

Epigonus carbonarius, a new species of deepwater cardinalfish (Perciformes: Epigonidae) from the Marquesas Islands, with a redefinition of the *Epigonus oligolepis* group

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Abstract A new epigonid fish, *Epigonus carbonarius*, is described on the basis of four specimens (50.8–95.3 mm standard length) collected from off Nuku Hiva Island, Marquesas Islands. This species belongs to the *Epigonus oligolepis* group, redefined in this study. It is distinguished from the three recognized species of the group by the following combination of characters: a small number of total gill rakers (21–23) and pyloric caeca (6), presence of lingual teeth, and absence of teeth from posterior part of vomer. A key to the species in the *E. oligolepis* group is provided.

Keywords *Epigonus carbonarius* · Lingual teeth · Rib · Nuku Hiva Island

Introduction

The genus *Epigonus* Rafinesque 1810 is distributed from temperate to tropical waters in the world, with 29 valid species (Mayer 1974; Okamoto 2011). In a worldwide taxonomic review of the deepwater cardinalfish genus *Epigonus*, Abramov (1992) proposed four species groups, the *Epigonus denticulatus* group, the *Epigonus oligolepis* group, the *Epigonus robustus* group, and the *Epigonus telescopus* group. Of these, the *E. oligolepis* group was the

smallest species group, including *Epigonus devaneyi* Gon 1985, *Epigonus glossodontus* Gon 1985, and *Epigonus oligolepis* Mayer 1974. Abramov (1992) defined this group by the following characters: “small size (up to 130 mm), large scales (33–39 in lateral line), the occurrence of 7 spines on the 1st dorsal fin and 10 soft rays in the 2nd dorsal fin as well as by the absence of an opercular spine.” However, he did not examine the specimens of the members of the group in the revision, and proposed the taxonomy of the genus without an important diagnostic character, viz. presence or absence of a rib on the last abdominal vertebra (see Mochizuki and Shirakihara 1983).

While investigating epigonid fish specimens for taxonomic study (Ida et al. 2007; Okamoto 2011), the first author found four specimens of a new species from the Marquesas Islands. This species is described herein, and the *E. oligolepis* group is redefined based on examination of all members of the group. A key to the species of the *E. oligolepis* group is provided.

Materials and methods

Meristic and morphometric methods generally followed Mayer (1974). Body depth and body width were measured at the pectoral-fin base. Lateral-line scales were estimated by counting scale pockets when specimens had lost their scales. The number of pored lateral-line scales on the caudal fin is represented as “+ *n*”. The term “mustache-like process” is used for a process on the maxillary head (see Mayer 1974). The first caudal vertebra is defined as the first vertebra bearing a definite hemal spine. Measurements were made with digital calipers to the nearest 0.1 mm. Terminology and formula of the supraneural bones followed Mabee (1988) and Ahlstrom et al. (1976), respectively.

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Counts of supraneurals, vertebrae, and ribs were taken from radiographs. Sex was determined by dissection of the abdomen on the right side. Standard length is abbreviated as SL. Institutional codes follow Leviton et al. (1985).

***Epigonus carbonarius* sp. nov.** (New English name: Charcoal Deepwater Cardinalfish) (Figs. 1, 2a, e, 3; Table 1).

Holotype. MNHN 2010-983: 95.3 mm SL, female, 08°58'S, 140°04'W, off Nuku Hiva Island, Marquesas Islands, 391–408 m depth, 24 August 1997.

Paratypes. Three specimens collected with the holotype: MNHN 2010-984, 89.7 mm SL, female; MNHN 2010-985, 67.7 mm SL, sex unknown; MNHN 2010-986, 50.8 mm SL, sex unknown.

Diagnosis. A species of *Epigonus* with the following combination of characters: opercular spine absent; rib absent on the last abdominal vertebra; lingual teeth present; vomerine teeth patch on anterior part, not extending posteriorly along midline of palate; mustache-like process absent; gill rakers 5–6 + 16–17 = 21–23; vertebrae 10 + 15; pored lateral-line scales 35–36 to end of hypural

plus 4–5 on caudal fin; dorsal fin VII–I, 10; anal fin II, 9; pyloric caeca 6.

