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A New Species of *Choridactylus* (Pisces: Scorpaenoidei) from Southern Oman

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Abstract *Choridactylus lineatus* is described as new to science based on two specimens collected in a trawl off the south coast of Oman near Salalah. Possessing conspicuous narrow, horizontal white lines that run nearly the length of its body, it differs from the two other species of *Choridactylus* Richardson, *C. multibarbus* (Richardson, 1848), which ranges from the Indo-West Pacific to India, and *C. natalensis* (Gilchrist, 1902), which occurs off southeastern Africa. *C. lineatus* also differs from the other species in lacking distinct markings on the medial surface of the pectoral fin. Like its stonefish relatives, *C. lineatus* has well-developed skin glands. Like other species of the Choridactylinae (*Choridactylus* and *Inimicus*), these glands arranged sequentially and best developed dorsal of the lateral line. A key to the species of *Choridactylus* is provided.

In 1848 John Richardson described the genus *Choridactylus* from a specimen of a single species, *Choridactylus multibarbus*, reported from the "Seas of China." This species has been subsequently reported from India and adjoing seas, the Red Sea, the Persian Gulf, the Philippines, the South China Sea and the Gulf of Thailand. The genus was reviewed by Eschmeyer et al. (1979), who provided references to earlier work and summarized its distribution. In 1902, Gilchrist described *Choridactylodes natalensis* from southern Africa, which was subsequently placed into *Choridactylus* by Barnard (1927). This species has been reported subsequently from Durban Bay to southern Mozambique (Eschmeyer et al., 1979).

This paper describes a third species, collected by the junior author aboard the R/V *Rastrelliger*, an FAO vessel conducting survey work for the government of Oman off the south coast of Oman near Salalah. The new species shares features with both *C. multibarbus* and *C. natalensis*, but is clearly distinct from either. Its capture brings the number of scorpaenoids known from the Western Indian Ocean to 70, including 11 from Oman.

Methods

Methods of counting and measuring follow those of Eschmeyer et al. (1979), as supplemented by Poss (1982). Counts for the holotype are listed first, followed in parentheses by those of the paratype. When counts are the same only one is listed. Measurements in mm for the holotype preceed those of the paratype, with the percentage standard length given in parentheses. Institutional codes follow those given in Leviton et al., 1985.

Key to the Species of *Choridactylus*

1a. Body strikingly covered by numerous white wavy lines; coloration of medial surface of pectoral fin almost uniform dark brown or black ..... *Choridactylus lineatus* sp. nov.

1b. Body with spots, specks or irregular marks, but without distinct wavy longitudinal white lines; medial surface of pectoral fin with either light brown between fin rays and with dark streaks over fin rays or with numerous white spots on a black background 2

2a. Medial surface of pectoral fin with numerous bright white spots on a black background; dorsalmost pectoral rays never filamentous; pelvic fin similarly colored; dorsal fin with 13–15 spines, but usually 13 ..... *C. multibarbus*

2b. Medial surface of pectoral fin light brown between fin rays and with dark streaks over fin

