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A new species of damselfish (*Chromis*: Pomacentridae) from Papua New Guinea

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Abstract

A new species of pomacentrid fish, *Chromis howsoni*, is described from 24 specimens, 30.7–56.2 mm SL, collected in 17–20 m at Milne Bay and Oro Provinces, Papua New Guinea. Diagnostic features include usual counts of XII,12 dorsal rays; II,12 anal rays; 15–16 pectoral rays; 2 spiniform caudal rays; 13 tubed lateral-line scales; body depth 1.6–1.8 (usually 1.7) in SL. The new taxon is closely allied to *Chromis amboinensis*, differing mainly on the basis of colour pattern and a slightly shorter caudal peduncle (length 2.3–2.9 versus 1.8–2.3 in head length). It is distinguished by an overall yellowish brown colour, yellow pelvic fins, and yellow areas posteriorly on the dorsal and anal fins. In contrast, *C. amboinensis* is overall brownish grey with white pelvic fins, and whitish or translucent areas posteriorly on the dorsal and anal fins. The two species occur sympatrically in Papua New Guinea, but exhibit marked habitat partitioning, with *C. howsoni* the only species present in sheltered coastal inlets and *C. amboinensis* vastly outnumbering *C. howsoni* on outer exposed reefs.

Key words: Teleostei, taxonomy, new species, Indo-Pacific, Pacific Ocean, coral-reef fishes.

Introduction

The pomacentrid genus *Chromis* Cuvier 1814 is common on coral and rocky reefs throughout tropical and warm temperate seas. The genus, which now contains 98 species (Randall & DiBattista 2013), is the largest in the family. Allen and Erdmann (2012) provided photographs and a brief diagnosis for each of the 40 species currently known from the Indo-Malayan region. The present paper describes a new species that was observed and collected by the first author on a trip to eastern Papua New Guinea during November–December 2012. The new species was initially believed to be a colour variant of *Chromis amboinensis* (Bleeker 1871), but extensive underwater observations and photographs presented herein provide evidence for its recognition as a valid species.

Materials and Methods

Lengths of specimens are given as standard length (SL) measured from the anterior end of the upper lip to the base of the caudal fin (posterior edge of hypural plate); head length (HL) is measured from the same anterior point to the posterior edge of the opercle flap; body depth is the maximum depth taken vertically between the belly and base of the dorsal spines; body width is the maximum width just posterior to the gill opening; snout length is measured from the anterior end of the upper lip to the anterior edge of the eye; orbit diameter is the horizontal fleshy diameter, and interorbital width the least fleshy width; upper jaw length is taken from the front of the upper lip to the posterior end of the maxilla; caudal peduncle depth is the least depth, and caudal peduncle length is the horizontal distance between verticals at the rear base of the anal fin and the caudal fin base; lengths of fin spines and rays are measured to their extreme bases (i.e., not from the point where the ray or spine emerges from the basal scaly sheath); caudal fin length is the horizontal length from the posterior edge of the hypural plate to a vertical at the tip of the longest ray; caudal concavity is the horizontal distance between verticals at the tips of the shortest and longest rays; pectoral fin length is the length of the longest ray; pelvic fin length is measured from the base of the pelvic spine to the filamentous tip of the longest soft ray; pectoral ray counts include the small splint-like, uppermost rudimentary ray; only the tube-bearing anterior lateral-line scales are counted; a separate count is given for the deeply pitted scales occurring in a continuous series midlaterally on the caudal peduncle; the decimal figure “.5” appearing in the scale row count above and below the lateral line refers to a small truncated scale at the respective bases of the dorsal and anal fins; gill raker counts include all rudiments and are presented as separate counts for the upper and lower limbs as well as a combined count (raker at middle of arch included with lower limb count); the last fin ray element of the dorsal and anal fins is usually branched near the base and is counted as a single ray.

Counts and proportions appearing in parentheses apply to the range for the paratypes if different from the holotype. Proportional measurements expressed as percentage of the standard length are provided in Table 1. Type specimens are deposited at the Australian Museum, Sydney (AMS), United States National Museum of Natural History, Washington, D.C. (USNM), and Western Australian Museum, Perth (WAM). The first author also examined the holotype of *Chromis amboinensis* at Naturalis Biodiversity Center, Leiden, Netherlands (RMNH).

Chromis howsoni, n. sp.

Figures 1–5, Tables 1 & 2.

