

Two New Species of Roughy (Trachichthyidae: *Optivus*) from Coastal Waters of Southern Australia

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ABSTRACT. Names are provided for two allopatric species of *Optivus* occurring in shelf waters of southeastern and southwestern Australia that have been treated in recent Australian literature. *Optivus agastos* n.sp., distributed from southern Queensland to central Victoria and northeastern Tasmania, and at Lord Howe Island, differs from the very similar *O. elongatus*, which is limited to New Zealand, in having fewer gill rakers (22–24, rarely 25, versus 25–27, rarely 24), slightly smaller eye, longer snout, and enlarged teeth along the inner margin of the premaxilla. *Optivus agrammus* n.sp., distributed from western South Australia to southwestern Western Australia, can be distinguished from congeners most readily by the lack of stripes on its caudal-fin lobes, curved dorsal outline of its nape and head in lateral profile, relatively deeper and shorter caudal peduncle, and lower dorsal and anal fins.

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Whitley (1947) proposed the generic name *Optivus* for *Trachichthys elongatus* Günther, 1859, separating it from *Hoplostethus* Cuvier (in Cuvier & Valenciennes, 1829) by its more elongate form and in having “only four dorsal spines instead of six”. Subsequent literature treated the Australasian genus as monotypic (e.g., Paulin, 1979; Kotlyar, 1980), before May & Maxwell (1986) and then Paxton *et al.* (1989) pointed out that two “new species” occur in Australia. Gomon (1994) considered *Optivus* to comprise three species, two allopatric undescribed species occurring in southern Australian waters, and *O. elongatus*, which is restricted to New Zealand. He presented descriptions for the unnamed species, separating them both with a key and diagnostic remarks in the treatment of each. Kotlyar (1996), in a major treatment of beryciform fishes, followed Gomon and presented additional evidence for the recognition of three species in the genus. The purpose of this paper is to provide names and detailed descriptions for the two Australian species.

Materials and methods

Terminology and methodology is that of Hubbs & Lagler (1949), except body depth is measured at dorsal-fin origin, head depth is taken at vertical through upper end of gill opening and jaw length is measured from anterior end of premaxilla to posteroventral corner of maxilla. Strong ctenii, which obscure scale margins, and the nature of merging scale rows above and below the lateral line in *Optivus* species make the determination of scale counts, such as numbers of lateral-line scales, oblique scale rows, scales above and below lateral line and predorsal scales with accuracy difficult. Broad ranges in these values may be attributed in part to this. In Descriptions, parenthetical values refer to paratypes, and all paratypes are included unless noted otherwise. Where structures were damaged, values were not recorded. The number and size range in standard length (mm) for each lot of specimens examined is presented as a parenthetical expression after the respective registration

number. Institutional abbreviations are listed in Leviton *et al.* (1985).

Comparative material of *Optivus elongatus* included: NMNZ 3155 (15, 61.1–82.1); NMNZ P15333 (106); NMNZ P17028 (11, 77.5–108); NMNZ P18423 (20, 16.7–113), all from New Zealand Waters.

***Optivus agastos* n.sp.**

Figs. 1, 2; Tables 1, 2

Trachichthys elongatus (non Günther, 1859). Günther, 1859: 10 (*partim*); Waite, 1898: pl. V.

Hoplostethus elongatus (non Günther, 1859). McCulloch, 1923: 14; 1929: 132 (*partim*); Marshall, 1964: 129 (*partim*); Allen *et al.*, 1976: 387 (*partim*).

Optivus elongatus (non Günther, 1859). Whitley, 1964: 40; McKnight, 1972: 154 (*partim*); Shimizu, 1977: 192; Kotlyar, 1980: 217 (*partim*); Paulin, 1979: 70 (*partim*); Last *et al.*, 1983: 275 (*partim*); Hutchins & Swainston, 1986: 38 (*partim*); Kotlyar, 1992: 38; Kuitert, 1993: 72; Kuitert, 1996: 58.