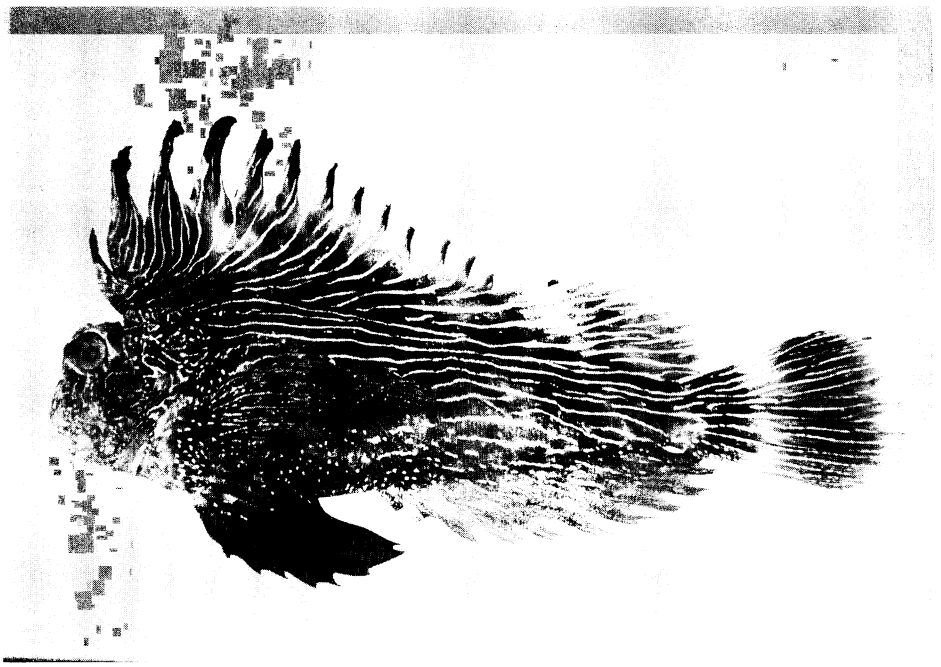

Fig. 1. Holotype of *Choridactylus lineatus* in lateral view (CAS 73230, 187.7 mm SL).

rays; dorsalmost pectoral rays filamentous in specimens greater than about (50 mm SL); pelvic fin without spots; dorsal fin with 14 or 15 spines, usually 14 ..... *C. natalensis*

Choridactylus lineatus sp. nov.
(Figs. 1, 2)

Holotype. CAS 73230 (187.7 mm SL) Arabian Sea, off south coast of Oman off Salalah (16°52′N, 54°09′E–16°51′N, 54°11′E) 41–42 m, trawl 93, FAO R/V *Rastrelliger*, J. K. L. Mee, daylight hours, 18 Feb. 1990.

Paratype. BPBM 34505 (179.9 mm SL), same data as holotype.

Description. Dorsal fin-rays XIV, 9 1/2 (XIV, 8 1/2). Anal fin-rays II, 8 1/2. Pectoral fin-rays 12, 2–5 or 6 (counted from above) branched. Lateral line with about 13 (14) scales, with last scale extending over base of caudal fin. Gill rakers of first arch 2–4 in upper arch +1 at middle of arch +11 or 12 in lower arch. Caudal fin with 5:6 branched rays (ventral: dorsal), 7:7 segmented rays, and 1:2 unsegmented, procurrent rays. Vertebrae 26, with 10 precaudal and 16 caudal centra.

Head small to moderate size (29–30% SL). Infraorbital 1 (IO_1) with 2 spines that extend over maxilla; first small, near base of second, pointing posteroventrally; second long, about 4 times length of first, pungent, pointing posteriorly and somewhat ventrally, reaching to level of posterior margin of pupil; a short spine or point on lateral face of bone at base of second spine pointing laterally. IO_2 without spines. IO_3 without spines, relatively broad posteriorly. IO_4 an elongate thin tube. Nasal spine absent, but ascending process of premaxilla prominent. Interorbital broad, with widely spaced ridges that separate a broad deep groove between sides of interorbit. Interorbital ridges diverge slightly posteriorly and merge with pronounced transverse ridge that extends across posterior end of the interorbit at the anterior margin of the occiput. Preocular spine stout. Supraocular spine with a small point preceeding it. Postocular spine better developed than supraocular spine. Each spine on dorsal margin of the orbit is connected to interorbital ridge by ridges that extend laterally from rear of orbit. Tympanic spine absent. Coronal spines absent. Sphenotic spine forms a prominent ridge but not ending in a well-defined spine. No spines along postocular margin between postocular and sphenotic spine. Pterotic with a slightly curved ridge that does not end in a well-defined spine. Parietal spines blade-like along anterior margin but fusing into base of nuchal spines

