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**DESCRIPTIONS OF TWO NEW SPECIES OF
HETERELEOTRIS (PISCES: GOBIIDAE) FROM THE
WESTERN INDIAN OCEAN, WITH DISCUSSION OF
RELATED SPECIES**

by

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DESCRIPTIONS OF TWO NEW SPECIES OF *HETERELEOTRIS*
(PISCES: GOBIIDAE) FROM THE WESTERN INDIAN OCEAN,
WITH DISCUSSION OF RELATED SPECIES

by

Douglass F. Hoese

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ABSTRACT

Thirteen species of the genus *Hetereleotris* are recognized from the Indian Ocean. Two of the species are described as new. *H. poecila* (Fowler) is recorded for the first time from the Indian Ocean, and *H. vulgaris* (Klunzinger) is recorded from the Mediterranean. Specimens of *H. zonata* from India and Pakistan were found to differ in several features from specimens from South Africa. A key is given to the species from the western Indian Ocean. Diagnoses and a primary synonymy are given for each of the 11 previously described species.

INTRODUCTION

Smith (1958, 1959) first noted that several gobioid species from the western Indian Ocean have the first gill slit closed by a thin membrane connecting the lower limb of the first gill arch with the inner face of the gill cover. He (1958) placed the species with separate pelvic fins in a new subfamily Lioterinae, and later (1959) noted the closure of the first gill slit in *Monishia oculata*, which has a pelvic disc. Evidence is presented here that the degree of pelvic connection is variable in the nominal *M. oculata*, and the species is transferred here to *Hetereleotris*, as a synonym of *H. zanzibarensis*. Smith (1958) recognized several genera of lioterine gobioids, separating genera on the basis of the presence or absence of scales, orbital tentacle, and whether the scales were ctenoid or cycloid. Hoese and Winterbottom (1979) regarded the genera as western Indian Ocean endemics. Akihito and Meguro (1981) in examining the relationships of *Riukiuia* from Japan, placed this genus and all lioterine genera as synonyms of *Hetereleotris*, extending the range of the genus to the Pacific.

The synonymy of Akihito and Meguro (1981) is followed here, since there is considerable variation in the scale coverage, varying from species with fully scaled bodies to those lacking all scales. There is, however, considerable variation in the body form, with some species being robust bodied, and other slender, some with a rounded head, and others with a depressed head. Further studies on the interrelationships of the species may result in recognition of various subgenera or genera.

Species of *Heteroteleotris* are readily separable on the degree of scalation, fin-ray counts, coloration, head shape, and head pore patterns. Although not studied in detail in all species, it is apparent that certain features, such as the degree of branching of the pelvic rays and the head papilla patterns, also show differences between species. Akihito and Meguro (1981) noted differences in these features in some species. In one species described here, the branching of the pelvic rays increases slightly with size, with the third ray having 3–4 branches in young to 5–6 branches in the largest adults.

Most species in the genus are known from restricted geographical areas, and in some cases there appears to be allopatric species-pairs (such as *H. bipunctata* — *H. margaretae*, and *H. caminata* — *H. vulgare*). In some cases, further studies may show these pairs to be conspecific, but it is likely that much of the apparent allopatry results from incomplete sampling of the western Indian Ocean. For example, *Heteroteleotris zonata* is known from South Africa, India and Pakistan, but may be more widespread. Similarly *H. apora* is known only from South Africa, St. Brandon Shoals and the Chagos Archipelago. These 3 localities have been collected more extensively using rotenone and scuba equipment, than any other areas in the western Indian Ocean outside the Red Sea.

METHODS

The first dorsal pterygiophore formula follows Birdsong (1975). Much of the material examined is very faded, and colour descriptions of some previously described species are based on the original descriptions. Meristics were based on examination of specimens, but in some cases the material examined is the same as that examined by Akihito and Meguro (1981), consequently some meristic data included in tables were also given by Akihito and Meguro (1981). In descriptions and tables, an asterisk indicates that the count of holotypes or syntypes are included in the given count. Where only one count occurs for a character no asterisk is given, but the count includes the holotypes, unless otherwise noted. Counts and measurements largely follow methods outlined by Hubbs and Lagler (1958). The first element of the anal and second dorsal fins is always a spine in the species studied, the remaining rays in these fins are segmented. The last ray of the second dorsal and anal fins consists of two elements in contact though distinct through the base. Segmented caudal rays include total segmented rays, and in most specimens there are 9 dorsal and 8 ventral rays. Branched caudal rays are recorded as dorsal/ventral rays. Longitudinal scale counts (LS) were taken along the midline of the sides of the body, from the upper end of the pectoral-fin base to the end of the hypurals, excluding small scales on the base of the caudal fin. In *Heteroteleotris tentaculata* the midline of the caudal peduncle is naked, and the scale count was taken along the caudal peduncle ventrally. Transverse scale counts (TRB) were taken from the anal spine upward and backward to the base of the second dorsal fin. In most species the skin is covered with thick mucus; and in some species with small cycloid scales, such as in *H. zonata*, transverse scale counts could not be accurately obtained. Vertebrae were

counted from radiographs. Caudal vertebrae are defined here as those with a closed hemal arch and a developed hemal spine. Generally in gobioids, one or two anal fin pterygiophores precede the first hemal spine (whether one or two depending on the genus). This condition facilitates counting vertebrae from radiographs. Occasionally, the last precaudal vertebra bears a closed hemal arch, but no hemal spine. This character is variable in some species, and is difficult to determine from radiographs.

The osteology was studied from trypsin-prepared cleared and stained specimens. Papillae were studied from the cleared and stained material and untreated specimens following methods outlined by Hoese (1983).

Material used for this study is deposited in the following institutions: Australian Museum, Sydney (AMS); Academy of Natural Sciences, Philadelphia (ANSP); Bernice P. Bishop Museum, Honolulu (BPBM); British Museum (Natural History), London (BMNH); Museu Zoologico dell'Universita di Firenze, via Rome (MF); Natural History Museum of Los Angeles County (LACM); J.L.B. Smith Institute of Ichthyology, Grahamstown (RUSI); Senckenberg Museum, Frankfurt (SMF); Staatliches Museum fur Naturkunde, Stuttgart (SMNS); Tel Aviv University, Tel Aviv (TAU); National Natural History Museum, Washington, D.C. (USNM); Universitetets Zoologiske Museum, Copenhagen (ZMK).

Genus *Hetereleotris* Bleeker, 1874

Hetereleotris Bleeker, 1874: 18 (type species: *Gobius diadematus* Rüppell, 1830, by original designation).

Leioeleotris Fowler, 1934: 494 (type species: *Leioeleotris zonatus* Fowler, 1934, by original designation).

Riukiuia Fowler, 1946: 200 (type species: *Riukiuia poecila* Fowler, 1946, by original designation).

Liotes Smith, 1958: 156 (type species: *Liotes caminatus* Smith, 1958, by original designation).

Pseudoliotes Smith, 1958: 157 (type species: *Liotes (Pseudoliotes) simulans* Smith, 1958, by original designation).

Chrolepidops Smith, 1958: 158 (type species: *Chrolepidops nebulofasciatus* Smith, 1958, by original designation).

Satulinus Smith, 1958: 160 (type species: *Satulinus zanzibarensis* Smith, 1958, by original designation).

Dactyleleotris Smith, 1958: 161 (type species: *Dactyleleotris tentaculatus* Smith, 1958, by original designation).

DIAGNOSIS: Gobiid species with the first gill slit closed by a membrane from the gill cover to one-half or more of the lower limb of first gill arch, vertebrae 10 + 17, first dorsal fin with 6 spines (in 235 specimens); first dorsal pterygiophore formula 3(22110), characteristic transverse papilla pattern (Figs. 3 and 5), and development of a distinct, single-lobed mental frenum, followed by two parallel papilla rows. First dorsal fin usually connected by

membrane to base of spine of second dorsal fin, two fins sometimes completely separate. All species examined have 17 segmented caudal rays and normally 15 branched caudal rays. Some large adults rarely have 16 or 17 branched caudal rays. Examination of cleared and stained material of *H. zonata*, *H. vinsoni* n. sp., *H. caminata*, and *H. zanzibarensis* shows the following distinctive osteological features: metapterygoid slender, without a ventral process extending across quadrate, a prominent median preopercular extension reaching to upper part of symplectic, and the lower hypural plate not fused with terminal vertebral element or upper hypural plate.