Holotype. WAM P.33812-001, female, 49.7 mm SL, Stewart Reefs (09° 07.741'S, 149°23.039'E), about 7 km southeast of Tufi, Oro Province, Papua New Guinea; 17–20 m, spear, G. Allen, 3 December 2012.

Paratypes. (collected with holotype unless stated otherwise). AMS I.46380-001, 4 specimens, 48.2–50.7 mm SL; USNM 427095, 4 specimens, 45.9–56.2 mm SL; WAM P.33812-002, 4 specimens, 45.3–55.6 mm SL; WAM



Figure 1. Underwater photo of *Chromis howsoni*, approximately 50 mm SL, Lusancay Islands, Papua New Guinea (photograph by G. Allen).

P.33811-001, 6 specimens, 30.7–50.7 mm SL, Fergusson Island (09° 43.907'S, 150°55.527'E), D'Entrecasteaux Islands, Milne Bay Province, Papua New Guinea, 20 m, spear, G. Allen, 2 December 2012; WAM P.33881-001, 5 specimens, 41.0–51.7 mm SL, off Nuakata Island (10° 18.689' S, 150° 58.494' E), Milne Bay Province, Papua New Guinea, 10–50 m, spear, M. Erdmann, 13 June 2013.

Diagnosis. A species of *Chromis* with the following combination of characters: dorsal rays XI or XII, 11–13 (usually XII, 13); anal rays II, 12–13 (rarely 13); pectoral rays 15–17 (rarely 17); spiniform caudal rays 2; tubed lateral-line scales 12–14 (usually 13); total gill rakers on first branchial arch 27–31; body depth 1.6–1.8 in SL; colour in life overall yellowish brown grading to grey brown on posterior body including caudal peduncle; orange bar across pectoral-fin base, invading axil of fin; pelvic fins yellow; dorsal and anal fins brown with yellow area posteriorly on each fin; dark brown margin, dorsally and ventrally on caudal fin, tapering in width posteriorly.

Description. Dorsal rays XII, 12 (XI or XII, 11–13); anal rays II, 12 (one paratype with 13); all dorsal and anal soft rays branched except first ray of dorsal, the last dorsal and anal rays branched to base; pectoral rays 16 (15–17), the upper 2 (3 in some paratypes) and lowermost unbranched; pelvic rays I, 5; principal caudal rays 15, upper and lowermost unbranched; spiniform caudal rays 2, followed by 2 accessory segmented rays; scales in longitudinal series 27; tubed lateral-line scales 13 (12–14); posterior midlateral scales with a pore or deep pit (in continuous series) 6 (4–6); scales above lateral line to origin of dorsal fin 2.5; scales above lateral line to base of middle dorsal spine 1.5; scales below lateral line to origin of anal fin 8.5; gill rakers 7 + 22 = 29 (6–8 + 20–24 = 27–31); branchiostegal rays 6; supraneural (predorsal) bones 3; vertebrae 11 + 15.

Body very deep and ovate, depth 1.7 (1.6–1.8) in SL, and compressed, body width 2.8 (2.7–3.0) in body depth; head length 3.2 (2.9–3.4) in SL; dorsal profile of head with a slight convexity above eye; snout shorter than orbit diameter, its length 3.5 (3.3–4.1) in HL; orbit diameter 2.7 (2.3–3.1) in HL; interorbital space convex, its width 2.7 (2.3–2.7) in HL; caudal-peduncle depth 2.0 (1.8–2.2) in HL; caudal-peduncle length 2.8 (2.3–2.9) in HL.

Mouth terminal, small, and oblique, forming an angle of about 42° to horizontal axis of head and body; posterior edge of maxilla reaching a vertical slightly behind anterior edge of pupil, upper-jaw length 3.3 (3.1–3.5) in head; teeth multiserial, an outer row of conical teeth in each jaw, largest anteriorly; 26 upper and 24 lower teeth on each side of jaw; a narrow band of villiform teeth lingual to outer row, in 2–3 irregular rows anteriorly, narrowing to a single row on side of jaws; tongue triangular with rounded tip; gill rakers long and slender, the longest on lower limb near angle about three-fourths length of longest gill filaments; nostril with a low, fleshy rim, more elevated on posterior edge and located at level of middle of pupil, about one-half distance from front of orbit to rear edge of upper lip at dorsal midline.

