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Redescription of and lectotype designation for *Balistes macrolepis* Boulenger, 1887, a senior synonym of *Canthidermis longirostris* Tortonese, 1954 and *C. villosus* Fedoryako, 1979 (Teleostei, Tetraodontiformes, Balistidae)

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SYNOPSIS. *Balistes macrolepis* Boulenger, 1887 is identified as a valid species of *Canthidermis* from an examination of the two stuffed syntype specimens, 444 and 457 mm SL, from Muscat, Oman. The larger of these is designated lectotype. The species is redescribed on the basis of the lectotype, paralectotype and two juvenile (30.5–32.0 mm SL) specimens from the Gulf of Aden, and is shown to be a senior synonym of *C. longirostris* Tortonese, 1954 (described from a 365 mm SL specimen from the Dahlak Islands, southern Red Sea) and *C. villosus* Fedoryako, 1979 (described from eight 55.5–177.3 mm SL juveniles from the Gulf of Aden). *Canthidermis macrolepis* is distinguished from congeners in having fewer body scale rows (35–40 versus 39–58). Juveniles of *C. macrolepis* are readily distinguished from those of congeners by scale morphology (relatively long, branched, fleshy outgrowths present on body and head scales versus fleshy outgrowths short and unbranched or absent) and coloration (pale spots on head and body large and forming a network pattern versus pale spots absent or small and not forming a network pattern).

INTRODUCTION

Boulenger (1887) described *Balistes macrolepis* from two large (stated total length one foot ll inches), dry specimens from Muscat, Oman. With the exception of two books [Randall (1995) and Debelius (1996)] that give accounts for *B. macrolepis* resulting from the present research, the species has not been referred to subsequently. Boulenger gave the following characters for the species: dorsal-fin rays III + 26; anal-fin rays 23; a groove in front of eye; no enlarged scales behind the gill opening; no spines on the tail; falciform dorsal and anal fins; and a strongly notched caudal fin. The absence of enlarged scales behind the gill opening is unique among Indo-Pacific balistids to the genera *Canthidermis* Swainson, *Xanthichthys* Kaup and *Xenobalistes* Matsuura (Matsuura, 1980, 1981; Smith & Heemstra, 1986). There are two stuffed specimens labelled as *B. macrolepis* in the Natural History Museum, London, which we believe to be the syntypes. One (BMNH 1887.11.11.334; Fig. 1) measures 457 mm SL and is mounted on an exhibition stand, whereas the other (BMNH 1887.11.11.335) measures 444 mm SL. The specimens have a terminal mouth with uneven, notched teeth, a deep groove before the eye, and a relatively well-developed third dorsal spine extending above the dorsal edge of the body, and lack enlarged scales behind the gill opening and longitudinal grooves on the cheek; this combination of characters is unique among balistids to species of the genus *Canthidermis* (Matsuura, 1980).

Recent authors (e.g., Berry & Baldwin, 1966; Matsuura, 1980; Smith & Heemstra, 1986) have recognised only two valid species of *Canthidermis*, the cosmopolitan *C. maculatus* (Bloch) and the Atlantic *C. sufflamen* (Mitchill). However, Fedoryako (1979) recognised five species of *Canthidermis* in the most recent review of the genus: *C. maculatus*, *C. sufflamen*, *C. willughbeii* (Lay & Bennett) (from the eastern Pacific), *C. rotundatus* (Proce) (from the Indo-West Pacific), and *C. villosus*, which Fedoryako described as a new species.

Fedoryako (1979) described *C. villosus* from eight pelagic juveniles (55.5–177.3 mm SL) from the Gulf of Aden. He distinguished it from juvenile congeners in having relatively long, branched, fleshy outgrowths on body and head scales (versus fleshy outgrowths short and unbranched or absent), large, pale spots on head and body forming a network pattern (versus pale spots absent or not forming a network pattern), and 36–40 (versus 39–57) transverse rows of scales (= body scale rows). We located two additional juvenile specimens of the species in the Natural History Museum, London, (BMNH 1939.5.24.1849–1850) that had been surface dipnetted in the Gulf of Aden by the 1933–34 John Murray Expedition (Station 25) on the 10th of October, 1933. These specimens had been identified as *Canthidermis* sp. and briefly described in Norman's (1939) report of fishes of the 1933–34 John Murray Expedition. Adult specimens of *C. villosus* have not been described. However, the fin-ray and scale counts of the two adult syntypes of *Balistes macrolepis* agree closely with those of *C. villosus* (Table 1), and we conclude that the two nominal species are conspecific. *Balistes macrolepis* Boulenger, 1887 is therefore a senior synonym of *Canthidermis villosus* Fedoryako, 1979.