RELATIONSHIPS: Of approximately 100 Indo-Pacific gobiid genera currently under study, few have a distinct mental frenum. A distinct mental frenum is present in *Palutris* (Smith, 1959), *Paragobiopsis* (Koumans, 1941), *Bathygobius* (Bleeker, 1878), and some species of *Glossogobius* (Gill, 1859), all of which have a longitudinal cheek papilla pattern. Some species of *Glossogobius* have apparently independently developed a transverse pattern (Hoese, 1983). A partial closure of the first gill slit is rare, but found in some species in some genera such as in *Callogobius* (Bleeker, 1874) and *Eleotris mauritanus*.

It is apparent that *Monishia* Smith, 1959 is the genus most closely related to *Heteroeleotris* in having a similar head and body shape, 10 + 17 vertebrae, a distinct lobed mental frenum, and a similar transverse papilla pattern. The first gill slit is partly closed in *Monishia*, which would be expected in a sister genus. The species of the two genera are so similar that Goren (1985) included *Heteroeleotris zanzibarensis* as a species of *Monishia* (as *M. oculata*). That species is included here with *Heteroeleotris* based on the closed first gill slit and lack of fusion of the lower hypural plate to the terminal vertebra, characteristic of *Heteroeleotris*. *Monishia* differs primarily in having the first gill slit largely open, or only partly closed. Examination of cleared and stained material of *M. william* (Smith, 1947) and *M. ochetica* (Norman, 1927) indicates the following osteological differences: metapterygoid expanded, with a ventral process extending across quadrate and the lower hypural fused with the terminal vertebra. The expanded metapterygoid in *M. ochetica* is figured by Miller (1978). Species of *Monishia* have the upper pectoral rays partly free from the membranes. Generally only the tips of the uppermost 1 or 2 pectoral rays are free in *Heteroeleotris*, however, in *H. zanzibarensis* and *H. poecila* the upper 2 pectoral rays are free for about half their length. In some species of *Heteroeleotris* the tongue is distinctly bilobed (as in *Bathygobius*), but in most, the tongue tip is rounded to truncate, although in some species there may be a very shallow indentation at the anterior tip of the tongue. The tongue in *Monishia* is truncate to weakly bilobed. Although this feature has been used as a generic character in gobioid fishes, its significance in this group is unclear. Generally *Monishia* is more primitive in having more extensive development of scales and head pores and connected pelvic fins. However, *Coryogalops* (Smith, 1958) appears to differ from *Monishia* only in having separate pelvic fins, although the osteology of *Coryogalops* was not studied. Further studies may show that *Monishia* is a synonym of *Coryogalops*.

Several genera could be regarded as possible relatives of *Hetereleotris*, *Monishia* and *Coryogalops*. For example, genera having a similar head and body form include *Caffrogobius*, *Callogobius*, *Gobiosoma* (Girard, 1858) and immediate relatives, *Palutris* and *Bathygobius*. The primary specializations uniting *Hetereleotris*, *Monishia* and *Coryogalops* include the partial closure of the first gill slit, elevated posterior nasal tubes, transverse papilla pattern and the presence of 10 + 17 vertebrae. *Callogobius* agrees in many of these features, but differs in normally having 10 + 16 vertebrae, which is typical of most tropical gobiids. *Gobiosoma* and most relatives, while having 27 vertebrae primitively, have 11 precaudal vertebrae and 7 dorsal spines. *Caffrogobius* normally has 11 + 16 vertebrae, except for *C. caffer*, which has 10 + 17 vertebrae and 6 dorsal spines. The genus is very similar to *Monishia* and differs from that genus in reaching a larger size and having more numerous scales. Some species of *Caffrogobius* have the upper pectoral rays free. *Bathygobius* appears to have many features in common with the *Hetereleotris* group (*Hetereleotris*, *Monishia*, *Coryogalops* and possibly *Palutris* and *Caffrogobius*), which suggest a relationship. These features include the free upper pectoral rays (at least at tip), 10 + 17 vertebrae, distinctive lobed mental frenum, preopercular extension connecting to the upper end of the symplectic and expansion of the metapterygoid over the quadrate. *Bathygobius* has a slightly elevated, but not tubular, posterior nasal tube and a longitudinal papilla pattern.

Palutris was not studied in detail, but agrees with *Hetereleotris* in most of the features distinguishing the genus listed above. *Palutris* has only a slightly elevated posterior nasal tube. It shows considerable similarity to *Bathygobius*. Akihito, Hayashi and Yoshino (1984) have included *P. reticularis* Smith, 1959 as a species of *Bathygobius* (as *B. meteori*). The genus lacks free pectoral rays and has a very reduced papilla pattern which is not clearly a longitudinal or a transverse pattern.

Further studies are required to determine the interrelationships of the *Hetereleotris* group or "lioterine" gobiid genera, and their relationships to other gobiids. The group shows many parallel features with the New World *Gobiosoma* and immediate relatives, such as the head and body form, tendency toward reduction of scales and head pores, secondary separation of the pelvic fins, thick mucous covering the skin, strong preopercular-symplectic bridge, and tubular posterior nostril.

REMARKS: *Eleotris* and various derived names, such as *Hetereleotris* have been treated as masculine in some cases, and feminine in other cases, with the name *Eleotris* of variable gender (Tortonese, 1976). The genus *Eleotris* dates from Bloch and Schneider (1801) and it is clear from their usage of the name in combination with the specific names *E. strigata*, *E. lagocephala*, *E. lanceolata*

and *E. minuta*, that the intended gender was feminine, which must be accepted under article 30 of the International Code of Zoological Nomenclature. Jordan, Tanaka and Snyder (1917) indicated that the derivation of *Eleotris* was uncertain and listed three possible derivations. Steyskal (1980), however indicated that *Eleotris* is cited in Greek lexicons as having an *-id-* stem, implying that *Eleotris* and names terminating in *-eleotris* should be feminine.

Most species of "lioterine" gobiids are restricted to the western Indian Ocean, although *Palutris* appears to be well represented throughout the Indo-Pacific region. The genus includes *P. reticularis* (with *Acentrogobius meteori* Klausewitz and Zander, 1967 as a synonym) and two or three additional species, some undescribed. *Caffrogobius* is restricted to Southern Africa and Madagascar. *Coryogalops* and *Monishia* are known only from the western and central Indian Ocean. Only one species of *Heteroeleotris* is known from the Pacific. About three undescribed species of gobies similar to *Heteroeleotris*, in having a closed first gill slit, are known from the Pacific Ocean, one from the western Pacific, one from Rapa and one from Easter Island.

Since many of the original descriptions did not include characters used here, a brief diagnosis is given for each species. Previously described species have been figured in Smith (1958), Akihito and Meguro (1981), Hoese and Winterbottom (1979) and Tortonese (1976). Some characters separating the various species and meristic data are given in Tables 1 to 3.

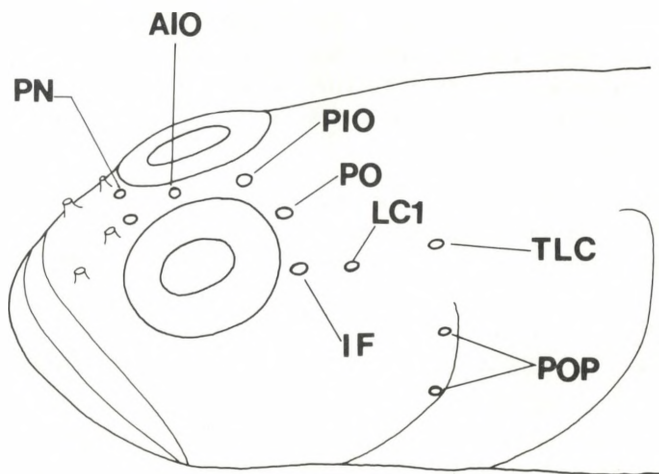


Figure 1: Head pores occurring in species of *Heteroeleotris*: posterior nasal pore (PN); anterior interorbital pore (AIO); posterior interorbital pore (PIO); postorbital pore (PO); infraorbital pore (IF); lateral canal pore (LC1); terminal lateral canal pore (TLC); preopercular pores (POP).