Optivus sp. 1.—May & Maxwell, 1986: 220; Gomon, 1994: 406; Kotlyar, 1996: 180.

Optivus n.sp.—Paxton *et al.*, 1989: 365; Johnson, 1999: 725.

Type material. HOLOTYPE: NMV A24972-001 (90.3) Cape Wellington, Wilsons Promontory, Victoria, 39°04.1'S 146°28.6'E, rotenone, 2 February 1982, Kuitert, R.H. & M. McDonald. PARATYPES: AMS I.30408-007 (97.2), northeast of Woolli, New South Wales, 29°52'S 153°25'E to 29°48'S 153°26'E, 64 m, 2 May 1990, trawl, FRV Kapala; AMS I.31476-005 (2, 64.3–91.5), off Murwillumbah, New South Wales, 28°20'S 153° 40'E to 28°25'S 153°41'E, 54–58 m, 15 August 1978, prawn trawl, FRV Kapala; CSIRO H.3509-01 (76.6), east of Lakes Entrance, Victoria, 37°55.5'S 148°12.4'E to 37°55.1'S 148°15.1'E, 42 m, 30 July 1993, demersal trawl, FRV Southern Surveyor, SS05/93/102; CSIRO H.3989-02 (82.0), northeast of Newcastle, New South Wales, 32°52'S 151°54'E, 29–33 m, 19 April 1995, demersal trawl, FRV Kapala, K 95-03-10; CSIRO T1922 (95.2), White Rock, Tasmania, 42°25'S 148°09'E, 96 m, 22 April 1980; NMV A2582 (80.0), Brown Head, west shore, Wilsons Promontory, Victoria, 39°02.7'S 146°28.3'E, 0–16 m, 10 February 1982, rotenone, Cochrane, T.G., Kuitert, R.H. & Larsen, M.; NMV A2737 (4, 66.6–81.0), Horn Point, north shore, Wilsons Promontory, Victoria, 39°01.6'S 146°28.2'E, 8 February 1982, Kuitert, R.H. & M. McDonald; NMV A3207 (46.5), Portsea, Port Phillip Bay, Victoria, 38°19'S 144°43'E, 10 m, 11 August 1982, quinaldine, Kuitert, R. H.; NMV A24972-002 (5, 56.4–92.5) same data as holotype; QM I.29706 (83.7) southeast of Point Lookout, Stradbroke Island, Queensland, 27°31'S 153°40'E, 80 m, trawl, 21 March 1995, collected by R. Joyce; QM I.32705 (76.1) northeast of Cape Moreton, Queensland, 26°57'S 153°32'E, 104 m, trawl, 12 March 2001, Queensland Fisheries Service; WAM P.25739-007 (83.6), Moreton Bay, 11.3 km (7 mi) northwest of Cape Moreton, southeastern Queensland, 23 February 1975, collected by R.J. McKay; WAM P.28843-001 (84.8), Port Hacking, New South Wales, 34°04'S 151°07'E, trawl, 14 November 1974, collected by CSIRO.

Non-type material. Lord Howe Island AMS IA.678 & 679 (2, 76.6–85.8); Sydney Harbour AMS IB.7384 (15, 34.7–49.4); Sydney Harbour AMS I.40840-034 (12, 53.1–77.0).

Diagnosis. Gill rakers 22–25, modally 23; lateral profile of nape and head nearly straight in lateral profile, distinctly angled downward in front of dorsal fin; snout tip rounded, usually projecting slightly in front of upper jaw; depth of head at vertical through upper end of gill opening 2.9–3.2 times in SL; snout length 1.6–2.7 times in eye diameter; inner row of teeth on premaxilla noticeably longer than others; caudal peduncle relatively short and deep, depth 0.9–1.3 times in length; dorsal and anal fins relatively low, third segmented dorsal-fin ray 3.5–4.2 times in SL, first anal-fin ray 5.2–6.3 times in SL; body greenish brown on back, silvery below; fins almost uniformly pink, though slightly dusky tips to caudal-fin lobes persisting in recently preserved large specimens.