Opercle ending posteriorly in a flat spine, tip relatively obtuse and obscured by a large scale; margin of preopercle smooth, posterior margin extending dorsally to level of upper edge of pupil, anterior margin extending to level of middle of pupil; suborbital with free lower margin extending nearly to a vertical at posterior edge of pupil.

Scales finely ctenoid; anterior lateral line ending beneath base of ninth or tenth dorsal spines; head scaled except lips, tip of snout, and a narrow zone from orbit to edge of snout containing nostrils; a scaly sheath at base of dorsal and anal fins, about two-thirds pupil diameter at base of middle of spinous portion of dorsal fin, progressively narrower on soft portion; a column of scales on each membrane of dorsal and anal fins, narrowing distally, those on spinous portion of dorsal progressively longer, reaching about two-thirds distance to spine tips on posterior membranes, then progressively shorter on soft portion; small scales covering most of rayed portion of caudal fin, but highly deciduous and frequently missing on preserved specimens; small scales on fleshy base of pectoral fins, but scarcely extending onto rayed portion; a median scaly process extending posteriorly from between base of pelvic fins, its length slightly more than half that of pelvic spine; axillary scale above base of pelvic spine about 2.5 times in length of spine.

Origin of dorsal fin over third lateral-line scale, the predorsal distance 2.3 (1.9–2.6) in SL; dorsal-fin base 1.7 (1.5–1.7) in HL; first dorsal spine 5.1 (3.7–4.9) in HL; seventh dorsal spine 2.0 (1.9–2.1) in HL; last dorsal spine



Figure 2. *Chromis howsoni*, preserved holotype, 49.7 mm SL, Stewart Reefs near Tufi, Papua New Guinea (G. Allen).

TABLE 1

Proportional measurements of selected type specimens of *Chromis howsoni* as percentage of the standard length

	holotype		paratypes					
	WAM	USNM	WAM	USNM	AMS	AMS	WAM	WAM
	P.33812	427095	P.33812	427095	I.46380	I.46380	P.33811	P.33811
Standard length (mm)	49.7	56.2	53.5	52.3	50.7	49.0	45.7	33.5
Body depth	60.2	58.4	58.1	60.4	59.6	58.6	56.0	59.7
Body width	21.7	19.4	20.4	20.1	22.3	20.0	19.0	21.5
Head length	30.8	30.1	29.3	32.7	30.2	31.0	30.6	34.0
Snout length	8.9	9.1	8.2	9.4	8.9	8.6	7.4	8.7
Orbit diameter	11.5	11.2	11.2	10.7	11.0	11.4	11.6	14.6
Interorbital width	11.5	11.6	11.6	12.8	11.8	11.6	11.6	12.5
Caudal peduncle depth	9.5	9.1	9.3	10.7	9.7	9.6	9.6	9.9
Caudal peduncle length	15.5	15.7	16.3	16.6	17.4	16.1	14.7	15.8
Upper jaw length	10.9	11.7	11.0	12.8	10.3	11.0	11.8	14.6
Predorsal distance	42.7	38.4	41.9	42.6	42.0	42.4	42.0	52.2
Preanal distance	68.0	73.1	67.3	74.2	70.6	68.0	70.9	69.3
Prepelvic distance	39.6	46.6	39.1	46.7	41.4	40.2	41.8	41.5
Length of dorsal fin base	59.4	57.5	61.3	59.3	60.4	59.0	59.5	61.2
Length of anal fin base	29.0	28.5	29.9	27.7	29.2	28.6	28.7	27.2
Pectoral fin length	38.2	40.4	39.1	41.5	41.2	40.2	39.8	45.1
Pelvic fin length	42.7	36.7	35.9	38.2	41.4	40.2	39.4	44.5
Pelvic fin spine length	17.7	17.8	17.8	18.9	20.1	19.2	19.7	20.9
1st dorsal spine	6.0	6.8	8.0	6.7	8.1	7.8	8.1	8.1
7th dorsal spine	15.1	15.8	15.1	15.9	16.2	15.5	15.8	17.9
Last dorsal spine	15.3	14.6	14.8	17.0	16.8	15.3	16.8	16.1
Longest soft dorsal ray	29.4	35.8	31.6	30.6	31.6	34.1	41.1	29.9
1st anal spine	7.0	6.8	8.6	9.4	8.7	6.5	9.4	9.9
2nd anal spine	16.9	15.8	18.3	18.0	15.8	15.3	19.3	20.0
Longest soft anal ray	26.8	23.7	28.6	30.2	31.2	28.0	29.1	25.4
Caudal fin length	67.6	71.5	68.0	69.0	87.0	68.8	85.6	51.3
Caudal concavity	44.5	53.0	55.0	51.6	66.7	51.4	64.6	28.4