KEY TO SPECIES OF *HETERELEOTRIS* FROM THE WESTERN INDIAN OCEAN

- 1a. Body densely scaled; longitudinal scale series (LS) 24–52 2
- 1b. Body naked, or with a few scales on caudal peduncle; LS 11 or less 8
- 2a. Scales ctenoid, at least from second dorsal fin origin to caudal peduncle 3
- 2b. Scales entirely cycloid 4
- 3a. Second dorsal fin I,9; anal fin I,8; pelvic fins I,5; a lateral canal pore between infraorbital pore and terminal lateral canal pore; belly naked. (St. Brandon Shoals, Mauritius, Seychelles, and Kenya to Mozambique) *H. zanzibarensis*
- 3b. Second dorsal fin I,10; anal fin I,9; pelvic fins usually I,4, fifth ray sometimes present as a rudiment, no lateral canal pore between infraorbital pore and terminal lateral canal pore; belly scaled. (St. Brandon Shoals, Mauritius and Mozambique) *H. vinsoni* sp. n.
- 4a. No head pores, head subterete to slightly depressed 5
- 4b. Head pores present, head distinctly depressed 6
- 5a. Second dorsal fin I,12–13; anal fin I,11; pectoral rays 15; a black spot dorsally at posterior end of caudal peduncle, body scales small, LS 40–52; body slender, depth at anal fin origin 14–15% SL. (Gulf of Aden) *H. bipunctata*.
- 5b. Second dorsal fin I,11; anal fin I,10; pectoral rays 17, no black spot dorsally at end of caudal peduncle, body scales large, LS 28–30; body more robust, depth at anal fin origin 16–19% SL. (South Africa) *H. margaretae* sp. n.
- 6a. Second dorsal fin usually I,10, rarely I,11; anal fin usually I,9; an enlarged dark brown bar on upper pectoral base, extending onto pectoral rays. (Japan to Comoro Islands) *H. poecila*
- 6b. Second dorsal fin I,12–13, rarely I,11; anal fin I,10–11, rarely I,9, upper pectoral base without a dark bar or with a small anterior spot not extending onto pectoral rays 7
- 7a. Scales small, LS 35–48; body with one vertical band below first dorsal fin. (South Africa, India and Pakistan) *H. zonata*
- 7b. Scales larger, LS 32–33; body with 4–6 brown vertical bands. (Kenya) *H. kenyae*
- 8a. Head pores absent 9
- 8b. Head pores present 10
- 9a. Body completely naked; second dorsal fin I,12; pelvic fins I,5; no opercular spine. (Red Sea) *H. diademata*
- 9b. Body with 4–5 rows of ctenoid scales on caudal peduncle, second dorsal fin I,10–11; pelvic fins I,4 (rarely with rudimentary fifth ray); operculum with 2 spines dorsally. (St. Brandon Shoals, Chagos Archipelago and South Africa) *H. apora*
- 10a. An enlarged tentacle over eye; posterior nasal tube elongate; anal fin usually I,11. (Seychelles) *H. tentaculata*
- 10b. No tentacle over eye; posterior nasal tube elongate or not; anal fin usually I,10 11
- 11a. Preopercular pores absent; caudal peduncle with 7–9 rows of scales. (Kenya to Mozambique) *H. nebulofasciata*
- 11b. Preopercle with 2 pores, caudal peduncle naked 12
- 12a. Posterior nasal tube elongate, about twice length of anterior nasal tube; second dorsal fin usually I,12; pectoral rays usually 17–18; posterior opercular border with dark bar. (Tanzania and Mozambique) *H. caminata*
- 12b. Posterior nasal tube subequal to anterior tube; second dorsal fin usually I,11; pectoral rays usually 15–16; posterior opercular border light. (Red Sea, Mozambique, Pakistan and Mediterranean) *H. vulgaris*

***Hetereleotris apora* (Hoesé & Winterbottom, 1979)**

Lioteris aporus Hoesé & Winterbottom, 1979: 2, figs. 1 and 2 (Sodwana Bay, KwaZulu, South Africa).

MATERIAL EXAMINED: NATAL SOUTH AFRICA – Holotype, RUSI 911 (20 mm); RUSI 9580 (18 mm), RUSI 10057 (2, 20–22 mm). ST. BRANDON SHOALS – USNM 264426 (2, 19–24 mm); USNM (VGS 76–22) (19 mm).

DIAGNOSIS: Dorsal fin usually VI/I, 11; anal fin usually I, 10; pectoral rays 15–16, pelvic fins separate, usually I, 4 (rarely with rudimentary fifth ray) fourth ray with 3 branches, third ray with 4–5 branches; segmented caudal rays 17 (4); branched caudal rays 8/7 (4); vertebrae 10 + 17 (3); LS 4–6. No head pores; head subterete; tongue tip rounded to truncate; nasal tubes subequal; operculum with 2 pointed spines near upper posterior margin (all other species in genus without spines); body largely naked, a few ctenoid scales confined to caudal peduncle.

Body with 8 diffuse saddles dorsally; a faint, oblique, ventral, postocular stripe present.

REMARKS: This species is known only from Sodwana Bay, South Africa, St. Brandon Shoals, and the Chagos Archipelago (Winterbottom and Emery, 1985).

***Hetereleotris bipunctata* Tortonese, 1976**

Hetereleotris bipunctata Tortonese, 1976: 191, fig. 2 (Gulf of Aden). Holotype: MF 2172.

MATERIAL EXAMINED: PARATYPES: MF 2184–2185 (2, 20–21 mm), Gulf of Aden. OTHER MATERIAL: RED SEA – TAU 9295 (26 mm); Museri Is., Dahlak Archipelago. GULF OF ADEN – AMS 1.25099-001 (2, 29–30 mm); BMNH 1985.7.29.3–6 (3, 27–28 mm).

DIAGNOSIS: Dorsal fin usually VI/I, 13; anal fin I, 12; pectoral rays 15; pelvic rays I, 5, rays with few branches; fifth pelvic ray slightly shorter than fourth ray, usually with 2 branches; fourth pelvic ray with 3 branches; third pelvic ray with 4–5 branches; segmented caudal rays 17 (9), branched caudal rays 8/7 (9); vertebrae 10 + 17 (9); LS 40–52; TRB 12–15. No head pores; head subterete, broader than deep; tongue tip rounded to truncate; nasal tubes subequal; body with cycloid scales posteriorly, narrowing to a wedge anteriorly, reaching to behind pectoral base (well short of pectoral base in some specimens); a thin naked area below dorsal fins and immediately above anal fin; belly naked; ventral half of lower limb of first gill arch connected by membrane to gill cover (in other species membrane connects almost all of lower limb of first gill arch).

Head and body brown with scattered melanophores. A thin black bar (faint in large specimens) extending from anteroventral margin of eye to near end of

upper lip, a second broader dark brown to black bar (often faint) extending obliquely downward from posteroventral margin of eye. A large black spot, slightly smaller than eye, above pectoral base, extending onto upper, anterior part of pectoral base. A dark brown vertical bar, with narrow light centre below first dorsal fin. Four or 5 faint light brown bars on body from below second dorsal fin to caudal peduncle. A round to vertically elongate dark brown spot on base of upper caudal rays, sometimes connected to a median blotch at rear end of caudal peduncle; a vertical brown bar ventrally on bases of caudal rays also often connected to median dorsal brown blotch. Distal margins of second dorsal and anal fins and often caudal fin with thin black rim; dorsal fins spotted; caudal fin with 5 – 6 wavy black bands on upper two-thirds of fin; pectoral and pelvic fins clear.

REMARKS: Tortonese (1976) recorded about 30 scale rows on the body, lower than counts obtained here. In the two paratypes examined, many of the scales have been lost, and counts indicate 40 and 44 scales. In some specimens the scales do not start until well behind the pectoral base. The original illustration of the holotype indicates that material examined here is undoubtedly conspecific. Tortonese (1976) recorded second dorsal fin as I,12 and anal fin as I,10, but both paratypes have second dorsal I,13 and anal I,11.

***Hetereleotris caminata* (Smith, 1958)**

Liotes (*Liotes*) *caminatus* Smith, 1958: 156. fig. 11 (Shimoni, Kenya).

MATERIAL EXAMINED. HOLOTYPE: RUSI 230 (32 mm), Shimoni, Kenya. PARATYPES: RUSI 10976 (14, 19–33 mm), Shimoni. MOZAMBIQUE – RUSI 10975 (22, 19–32 mm), Ibo; AMS I.19419-001 (3, 24–34 mm), Ibo lighthouse.

DIAGNOSIS: First dorsal fin VI (in 25); second dorsal fin I,12; anal fin I,10; pectoral rays 17–18; pelvic rays I,5; fifth ray unbranched or with one bifurcation, subequal to fourth ray; fourth pelvic ray with 5–6 branches, third pelvic ray with 6 branches; segmented caudal rays 17 (10), branched caudal rays 8/7 (10), vertebrae 10 + 17 (3). Body naked, head subterete, tongue tip truncate to emarginate; head pores present: posterior nasal, median anterior interorbital, median posterior interorbital, postorbital, infraorbital, terminal lateral canal, and two preopercular pores; lower longitudinal papilla row not extending between second and third vertical papilla rows; posterior nasal tube much longer than anterior nasal tube.

