered to be derived. In some slender-bodied labrids, however, the number of dorsal fin ray elements is higher than the hypothesised primitive number and it appears that an increase in the number of elements may occur as a result of elongation of the body. An increase in the number of dorsal fin elements from 20 back to 21, associated with elongation of the body, is therefore considered to be secondarily derived (**15a**).

(16) Supraoccipital crest reduced – the supraoccipital crest provides a site of attachment for the epiaxial muscles and its development seems directly related to body depth (Gregory, 1932). The primitive perciform condition and that found in embiotocids and the other out-groups is for a relatively deep, laterally-compressed body with a high supraoccipital crest (Takahashi, 1962; Greenwood, 1974), and this has been hypothesised as the ancestral condition in labrid fishes (Yamaoka, 1978). A reduction in the size of the supraoccipital crest occurs with a reduction in size of the lower pharyngeal as well as with elongation of the body (Yamaoka, 1978). A low supraoccipital crest (**16a**) or rudimentry crest (**16b**) are here considered to be successively derived character states.

(17) Well-developed posterior canine(s) in upper

jaw – the presence of one, sometimes two, enlarged, forwardly-curved canines at the distal end of the alveolar process of the premaxilla is unique to labrids and scarids and is considered to be derived (**17a**). The occurrence of this character in several apparently otherwise unrelated labrid groups suggests it is probably homoplasous and may have been independently acquired in a number of lineages.

(18) First caudal vertebra with a secondary haemal arch – the usual condition in perciforms is for the first caudal vertebra to have a haemal spine (Ford, 1937; Clothier, 1950; Takahashi, 1962). In some perciforms the tips of the haemapophyses of the posterior precaudal vertebrae are fused mesially (Δ-type haemapophyses - Takahashi, 1962) to form a short spine which becomes progressively longer on succeeding vertebrae. In other perciforms, including embiotocids, cichlids and pomacentrids, the haemapophyses are bridged near their bases by a narrow piece of bone (H-type haemapophyses - Takahashi, 1962) from which the haemal spine develops. In embiotocids, the first haemal spine is a robust structure, with prominent basal haemapophyseal remnants (Takahashi, 1962; Morris, 1982), and this condition is hypothesised as plesiomorphic. Loss of the haemapophyseal remnants (**18a**), development of a narrow secondary haemal arch (**18b**), and an enlarged secondary haemal arch (**18c**) on the first caudal vertebra are considered here to be successively derived conditions in the Labridae. Formation of a secondary haemal arch appears to be associated with elongation of the body and concommitant reduction in the number of precaudal vertebrae, and probably is a development in response to the necessity to accomodate the posterior end of the swim bladder. In a few labrid species (e.g. *Suezichthys*) the swim bladder extends posteriorly beyond the first caudal vertebra, and the first 2-3 caudal vertebrae may have well-developed secondary haemal arches (Russell, 1985). In deeper-bodied forms, or elongate forms which have an increased number of vertebrae, secondary haemal arch development apparently does not occur.

(19) Symphysis of dentary with interdigitating suture – most generalised perciforms, including the embiotocids and the other out-groups, have the dentaries joined by an even, non-suturing joint, and the development of an interdigitating suture joining the dentaries is considered to be derived in labrids (**19a**). Suturing has occurred in a number of groups (e.g. in the Blenniid tribe Nemophini - Springer, 1968; Smith-Vaniz, 1976; in the Odacidae - Gomon & Paxton, 1986; and in some labrid lines) and appears to be a convergent specialisation associated with a more oblique angling of the lower jaw. An interdigitating suture probably acts as a brace against the greater ventrolateral forces placed on the jaw (cf. Smith-Vaniz, 1976: 153).

(20) Number of pectoral fin rays reduced (12-13) – a high number of pectoral fin rays is hypothesised as plesiomorphic for the Labridae. In embiotocids the number of pectoral fin rays ranges from 17-28 (Tarp, 1952). In labrids the maximum number of pectoral fin rays is 16, and a reduction in this number to 13 (**20a**) or 12 (**20b**) are hypothesised as subsequently derived conditions.