Description. Counts and proportional measurements are given in Table 1. Body moderately slender, compressed, nape not humped, deepest at pectoral-fin base. Head large, slightly compressed. Mustache-like process absent. Snout short and round, length shorter than interorbital width; two nostrils closely set in front of upper edge of pupil, anterior nostril short and with membranous tube, posterior nostril elliptical without dermal flap. Eye large, round, orbital diameter slightly shorter than postorbital length; bony rim of orbit raised above dorsal profile; interorbital region flat. Mouth large, gape oblique; posterior margin of maxilla reaching to below anterior margin of pupil; lower jaw not projecting when mouth is closed, anterior projecting teeth or nub-like structure absent on symphysis of lower jaw. Small conical teeth on both jaws and palatines, upper jaw and palatines teeth arranged in a single row, lower jaw teeth arranged in a single row but in two or three rows at symphyseal part. Vomerine teeth minute, 2–5 teeth restricted to anterior part (Fig. 2a). Lingual teeth present, villiform, forming v-shaped tooth patch (Fig. 2e). Opercular spine absent, not forming median ridges; preopercular edges smooth. Origin of first dorsal fin vertically above

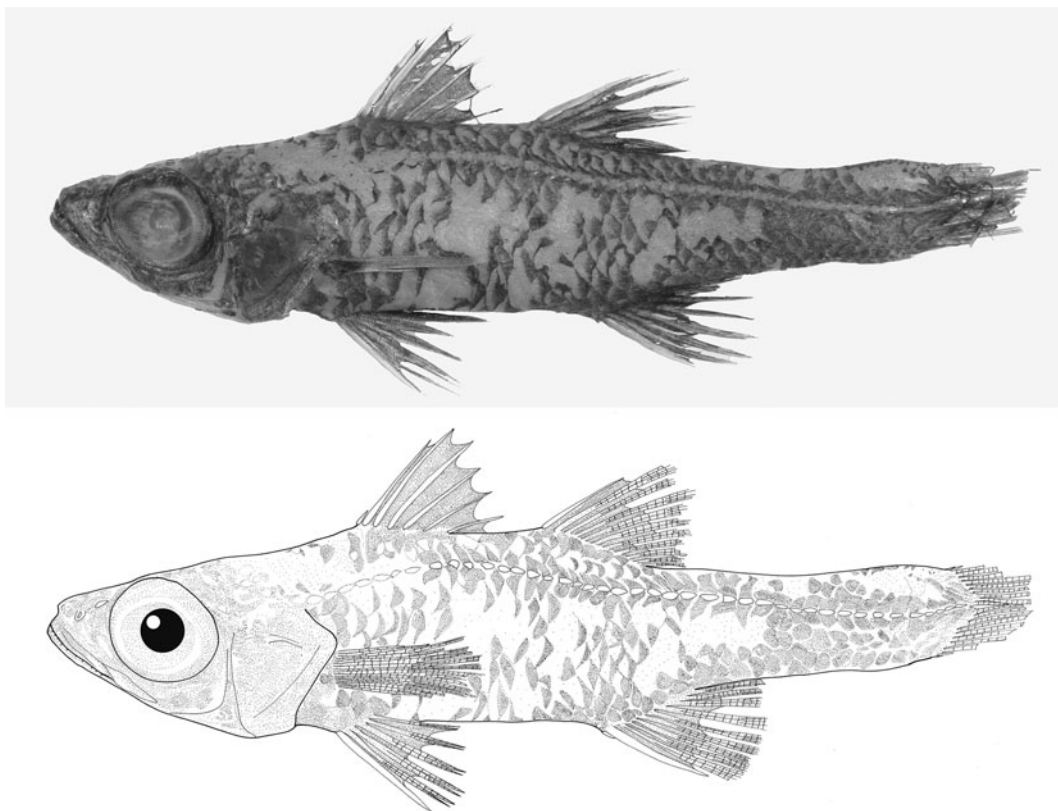


Fig. 1 *Epigonus carbonarius* sp. nov., MNHN 2010-983, holotype, 95.3 mm SL

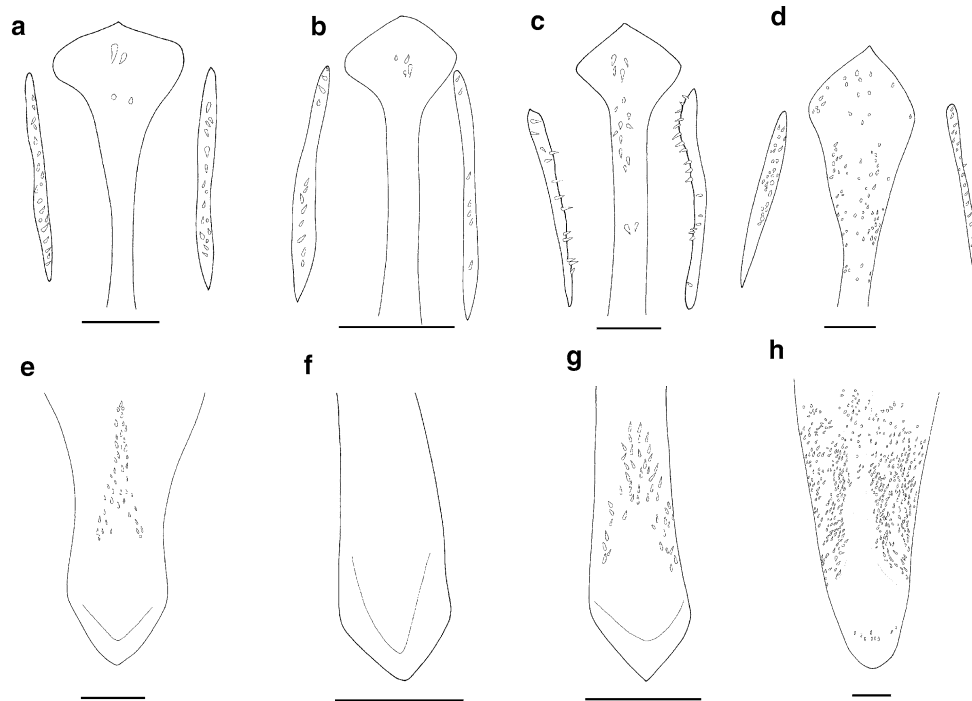


Fig. 2 Dentitions of vomer and palatine (*upper part*) and basihyal (*lower part*) of *Epigonus oligolepis* group. **a, e** *Epigonus carbonarius* sp. nov., MNHN 2010-983, 95.3 mm SL, holotype; **b, f** *E. devaneyi*,

BPBM 30277, 68.5 mm SL, paratype; **c, g** *E. glossodontus*, BPBM 30278, 54.3 mm SL, paratype; **d, h** *E. oligolepis*, USNM 207719, 77.6 mm SL, paratype. Bars 1 mm

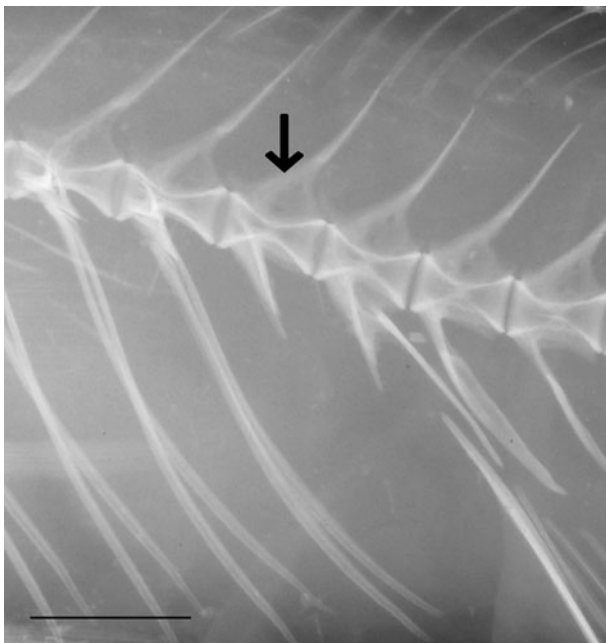


Fig. 3 X-ray photograph of abdominal region of *Epigonus carbonarius* sp. nov., MNHN 2010-983, holotype. Arrow shows the 10th abdominal vertebra. Bar 5 mm