Description. Dorsal-fin rays IV, 11 (V, 10 in one of 22 paratypes); anal-fin rays III, 9 (III, 10 in 2); caudal-fin rays 7 (8 in 1) + 19 (18 in 1) + 6; pectoral-fin rays 12 (11 in 2 and 13 in 5 of 36 fins counted); vertebrae 12 + 14; lateral-line scales 28 (26–27); scales above lateral line approximately 12 (11–13); scales below lateral line approximately 18 (16–18); predorsal scales approximately 32 (31–36); ventral scutes 11 (9–13); total gill rakers 23 (20–24, modally 23; Table 2). (See Table 1 for morphometric values).

Body of moderate depth; caudal peduncle short and deep, tapering slightly posteriorly; anus positioned well behind pelvic-fin bases, just in advance of anal-fin origin; no apparent luminescent tissue. Head and snout rounded; dorsal outline of nape and head nearly straight in lateral profile, distinctly angled downward in front of dorsal fin; snout short, usually projecting slightly in advance of mouth; posttemporal spine short and sharp. Posterior edge of preopercle finely serrate, posteroventral corner produced as broad spine reaching just beyond hind edge of operculum. Dorsoposterior corner at rear end of maxilla posterior to vertical through posterior margin of orbit. Gill rakers on upper limb of first arch long and slender.

Oral edge of premaxilla and dentary broadly covered with fine teeth, those in row on ventral-most edge of premaxilla only slightly, but noticeably longer than those on either side; dentigerous surface extending laterally around expanded anterior end of dentary to underside. Vomer naked; palatine covered with fine teeth.

Scales adherent, each with numerous rows of strong ctenii obscuring scale margins and making determination of squamation patterns difficult; single row of scales overlapping onto bases of dorsal and anal fins. Predorsal scales on dorsal midline of head reaching just in advance of vertical through centre of orbit on dorsal midline of head. Cheek scales reaching forward just in advance of vertical through posterior extent of orbit. Lateral-line pores mostly obscured by ctenii. Scales on ventral midline between pelvic-fin bases and anus modified as moderately large bony scutes.

Dorsal fin short based, continuous, spines and rays increasing in length progressively to third soft ray, subsequent rays gradually decreasing in length; first soft ray unbranched, remaining rays branched; origin of fin above centre of pectoral fin. Anal fin short based, first spine tiny, spines and rays increasing in length progressively to second soft ray, subsequent rays subequal or decreasing slightly in length. Caudal fin distinctly forked. Posterior edge of pectoral fin curved, middle rays longest, first and last rays simple and short, second longer but also simple,