(21) Interspinous membrane of dorsal and anal fins continuous, not deeply incised – most generalised perciforms, as well as embiotocids and the other out-groups, have the membrane of the dorsal and anal fins incised between the spines, often with the membrane extending as free points beyond the spines, and this character state is hypothesised as plesiomorphic for the Labridae. A derived condition (**21a**) in the Labridae appears to be for the membrane of the spinous dorsal and anal fins to be continuous, not incised between the spines. A further derived condition (**21b**) is extension of the interspinous membrane well beyond the tips of the spines, with the fin being continuous and unsupported along its outer margin.

(22) Reduced number of opercle scales (8-10) – in embiotocids and the other out-groups the opercle is covered with 12 or more scales, and this condition is hypothesised as plesiomorphic. A reduction in the number (to 8-10) and extent of scales on the opercle in labrids is considered to be derived (**22a**).

(23) Laterosensory canal tube with subterminal as well as terminal pores opening to the exterior – in embiotocids and the other out-groups, the laterosensory canal tube pores open to the exterior terminally, and this condition is hypothesised as plesiomorphic for the Labridae. The presence of subterminal laterosensory canal tube pores in addition to terminal pores is considered to be derived (**23a**).

(24) Body moderately elongate, body depth >4.5 in SL – the primitive perciform body was moderately deep (Patterson 1964), and this was also considered by Tarp (1952) to be the primitive condition in embiotocids. A deep body is here hypothesised as plesiomorphic for the Labridae, and elongation of the body without any increase in vertebral number is considered to be derived (**24a**).

(25) Number of epihaemal ribs reduced (2-3) – the presence of 4 or more epihaemal ribs is typical of most perciforms, including embiotocids, and is hypothesised as plesiomorphic. In labrids the number of epihaemal ribs is not correlated with number of vertebrae. The maximum number of epihaemal ribs for the Labridae is 9 (*Neolabrus*), but more usually ranges from 4-7, and any reduction in this number (to 2-3) is here considered to be derived (**25a**).

(26) Lateral jaw teeth reduced in number – jaw dentition in labroid fishes is highly variable. The number of lateral jaw teeth in labrids ranges from about 2-14, with a reduced number of teeth being associated with specialisation in feeding. In embiotocids and in cichlids the number of lateral jaw teeth is similarly variable, and also is related to feeding specialisation (Greenwood, 1974; Morris, 1982). In

pomacentrids, however, the number of jaw teeth is much less variable and usually there are more than 20 lateral teeth (Emery, 1973; Allen, 1975). The relatively high number of lateral jaw teeth of pomacentrids is similar to that of many generalised perciforms, and a high number of teeth is hypothesised as representing the plesiomorphic condition for the other out-groups. In labrids, a reduction in the number of lateral jaw teeth (to 10-15) is hypothesised as derived, with a further reduction to <8 teeth representing the most derived condition (**26a**).

(27) Anterior jaw teeth forwardly curved – in embiotocids the anterior jaw teeth are canine like and either more or less straight or backwardly curved. This type of dentition is typical of most generalised perciforms and is hypothesised as plesiomorphic. Extreme modification of the anterior pair of canines in some labrids, with the teeth forwardly curved (Fig. 13b) is considered to be derived (**27a**).

(28) Reduction in size of the anterior jaw teeth, with the first pair subequal in size to the second pair – in embiotocids and in most generalised perciforms the anteriormost jaw teeth are usually largest, with those behind subequal in size, and this condition is hypothesised as plesiomorphic for labrids. Modification of this pattern, with the first pair of teeth subequal to the second pair is considered to be derived (**28a**).

(29) Branchiostegal rays 5 – the usual (primitive) number of branchiostegal rays in perciforms is 6-7 (Gosline, 1968; McAllister, 1968), and for embiotocids and the other out-groups, as well as most labrids, typically is 6. Reduction of this number to 5, usually by loss of the ventralmost branchiostegal (McAllister, 1968), represents the derived condition (**29a**).

