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A NEW SPECIES OF CARDINALFISH (APOGONIDAE) FROM NORTHERN QUEENSLAND & PAPUA NEW GUINEA

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SUMMARY

Apogon albimaculosus, a new species of cardinalfish, is described from eight specimens caught between Townsville in north Queensland and Yule Island in Papua New Guinea. The species is easily distinguished from other members of the family by its colouration. *A. albimaculosus* is provisionally placed in the subgenus *Nectamia*, but its precise relationships are obscure.

INTRODUCTION

In two samples of fish taken during experimental trawling near Yule Island, Papua, in November 1970 and February 1971, were single specimens of an apogonid fish which could not be assigned to any known species from the Indo-Australian region. A third specimen from near Daru, western Papua, was discovered in the fish collection at the Fisheries Research Station in Port Moresby. Enquiries revealed the presence of five more specimens in collections in Australia. The species represented by these eight specimens is placed in the subgenus *Nectamia* Jordan, in the genus *Apogon* Lacépède.

The description is based on the holotype and seven paratypes. Counts and proportions are given for the holotype, followed in parenthesis by the range and mean of those for the paratypes, except when these are the same as for the holotype. Measurements in millimetres for all types are presented in Table 1. These were made with dial calipers and recorded to the nearest 0.1 mm. Standard length is abbreviated as S.L. The last rays in the dorsal and anal fins are counted as one element each. One paratype (AM. I. 16232-001, 58 mm S.L.) was cleared and stained in Alizarin Red-S, using Taylor's (1967) enzyme method.

The holotype and three paratypes are deposited at the Australian Museum, Sydney (AM). Another paratype is lodged at the CSIRO, Division of Fisheries and Oceanography, Cronulla (CSIRO F. & O.). The three Papua New Guinea paratypes are held at the Australian Museum "in trust" to be eventually returned to Port Moresby upon the establishment of a curated fish collection at the Papua New Guinea National Museum.

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Fig. 1.—*Apogon albimaculosus* holotype (AM TB. 8347), 66 mm S.L.

Apogon albimaculosus new species

Fig. 1, Fig. 2, Table 1.

MATERIAL EXAMINED: Holotype, AM IB. 8347, female specimen, 66 mm S.L., trawled at night between Gloucester Island and Bowen (20°01'S, 148°15'E), north Queensland, 10 fathoms (18.3 metres), September 1967, collector G. Coates.

Paratypes, AM I. 16232-001, two female specimens, 58 and 63 mm S.L. (smaller specimen is cleared and stained in Alizarin Red-S), trawled at night 3 miles north of Magnetic Island, Townsville (19°10'0'S, 146°50'E), north Queensland, 12 fathoms (21.9 metres), June 1969, collector G. Coates; AM I. 15557-287, male specimen, from Rama station 410, 17°24'50"S, 140°09'45"E, Gulf of Carpentaria, 5½ fathoms (10.1 metres), 27 November 1963, collector I.S.R. Munro; CSIRO F. & O. A. 2521 female specimen, 58 mm S.L., from *Kestrel* station 13, ca. 10 miles northeast of North Point Islet, off Groote Eylandt (14°00'S, 136°36'E), Gulf of Carpentaria, 15 fathoms (27.4 metres), 4 September 1963, collector I.S.R. Munro; AM I. 16895-001, female specimen, 61 mm S.L., trawled north of Yule Island (8°49'S, 146°31'E), Papua, 20 fathoms (36.6 metres), 13 February 1971, from FRV *Rosel*, collector R. Pyne; AM I. 16896-001, male specimen, 55 mm S.L., trawled north of Yule Island (8°49'S, 146°31'E), Papua, 18 fathoms (32.9 metres), 13 November 1970, from FRV *Maragili*, collector R. Pyne; AM I. 17818-001, male specimen, 65 mm S.L., from Daru Roads, northeast of Daru and Bristow Islands (9°08'S, 143°14'E), western Papua, 4 fathoms (7.3 metres) 19 January 1961, from FRV *Tagula*.

DIAGNOSIS: The combination of the following characters distinguishes the new species from other species of *Apogon*: eight spines in first dorsal fin; eight well-formed gill rakers; preopercular ridge smooth, edges crenulate to weakly serrate; elongate ventral fins 1 to 1.4 in head length; rounded caudal fin; a short row of villiform teeth on palatines; 17 to 19 elements in pectoral fin; no supramaxilla; first and second hypural bones fused; well-developed crests on frontals; lateral line complete; scales ctenoid; colour in preservative generally brown with rows of large black-edged pearly spots along body and rows of white spots on fins.

