

Redescription of the spookfish *Dolichopteryx anascopa* Brauer 1901 (Argentinoidei: Opisthoproctidae)

Nobuyuki Mizusawa · Munehiro Takami ·
Atsushi Fukui

Received: 29 May 2014/Revised: 2 July 2014/Accepted: 2 July 2014/Published online: 5 August 2014
© The Ichthyological Society of Japan 2014

Abstract The rare spookfish *Dolichopteryx anascopa* Brauer 1901, the original description of which was incomplete due to damage, is redescribed on the basis of the holotype and an additional single specimen collected from south of west Mariana Ridge, western North Pacific. It is easily distinguishable from other species of *Dolichopteryx* by the tubular eyes with an oval opaque layer on the ventral aspect, anal-fin base originating under the dorsal-fin base, pelvic-fin base inserted at ca. 3/5 of standard length, anus anterior to the dorsal-fin base, elongate pectoral- and pelvic-fin rays, an adipose fin present, 31–32 (= 8 + 1 + 22–23) gill rakers and 43 vertebrae.

Keywords *Dolichopteryx anascopa* · Redescription · Opisthoproctidae · Western North Pacific Ocean

Introduction

Dolichopteryx anascopa Brauer 1901 was originally described from a single specimen from the eastern Indian Ocean, an illustration being published subsequently (Brauer 1906). However, due to specimen damage both the description and illustration were incomplete. Although four specimens from the South Atlantic Ocean were reported as *D. anascopa* by Trunov (1997), Parin (2005) later originally described *Dolichopteryx trunovi* Parin 2005 based on these specimens. Accordingly, the description of *D. anascopa* has remained incomplete for more than 100 years. A single specimen, collected from south of west Mariana Ridge, western North Pacific, during ichthyoplankton surveys in 2007 and identified as *D. anascopa* following comparison with the holotype, has now made possible a redescription of that species.

Counts and measurements followed Cohen (1964) and Nakabo (2002), except for preadipose length, preanal length, preanus length and prepelvic length, which followed Fukui and Kitagawa (2006a). Body measurements were made to the nearest 0.1 mm. Standard length is abbreviated as SL. Gill rakers were counted on the outer side of the first arch on the right side. Vertebral counts were made from radiographs. Because the urostyle is clearly subdivided into three parts in *Dolichopteryx*, it was here counted as three. Institutional abbreviations follow Leviton et al. (1985).

Dolichopteryx anascopa Brauer 1901

(Figs. 1, 2; Table 1)

This article was registered in the *Official Register of Zoological Nomenclature* (ZooBank) as [37447FFA-AE7F-4E11-8EA6-ECF109CB9A0C](https://doi.org/10.3896/BBID.37447FFA-AE7F-4E11-8EA6-ECF109CB9A0C).

This article was published as an Online First article on the online publication date shown on this page. The article should be cited by using the doi number.

N. Mizusawa
Graduate School of Marine Science and Technology, Tokai
University, 3-20-1 Orido Shimizu-ku, Shizuoka 424-8610, Japan

Present Address:

N. Mizusawa
Nichimo Co., Ltd., Tennoz Yusen Building, 2-2-20 Higashi-
Shinagawa, Shinagawa-ku, Tokyo 140-0002, Japan

M. Takami (✉) · A. Fukui
Department of Fisheries, School of Marine science and
Technology, Tokai University, 3-20-1 Orido Shimizu-ku,
Shizuoka 424-8610, Japan
e-mail: mune-takami@hotmail.co.jp

Fig. 1 *Dolichopteryx anascopa*, NSMT-P 95484, 33.5 mm SL, Suruga Seamount, western North Pacific. Bar 5 mm