anterior portion of pectoral fin; first dorsal-fin spine minute; third dorsal-fin spine the longest. Spine of second dorsal fin long, thicker than first dorsal-fin spines. First and second dorsal fins widely separated by a distance longer

than snout length. Origin of anal fin vertically below posterior portion of second dorsal-fin base; first anal spine minute; second spine fairly thick. Posterior tips of pectoral and pelvic fins not reaching vertical line from anus. Caudal fin deeply forked. Anus located vertically below first soft ray of second dorsal fin. Abdominal vertebrae 10, rib absent on last vertebra (Fig. 3); caudal vertebrae 15. Supraneural bones three (0+0/0+2/1+1/1). Scales deciduous, weakly ctenoid, covering the whole body except snout tip, anterior to rim of orbit and surface of jaws; scales also present on bases of second dorsal, anal, and caudal fins; series of pored lateral-line scales complete, 4–5 pored scales on caudal fin. No trace of luminous organ around belly or visceral organ.

Color in alcohol. Body and head uniformly dark brown. All fins black, except for pectoral fin (light brown). Mouth cavity pale with scattered small melanophores.

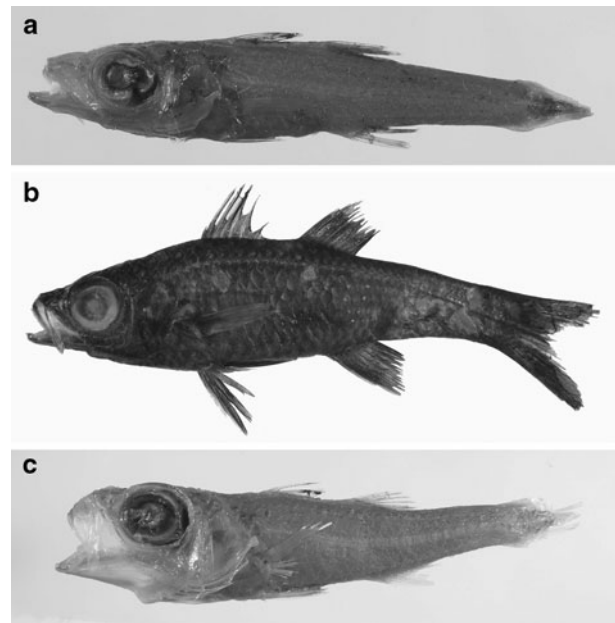
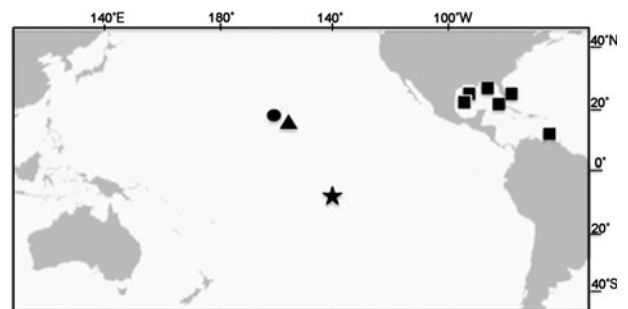
Distribution. All specimens were collected from off Nuku Hiva Island, Marquesas Islands, at a depth of 391–408 m.

Etymology. The specific name, *carbonarius*, is a Latin noun (meaning “charcoal”) referring to the blackish coloration of the body and fins of the new species.

Comparison. *Epigonus carbonarius* sp. nov. belongs to a group of three similar species in the *E. oligolepis* group (see “Remarks”); *E. devaneyi*, *E. glossodontus*, and *E. oligolepis* (Fig. 4). Although *E. carbonarius* is similar to *E. glossodontus* and *E. oligolepis* in having lingual teeth

Table 1 Counts and measurements of *Epigonus carbonarius* sp. nov.

