

A new species of *Malacoctenus* from the Cape Verde Islands, eastern Atlantic (Pisces Teleostei, Labrisomidae)

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Malacoctenus carrowi is described on the basis of three specimens from the Cape Verde Islands. The species is most similar to the only other eastern Atlantic species of the same genus, *Malacoctenus africanus* Cadenat, 1951. *M. carrowi* differs in colouration, a more elongated body, longer snout length, lower lateral line scale count and the absence of scales on the breast and is probably endemic to the Cape Verde Islands. A key to the Atlantic species of *Malacoctenus* is provided.

Key words: Blennioidei, eastern Atlantic, endemic species, mitochondrial COI

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INTRODUCTION

The blennioid genus *Malacoctenus* currently contains 22 valid species, ten in the Atlantic Ocean and twelve in the eastern Pacific (Eschmeyer & Fricke 2014). Nine of the ten Atlantic species live in the western Atlantic and only one, *Malacoctenus africanus* Cadenat, 1951, lives in the eastern Atlantic.

Malacoctenus africanus has been recorded from the coast of Senegal (Cadenat 1951; Wirtz 1980) and from the Cape Verde Islands (Brito et al. 1999). However, in the following it is shown that the *Malacoctenus* of the Cape Verde Islands belong, in fact, to a hitherto undescribed species, probably endemic to the Cape Verde Islands.

MATERIAL AND METHODS

The specimens were obtained by spraying an anaesthetic (quinaldine or clove oil) into horizontal cracks in rock faces or below large stones at depths of about 10 to 13 m. They were preserved in 96% ethanol. Point to point measurements were taken on the left side of each specimen

using a digital caliper with an accuracy of 0.01 mm and rounded to the nearest 0.1 mm. Body depth was measured at the height of the anus.

Specimens are deposited at the Bavarian State Collection of Zoology (Zoologische Staatssammlung) (ZSM) in Munich, Germany, and at the Stuttgart State Museum of Natural History (Staatliches Museum für Naturkunde) (SMNS), Germany.

The right ventral fin of the holotype and the paratype were removed for tissue sampling. DNA extraction was performed as described in Victor (2010). The mitochondrial COI gene was sequenced and pairwise distances were compared between the holotype and one paratype of *M. carrowi* (ZSM43040) and one *M. africanus* specimen (SMNS 13458-2).

RESULTS

TAXONOMY

Malacoctenus carrowi, spec. nov.

Figure 1(a-d), Table 1

Malacoctenus africanus (non Cadenat, 1951) in Brito et al. 1999: 31.

Malacoctenus n.sp. in Wirtz et al. 2013: 132, figure 14.

TYPES

Holotype ZSM 43039, King Bay, Tarrafal, Santiago Island, Cape Verde Islands, coordinates approximately 15.2749N, 23.7582W, 16 March 2010, male, from a horizontal crack in the rock at a depth of about 12 m, using the anaesthetic quinaldine. Right ventral fin removed for DNA analysis.

Paratype ZSM 43040, from approximately 3 km SW of São Pedro, São Vicente Island, Cape Verde Islands, coordinates approximately 16.8020 N, 25.0392 W, 15 October 2013, female, from a horizontal crack in the rock at a depth of about 11 m, using the anaesthetic clove oil. Right ventral fin removed for DNA analysis.

Paratype ZSM 41223, juvenile from in front of Furna da Rosa, approximately 3.5 km (airline distance) NW of São Pedro, São Vicente Island, Cape Verde Islands, 13 October 2011, with quinaldine from below a large rock in front of a cave at a depth of 13 m.

DIAGNOSIS

Dorsal rays XX+10; anal rays II+19; pectoral 14 soft rays; ventrals three soft rays; length of shortest pelvic ray more than half the length of the longest pelvic ray. Lateral line scales 55-56. Prepectoral scales present, considerably smaller than scales on body; belly scaled but breast area without scales (Fig. 1c). Colour pattern dominated by six vertical bars on the body, delineated in straight vertical lines; these bars barely enter the dorsal fin; dorsal fin membranes transparent.