(30) Infraorbitals ventrally expanded – the infraorbitals in embiotocids are narrow (first infraorbital expanded in some species), and this condition is hypothesised as plesiomorphic for the Labridae. Derived states in labrids are for the infraorbitals to be slightly expanded (**30a**), or for the infraorbitals to be ventrally broad (**30b**).

(31) Infraorbitals (including lacrymal and dermosphenotic) 6 – the primitive number of infraorbitals in perciforms and in embiotocids is 7 (Gosline, 1966). Reduction in this number to 6 in some labrids, by fusion of the first two infraorbitals, is considered to be derived (**31a**).

(32) First epibranchial with a bilobed, posteriorly directed uncinate process – the generalised perciform branchial skeleton primitively has a single posteriorly-directed uncinate process on the first epibranchial (Rosen, 1973), and Gomon (1979) has hypothesised that this structure in labrids is probably homologous and plesiomorphic. A similar uncinate process appears to be lacking in embiotocids (Morris, 1982). In labrids the presence of a second uncinate process is considered to be derived (**32a**).

(33) Scaly sheath at base of dorsal and anal fins – the presence of body scales as a distinct sheath at the base of the medial fins occurs in embiotocids and some labrids, but is lacking in cichlids and pomacentrids. In embiotocids, the scaly sheath is separated by a distinct furrow from the body scales (Tarp, 1952), and is morphologically unlike that of labrids. For this reason the presence of scaly sheaths in these two groups are considered to be homoplasies. Within the pseudolabrines, the presence of a low scaly sheath at the base of the dorsal and anal fins (**33a**), or a high scaly sheath extending about halfway up the base of the dorsal and anal fins (**33b**), are hypothesised as separately derived character states from the primitive state of no sheath.

Relationships to Other Julidine Genera

The pseudolabrine genera are here recognised as belonging to the labrid subfamily Julidinae (sensu Norman, 1966), and within this group are provisionally placed in a tribal group, the Julidini, which also includes the genera *Anampses, Artisia, Coris, Gomphosus, Halichoeres, Hologymnosus, Leptojulis, Macropharyngodon, Neolabrus, Nelabrichthys, Ophthalmolepis, Oxyjulis, Parajulis, Pseudojuloides, Stethojulis, Suezichthys,* and *Thalassoma* (including *Minilabrus*). Synapomorphies characterising this group include: the presence of a well-developed frontal process on the neurocranium (**1a**); preopercle entire (**2a**); first pectoral ray rudimentry (**3a**); first neural spine reduced (**4a**); fifth hypural reduced (**5a**), and lateral line abruptly bent downwards posteriorly (**6a**).

Within the Julidini, cladistic analysis of the character states discussed above (characters 1-13) resulted in the cladogram shown in Fig. 25 as representing the most parsimonius hypothesis of relationships. The pseudolabrines are plesiomorphic for most of the characters that define the other julidines and thus are placed as the primitive sister-group of all the other studied genera. Relationships between the remaining taxa, however, are only partially resolved: an unresolved trichotomy remains between *Suezichthys, Nelabrichthys* and the more derived julidines, and based on the limited number of characters examined, monophyly for all of the genera was not able to be established. Much detailed anatomical work on labrid fishes remains to be done, and further examination of julidine genera in greater detail than has been attempted here should provide a clearer resolution of relationships.