	Holotype MNHN 2010-983	Paratypes (n = 3)
Standard length (mm)	95.3	50.8–89.7
Counts		
Dorsal-fin rays	VII-I, 10	VII-I, 10
Anal-fin rays	II, 9	II, 9
Pectoral-fin rays	17	17
Pored lateral-line scales	36 + 5	35 + 4
Scales above lateral line	3	3
Scales below lateral line	7	8
Gill rakers	5 + 16 = 21	5–6 + 16–17 = 21–23
Pyloric caeca	6	6
Vertebrae	10 + 15	10 + 15
Measurements (% standard length)		
Head length	34.7	35.8–38.2
Head width	14.4	13.0–15.1
Head height	16.1	16.6–17.1
Body depth	21.6	21.9–23.1
Body width	12.8	11.7–14.6
Caudal-peduncle depth	9.9	9.6–10.6
Caudal-peduncle length	29.1	25.0–28.4
Orbital diameter	13.6	13.4–15.2
Interorbital width	9.1	8.9–9.3
Postorbital length	14.1	14.2–15.9
Upper-jaw length	13.7	13.6–14.6
Lower-jaw length	14.8	15.5–17.0
Snout length	8.0	8.1–8.7
Pre-1st dorsal-fin length	37.4	36.4–39.7
Pre-2nd dorsal-fin length	57.7	56.1–60.7
Pre-pectoral-fin length	34.4	34.8–35.8
Pre-pelvic-fin length	36.5	36.6–39.0
Pre-anus-length	55.3	56.9–58.0
Pre-anal-fin length	65.6	64.6–66.3
1st spine length on 1st dorsal fin	2.4	2.1–3.9
2nd spine length on 1st dorsal fin	14.4	14.3–17.7
3rd spine length on 1st dorsal fin	15.7	14.5–16.8
2nd dorsal-fin spine length	14.1	14.0–15.0
1st anal-fin spine length	2.2	2.5–3.3
2nd anal-fin spine length	13.1	13.9–14.4
Pelvic-fin spine length	13.2	13.0–13.3
1st dorsal-fin base	15.8	13.2–15.9
2nd dorsal-fin base	13.0	12.0–12.7
Anal-fin base	11.1	10.2–10.8
Pectoral-fin length	18.8	18.6–22.2
Pelvic-fin length	18.8	18.1–18.5

**Fig. 4** Other three species of *Epigonus oligolepis* group. **a** *Epigonus devaneyi*, BPBM 30277, 68.5 mm SL, paratype; **b** *E. glossodontus*, BPBM 40445, 78.0 mm SL; **c** *E. oligolepis*, USNM 207719, 77.6 mm SL, paratype**Fig. 5** Distribution records of the *Epigonus oligolepis* group. *Epigonus carbonarius* sp. nov. (star); *E. devaneyi* (triangle); *E. glossodontus* (circle); *E. oligolepis* (squares)

(Fig. 2), the new species differs in having 21–23 total gill rakers (vs. 24–27 and 29–32 in *E. glossodontus* and *E. oligolepis*, respectively) and vomerine teeth not extending posteriorly (vs. teeth present posteriorly along midline of palate in the latter two species; Fig. 2). The new species also clearly differs from *E. devaneyi* in having lingual teeth (vs. lingual teeth absent in *E. devaneyi*, Fig. 2) and fewer gill rakers and pyloric caeca (21–23 and 6 in *E. carbonarius* vs. 26–29 and 8–10 in *E. devaneyi*). In addition, the new species is distributed in the South Pacific, although all other members of the species group have been reported only from the Northern Hemisphere (Fig. 5). Selected characters of the four species are compared in Table 2.

Table 2 Comparison of the selected characters and distribution among four species of the *Epigonus oligolepis* group

Species Sources	<i>E. carbonarius</i> sp. nov. Present study	<i>E. devaneyi</i> Present study, Gon (1985)	<i>E. glossodontus</i> Present study, Gon (1985)	<i>E. oligolepis</i> Present study, Mayer (1974)
Lingual teeth	Present	Absent	Present	Present
Vomerine teeth on posterior part	Absent	Absent	Present	Present
Anterior projecting teeth on lower jaw	Absent	Absent	Present	Absent
Gill rakers (total)	21–23	26–29	24–27	29–32
Pyloric caeca	6	8–10	6–8	8–10
Distribution	Marquesas Islands	Hawaiian Islands	Hawaiian Islands	Gulf of Mexico to Caribbean region