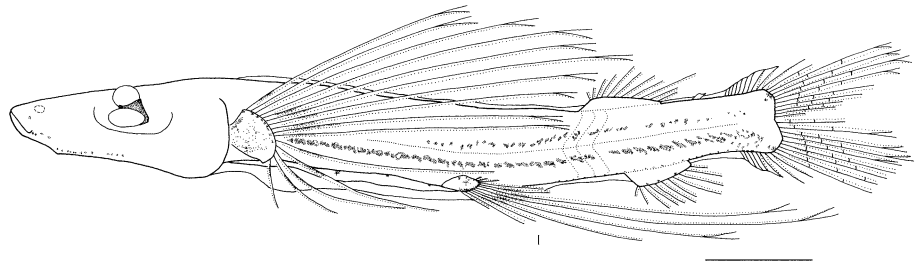
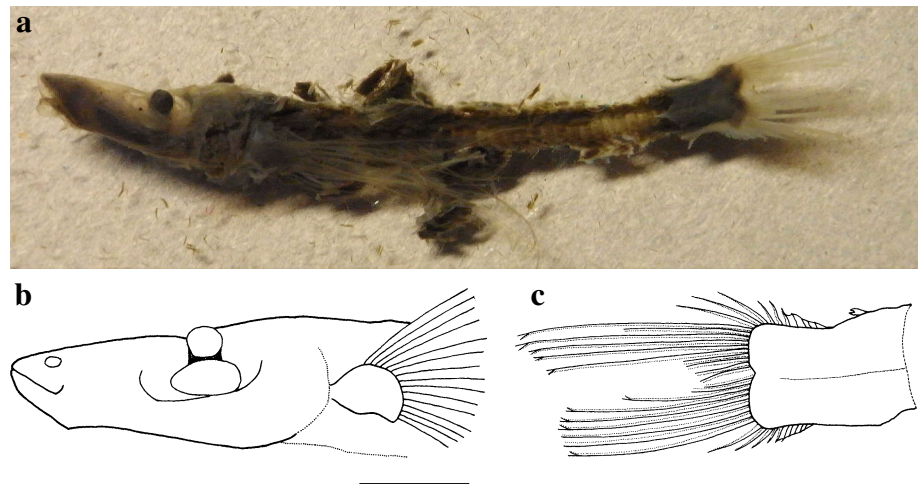


Fig. 2 Holotype of *Dolichopteryx anascopa*, ZMB 17428, 34.3 mm SL, west of Cocos Islands, Indian Ocean. **a** Lateral view; **b** lateral view of head; **c** lateral view of tail (right side). Bars 5 mm



Dolichopteryx anascopa Brauer 1901: 127–128 (type locality: west of Cocos Islands, Indian Ocean; ZMB 17428); Brauer 1906: 24–25, fig. 4; Parin et al. 2009: 846.

Material examined. Two specimens: holotype, ZMB 17428, 34.3 mm SL, west of Cocos Islands, Indian Ocean; non-type, NSMT-P 95484, 33.5 mm SL, south of Suruga Seamount, west Mariana Ridge, western North Pacific Ocean (13°51.1' N, 143°00.1' E), 13 September 2007, coll. by ORI-BF (Ocean Research Institute Big Fish) plankton net (3 m in diameter, 0.5 mm in mesh size), capture depth surface–503 m, R/V *Hakuho-maru*.

Diagnosis. Eyes tubular, protruding anterodorsally, an oval opaque layer apparent on ventral aspect; anal-fin base originating under dorsal-fin base; pelvic-fin base inserted at ca. 3/5 of SL; anus anterior to dorsal-fin base; pectoral- and pelvic-fin rays elongate; adipose fin present; gill rakers 31–32 (= 8 + 1 + 22–23); vertebrae 43.

Description. Counts and measurements are presented in Table 1. Description below mostly based on the non-type specimen owing to the poor condition of the holotype (see Fig. 2). Body elongate, cross section broadly elliptic on head, thereafter compressed, thinly rectangular on caudal peduncle. Head rather short, horizontal distance from tip of snout to anterior margin of eye 1.27 times that from posterior margin of eye to posterior margin of operculum. Head and body depth increasing from snout tip, greatest depth just before posterior margin of operculum, thereafter