Body with 5–6 broad irregular bands; band under first dorsal fin extending onto front of fin; a dark bar across rear margin of operculum.

***Hetereleotris diademata* (Rüppell, 1830)**

Gobius diadematus Rüppell, 1830: 137 (Red Sea).

Liotes (*Pseudoliotes*) *simulans* Smith, 1958: 157, fig. 13 (Gulf of Suez). Holotype: BMNH 1925.12.31: 51.

MATERIAL EXAMINED: HOLOTYPE: SMF 1786 (50 mm), Red Sea. MUSERI IS., DAHLAK ARCHIPELAGO, RED SEA — TAU 1179 (3, 26–31 mm); TAU 1187 (30 mm).

DIAGNOSIS: (partly after Akihito & Meguro, 1981, and Smith, 1958). Dorsal fin VI/I,12; anal fin usually I,11; pectoral rays 15–17; pelvic rays I,5, the first 4 rays highly branched; fifth pelvic ray unbranched or with 2 branches; fourth pelvic ray with 3–5 branches; third pelvic ray with 5–8 branches; segmented caudal rays 17 (5); branched caudal rays 8/7 (4), 9/8 (1); vertebrae 10 + 17 (4, count not taken for holotype). No head pores; head subterete; tongue tip rounded to truncate; anterior nasal tube slightly longer than posterior nasal tube; head and body without scales.

Body with widely-spaced, broad, faint, vertical, dark bars, confined to upper half of body. Bar under first dorsal fin sometimes darker than other bars; a thin, dark line from eye to upper jaw and an oblique, thin, dark bar extending obliquely down from posteroventral margin of eye; a dark spot dorsally at end of caudal peduncle, often with a ventral extension forming a bar.

REMARKS: As noted by Smith (1958), Rüppell (1830) described this species as being scaled, but subsequently (1835) indicated that the species lacked scales. The presumed holotype of *Gobius diadematus* is badly dehydrated, and I was unable to find scales.

Provisionally, *Lioteres simulans* is regarded here as a synonym of this species following Akihito and Meguro (1981). The type of *L. simulans* has 17 pectoral rays; the other 5 specimens examined have 15. Smith (1958) shows distinct dark vertical bands on the body and a large caudal peduncle spot in the figure of the type, but the material studied lacks the caudal peduncle spot and has very faint banding.

H. diademata is unusual in having 4–5 transverse papilla rows (composed of 2–3 papilla each) under the lower jaw in the preopercular-mandibular series.

The species is known only from the Red Sea.

Heteroteleotris kenya Smith, 1958

Heteroteleotris kenya Smith, 1958: 159, fig. 15 (Vuma, north Kenya).

Monishia oculata Smith, 1959: 206 (in part, Malindi, Kenya only).

MATERIAL EXAMINED (all from Kenya): HOLOTYPE: RUSI 236 (34 mm). PARATYPES: RUSI 725 (30 mm); RUSI 742 (2, 28–29 mm). OTHER MATERIAL: RUSI 824 (15 mm), Malindi, paratype of *Monishia oculata*; SMF 9106 (6, 20–30 mm), Bamburi, near Mombassa.

DIAGNOSIS: Dorsal fin VI/I,12; anal fin I,9–10; pectoral rays 16–18; pelvic fins separate, I,5, fifth ray unbranched, slightly shorter than fourth ray (fins damaged in material examined); segmented caudal rays 17 (3); branched

caudal rays 8/7 (1); LS 32–33. Head pores present: posterior nasal pore, posterior interorbital pore normally absent (present in 1 specimen), an infraorbital pore, a terminal lateral canal pore above posterior end of preoperculum, no preopercular pores. Head distinctly depressed; tongue tip truncate; nasal tubes subequal. Body covered with cycloid scales; belly naked; a thin, naked wedge from below middle of second dorsal fin to upper pectoral base.

A dark, oblique, postocular stripe from eye, sloping downward across cheek; dark bar from anteroventral margin of eye to middle of jaws. Dark brown bar below front half of first dorsal fin, followed by 6–7 irregularly-shaped, almost vertical, oblique bars, sloping anteriorly downward; typically with oblique bars sloping ventrally and posteriorly interconnecting other bands, giving a jagged appearance dorsally.

REMARKS: This species is most similar to *H. zonata* in having a markedly depressed head, head pore pattern and cycloid scales and is similar in fin-ray counts. It differs from *H. zonata* in having fewer scale rows and in having more bands on the body.

Scale counts given here are slightly lower than those obtained by Akihito and Meguro (1981), but since the skin is covered by a dense mucus in this species and *H. zonata*, it is difficult to obtain consistent scale counts in these species.

The species is known only from southern Kenya.

Heteroleotris margaretae sp. n.

Figs. 2 & 3

HOLOTYPE: RUSI 21810, 23.2 mm SL female, from reef off Sodwana Bay, KwaZulu, South Africa, sand and coral, 19 April 1979, rotenone, 8–10 m; P. C. Heemstra, J. E. Randall and G. R. Allen. PARATYPE: AMS I.25056-001, 21 mm SL female from reef off Sodwana Bay, South Africa.

DIAGNOSIS: Dorsal fin VI/I,11; anal fin I,10; pectoral rays 17; pelvic fins completely separate, I,5, fifth ray branched at extreme tip, subequal to fourth ray, third and fourth pelvic rays with 3 branches, second pelvic ray with 5 branches, first ray with 4 branches. No head pores; head subterete; tongue tip narrow with a very shallow notch (holotype) or with a broadly rounded tip (paratype); nasal tubes subequal. Body with cycloid scales from pectoral base to caudal peduncle.

A dark brown spot, equal to pupil diameter, above posterior end of operculum; body with 4 dark grey vertical bands from pectoral base to anal origin, and 3 broken bands under middle of second dorsal fin to caudal peduncle.

DESCRIPTION: Segmented caudal rays 17 (2); branched caudal rays 8/7 (1), 8/8 (1*); vertebrae 10 + 17 (in paratype); LS 28 in holotype, 30 in paratype. Measurements of holotype in mm: SL 23.2, head length 7.1, head width at posterior preopercular margin 4.0, head depth at posterior preopercular margin 5.1, body depth at pelvic origin 4.4, body depth at anal origin 4.5,

pectoral length 7.4, pelvic length 5.1, caudal length 6.0, third dorsal spine length 3.9.

Head, pectoral base, breast and midline of belly without scales. Eyes elevated, a shallow groove behind eye; interorbital narrow, eyes almost touching; mouth oblique, forming an angle of about 45° with body axis; lips thick, jaws reach to below rear half of pupil; gill opening restricted to level of pectoral base; lower limb of first gill arch joined to gill cover by membrane; no spines on operculum; chin with a small V-shaped frenum.

Coloration in alcohol of holotype: Head and body light brown; snout grey; a thin dark grey bar from eye to end of jaws, followed by a thin grey vertical bar from eye to behind jaws; a black spot about equal in size to pupil above rear end of operculum. Body with 6 or 7 grey bars; a thin grey bar across predorsal, extending ventrally behind pectoral base; a second vertical grey bar under first dorsal origin; third vertical bar under posterior end of first dorsal fin; fourth vertical bar from just behind second dorsal origin to anal origin; fifth bar under middle of second dorsal fin, extending to above mid-side, partly divided ventrally; followed posteriorly by an irregular shaped or broken faint grey bar; and sometimes a faint irregularly shaped seventh bar; a diffuse spot on peduncle extending onto base of caudal fin. First dorsal fin dusky; second dorsal fin with small black spots; caudal fin with thin, dark, wavy bands; anal fin with distal margin dark grey; pectoral and pelvic fins clear.