DESCRIPTION

Dorsal rays XX+10; anal rays II+19; pectoral 14 soft rays; ventrals three soft rays; length of shortest pelvic ray more than half the length of the longest pelvic ray. Spinous dorsal fin indented twice: 3rd to 5th spines lower than the first two spines; 18th and 19th spines considerably lower than spine 20 and less than a third the length of the longest soft dorsal rays. Preopercular canals

do not extend onto the operculum. Lateral line scales 55-56. Lateral prepectoral scales present, considerably smaller than scales on body; belly scaled but breast area without scales (Fig. 1c); the head is entirely without scales. In adults, sexes can be differentiated by the shape of the urogenital papilla: pointed papilla in the male, a rugose knob in the female. The nasal cirrus is bifid. Upper rear edge of each eye with 3-4 supraorbital cirri: 6-7 nuchal cirri per side.

Colour in alcohol (Fig. 1b): Six dark vertical bands on body, delineated in straight vertical lines; these bands barely enter the dorsal fin; dorsal fin membranes transparent. Spaces between bars are light grey. No dark blotch below the origin of the dorsal fin. Semicircular dark band in front of nuchal cirri to the rear middle edge of the eye.

Colour *in vivo* (Fig. 1a and 1d): Six dark brown vertical bands on body, delineated in straight vertical lines; bands barely enter the dorsal fin; dorsal fin membranes transparent. Spaces between bars are light grey-brown, spaces between rear dark bands being lighter than spaces between anterior dark bands, yellowish in young animals.

HABITAT NOTES

The specimens were obtained by spraying an anaesthetic (quinaldine or clove oil) into horizontal cracks in rock faces or below large stones at depths of about 10 to 13 m. Additional animals were seen when overturning big stones at 10 to 16 m and one animal was photographed at night, resting on open rock in water only 3 m deep (Fig. 1a). Currently the species is only recorded from Santiago and São Vicente Islands but it is probably present at all islands of the Republic of Cabo Verde.

DNA SEQUENCES

The COI sequence of the holotype and paratype of *M. carrowi* are 14.3 and 14.6% different from the *M. africanus* specimen (pairwise distance). The degree of divergence in this gene between fish species that belong to same genus usually is much lower, i.e. *Malacoctenus africanus* and *Malacoctenus carrowi* are more distant from each other in this gene than most recognized species

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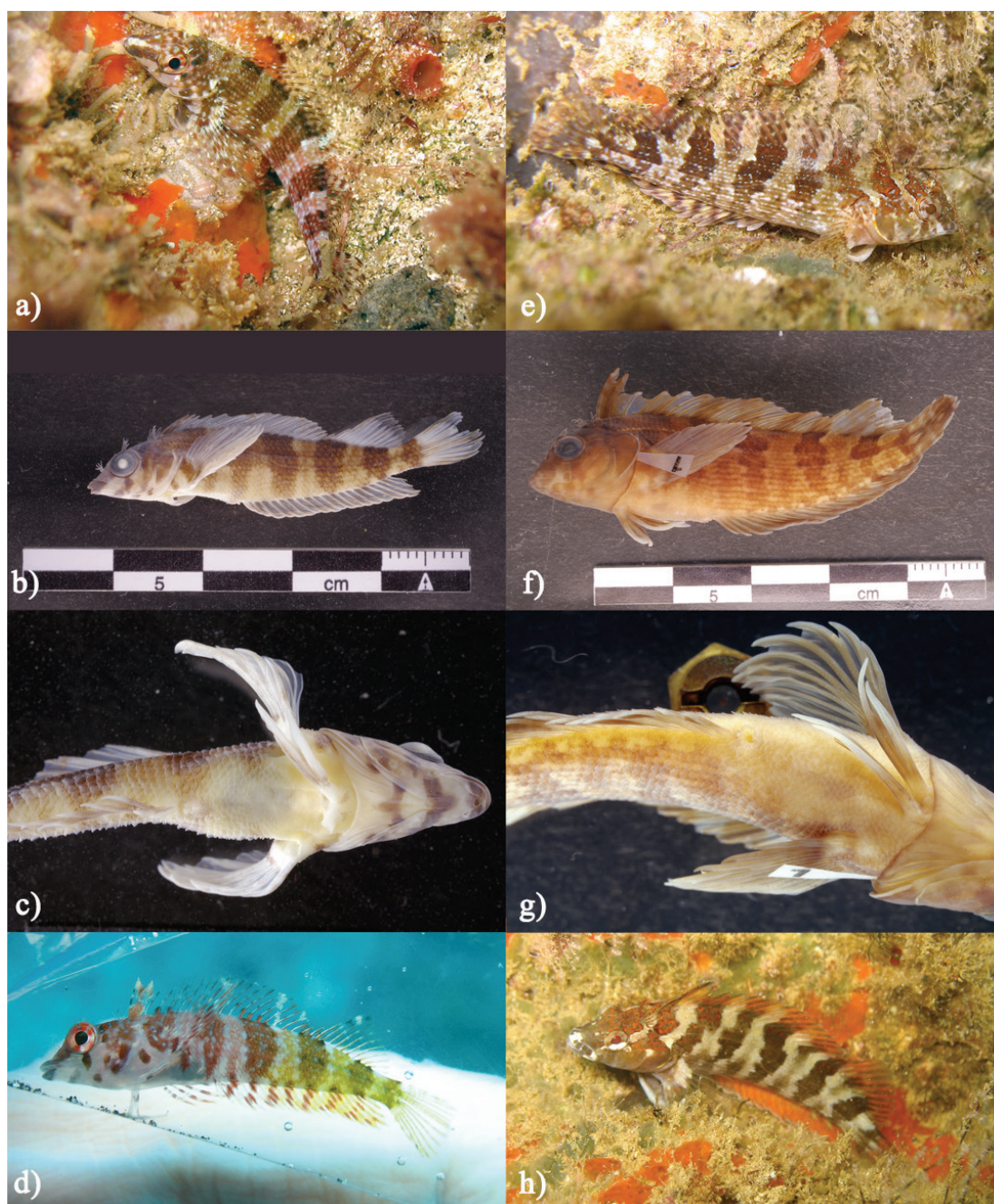