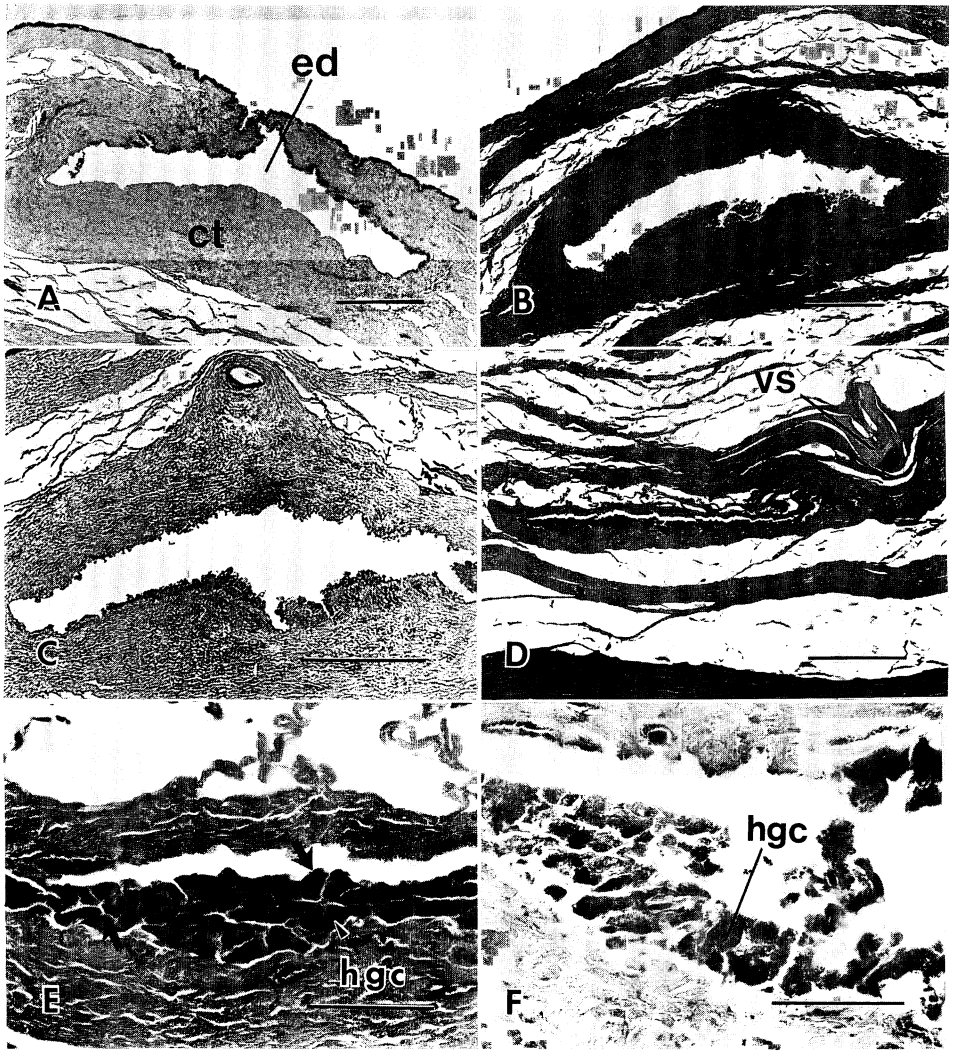

Fig. 2. Transverse sections of gland observed in skin dorsal to lateral line and ventral to dorsal fin-spines 8–11 of BPBM 34505. A) Anteriorly near apex of excretory duct (ed) surrounded by connective tissue (ct) (bar=200 μm); B) at level of excretory duct near mid-point of gland (bar=200 μm); C) and D) at duct near its posterior terminus (note vestigial scale (vs); bar=200 μm); E) and F) holocrine gland cells (hgc) near terminus of duct (note acinii [arrows]; bar=50 μm).