The pseudolabrines are considered to be monophyletic on the basis of two synapomorphies: number of anal soft rays reduced to 10 (**12a**), and a bifurcate (**13a**) or complexly branched laterosensory canal tube (**13b**). The genus *Suezichthys* also shares character state **12a**, and *Nelabrichthys* shares character state **13b**, which could suggest a possible close relationship between these taxa and the pseudolabrines. However, *Suezichthys, Nelabrichthys* and the other julidines are synapomorphic for

characters **7a, 8a, 9a** (except *Ophthalmolepis* plesiomorphic for character 8; *Anampses* plesiomorphic for character 7). Consequently, *Suezichthys* and *Nelabrichthys* are placed together in an unresolved trichotomy with the lineage leading to the more 'derived' julidines, and it is hypothesised that the reduced number of anal fin rays (**12a**) in *Suezichthys*, and branched laterosensory canal tube system (**13b**) in *Nelabrichthys* are homoplasies. Remaining julidines can be separated on the basis of a reduction in head squamation. Cheek scales are reduced (**10a**) in *Neolabrus*, and absent (**10b**) in the remaining genera. *Ophthalmolepis* lacks gill membranes joined to the isthmus (**11a**), a synapomorphy that characterises all of the remaining 'derived' julidines (*Anampses, Artisia, Halichoeres, Leptojulis, Pseudojuloides, Parajulis, Stethojulis, Macropharyngodon, Coris, Hologymnosus, Gomphosus, Thalassoma*).

Relationships within the Pseudolabrine Group

Within the pseudolabrine group, cladistic analysis of the characters presented above (characters 12-33) resulted in two alternative, equally parsimonius cladograms. The two proposed phylogenies (Fig. 26) differ principally in the placement of *Dotalabrus* and *Notolabrus*. In the first cladogram (Fig. 26a), *Dotalabrus* is placed as the sister-group to the other pseudolabrines, which are united by having a laterosensory canal tube with multiple branches (**13b**) and reduced supraoccipital crest (**16a**); while in the second cladogram (Fig. 26b), *Notolabrus* is placed as the sister-group to the other pseudolabrines, which are united by the absence of haemapophyseal remnants associated with the first haemal spine (**18a**), and a reduced number of pectoral fin rays (**20a**). The first cladogram (Fig. 26a) seems slightly preferable in that it involves fewer homoplasies than the second, thereby better satisfying the criterion of overall parsimony. Both hypothesised phylogenies support the recognition of six monophyletic lineages, here recognised as genera, within the pseudolabrine group. The separation of *Notolabrus*, as a new genus previously included within *Pseudolabrus*, is supported by both cladograms. A seventh taxon, *Lunolabrus*, originally proposed as a subgenus of *Pseudolabrus* by Whitley (1933), was not supported by any autapomorphies, and is retained here as a subgenus.

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PLATES

PLATE 1.

1A *Dotolabrus aurantiacus* IP, Victor Harbour, South Australia (photo. R. Kuiter).

1B *D. aurantiacus* TP, Portsea, Port Philip Bay, Victoria (photo. R. Kuiter).

1C *D. alleni* IP, Rottnest Island, Western Australia (photo. G.R. Allen).

1D *D. alleni* TP, Rottnest Island, Western Australia (photo. G.R. Allen).

1E *Notolabrus parilus* IP, Penneshaw, Kangaroo Island, South Australia (photo. R.Kuiter).

1F *N. parilus* TP, Rottnest Island, Western Australia (photo. J.B. Hutchins).

1G *N. gymnogenis* IP, Montague Island, New South Wales (photo. R. Kuiter).

1H *N. gymnogenis* TP, Bondi, New South Wales (photo. R. Kuiter).

1I *N. tetricus* IP, Jervis Bay, New South Wales (photo. S. Parish).

1J *N. tetricus* TP, Portsea, Port Philip Bay, Victoria (photo. R. Kuiter).

PLATE 2

2A *Notolabrus celidotus* IP, Leigh, north-eastern New Zealand (photo. A.M. Ayling).

2B *N. celidotus* TP, Leigh, north-eastern New Zealand (photo. A.M. Ayling).

2C *N. fucicola,* New South Wales (photo. N. Coleman).

2D *N. fucicola* x *N. tetricus* hybrid, Bermagui, New South Wales (photo. R. Kuiter).

2E *N. inscriptus* IP, Baraga Bay, New South Wales (photo. R. Kuiter).