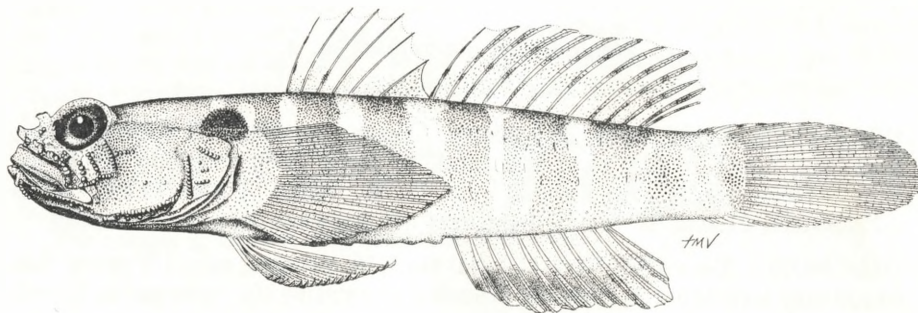


Figure 2: *Heteroteleotris margaretae*, holotype, 23.2 mm SL, RUSI 21810, from South Africa. Drawing by J. M. Vinson.

RELATIONSHIPS: This species is similar to *H. bipunctata*, *H. diadematus* and *H. apora* in lacking head pores. *Heteroteleotris apora* differs in having 2 pointed opercular spines; pelvic fins I,4, and few scales on the caudal peduncle. *H. diademata* differs in lacking all scales and in having a postocular stripe from eye to angle of preopercle. *Heteroteleotris bipunctata* is most similar to *H. margaretae*, differing in several features including more numerous dorsal and anal rays, more numerous scale rows, naked belly, fewer pectoral rays, extensive naked area below dorsal fins, and in being more slender bodied (body depth at anal origin 13.9–15.2% SL versus 16.1–19.3% SL in *H. margaretae*).

ETYMOLOGY: Named for Margaret M. Smith.

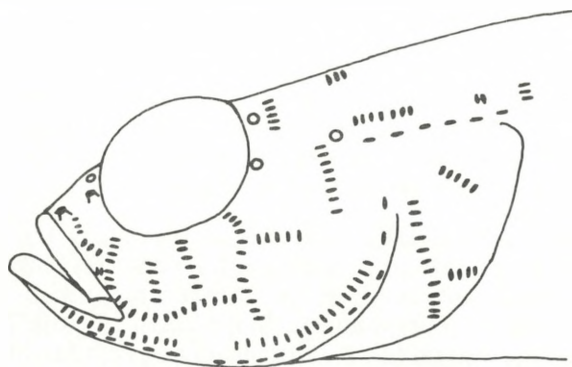


Figure 3: *Hetereleotris margaretae*, paratype, 21 mm SL, AMS I.25056-001, from Natal South Africa, showing sensory papillae.

Hetereleotris nebulofasciata (Smith, 1958)

Chriolepidops nebulofasciata Smith, 1958: 158, fig. 14 (Pinda, Mozambique).

MATERIAL EXAMINED: HOLOTYPE: RUSI 252 (32 mm), Pinda Mozambique. PARATYPES: KENYA — RUSI 17528 (35 mm), Malindi. MOZAMBIQUE — RUSI 16779, (2, 26–33 mm), Pinda; RUSI 17529 (2, 23–29 mm), Ibo; RUSI 16780 (2, 32 mm), Ilha des Rolas; RUSI 17270 (2, 27–29 mm), Tekomaji Is.; RUSI 17531 (4, 26–32 mm), Pinda; RUSI 17530 (4, 27–31 mm), Ibo.

DIAGNOSIS: Dorsal fin VI/I,11; anal fin usually I,10; pectoral rays 15–16; pelvic fins separate, I,5, fifth ray unbranched or branched once, slightly shorter than fourth ray with 4 branches, third ray with 4–5 branches; segmented caudal rays 17 (2); branched caudal rays 8/7 (2); vertebrae 10 + 17 (1); LS 7–11. Head pores present: a posterior nasal pore, a median anterior and a median posterior interorbital pore, a postorbital pore, an infraorbital pore, a terminal lateral canal pore above posterior end of preoperculum, no preopercular pores. Head subterete; tongue tip rounded; anterior nasal tube slightly longer than posterior nasal tube. Body largely naked, cycloid scales confined to caudal peduncle, reaching forward to below end of second dorsal fin.

Body covered with scattered dark spots, a distinct vertical dark bar below front of first dorsal fin, followed by 4–5 fainter, irregular, broken, more or less vertical bars.

Heteroleotris poecila (Fowler, 1946)

Riukiuia poecila Fowler, 1946: 201, figs. 62 and 63 (Aguni Shima, Ryukyu Islands).

Heteroleotris poecila: Akihito & Meguro, 1981: 332, fig. 4 (Japan).

MATERIAL EXAMINED. HOLOTYPE: ANSP 72080 (17 mm), Ryukyu Is. TAIWAN — BPBM 23285 (59 mm); USNM 263362, (29 mm). GRANDE COMORE ISLAND — CAS 33051 (20 mm); CAS 33463 (14 mm). SRI LANKA — USNM 263383 (23 mm), Trincomalee; USNM 263422 (22, 19–30 mm).

DIAGNOSIS: Dorsal fin usually VI/I,10; anal fin usually I,9; pectoral rays 15–18, rarely 15 or 18; pelvic fins separate, I,5; pelvic rays highly branched, fifth ray short, about half length of fourth pelvic ray, usually unbranched, rarely branched once in large specimens, fourth pelvic ray with 2–4 branches in specimens less than 19 mm SL, 4–7 branches in specimens 19–30 mm SL, third pelvic ray with 3–5 branches in specimens less than 19 mm SL, 4–7 branches (usually 5–6) in specimens 19–30 mm SL; segmented caudal rays 17 (25); branched caudal rays 8/7(23*), 8/8(1), 9/8(1); vertebrae 10 + 16 (1), 10 + 17 (13); LS 30–37. Head pores present: a posterior nasal pore, a median anterior and a median posterior interorbital pore, a postorbital pore, an infraorbital pore, a terminal lateral canal pore over posterior preopercular margin; no preopercular pores. Head depressed; tongue tip bilobed; upper two pectoral rays partly free from membranes; nasal tubes subequal.

Body covered with cycloid scales; belly completely scaled. Head and body with irregular mottling, sometimes forming irregularly shaped wavy bands; a dark brown vertical bar at base of caudal fin; dorsal and posterior end of pectoral base with a large irregularly shaped brown blotch extending onto bases of upper pectoral rays.

REMARKS: Previously this species was known only from the Ryukyu Islands. Specimens from Sri Lanka and Grand Comore Island do not differ in any obvious features from the specimen examined from Taiwan. All agree with the figures and description given by Akihito and Meguro (1981) for specimens from Japan. Specimens from the Indian Ocean differ slightly in usually having 17 pectoral rays, while specimens recorded from Japan by Akihito & Meguro had 16 (in 15) or 17 (in 12) pectoral rays. The holotype is in poor condition, but agrees with other material in pores and meristics. All material examined was taken from depths between 1 and 3 metres.

Heteroleotris tentaculata (Smith, 1958)

Dactyleleotris tentaculatus Smith, 1958: 161, fig. 17 (Bazaruto, Mozambique).

MATERIAL EXAMINED. HOLOTYPE: RUSI 253 (22 mm), Bazaruto, Mozambique. OTHER MATERIAL: LOCALITY UNKNOWN — USNM 263586 (18 mm). SEYCHELLES — ANSP 156913 (21 mm), Mahé; 156911 (4, 15–17 mm), Round Is.; ANSP 156912 (22 mm), Mahé. KENYA — LACM 30859-36 (3, 12–20 mm), Kisiti Is. SOUTH AFRICA — RUSI 76–11 (21 mm), Sodwana Bay, KwaZulu.

DIAGNOSIS: Dorsal fin VI/I,12; anal fin usually I,11; pectoral rays 15; pelvic fins separate, I,5; fifth pelvic ray unbranched or branched once, slightly shorter than fourth ray with 3–4 branches; third pelvic ray with 4–6 branches; segmented caudal rays 17 (7); branched caudal rays 7/7 (1), 8/7 (6*); vertebrae 10 + 17 (6, not examined in holotype). Head pores present: a posterior nasal pore; a median anterior and a median posterior interorbital pore; a postorbital pore; an infraorbital pore; a terminal lateral canal pore over posterior third of preopercle, but before posterior preopercular margin; 2 preopercular pores. Head subterete; a prominent tentacle extending from dorsal margin of eye; posterior nasal tube much longer than anterior nasal tube; tongue tip rounded. Body naked in holotype; in other specimens 1 scale dorsally at rear end of caudal peduncle and 3–6 scales in a horizontal line along lower margin of caudal peduncle, ending at rear end of caudal peduncle.

Head and body brown; head darker than body. A vertical dark brown bar on body below anterior half of first dorsal fin. Midside with irregularly shaped brown blotches. A series of pairs of brown blotches along the bases of the second dorsal and anal fins. Dorsal fins with irregular mottling. Anal and caudal fin clear. Pectoral and pelvic fins light to dark brown; pelvics darker than pectorals.

