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## A review of the anglerfish genus *Chaunax* (Lophiiformes: Chaunacidae) from New Zealand and adjacent waters, with descriptions of four new species

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### Abstract

Species of the anglerfish genus *Chaunax* Lowe, 1846 from the New Zealand region are taxonomically reviewed with six species recognized and described: *Chaunax penicillatus* McCulloch; *C. nudiventer* Ho & Shao, a new record for New Zealand; and four species new to science. *Chaunax flavomaculatus* **sp. nov.** distinguished by having its skin covered with a mix of numerous bifurcated and simple spinules, large yellow spots on dorsal surface of fresh specimens, and brownish coloured escal cirri; *Chaunax mulleus* **sp. nov.** by having a uniformly pink body with a deep red colour on ventral surfaces of the outer pectoral-fin and pelvic-fin, and lower part of caudal fin; *Chaunax reticulatus* **sp. nov.** by having cirri on the dorsal surface of head, and a pale reticulate colour pattern on a greyish background dorsally; and *Chaunax russatus* **sp. nov.** by its very wide illicial trough that is usually as wide or wider than the diameter of the pupil, and uniformly deep red body colour with creamy white to fuzzy greyish spots or patches on its dorsal surface. A key to species recognized from the study area is given.

**Key words:** Chaunacidae, *Chaunax*, taxonomy, new species, new record, New Zealand

### Introduction

The Chaunacidae, one of 18 families in the order Lophiiformes, is a group of medium-sized (up to 400 mm total length) benthic fishes inhabiting the continental slope, usually at depths in excess of 200 m to about 2500 m. Members of Chaunacidae differ from those of other lophiiform families in having a large rounded, elevated head and a body with flaccid, loose skin, which is densely covered by minute, prickle-like scales; a relatively short illicium near the tip of the snout, bearing a terminal esca with a dense cluster of short cirri, which is retractable into a scaleless illicial trough immediately behind it; and a conspicuous network of open sensory canals on the head and body. The taxonomic history of Chaunacidae has been reviewed by Caruso (1989) and Ho & Shao (2010), who recognized a total of 16 species in two genera. Following the results of the present paper, a total of 20 species are now recognized.

The family Chaunacidae was first recorded in northern offshore waters of New Zealand by Stephenson (1971) who reported two species: *Chaunax penicillatus* McCulloch, 1915, captured in 1969 from east of the Aldermen Islands at 365–475 m depth, and *Chaunax pictus* Lowe, 1846, captured in 1962 from the northern Three Kings Ridge (outside the NZ EEZ) at 537–676 m.

*Chaunax penicillatus* was erroneously omitted from subsequent faunal lists of New Zealand fishes, whereas the name *Chaunax pictus* was reported in the New Zealand fish fauna by Ayling & Cox (1982: 136), Paulin & Stewart (1985: 27) and Paulin *et al.* (1989: 135, 256). Over time, following the development of a deep-water orange roughy and oreo dory fishery using bottom trawls around New Zealand, further specimens were collected by research vessels and commercial fishing vessels and sent to the National Fish Collection at Te Papa for further study. However, the names registered for these specimens were largely inaccurate due to the lack of reference resources, especially detailed descriptions and reliable keys. The accounts by Ayling & Cox (1982) and Paulin *et*

al. (1989) of a species referred to as *Chaunax pictus* are too general to reliably identify the species. Based on our present study, it is probable that the name *Chaunax pictus* has been applied incorrectly to three New Zealand species. Okamura (1990) was the first to observe that *C. pictus* is an Atlantic species, and that the common *Chaunax* taken in New Zealand waters was distinct and new, recording and figuring it as *Chaunax* sp. Based on preliminary examination of this material, the most recent checklist of New Zealand fishes recorded three OTU (operational taxonomic unit) species: *Chaunax* species A, B and C (Roberts *et al.*, 2009: 532). As a result, the known diversity of *Chaunax* in the New Zealand region increased, but the correct scientific names remained illusive.

Nearly 200 chaunacid specimens collected from New Zealand and adjacent waters since the 1980s were examined during the present study. Within a framework of addressing the taxonomic problems of the Indo-west Pacific chaunacids, the first author made an intensive collection and global study of this group, examining most specimens (including all known types) deposited in the major fish collections around the world, which made the recognition and identification of new species possible. In this study, the chaunacids of New Zealand and adjacent waters are reviewed. A total of six species of *Chaunax* are recognized from this region: *Chaunax penicillatus*, *C. nudiventer*, a new record for New Zealand, and four species new to science: *C. flavomaculatus* **sp. nov.**, *C. mulleus* **sp. nov.**, *Chaunax reticulatus* **sp. nov.** and *C. russatus* **sp. nov.**

The main purposes of this paper are to (1) document the chaunacid species from New Zealand and adjacent waters, (2) to name and describe the new species, and (3) to provide a key to all known species in the area.

## Material and methods

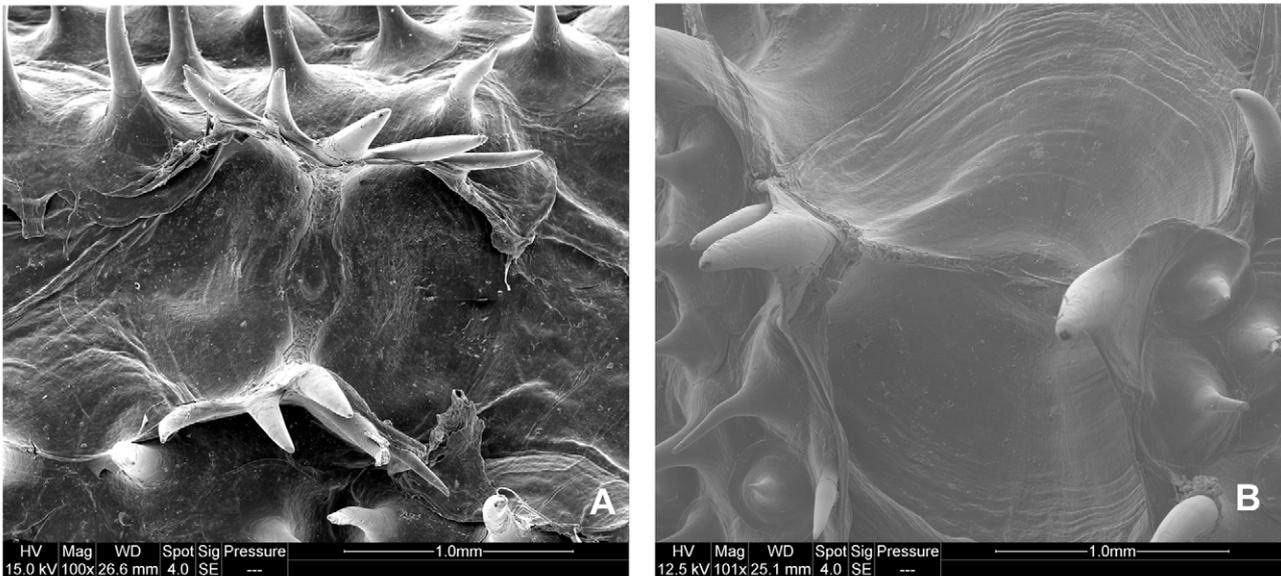
Standard length (SL), measured from the symphysis of the upper jaw to the caudal-fin base (posterior end of hypural plate), is used throughout. Methodology for measurements follow Ho & Shao (2010) and are defined as: head length (HL), distance from the symphysis of upper jaw to second neural spine; head width, the widest distance between the outer margins of both sphenotic bones (*sensu* ISP in Caruso, 1989); pre-dorsal length, from the symphysis of upper jaw to the anterior base of first ray of dorsal fin; pre-preopercular length, from the symphysis of upper jaw to the rear edge of preopercular bone; pre-gill opening, from the symphysis of upper jaw to anterior margin of the right gill opening; upper jaw length, from the symphysis of upper jaw to lower margin of the maxilla; illicial length, from the articulation of illicial pterygiophore to the tip of illicium; illicial trough length, from anterior to posterior extent of illicial trough; post-anus length, from urogenital papilla to the caudal fin base (*sensu* tail length 1 in Caruso, 1989); post-dorsal fin length, from the posterior end of dorsal fin base to caudal fin base (*sensu* tail length 2 in Caruso, 1989); and post-anal fin length, from the end of anal fin base to the caudal fin base (*sensu* tail length 3 in Caruso, 1989); caudal peduncle depth, the vertical distance between upper and lower margin of hypural plate; and caudal fin length, from the base of caudal fin to the posterior tip. Measurements in the text are to the nearest 1 mm.

The proportional values, expressed in ratio of SL or HL, are given for the holotype followed by that of the paratype in parentheses in the Description section.

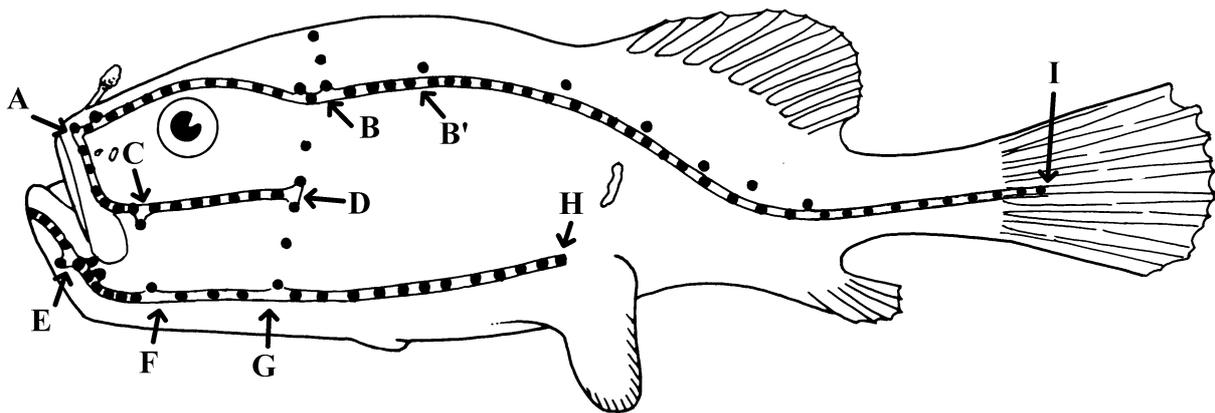
Terminology used in describing the angling apparatus follows Le Danios (1979) and Caruso (1989). Lateral-line neuromast complex is a tubercle comprising a modified flat and bent scale with a central hole where a rounded neuromast is located bordered by paired spinules (Fig. 1).

The lateral line network system is as described by Caruso (1989). Landmarks for taking lateral-line neuromast counts are those modified from Gomon & Ho (2008) shown in Fig. 2. Lateral-line neuromast numbers are given as follows: supraorbital series (AB); anterior lateral-line proper (BB'); upper preopercular series (BD); infraorbital series (CD); lower preopercular series (DG); hyomandibular series (FG); pectoral series (GH); lateral-line proper (BI, including those on the caudal fin).

Dissection is necessary to count the gill rakers and to determine the sex and, if female, size of the ovaries. Numbers of fin rays are counted by using a microscope with a light understage and partially removing skin when necessary. Numbers of gill rakers are given as: first arch (GRi, upper limb+lower limb), second arch (GRii), third arch (GRiii), and fourth arch (GRiv); those of the second and third arches are counted on outer row, which are paired. Micrographs of dermal spines were taken by an environmental scanning electron microscope (FEI Quanta 200) at Biodiversity Research Center, Academia Sinica, Taipei.



**FIGURE 1.** Micrographs of lateral-line neuromast complex of *Chaunax* species. A. *Chaunax penicillatus*, ASIZP 58059. B. *Chaunax russatus* sp. nov., BSKU 44629. Taken by SEM at Biodiversity Research Center, Academia Sinica, Taipei.



**FIGURE 2.** Landmarks for lateral-line neuromast counts. AB = Supraorbital series. BB' =anterior lateral line proper. BD = upper preopercular series. CD = infraorbital series. DG = lower preopercular series. EF = mandibular series. FG = hyomandibular series. GH = pectoral series. BI = lateral-line proper (including those on the caudal fin). From Gomon and Ho (2010), with minor modification.

Materials used in this study are deposited in the Auckland War Memorial and Institute Museum, Auckland, New Zealand (AIM); CSIRO Marine and Atmospheric Research, Hobart, Tasmania, Australia (CSIRO); Muséum national d'Histoire naturelle, Paris, France (MNHN); Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand (NMNZ); National Museum of Marine Biology & Aquarium, Pingtung, Taiwan (NMMB); Museum Victoria, Melbourne, Australia (NMV); and National Museum of Natural History, Smithsonian Institution, Washington, DC, USA (USNM). Abbreviations for institutions follow Fricke and Eschmeyer (2011, online version).

Comparative materials examined: *Chaunax abei* Le Danois, 1978: ASIZP (Taiwan), BSKU (Japan), FAKU (Japan, East China Sea), MNHN (Japan, holotype); *C. breviradius* Le Danois, 1978: NMMB-P (Taiwan, Vietnam), MNHN (the Philippines, holotype); *C. endeavouri* Whitley, 1929: AMS (Australia, including holotype), NMV (Australia), QM (Australia), CSIRO (Australia); *C. fimbriatus* Hilgendorf, 1879: ASIZP (Taiwan), BSKU (Japan), NSMT-P (Japan); *C. nudiventer* Ho & Shao, 2010: as listed; *C. penicillatus* McCulloch, 1915: AMS (Australia, including holotype), ASIZP (Taiwan), BSKU (Japan, including type series of *C. tosaensis* Okamura & Oryuu, 1984: FAKU (Japan), MNHN (tropical Pacific).