Fig.1 a) *Malacoctenus carrowi* photographed at night at Tarrafal, Santiago Island; b) holotype of *M. carrowi* in alcohol; c) belly of holotype of *M. carrowi* (note absence of scales in prepectoral region); d) juvenile *M. carrowi* from São Vicente Island (Paratype); e) *Malacoctenus africanus* female from Ile de Gorée, Senegal; f) *Malacoctenus africanus* in alcohol (SMNS 13458/1); g) belly of *Malacoctenus africanus* (SMNS 13458/1; note presence of scales from throat to anus); h) territorial male of *Malacoctenus africanus* from Ile de Gorée, Senegal.

pairs (but note that comparison between different fish genera may be problematic because they may have different mutation rates; see Ruber and Zardoya 2005). The COI sequences of the holotype and paratype of *M. carrowi* differ by 5.8%. This unexpectedly large difference between the holotype from Santiago Island and the paratype from São Vicente Island indicates that *Malacoctenus carrowi* is in the process of breaking up into two discrete lineages, presumably in allopatry.

ETYMOLOGY

Malacoctenus carrowi was named in honor of Frank Carrow, whose interest in marine conservation led to his creation and funding of the Carrow Foundation, a charitable organization that supports a broad range of marine conservation activities.

REMARKS

The species most similar in morphology and colour pattern to *Malacoctenus carrowi* is the only other eastern Atlantic congener, *M. africanus* Cadenat 1951 (see key to the Atlantic species of *Malacoctenus*). It differs from *M. carrowi* in numerous characters, among them: belly completely scaled from throat to anus, (Fig. 1g) lateral line scales 55-60 (usually more than 56), snout shorter, body less elongated (see Table 2 as well as Table 3 in Wirtz 1980). In alcohol, *M. africanus* specimens are a dark chocolate brown (Fig. 1f). The six dark bands on the body are delineated by zigzag vertical lines and reach far into the dorsal fin. There is a dark blotch below the origin of the dorsal fin that has a red rim in living animals; the rear of the operculum has a yellow-golden rim in living animals (Fig. 1e). On 21 October 2009, the population of *M. africanus* at Ile de Gorée, Senegal was spawning. The spaces between the dark bars of territorial males were very light, increasing the contrast between the dark and light areas (Fig. 1h). Both during the spawning season and outside of it, *M. africanus* can frequently be seen on open rock faces during daylight, i.e. it is considerably less cryptic than *M. carrowi*.