2.0 (1.6–2.1) in HL; membranes of spinous portion of dorsal fin prominently incised; fourth and fifth dorsal soft rays longest, 3.4 (2.4–3.4) in SL; preanal distance 1.5 (1.3–1.6) in SL; anal-fin base 2.0 (2.0–2.3) in dorsal-fin base; first anal spine 4.4 (3.3–4.8) in HL; second anal spine 1.8 (1.6–2.0) in HL; sixth and seventh anal soft rays longest, 3.7 (2.9–4.2) in SL; caudal fin forked with long outer filaments, its length 1.5 (1.1–1.9) in SL, caudal concavity 2.2 (1.5–3.5) in SL; third and fourth pectoral ray longest, 2.6 (2.2–2.8) in SL; first soft ray of pelvic fin filamentous, 1.7 (1.5–1.7) in SL; pelvic spine 1.7 (1.5–1.7) in HL.

TABLE 2

Summary of counts of soft dorsal rays, soft anal rays, pectoral rays, tubed lateral-line scales, and gill-rakers on the first branchial arch of *Chromis howsoni*.

Dorsal fin rays			Anal fin rays		Pectoral fin rays			Lateral line scales		
11	12	13	12	13	15	16	17	12	13	14
3	20	1	23	1	6	17	1	5	17	2

Upper limb gill-rakers			Lower limb gill-rakers					Total gill-rakers				
6	7	8	20	21	22	23	24	27	28	29	30	31
3	20	1	2	5	14	2	1	5	2	13	3	1

Colour in life (Figs. 1, 3–5). Overall yellowish brown grading to grey brown on posterior body and caudal peduncle; iris broadly sky-blue anteriorly and posteriorly, the two areas separated by median blackish zone; pale blue band on side of snout, extending just below ventral edge of eye; sometimes a few small, pale blue spots on cheek; narrow orange band from anterior edge of eye to snout tip; dorsal and anal fins generally brown with narrow, pale blue outer margin, blackish on outer anterior margin of soft portion of fins; posteriormost portion of dorsal and anal fins translucent except narrow streak of yellow; caudal fin translucent greyish with dark brown bands along dorsal and ventral edges, tapering in width posteriorly with pale yellowish spot at base between the bands; pelvic fins yellow with narrow, pale blue anterior margin; pectoral fin translucent with prominent orange band across base, extending onto axil of fin.

Colour of holotype in alcohol (Fig. 2). Generally brownish tan to grey with dark markings on dorsal, anal, and caudal fins as described above; yellow fins and markings faded and generally whitish.



Figure 3. Underwater photograph of *Chromis howsoni*, approximately 50 mm SL, with *C. amboinensis* in background, showing contrasting colour patterns, Fergusson Island, Papua New Guinea (G. Allen).

Etymology. This species is named *howsoni* in honour of Craig Howson, a friend of many years and owner of the luxurious Australian cruise ship *True North*. Craig has provided the first author with numerous collecting and diving opportunities in the Australia-New Guinea region, resulting in the discovery of several new species including *Chromis howsoni*.

Remarks. The new species was first noticed during a 2012 visit to Papua New Guinea and was initially thought to be merely a colour variation of the widely distributed (Cocos-Keeling Islands to Samoa, and northern