## Taxonomy

### *Chaunax flavomaculatus* sp. nov.

New English name: Yellowspot frogmouth

(Figures 3A–C, Table 1)

*Chaunax* sp. A: Roberts *et al.*, 2009: 532 (listed).

**Holotype:** NMNZ P.032620, 105 mm, NE of Great Barrier Island, New Zealand, 35°43.65'S, 175°52.8'E, 370–375 m, F/V *Albatross II*, stn. OBS 0864/031, bottom trawl, 16 Jul. 1995, coll. D. Wrightson.

**Paratype:** NMNZ P.034946, 122 mm, Moa Seamount, New Zealand, 35°45.15'S, 175°50.1'E, 353–355 m, F/V *Drysdale*, stn. OBS 1054/062, bottom trawl, 13 Dec 1997, coll. B. Liddle.

**Diagnosis.** A member of the *Chaunax abei*-species group distinguished from its congeners in having a mix of bifurcated and simple dermal spinules and large yellow spots on a pinkish background dorsally when fresh, uniformly creamy white in preservation. Gill rakers: GR<sub>i</sub> = 11 (2+9); GR<sub>ii</sub> = 9; GR<sub>iii</sub> = 8–9; GR<sub>iv</sub> = 7. Lateral-line neuromasts: AB = 11; AC = 8; BB' = 4; BD = 2; CD = 5–6; DG=3–4; EF = 4; FG = 3; GH = 12–13; BI = 32–34.

**Description.** Morphometric and meristic data are given in Table 1. Head length 2.4 (2.6) in SL; head width 5.4 (5.7) in SL, 2.2 (2.2) in HL; pre-dorsal length 2.1 (2.0) in SL; pre-gill opening length 1.6 (1.5) in SL; pre-preopercular length 3.6 (3.7) in SL, 1.5 (1.4) in HL; upper jaw 5.0 (5.2) in SL, 2.1 (2.0) in HL; illicial length 9.1 (8.7) in HL; illicial trough length 5.9 (6.3) in HL; eye diameter 5.0 (5.8) in HL; post-dorsal fin length 4.9 (4.9) in SL, 2.0 (1.9) in HL; post-anus length 2.9 (2.8) in SL, 1.2 (1.1) in HL; post-anal fin length 5.7 (5.5) in SL, 2.4 (2.1) in HL; caudal peduncle depth 4.9 (5.0) in HL; caudal fin length 3.4 (3.2) in SL, 1.4 (1.3) in HL

Head globular, skull elevated posteriorly; body deep; trunk cylindrical, slightly compressed, tapering posteriorly; ventral surface flattened; skin loose and flaccid; interorbital space broad; caudal peduncle short and stout, slightly depressed, tapering posterior. Eyes rounded, directed dorsolaterally, covered by a dermal membrane broadly connected to adjoining skin, forming a clear “window”.

Illicium long and slender; esca with a small central tongue bearing many thin brown cirri; second dorsal-fin spine close to illicium, embedded under skin; third dorsal-fin spine situated at about mid-point of pre-dorsal distance, embedded under skin. Illicial trough small and relatively concave, oval, longer than wide, its width less than diameter of eye pupil.

Two nostrils anterior to each eye, anterior nostril surrounded by a fleshy membrane, posterior part higher than anterior part, posterior nostril a simple round hole; mouth wide, terminal, its opening nearly vertical; lower jaw slightly protruding beyond upper jaw; maxilla tapering above, broad below; a blunt symphyseal spine on lower jaw symphysis.

Broad transparent membrane on first gill arch; first ceratobranchial broadly connected to opercular wall; gill filaments present on second to fourth gill arches, two rows of gill filaments on second and third gill arches, one row of gill filaments on fourth gill arch; gill filaments on inner row of third and fourth gill arches about half length of those on other arches; inner surface of fourth gill arch completely connected to body. Single row of 11 rakers on 1st gill arch, 2 on upper limb and 9 on lower limb, 9 paired rakers on 2nd arch, 8–9 paired rakers on 3rd arch and single row of 7 rakers on 4th arch.

Skin thin, tips of pectoral- and pelvic-fin rays free. Dermal spinules relatively short and stout, mixed with simple and bifurcated spinules covering entire body, except for the eye window, outer half of pectoral fins, entire anal fin and inter membranes of all fins. Wide band of 8–10 rows of dermal spinules in front of illicial trough. Lateral-line network system as described by Caruso (1989). Interspaces of lateral-line neuromast complex slightly wider than its width; 3 pairs of short spines bridging neuromasts.

Teeth villiform, short, fang-like; 5–6 irregular rows in upper jaw, similar in size, except for those in innermost row that are slightly longer than others; teeth in lower jaw with same arrangements. Teeth on vomer small, forming two wide bands, in about 3 rows, distinctly separated by small medial space; those on palatine small, forming elongate patch, close to outer end of vomerine tooth patch.

Dorsal fin rays III, 12, first ray shortest, about half length of the second; all except last 2 rays branched. Pectoral fin fan-shaped, with 13 rays, the 4th or 5th ray longest, those below 6th ray gradually shorter. Anal fin with 7 rays, first shortest, first and second simple, last 5 branched. Caudal fin truncate, with 9 rays, second to seventh rays branched, other 3 simple, lower most ray shortest, close to adjacent one.

Cirri present on outside of both jaws, laterally on body and caudal peduncle, but absent from dorsal surface of head.

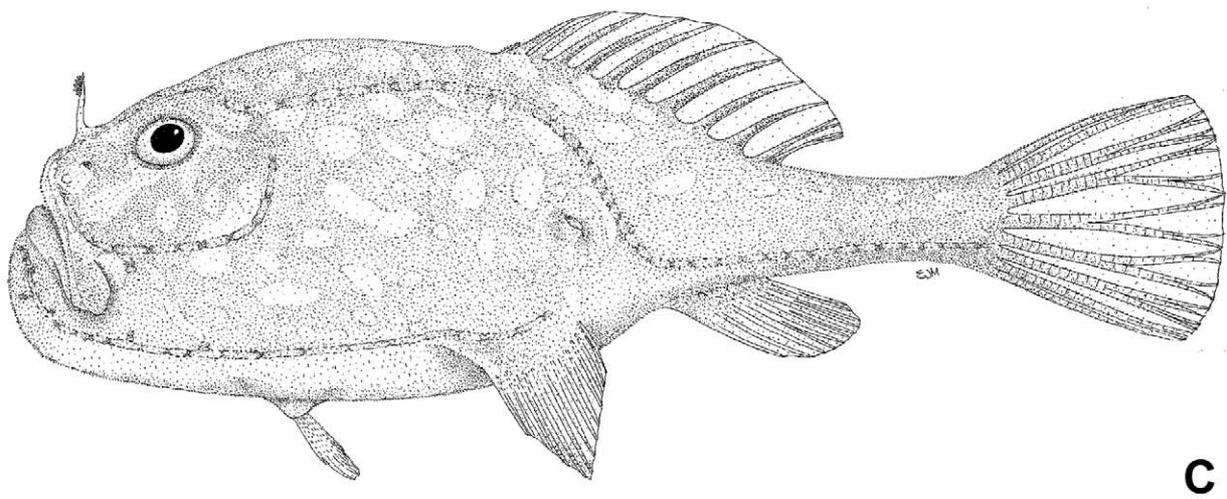
Colouration. Fresh (Fig.3A–B): large irregular-sized yellow blotches on dorsal surface; all fins yellowish; esca with grey cirri. Preserved: body creamy white; esca with brownish cirri.

**Distribution.** Known only from the type series collected from northern New Zealand at depths of 353–375 m (Fig. 4).

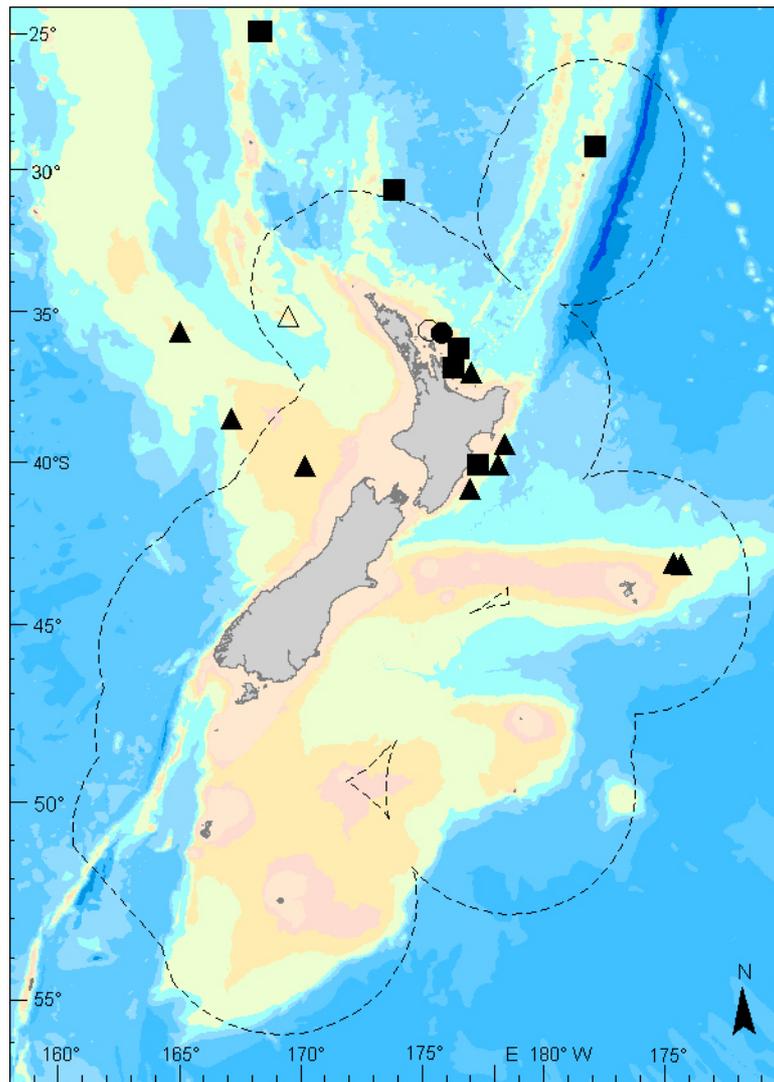
**Etmology.** From the Latin “flavo” – yellow and “maculatus” – spot, in reference to the fresh colouration of the dorsal body.

**TABLE 1.** Morphometric and meristic data for three *Chaunax* species in present study. Meristic features are counted on both sides when paired. H = holotype. SD = standard deviation. \* donates value of holotype.

	<i>C. flavomaculatus</i> sp. nov.		<i>C. mulleus</i> sp. nov.		<i>C. nudiventer</i>		
	H	All types	H				
SL (mm)	105	105–122 (n=2)	146	112–146 (n=24)		71–94 (n=4)	
Morphometrics values (% SL)				Mean (Range)	SD	Mean (Range)	SD
Head length	41.7	39.1–41.7	40.2	40.9 (38.7–43.0)	1.0	40.3 (38.6–41.7)	1.3
Head width	18.7	17.4–18.7	20.1	19.3 (18.0–20.4)	0.8	17.1 (16.2–17.9)	0.8
Pre-dorsal length	47.1	47.1–49.8	46.7	47.9 (45.9–50.6)	1.2	49.4 (48.2–51.3)	1.7
Pre-gill opening length	62.3	62.3–65.5	62.9	61.9 (59.3–66.3)	1.7	61.9 (60.5–63.5)	1.5
Pre-preopercular length	27.8	27.0–27.8	28.1	28.4 (26.7–31.6)	1.2	27.9 (27.2–28.8)	0.7
Upper jaw length	20.1	19.1–20.1	20.8	21.2 (19.4–24.2)	1.1	19.9 (17.9–21.6)	1.7
Illicial length	4.6	4.5–4.6	3.6	4.1 (3.4–4.7)	0.4	3.5 (2.8–3.9)	0.5
Illicial trough length	7.0	6.2–7.0	5.8	6.5 (5.5–7.9)	0.4	6.0 (5.0–6.6)	0.7
Eye diameter	8.3	6.7–8.3	8.5	8.5 (7.5–9.3)	0.5	8.5 (7.6–9.1)	0.7
Post-dorsal fin length	20.6	20.3–20.6	19.4	20.1 (17.6–22.4)	1.2	20.8 (20.4–21.4)	0.4
Post-anus length	34.0	34.0–35.8	34.5	33.5 (29.1–35.9)	1.5	33.3 (29.3–37.9)	3.8
Post-anal fin length	17.6	17.6–18.3	17.9	17.5 (15.1–19.3)	0.9	18.4 (17.6–20.6)	1.5
Caudal peduncle depth	8.6	7.9–8.6	8.9	8.2 (7.2–9.3)	0.6	7.3 (6.8–7.7)	0.4
Caudal fin length	29.4	29.4–31.0	30.4	30.5 (27.0–34.2)	1.7	31.1 (29.8–32.4)	1.2
Meristics values		n=2		n=24		n=1	
Pectoral-fin rays		13*(4)		12*(46), 13(2)		14(2)	
Lateral-line neuromasts		Value (frequency)		Value (frequency)			
AB		11*(4)		11 (5), 12*(39), 13(4)		11	
BB'		4*(4)		4*(37), 5(11)		4	
AC		8*(4)		8*(47), 9(1)		8	
BD		2*(4)		2*(34), 3 (14)		4	
CD		5*(2), 6*(2)		6*(24), 7(23), 8*(1)		6, 7	
DG		3*(4)		3*(37), 4(11)		3	
EF		4*(4)		3*(2), 4*(40), 5(5), 6(1)		4	
FG		3*(4)		4*(42), 5(6)		3	
GH		12*(2), 13*(2)		11*(4), 12*(26), 13(6), 14(11), 15(1)		14, 15	
BI		32*(2), 33*(1), 34(1)		32*(2), 33*(6), 34(7), 35(5), 36(7), 37(4), 38(6), 39(7), 40(4)		39, 40	



**FIGURE 3.** *Chaunax flavomaculatus* sp. nov., NMNZ P.032620, holotype, 105 mm SL. A. Lateral view. B. Dorsal view. Photos: A Stewart, Te Papa. C. Drawing of lateral view, illustrated by E. Mackay, edited by M. Freeborn, Te Papa.