Heteroleotris vinsoni, sp. n.

Figs. 4 & 5

Monishia oculata Smith, 1959: 206 (in part, Cape Delgado, Mozambique only).

HOLOTYPE: RUSI 74–91, 19.5 mm male, Beauchamp, Jacotet Bay, Mauritius, 0–4 m, T. Fraser, 7 March, 1971. PARATYPES: MAURITIUS — AMS I.25098-001 (4, 14–20 mm), Beauchamp, 7 March, 1971, T. Fraser; RUSI 74-311 (4, 17–21 mm), 2 km from Riambel, east side of Jacotet Bay, T. Fraser, 26 March, 1971; RUSI 74-312 (18 mm), Palomar, 3 km north of Trou d'eau Douice, 0–1 m, T. Fraser 27 March, 1971; RUSI 21817 (13 mm), Beauchamp, one mile E on road near Jacotet Bay, 0.3 miles E of St. Marie Bridge, 6 March, 1971, T. Fraser; ZMK P.781425-78428 (4, 17–24 mm), 17 October, 1929. ST. BRANDON SHOALS — USNM 263340 (18 mm), Tortue Is., V. G. Springer and party, 7 April, 1976; USNM [ex 263351] (22 mm), 16° 36' S, 59° 31' E, V. G. Springer and party, 1 April, 1976. OTHER MATERIAL: MOZAMBIQUE — AMS I.19416-002 (20 mm) Cape Delgado, J. L. B. and M. M. Smith, July 1951 (paratype of *Monishia oculata*).

DIAGNOSIS: Dorsal fin VI/I,10; anal fin I,9; pectoral rays 17–18; LS 25–30 in adult; TRB 10–11; head pores present: posterior nasal pore, median anterior interorbital pore, median posterior interorbital pore, postorbital pore behind each eye, infraorbital pore, terminal lateral canal pore above posterior preopercular margin; no preopercular pores. Head slightly depressed, broader than deep, tongue tip weakly bilobed, with a shallow notch; anterior nasal tube slightly longer than posterior. Body with cycloid

scales from pectoral base to below second dorsal fin; a wedge of ctenoid scales from caudal fin base to below middle of second dorsal fin; midline of belly with cycloid scales. Pelvic fins separate, rays 1,4-5, fifth ray if present, rudimentary, less than one-third length of fourth ray. Extreme tips of first 3 pectoral rays with free tips.

Body with Y-shaped dark brown bar under end of first dorsal fin and beginning of second dorsal fin; one, broad, vertical, dark brown band below beginning of first dorsal fin; a vertical dark brown bar below middle of second dorsal fin; a similar bar on caudal peduncle; and one at caudal base; bars incomplete, not reaching ventral surface of body.

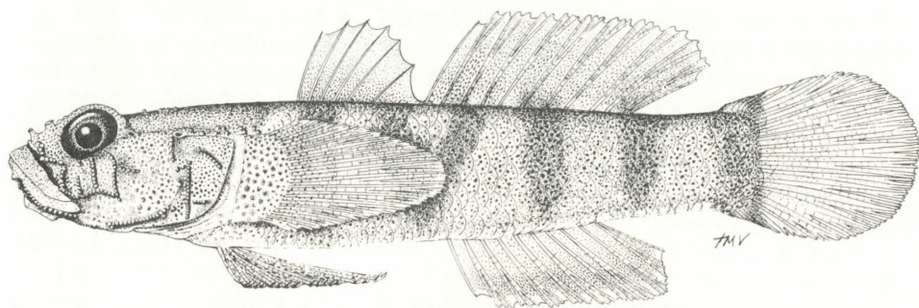


Figure 4: *Heteroleotris vinsoni*, a composite based on holotype, RUSI 74-91 and 2 paratypes RUSI 74-311, from Mauritius. Drawing by J. M. Vinson.

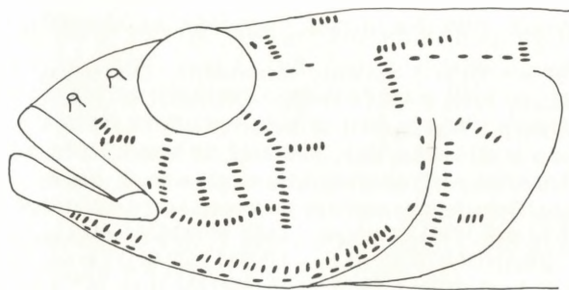


Figure 5: *Heteroleotris vinsoni*, paratype, 15 mm SL, AMS I.25098-001, from Mauritius, showing sensory papillae.

DESCRIPTION: Segmented caudal rays 17 (11); branched caudal rays 8/7 (5*), 8/8 (2), 9/7 (1), 9/8 (1); vertebrae 10 + 17 (13). Measurements of holotype in mm: SL 19.5, head length 6.5, head width at posterior preopercular margin 4.7, head depth at posterior preopercular margin 3.4, body depth at pelvic origin 4.0, body depth at anal origin 4.1, pectoral length 5.5, pelvic length 5.0, caudal length 5.3, third dorsal spine length 1.9.

Eyes elevated, with a shallow groove behind eye; interorbital narrow, eyes almost touching; mouth oblique forming an angle of $40-45^\circ$ with body axis; lips thick, jaws reach to below front margin of pupil; gill opening restricted to level of pectoral base; lower limb of first gill arch joined to gill cover by membrane; no spines on operculum; mandibular frenum broad with rounded margin; head, pectoral base and prepelvic area naked, belly completely scaled.

Coloration in alcohol: Head and body light brown; a thin brown bar from anteroventral margin of eye extending across middle of sides of jaws; similar bar extending from posteroventral margin of eye obliquely across preopercle, both bars diffuse in small specimens. Two transverse brown bars dorsally on head between opercula, often intensifying into large brownish spots, just above operculum; brown transverse bar crossing nape just before first dorsal origin; broad dark brown vertical band below front half of first dorsal fin, becoming narrower ventrally and not extending across belly; a Y-shaped dark brown band below posterior quarter of first dorsal fin and below front of second dorsal fin; a dark brown vertical band below middle of second dorsal fin; dark brown vertical band on caudal peduncle, beginning at end of second dorsal fin; dark brown vertical bar at posterior end of caudal peduncle; two vertical bands below second dorsal fin slightly oblique, with irregular connecting bars dorsally in St. Brandon Shoals material. First dorsal fin with dark brown blotches anteriorly and posteriorly at base of fin; blotches formed by extensions of body bands onto base of fin; body bands extending onto base of second dorsal fin forming brown spots at base, becoming lighter brown bands dorsally on fin; base of anal fin with 4–6 small brown spots, fin clear to dusky, with black stripe just above distal tip, in large specimens; pectoral-fin base with scattered brown spots often covering all of pectoral base; often with dark brown spot (smaller than pupil) dorsally on base of pectoral rays; pectoral fin clear with a few minute brown flecks; pelvic fins clear; caudal fin clear, sometimes with minute scattered grey spots.

RELATIONSHIPS: This species is most similar to *H. zanzibarensis* in head shape and body form, and in having ctenoid scales. *Heteroteleotris zanzibarensis* differs in having an extra lateral canal pore, fewer dorsal and anal rays, well developed fifth pelvic ray and in having a distinctly bilobed tongue. The species is also similar to *H. poecila* in fin-ray counts, head pores and scaled belly. *Heteroteleotris poecila* differs in having cycloid scales, longer fifth pelvic ray, dark bar on pectoral fin base and darker coloration. The colour pattern of *H. vinsoni* is very similar to that of *H. kenya*, which has no anterior interorbital pore and more numerous second dorsal rays.

REMARKS: The species is known only from Cape Delgado, Mozambique, Mauritius and St. Brandon Shoals. A single 12 mm juvenile differs from adults in having fewer scales on the body. The scales are entirely ctenoid and extend forward in a wedge to below the middle of the second dorsal fin. A 13 mm specimen has the scales completely developed.

ETYMOLOGY: Named for J. M. Vinson, who illustrated the types of the new species described in this paper as well as other gobiid species.

Hetereleotris vulgaris (Klunzinger, 1871)

Eleotris vulgare Klunzinger, 1871: 484 (Red Sea).