The second author searched his photographic library and found four photographs of individuals that we believe to be conspecific with the syntypes of *B. macrolepis*. One photograph taken at Fahl Island off Muscat in the Gulf of Oman by J.P. Hoover shows a nesting pair (Fig. 2). Two others by H. Debelius are of specimens from Oman, one a natural underwater photograph, the other of an

aquarium specimen in the Muscat Aquarium; both photographs were reproduced in Debelius (1993: 298). The final photograph, taken by the second author, is of a *ca.* 300 mm total length specimen in the Zubayr Islands, southern Red Sea (reproduced in Randall, 1995: fig. 1108). The localities for these photographs and specimens suggest that the species might be restricted to the northwestern Indian Ocean and Red Sea. We searched literature on *Canthidermis* from the area and found two additional references. Tortonese (1954) described *C. longirostris* from the Dahlak Islands, southern Red Sea, and Dor (1984) recorded *C. maculatus* from the Red Sea. However, Dor's record was based on Tortonese's specimen of *C. longirostris*, and followed Berry & Baldwin's (1966) synonymy of the two species; apparently, Fedoryako (1979) overlooked *C. longirostris* in his review of the genus. Examination of Tortonese's description and figure of *C. longirostris* revealed that it is not referable to *C. maculatus*, rather it is a second junior synonym of *B. macrolepis*.

MATERIALS AND METHODS

Pectoral-fin ray counts include the uppermost, rudimentary ray. Other methods of counting and measuring follow Matsuura (1980). Institutional codes follow Leviton *et al.* (1985).

SYSTEMATIC ACCOUNT

Canthidermis macrolepis (Boulenger, 1887)

Figures 1–3; Tables 1–2

Balistes macrolepis Boulenger, 1887: 666 (type locality: Muscat; lectotype: BMNH 1887.11.11.334, 457 mm SL, designated below).

Canthidermis sp. – Norman, 1939: 109 (Gulf of Aden).

Canthidermis longirostris Tortonese, 1954: 77, fig. 1 (type locality: Dahlak Is, Red Sea; holotype: MZGZ 20162, 365 mm SL).

Canthidermis villosus Fedoryako, 1979: 985, fig. 1B (type locality: 12°29'N 44°23'E, Gulf of Aden; holotype: MGY P-15097, 55.5 mm SL). – Fedoryako, 1981: 21, fig. 1c (English translation of original description).

Canthidermis maculatus [*non Balistes maculatus*, Bloch 1786]. – Berry & Baldwin, 1966: 463 (synonymy with *C. longirostris*). – Dor, 1984: 275 (Red Sea; based on holotype of *C. longirostris*). – Debelius, 1993: 298 (colour photographs of specimens from Oman).

Canthidermis macrolepis. – Randall, 1995: 393, fig. 1108 (description, synonymy and distribution based on present study; colour photograph). – Debelius, 1996: 298 (colour photographs of specimens from Oman).

DIAGNOSIS. *Canthidermis macrolepis* is readily distinguished from congeners in having fewer body scale rows (35–40 versus 39–58). As noted by Fedoryako (1979, 1981; see above), juveniles of *Canthidermis macrolepis* are readily distinguished from those of congeners by scale morphology (relatively long, branched, fleshy outgrowths present on body and head scales versus fleshy outgrowths short and unbranched or absent; Fedoryako, *loc. cit.*: fig. 1C *cf.* fig. 1A,B) and coloration (pale spots on head and body large and forming a network pattern versus pale spots absent or small and not forming a network pattern).