Remarks. Although Abramov (1992) recognized four species groups in the genus *Epigonus*, he did not examine material of all members of the *E. oligolepis* group. In addition, he did not discuss the importance of the presence or absence of a rib on the last abdominal vertebra, although Mochizuki and Shirakihara (1983) considered it to be an important diagnostic character in the genus. As a result, there are species that do not fall under the definition of any of the four species group of the genus (treated as exceptions; Abramov 1992), and the limits between the four species groups are not clear. Our examination of the presence or absence of the rib on the last abdominal vertebra in the *E. oligolepis* group revealed that all members of the group lack the rib. On the other hand, presence or absence of this rib is variable within the other three species groups (Mochizuki and Shirakihara 1983; Okamoto 2011).

The holotype (95.3 mm SL) and one paratype (89.7 mm SL, MNHN 2010-984) of *E. carbonarius* are females with developed mature ova. Gon (1985) reported the largest size of *E. devaneyi* and *E. glossodontus* of the *E. oligolepis* group as 78.3 mm SL and 100.0 mm SL, respectively. *Epigonus oligolepis* was found in this study to reach at least 150 mm SL (based on one specimen, UF 43252). With the exception of a small species, *Epigonus cavaticus* Ida, Okamoto and Sakaue 2007 (<100 mm SL), adult specimens of the other species groups are known to attain 100–350 mm SL (Abramov 1992; Okamoto 2011). Thus, the *E. oligolepis* group appears to be a group with relatively small-sized species.

Epigonus carbonarius was collected from a depth of 391–408 m in the Marquesas Islands. All other species of the *E. oligolepis* group occur in depths of more than 300 m (Mayer 1974; Gon 1985).

The *Epigonus oligolepis* group

The *Epigonus oligolepis* group: Abramov 1992: 100

Diagnosis. Pungent opercular spine absent; rib absent on last abdominal vertebra; dorsal fin VII-I, 10; and 33–40 pored lateral-line scales to end of hypural.

Key to the species of the *Epigonus oligolepis* group

- 1a. Lingual teeth absent (Hawaiian Islands)..... *E. devaneyi*
 1b. Lingual teeth present2
 2a. Total gill rakers 21–23; vomerine teeth patch on anterior part, not extending posteriorly along midline of palate (Marquesas Islands) *E. carbonarius* sp. nov.
 2b. Total gill rakers 24–31; vomerine teeth patch on anterior part and extending posteriorly along midline of palate3
 3a. Maxillary teeth small and conical, visible when mouth is closed; two or three large anterior projecting teeth on the each side of the symphysis of the lower jaw (individuals larger than 50 mm SL); total gill rakes 24–27 (Hawaiian Islands)..... *E. glossodontus*
 3b. Maxillary teeth minute, not visible when mouth is closed; large teeth absent on the symphysis of the lower jaw; total gill rakes 29–32 (Gulf of Mexico to Caribbean region)..... *E. oligolepis*

Comparative materials. *Epigonus devaneyi*: BPBM 30277, paratype, 1 specimen, 68.5 mm SL, off south end of Necker Ridge, northwestern Hawaiian Islands, 311–347 m depth, 15 October 1976; HUMZ 129680, 1 specimen, 40.7 mm SL, 24°54'N, 165°36'W, off Hawaii, February 1994. *E. glossodontus*: BPBM 30278, paratypes, 2 specimens, 39.6–54.3 mm SL, off Pearl Harbor, Mamala Bay, Oahu, Hawaii, 1 September 1982; BPBM 40445, 1 specimen, 78.0 mm SL, 20°57'N, 157°23'W, Penguin Bank, off Molokai, Hawaii, 30 October 2002. *E. oligolepis*: UF 43252, 6 specimens, 104.5–150.3 mm SL, 26°11'N, 84°43'W, Gulf of Mexico, Florida, 300 m depth, 19 September 1985; USNM 207719, paratypes, 2 specimens,

52.0–77.6 mm SL, 12°01'N, 61°53'W, Caribbean Sea, 384–457 m depth, 4 September 1974.

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