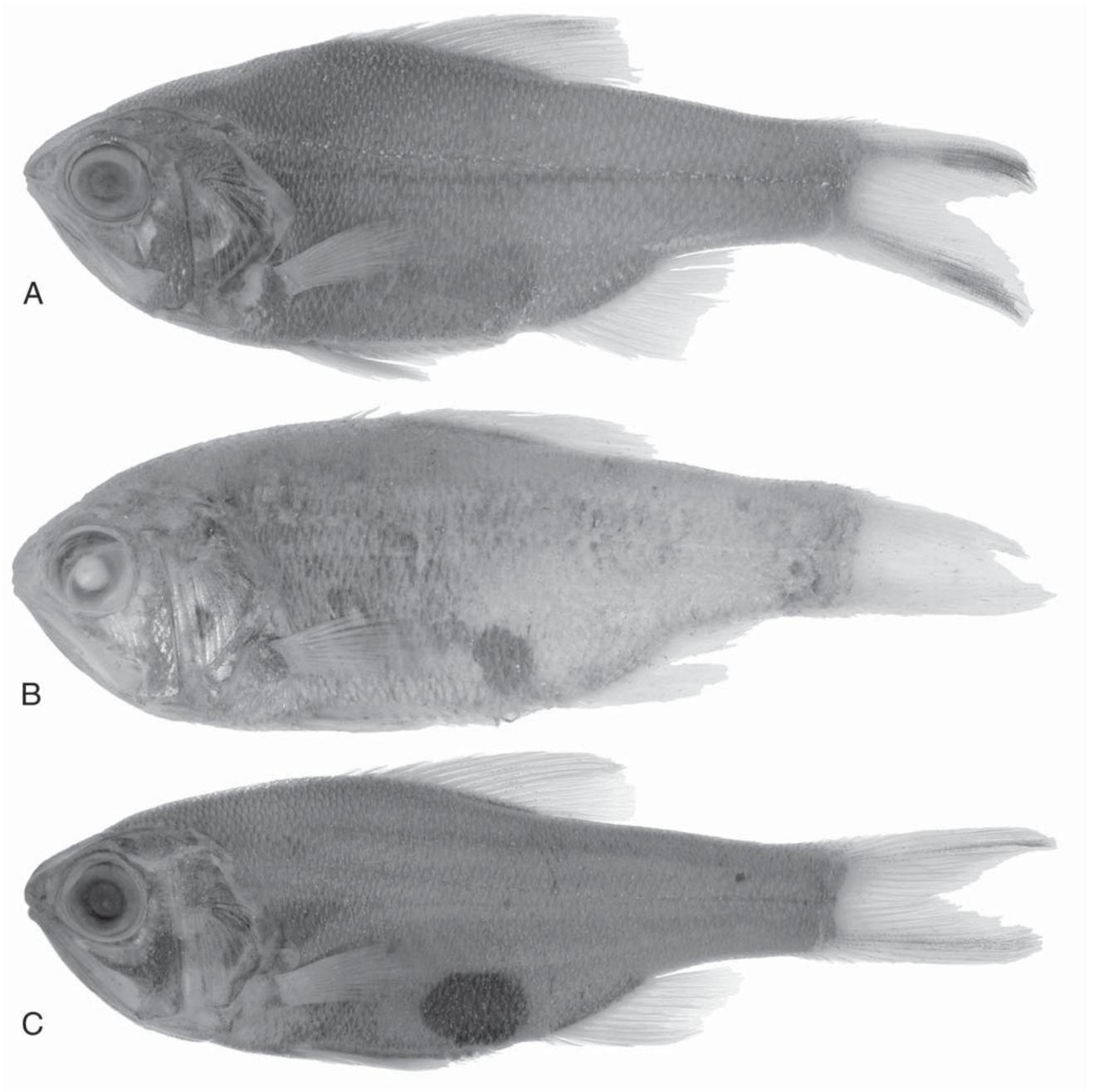


Fig. 1. Specimens of the three species of *Optivus*: (A) *O. agastos* n.sp., holotype, NMV A24972-001 (90.3 mm SL) Cape Wellington, Wilsons Promontory, Victoria; (B) *O. agrammus* n.sp., holotype, CSIRO H.5316-08 (86.7 mm SL) central Great Australian Bight, South Australia; and (C) *O. elongatus* NMNZ P17028 (82.7 mm SL), Seal Rock Group, Sugar Loaf Islands, New Plymouth, New Zealand. The dark area above the anal region in all three images is not pigmentation, but appears to be an artifact of preservation that is frequently present in specimens, though variable in size, shape and intensity.

others branched. Posterior tip of pelvic fin reaching about two thirds of way to anal-fin origin.

Preserved coloration (in alcohol). Pale to slightly dusky, body darkest dorsally; dorsal fin sometimes with dusky smudge dorsally; each caudal-fin lobe with dark longitudinal stripe.