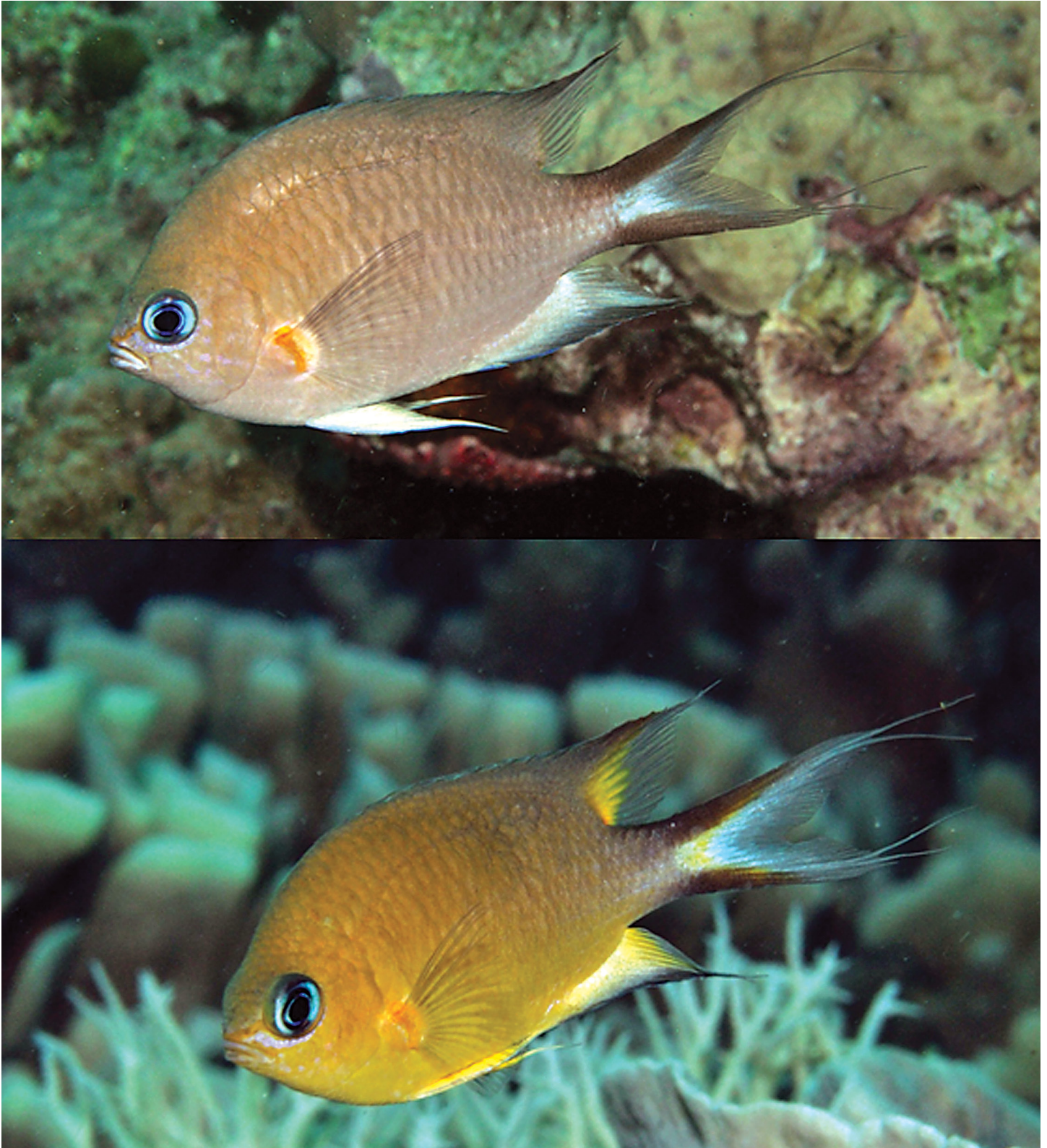


Figure 4. Comparison of adult (approximately 50 mm SL) colour patterns of *Chromis amboinensis* (upper), East Cape, Papua New Guinea, and *C. howsoni* (lower), Fergusson Island, Papua New Guinea (G. Allen).

Australia to Japan) *C. amboinensis* (Figs. 3–5). However, the presence of both species at several locations in Oro and Milne Bay Provinces presented an ideal opportunity to make detailed *in situ* comparisons at the time of first collection and during a subsequent visit to eastern Papua New Guinea during March 2013. These observations lead us to conclude with certainty that the yellowish brown-coloured fish represents a new species.

Both species are characterised by an orbicular body shape (depth 1.6–1.8 in SL); long bifurcate filaments on each caudal lobe; dark brown, outer caudal-fin margins; an orange bar across the pectoral-fin base that invades the axil of the fin; and similar facial markings including bluish lips, blue band below the eye, and narrow orange band from the front edge of the eye to the snout tip. However, the two species are easily differentiated in the field on the basis of general colouration (Fig. 4). *Chromis howsoni* is distinguished by an overall yellowish brown colour, yellow pelvic fins, and yellow areas posteriorly on the dorsal and anal fins. In contrast, *C. amboinensis* is overall brownish grey with white pelvic fins, and whitish or translucent areas posteriorly on the dorsal and anal fins. It also differs in frequently having a bluish cast on the lower head and breast region, as well as series of faint pale stripes ventrally on the side, which are noticeable in underwater photographs. Even small juveniles (Fig. 5) are readily distinguished on the basis of their colour patterns. Although very similar morphologically, *C. howsoni* possesses a slightly shorter caudal peduncle (2.3–2.9, mean 2.7, in HL, n = 14) compared with that of *C. amboinensis* (1.8–2.3, mean 2.1, in HL, n = 25). A total of 28 lots containing 102 specimens, 20–67 mm SL, of *C. amboinensis* from Vanuatu, Coral Sea, New Britain, Western Australia (Rowley Shoals and Ashmore Reef), Christmas Island, and Cocos-Keeling Islands were examined in the WAM collection. In addition we have examined Bleeker's holotype of *Heliases amboinensis* (RMNH 6505) from Ambon, Indonesia.