2F *N. inscriptus* TP, Bermagui, New South Wales (photo. R. Kuiter).

2G *Pseudolabrus japonicus* IP, Miyake-Jima, Izu Islands, Japan (photo. J.E. Randall).

2H *P. japonicus* TP, Shirahama, Japan (photo. J.E. Randall).

2I *P. luculentus* IP, Montague Island, New South Wales (photo. R. Kuiter).

2J *P. luculentus* TP, Montague Island, New South Wales (photo. R. Kuiter).

PLATE 3

3A *Pseudolabrus biserialis* IP, Esperance, Western Australia (photo. R. Kuiter).

3B *P. biserialis* TP, Esperance, Western Australia (photo. R. Kuiter).

3C *P. guentheri* IP, Clovelly, New South Wales (photo. R. Kuiter).

3D *P. guentheri* TP, Clovelly, New South Wales (photo. R. Kuiter).

3E *P. fuentesi* TP green phase, Easter Island (photo. J.E. Randall).

3F *P. fuentesi* TP red phase, Easter Island (photo. J.E. Randall).

3G *P. semifasciatus*, Easter Island (photo. J.E. Randall).

3H *P. torotai*, Rapa (photo. J.E. Randall).

3I *P. psittaculus*, Pope's Eye, Port Philip Bay, Victoria (photo. R. Kuiter).

3J *P. miles*, Napier, New Zealand (photo. R. Kuiter).

PLATE 4

4A *Pictilabrus laticlavius* IP, Bermagui, New South Wales (photo. R. Kuiter).

4B *P. laticlavius* TP, Bermagui, New South Wales (photo. R. Kuiter).

4C *P. laticlavius* red phase, Pope's Eye, Port Philip Bay, Victoria (photo. R. Kuiter).

4D *Austrolabrus maculatus* TP, Esperance, Western Australia (photo. R. Kuiter).

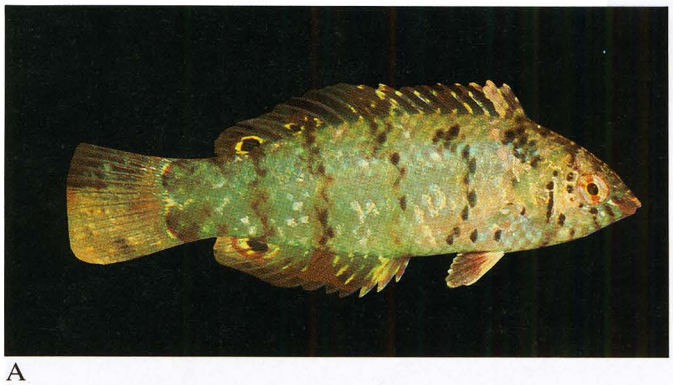
4E *Pictilabrus viridis* IP, Bunkers Bay, Western Australia (photo. J.B. Hutchins).

4F *P. viridis* TP, Rottnest Island, Western Australia (photo. J.B. Hutchins).

4G *Eupetrichthys angustipes*, Clovelly, New South Wales (photo. R. Kuiter).

4H *E. angustipes* male sexual colouration, Clovelly, New South Wales (photo. R. Kuiter).

PLATE 1



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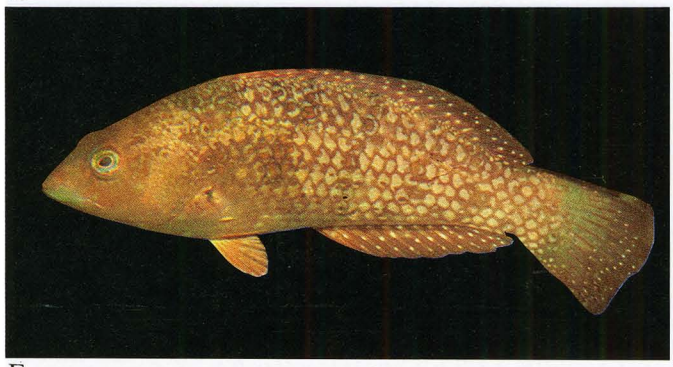

