

of fish ($4\frac{1}{2}$ in *B. cultratum*), eye larger, $3\frac{1}{2}$ in length of head or nearly equal to its distance from edge of lower limb of præoperculum ($4\frac{1}{2}$ in head and $1\frac{1}{2}$ in its distance from lower edge of præoperculum in *B. cultratum*), and fin-rays more numerous. Dorsal VIII, I 27; anal III 32 (VIII, I 23-25 and III 28-30 in *B. cultratum*).

The type from Easter Island measures about 200 mm. in total length (to end of middle caudal rays), the examples of *B. cultratum* from Norfolk Island that I have examined 170 to 180 mm.]

28. A Revision of the Fishes of the Genus *Kuhlia*.

By C. TATE REGAN, M.A., F.Z.S.

[Received March 4, 1913: Read April 8, 1913.]

(Text-figures 68 & 69.)

INDEX.	Page
<i>Kuhlia cærulescens</i> , sp. n.	376
<i>K. sauvagii</i> , sp. n.	377
<i>K. splendens</i> , sp. n.	379

I have been led to undertake a revision of the species of the Indo-Pacific genus *Kuhlia* Gill, owing to the difficulty I experienced in determining the correct name for a fish of this genus from Easter Island (*Kuhlia mutabunda*).

To the synonymy of *Kuhlia* as given by Boulenger (Cat. Fish. i. p. 36) may be added *Boulengerina* (*non* Dollo) Fowler (Proc. Acad. Philad. 1906, p. 512), and *Safole* Jordan (Proc. U.S. Nat. Mus. xlii. 1912, p. 655).

These names are intended to distinguish the more silvery and more strictly marine species with more numerous gill-rakers (*Safole*) from the spotted forms that enter rivers and have fewer gill-rakers (*Kuhlia*). There is but little justification for such a generic division. *K. boninensis* is intermediate between the two groups in the number of gill-rakers; *K. marginata* may sometimes be unspotted, and in the form and coloration of the caudal fin is nearer to *K. humilis* than to *K. rupestris*, and *K. splendens*, a silvery, unspotted species, with numerous gill-rakers, is described below from the fresh-waters of Rodriguez.

Synopsis of the Species.

- I. Lateral line of 40 to 45 scales (+ 4 or 5 on base of caudal fin); 16 to 19 gill-rakers on lower part of anterior arch; body usually spotted.
 - A. Caudal fin slightly emarginate; middle rays $\frac{2}{3}$ or $\frac{3}{4}$ as long as longest; lobes rounded. Dorsal X 11. Anal III 10.
 1. Maxillary extending to below middle of eye (young) or beyond (adult) 1. *rupestris*.
 2. Maxillary not or barely reaching middle of eye in adult.

- Upper opercular spine nearly as strong as lower; dorsal origin in advance of pelvics..... 2. *cærulescens*.
- Lower opercular spine much the stronger; dorsal origin above base of pelvics 3. *sauvaggi*.
- B. Caudal fin more deeply emarginate; middle rays $\frac{1}{2}$ to $\frac{3}{5}$ as long as longest; lobes pointed. Dorsal X 10-12. Anal III 11-13.
- Maxillary extending beyond middle of eye 4. *urvillii*.
- Maxillary not or barely reaching middle of eye 5. *marginata*.
- II. Lateral line of 46 to 56 scales (+ 4 or 5 on base of caudal fin); no spots on body.
- A. 21 or 22 gill-rakers on lower part of anterior arch ... 6. *boninensis*.
- B. 24 to 29 gill-rakers on lower part of anterior arch.
1. Dorsal X 13-14. Anal III 12-13 7. *caudovittata*.
2. Dorsal X 11. Anal III 11; caudal fin plain, usually with dark posterior margin.
- a. Middle caudal rays more than $\frac{1}{2}$ as long as longest; 4 scales from sheath at base of spinous dorsal to nearest part of lateral line.
- Eye a little shorter than postorbital part of head 8. *splendens*.
- Eye as long as postorbital part of head 9. *humilis*.
- b. Middle caudal rays less than $\frac{1}{2}$ as long as longest; 5 or 6 scales from sheath at base of spinous dorsal to nearest part of lateral line.
- Anal nearly as long as head, much longer than caudal peduncle 10. *sandvicensis*.
- Anal $\frac{2}{3}$ length of head, a little longer than caudal peduncle ... 11. *mutabunda*.
3. Dorsal X 9-11. Anal III 10-11. Caudal fin with five blackish bands, one median and two on each lobe 12. *tæniura*.