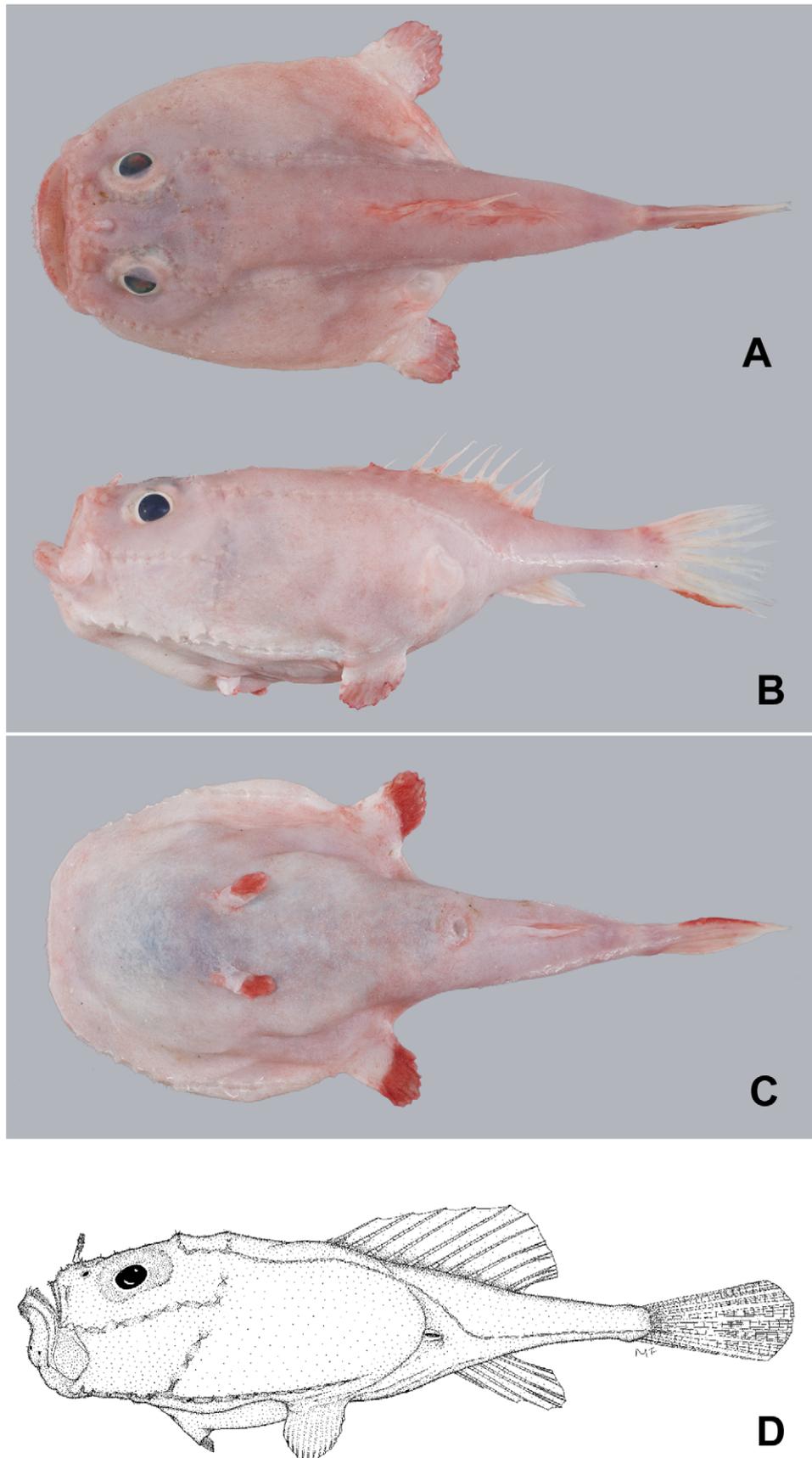
**FIGURE 4.** Distribution map of specimens examined for three *Chaunax* species in present study. Circle = *Chaunax flavomaculatus* **sp. nov.** Triangle = *C. mulleus* **sp. nov.** Square = *C. nudiventer*. Open symbols are primary types. A symbol may represent more than one capture.

**Remarks.** *Chaunax flavomaculatus* **sp. nov.** is most similar to *C. abei* and *C. endeavouri*, with which it shares a mix of numerous bifurcated and simple dermal spinules. *Chaunax flavomaculatus* **sp. nov.** is unique in having many large yellow spots on the pinkish background of the dorsal surface when fresh, and a creamy white body when preserved. *Chaunax abei* has much smaller green spots each circled by a yellow ring, and *C. endeavouri* has relatively numerous, irregular green spots on the dorsal surface when fresh; and these spots of both species turn to gray or brown in preservation. Moreover, *C. abei* is restricted to the northwestern Pacific Ocean ranging from Japan to southern Taiwan and into the South China Sea (Ho, unpublished data); and *C. endeavouri* is endemic to eastern Australia, ranging from Queensland to Tasmania (Gomon & Ho, 2008), whereas *C. flavomaculatus* **sp. nov.** is apparently endemic to northern New Zealand.

***Chaunax mulleus* sp. nov.**

New English Name: Redshoes frogmouth  
(Figures 5A–C, 6A, Table 1)

**Holotype.** NMNZ P.039650 (146 mm), West Norfolk Ridge, New Zealand, 35°10.055'S, 169° 29.125'E, R/V *Tangaroa*, stn. NORFANZ TAN 0308/158, beam trawl, 867–869 m, 4 Jun. 2003.



**FIGURE 5.** *Chaunax mulleus* sp. nov., NMNZ P.039650, holotype, 146 mm SL. A. Lateral view. B. Dorsal view. C. Ventral view. Photos: R. McPhee, Te Papa and K. Parkinson, AMS. D. Drawing of lateral view, illustrated by M. Freeborn, Te Papa.

**Paratypes.** 24 specimens, 112–161 mm SL. **New Zealand:** CSIRO H.6090–01, 150 mm, and CSIRO H.6090–02, 147 mm, collected with holotype. NMMB–P10460 (formerly NMNZ P.039659), 113 mm, collected with holotype. NMV A.25176–001, 138 mm SL and NMV A.25176–002, 147 mm, collected with holotype. NMV A 25177–001, 2, 127–140 mm and NMV A 25177–002, 2, 107–145 mm, W Norfolk Ridge, 35 ° 10'S, 169 ° 29'E, 871 m, 4 Jun. 2003. NMNZ P.035278, 119 mm, Hikurangi Trough, 39°25.8'S, 178°25'E, NZOI R 435, 985 m, Jun. 1990. NMNZ P.039649, 156 mm, NMNZ P.039658, 3, 131–147 mm, and NMNZ P.039659, 114 mm, collected with holotype. NMNZ P.039669, 140 mm, and NMNZ P.039670, 112 mm, W Norfolk Ridge, 35°9.28'S, 169°28.805'E, R/V *Tangaroa*, stn. NORFANZ TAN 0308/159, 868–872 m, ratcatcher trawl, 4 Jun. 2003. NMNZ P.044552, 127 mm, central Challenger Plateau, 40°7.605'S, 170°12.17993'E, R/V *Tangaroa*, stn. Ocean Survey 20/20 TAN 0707/106,803–804 m, beam trawl, 5 Jun. 2007. NMNZ P.046017, 135 mm, NE Chatham Rise, 43°10.45'S, 174°18.3'W, F/V *San Waitaki*, stn. OBS 2428/027, 993–995 m, bottom trawl, 26 May 2007. **Outside NZ EEZ.** CSIRO H2942–01, 160 mm, 37 ° 32'S, 169 ° 07'E, Challenger Plateau, Tasman Sea, 980 m, 14 Apr. 1992. CSIRO H3138–13, 127 mm, 35 ° 26'S, 164 ° 43'E, Lord Howe Rise, Tasman Sea, 929 m, 17 Jun. 1992. CSIRO H6041–01, 145 mm, 32 ° 40'S, 162 ° 33'E, Lord Howe Rise, Tasman Sea, 864 m, 25 May 2003. NMNZ P.040942, 150 mm, central Louisville Ridge, 38°25'S, 168°09'W, F/V *Sapun Gora*, stn. OBS 1950/126, 1000 m, bottom trawl, 13 Jul. 2004. NMNZ P.044562, 161 mm, Challenger Plateau, NE Bellona Trough, 38°34.78'S, 167°8.995'E, R/V *Tangaroa*, stn. Ocean Survey 20/20 TAN 0707/056, 974 m, beam trawl, 31 May 2007.

**Non-types.** 7 specimens, 85–180 mm. NMNZ P.011552, 85 mm, W Hikurangi Slope, SE of Cape Turnagain, 40°51.1'S, 176°57.5'E, F/V *Kalinovo*, stn. K 8101/145, 1058–1100 m, bottom trawl, 18 Dec. 1981. NMNZ P.012866, 180 mm, N Chatham Rise, 43°9.65'S, 174°37.7'W, F/V *Kaltan*, stn. KTN 8201/060, 885 m, 13 Aug. 1982. NMNZ P.017811, 3, 160–170 mm, off Shoe and Slipper Islands, 37°6.2'S, 176°45.55'E, F/V *Wanaka*, stn. WNK 8502/056, 1052–1081 m, 11 Sep. 1985. NMNZ P.036062, 125 mm, Ritchie Banks, 40°4.8'S, 178°9.35'E, 720–972 m, F/V *San Torshavn*, stn. OBS 1172/061, bottom trawl, 15 Dec. 1998. NMV A 25139–007, 143 mm SL, Lord Howe Plateau, 32 ° 41'48"S, 162 ° 33'28"E, R/V *Tangaroa*, trawl, 855–874 m, 25 May 2003, coll. M. Gomon & NORFANZ team.

**Diagnosis.** A species unique for the genus in having a uniformly pinkish colour with deep red colour on under side of distal half of pectoral and pelvic fins and lower margin of caudal fin. It can be further distinguished from the congeners in having modally 1 spine on each side of lateral line neuromast complex; usually 12 pectoral-fin rays; a thin and tapering caudal peduncle; illicium relatively short and thick; esca whitish with some pink cirri when fresh; and greyish gill chamber and gill arches. Gill rakers: GR<sub>i</sub> =17–18 (3–4+14); GR<sub>ii</sub> 14–15; GR<sub>iii</sub> 14–15; GR<sub>iv</sub> =12. Lateral-line neuromast counts: AB =11–13 (mainly 12); AC =8–9 (8); BB' =4–5 (4); BD =2–3; CD =6–8 (6–7); EF =3–6 (4); FG =4–5 (4); GH =11–15 (12–14); BI =32–40.

**Description.** Morphometric and meristic data are given in Table 1. Head length 2.5 (2.3–2.6) in SL; head width 5.0 (4.9–5.6) in SL, 2.0 (2.0–2.3) in HL; pre-dorsal length 2.1 (2.0–2.2) in SL; pre-gill opening length 1.6 (1.5–1.7); pre-preopercular length 3.6 (3.2–3.7) in SL, 1.4 (1.4–1.5) in HL; upper jaw 4.8 (4.1–5.0) in SL, 1.9 (1.9–2.1) in HL; illicial length 11.3 (8.7–11.3) in HL; illicial trough length 6.9 (5.5–7.4) in HL; eye diameter 4.7 (4.6–5.3) in HL; post-dorsal fin length 5.2 (4.5–5.7) in SL, 2.1 (1.7–2.2) in HL; post-anus length 3.2 (2.8–3.4) in SL, 1.3 (1.1–1.4) in HL; post-anal fin length 5.6 (5.2–6.5) in SL, 2.2 (2.1–2.8) in HL; caudal peduncle depth 4.5 (4.5–5.5) in HL; caudal fin length 3.3 (2.9–3.7) in SL, 1.3 (1.2–1.5) in HL.