Live coloration (see colour photo in Gomon, 1994, fig. 364). Deep violet brown dorsally, silvery violet below; fins translucent; medial fins whitish basally and distally, pink centrally; caudal fin with prominent longitudinal brown

stripe on each lobe; dorsal fin with brown smudge distally; pectoral fin pink; pelvic fin pinkish white.

Etymology. *agastos*, Greek meaning “near kinsman” in reference to the similarity and presumed close relationship of this species to the type of the genus.

Distribution. Restricted to southeastern Australia between Noosa, Queensland in the north, Lord Howe Island to the east, Port Phillip Bay, Victoria to the west and Freycinet, Tasmania in the south, in the vicinity of reefs at depths of 1–146 m.

Comments. Günther (1859) described *Trachichthys elongatus* on the basis of a “skin, in spirits” from Great Barrier Island, New Zealand, purchased from Sowerby and subsequently registered as BMNH 1850.12.3.1 and “young” from Australia, presumably BMNH 1854.11.1.7 (40.5). Registration details and the jar label accompanying the latter lack locality information, recording only “purchased of Mr Stevens” (A.C. Gill, pers. comm.). The measurements provided with Günther’s description are clearly of an adult specimen and approximate those of the New Zealand specimen (c. 82 mm SL). The figure cited at the beginning of Günther’s species account apparently was not published. The New Zealand specimen is here designated lectotype. The presumed Australian specimen, despite having paralectotype status, is likely to represent the species described above.

Superficially, *O. agastos* closely resembles *O. elongatus* both morphologically and with respect to coloration. It differs from the latter in usually having fewer gill-rakers on the front of the first gill arch (22–24, rarely 25, versus 25–27, rarely 24; Table 2), slightly smaller eye and longer

snout, and taller teeth along the inner margin of the jaws, rather than teeth that are little, if at all enlarged.

Values for the number of oblique scale rows for the three species presented by Kotlyar (1996) that distinguish between *O. sp. 1* (= *O. agastos*) and *O. elongatus* do not match those recorded for this study. Specimens of *O. elongatus* listed above have 59–71 rows (47–51 in Kotlyar), whereas those of *O. agastos* have 63–71 (62–71 in Kotlyar). The discrepancy is likely attributable to the difficulty in identifying individual scale rows associated with scale structures and patterns, discussed above in Methods and Materials.

Gomon (1994) stated that *O. elongatus* occurs at Lord Howe Island, as well as in New Zealand. The two Australian Museum specimens on which the statement was based (listed above in Non-type material) have characters consistent with *O. agastos*, including a gill-raker count of 24.

Optivus agrammus n.sp.

Figs. 1, 2; Tables 1, 2

Optivus elongatus (non Günther, 1859). McKay, 1970: 6; Kotlyar, 1980: 217.

Optivus n. sp.—May & Maxwell, 1986: 220; Paxton *et al.*, 1989: 365.

Optivus sp. 2.—Gomon, 1994: 407, fig. 365; Kotlyar, 1996: 182.

Type material. HOLOTYPE: CSIRO H.5316-08 (86.7), central Great Australian Bight, South Australia, 31°50'S 130°45'E, 54 m, trawl, 14 May 2000, SS01/00/380, FRV Southern Surveyor. PARATYPES: CSIRO CA3459 (70.9), south of Point Dover, Great Australian Bight, Western Australia, 32°50'S 125°31'E to 32°48'S 125°32'E, 50–44 m, trawl, 7 March 1979, F.V. Courageous; CSIRO CA3460 (82.4), south of Point Dover, Great Australian Bight, Western Australia, 32°50'S 125°31'E to 32°48'S 125°32'E, 50–44 m, trawl, 7 March 1979, F.V. Courageous; CSIRO H.5316-09 (3, 76.9–91.0), same data as holotype; NMV A24987-001 (73.5), 6 mi (9.6 km) off Venus Bay, South Australia, 18–25 fms (33–46 m), June 1982, T. Olsen; SAMA A478 (72.7), presumably 34°25.0'S 133°25'E to 34°25.0'S 133°23'E, 128–130 m, 15 August 1981, SO3/81/65, FRV Soela; SAMA A744 (2, 72.0–74.3), western Great Australian Bight, Western Australia, 33°15'S 125°24'E to 33°13'S 125°24'E, 60–61 m, 29 July 1981, SO3/81/13, FRV Soela; SAMA A776 (51.7), western Great Australian Bight, Western Australia, 34°10'S 124°31'E to 34°11'S 124°32'E, 320–380 m, 29 July 1981, SO3/81/9, FRV Soela; SAMA A1664 (80.0), same data as NMV A24987-001; WAM P.15263 (62.3), Lookout Point, Cheyne Beach, Western Australia, 34°53'S 118°25'E, trawl, 19 April 1980, B. Hutchins *et al.*; WAM P.26608-08 (54.7), west of Fremantle, Western Australia, 32°09'S 114°27'E, trawl, 1965, Suruga Maru.