DESCRIPTION: D. VIII; I, 9. A. II, 8. P. ii, 14, ii (ii, 13, ii to ii, 14, iii). V. I, 5. C. (3-4) ii, 8 + 7, ii (3-4). L. lat. 23, plus one over base of caudal rays (21 to 23, plus 1 or 2). L. tr. 2 + 6. Predorsal 5 (4 to 5). Gill rakers on first branchial arch (2) 1 + 1 + 6 (5), [(2) 1 + 1 + 6 (3) to (3) 1 + 1 + 6 (5), mean (2.6) 1 + 1 + 6 (4.2)], total 13 to 16. Vertebrae 24. Branchiostegals 7.

Body deep, 2.3 in S.L. (2.1 to 2.5, mean 2.3); upper profile slightly more convex than lower profile. Head fairly large, 2.6 (2.3 to 2.6, mean 2.5) in S.L. Snout short and bluntly rounded, 1.5 (1.3 to 1.6, mean 1.5) in eye. Mouth slightly oblique; jaws equal, though lower heavier. Small knob at symphysis of lower jaw. Eye in head 3.4 (3.2 to 3.8, mean 3.5). Maxillary reaches to middle of eye or beyond, upper edge concealed by suborbital when mouth closed. Maxillary expansion 1.8 in eye diameter (1.6 to 2.1, mean 1.8). Supramaxilla absent. Posterior nostril tear-shaped, close to front of eye and in line with centre of pupil; anterior nostril in short tube, close to upper jaw and about midway between front border of eye and snout tip. Suborbital entire; orbital rim entire, undulate below. Preopercular ridge entire; preopercular margin varies from crenulate to finely serrate along posterior and ventral limbs (fig. 1). A weakly developed spine on operculum.

Gill rakers slender and spiculate, rudiments densely so. Gill raker at angle 1.2 (0.8 to 1.4, mean 1.1) longer than longest gill filament, and 2.4 (2.2 to 4.2, mean 2.9) in eye diameter.

Band of fine, pointed teeth on both upper and lower jaws: 6 or 7 series in band on