DESCRIPTION. (based on data from BMNH specimens; see Tables 1,2 for counts and measurements of individual specimens, and for data from Tortonese's and Fedoryako's respective descriptions of *C. longirostris* and *C. villosus*)

Dorsal-fin rays III + 25–26, all segmented rays branched except for the first 1–2; anal-fin rays 22–23, all rays branched except for the first; pectoral-fin rays 15–16, the upper ray a rudiment, and the second from uppermost unbranched; body scale rows 35–39; head scale rows 25–29; vertebrae 7 + 11 (from radiographs of BMNH 1939.5.24.1849–1850 only); gill rakers 8–10 + 20–22 = 30, the

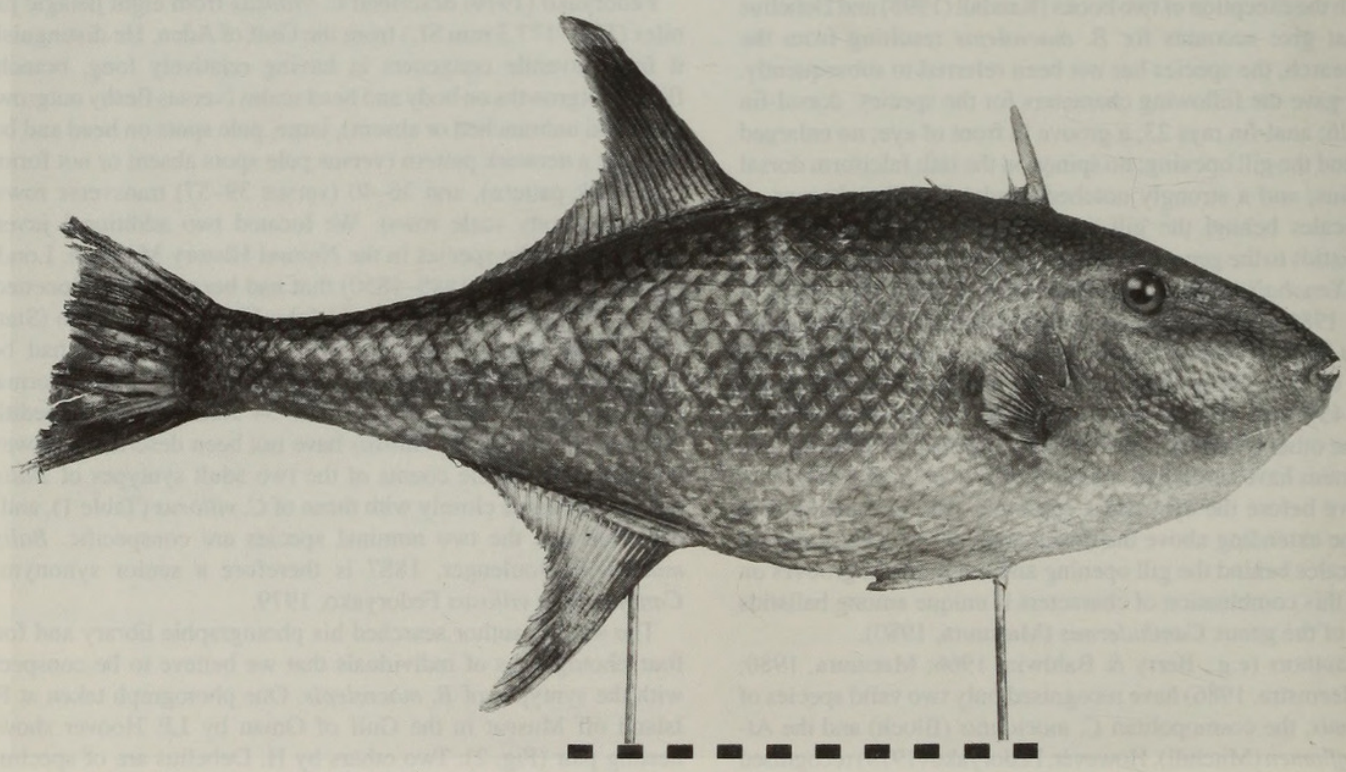

Fig. 1 *Canthidermis macrolepis*, BMNH 1887.11.11.334, lectotype, 457 mm SL, Muscat, Oman (photograph by P. Hurst).