gradually becoming shallow. Head and body width gradually increasing from snout tip, greatest width 11.3 % SL just before posterior margin of operculum, thereafter gradually becoming narrow, ca. 4/5 maximum body width at insertion of pelvic-fin base, ca. 1/2 at adipose fin base. Branchiostegal rays two. Gill membranes broadly united, separated from isthmus. Mouth terminal, small, maxillary length ca. 1/10 head length. Premaxillary apparently absent. Two or three rows of small conical teeth on vomer. Nostrils small, located at anterior 1/7 of head length. Eyes tubular, protruding anterodorsally; an oval opaque layer apparent on ventral aspect, its major axis longer than eye diameter; lens directed anterodorsally. Orbital width relatively narrow, ca. 1/6 maximum body width. Gill rakers present, those on outer side of first arch forming a triangular patch, those on inner side small, spinous. Dorsal margin of epaxial and ventral margin of hypaxial portions of trunk undeveloped, gut enclosed along ventral margin by peritoneum and skin. Anus below 24th myomere midway between insertion of pelvic fin and origin of anal-fin base. Deep cleavage along dorsal midline from nape to origin of caudal procurent ray; shallow cleavage along ventral midline from just after anus to origin of caudal procurent ray; both cleavages becoming shallower posteriorly. Pterygiophores of dorsal and anal fins extending above and below dorsal and ventral margins of body, respectively, being inserted proximally into each cleavage. First ray of

Table 1 Counts and proportional measurements of *Dolichopteryx anascopa*

| | Present specimen NSMT-P 95484 | Holotype ZMB 17428 |
|-------------------------------------|----------------------------------|-----------------------|
| Standard length (mm) | 33.5 | 34.3 |
| Counts | | |
| Dorsal-fin rays | 11 | 10? ^a |
| Anal-fin rays | 11 | 12 ^a |
| Pectoral-fin rays | 15 | 15 |
| Pelvic-fin rays | 12 | 12 |
| Principal caudal-fin rays | 10 + 9 | 10 + 9 |
| Procurrent caudal-fin rays | 10 + 8 | 10 + 10 |
| Gill rakers on first arch | 32 (= 8 + 1 + 23) | 31 (= 8 + 1 + 22) |
| Vertebrae* | 43 | Uncountable |
| Myomeres | 41 (= 24 + 17) | 42? |
| Proportional measurements (% SL) | | |
| Head length | 30.1 | 32.7 |
| Snout length | 15.2 | 15.7 |
| Body depth | 13.1 | 10.1 ^a |
| Caudal peduncle depth | 7.2 | 7.9 |
| Predorsal length | 76.2 | 78.4 ^a |
| Preanal length | 82.1 | 81.3 ^a |
| Prepelvic length | 59.1 | 61.2 ^a |
| Preadipose length | 91.9 | 92.4 |
| Preanus length | 70.1 | Uncountable |
| Pectoral-fin length | 48.9 | 45.5 |
| Pelvic-fin length | 48.5 | 39.7 |
| Eye diameter | 3.3 | 3.8 |
| Eye height | 5.4 | 6.1 |
| Dorsal-fin base | 9.3 | ca. 7 ^a |
| Anal-fin base | 8.1 | 8.6 ^a |
| Pectoral-fin base | 6.7 | 6.4 |
| Pelvic-fin base | 3.3 | 3.5 |

* Urostyles counted as three

^a From Brauer (1906)

dorsal fin on a vertical line from about midway between anus and first ray of anal fin. First ray of anal fin on a vertical line from seventh ray of dorsal fin. Horizontal distance from posterior end of anal-fin base to base of lowest principal caudal-fin ray 11.1 % SL. Pelvic-fin base with a small knot of musculature, inserted anterior to anus, at ca. 3/5 of SL, ventrally between 19th and 20th myomeres; tip of longest (sixth) ray extending to caudal fin base. Pectoral fin with a short stalk-like base, its upper margin inserted on a horizontal line from ventral margin of eyes; rays elongate, tip of longest (sixth) ray extending beyond origin of dorsal-fin base. Adipose fin feeble just posterior to a vertical line from end of anal-fin base, projecting slightly from skin. Scales apparently absent. Trunk

and tail covered by thin transparent skin. Nerves visible between nape and origin of dorsal-fin base in dorsal cleavage. Gonad immature.