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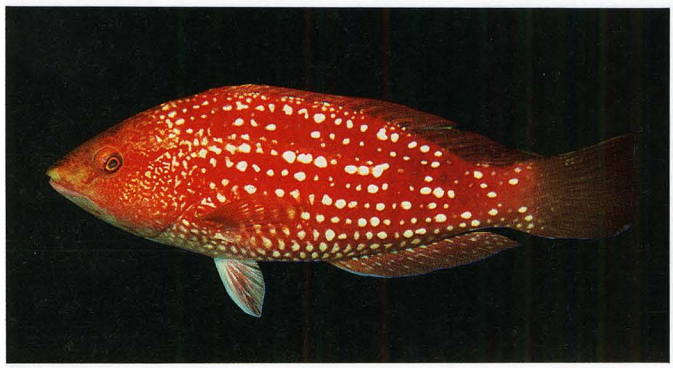

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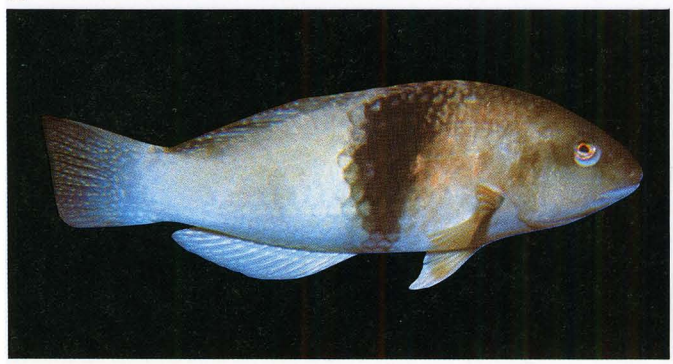

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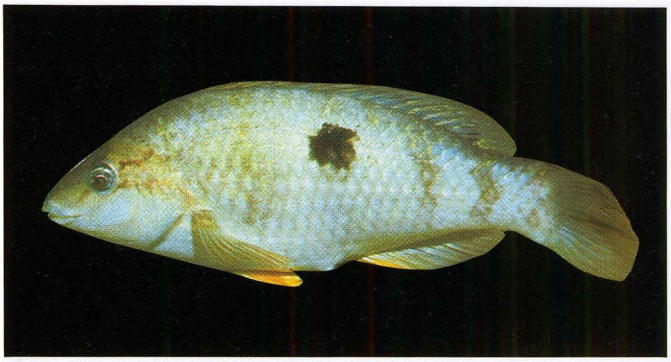
PLATE 2



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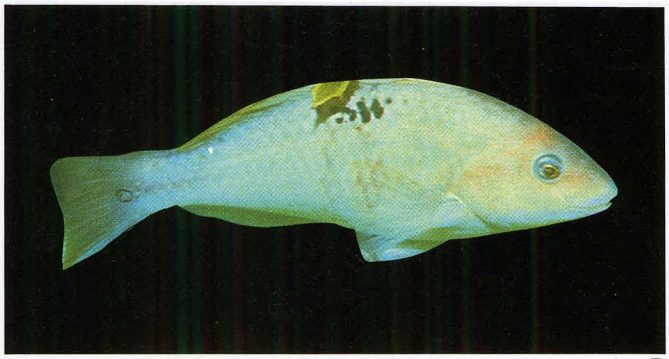

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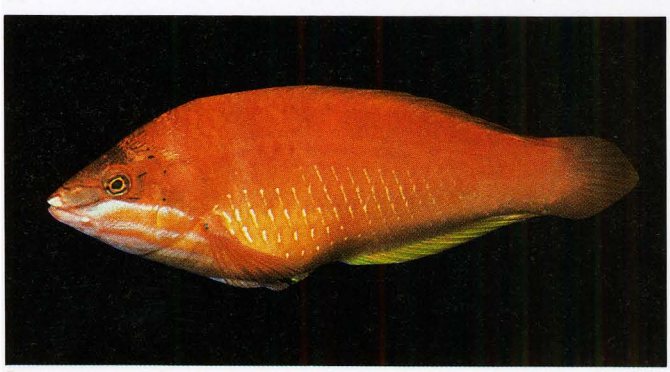