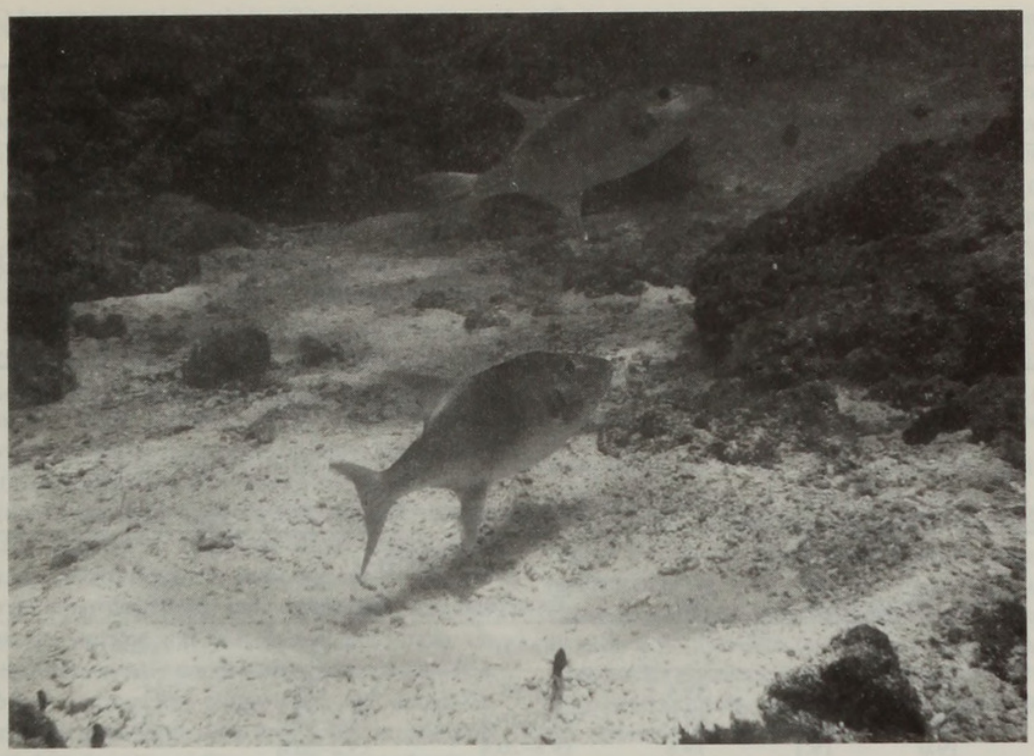

Fig. 2 *Canthidermis macrolepis*, nesting pair in 7 m, Fahl Island, off Muscat, Oman (underwater photograph by J.P. Hoover).