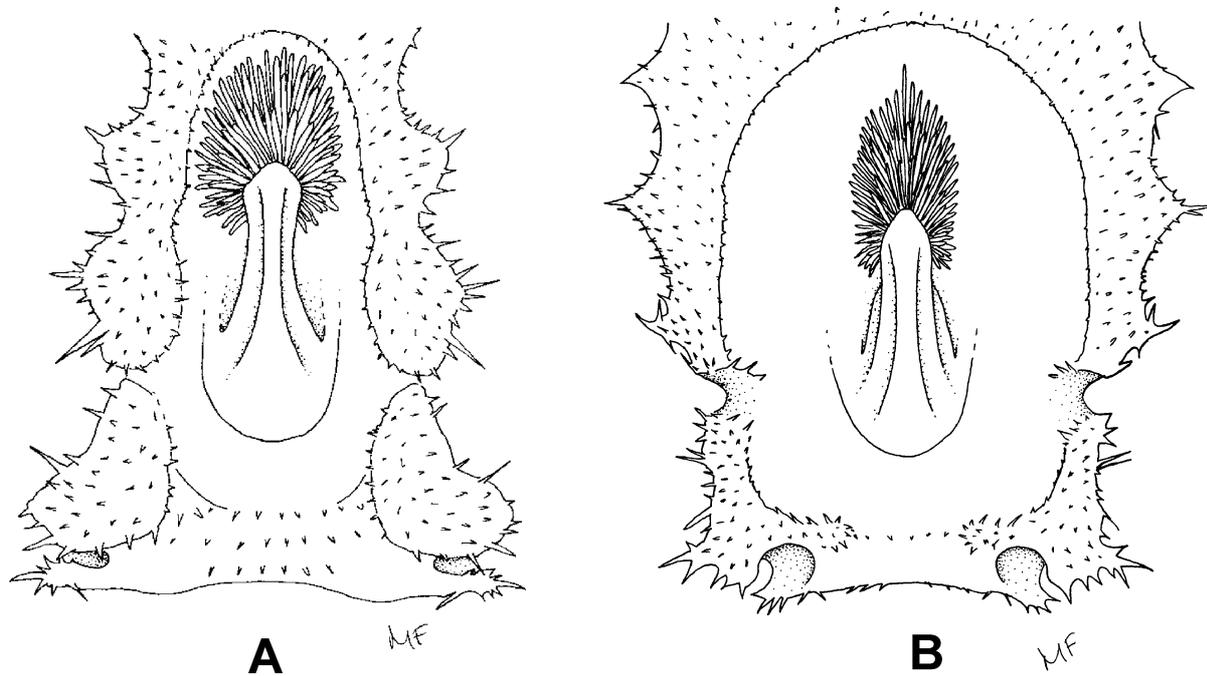
Head globular, skull slightly elevated posteriorly; trunk cylindrical, slightly compressed, tapering posteriorly; skin thin, loose and flaccid; interorbital space broad; caudal peduncle relatively long and slender, slightly compressed, tapering posterior. Eyes rounded, directed dorsolaterally, covered by dermal membrane broadly connected to adjoining skin, forming clear “window”.

Illicium short and stout; esca with large central tongue bearing many thin whitish and pinkish cirri; second dorsal-fin spine close to illicium, embedded under skin; third dorsal-fin spine situated at about mid-point of pre-dorsal distance, embedded under skin. Illicial trough oval-shaped, slightly concave, relatively short and narrow, smaller than eye pupil, longer than wide (Fig. 6A).

Two nostrils anterior to eye, anterior nostril surrounded by fleshy membrane, posterior part higher than anterior part, posterior nostril a simple round hole; mouth relatively wide, terminal, opening nearly vertically; lower jaw slightly protruding in front of upper jaw; maxilla tapering above, broad below; blunt symphyseal spine on lower jaw symphysis.

Broad transparent membrane on first gill arch; first ceratobranchial broadly connected to opercular wall; gill

filaments on second to fourth gill arches, two rows of gill filaments on second and third gill arches, single row of gill filaments on fourth gill arch; those on inner row of third arch and fourth gill arch about one-third length of those of other arches; inner surface of fourth gill arch completely connected to body. Single row of 17–18 rakers on 1st gill arch, 3–4 on upper limb and 14 on lower limb, 14–15 paired rakers on 2nd arch, 14–15 paired rakers on 3rd arch and single row of 12 rakers on 4th arch.



**FIGURE 6.** Dorsal view of illicial trough area showing relative size of trough in two *Chaunax* species. A. From holotype of *C. mulleus* **sp. nov.** B. From holotype of *C. russatus* **sp. nov.** Illustrated by M. Freeborn, Te Papa.

Interspaces of lateral-line neuromast complex slightly longer than its width; 1–3 (mainly 1) pairs of slender spines bridging neuromasts (cf. Fig. 1B).

Skin thin, tips of pectoral- and pelvic-fin rays free. Dermal spinules long and slender, all simple, covering entire body, except eye window, outer half of pectoral fins, entire anal fin and membranes of others. Narrow band comprising 3–4 rows of spinules in front of illicial trough.

Teeth in both jaws slender, fang-like; 5–8 irregular rows in upper jaw, tooth length gradually increasing from outer to inner row, those in inner row longest; teeth in lower jaw in same arrangements. Teeth on vomer small, in two wide bands, each with about 3 rows, distinctly separated by a small medial space; teeth on palatine small, in elongate patch, close to outer end of vomerine patch.

Dorsal fin rays III, 12, first ray shortest, about half length of second; last two rays branched. Pectoral fin fan-shaped, with 12–13 rays (mainly 12), 4th or 5th ray longest, those below 6th ray gradually shorter. Anal fin with 6–7 rays, first shortest, first and second simple, 3rd or 4th to the last branched. Caudal fin truncate, with 9 rays, second to seventh rays branched, other 3 simple, lower most ray shortest, close to adjacent one.

Colouration. Fresh (Fig. 5A–C): uniformly pinkish, except for deep-red colour on ventral surface of distal half of pectoral and pelvic fins and lower part of caudal fin. Cirri laterally on body bright white. Preserved: uniformly creamy white. Inner part of mouth cavity and gill chamber blackish, including gill arches.

**Distribution.** Endemic to the northern New Zealand region, extending from the southern Lord Howe Rise, central Challenger Plateau, West Norfolk Ridge, Bay of Plenty, eastern North Island and northern Chatham Rise, to the Louisville Ridge (Fig. 4) at 720–1100 m depth.

**Etymology.** From the Latin “mulleus” – a red shoe, in reference to the distinct deep-red ventral surface of outer half of the pectoral and pelvic fins and ventral surface of anal and caudal fins in fresh specimens.

***Chaunax nudiventer* Ho and Shao, 2010**

(Figure 7, Table 1)

*Chaunax nudiventer* Ho & Shao, 2010: 54, figs 1A, 2A–C, 3, 4A–B. (Holotype: NSMT-P95084. Paratypes: many at MNHN and NSMT; type locality: South Fiji Ridge, 26°01.7'S, 179°02.3'W, depth 538–620 m).

*Chaunax pictus* (non Lowe, 1846): Stephenson, 1971: 239 (mis-identification); Paulin *et al.*, 1989: 135, fig 62.1, colour plate. Paulin & Stewart, 1985: 27 (listed, in part).

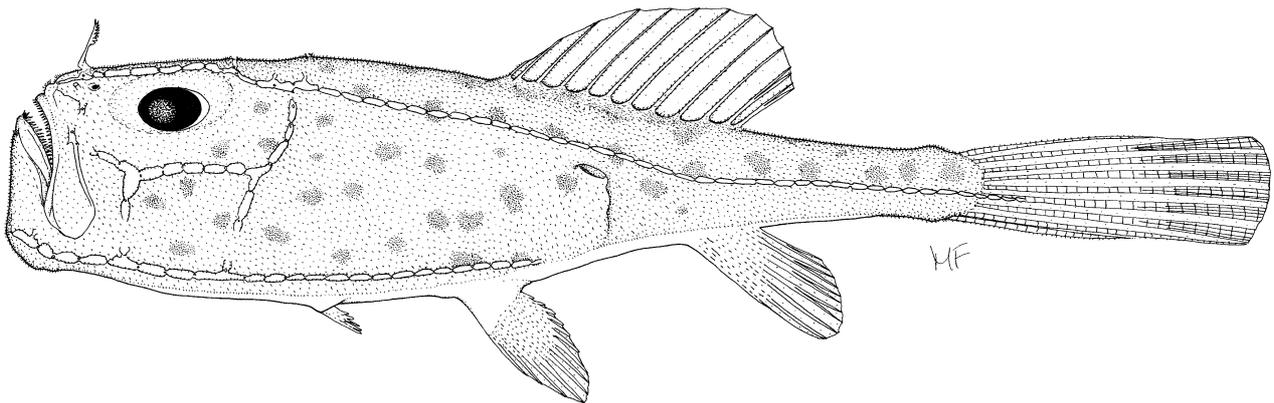
*Chaunax* sp. C: Roberts *et al.* 2009: 532 (listed, in part).

**Specimens examined.** 10 specimens, 54–193 mm SL. **New Zealand:** NMNZ P.005525, 85 mm, E of northern Three Kings Rise, 30°45'S, 173°51'E, RNZFA *Tui*, stn. AUZ 011 02, 501–678 m, 6 Jul. 1962. NMNZ P.031015, 79 mm, Mercury Islands, 36°16.27'S, 176°16.02'E, R/V *Kaharoa*, stn. KAH 9401/010, 527–531 m, prawn trawl, 7 Jan. 1994. NMNZ P.033935, 56 mm, SE of Alderman Islands, 36°55.975'S, 176°16.81'E, F/V *Drysdale*, stn. DRY 9602/001, 395 m, bottom trawl, 18 Oct. 1996. NMNZ P.035223, 58 mm, off Raoul Island, 29°11.5'S, 177°53.05'W, NZOI K 830, 545–545 m, Jul 1974. NMNZ P.037207, 94 mm, S of Hastings, 40°4.4'S, 177°19.3'E, 14 Feb. 1999. **New Caledonia:** NMNZ P.027483, 71 mm, Seamount B, S of New Caledonia, 24°54.2'S, 168°21.7'E, Beryx 2, stn. 19, 510–519 m, bottom trawl, 30 Oct. 1991, coll. C. Roberts. NMNZ P.029205, 193 mm, paratype, Seamount B, S of New Caledonia, 24°55.5'S, 168°21.45'E, Beryx 11, stn. CP7, 540–670 m, beam trawl, 15 Oct. 1992, coll. C. Roberts & C. Paulin. NMNZ P.029237, 3, 54–73 mm, Seamount B, S of New Caledonia, 24°51.4'S, 168°21.95'E, Beryx 11, stn. 4, 550–920 m, trawl, 14 Oct. 1992, coll. C. Roberts & C. Paulin.

**Diagnosis.** Dorsal-fin rays III, 11–12 (modally 12); anal-fin rays 6–7 (7); pectoral-fin rays 13–14 (14). A member of the *C. abei*-species group that differs from its congeners in having large spots on the dorsal surface; largely naked area on abdomen; relatively short head and long tail, reflected in the relatively elongated body; 3 pairs of spinules bridging lateral-line neuromasts; dermal spines on body surface simple, slender and elongate; and lateral-line neuromasts in pectoral series extending well beyond pectoral fin base. Lateral-line neuromast counts: AB = 10–12 (modally 11); BB' = 4; BD = 3–5 (4–5); CD = 5–7 (6–7); EF = 3; FG = 3–4 (3); GH = 15–19 (16–17); BI = 39–50 (41–43).

**Distribution.** Known from New Caledonia, South Fiji Ridge and now off northern New Zealand (Fig. 8). Bathymetric range 282–1089 m (Ho & Shao, 2010); specimens from the present study area taken at 395–920 m.

**Remarks.** Five specimens collected from northern New Zealand represent the first record for the area; one of these (NMNZ P.005525) was originally reported by Stephenson (1971) as *C. pictus*. It is notable that no specimens exceeding 100 mm SL were found in New Zealand waters, whereas adults attain 271 mm SL elsewhere (Ho & Shao, 2010).



**FIGURE 7.** *Chaunax nudiventer* Ho and Shao, 2010, NMNZ P.05525, 85 mm SL, illustrated by M. Freeborn, Te Papa.

***Chaunax penicillatus* McCulloch, 1915**

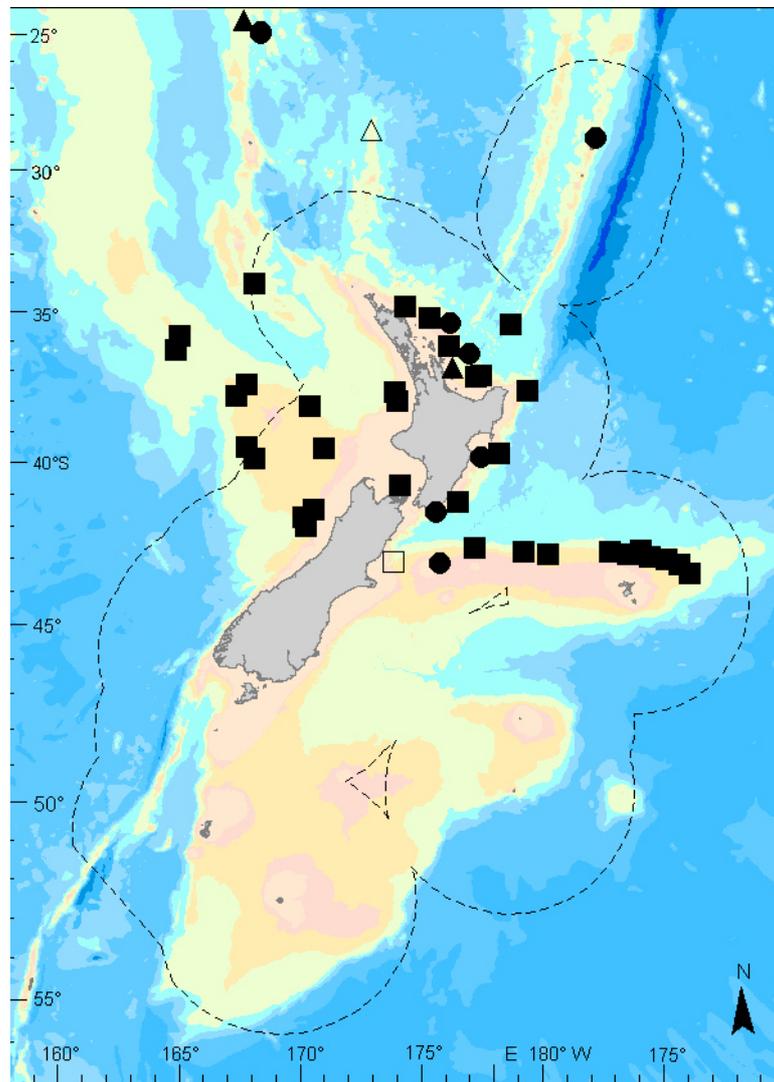
(Figures 9A–C, Table 2)

*Chaunax penicillatus* McCulloch, 1915: 167, Pl. 33, fig. 2 (Holotype: AMS E.5488; paratype: AMS I.13605 (1); type locality: 60 km SW of Cape Everard, Victoria, Australia, depth 293–366 m). Le Danois, 1979: 34 (in part); Stephenson, 1971: 238,

fig. 4; Caruso, 1999: 2022; Paxton *et al.*, 1989: 282; Gomon & Ho, 2008: 377; Paxton *et al.*, 2006: 651 ; Ho & Shao, 2010: 53.