Color in non-type specimen. Just after collection, body base color whitish, slightly reddish on hypaxial region and gut anterior and posterior, respectively, to insertion of pelvic-fin; two longitudinal black rows composed of melanophores close to midlateral line on both epaxial and hypaxial portions of trunk and tail. In 70 % ethanol, after fixation in 10 % sea water formalin, body base color light yellow, reddish color lost. Melanophore patterns—several melanophores below nostrils and behind upper jaw, a feeble line from articular region to below eye along ventral margin of operculum, epaxial row from just before a vertical line from insertion of pelvic-fin base to caudal peduncle, hypaxial row from just after insertion of pectoral-fin base to caudal peduncle (hypaxial row more conspicuous than epaxial), three melanophores laterally on gut, 24 along midlateral line of ventral cleavage; melanophores also present on anal-fin base, outer surfaces of stalked base of pectoral fin, proximal parts of pectoral- and pelvic-fin membranes, and caudal-fin base (dorsal and ventral margins).

Distribution. Known from south of the Suruga Seamount, west Mariana Ridge, western North Pacific (NSMT-P 95484) and west of Cocos Islands, Indian Ocean (holotype, Brauer 1901).

Remarks. The present specimen agreed with *D. anascopa*, described and illustrated by Brauer (1901, 1906), in having tubular eyes, the anal-fin base originating under the dorsal-fin base, the pelvic-fin base inserted at ca. 3/5 of SL, elongate pectoral- and pelvic-fin rays and two longitudinal black rows on the trunk and tail. Counts and measurements of the two specimens were also very similar (Table 1). In addition, the holotype of *D. anascopa* has an oval opaque layer on the ventral aspect of the eyes and a feeble adipose fin (Fig. 2), which were not described or illustrated by Brauer (1901, 1906). Accordingly, the present specimen was confidently identified as *D. anascopa*, being the second known example of the species.

Of the nine valid species included in *Dolichopteryx* at present (Parin et al. 2009), plus an additional species (represented by SIO 93-246) briefly described but not yet named (Moser 1996), the last-mentioned along with *D. anascopa*, *Dolichopteryx pseudolongipes* Fukui, Kitagawa and Parin 2008, *D. trunovi*, *Dolichopteryx vityazi* Parin, Belyanina and Evseenko 2009 and *Dolichopteryx* sp. (SIO 93-246, present study) share characters as both tubular eyes and an adipose fin [tubular eyes but an adipose fin absent in *Dolichopteryx andriashevi* Parin, Belyanina and Evseenko 2009 and *Dolichopteryx longipes* (Vaillant 1888), an adipose fin present but pouch-like eyes in *Dolichopteryx minuscula* Fukui and Kitagawa 2006b, *Dolichopteryx parini*

Kobylianskii and Fedorov 2001 and *Dolichopteryx rostrata* Fukui and Kitagawa 2006a] (Parr 1937; Cohen 1964; Trunov 1997; Fukui and Kitagawa 2006a, b; Fukui et al. 2008; Mizusawa and Fukui 2009). However, *D. anascopa* is clearly distinguishable from them in having the anus anterior to the dorsal-fin base [vs. under in *D. pseudolongipes* (see Fukui et al. 2008) and *D. vityazi* (see Parin et al. 2009), under to just after in *D. trunovi* (see Trunov 1997; Parin 2005) and *Dolichopteryx* sp. (SIO 93-246, present study)]. The opaque layer on the ventral aspect of the eyes in *D. anascopa*, which seems to be related to the black sac-like retinal diverticulum on the eyes of *D. pseudolongipes* (see Fukui et al. 2008), was also recognized in *D. minuscula* and *D. rostrata* (see Fukui and Kitagawa 2006a, b). However, that of *D. anascopa* was most developed in size (major axis longer than eye diameter vs. shorter in *D. minuscula* and *D. rostrata*). The maximum recorded size in *D. anascopa* (34.3 mm SL in holotype) was smaller than those in other *Dolichopteryx* (59.6 mm SL in *D. minuscula*–217.0 mm SL in *D. parini*) (Kobylianskii and Fedorov 2001; Parin 2005; Fukui and Kitagawa 2006a, b; Fukui et al. 2008; Parin et al. 2009).

The occurrence of *D. anascopa* in the tropical eastern Indian and western Pacific Oceans indicates that the species is widely distributed.

Comparative material. *Dolichopteryx* sp.: SIO 93-246, 70.9 mm SL, eastern Pacific Ocean (33°47' N, 119°46' E), 22 May 1962, coll. by IKMT net (wire out 1062 m).