Diagnosis. Gill rakers 20–24, modally 22; lateral profile of nape and dorsal surface of head gently curved, nearly horizontal in front of dorsal-fin origin, almost straight between eyes; tip of snout broadly rounded; depth of head at vertical through upper end of gill opening 2.7–2.9 times in SL; snout length 1.5–2.6 times in eye diameter; inner row of teeth on premaxilla noticeably longer than others;

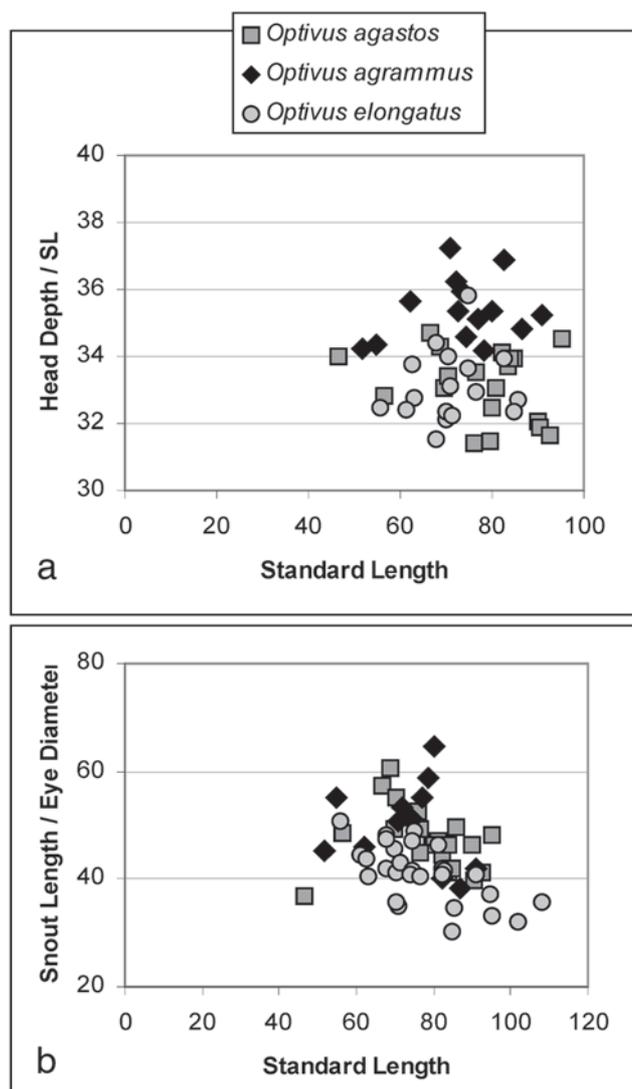


Fig. 2. Comparison of selected morphometric values in the three species of *Optivus*: (a) head depth versus head length relative to standard length; and (b) snout length versus eye diameter relative to standard length.

Table 1. Selected morphometric values expressed as a percent of standard length for the holotype and paratypes of *Optivus agastos* n.sp., *O. agrammus* n.sp., and for examples of *O. elongatus*.