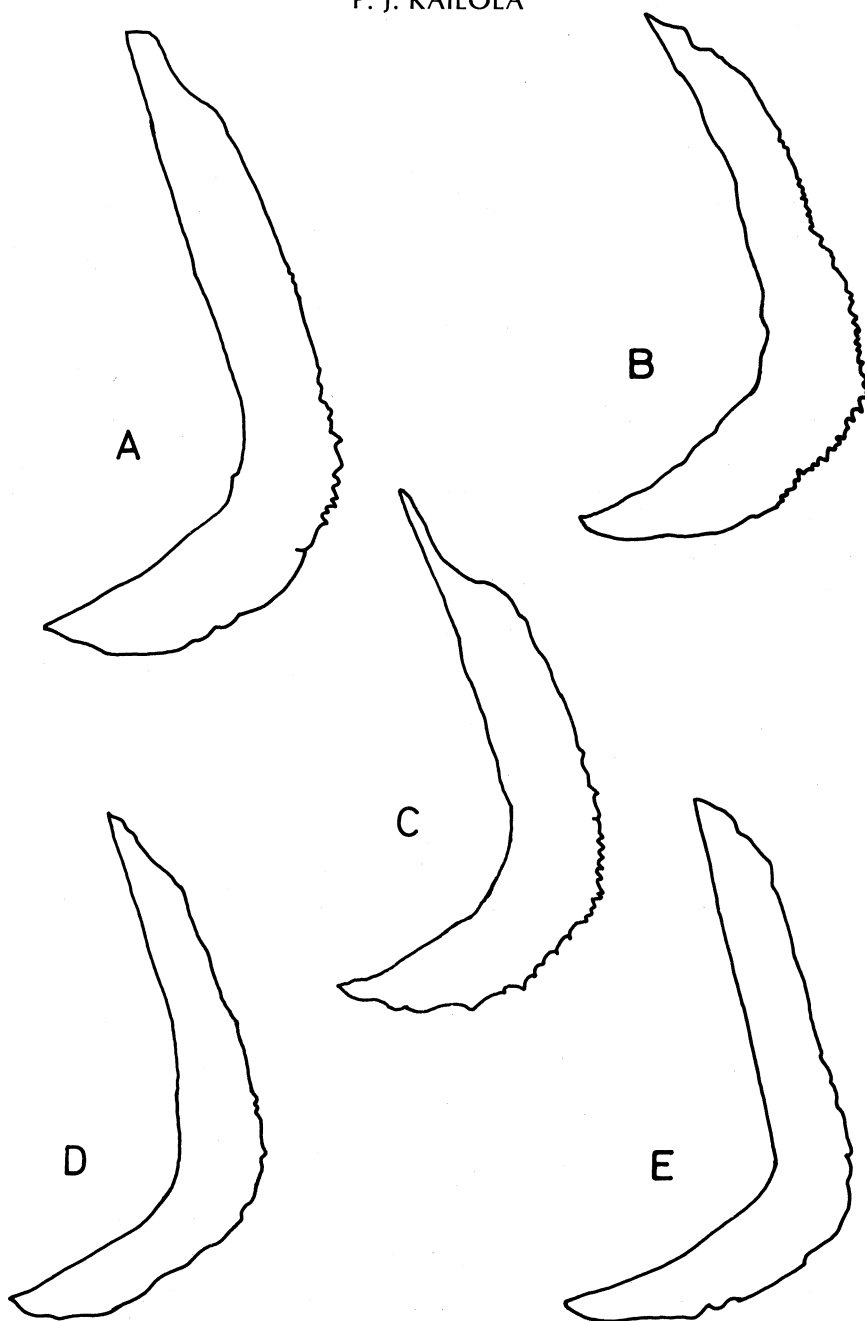


Fig. 2.—Variation in the serrature of the preopercular margin in *Apogon albimaculosus*.
A. Holotype. AM 1B. 8347. 66 mm S.L. B. Paratype. AM I 15557-287. 57 mm S.L.
C. Paratype. AM I. 16232-001. 58 mm S.L. D. Paratype. CSIRO F. & O. A. 2521. 58 mm S.L.
E. Paratype. AM I. 16895-001. 61 mm S.L.

dentary, 9 in premaxillary band. No teeth at symphyses; in upper jaw length of edentulous symphysis slightly less than width of teeth band. Three to four series of villiform teeth on vomer in shape of inverted "V". Few teeth on front of palatine bones, varying from 2 or 3 rudiments to one row of 7 or 8 fine, pointed teeth. No teeth on tongue and ectopterygoids. One large and several smaller patches of small conical teeth on pharyngobranchial bones at back of mouth. Tongue smooth, rounded in female specimens, but tip upturned and excavated in male specimens.

Interorbital broad, concave on each side of central flat ridge, 1.2 (1 to 1.4, mean 1.2) in eye. Predorsal profile rises gently to above posterior half of eye, then arches to dorsal fin origin. About 8 longitudinal folds of skin on nape.

Ctenoid scales cover body and opercular bones, also one embedded scale on temporal region directly above preopercular ridge. Scales with 8 to 10 basal radiating striae and 5 rows of denticles on posterior margin. Lateral line complete, originating at upper insertion of operculum and following curve of back, becoming straight on caudal peduncle.

Two dorsal fins, almost united basally by low vestigial membrane. First dorsal fin originates directly above edge of operculum. First dorsal spine twice (2 to 2.3, mean 2.1) in length of second spine; third spine twice (1.9 to 2.3, mean 2.1) length of second spine. Third spine strongest, slightly longer than fourth spine, and 1.9 (1.5 to 2, mean 1.8) longer than eye diameter. Spines decrease regularly in length to minute eighth spine. In holotype and three paratypes, eighth spine clearly visible, but enveloped in skin close to dorsal profile in remainder of paratypes. Dorsal membrane scalloped, spine tips free.

Spine of second dorsal fin 1.3 (1.2 to 1.5, mean 1.3) times eye diameter. Second or third dorsal ray longest, 1.6 length of spine (1.4 to 1.8, mean 1.6). Soft dorsal outline truncate, fin higher than spinous dorsal.

Anal fin outline truncate to rounded. Second anal spine subequal to soft dorsal spine; longest anal rays slightly longer than longest dorsal rays.

Pectoral fins narrow and rounded, longest ray 1.6 in head length (1.6 to 1.7, mean 1.7). First simple ray very short, second simple ray only slightly shorter than longest divided ray.

Ventral fins close together and elongate, subequal (1.1) to head length (1 to 1.4, mean 1.2 in head length), and 1.5 longer than pectoral fin (1.2 to 1.6, mean 1.5). Ventral fins extend at least as far as vent, usually further, in one male specimen to fifth anal ray. Varying length of ventral fin apparently not sexually related (see table 1). Inner ventral ray united to abdomen by membrane, best developed in paratype (I. 16895-001) where membrane extends halfway along inner ray. Two enlarged scales between bases of ventral fins (lost in some specimens); second the largest, ovate, extending two-thirds distance along ventral spine and obscuring inner membrane.