without forming well-defined points. Nuchal spines stout, not particularly pungent. Occiput naked, with deep transverse channel between transverse ridges at level of postorbital spines and parietal spines. No scales on head. Dorsal posttemporal spine large prominent, somewhat more pungent than neighboring spines; ventral posttemporal spine small. Supracleithral spine absent. Cleithral spine large, thick, well developed. Posterior margin of preoperculum with 5 spines, the dorsalmost much larger than rest, extending posteriorly and slightly dorsally, nearly to posterior margin of operculum; second spine about 1/5 length of first, pungent; third a small point, smaller than fourth; fifth a barely perceptible point near mandible. No supplemental preopercular spine. Operculum relatively small, with ridges that end in slight points, the uppermost better developed. Maxilla extends to level about middle of pupil, without scales. Fringed, fleshy, relatively elongate cirri on mandible. Small slit present posterior to last hemibranch.

Body without scales, except for lateral line. Later-

al line scales weakly ossified and appearing only as thin tubes. Cirri absent on body. Body with 11 to 13 well-developed venom glands sequentially arranged above lateral line, each with a prominent extcretory duct (Fig. 2); 0–3 less-developed glands dorsal to base of anal fin. Swimbladder absent.

Dorsal fin originates immediately behind parietal spines; spines 3–4 longest, with anteriormost spines more curved than those posteriorly; all soft rays branched. Anal fin with 2 spines, second longer than first; all soft rays branched. Pectoral fin with lowermost 3 rays free from rest of fin, with thickend epidermial cuticle distally; middle fin rays longest, extending posteriorly past base of second anal spine. Caudal fin oblong, rounded.

Caudal skeleton with last haemal spine ankylosed to second preural centrum (to third in paratype), not supporting procurrent caudal fin-rays; parhypural ankylosed to second preural centrum and weakly ankylosed to compound urostylar centrum, but free of hypurals, typically supporting 1 unsegmented ray ventral to lowermost branched ray; hypurals 1 and 2, usually supporting 5 branched rays, ankylosed to urostylar centrum and hypural 3; hypurals 3 and 4 fused, firmly ankylosed to urostylar centrum; supporting 6 branched rays; hypural 5 autogenous, supporting 1 segmented but unbranched ray; 3 epurals, none supporting procurrent rays; uroneural long, broad; neural spine of preural centrum.

Head and body brown. Head darker dorsally, lighter ventrally. Small white vermiculations, most notable over operculum; forming minute white specks ventrally. Distinct long, narrow white lines on side of body, extending onto caudal fin distally, and extending onto base of dorsal fin; lines run almost horizontally on body and obliquely over most of dorsal fin. Lines much shorter and forming small white vermiculations behind head dorsally. Flank immediately dorsal and medial to pectoral fin with distinct white spots. Several large black blotches or spots on dorsum, those at base of dorsal spines 8–10 most prominent. Ventrum with scattered white spots and speckes. Dorsal fin black near tips. Anal fin black. Caudal fin with two narrow pale bars, the second wider and more distinct than the first. Pectoral fins dark, black distally, with numerous white specks and short white lines over base of lateral surface, but relatively uniform light brown proximally, becoming darker, nearly black distally and without specks or spots on medial surface. Pelvic fins black, with a few white specks at base.

