Revised Diagnosis of the Rare Clingfish *Kopua nuimata* (Gobiesocidae) with Notes on Fresh Coloration and First Australian Record

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The live coloration of *Kopua nuimata* Hardy, 1984 is described for the first time based on a recently collected specimen from south of Norfolk Island, Australia. The new color information includes new diagnostic characters of the species, including arch-shaped blotches on the lateral aspect of the body and two reddish-orange stripes on the cheek. Although *K. minima* (Döderlein, 1887) and *K. yoko* Fujiwara, Okamoto, and Motomura, 2018 share a similar live coloration with *K. nuimata*, *K. kuiteri* Hutchins, 1991 and *K. vermiculata* Shinohara and Katayama, 2015 differ markedly by lacking arch-shaped blotches on the body and by exhibiting reddish-orange markings on the cheek. A revised diagnosis and redescription of *K. nuimata* is provided based on the recently collected specimen, which represents the first Australian record of the species.

**Key Words:** Teleostei, Trachelochisminae, range extension, Australia, continental shelf.

**Introduction**

The original description of the Bigeye Clingfish, *Kopua nuimata* Hardy, 1984, proposed as a new genus and species of the family Gobiesocidae on the basis of seven specimens from New Zealand, included details of external and osteological characters. However, because of a lack of fresh color photographs of the specimens, only preserved coloration was noted by Hardy (1984: 247) (“all of the specimens are devoid of pigment in spirit, except for the dark eyes”). Additional specimens of *K. nuimata* have not been recorded until now, likely because of the difficulty of collecting small, benthic fishes from deeper coastal areas. Specimens of *Kopua* are not known to exceed lengths of 37.0 mm (standard length) and have only rarely been collected from 80–408 m depth (Fujiwara et al. 2018) via bottom trawl or dredge (Okamoto and Todate 2014; Fujiwara et al. 2018). Specimens have been collected only when articles from the substrate, including shells of dead bivalves or empty cans, are also retrieved by the collecting gear.

An unidentified specimen of *Kopua* collected from south of Norfolk Island, Australia, was recently deposited in the Australian National Fish Collection, Commonwealth Scientific and Industrial Research Organization. This specimen was subsequently identified as *K. nuimata*, based on meristics and head sensory canal pore characters, and represents the first record of this species from Australia. Herein, we provide a detailed description of this specimen, including for the first time a description of fresh coloration, and provide a revised diagnosis for *K. nuimata*.

**Materials and Methods**

Counts (except caudal-fin rays) and measurements followed Fujiwara et al. (2018). Counts of caudal-fin rays followed Smith-Vaniz (1971). Measurements were made to the nearest 0.01 mm, except for standard length (nearest 0.1 mm), with needle-point calipers under a dissecting microscope. Standard length is abbreviated as SL.

Disc terminology follows Briggs (1955: fig. 1) and Hutchins (1991). Head sensory pore terminology follows Shiogaki and Dotsu (1983: fig. 1) and Conway et al. (2017: fig. 1). Those regions were observed using versatile staining with Cyanine Blue (Saruwatari et al. 1997). Osteological elements were examined from radiographs. The distributional map was prepared using GMT 5.3.1, with data from GSHHG (Wessel and Smith 1996). Institutional codes followed Sabaj (2016).

**Material examined.** *Kopua kuiteri* Hutchins, 1991: Hutchins (1991, 2008) and CSIRO H6155-01, 37.1 mm SL, west of King Island, Tasmania, Australia, 39°54′S, 143°10′E, 249 m, 17 April 2004; see Fujiwara et al. (2018) and Fujiwara and Motomura (2019) for list of additional material examined.

*Kopua nuimata* Hardy, 1984  
[English name: Bigeye Clingfish]  
(Figs 1–4)

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key; northern New Zealand); Hutchins 1991: 464, fig. 1b [sketches of head sensory canal pores; same as type locality: based on NMNZ P. 13110 (paratype)]; Shinohara and Katayama 2015: 436 (in key; northern New Zealand); Stewart 2015: 1551, fig. 218.8 (brief description; same as type locality: based on NMNZ P. 13110); Fujiwara et al. 2018: 449 (in key; northern New Zealand).

**Material examined.** CSIRO H6007-17, 29.0 mm SL, Norfolk Ridge, south of Norfolk Island, New South Wales, Australia, 29°42′S, 168°01′E, 322 m, 14 May 2013.