Least depth of caudal peduncle in peduncle length measured from anal fin 1.5 (1.1 to 1.4, mean 1.3). Caudal fin rounded, with 15 divided rays, two developed simple rays and three or four rudimentary rays on upper and lower edges.

Colouration of types after preservation in 45% isopropyl alcohol fawn, mottled with brown. Head and nape darker; brown alternating blotches across lips, isthmus, chin and radiating from eyes. Iris dark grey; brown patches visible on eye in some specimens. Broad, dark brown band extends obliquely upwards from hind border of eye to origin of lateral line. Second brown band extends from lower hind border of eye across cheek and maxillary expansion to isthmus. This band not readily apparent in some specimens.

Longitudinal rows of distinct, large white black-edged spots on body, roughly following centres of scale rows. The two or three rows above lateral line and that directly

Table 1. Measurements in millimetres of the holotype and paratypes of *Apogon albimaculosus* n. sp.

CHARACTER	HOLOTYPE		PARATYPES					
	IB. 8347	I. 16232-001	I. 16232-001	I. 16895-001	I. 16896-001	I. 15557-287	A. 2521	I. 17818-001
Standard length	66	63	58	61	55	57	58	65
Depth	29.0	29.5	23.0	26.2	26.4	26.4	24.1	29.6
		(belly swollen)						
Head length	25.4	25.1	22.3	23.2	22.8	23.0	22.9	28.7
Eye diameter	7.5	7.1	6.5	6.8	7.2	6.0	6.1	8.4
Snout length	4.9	5.0	4.6	4.9	5.1	4.7	4.5	5.2
Interorbital	6.4	6.1	5.8	5.9	5.6	5.8	5.5	6.2
Maxillary expansion	4.1	4.0	3.2	4.2	3.8	3.7	3.7	3.9
First dorsal spine	3.6	3.5	2.9	2.7	2.4	2.4	1.4 (broken)	2.6
Second dorsal spine	7.2	7.1	6.3	5.9	4.7	5.5	5.1	5.6
Third dorsal spine	14.2	13.5	12.8	13.3	11.0	11.7	10.6	12.7
Fourth dorsal spine	13.7	13.6	11.9	12.1	10.4	11.2	10.1	11.7
Spine of second dorsal fin	9.9	10.2	9.6	8.9	8.3	8.5	8.3	10.0
Second anal spine	10.2	10.0	9.6	9.5	8.7	9.3	7.2	10.4
Longest dorsal ray	16.3	14.9	13.8	14.9	15.1	14.2	14.8	15.0
Longest anal ray	17.0	15.8	14.8	16.7	15.0	14.5	14.6	15.2
Pectoral fin length	15.8	14.6	13.6	14.4	15.0	13.5	13.5	17.0
Ventral fin length	23.3	23.1	19.1	22.9	19.8	18.6	20.3	20.2
Caudal fin length	21.3	23.1	19.3	21.6	20.9	19.7	18.7	21.7
Length of caudal peduncle (from last anal ray)	14.4	13.1	13.0	11.8	10.3	11.5	12.4	12.7
Least depth of caudal peduncle ..	10.6	9.5	8.4	9.8	8.5	9.2	9.1	10.3
Length of edentulous symphysis in upper jaw	0.9	0.9	0.5	0.6	0.6	0.7	0.6	0.8
Width of band of teeth in upper jaw	1.1	1.1	0.8	1.0	0.9	1.0	1.0	1.0
Length of gill raker in angle	3.1	3.0	2.9	2.8	1.9	2.0	1.6	2.0
Length of gill filaments	2.6	2.8	2.6	2.3	1.8	2.1	2.4	2.4
Head length without snout	20.0	19.9	17.0	18.7	18.2	19.0	17.7	21.0
Base of anal fin	10.3	9.4	8.0	9.9	8.9	8.1	9.2	10.4
Base of first dorsal fin	16.0	14.2	11.8	14.0	13.5	14.0	13.5	15.3
Base of second dorsal fin	11.2	10.2	9.7	9.1	9.6	9.5	10.6	11.0
Ventral spine length	10.8	11.4	10.6	11.1	10.1	10.0	9.1	10.6
Length of median ventral scale	6.5	absent	absent	absent	5.8	6.2	absent	6.7

below follow its course to tail base. Four or five shorter, horizontal rows of spots on flanks. First of these terminates opposite end of soft dorsal fin; remainder successively decrease in length. Last rows of spots runs along breast terminating halfway between ventral fin base and vent. Lower rows often represented by only one or two spots.