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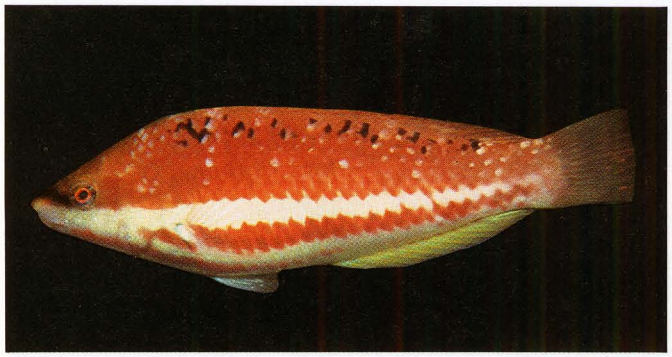
PLATE 3



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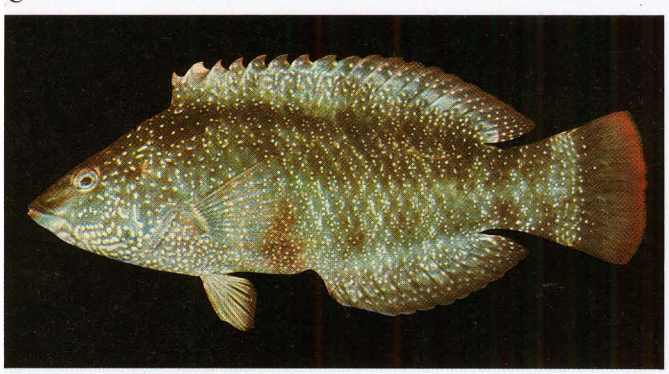

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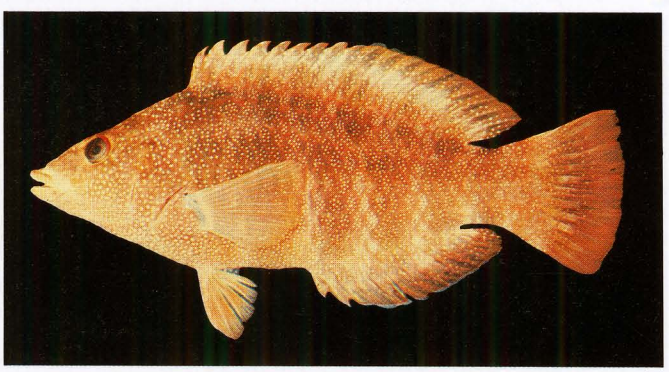

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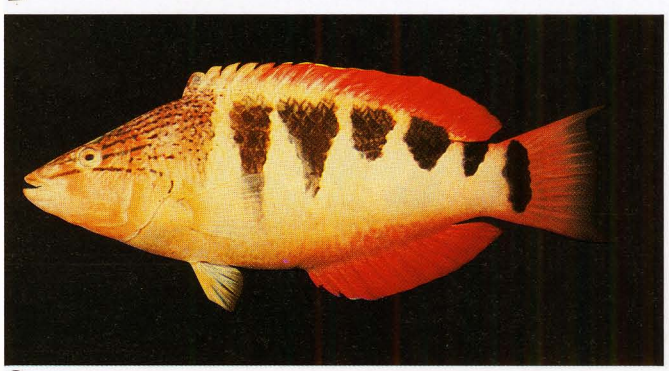