1. KUHLIA RUPESTRIS.

Centropomus rupestris Lacep. Hist. Nat. Poiss. iv. pp. 252, 273 (1802).

Kuhlia rupestris (part.) Bouleng. Cat. Fish. i. p. 36 (1895).*

Kuhlia rupestris hedleyi Ogilby, Proc. Linn. Soc. N. S. Wales, xxii. 1897, p. 767.

Depth of body $2\frac{1}{2}$ to 3 in the length, length of head $2\frac{3}{4}$ to $3\frac{1}{2}$. Snout $\frac{3}{4}$ to $1\frac{1}{2}$ diameter of eye, which is $3\frac{1}{4}$ to $5\frac{1}{2}$ in length of head; interorbital width 3 to $3\frac{2}{3}$. Maxillary extending to below middle of eye (young) or beyond. 16 to 19 gill-rakers on lower part of anterior arch. 40 to 44 scales in lateral line, 4 or $4\frac{1}{2}$ from scaly sheath at base of spinous dorsal to highest part of lateral line, 9 to 11 thence to base of pelvic fin. Dorsal X 11; fourth or fifth spine longest, $\frac{1}{3}$ to more than $\frac{1}{2}$ length of head; last as long as sixth, seventh, or eighth, $\frac{2}{7}$ to more than $\frac{2}{5}$ length of head. Anal III 10; third spine usually shorter than tenth dorsal; base $\frac{3}{5}$ to $\frac{4}{5}$ length of head, longer than caudal peduncle. Pectoral $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Caudal peduncle as long as, or longer than, deep. Bluish silvery; each scale usually with a dark spot; each lobe of caudal and soft dorsal with a blackish

* The synonymy is as given by Boulenger, except for *Dules fuscus* of Sauvage, which is a distinct species.

or brownish spot in young, these spreading to form broad marginal bands in adult ; soft dorsal and upper and lower margins of caudal often narrowly edged with white ; soft vertical fins usually with one or more series of spots.