Acknowledgments We thank the captain and crews of R/V *Hakuho-maru* and scientists on board during cruise KH-07-2 for their assistance in sampling. Grateful thanks are also given to P. Bartsch (ZMB) for access to the holotype *D. anascopa*, P. A. Hastings and C. Klepadlo (SIO) for specimen loans, and G. S. Hardy (Ngunguru, New Zealand) for his critical comments on the manuscript and great help with English. This study was supported in part by a Grant-in-Aid for Promotion of Scientific Research (C) (no. 25450280) from the Ministry of Education, Culture, Sports, Science and Technology, Japan to the last author.

References

- Brauer A (1901) Über einige von der Valdivia-Expedition gesammelte Tiefseefische und ihre Augen. Sitzungsber Ges Naturw Marburg 8:115–130

- Brauer A (1906) Die Tiefsee-Fische. I. Systematischer Teil. In: Chun C (ed) Wissenschaftl. Ergebnisse der deutschen Tiefsee-Expedition “Valdivia,” 1898–99. Jena Tiefsee-Fische 15:1–432, pls 1–18
- Cohen DM (1964) Suborder Argentinoidea. In: Bigelow HB (ed) Fishes of the western North Atlantic. Pt 4. Mem Sears Found. Mar Res, No. 1. Yale Univ, New Haven, pp 1–70
- Fukui A, Kitagawa Y (2006a) *Dolichopteryx rostrata*, a new species of spookfish (Argentinoidea: Opisthoproctidae) from the eastern North Atlantic Ocean. Ichthyol Res 53:7–12
- Fukui A, Kitagawa Y (2006b) *Dolichopteryx minuscula*, a new species of spookfish (Argentinoidea: Opisthoproctidae) from the Indo-West Pacific. Ichthyol Res 53:113–120
- Fukui A, Kitagawa Y, Parin NV (2008) *Dolichopteryx pseudolongipes*, a new species of spookfish (Argentinoidea: Opisthoproctidae) from the eastern Pacific Ocean. Ichthyol Res 55:267–273
- Kobylianskii SG, Fedorov VV (2001) A new species of the Genus *Dolichopteryx*—*D. parini* (Opisthoproctidae, Salmoniformes) from the mesopelagial zone of the Sea of Okhotsk and the Bering Sea. J Ichthyol 41:115–118
- Leviton AE, Gibbs RH Jr, Heal E, Dawson CE (1985) Standards in herpetology and ichthyology: part I. Standard symbolic codes for institutional resource collection in herpetology and ichthyology. Copeia 1985:802–832
- Mizusawa N, Fukui A (2009) First record of spookfish, *Dolichopteryx parini* (Argentinoidea: Opisthoproctidae), from off the coast of Aomori, Japan. Jpn J Ichthyol 149–152
- Moser HG (1996) Opisthoproctidae: spookfishes. In: Moser HG (ed) The early stages of fishes in the California Current region. CalCOFI Atlas 33. Allen Press, Lawrence, Kansas, pp 216–223
- Nakabo T (2002) Introduction to ichthyology. In: Nakabo T (ed) Fishes of Japan with pictorial keys to the species (English edition). Tokai University Press, Tokyo, pp xxi–xlii
- Parin NV (2005) *Dolichopteryx trunovi* sp. nova—a new name for *D. anascopa* (nec Brauer, 1901) Trunov, 1997 (Opisthoproctidae, Argentinoidea). J Ichthyol 45:132–133
- Parin NV, Belyanina TN, Evseenko SA (2009) Materials to the revision of the genus *Dolichopteryx* and closely related taxa (*Ioichthys*, *Bathylychnops*) with the separation of a new genus *Dolichopteroides* and description of three new species (fam. Opisthoproctidae). J Ichthyol 49:839–851
- Parr AE (1937) Concluding report on fishes. With species index for articles 1–7 (fishes of the third oceanographic expedition of the “Pawnee”). Bull Bingham Oceanogr Collect Yale Univ 3:1–79
- Trunov IA (1997) The species of the Opisthoproctidae family from the Southern Atlantic Ocean. J Ichthyol 37:810–814
- Vaillant LL (1888) Expéditions scientifiques du “Travailleur” et du “Talisman” pendant les années 1880, 1881, 1882, 1883. Poissons. G Masson, Éditeur, Paris