*Chaunax tosaensis* Okamura & Oryuu in Okamura & Kitajima, 1984: 275, Pl. 192. (Holotype: BSKU 36101. Paratypes: BSKU 99 specimens; type locality: Mimase fish market, Tosa Bay, depth probably 200–300 m).

*Chaunax* sp. B: Roberts *et al.*, 2009: 532 (listed).



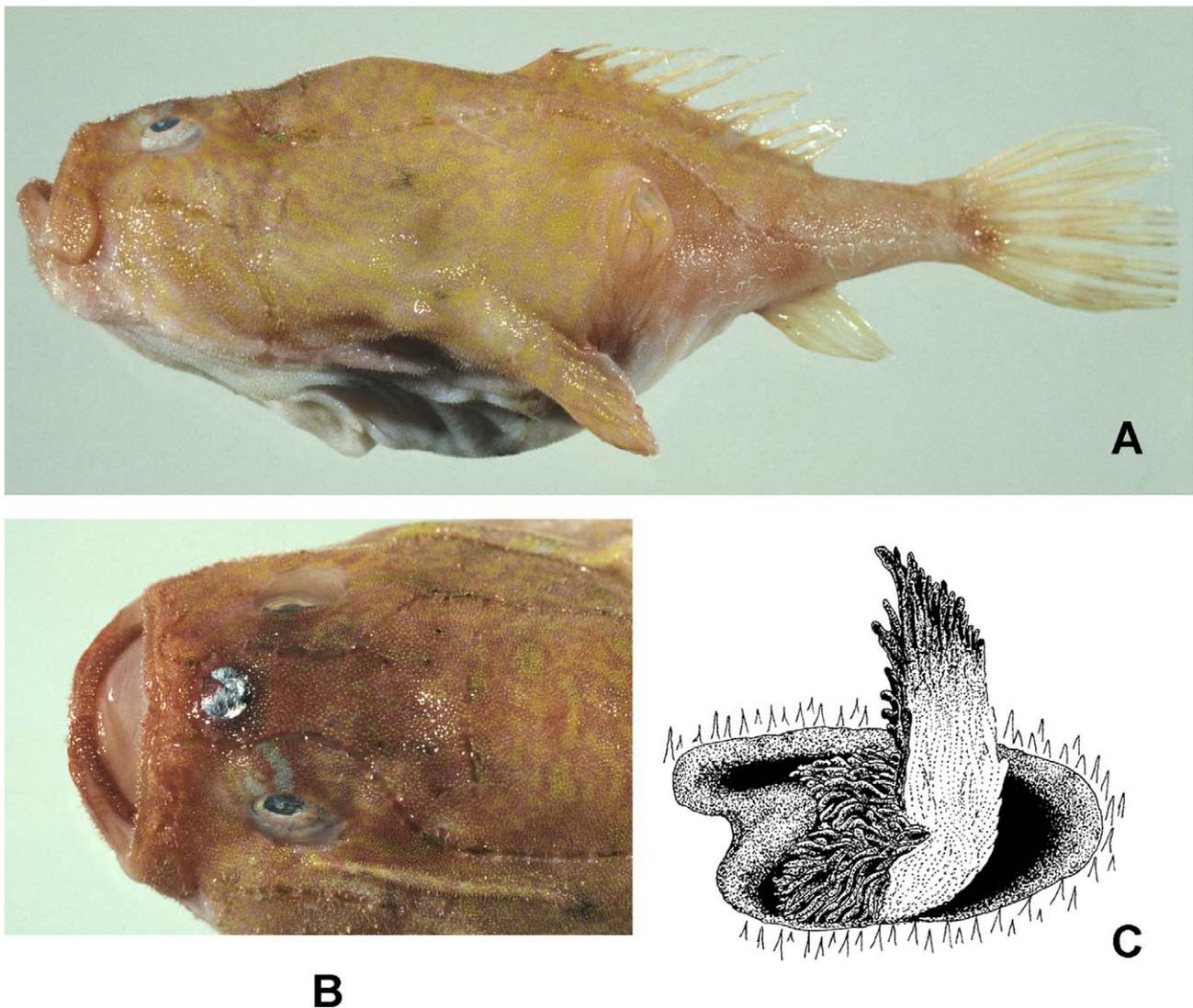
**FIGURE 8.** Distribution map of three *Chaunax* species in present study. Circle = *Chaunax penicillatus*. Triangle = *C. reticulatu* **sp. nov.** Square = *C. russatus* **sp. nov.** Open symbols are primary types. A symbol may represent more than one capture. Dashed line = limit of Exclusive Economic Zone. Prepared by C. Struthers, Te Papa. Dashed line = limit of Exclusive Economic Zone. Prepared by C. Struthers, Te Papa.

**Specimens examined.** 17 specimens, 91–269 mm SL. **New Zealand:** AIM AK 1000, 120 mm, E of Alderman Islands, 356–475m, trawled, 8–12 June 1969. NMNZ P.032640, 108 mm, NE of Great Barrier Island, 35°24.4'S, 176°10.1'E, F/V *Albatross* II, stn. OBS 0864/035, 400–402 m, bottom trawl, 17 Jul. 1995. NMNZ P.033033, 126 mm, Mernoo Bank, Chatham Rise, 43°10'S, 175°44'E, F/V *Petersen*, 430–470 m, Oct. 1995. NMNZ P.033901, 106 mm, SE of Alderman Islands, 36°57.305'S, 176°16.84'E, F/V *Drysdale*, stn. DRY 9602/007, 403–406 m, bottom trawl, 20 Oct. 1996. NMNZ P.033933, 108 mm, SE of Alderman Islands, 36°55.975'S, 176°16.81'E, F/V *Drysdale*, stn. DRY 9602/001, 395 m, bottom trawl, 18 Oct. 1996. NMNZ P.034457, 124 mm, Kermadec Ridge, N of Raoul Island, 28°50.8'S, 177°50.4'W, F/V *Santa Maria*, stn. OBS 1021/003, drop line, 7 Jul. 1997. NMNZ P.036972, 105 mm, Southern Colville Ridge, 36°51.7'S, 176°16.8'E, R/V *Kaharoa*, stn. KAH 9604/035, 384–390 m, bottom trawl, 18 Apr. 1996. NMNZ P.038479, 214 mm, SE of Tora, Wairarapa, 41°33.8'S, 175°37.1'E, F/V *Venture* K, stn. OBS 1660/032, 336–353 m, bottom trawl, 9 Jul. 2002. NMNZ P.046324, 65 mm, E of Cape Kidnappers, 39°41.8'S, 177°41.2'E, F/V *Venture* K, stn. OBS 2827/026, 343 m, 7 Apr. 2009. **New Caledonia:** NMNZ P.027438, 157 mm, Seamount B, S of New Caledonia, 24°56.7'S, 168°21.7'E, Beryx 2, stn. 1, 505–577 m, bottom trawl, 23 Oct. 1991,

coll. C. Roberts. NMNZ P.027449, 188 mm, Seamount B, S of New Caledonia, 24°26.6'S, 168°21.1'E, Beryx 2, stn. 5, 522–575 m, bottom trawl, 24 Oct. 1991, coll. C. Roberts. NMNZ P.027481, 269 mm, Seamount B, S of New Caledonia, 24°54.2'S, 168°21.7'E, Beryx 2, stn. 19, 510–519 m, bottom trawl, 30 Oct. 1991, C. Roberts. NMNZ P.029370, 263 mm, Seamount B, S of New Caledonia, 24°55.75'S, 168°21.4'E, Beryx 11, stn. 6, 505–620 m, bottom trawl, 15 Oct. 1992, coll. C. Roberts & C. Paulin. NMNZ P.029415, 2, 137–227 mm, and NMNZ P.042786, 137 mm, Seamount B, S of New Caledonia, 24°55.1'S, 168°21.55'E, Beryx 11, stn. 3, 502–610 m, bottom trawl, 14 Oct. 1992, C. Roberts & C. Paulin. NMNZ P.042784, 91 mm, Seamount B, S of New Caledonia, 24°54.2'S, 168°21.7'E, Beryx 2, stn. 19, 510–519 m, bottom trawl, 30 Oct. 1991, coll. C. Roberts.

**Diagnosis.** Dorsal-fin rays III, 11–12 (modally 12); anal-fin rays 6–7 (7); pectoral-fin rays 11–13. A species in the *C. pictus*-species group with a black and very deep illicial trough, an extremely short illicium and esca with numerous stout black (anterior face) and white (posterior face) cirri (Figs. 9B–C). Gill rakers: GRi = 13–14 (3–4+9–10); GRii = 8–10; GRiii = 8–11; GRiv = 7–8. Lateral-line counts: AB = 10–12 (mainly 11); BB' = 4–5 (5); BD = 2–3 (2); CD = 6–7; EF = 3–5 (4); FG = 3–4 (3); GH = 10–13 (11–12); BI = 35–40 (36–38).

It can be distinguished from *C. stigmaeus* Fowler, 1946 in its extremely short illicium, lacking a black ring on illicial stem, and distinct markings of rings or blotches on dorsal surface of body when preserved; and from *C. pictus* in having a relatively short tail (all three values of tail lengths relatively small), blackish blotches usually present on dorsal surface, and a relatively narrow head.



**FIGURE 9.** *Chaunax penicillatus* McCulloch, 1915, NMNZ P.032640, 108 mm SL. A. Lateral view. B. Laterodorsal view of head. Photos: A Stewart, Te Papa. C. Close-up view of illicial trough area, illustrated by E McKay edited by M. Freeborn, Te Papa.

**Distribution.** Widespread in the Indo-west Pacific, including Kenya, South Africa, Madagascar, Japan, Taiwan, South China Sea, Australia and New Zealand (Fig. 8). Bathymetric range 343–620 m in the present study area.

**Remarks.** This is the only member in the *C. pictus*-species group that occurs outside the Atlantic Ocean and is also the widest distributed species of the genus in the Indo-Pacific region. *Chauxanx tosaensis* is a junior synonym proposed by Caruso (1999) and confirmed by comparisons of both morphological characters and Cytochrome c oxidase subunit I (COI) sequences made by the first author (Ho, unpublished data). First record of family Chaunacidae in New Zealand waters was by Stephenson (1971), who accurately identified, diagnosed and figured this species.

***Chaunax reticulatus* sp. nov.**

New English name: Netted frogmouth  
(Figures 10A–C, Table 2)

**Holotype:** NMNZ P.040686, 188 mm, northern Three Kings Ridge, New Zealand, 28°35.7'S, 172°55.65'E, F/V *Clarabelle*, stn. OBS 1735/022, 360–398 m, bottom trawl, 21 Jan. 2003, coll. Simon Beatson.

**Paratypes:** 11 specimens, 30–102 mm SL. **New Zealand:** NMNZ P.033934, 78 mm, SE of Alderman Islands, New Zealand, 36°55.975'S, 176°16.81'E, 3 F/V *Drysdale*, stn. DRY 9602/001, 95 m, bottom trawl, 18 Oct 1996. **New Caledonia:** MNHN 2002–0172, 3, 74–102 mm, Norfolk Ridge, 23°37' 59"S, 167°43'1"E, Campagne Chalcal 2, stn. CP25, 418 m, beam trawl, 30 Oct. 1986. MNHN 2003–1094, 64 mm, Norfolk Ridge, 23°37'01"S, 167°40'59"E, Campagne Lithist, stn. CP2, 442 m, beam trawl, 10 Aug. 1999. MNHN 2003–1124, 3, 30–58 mm, Norfolk Ridge, 23°37'05"S, 167°42'00"E, Campagne Lithist, stn. CC6, 440–579 m, otter trawl, 10 Aug. 1999. MNHN 2003–1521, 76 mm, Norfolk Ridge, 23°42'05"S, 168°15'00"E, Campagne Lithist, stn. CP14, 378 m, beam trawl, 12 Aug. 1999. MNHN 2003–1532, 73 mm, Norfolk Ridge, 23°43'01"S, 168°16'01"E, Campagne Lithist, stn. CP16, 379 m, beam trawl, 12 Aug. 1999. NMNZ P.029330, 98 mm, Jumeaux Seamount, S of New Caledonia, 23°48.75'S, 168°17.1'E, Beryx 11, stn. 53, 540–950 m, beam trawl, 21 Oct. 1992, coll. C. Roberts & C. Paulin.