**Diagnosis.** A species of *Kopua* distinguished from other members of the genus by the following combination of characters: 10 or 11 dorsal-fin rays; 8–10 anal-fin rays; 23–25 pectoral-fin rays; 7 or 8 gill rakers on 2nd arch; 34–36 vertebrae; 2 pores in nasal, lacrimal, and preopercular canals; snout short, its length 7.5–10.4% SL; gill opening wide, its depth 7.5% SL, upper end of gill membrane level with 2nd to 4th pectoral-fin ray base in lateral view; anterior, posterior and least interorbital widths 7.9, 15.0, and 1.2% SL, respectively; disc large, its length 19.6–22.7% SL, disc region D with ca. 6 rows of papillae; caudal-peduncle depth 8.2–11.2% SL; anus slightly closer to posterior margin of disc than to anal-fin origin, disc and disc C to anus lengths 14.3 and 27.4% SL, respectively; dorsal and anal-fin origins located posteriorly on body, pre-dorsal- and anal-fin lengths 66.7–71.4 and 71.4–74.1% SL, respectively; disc and disc C to anal-fin origin 31.9 and 43.8% SL, respectively; post-dorsal-caudal length 14.4% SL; arch-shaped blotches on lateral aspect of body; and two reddish-orange stripes on cheek.

**Description of Australian specimen (CSIRO H6007-17).** Dorsal-fin rays 10; anal-fin rays 10; pectoral-fin rays 23; caudal-fin rays 6–5+5–6; gill rakers 7 on each arch; vertebrae 34. The following morphometrics are expressed as percentage of SL: head length 34.2; postorbital length 16.4; head depth 10.8; head width 19.8; body depth 12.1; body width 17.2; gill-opening depth 7.5; snout length 7.5; snout depth 6.9; upper-jaw length 11.9; orbit diameter 10.9; anterior in-

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**Fig. 1.** Preserved specimen of *Kopua nuimata* from Norfolk Ridge, south of Norfolk Island, Australia (CSIRO H6007-17, 29.0 mm SL). A, lateral view; B, dorsal view; C, ventral view; D, radiograph.
terorial width 7.9; posterior interorbital width 15.0; least interorbital width 1.2; disc length 22.4; caudal-peduncle length 10.1; caudal-peduncle depth 8.2; pre-disc length 20.7; pre-anus length 57.8; disc to anal-fin origin length 31.9; disc to anus length 14.3; disc C to anal-fin origin length 43.8; disc C to anus length 27.4; pre-dorsal-fin length 68.5; pre-anal-fin length 74.1; dorsal-caudal length 32.6; post-dorsal-caudal length 14.4; anal-caudal length 25.8; dorsal-fin base length 18.8; anal-fin base length 17.4; pectoral-fin length 16.8; and caudal-fin length 20.3.

Body slender, cylindrical, compressed at caudal peduncle (Figs 1, 2). Head large, depressed anteriorly. Snout somewhat rounded in lateral view, triangular in dorsal view; dorsal profile of snout slightly concave. Anterior and posterior nostrils with long membranous tube. Posterior nostril located in front of anterodorsal margin of orbit; anterior nostril located between posterior nostril and nasal canal pore (NC1). Eye very large. Interorbital region very narrow, flattened, its width 10% of orbit diameter. Mouth terminal. Upper jaw slightly longer than lower jaw, posterior margin of former reaching to anterior margin of eye lens. Upper lip thickened. Single row of thin, broad incisiform teeth in both jaws; tips of upper-jaw teeth slightly pointed; posterior part of upper symphysis with much smaller, villiform tooth patch; lower-jaw teeth somewhat larger than upper-jaw teeth, tips slightly curved posteriorly.

First gill arch with one row of gill filaments, 2nd to 4th arches with 2 rows of gill filaments. Gill rakers very short, somewhat pointed. Each side of gill membrane united on underside of head, free from isthmus. Upper attachment of gill membrane level with 2nd pectoral-fin ray in lateral view.


Head sensory canal pores well-developed, comprising 2 nasal, 2 lacrimal and 2 preopercular pores, and 1 postorbital pore (Fig. 3); mandibular canal pores absent. Nasal canal pore smaller than nostrils, NC1 and NC2 located slightly before anterior margin of anterior and posterior nostrils, re-
spectively, in dorsal view; lacrimal canal pore same size as nasal canal pore, LC1 located in front of anterior margin of eye, LC2 located posterodorsally below LC1; 1 postocular canal pore (largest of all pores) located just behind posterior margin of orbit; PR2 and PR3 located on ventral surface and lateral to operculum, respectively; all pores with distinct membranous tube (Fig. 3).

**Coloration.** Based on Fig. 2. Body ground color whitish to pale pink. ca. 9 reddish-orange irregular bands on lateral aspect of body (upper part of some bands disrupted), each band interconnected at mid-line of body and forming arc-shaped blotches (4th and 9th bands distinct and isolated); 1st to 3rd band located above pelvic disc, merging with ground color dorsally; 4th and 5th band located around anus, somewhat broad, connected with antimere dorsally; 6–8th band (7th and 8th rudimentary) located below dorsal-fin base; posteriormost band located just anterior to caudal-fin base, slightly broadening ventrally. 4th and 9th band extended further ventrally than other bands; 9th band connected with antimere. Dorsal surface of anterior body with irregular faint yellowish bands and dots. Head ground color similar to body color. Snout with somewhat broad yellowish-orange stripe laterally, faint yellow “V” shaped tinge dorsally. Mouth faint yellowish-orange. Eye red, transitioning to brownish-green dorsally, a pale ring encircling black pupil. Two reddish-orange stripes from eye to cheek; upper stripe narrow, horizontally level with upper end of pupil, its tip close to 1st band; lower stripe directed diagonally downward, broad but narrowing to tip, extending to underside of head. Dorsal, anal and caudal fins reddish to translucent whitish. Center of caudal fin with faint red tinge, fin base with broad white band. Pectoral fin translucent white. Disc whitish to faint reddish. Preserved specimen uniformly yellowish-white (Fig. 1).