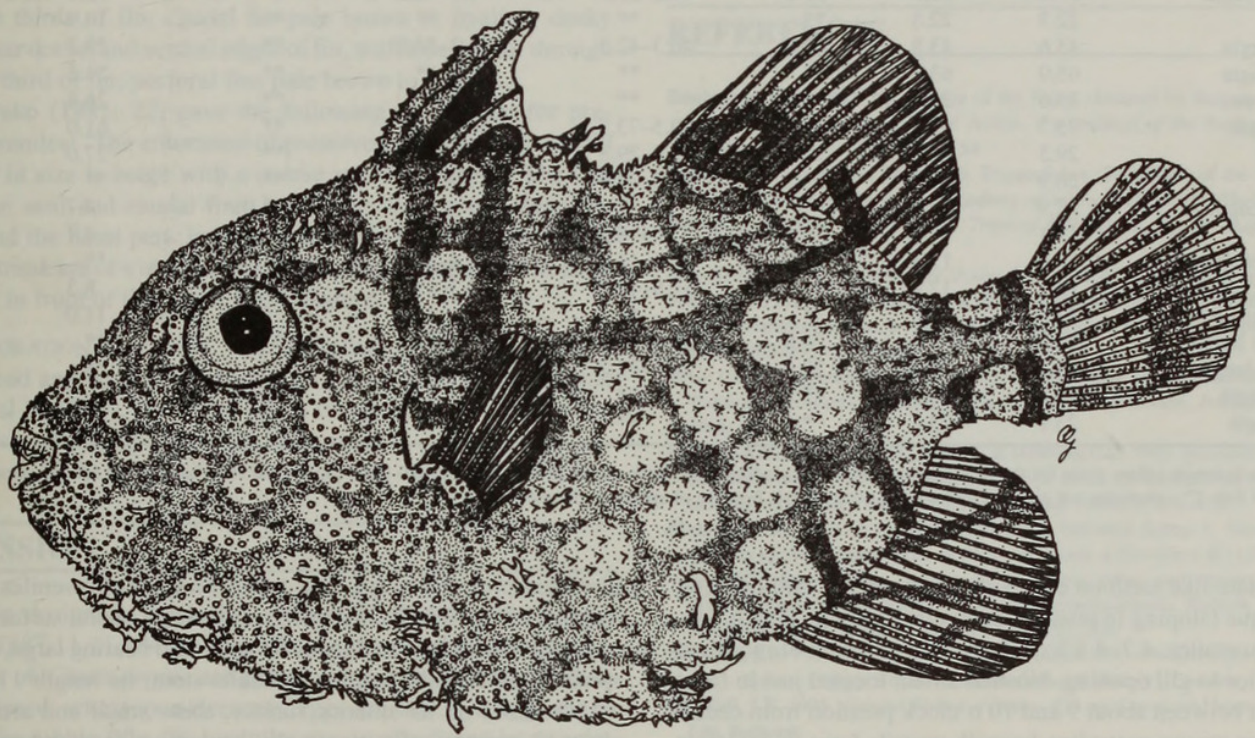

Fig. 3 *Canthidermis macrolepis*, BMNH 1939.5.24.1849–1850, 30.5 mm SL, 1933–34 John Murray Expedition station 25, Gulf of Aden (drawing by A.C. Gill).

upper-lobe rakers markedly smaller than those of lower lobe (from examination of right sides of BMNH 1939.5.24.1849–1850).

Body relatively deep in juveniles (greatest body depth 56.3–57.0% SL; depth of body 46.6–46.9% SL), more elongate in adults (greatest body depth 32.9–35.9% SL; depth of body 27.9–29.3% SL); width of body 22.3–22.5% SL in juveniles, 14.9–15.3% SL in adults; head large in juveniles (head length 39.0–39.7% SL), shorter in adults (26.0–27.5% SL); snout length 19.0–19.1% SL in juveniles, 17.1–17.8% SL in adults, the dorsal profile of snout slightly concave in juveniles and slightly convex in adults; eye round, the greatest orbit diameter 11.8–12.1% SL in juveniles, 4.6–4.7% SL in adults; interorbital space broad (interorbital width 13.1% SL) and concave in juveniles, convex and narrower (interorbital width 9.4–9.5% SL) in adults; caudal peduncle short and deep in juveniles (least depth 12.5–12.8% SL, length 12.8–13.1% SL), long and slender in adults (least depth 8.3% SL, length 22.8% SL); pelvic flap not capable of large ventral expansion, the free pelvic terminus with two apparent, weakly movable sections.

Mouth small and terminal; teeth incisiform, sharp and notched on the edges, projecting and close set, four on each side of jaws, with an

Table 1 Meristic frequencies for specimens of *Canthidermis macrolepis*. Data for type specimens of *Canthidermis longirostris* and *C. villosus* follow Tortonese (1954) and Fedoryako (1979), respectively.

	D_2 rays			A rays			P_1 rays*		Body scale rows*						Head scale rows*				
	24	25	26	22	23	24	15	16	35	36	37	38	39	40	25	26	27	28	29
B. macrolepis																			
Lectotype	–	–	1	–	1	–	–	2	–	–	–	–	2	–	2	–	–	–	–
Paralectotype	–	1	–	damaged			1	1	–	–	2	–	–	–	–	2	–	–	–
C. longirostris holotype	–	–	1	–	–	1	not given		–	–	–	1	–	–	not given				
C. villosus types**	1	2	3	3	5	–	1	7	–	2	–	3	1	2	not given				
Murray specimens	–	2	–	1	1	–	–	4	1	1	2	–	–	–	–	–	2	1	1
Totals	1	5	5	4	7	1	2	14	1	3	4	4	3	2	2	2	2	1	1

* - characters where bilateral counts are included for some specimens. ** - it is apparent from data given for other *Canthidermis* species that Fedoryako (1979) did not include the upper rudiment in his counts of pectoral-fin rays; we have therefore added one to the values recorded by him.