**Diagnosis.** A member of the *Chaunax fimbriatus*-species group with cirri on head, reticulate colour pattern on dorsal surface and more than 3 pairs of spinules in lateral-line neuromast complex. Distinguished from congeners in having greyish dorsal background colour with pale reticulate pattern; cirri present above the eye and absent from lower part of maxilla; 4–6 pairs of stout spinules bridging each neuromast; 14 pectoral-fin rays; relatively long and slender illicium; elongate illicial trough, longer than wide; and numerous thin brownish cirri on esca. Gill rakers: GRi = 12–13 (3+8–9); GRii = 9; GRiii = 9; GRiv = 7–8. Lateral-line neuromasts: AB = 11–12 (modally 11); AC = 7–9 (8); BB' = 4–5 (4); BD = 2–3 (2); CD = 5–8 (6–7); EF = 3–4 (4); FG = 3–4 (3); GH = 11–13 (12); BI = 30–35.

**Description.** Morphometric and meristic data are given in Table 2. Head length 2.4 (2.3–2.4) in SL; head width 5.1 (4.9–5.2) in SL, 2.1 (2.1–2.2) in HL; pre-dorsal length 2.0 (1.9–2.0) in SL; pre-gill opening length 1.5 (1.5–1.6); pre-preopercular length 3.7 (3.3–3.7) in SL, 1.5 (1.4–1.5) in HL; upper jaw 4.7 (4.3–4.8) in SL, 2.0 (1.8–2.0) in HL; illicial length 11.6 (9.3–12.0) in HL; illicial trough length 6.0 (4.4–6.7) in HL; eye diameter 6.0 (4.4–6.0) in HL; post-dorsal fin length 5.1 (5.1–6.9) in SL, 2.1 (2.1–3.0) in HL; post-anus length 3.5 (3.2–4.0) in SL, 1.4 (1.4–1.8) in HL; post-anal fin length 6.9 (6.3–6.9) in SL, 2.9 (2.7–3.3) in HL; caudal peduncle depth 4.2 (4.2–4.6) in HL; caudal fin length 3.3 (2.9–3.3) in SL, 1.4 (1.3–1.4) in HL.

Head globular, skull slightly elevated posteriorly; trunk cylindrical, slightly compressed, tapering posteriorly; ventral surface flattened; skin thick, loose and flaccid; interorbital space broad; caudal peduncle short, slightly compressed, tapering posterior. Eyes rounded, directed dorsolaterally, covered by dermal membrane broadly connected to adjoining skin, forming clear “window”.

Illicium long and slender; esca with small central tongue bearing many thin brown cirri; second dorsal-fin spine close to illicium, embedded under skin; third dorsal-fin spine situated at about mid-point of pre-dorsal distance, embedded under skin. Illicial trough slender, slightly concave, its length about twice its width.

Two nostrils anterior to eye, anterior nostril surrounded by fleshy membrane, posterior part higher than anterior part, posterior nostril a simple round hole; mouth wide, terminal, its opening nearly vertical; lower jaw slightly protruding in front of upper jaw; maxilla tapering above, broad below; blunt symphyseal spine on lower jaw symphysis.

Broad transparent membrane on first gill arch; first ceratobranchial well connected to opercular wall; gill filaments present on second to fourth gill arches, two rows of gill filaments in second and third gill arches, single row of gill filaments on fourth gill arch; those on inner row of third arch and fourth gill arch about two–third length of other arches; inner surface of fourth gill arch completely connected to body. Single row of 11–12 rakers on 1st gill arch, 3 on upper limb and 8–9 on lower limb, 9 paired rakers on 2nd arch, 9 paired rakers on 3rd arch and single row of 7–8 rakers on 4th arch.

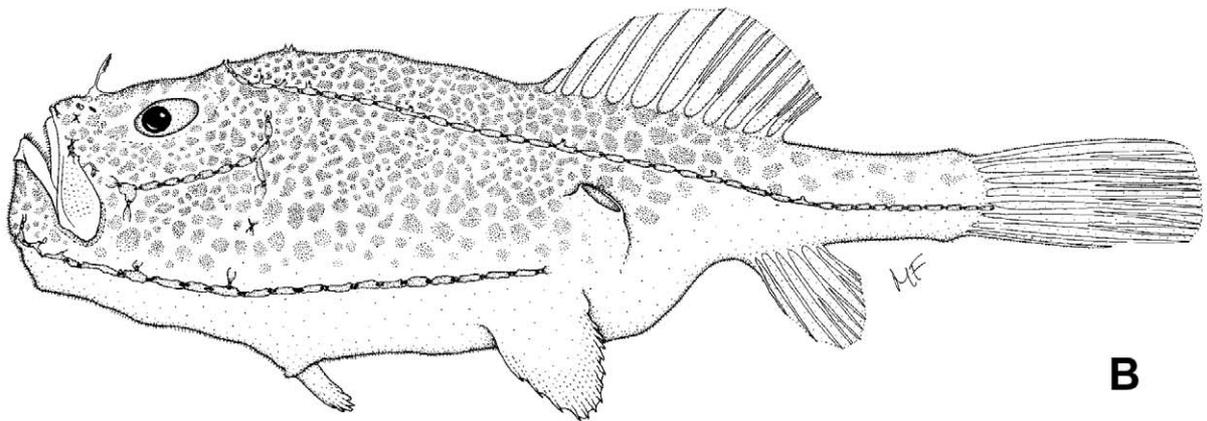
Interspaces of lateral-line neuromast complex slightly wider than its width; 4–6 pairs of short spines bridging each neuromast.

**TABLE 2.** Morphometric and meristic data for three *Chaunax* species in present study. Meristic features are counted on both sides when paired. H = holotype. SD = standard deviation. \* donates value of holotype.

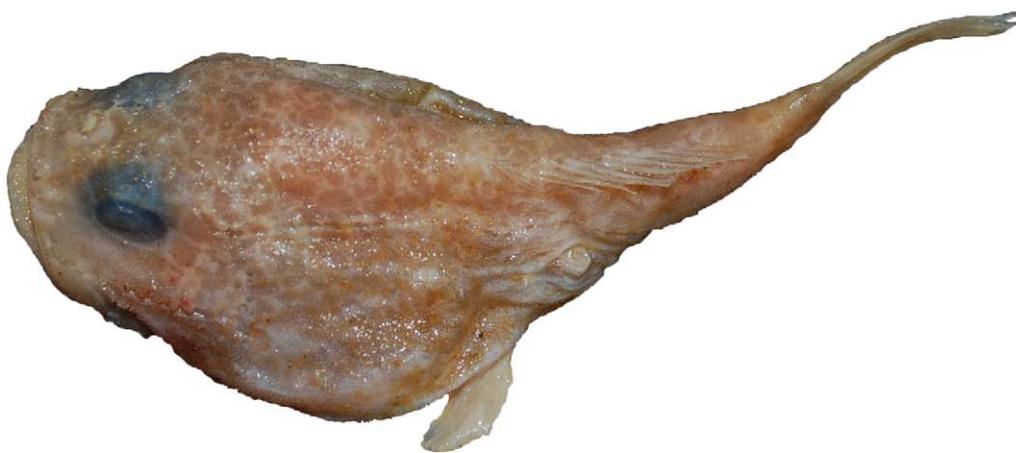
	<i>C. reticulatus</i> sp. nov.			<i>C. russatus</i> sp. nov.			<i>C. penicillatus</i>	
	H	Types		H	Types		Non-types	
SL (mm)	188	64–188 (n=7)		170	100–214 (n=22)		97–197 (n=9)	
Morphometric value (% SL)		Mean (Range)	SD		Mean (Range)	SD	Mean (Range)	SD
Head length	41.3	42.3 (41.3–46.9)	1.9	41.7	39.7 (34.7–42.7)	1.9	41.0 (37.8–45.2)	2.2
Head width	19.7	19.8 (19.4–20.2)	0.4	18.5	18.5 (17.5–19.6)	0.6	18.2 (17.0–20.4)	1.0
Pre-dorsal length	49.3	52.0 (49.3–53.2)	1.4	47.6	47.3 (44.0–49.2)	1.6	49.4 (45.6–53.4)	2.4
Pre-gill opening length	65.2	64.6 (62.5–68.5)	2.1	66.7	62.9 (59.6–66.5)	2.3	63.1 (58.3–67.7)	3.0
Pre-preopercular length	27.2	29.7 (27.2–32.3)	1.5	28.6	27.9 (25.0–30.2)	1.2	28.3 (27.4–29.5)	0.7
Upper jaw length	21.1	22.0 (20.8–23.2)	1.0	20.0	20.8 (18.5–22.8)	1.1	20.7 (19.3–22.1)	0.9
Illicial length	3.6	4.0 (3.6–4.5)	0.4	5.1	4.3 (3.5–5.5)	0.5	1.9 (1.5–2.2)	0.3
Illicial trough length	6.9	7.8 (6.9–9.5)	0.9	8.2	6.9 (6.0–8.2)	0.7	4.1 (3.6–5.3)	0.6
Eye diameter	6.9	8.4 (6.9–9.5)	1.3	8.7	8.2 (7.2–9.0)	0.5	7.8 (6.8–8.7)	0.7
Post-dorsal fin length	19.6	17.6 (14.5–19.6)	2.0	20.4	19.7 (17.9–22.4)	1.3	16.9 (15.0–18.7)	1.4
Post-anus length	28.8	27.8 (25.0–31.1)	2.4	38.5	31.7 (28.0–34.8)	1.7	29.1 (26.5–31.8)	1.9
Post-anal fin length	14.4	13.6 (10.5–15.6)	2.0	17.9	16.8 (14.5–18.4)	1.3	14.3 (13.0–15.3)	0.7
Caudal peduncle depth	9.9	9.7 (9.5–9.9)	0.2	8.3	7.9 (6.0–8.7)	0.7	8.8 (7.4–9.5)	0.6
Caudal fin length	29.9	32.0 (29.9–34.2)	1.5	27.8	28.6 (26.1–30.9)	1.8	30.2 (27.5–32.2)	1.7
Meristic values		n=12			n=22		n=11	
Pectoral-fin rays		14*(24)			11(4), 12*(36), 13(4)		11(2), 13(20)	
Lateral-line neuromasts		Value (frequency)			Value (frequency)		Value (frequency)	
AB		11*(22), 12 (2)			11(7), 12*(37)		10 (2), 11 (16), 12 (4)	
BB'		4*(21), 5 (3)			4*(38), 5(6)		4(2), 5 (20)	
AC		7 (1), 8*(22), 9 (1)			8*(44)		8 (22)	
BD		2*(23), 3(1)			2*(36), 3(8)		2 (19), 3 (3)	
CD		5(1), 6*(10), 7*(12), 8(1)			6(12), 7*(32)		6 (10), 7 (12)	
DG		3*(23), 4(1)			3*(40), 4(4)		3 (14), 4 (8)	
EF		3*(3), 4*(21)			4*(38), 5(6)		3 (1), 4 (19), 5 (2)	
FG		3*(23), 4 (1)			4*(36), 5 (8)		3 (20), 4 (2)	
GH		11*(3), 12*(18), 13(3)			12(5), 13*(37), 14(2)		10 (1), 11 (12), 12 (8), 13 (1)	
BI		30(3), 32*(4), 33(9), 34(6), 35(2)			32(2), 33(2), 34(2), 35(4), 36*(12), 37*(13), 38(6), 39(3)		35 (1), 36 (5), 37 (8), 38 (6), 40 (2)	



A



B



C

**FIGURE 10.** *Chaunax reticulatus* sp. nov. A. Holotype, NMNZ P.040686, 188 mm SL, dorsal view. Photo C. Struthers, Te Papa. B. Drawing of lateral view of holotype, illustrated by M. Freeborn, Te Papa. C. Laterodorsal view of paratype, MNHN 2003–1532, 73 mm SL, photo: H.–C. Ho, NMMB, Taiwan.

Skin thick, that covering pectoral and pelvic fins forming thick membrane, tips of rays not free. Dermal spinules short and stout, covering entire body except for eye window, outer half of pectoral fins, entire anal fin and membranes of all fins. Wide band of 8–10 rows of dermal spinules in front of illicial trough.

Teeth in both jaws slender, fang-like; 8 irregular rows (5–6 rows in two paratypes) in upper jaw, teeth gradually increasing from outer to inner row, inner row longest, more than twice length of those in outer row; lower jaw with 5–6 irregular rows of teeth and in similar arrangement. Teeth on vomer small, in about 3 rows, forming two wide bands, well-separated by a small space; those on palatine small, forming an elongated patch and close to outer end of vomer teeth.

Dorsal-fin rays III, 12; first shortest, about half length of second; all simple except last two branched. Pectoral fin fan-shaped, with 14 rays, 4th or 5th longest, gradually shorter from the 6th to behind. Anal fin with 6–7 rays, first shortest, first and second simple, third to last branched. Caudal fin truncate, with 9 rays, second to seventh branched, remaining 3 simple, lower most ray shortest, close to adjacent one.

Colouration. Fresh: unknown. Preserved: (juveniles, paratypes) white reticulate pattern on light grey background; (adult, holotype) reticulate pattern stronger, transforming into many small irregular pale grey spots. Esca with deep brown cirri in all sizes.

**Distribution.** Known only from type series collected from seamounts and oceanic ridges of northern New Zealand and southern New Caledonia, at depths of 360–950 m (Fig. 8).

**Etymology.** From the Latin “retis” – net, means netted or reticulate, in reference to the netted colour pattern of the body.