**Distribution.** Currently recorded only from Norfolk Island, Australia (Fig. 4), and the Three Kings Islands and White Island, New Zealand (Hardy 1984). These localities are on the Zealandia Continent (Roberts et al. 2015).

**Remarks.** The present specimen agrees closely with the original description of *Kopua nuimata* in having the following combination of characters: 10 dorsal-fin rays; 23 pectoral-fin rays; 6–5+5–6 caudal-fin rays; 7 gill rakers on each arch; very large eyes and narrow interorbital width, orbit diameter 10.9% SL and 0.1 in least interorbital width; “double” type disc, with disc region B squarish; 4 gill arches with filaments; and gill membrane on each side united on underside of head and free from isthmus (Hardy 1984). In addition, the head sensory canal pore characters of the present specimen matched those of *K. nuimata* provided by Hutchins (1991). However, the location of the gill mem-

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**Fig. 3.** Illustration of head sensory canal pores of *Kopua nuimata*, based on CSIRO H6007-17, 29.0 mm SL. AN and PN, anterior and posterior nostrils, respectively; LC1–2, lacrimal canal pores; NC1–2, nasal canal pores; PO1, postorbital canal pore; PR2–3, preopercular canal pores. Bar indicates 1 mm.

**Fig. 4.** Distributional records of *Kopua nuimata*. Star and circles indicate new and previous records, respectively. Arrowhead indicates type locality.
braine and counts of anal-fin rays and vertebrae of the present specimen differed slightly from those given by Hardy (1984) (viz., upper attachment of gill membrane same level as 2nd pectoral-fin ray, 10 anal-fin rays, and 34 vertebrae in the former vs. 4th ray, 8 or 9, and 35 or 36, respectively, in the latter). These minor differences were regarded as intraspecific variations in this study because similar variations exist in other species of Kopua (e.g., see Fujiwara et al. 2018). Although Hardy (1984) provided a detailed pattern of disc papillae (Hardy 1984: fig. 3), this character could not be examined completely here (only papillae on disc region C confirmed) because of the poor condition of the Norfolk Island specimen.

To date, six nominal species of Kopua have been described, five being regarded as valid, viz., Kopua minima (Döderlein, 1887), Kopua nuimata, K. kuiteri Hutchins, 1991, K. vermiculata Shinohara and Katayama, 2015, and K. yoko Fujiwara, Okamoto, and Motomura, 2018 (Fujiwara et al. 2018; Fujiiwara and Motomura 2019). Kopua nuimata can be easily distinguished from other congeners by the following features: 10 or 11 dorsal-fin rays (vs. 6–8 in the latter), 8–10 anal-fin rays (4–8), 23–25 pectoral-fin rays (21–23), 2 nasal canal pores (1; very rarely 2 in K. yoko [left side only in 1 of 14 specimens]), and papillae on disc region D. In other meristic characters, Kopua nuimata differs from Kopua minima, K. vermiculata, and K. yoko: 7 or 8 gill rakers on the 2nd arch (vs. 6 in K. vermiculata and 4–6 in K. yoko) and 34–36 vertebrae (31–33 in K. minima and K. yoko). Some morphometrics (see above) can also be used for identification purposes (Fujiwara et al. 2018). The head sensory canal pore condition of Kopua nuimata is the most developed in the genus (K. yoko being most similar) and distinctly different from Kopua minima, K. kuiteri, and K. vermiculata (but see above) in having 2 lacrimal and preopercular canal pores (vs. no lacrimal or preopercular canal pores). The fresh coloration of Kopua nuimata, detailed here for the first time, also provides very good field characters for species identification. Although the arch-shaped blotches on the lateral aspect of the body and two reddish-orange stripes on the cheek in Kopua nuimata are shared with Kopua minima and K. yoko, Kopua kuiteri and Kopua vermiculata differ significantly, both lacking arch-shaped blotches on the body, and having four or five reddish-orange stripes and a triangular reddish-orange blotch on the cheek, respectively.

Kopua nuimata has previously been recorded only from northern New Zealand (Three Kings Islands and White Island; Hardy 1984). The present specimen, from south of northern New Zealand (Three Kings Islands and White Islands, respectively), represents the first record of Kopua nuimata from Australia as well as the northernmost record for the species (Fig. 4).

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