MATERIAL EXAMINED: SYNTYPES: SMNS (uncatalogued) (6, 16–25 mm), Red SEA. OTHER MATERIAL: RED SEA — ANSP 83370 (2, 15–20), Gulf of Aqaba; BPBM 18220 (21 mm), Gulf of Aqaba; RUSI 5795 (26 mm); SMF 8349 (22 mm); SMF 13228 (34 mm), Gulf of Suez; USNM 263360 (18 mm), El-Tur, Sinai Peninsula, Gulf of Suez, Israel; USNM 263364 (24 mm), just north of Ras Burqa, Gulf of Aqaba, Israel; USNM 263368 (4, 19–24 mm), El-Tur, Israel; USNM 263372 (16 mm), Masawa, Ethiopia; USNM 263373 (22 mm), Sheikh El Abu, Ethiopia; USNM 263374 (3, 17–25 mm), Mugabila, Gulf of Aqaba, Israel; USNM 263375 (15 mm), Ras Burqu, Gulf of Aqaba, Red Sea; USNM 263377 (2, 21–23 mm), Harat Is., Sheikh El Abu, Ethiopia; USNM 263421 (8, 13–18 mm), Zubair Is. MEDITERRANEAN — ANSP 83364 (20 mm), Caesarae, Israel.

DIAGNOSIS: Dorsal fin usually VI/I,11; anal fin usually I,10; pectoral rays 15–17, rarely 17; pelvic fins separate; pelvic rays highly branched, fifth ray unbranched or with 2 branches, slightly shorter than fourth ray with 3–6 branches, third ray with 4–8 branches; segmented caudal rays 17 (17); branched caudal rays 7/7 (2), 7/8 (1), 8/7 (12), 8/8 (1), 9/8 (1); vertebrae 10 + 17 (20), 10 + 18 (1). Head pores present: a posterior nasal pore, a median anterior and a median posterior interorbital pore, a postorbital pore, an infraorbital pore, a terminal lateral canal pore over posterior preopercular margin; 2 preopercular pores. Head subterete; tongue tip truncate; nasal tubes subequal.

Body with 5–6 irregular cross bands, distinct dorsally, fading ventrally; no dark bar across margin of operculum. A thin vertical brown bar at base of caudal fin on caudal peduncle.

REMARKS: The specimen figured by Smith (1958) was not located. A single specimen in poor condition, from Mozambique (RUSI 10973) is provisionally assigned to this species on the basis of coloration and second dorsal I,11, but the specimen has 18 pectoral rays, characteristic of *H. caminata* (versus 15–17 for Red Sea material of *H. vulgaris*). The posterior nostril tube is longer than in Red Sea material, but shorter than the posterior nostril tube of *H. caminata*. The mixture of characters of *H. caminata* and *H. vulgaris* in this specimen suggests that the two species may intergrade in central east Africa, although the specimen is in poor condition and faded, and may be an abnormal specimen of *H. caminata*. A specimen from Karachi, Pakistan, from 42 m (USNM 263382) is also provisionally identified as *H. vulgaris*. It has 17 pectoral rays and agrees in other features with *H. vulgaris*, but is completely faded. A single specimen from Caesarae, Israel in the Mediterranean agrees in all features with Red Sea material. The species has not been recorded previously from the Mediterranean.

Males of this species have a darker head and pelvic and anal fins. The mouth becomes progressively larger with growth. In specimens less than 19 mm SL, the jaws end approximately below the middle of the eye, while in specimens about 24 mm SL, the jaws reach approximately to below the rear edge of the eye.

Heteroteleotris zanzibarensis (Smith, 1958)

Satulinus zanzibarensis Smith, 1958: 160, fig. 16 (Zanzibar).

Monishia oculata Smith, 1959: 206, pl. 9H (Mahé, Seychelles).

MATERIAL EXAMINED: HOLOTYPE: RUSI 224, 19.5 mm, Zanzibar. RUSI 193, Mahé, Seychelles (holotype of *M. oculata*). Paratypes of *M. oculata*: KENYA — RUSI 829 (21 mm), Malindi; RUSI 826 (3, 12–18), Shimoni. MOZAMBIQUE — AMS I.19416-001 (14 mm), Cape Delgado; RUSI 827 (10, 12–20 mm), Ibo; RUSI 828 (17 mm), Pinda; RUSI 831 (14 mm) Ibo. RUSI 832 (8, 15–19 mm), Cape Delgado; RUSI 833 (3, 18–20 mm), Pinda; SEYCHELLES — RUSI 834 (5, 20–24 mm). OTHER MATERIAL: KENYA — USNM 263423 (21 mm), Mombassa; USNM 263580 (1, 23 mm), Andromache Reef. SEYCHELLES — AMS I.25090-001 (6, 18–19 mm), Curieuse Is.; ANSP 157330 (3, 19–22 mm), Mahé vicinity; ANSP 157329 (19, 16–21 mm), Curieuse Is. AGALEGA IS. — USNM 263344 (19 mm). ST. BRANDON SHOALS — AMS I.24398-001, (2, 20–22 mm); USNM 263351 (10, 18–23 mm). MAURITIUS — RUSI 17276 (2, 20–21 mm), Beauchamp.

DIAGNOSIS: Dorsal fin usually VI/1,9; anal fin usually I,8; pectoral rays 15–18, rarely 15; pelvic fins often fused into a cup-shaped disc, partly separate or rarely completely separate; pelvic frenum rudimentary, sometimes absent, fifth pelvic ray with 3–5 branches, slightly shorter than fourth ray with 3–4 branches, third pelvic ray with 3–4 branches; segmented caudal rays 17 (18); branched caudal rays 7/7 (1), 8/7(15), 9/7(2); vertebrae 10 + 16 (2), 10 + 17 (in 40*); LS 25–30. Head pores present: a posterior nasal pore, anterior interorbital pore, posterior interorbital pore, postorbital pore, an infraorbital pore, a lateral canal pore, a terminal lateral canal pore above posterior preopercular margin, no preopercular pores. Head distinctly depressed; tongue tip bilobed; nasal tubes subequal; upper 2–3 pectoral rays partly free from membranes. Body scales largely ctenoid, reaching forward to pectoral base; scales cycloid in area below first dorsal fin to upper pectoral-fin base; belly largely naked, with lower extent of scales arching from anal origin to lower pectoral-fin base.

A dark postocular stripe from eye, sloping downward across cheek; a brown vertical bar at posterior end of caudal peduncle; a black spot on first dorsal fin on membrane near base behind sixth dorsal spine, spot larger in male.

REMARKS: This species is most similar to *H. vinsoni* as discussed under that species. Both species occur at St. Brandon Shoals.

In the holotype of *Satulinus zanzibarensis*, there is no trace of a pelvic frenum and the pelvic fins are almost completely separate, connected only at the base. In most other material, including the holotype of *Monishia oculata*, the pelvics are connected to form a cup-shaped disc, with a low pelvic frenum. In some specimens from Ibo, Mozambique, the frenum is not discernible and the pelvic fins are connected only at their bases as in the holotype of *Satulinus zanzibarensis*. Since much of the material is not in the best of condition, it is possible that the apparent separation of the pelvic fins and the absence of the pelvic frenum may be an artifact. The holotype of *Satulinus zanzibarensis* agrees in all other features with other material. Type material of *Monishia oculata* from the Seychelles does not have the body bands as distinctive as in

other material, however, other material collected from the Seychelles agrees in coloration with material from other areas. Pectoral-ray counts are variable in the species, but the variability is high at St. Brandon Shoals and the Seychelles. Material from the Seychelles usually has pectoral rays of 17 or 18, with counts of 16 (in 1), 17 (in 14) or 18 (in 17), while material from St. Brandon Shoals has pectoral ray counts of 15 (in 1), 16 (4), 17(5), 18(3). Material from Mozambique and Tanzania has pectoral ray counts of 15(1), 16(4), 17(6), 18(1).

Other species were found included with type material of *Monishia oculata*. One specimen (from RUSI 831) represents a juvenile of *Bathygobius* and one from RUSI 826 is a specimen of *Coryogalops*. Similarly 7 specimens from RUSI 728 are specimens of *Eviota*. One specimen (RUSI 824) is a specimen of *Heteroeleotris kenya*e and one (AMS I.19416-002) is a specimen of *H. vinsoni*.

Heteroeleotris zonata (Fowler, 1934)

Leioeleotris zonatus Fowler, 1934: 494, fig. 48 (St. Lucia coast, South Africa).