Table 2 Selected morphometric values expressed as percentages of SL for specimens of *Canthidermis macrolepis*.

			C. villosus types					
	Murray specs		Holo.	Paratypes	Paratypes	*longirostris*	*macrolepis* types	
				(n=3)	(n=4)	holo.	Paral.	Lecto.
SL	30.5	32.0	55.5	75–95	111–177	365	444	457
Head length	39.0	39.7	37.6	35.0–36.4	33.6–34.0	26.5	27.5	26.0
Snout length	19.0	19.1	19.8	19.8–20.4	19.2–20.6	**	17.8	17.1
Body depth	46.6	46.9	**	**	**	**	27.9	29.3
Greatest body depth	57.0	56.3	53.0	46.2–53.3	41.1–48.3	**	32.9	35.9
Body width	22.3	22.5	**	**	**	**	14.9	15.3
Snout to D_1 origin	43.6	43.8	42.0	40.3–42.3	35.2–38.9	**	29.7	28.4
Snout to D_2 origin	65.9	63.4	**	**	**	**	54.5	54.5
Interdorsal space	23.6	20.6	**	**	**	**	26.4	27.6
Snout to A origin	75.7	75.3	73.0	69.5–73.7	66.3–68.1	**	61.0	60.8
D_2 base length	29.5	30.3	28.8	29.4–29.8	27.9–30.2	**	27.0	26.9
A base length	26.9	27.5	24.2	24.3–24.7	23.9–24.9	**	**	22.3
Gill opening length	7.9	9.4	**	**	**	6.0	4.7	4.8
Eye diameter	12.1	11.8	10.5	8.4–8.8	7.1–8.9	4.9	4.7	4.6
Caudal peduncle length*	12.8	13.1	12.0	12.6–14.1	13.4–17.2	**	**	22.8
Caudal peduncle depth	12.5	12.8	12.1	10.9–12.7	10.3–11.4	9.5	8.3	8.3
First dorsal spine length	22.3	21.8	**	**	**	**	11.0	**
Longest D_2 ray length	20.0	21.3	24.0	20.2–24.8	20.7–29.5	**	**	22.5
Longest A ray length	18.7	20.3	20.4	20.5–22.7	22.0–25.4	**	**	21.4
Pectoral fin length	15.4	16.3	**	**	**	9.6	10.1	**
Caudal fin length	23.9	23.1	**	**	**	20.4	24.3	**

* - caudal peduncle length values given for the *C. villosus* types are the postdorsal distance values given by Fedoryako (1981; measured from base of last second-dorsal ray base to base of caudal fin). ** - character not given in literature or not available because of specimen damage.

inner three plate-like teeth on each side of upper jaw. Gill opening slightly oblique (sloping in posterodorsal direction), its length 7.9–9.4% SL in juveniles, 4.7–4.8% SL in adults; no patch of modified scales posterior to gill opening. Nostrils small, located just in front of orbital rim between about 9 and 10 o'clock position from centre of eye. A deep groove extending beneath nostrils from midanterior edge of eye along upper third of snout. No longitudinal or diagonal grooves on cheek.

Scales of juveniles rhomboidal, not overlapping, with a large spine projecting posterolaterally from scale centre and well-developed ridges that extend posteroventrally and posterodorsally from base of central spine; ridges usually ending dorsally and ventrally with a smaller spine; scale spines each with a fleshy outgrowth, these small and unbranched on most scales, but large and highly branched on at least some scales. Scales of adults rhomboidal, weakly overlapping, those on body with a spine-like ridge on centre, and about 25–60 small nodules arranged in a diamond-shaped patch immediately behind ridge. Lateral line not apparent.