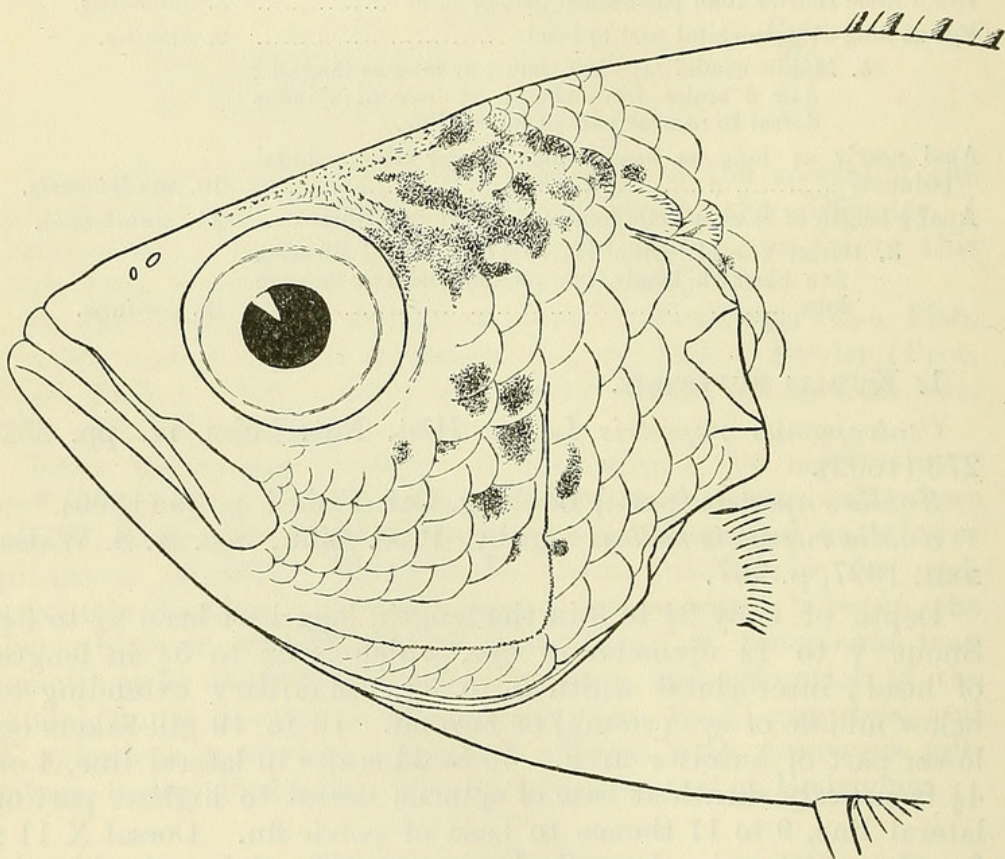
Indo-Pacific, from Africa to the Paumotu Archipelago. Twenty-six specimens, 85 to 400 mm. in total length.

2. *KUHLIA CÆRULESCENS*, sp. n. (Text-fig. 68.)

Kuhlia rupestris (part.) Bouleng. Cat. Fish. i. p. 36 (1895).

Depth of body 3 in the length, length of head $3\frac{1}{5}$. Snout $\frac{3}{4}$ diameter of eye, which is $3\frac{3}{5}$ in length of head ; interorbital width $3\frac{1}{3}$. Maxillary extending to below middle of eye ; upper opercular spine nearly as strong as lower ; 7 gill-rakers on lower part of anterior arch. 41 scales in lateral line, $4\frac{1}{2}$ from sheath at base of

Text-fig. 68.



Head of *Kuhlia caerulea*.

spinous dorsal to highest part of lateral line, $9\frac{1}{2}$ thence to base of pelvic fin. Dorsal X 11 ; origin in advance of base of pelvics ; fifth spine longest, $\frac{2}{5}$ length of head ; last as long as seventh, $\frac{3}{8}$ length of head. Anal III 10 ; third spine $\frac{1}{3}$ length of head ; base $\frac{3}{4}$ length of head or $1\frac{2}{5}$ as long as caudal peduncle. Pectoral less than $\frac{3}{5}$ length of head. Caudal slightly emarginate, with rounded lobes. Caudal peduncle $1\frac{1}{3}$ as long as deep. Bluish

silvery; a dark spot at base of each scale; cheeks and opercles spotted; soft dorsal and anal with longitudinal bands or series of spots; caudal with broad dark band posteriorly.

Solomon Islands.

A single specimen, 290 mm. in total length, from Stirling Island.

This species is near *K. sauvagii*, but has the coloration of *K. rupestris*. Sauvage's figure of the former agrees with the example in the British Museum collection, and differs from the type of *K. caerulea* in the much smaller upper opercular spine and the more posterior origin of the dorsal fin.

3. KUHLIA SAUVAGII, sp. n.

Dules fuscus (non Cuv. & Val.) Sauvage, Hist. Madag., Poiss. p. 149, pl. xv. f. 4 (1891).

? *Moronopsis fuscus* Steind. Sitzungs. Akad. Wien, lxxxii. 1881, p. 240.