**Remarks.** To date, *Chaunax reticulatus* is the only member of the *C. fimbriatus*-species group known from the southern Pacific Ocean. This group currently comprises four nominal species: *C. fimbriatus* from the northwestern Pacific Ocean, *C. umbrinus* Gilbert, 1905 from Hawaii, *C. flammeus* Le Danois, 1979 from the western Indian Ocean, and *C. reticulatus* described herein.

*Chaunax reticulatus* can be distinguished from others in the group by the pale reticulate pattern on a grey background dorsally. It further differs from *C. fimbriatus* in lacking two white patches on the dorsal surface (vs. two large white patches present), from *C. umbrinus* in its pale reticulate pattern being relatively thick and well-connected (vs. finely marbled), and from *C. flammeus* in having a distinct pattern (vs. unpatterned, based on the sole holotype).

Cirri on the head are sometimes hard to detect due to preservation. With careful examination, a few were found above the eyes of the holotype but none were found on the lower part of the maxilla.

The holotype is a mature female with two large, empty ovaries. It appears to have just spawned suggesting the breeding season may be during summer months.

An apparently aberrant specimen collected from East Cape, North Island, New Zealand (NMNZ P.037208) may be close to *C. reticulatus*. It differs from the type series of the present species in having a relatively short and narrow head, a relatively long tail, and a relatively low caudal peduncle. It may be a specimen of an undescribed species, but more specimens are needed to assess its status.

### ***Chaunax russatus* sp. nov.**

New English Name: Red Coffinfish

(Figures 6B, 11A–B, 12A–B, Table 2)

**Holotype.** NMNZ P.038059 (170 mm), Kaikoura Canyon, 43°0.09'S, 173°53.85'E, F/V *San Tongariro*, stn. OBS 1451/032, 821–1030 m, bottom trawl, 29 Jan. 2001, coll. A. Sealey and S. Mulgrew.

**Paratypes.** 24 specimens, 115–233 mm SL. **New Zealand:** CSIRO H 7374–01, 140 mm (ex NMNZ P.041743) Ritchie Banks off Napier, Hawke Bay, 39°42.1'S, 178°13'E, 900–1150 m, 8 Jun 2005, D. Prendergast & J. Plowmen. NMMB–P10461 (ex NMNZ P.014899, 146 mm, Uruti High, off Cape Palliser, 41°15.5'S, 176°31'E, 1200 m, trawl, 13 Dec. 1983, coll. A. Adie. NMV A.30941–001, 172 mm SL (ex NMNZ P.038060), taken with holotype, Kaikoura Canyon. NMNZ P.009647, 163 mm, NE of Chatham Islands, 42°52.2'S, 176°0.8'W, R/V *Wesermunde*, stn. WES 8001/052, 889–907 m, 23 Jul. 1980. NMNZ P.010502, 170 mm, N Chatham Rise, 42°52'S, 175°48.3'W, R/V *Wesermunde*, stn. WES 8001/018, 945 m, 14 Jul. 1980. NMNZ P.011445, 140 mm, F/V *Kalinovo*, stn. K8101/015, 35°14.4'S, 175°19.55'E, E of Poor Knights Islands, 875–900 m, bottom trawl, 22 Nov. 1981. NMNZ P.012846, 198 mm, F/V *Kaltan*, stn. KTN 8201/006, 42°47.6'S, 177°12.6'W, N Chatham Rise, 980 m, 3

Aug. 1982. NMNZ P.012871, 180 mm, F/V *Kaltan*, stn. KTN 8201/045, 42°57.45'S, 175°35.6'W, N Chatham Rise, 860 m, 10 Aug. 1982. NMNZ P.014899, 145 mm, 41°15.5'S, 176°31'E, Uruti High, off Cape Palliser, 1200 m, trawl, 13 Dec. 1983, coll. A. Adie. NMNZ P.015453, 143 mm, 41°17.4'S, 176°33.7'E, Uruti Depression, S Hikurangi Trench, R/V *James Cook*, stn. JCO 8406/026, 780–840 m, bottom trawl, 5 Apr. 1984. NMNZ P.031012, 233 mm, R/V *Wesermunde*, stn. WES 8001/005, 42°48.8'S, 176°35.8'W, E Chatham Rise, 930–950 m, 10 Jul. 1980. NMNZ P.036063, 193 mm, 42°41.5'S, 177°11'E, NE Chatham Rise, F/V *San Torshavn*, stn. OBS 1172/024, 950–970 m, bottom trawl, 2 Dec. 1998, coll. G. Marks & L. Summerfield. NMNZ P.037188, 180 mm, 37°4.6'S, 176°41.2'E, Mayor Channel, Raukumara Plain, F/V *Ocean Fresh*, stn. OBS 1337/011, 1049–1071 m, bottom trawl, 27 Mar. 2000, coll. D. Wrightson. NMNZ P.037200, 115 mm, 38°0.0'S, 174°00.0'E, off Manakau, Auckland, F/V *San Rakaia*, 900 m bottom trawl, B. Adams, 26 Jun. 2000. NMNZ P.038060, 172 mm, 43°0.09'S, 173°53.85'E, Kaikoura Canyons, F/V *San Tongariro*, stn. OBS 1451/032, 821–1030 m, bottom trawl, 29 Jan. 2001, coll. A. Sealey & S. Mulgrew. NMNZ P.040706, 155 mm, 37°41'S, 179°21'E, off East Cape, F/V *San Rakaia*, bottom trawl, 29 May 2004. NMNZ P.041328, 163 mm, 37°13.65'S, 177°15.215'E, Whakatane Seamount, SW of Kermadec Ridge, R/V *Tangaroa*, stn. TAN 0413/062, 788–807 m, beam trawl, 11 Nov. 2004. NMNZ P.041743, 140 mm, 39°42.1'S, 178°13'E, Ritchie Banks off Napier, 900–1150 m, 8 Jun. 2005. NMNZ P.042410, 187 mm, 43°2.3'S, 174°54.55'W, E Chatham Rise, F/V *San Waitaki*, stn. OBS 2247/022, 920–938 m, bottom trawl, 3 May 2006, coll. R. Cropp & R. Fraser. NMNZ P.042411, 168 mm, 43°2'S, 175°6'W, E Chatham Rise, F/V *San Waitaki*, stn. OBS 2247/024, 915–917 m, bottom trawl, 4 May 2006, R. Cropp & R. Fraser. NMNZ P.046333, 143 mm, 34°1.45'S, 168°7.6'E, seamount at middle of West Norfolk Ridge, stn. OBS 2170/054, 808–954 m, bottom trawl, 17 Oct. 2005, coll. T. Turton. USNM 406854, 168 mm SL, (ex NMNZ P.042411), east Chatham Rise, 43°2.0'S, 175°6.0'W, F/V *San Waitaki*, stn. OBS 2247/024, 915–917 m, bottom trawl, 4 May 2006, R. Cropp & R. Fraser. **Outside NZ EEZ:** NMNZ P.020312, 2, 175–179 mm, 37°28.3'S, 167°33.4'E, NW Challenger Plateau, Lord Howe Rise, F/V *Albert Sanford*, stn. OBS 0033/023, 700–888 m, bottom trawl, 28 Sep. 1986, coll. R. Stewart. NMNZ P.023482, 2, 185–196 mm, 39°30.25'S, 167°47.55'E, W Challenger Plateau, F/V *Oyang 7*, stn. OBS 0284/002, 814–868 m, bottom trawl, 1 Sep. 1988, coll. P. Sharples. NMNZ P.041711, 165 mm, 35°51'S, 165°1.2'E, S Lord Howe Rise, F/V *Korvet 358*, stn. OBS 1357/006, 948–949 m, bottom trawl, 14 May 2000, G. Anderson & S. Beatson.

**Non-types.** 31 specimens, 61–195 mm SL. NMNZ P.008426, 110 mm, 42°50'S, 176°36'W, Chatham Rise, R/V *Wesermunde*, stn. WES 7903/055, 902–930 m, 5 Jun. 1979. NMNZ P.008452, 238 mm, 42°50.5'S, 176°46.5'W, Chatham Rise, R/V *Wesermunde*, stn. WES 7903/041, 855–879 m, 2 Jun. 1979. NMNZ P.009646, 245 mm, 42°53.5'S, 176° 12.4'W, N. of Chatham Island, R/V *Wesermunde*, stn. WES 8001/049, 880–890 m, 22 Jul. 1979. NMNZ P.009832, 72 mm, 37°10.85'S, 177°38.35'E, W. of White Island, R/V *Tangaroa*, stn. NZOI BS844/O590, 685–705 m, beam trawl, 23 Jan. 1981. NMNZ P.009862, 95 mm, 38°11.45'S, 170°22.15'E, NE Challenger Plateau, R/V *James Cook*, stn. JCO 8102/041, 851 m, bottom trawl, 29 Jan. 1981, NMNZ P.010128, 115 mm, 37°42.1'S, 173°53.6'E, SE of Aotea Seamount, off Raglan, R/V *James Cook*, stn. JCO 8106/064, 841–848 m, trawl, 25 Apr. 1981. NMNZ P.010512, 2, 110–160 mm, 42°51.95'S, 179°46.4'W, NW of Chatham Islands, R/V *James Cook*, stn. JCO 8101/004, 802–816 m, trawl, 10 Jan. 1981. NMNZ P.012876, 170 mm, 42°54.65'S, 175°53.75'W, N Chatham Rise, F/V *Kaltan*, stn. KTN 8201/032, 840–840 m, bottom trawl, 8 Aug. 1982. NMNZ P.012973, 195 mm, 43°12.65'S, 174°20.55'W, NE Chatham Rise, F/V *Kaltan*, stn. KTN 8201/070, 970 m, bottom trawl, 14 Aug. 1982. NMNZ P.014022, 82 mm, 35°55'S, 174°20'E, 22 miles N of Cape Brett, 731–732 m, 22 Nov. 1962. NMNZ P.014157, 140 mm, 39°33.1'S, 170°58.95'E, Central Challenger Plateau, R/V *James Cook*, stn. JCO 8307/031, 837–841 m, bottom trawl, 6 Jul. 1983. NMNZ P.015766, 100 mm, 37°26.9'S, 173°58.8'E, SW of Manukau Harbour, R/V *James Cook*, stn. JCO 8409/017, 720–800 m, bottom trawl, 28 May 1984. NMNZ P.031132, 156 mm, 40°45'S, 174°45'E, off D'Urville Island, depth unknown setline, Jun. 1994. NMNZ P.031355, 160 mm, Challenger Plateau, F/V *San Manukau*, 39°54'S, 168°07'E, 850–865 m. NMNZ P.037235, 80 mm, 36°29.98'S, 176°30.155'E, E of Alderman Islands, R/V *Kaharoa*, stn. KAH 9907/053, 990–1100 m, bottom trawl, 5 Jun. 1999. NMNZ P.037968, 143 mm, 42°48.2'S, 179°11.05'E, N central Chatham Rise, F/V *Kap Farvel*, stn. OBS 1571/081, 1070–1100 m, bottom trawl, 26 Oct. 2001, coll. D. Wrightson. NMNZ P.038417, 61 mm, 41°30.5'S, 170°33.45'E, Challenger Plateau, NW of Cape Foulwind, F/V *Sureste 709*, stn. OBS 1656/010, 512–592 m, midwater trawl, 24 Jun. 2002, coll. C. Loveridge & T. Brunning. NMNZ P.038418, 65 mm, 41°32.3'S, 170°25.2'E, Challenger Plateau, NW of Cape Foulwind, F/V *Sureste 709*, stn. OBS 1656/031, 617–650 m, midwater trawl, 2 Jul. 2002. NMNZ P.038765, 77 mm, Cameron Rattray and Geoff Dolan, F/V *Sureste 700*, stn. OBS 1662/019, 42°01'S, 170°13.25'E, Challenger Plateau, SW of Cape Foulwind, 721–787 m, bottom trawl, 13 Jul. 2002, coll. C. Loveridge & T. Brunning. NMNZ P.041264, 85 mm, 42°5.7'S, 170°18.3'E, SE Challenger Plateau, SW of Cape Foulwind, F/V

*Melilla* 203, stn. OBS 1969/082, 643–680 m, bottom trawl, 11 Sep. 2004, coll. L. Dalton & S. Thickpenny. NMNZ P.041456, 105 mm, 43°26.95'S, 173°56.025'W, NE of Chatham Islands, R/V *Tangaroa*, stn. TAN 0408/043, 1199–1200 m, bottom trawl, 22 Jul. 2004. NMNZ P.041841, 2, 69–90 mm, 37°13.65'S, 177°15.215'E, Whakatane Seamount, SW Kermadec Ridge, R/V *Tangaroa*, stn. TAN 0413/062, 788–807 m, beam trawl, 11 Nov. 2004. **Outside NZ EEZ:** NMNZ P.009863, 100 mm, 37°50.9'S, 167°20.75'E, W Challenger Plateau, R/V *James Cook*, stn. JCO 8102/017, 866–878 m, trawl, 25 Jan. 1981. NMNZ P.014552, 100 mm, 37°28.9'S, 167°45.95'E, NW Challenger Plateau, F/V *Arrow*, stn. ARR 8301/061, 878–887 m, 9 Sep. 1983. NMNZ P.025723, 3, 112–156 mm, 36°18.55'S, 164°51.6'E, S Lord Howe Rise, F/V *Tampen*, stn. OBS 0429/030, 937–943 m, bottom trawl, 15 Jul. 1990, coll. M. Nedd. NMNZ P.032501, damaged, 40°52'S, 165°02'W, Valerie Guyot, Louisville Ridge, 670–850 m, 12 Jul. 1995, coll. M. Marinovich. NMNZ P.037204, 155 mm, 37°22.35'S, 167°39.65'E, S Lord Howe Rise, F/V *Baldur*, stn. OBS 1281/017, 950–951 m, bottom trawl, 19 Oct. 1999, coll. N. Mitchell.