Origin of spinous dorsal fin about 1 (juveniles) to 2 (adults) eye diameters posterior to eye; first dorsal-fin spine of juveniles stout, its length 21.8–22.3% SL, with two ridges on its lateral surfaces, these converging near base and tip of fin spine and bearing large, irregular spines; first dorsal-fin spine of adults stout, its length 11.0% SL, with nodules on its anterior surface, these small and arranged in about 12 irregular rows proximally, becoming larger and arranged in 3 prominent rows distally; second spine of juveniles and adults slender, without spinules or nodules, about half to two-thirds length of first spine, acting as trigger to release the first spine when the latter is locked in upright position; third spine of juveniles and adults slender and short, about two-thirds length of second spine, without spinules or nodules, and partly concealed by a deep groove into which the spinous dorsal fin folds; origin of soft dorsal fin about one eye diameter anterior to anal-fin origin in juveniles, and above anus in adults; first soft dorsal-fin ray short, the longest ray in juveniles the sixth or seventh, 20.0–21.3% SL, and in adults the fourth, 22.5% SL; first anal-fin ray short, the longest ray in juveniles the fifth or sixth, 18.7–20.3% SL, and in adults the fourth, 21.4% SL; soft dorsal and anal fins broadly rounded in juveniles, strongly pointed

and falcate in adults; pectoral fins rounded, 15.4–16.3% SL in juveniles, 10.1% SL in adults; caudal fin rounded in juveniles, double emarginate in adults, its length 23.1–24.3% SL; segmented fin rays of juveniles bearing 1–3 rows of small spinules, these largest on basal part of fins; segmented-fin-ray spinules not apparent in adults.

PRESERVED COLORATION OF JUVENILES (based on BMNH 1939.5.24.1849–1850; Fig. 3). Head and body pale brown, paler ventrally; body and caudal peduncle with large (slightly larger than pupil to about twice diameter of eye), pale brown to whitish spots arranged in about six oblique columns; about six spots in anteriormost column (just behind pectoral-fin base), reducing to two spots in posteriormost column (on caudal peduncle); pale spots most conspicuous on caudal peduncle and posterior part of body; interspaces between spots accentuated with dark grey-brown stripes, bars and (particularly at junctions of bars and stripes) spots, these forming a reticulate pattern; dark grey-brown markings most conspicuous below first dorsal fin, on caudal peduncle and adjacent to bases of anal and second dorsal fins; head with pale spots and irregular markings, these generally smaller and less distinct than those on body; fleshy scale outgrowths mostly unpigmented, except for a few scattered dark grey-brown unbranched outgrowths; first dorsal fin pale brown to hyaline, with three large dark grey spots, one behind each fin spine; second dorsal and anal fins pale brown to hyaline, with large pale spots and dark grey reticulate pattern extending on to basal two thirds of fin; caudal fin pale brown to hyaline, dusky basally near dorsal and ventral edges of fin, with a dusky bar through proximal third of fin; pectoral fins pale brown to hyaline.

Fedoryako (1981: 22) gave the following description for preserved juveniles: 'The coloration of preserved specimens up to 100 mm [SL] in size is beige with a coarse reticular pattern. The 2nd dorsal, the anal and caudal fins, have large light spots along the margin and the basal part. In large fish [i.e., 111–177 mm SL] the head and trunk are of a uniform beige, the ventral surface of the head and trunk in front of the pelvic fins is lighter.'

LIVE COLORATION OF ADULTS (see Debelius, 1993, 1996; Randall, 1995). Head and body grey, shading to pale ventrally; dorsal, anal and caudal fins grey, the distal edges of caudal, anal and second dorsal fins dark grey; pectoral fins dark grey.

DISCUSSION

We herein designate the larger syntype of *Balistes macrolepis* (BMNH 1887.11.11.334, 457 mm SL) lectotype of the species.

Species of *Canthidermis* are pelagic, only coming into shallow areas to breed, whereupon demersal eggs are laid in a large pit in sand and/or rubble (Fig. 2). Juveniles are usually found in association with floating debris and vegetation; Fedoryako (1979: 986; 1981: 21) indicated that the type specimens of *C. villosus* were collected near the surface beneath 'floating microphytes.' Presumably, juveniles are camouflaged by their spotted/reticulate coloration and branched, fleshy scale outgrowths. Current evidence suggests that *C. macrolepis* breeds in Oman from at least July to November. J.P. Hoover has photographed adults of the species in shallow areas in Oman during the months of July and September, and J.K.L. Mee (pers. comm.) informed us that adults are commonly caught by hook-and-line fishermen working in shallow areas off Muscat around October to November. Interestingly, although taste tests conducted by Omani fisheries researchers indicate that the species is one of the most flavoursome of Omani fishes, Omani fisherman usually discard their catches believing the species to be poisonous, or at least inedible (J.K.L. Mee, pers. comm.).

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