Key to the Atlantic species of *Malacoctenus*
(modified after Williams 2003)

- 1a. Length of shortest pelvic ray contained four or more times in length of longest ray; pectoral fin rays usually 15*Malacoctenus boehlkei*
- 1b. Length of shortest pelvic ray contained fewer than four times in length of longest ray; pectoral fin rays 14-17.....2
- 2a. Pectoral fin rays usually 15-17; pectoral fin base scales, when present, same size as those on the body.....3
- 2b. Pectoral fin rays usually 14; pectoral fin base scales, when present, smaller than those on the body..... 4
- 3a. Pectoral fin rays usually 16; pectoral fin base without scales; distinct dark blotch at bases of posteriormost dorsal-fin spines.....
..... *Malacoctenus erdmani*
- 3b. Pectoral fin rays usually 15; pectoral fin base usually with scales; no distinct dark blotch at bases of posteriormost dorsal-fin spines*Malacoctenus macropus*
- 4a. Combination of conspicuous dark spot on anterior dorsal-fin spines and a dark ocellus extending from bases of posterior dorsal-fin spines onto dorsal contour of body; nasal cirri 1*Malacoctenus gilli*
- 4b. Combination of conspicuous dark spot on anterior dorsal-fin spines and a dark ocellus extending from bases of posterior dorsal-fin spines onto dorsal contour of body not present; nasal cirri usually 25
- 5a. Dorsal-fin spines usually 18; total nasal cirri (both sides) usually more than seven *Malacoctenus versicolor*
- 5b. Dorsal-fin spines usually 19-20; total nasal cirri (both sides) fewer than six.....6
- 6a. Supraorbital cirri two on each side; nape cirri 9-13 on each side; anterior two dark bands often merging dorsally to form a humoral blotch; lateral line scales 42-55.....*Malacoctenus aurolineatus*

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- 6b. Supraorbital cirri usually more than two on each side; nape cirri 4-18 on each side; lateral line scales 48-62.....7
- 7a. Total nape cirri (both sides) 24-36; pectoral fin base without scales.....
.....*Malacoctenus delalandei*
- 7b. Total nape cirri (both sides) usually fewer than 21; pectoral fin base with or without scales.....8
- 8a. Lateral line scales 60-69; two longitudinal rows of dark brown spots along the sides of the body.....*Malacoctenus brunoi*
- 8b. Lateral line scales 49-60 (usually fewer than 60); two longitudinal rows of dark brown spots along the sides of the body not present.....9
- 9a. Segmented dorsal fin rays usually 11-13, rarely 10; segmented anal fin rays 18-21, usually 20; lateral line scales 49-54; preopercular canal extends onto the operculum.....*M. triangulatus*
- 9b. Segmented dorsal fin rays usually 10, rarely 11; segmented anal fin rays usually 19 (rarely 20), lateral line scales 55-60; preopercular canal does not extend onto the operculum..... 10
- 10a. Belly completely scaled (from throat to anus); edges of dark bands on the body in zigzag lines; the dark bands on the body extend well onto the dorsal fin.....*Malacoctenus africanus*
- 10b. Belly scaled behind pectoral fins to anus but scales absent from pectoral and prepectoral region of belly; edges of dark bands in straight lines; the dark bands on the body barely enter the dorsal fin.....*Malacoctenus carrowi*

Table 1. Counts and measurement (in mm) of *M. carrowi* holotype and paratypes.

	Holotype	Paratype	Paratype
Catalogue number	ZSM 43039	ZSM 43040	ZSM 41223
Sex	male	female	juvenile
Standard length	34.6	32.3	22.9
Total length	40.9	39.3	26.9
Dorsal fin rays	XX, 10	XX, 10	XX, 10
Anal fin rays	II, 19	II, 19	II, 19
Pectoral fin rays	14/14	14/14	14/14
Pelvic fin rays	I, 3	I, 3	I, 3
Lateral line scales	54	55	-
Nasal tentacles	2/2	2/2	-
Supraorbital tentacles	4/4	3/4	-
Nuchal cirri	7/6	6/6	-
Body depth	7.13	6.41	4.17
Body depth as % of standard length	20.6	19.8	20.5

Table 2. Counts and measurements (in mm) of *Malacoctenus africanus* specimens.

Catalogue number	SMNS	SMNS	SMNS	SMNS	ZSM
	13457	13420	13458/1	13458/2	40098
Sex	female	female	female	female	female
Standard length	61.9	59.8	47.3	45.1	39.1
Total length	72.2	71.6	56.9	53.6	46.1
Dorsal fin rays	XXI,	XX, 10	XX, 10	XX, 10	XX, 10
Body depth	16.34	14.97	12.04	11.97	11.02
Body depth as % of standard length	26.4	25	26.5	27.8	28.2

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