	<i>Optivus agastos</i> n.sp. Eastern Australia		<i>Optivus agrammus</i> n.sp. Western Australia		<i>O. elongatus</i> New Zealand
	holotype	paratypes	holotype	paratypes	
number of specimens: standard lengths	90.3	22: 56.4–95.2	86.7	13: 51.7–91.0	23: 55.8–108
body depth	39.6	33.6–40.2	38.0	37.1–41.9	33.9–38.3
head length	33.7	33.0–35.8	34.0	32.6–37.2	32.9–35.8
head depth	31.9	31.4–34.7	34.8	34.2–37.2	31.5–34.4
eye diameter	10.6	10.2–12.9	10.8	10.2–12.5	11.0–13.2
snout length	4.2	4.5–6.7	4.2	4.2–6.7	3.7–5.8
jaw length	20.8	20.6–21.7	20.0	20.0–22.4	—
caudal-peduncle depth (ant.)	20.7	19.1–22.6	21.6	20.3–24.1	18.1–20.4
caudal-peduncle depth (post.)	16.1	14.8–17.1	16.4	15.9–18.1	14.4–16.7
caudal-peduncle length	24.9	20.6–25.3	20.4	20.0–23.1	17.8–23.0
dorsal-spine length (1st)	3.4	2.1–5.3	3.5	1.8–4.7	—
dorsal-spine length (4th)	12.7	11.5–15.5	9.4	7.1–12.4	—
dorsal-ray length (1st)	18.3	17.4–23.1	16.0	14.6–20.1	—
dorsal-ray length (3rd)	24.8	23.7–28.9	21.7	21.7–25.7	25.2–29.1
dorsal-ray length (11th)	12.1	9.3–15.2	13.4	12.0–13.9	—
anal-spine length (1st)	1.6	1.2–3.2	1.0	0.8–2.2	—
anal-spine length (3rd)	10.4	9.2–11.9	7.7	7.7–11.7	—
anal-ray length (1st)	15.7	16.0–19.3	14.8	12.2–18.0	16.2–20.2
anal-ray length (9th)	12.7	10.8–14.0	12.6	11.6–13.5	—
caudal-fin length (upper lobe)	29.9	27.7–33.3	31.5	26.1–31.5	—
pectoral-fin length	19.3	19.0–22.5	20.3	17.0–20.9	—
pelvic-fin length	20.3	19.1–22.7	19.8	19.2–22.3	—

caudal peduncle relatively short and deep, depth 0.9–1.2 in length; dorsal and anal fins relatively low, third segmented dorsal-fin ray 3.8–4.6 times in SL, first anal-fin ray 5.6–8.2 times in SL; body greenish brown on back, silvery below; fins almost uniformly pink, though slightly dusky tips to caudal-fin lobes persisting in recently preserved large specimens.

Description. Dorsal-fin rays IV, 11 (III, 11 and IV, 10 in two of 13 paratypes); anal-fin rays III, 9 (III, 10 in 1); caudal-fin rays 6 (7 in 12) + 19 + 6 (5 in 2); pectoral-fin rays 12 (11 in 2 and 13 in 1 of 26 fins counted); vertebrae 12 + 14; lateral-line scales 26; scales above lateral line approximately 9 (9–11); scales below lateral line approximately 12 (12–15); predorsal scales approximately 27 (27–29); ventral scutes 11 (9 in 3 and 10 in 5); total gill rakers 22 (20–24, modally 22; Table 2). (See Table 1 for morphometric values).

Body of moderate depth; caudal peduncle rather short and deep, tapering only slightly posteriorly; anus positioned well behind pelvic-fin bases, just in advance of anal-fin origin; no apparent luminescent tissue. Head and snout rounded; dorsal outline of nape and head gently curved in lateral profile, nearly horizontal in front of dorsal fin, almost straight between eyes; snout short, not projecting in advance of mouth; posttemporal spine short and sharp. Posterior edge of preopercle finely serrate, posteroventral corner produced as broad spine reaching nearly to hind edge of operculum. Dorsoposterior corner at rear end of maxilla positioned vertically below posterior margin of orbit. Gill rakers on upper limb of first arch long and slender.