Fins dark brown except hyaline pectorals. White spots on all fins roughly forming 3 or 4 longitudinal bands. Fewer white spots on spinous dorsal; rows of spots on caudal fin convex, following outline of fin. Large semicircular, dark brown or black ocellus basally on soft dorsal fin, between first and sixth rays. This blotch sometimes with white or cream margin; sometimes covered with milky wash. Similar dark blotch present in some specimens on anal fin, although not as prominent as dorsal ocellus. Except pectorals, black on margins of all fins and over distal half of ventrals. Peritoneum white to silvery with small, scattered black spots.

Life colours of the holotype are as follows: Body brown, darker above and in scattered patches on body and head. Iris yellow; yellow highlights on operculum. Spots on body white outlined in black. Pectoral fins pale yellow; all other fins brown with rows of yellow spots; anal and ventral fins darker distally. Black ocellus on soft dorsal fin covered by white wash extending over basal third of fin.

REMARKS

This species is included in the genus *Apogon* and subgenus *Nectamia* as outlined by Fraser (1972). However, *A. albimaculosus* differs from other members of *Nectamia* in the following characters: (i) posterior and ventral edges of the preoperculum vary from practically smooth to weakly serrated (figure 1), not fully serrated as in *Nectamia*; (ii) frontals with well-developed crests (usually not with developed crests in *Nectamia*); (iii) only four hypurals, one and two being fused (usually five hypurals in *Nectamia*, though in specimens of *A. margaritophorus* Bleeker examined by Fraser, the first two hypurals were fused). Other characters of *albimaculosus* such as the scarcely developed palatine tooth patch, eight dorsal fin spines, absent supramaxilla and well-developed basisphenoid agree with *Nectamia*. *Apogon* Lacépède is the closest related subgenus to *Nectamia*. However, *Apogon* has six spines in the first dorsal fin, 2 predorsal scales, and no uroneurals, which effectively exclude *A. albimaculosus*.

Fraser (*in litt.*, 1974) after examining the cleared and stained paratype (AM I. 16232-001) and the 61 mm paratype (AM I. 16895-001) has suggested several possible relationships for *A. albimaculosus*: (a) it is related to the *A. taeniatus* Cuvier and Valenciennes group in *Nectamia*; (b) it is related to *A. chrysurus* Ogilby and another undescribed species; (c) it is related to both (a) and (b); (d) it represents a distinct group and has no close relatives. At least from the description given by Munro (1960), *A. chrysurus* differs from *A. albimaculosus* significantly in possessing bands of villiform teeth on the palatines and a finely serrated hind margin to the preoperculum, though the lower margin and ridge of the preoperculum are entire.

Another species, *Apogon brevicaudatus* Weber from the Aru Islands, Queensland and Western Australia, not only has similar meristics to *A. albimaculosus*, but has seven or eight dark brown longitudinal bands on the body, and basal black ocelli on the soft dorsal and anal fins (Weber and de Beaufort, 1929). The ventral fins are also elongate, 1.3 longer than the pectoral fins in a 135 mm S.L. syntype (Zoölogisch Museum Amsterdam no. 101.127) and equal to the head without snout. However the presence of well-toothed palatines, a strongly serrated preopercular margin, irregularly serrated orbital rim, and large serrae on the angle of the preopercular ridge clearly separate this species from *A. albimaculosus*.

The holotype (AM IB. 8347) of *A. albimaculosus* and the 61 and 63 mm S.L. paratypes (AM I. 16232-001, and I. 16895-001) are all gravid females with egg masses extruding from the vent (as was AM I. 16232-001, 58 mm S.L. paratype, before clearing and staining). There are three male paratypes (AM I. 16896-001, I. 15557-287 and I. 17818-001). Each have an excavated and scalloped tongue tip, and one specimen (I. 17818-001) has a greatly distended throat. The male paratypes also have a relatively smaller, compact body with slightly higher depth. A small pointed papilla is situated behind the vent. Paratype CSIRO F. & O. A. 2521 is female, and has the heavier body of the other females.

Apogon albimaculosus is a benthic species, known from the Gulf of Papua to the Gulf of Carpentaria and tropical north Queensland. It is found in muddy and clear shallow coastal waters.

The species name, *albimaculosus*, refers to the distinctive rows of large white spots on the body.

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