MATERIAL EXAMINED: HOLOTYPE. ANSP 54992 (37 mm), Natal, South Africa. PARATYPE: ANSP 54993 (27 mm), collected with holotype. OTHER MATERIAL: SOUTH AFRICA, NATAL — AMS I.23627-002 (4, 30–31 mm) KwaZulu; BPBM 21765 (4, 27–30 mm), south of Sodwana Bay; RUSI 74–70 (6, 23–34 mm), Ballito Bay. SOUTH AFRICA, TRANSKEI — RUSI 74–329 (2, 30–45 mm), Coffee Bay; RUSI 75–5 (39 mm), between Goss Bay and Goss Point; RUSI 75–7 (3, 30–45 mm), Grosvenor Point; RUSI 75–16 (38 mm), between Goss Bay and Goss Point; RUSI 75–33 (9, 27–42 mm), Coffee Bay; RUSI 75–34 (6, 27–34 mm); RUSI 76–6 (3, 27–35 mm), Hluleka. INDIA — USNM 263428 (2, 36–48 mm), Okha Point, west coast of India; USNM 263578 (2, 27–42 mm), Okha Point, west coast of India. PAKISTAN — CAS 31441 (34 mm), 15 km west of Karachi; CAS 35599 (10, 30–54 mm), Astola Is., USNM 2263447 (2, 45–52 mm), Astola Is.; USNM 2633584 (5, 31–38 mm), Astola Is.; ZMK 781048 (45 mm) Karachi.

DIAGNOSIS: Dorsal fin usually VI/I, 12–13; anal fin usually I, 10–11; pectoral rays 15–18; pelvic fins separate, fifth ray rarely unbranched in small specimens, usually with 2–3 branches, ray slightly shorter than fourth ray with 4–5 branches, third ray with 5–6 branches; segmented caudal rays 17 (15); branched caudal rays 8/7 (14*), 9/7 (1); vertebrae 10 + 17 (in 42), 11 + 16 (1). Head pores present: a posterior nasal pore, no anterior interorbital pore, posterior interorbital pore usually absent, no postorbital pore, an infraorbital pore, a terminal lateral canal pore above posterior preopercular margin, no preopercular pores. Head distinctly depressed; tongue tip rounded to slightly emarginate; nasal tubes subequal. Body covered with cycloid scales; belly scaled or with a naked midline.

A dark postocular stripe from eye, sloping downward across cheek; no bar under eye; a dark broad bar below front half of first dorsal fin, rest of body uniform, or with faint saddles dorsally.

REMARKS: Smith (1958) has figured this species from South Africa. Hoda (1981) recorded the species from Pakistan. Provisionally specimens from Pakistan and India are treated here as *H. zonata*. The species is otherwise known only from South Africa. Specimens from India and Pakistan differ in several characters from those from South Africa. Specimens from Pakistan and India normally have one more second dorsal and anal rays (I,13 and I,11 versus I,12 and I,10, respectively, Table 2). Similarly pectoral ray counts are typically higher in specimens from India and Pakistan (usually 17–18 versus 16–17, Table 2). The pectoral fins are shorter in specimens from India and Pakistan (20.1–22.3% SL versus 21.8–24.0% SL). The pelvic fins are shorter with a broadly rounded margin in specimens from India and Pakistan (17.3–18.5% SL versus 18.8–20.1% SL, with more pointed posterior margin). Specimens from India and Pakistan also have the body less extensively scaled, with the scales not reaching forward to the pectoral base, belly largely naked, a naked strip below the base of the dorsal fins and a naked strip above the base of the anal fin. In specimens from South Africa the scales reach to the pectoral base, the belly is largely scaled, naked along midline anteriorly, and there are no naked areas below the second dorsal fin or above anal fin base. Additional material from other areas is required to determine whether the disjunct populations of *H. zonata* represent distinct species or localized geographical variants of a single species.

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Table 1: Head pore pattern and scale type of western Indian Ocean species of *Heteroleotris*. See Figure 1 for meaning of abbreviations: “+” = present, “-” = absent.

	PN	AIO	PIO	PO	IF	LC1	TLC	POP	SCALE TYPE	BELLY SCALES
<i>H. apora</i>	-	-	-	-	-	-	-	-	Ctenoid	Absent
<i>H. bipunctata</i>	-	-	-	-	-	-	-	-	Cycloid	Absent
<i>H. caminata</i>	+	+	+	+	+	-	+	2	Absent	Absent
<i>H. diademata</i>	-	-	-	-	-	-	-	-	Absent	Absent
<i>H. kenya</i>	+	-	+	-	+	-	+	-	Cycloid	Absent
<i>H. margaretae</i>	-	-	-	-	-	-	-	-	Cycloid	Absent/midline
<i>H. nebulofasciata</i>	+	+	+	+	+	-	+	-	Cycloid	Absent
<i>H. poecila</i>	+	+	+	+	+	-	+	-	Cycloid	Absent
<i>H. tentaculata</i>	+	+	+	+	+	-	+	2	Ctenoid/Absent	Absent
<i>H. vinsoni</i>	+	+	+	+	+	-	+	-	Ctenoid	Scaled
<i>H. vulgaris</i>	+	+	+	+	+	-	+	2	Absent	Absent
<i>H. zanzibarensis</i>	+	+	+	+	+	+	+	-	Ctenoid	Absent
<i>H. zonata</i>	+	-	±	-	-	-	+	-	Cycloid	Absent/sparse

Table 2: Frequency distributions of dorsal, anal and pectoral ray counts in species of *Hetereleotris* from the western Indian Ocean. An asterisk indicates count of holotype or syntype.

	Second dorsal rays							Anal rays							Pectoral rays				
	1,8	1,9	1,10	1,11	1,12	1,13	1,14	1,7	1,8	1,9	1,10	1,11	1,12		15	16	17	18	19
<i>H. apora</i>	—	—	2	4	—	—	—	—	—	1	5	—	—		1	4	—	—	—
<i>H. bipunctata</i>	—	—	—	—	2	7	—	—	—	—	—	9	—		9	—	—	—	—
<i>H. caminata</i>	—	—	—	3	25*	3	—	—	—	2	27*	1	—		—	1	13	16*	1
<i>H. diademata</i>	—	—	—	—	5*	—	—	—	—	—	1	4*	—		5*	—	—	—	—
<i>H. kenya</i>	—	—	—	—	6*	—	—	—	—	1	5*	—	—		1	1	4*	—	—
<i>H. margaretae</i>	—	—	—	2*	—	—	—	—	—	—	2*	—	—		—	—	2*	—	—
<i>H. nebulofasciata</i>	—	—	—	16*	—	—	—	—	—	1	15*	—	—		4	12*	—	—	—
<i>H. poecila</i>	—	1*	23	2	—	—	—	—	1	25*	—	—	—		—	3*	17	5	—
<i>H. tentaculata</i>	—	—	—	—	11*	—	—	—	—	—	—	9*	2		10*	1	—	—	—
<i>H. vinsoni</i>	—	—	17*	—	—	—	—	—	1	16*	—	—	—		—	—	14*	2	—
<i>H. vulgaris</i>	—	—	1	25*	1	—	—	—	—	1	25*	1	—		8	18*	1	—	—
<i>H. zanzibarensis</i>	1	67*	1	—	—	—	—	4	64*	1	—	—	—		2	10*	37	22	—
<i>H. zonata</i> (S. Africa)	—	—	—	2	20*	—	—	—	—	2	20*	—	—		—	14	15*	2	—
<i>H. zonata</i> (India/Pakistan)	—	—	—	—	1	22	1	—	—	—	—	24	—		—	1	7	12	1

Table 3: Frequency distributions of longitudinal scale counts of western Indian Ocean species of *Hetereleotris*. An asterisk indicates count of holotype or syntypes.

	0	4	5	7	8	9	11	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	48	52
<i>H. apora</i>		2	3																												
<i>H. bipunctata</i>																							1	1			2		2	1	1
<i>H. caminata</i>	13*																														
<i>H. diademata</i>	5*																														
<i>H. kenya</i>																		3*	3												
<i>H. margaretae</i>											1*		1																		
<i>H. nebulofasciata</i>				4	3*	4	1																								
<i>H. poecila</i>													4		3	4	3	2	1	1											
<i>H. tentaculata</i>	1*	6	3																												
<i>H. vinsoni</i>							1		7	3	3*	1																			
<i>H. vulgaris</i>	34*																														
<i>H. zanzibarensis</i>								8	5	8	7	2*																			
<i>H. zonata</i> (S. Africa)																	1	1		1	1	1	2	3	1	2	5	2	1		
<i>H. zonata</i> (India/Pakistan)																				2	1	1	1		2		1		1	1	