Oral edge of premaxilla and dentary broadly covered with fine teeth of similar size, dentigerous surface extending laterally around expanded anterior end of dentary to underside. Vomer naked; palatine covered with fine teeth.

Scales adherent, each with numerous rows of strong ctenii obscuring scale margins and making determination of squamation patterns difficult; single row of scales overlapping onto bases of dorsal and anal fins. Predorsal scales on dorsal midline of head reaching just in advance of vertical through centre of orbit on dorsal midline of head. Cheek scales reaching forward just in advance of vertical through posterior extent of orbit. Lateral-line pores mostly obscured by ctenii. Scales on ventral midline between pelvic-fin bases and anus modified as moderately large bony scutes.

Dorsal fin short based, continuous, spines and rays increasing in length progressively to third soft ray, subsequent rays gradually decreasing in length; first soft ray unbranched, remaining rays branched; origin of fin above centre of pectoral fin. Anal fin short based, first spine tiny, spines and rays increasing in length progressively to second soft ray, subsequent rays subequal or decreasing slightly in length. Caudal fin distinctly forked. Posterior edge of pectoral fin curved, middle rays longest, first and last rays simple and short, second longer and also simple, others branched. Posterior tip of pelvic fin reaching about two thirds of way to anal-fin origin.

Table 2. Frequency of gill-raker counts in the three species of *Optivus* as reflected in specimens examined.

	gill-raker number								
	20	21	22	23	24	25	26	27	
<i>Optivus agastos</i>			1	9	9	1			
<i>Optivus agrammus</i>	1	1	7	4	1				
<i>Optivus elongatus</i>					1	8	5	2	

Preserved coloration (in alcohol). Body and fins pale; large, recently preserved individuals with slightly dusky caudal-fin tips.

Live coloration. See colour photo in Gomon, 1994 (fig. 365). Greenish brown on back, silver below; fins pink.

Etymology. *agrammus*, from the Greek *a*, meaning “without”, and *gramme*, for “line”, in reference to the absence of stripes on the caudal fin of this species.

Distribution. Known only from western and central southern Australia, between Fremantle, Western Australia and Venus Bay, South Australia, at the eastern end of the Great Australian Bight, in depths of 40–320 m.

Discussion. Freshly preserved individuals of *Optivus agrammus* are readily separable from the other two species of *Optivus* by colour pattern, the former lacking the distinctive lengthwise dark stripe on each of the caudal-fin lobes found in its congeners (see colour photos in Gomon, 1994, of *O. agastos*—fig. 364 and *O. agrammus*—fig. 365, and Doak, 1972, of *O. elongatus*—pl. 8, as *Hoplostethus elongatus*). Other features that differ between it and its congeners relate to the overall shape of the head, body and fins and are evident as morphometric shifts, with overlapping values (Table 1). The distribution of characters in the species do not support any clear relationships (e.g., Fig. 2). Although *O. agrammus* has modally fewer gill-rakers than *O. agastos*, both have less than *O. elongatus* (Table 2). The use of the distribution of cheek scales by Gomon (1994) to separate *O. agastos* and *O. agrammus* (as *O. sp. 1* and *O. sp. 2*, respectively) is invalid as the character is more variable than described.

The precise collection site of the paratype SAMA A478 is unclear, due to incomplete registration information. The specimen was recorded as coming from a Soela station “65” without further details. It is surmized that the specimen was taken on the same Soela cruise as the other two specimens sent to the South Australian Museum by CSIRO, both of which were registered later than this specimen, rather than from one of the three subsequent cruises to the Bight region by the vessel.

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