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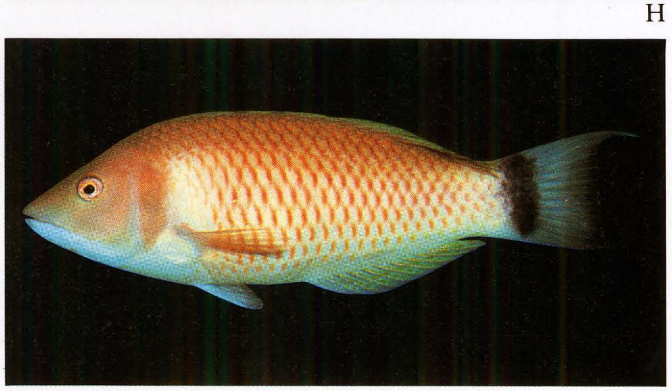

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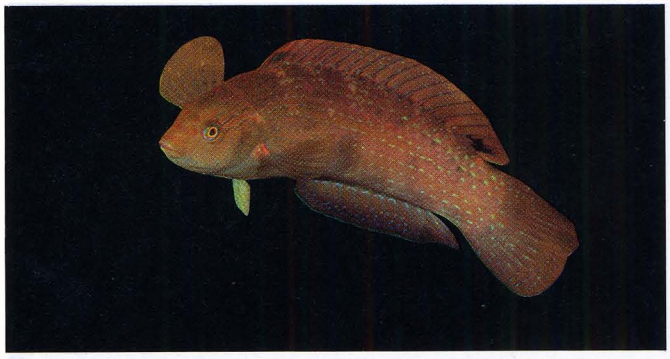
PLATE 4



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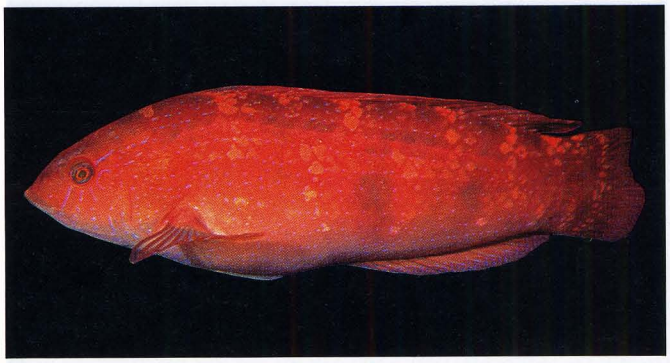

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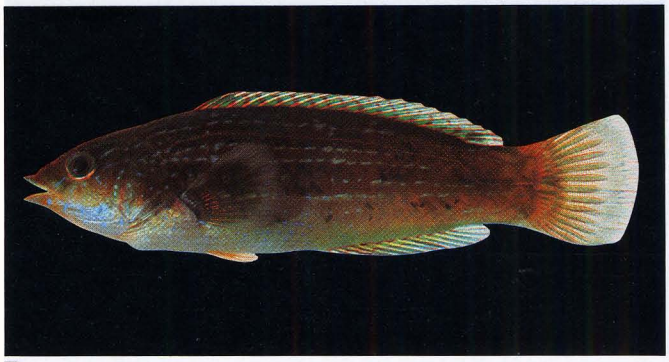

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NOTE ADDED IN PRESS

In a recently published paper, Stiassney & Jensen (Bulletin of the Museum of Comparative Zoology 151: 269-319, 1987) present a re-examination of labroid interrelationships based on pharyngognath and other characters. Their analysis supports the integrity of a monophyletic assemblage composed of the Cichlidae, Embiotocidae, Pomacentridae and Labridae (sensu Kaufman & Liem), but in contrast to previous hypotheses they place the Pomacentridae as the sistergroup of the Labridae, with the Embiotocidae as the sistergroup of the former two, and the Cichlidae as the plesiomorphic sistergroup of the other labroid groups. They caution, however, that within the Labroidei, morphological character transformations display a disconcertingly large amount of homoplasy and until a single highly corroborated phylogeny is available, statements about relationships within the suborder must remain tentative.