Head length 54.5 (29), 53.6 (30); snout 18.3 (10), 17.9 (10); orbit diameter 12.7 (7), 12.7 (7); least width of interorbit 17.8 (9), 16.8 (9); upper jaw length 18.5 (10), 17.7 (10); postorbit 30.2 (16), 28.1 (16); body depth at level of pelvic insertion 59.8 (32), 52.9 (29); predorsal 37.8 (20), 39.8 (22); anal fin 101.1 (54), 82.6 (46); caudal fin 60.1 (32), 64.7 (36); pectoral fin 66.2 (35), 63.1 (35); pelvic fin 69.9 (37), 64.2 (36); first dorsal spine 28.6 (16), 29.1 (15); second dorsal spine 49.8 (27), 52.6 (29); third dorsal spine 51.6 (27), 63.6 (35); fourth dorsal spine 48.5 (26), 60.6 (34); fifth dorsal spine 48.0 (26), 45.3 (25); penultimate dorsal spine 28.7 (15), 19.0 (11); last dorsal spine 14.9 (16), 19.8 (11); first anal spine 14.9 (8), 11.8 (7); second anal spine 20.9 (8), 16.1 (7); third anal ray 33.0 (15), 26.8 (18); width between interorbital ridge 8.4 (9), 1.8 (9); caudal peduncle 15.8 (10), 17.6 (8); snout to base of second dorsal spine 43.7 (24), 43.0 (23); snout to base of third dorsal spine 50.5 (27), 50.6 (28); snout to base of fourth dorsal spine 58.9 (31), 58.2 (32); snout to base of fifth dorsal spine 65.2 (35), 65.1 (36); width of first dorsal spine at midlength 2.5 (1.0), 1.8 (1.0); depth of interorbit 2.5 (1.3), 4.5 (2.5); incision of fin membrane at fourth dorsal spine from tip to membrane 27.9 (15), 30.4 (17); snout to pelvic insertion 43.3 (23), 45.6 (25); opercular tip to dorsal fin 25.2 (13), 24.3 (13); uppermost preopercular spine length 15.0 (8), 14.4 (8); base of first dorsal spine to base of fifth dorsal spine 29.9 (16), 30.1 (17); base of fifth dorsal spine to pelvic insertion 62.5 (33), 55.8 (31); first dorsal spine base to pelvic insertion 50.3 (27), 50.8 (28); fifth dorsal spine base to base of last dorsal spine 64.0 (34), 68.2 (38); base of last dorsal spine to base of last dorsal ray 62.5 (33), 57.3 (32); base of last dorsal ray to base of last anal ray 19.6 (10), 19.7 (11); anal origin to base of last anal ray 71.9 (38), 72.2 (40); pelvic insertion to anal origin 51.6 (28), 54.1 (30); first dorsal spine base to anal origin 84.7 (45), 83.8 (47); base of last dorsal spine to pelvic insertion 87.8 (47), 87.6 (49); base of last dorsal spine to base of last anal ray 60.1 (47), 62.2 (35); base of last dorsal ray to anal origin 84.2 (44), 86.5 (48); base of last dorsal spine to anal origin 51.1 (27), 47.5 (26); base of fifth dorsal spine to anal origin 74.6 (40), 72.1 (40).

Discussion

Although Kaup (1858) first proposed the Chori-

dactylinae as a subfamily of the Scorpaenidae, it was Gill (1893, 1905), who first correctly identified their close relationships with the Synanceidae. Jordan and Starks (1904) and Matsubara (1943) concurred with this opinion, although these authors ranked these fishes as subfamilies (Pelorinae and Synanceiinae) of the Scorpaenidae. As noted by Eschmeyer, et al. (1979), *Choridactylus* and *Inimicus* are similar in fin ray counts and in being largely devoid of scales and form a group distinct from other scorpaenoids. However, synapomorphies have not been established that would assert their status as sister-genera distinct from other synanceids and some velvetfishes, which also share these features. Choridactylines share restricted gill openings with synanceiines, bathyaploactine aploactinids, and minoines, as well as supraoccipitals lacking a medial crest, partially reduced or "lunate" metapterygoid lamina, emarginate posttemporals, dorsal-most actinost ankylosed to coracoid, and bayonet-shaped supracleithra, which are specializations that Matsubara (1943) used to suggest their propinquity. Although the pattern of variation in these features is complex and can not be used uncritically to assert synapomorphy, to these we may add the presence of well-developed and regularly arranged, acinar secretory glands with excretory ducts to the skin surface. These glands contain holocrine cells bearing proteinaceous product and are of similar histology to those reported by Cameron and Endean (1966) in *Notesthes* and Cameron and Endean (1972) in *Paraploactis*. Although the glands are probably homologous, it is unclear if the well-developed excretory ducts, as well as the several patterns of distribution of glands over the body, have evolved more than once. Proteinaceous secretory gland-cell clusters are observed in the skin of species of *Kanekonia* and likely occur in other aploactinids, although in velvetfishes they are more superficial, less well-organized, and lack well-developed excretory ducts. In the Choridactylinae these glands are typically sequentially arranged and best developed above the lateral line, but also occur ventral to it, either immediately below the lateral line or just dorsal to the anal fin. Similar acinar glands are found in *Erosa* (including *Dampierosa*), *Leptosynanceia*, *Synanceia*, *Pseudosynanceia*, and *Trachicephalus*. However, in *Synanceia* they appear associated with "warts," that are more numerous and occur over the entire body, whereas in *Erosa*, *Leptosynanceia*, *Pseudosynanceia*, and *Trachicephalus* these glands are fewer in number, serially arranged, and typically smaller.