Ecological observations by the authors indicate that the two species occur together in some habitats. However, they show distinctly different habitat preferences, with *C. howsoni* most abundant on sheltered coastal reefs and *C. amboinensis* commonly inhabiting exposed, outer reef areas. The species co-occur (Fig. 3) on both exposed outer reefs (Lusancay Islands and Nuakata vicinity, Milne Bay Province) and semi-exposed reefs closer to the coast (Fergusson Island and Lawadi-Tawali area, Milne Bay Province and Stewart Reefs off Tufi, Oro Province), but *C. amboinensis* far outnumbered *C. howsoni* on fully exposed outer reefs. Both were equally common in semi-exposed situation, but *C. amboinensis* was entirely absent in highly sheltered coastal inlets at Tufi, where *C. howsoni* was abundant.

Both species occur solitarily or in small loose groups, but observations indicate that *C. howsoni* is more gregarious, often occurring in groups of 10 or more individuals and seldom seen alone. It was interesting to note that in several situations where the home ranges of the two species were in close proximity, *C. amboinensis* invariably exhibited agonistic behaviour, aggressively chasing any individuals of *C. howsoni* that closely approached, while no such aggression was observed towards conspecifics. This behaviour was also easily elicited by herding individuals of *C. howsoni* towards a neighbouring *C. amboinensis*.

The overall strong similarity between *C. howsoni* and *C. amboinensis* suggests a sister-taxa relationship. Judging from the broad distribution of the latter species, which encompasses most of the Indonesian Archipelago, Sabah province of Malaysia, Philippines, Ryukyu Islands, Cocos-Keeling Islands, Christmas Island (Indian Ocean), offshore reefs of northern Australia, Great Barrier Reef, Coral Sea islands, Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, Fiji, Samoa, and islands of Micronesia, we hypothesize that *C. howsoni* is a younger species that evolved from *C. amboinensis*, possibly due to local ecological isolation. One possibility is that it became reproductively isolated by invading coastal lagoons or bay-like fjords, such as those now found in the vicinity of Tufi, Papua New Guinea where *C. howsoni* is very common. This highly sheltered environment is atypical for *C. amboinensis*, and most other members of the genus *Chromis*, which are generally found in more exposed, outer reef situations. Possibly, the founder population was isolated here, but later spread to more exposed, offshore areas such as the D'Entrecasteaux Islands, East Cape (10° 13.468'S, 150° 52.756'E), and reefs in the vicinity of Nuakata Island (10° 15.921'S, 151° 00.121'E), where it now co-occurs with *C. amboinensis*.

Distribution and habitat. *C. howsoni* is currently known only from Papua New Guinea at Milne Bay (Nuakata, East Cape, Lawadi-Tawali area, Lusancay Islands, and Fergusson Island in the D'Entrecasteaux Group) and Oro (vicinity of Tufi) Provinces. It has not been observed at other parts of Milne Bay Province (e.g. Misima, Woodlark Island, Egum Atoll, Louisiade Islands, and Rennell Island), New Britain, New Ireland, Manus Island,



Figure 5. Comparison of juvenile (approximately 20 mm SL) colour patterns of *Chromis amboinensis* (upper), Lusancay Islands, Papua New Guinea, and *C. howsoni* (lower), Tufi, Papua New Guinea (G. Allen).

Hermit and Ninigo Island, and Madang vicinity despite intensive survey efforts. The preferred habitat consists of gentler slopes of coral-rich areas of highly sheltered lagoons and bays, but also on steep outer reef slopes where it can be found in the vicinity of crevices and caverns. The depth range is about 2.2–65 m, but it is most commonly encountered in approximately 6–20 m.

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