**Diagnosis.** A member of the *C. abei*-species group with a broad illicial trough that is wider than the eye pupil diameter, and a uniformly deep red body. It can be further distinguished from other congeners in having modally one spine on each side of lateral-line neuromast; modally 12 pectoral-fin rays; wide and stout caudal peduncle; short and stout illicium; large esca with numerous bright red cirri; and a greyish gill chamber and gill arches. Gill rakers: GR<sub>i</sub> = 17–18 (3–4+13–15); GR<sub>ii</sub> = 14–15; GR<sub>iii</sub> = 14–15; GR<sub>iv</sub> = 12. Lateral-line neuromast counts: AB = 11–12 (modally 12); AC = 8; BB' = 4–5 (4); BD = 2–3 (2); CD = 6–7 (7); EF = 4–5 (4); FG = 4–5 (4); GH = 11–14 (13); BI = 32–39.

**Description.** Morphometric and meristic data are given in Table 2. Head length 2.4 (2.3–2.9) in SL; head width 5.4 (5.1–5.7) in SL, 2.3 (2.0–2.3) in HL; predorsal length 2.1 (2.0–2.3) in SL; pre-gill opening length 1.5 (1.5–1.7); pre-preopercular length 3.5 (3.3–4.0) in SL, 1.5 (1.4–1.5) in HL; upper jaw 5.0 (4.4–5.2) in SL, 2.1 (1.8–2.2) in HL; illicial length 8.1 (7.8–11.2) in HL; illicial trough length 5.1 (4.7–6.7) in HL; eye diameter 4.8 (4.5–5.5) in HL; post-dorsal fin length 4.9 (4.5–5.6) in SL, 1.9 (1.7–2.3) in HL; post-anus length 2.6 (2.4–3.6) in SL, 1.1 (1.0–1.4) in HL; post-anal fin length 5.6 (5.4–6.9) in SL, 2.3 (2.0–2.9) in HL; caudal peduncle depth 5.0 (4.2–5.5) in HL; caudal fin length 3.6 (3.2–3.8) in SL, 1.5 (1.2–1.5) in HL.

Head globular, skull slightly elevated posteriorly; trunk cylindrical, slightly compressed, tapering posteriorly; skin thin, loose and flaccid; interorbital space broad; caudal peduncle short and stout, rather depressed, tapering posteriorly. Eyes rounded, directed dorsolaterally, covered by dermal membrane broadly connected to adjoining skin, forming clear “window”.

Illicium short and stout; esca large, with large central tongue bearing many stout whitish and pinkish cirri (Fig. 6B); second dorsal-fin spine close to illicium, embedded under skin; third dorsal-fin spine situated at about mid-point of pre-dorsal distance, embedded under skin. Illicial trough very wide, rounded in outline, relatively flattened, its width greater than diameter of eye pupil.

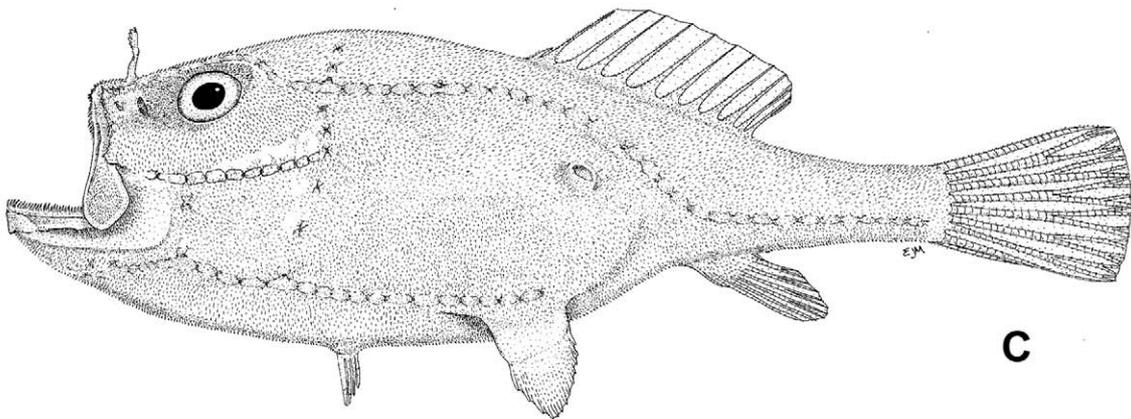
Two nostrils anterior to each eye, anterior nostril surrounded by flesh membrane, posterior part higher than anterior part, posterior nostril a simple round hole; mouth wide, terminal, its opening nearly vertical; lower jaw slightly protruding in front of upper jaw; maxilla tapering above, broad below; blunt symphyseal spine on lower jaw.

A broad transparent membrane on first gill arch; first ceratobranchial broadly connected to opercular wall; gill filaments present on second to fourth gill arches, two row of gill filaments (holobranch) on second and third gill arches, one single row of gill filaments (hemibranch) on fourth gill arch; those on inner row of third arch and fourth gill arch about one-third length of those of other; inner surface of fourth gill arch completely connected to body. A single row of 17–18 rakers on first gill arch, 3–4 on upper limb and 13–15 on lower limb, 14–15 paired rakers on 2nd arch, 14–15 paired rakers on 3rd arch and a single row of 12 rakers on 4th arch.

Interspaces of lateral-line neuromast complex slightly longer than its width; 1–3 (modally 1) pairs of slender spines bridging each neuromast (Figs. 1B, 12A).

Skin thin, tips of pectoral-fin rays and pelvic-fin rays free from membrane, dermal spinules long and slender, simple (Fig. 12B), covering entire body, except eye window, outer half of pectoral fins, entire anal fin and membranes between rays of fins. Large naked area in front of illicial trough with scattered spinules in some.

Teeth in both jaws slender, fang-like; 5–8 irregular rows in upper jaw, their length gradually increasing from outer to inner row, those in inner row slightly longer than those of outer rows; 5–8 irregular rows in lower jaw, their length gradually increasing from outer to inner row, those of inner row longest. Teeth on vomer small, forming two wide bands, in about 3 rows, distinctly separated by a small intermediate space; those on palatine small, forming elongate patch, close to outer end of vomerine teeth.



**FIGURE 11.** *Chaunax russatus* sp. nov., NMNZ P.038059, holotype, 170 mm SL. A. Dorsal view. B. dorsal view of head. Photos: R. McPhee, Te Papa. C. NMNZ P.014899, paratype, 145 mm SL, drawing of lateral view. Illustrated by E. McKay, Te Papa.

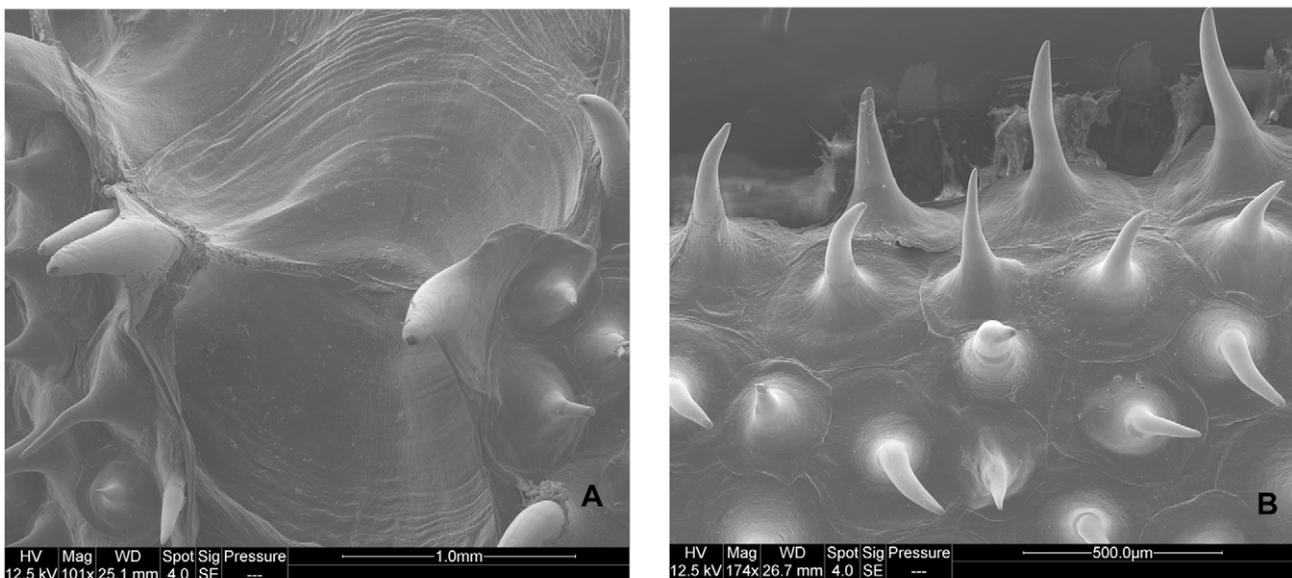
Dorsal-fin rays III, 12; first ray shortest, about half length of second ray; last two rays branched. Pectoral fin fan-shaped, with 11–13 rays (mainly 12), 4th or 5th ray longest, rays gradually shorter from 6th to last ray. Anal fin with 6–7 rays, first ray shortest, first and second simple, 3rd or 4th to last branched. Caudal fin truncate, with 9 rays, lowermost shortest, close to ray above, second to seventh rays branched, remaining 3 simple.

Colouration. Fresh (Fig. 11A–B): bright red with scattered patches of darker pigment; lateral cirri bright red. Preserved: uniformly creamy white with some fuzzy patches of dark pigment usually present; inner part of mouth cavity and gill chamber including gill arches blackish.

**Distribution.** Widely distributed on the continental slopes of the North Island and the northern South Island of New Zealand north of the subtropical convergence, from the southern Lord Howe Rise, West Norfolk Ridge, southern Kermadec Ridge, along the northern slope of the Chatham Rise to east of the Chatham Islands, and the Louisville Ridge (Fig. 8). Bathymetric range 512–1200 m.

**Etymology.** From the Latin “russatus” – clothed in red, in reference to the uniform bright red colour of the body and fins.

**Remarks.** *Chaunax russatus* **sp. nov.** is most similar to *C. mulleus* when preserved. They have similar lateral-line neuromast counts and squamation, and their proportions overlap. *Chaunax russatus* **sp. nov.** differs from *C. mulleus* in having a very large illicial trough (Fig. 6B), usually wider than the diameter of the eye pupil (vs. narrower), a uniformly deep red colour (vs. pinkish with red tips of the pectoral and pelvic fins) and a naked area in front of the illicial trough (vs. a narrow band of dermal spinules).



**FIGURE 12.** Micrographs of dermal squamation of *Chaunax russatus* **sp. nov.**, BSKU 44629. A. Close-up view of lateral-line neuromast area. B. Dermal spinules. Taken by SEM at Biodiversity Research Center, Academia Sinica, Taipei.

### Key to *Chaunax* species in New Zealand and adjacent waters

- 1A. Illicial trough black, deeply concave; illicium extremely short, bearing many stout cirri . . . . . [*C. pictus*-group] *C. penicillatus*
- 1B. Illicial trough same colour as body, quite shallow; illicium relatively long, bearing many thin cirri. . . . . 2
- 2A. Filamentous cirri absent from head; 1–3 spinules bridging the lateral-line neuromast complex . . . . . [*C. abei*-group] ...3
- 2B. Filamentous cirri present on head; 4–8 spinules bridging the lateral-line neuromast complex . . . . . [*C. fimbriatus*-group] *C. reticulatus* **sp. nov.**
- 3A. Mix of numerous bifurcated and simple dermal spinules on the dorsal surface; body with large irregular scattered spots across the dorsal surface. . . . . *C. flavomaculatus* **sp. nov.**
- 3B. Only simple dermal spinules on the dorsal surface, or at most a few scattered bifurcated dermal spinules; fresh colour not as above, spots (if present) dark brownish–red, otherwise uniform red to pinkish–red across top of body . . . . . 4
- 4A. Modally 3 spinules bridging the lateral-line neuromast complex; a large naked area on belly (>120 mm SL); mainly 14 pectoral-fin rays; BD=3–5 (mainly 4); GH = 15–19. . . . . *C. nudiventer*
- 4B. Modally 1 spinule bridging lateral-line neuromast complex; ventral surface densely covered by dermal spinules; 11–13 (mainly 12) pectoral-fin rays; BD = 2–3; GH = 11–15. . . . . 5

- 5A. Body pinkish with outer half of pectoral and pelvic fins deeply red when fresh; illicial trough width less than diameter of pupil ..... *C. mulleus* **sp. nov.**
- 5B. Body uniformly deep red when fresh; illicial trough greater than diameter of pupil ..... *C. russatus* **sp. nov.**

**Postscript.** After this paper went to press, an additional specimen of our new species, *Chaunax reticulatus* **sp. nov.**, was discovered in the collection of Museum Victoria, Australia (NMV). The specimen is in very good condition and is by far the largest known specimen for the species. The specimen has cirri on the dorsal surface of the head and body, mainly 6 pairs of spinules bridging the neuromasts, and a strong reticulate pattern on the dorsal surface. This new material conforms well with the diagnosis and description provided above and, therefore, is recognized as an additional paratype of *C. reticulatus*. The collection data are provided as following: NMV A.13164, 258 mm SL, 43 km SSE of Gabo Island, Victoria, Australia, 36°56.9'S, 150°02.1'E, 220–224 m, 10 Aug. 1993.

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