Choridactylus multibarbus is relatively well known from the western Pacific and the northern Indian Ocean and is taken near shore to 40 m. It reaches the Red Sea, with records from the Gulf of Oman, and the Persian Gulf. In contrast, *Choridactylus natalensis* occurs at greater depths (35–75 m), is more rarely taken, and known only from Durban northward to southern Mozambique (Inhaca Peninsula). *Choridactylus lineatus* from southern Oman comprised much less than 1% of the haul in which it was taken, with 21% of the catch by weight being *Cheimerius nufar*, 21% *Argyrops filamentosus*, 16% *Lethrinus nebulosus*, 14% *Umbrina ronchus*, 7% *Argyrops spinifer*, 3% *Sufflamen fraenatus*, and 3% *Plectorhinchus pictus*. Some 35 other species were reported in the haul, including 2 other scorpaenoids, *Pterois russelli* and *Pterois mombasae*.

The new species shares a mixture of characters seen in its two previously described congeners and, with additional collecting, may prove intermediate in dorsal and anal fin-ray counts. Available comparative materials of both *C. multibarbus* (ANSP 77541; BMNH uncat. [holotype]; BPBM 21081; CAS 16055; CAS 15067; CAS 15068; CAS 15069; CAS 15071; CAS 15072; CAS 31462; CAS 33951; MNHN 02-196; SU 14665; UMMZ 22698; UMMZ 21690; UW 10164) and *C. natalensis* (BMNH 1901.9.24.2; ANSP 86316; ANSP 87807; ANSP 88020; CAS 31463; RUSI 2000; RUSI 2001) show notable variation in both counts. Unlike either species, the medial surface of the pectoral fin bears no longitudinal streaks. It is a relatively uniform light brown proximally, becoming darker, nearly black distally, like *C. multibarbus*. The white lines on the body break up into small spots on the caudal fin, similar to those found elsewhere on the body of *C. multibarbus*, but nowhere are these spots large. The banded skin coloration, so strikingly evident in *C. lineatus*, is seen elsewhere only in the proximal part of the pectoral axil of *Inimicus didactylus*. Although the color pattern over the body and fins of *C. multibarbus* and *C. natalensis* are most similar, which of the three species are most closely related remains difficult to establish, because material of both *C. natalensis* and *C. lineatus* are limited.

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オマーン南部沿岸産 *Choridactylus*（フサカサゴ亜目）の一新種

S. G. Poss·J. K. L. Mee

オマーン南部 Salalah 沿岸から採集されたフサカサゴ亜目 *Choridactylus* 属の一新種 *C. lineatus* を記載した．*C. lineatus* は体に顕著な白縦線を多数もち，胸鰭の内側がほぼ暗色で目立った斑紋がないことで同属の *C. multibarbus* と *C. natalensis* から区別される．*C. lineatus* は類縁の他種と同様に体の側線の背方に皮膚腺が列をなして存在する．*C. lineatus* は *Choridactylus* 属の第3番目の種である．