Depth of body $2\frac{2}{3}$ in the length, length of head $3\frac{1}{3}$. Snout $\frac{2}{3}$ as long as diameter of eye, which is 3 in the length of head and equal to the interorbital width. Maxillary extending to below anterior $\frac{1}{3}$ of eye; lower opercular spine much stronger than upper; 16 or 17 gill-rakers on lower part of anterior arch. 44 scales in lateral line, 4 between sheath at base of spinous dorsal and arch of lateral line, 10 thence to base of pelvic fin. Dorsal X 11; origin above base of pelvics; fifth spine longest, $\frac{2}{3}$ length of head; last nearly as long as seventh, $\frac{1}{2}$ length of head. Anal III 10; base nearly as long as head or nearly twice as long as caudal peduncle; third spine less than $\frac{1}{2}$ length of head. Pectoral $\frac{3}{4}$ length of head. Caudal slightly emarginate. Caudal peduncle a little longer than deep. Silvery, back darker; sides with scattered rounded or crescentic reddish-brown spots; soft dorsal and anal spotted; caudal with dark membrane and pale rays.

Madagascar.

The above description is based on a single specimen, 150 mm. in total length, from Imerina, Madagascar, which evidently belongs to the same species as the example of 300 mm., also from Madagascar, figured by Sauvage. This larger fish has, of course, shorter spines, a smaller eye, etc., and in it the maxillary almost reaches the vertical from the middle of the eye.

Dr. Pellegrin has kindly examined the types of *Dules fuscus* Cuv. & Val., two examples only 4 inches long, and writes that the maxillary extends slightly beyond the vertical from the middle of the eye. There can be little doubt but that these are specimens of *K. rupestris*.

4. KUHLIA URVILLII.

Kuhlia urvillii Bouleng. Cat. Fish. i. p. 38 (1895).

This species is based on a coloured figure in Dumont D'Urville's 'Voyage au Pôle Sud,' which represents a fish of 160 mm. very similar to *K. marginata*, but with the last dorsal spine longest of

all, $\frac{2}{3}$ the length of head, and with the maxillary extending to below the posterior part of the eye.

5. KUHLIA MARGINATA.

Dules marginatus Cuv. & Val. Hist. Nat. Poiss. iii. p. 116, pl. ii. (1829).

Dules maculatus Cuv. & Val. op. c. vol. vii. p. 475 (1831).

Dules malo Cuv. & Val. t. c. p. 479.

Dules mato Lesson, Voy. Coquille, Zool. ii. p. 223 (1831).

Dules leuciscus Jenyns, Zool. Beagle, Fish. p. 17 (1842).

Kuhlia marginata Boulenger, Cat. Fish. i. p. 38 (1895) (with synonymy).

Kuhlia malo Kendall & Goldsborough, Mem. Mus. Comp. Zool. xxvi. 1911, p. 280, pl. ii. f. 2.

Kuhlia maculata Kendall & Goldsborough, t. c. p. 281, pl. iii. f. 1.

Depth of body $2\frac{3}{5}$ to $3\frac{1}{5}$ in the length, length of head 3 to $3\frac{1}{2}$. Snout $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye, which is $2\frac{2}{3}$ to $3\frac{1}{3}$ in length of head; interorbital width 3 to $3\frac{2}{3}$. Maxillary extending to below anterior $\frac{1}{3}$ of eye. 16 to 18 gill-rakers on lower part of anterior arch. 40 to 45 scales in lateral line, 4 or $4\frac{1}{2}$ from sheath at base of spinous dorsal to highest part of lateral line, 8 or 9 thence to base of pelvic fin. Dorsal X 10–12; fifth spine usually longest, $\frac{1}{2}$ to $\frac{2}{3}$ length of head; last as long as sixth, seventh, or eighth, $\frac{2}{5}$ to more than $\frac{3}{5}$ length of head. Anal III 11–13; third spine shorter than tenth dorsal; base nearly as long as head, nearly twice as long as caudal peduncle. Pectoral $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Caudal moderately emarginate, the middle rays $\frac{1}{2}$ to $\frac{3}{5}$ as long as longest. Caudal peduncle longer than deep. Silvery, usually dark spotted above lateral line and sometimes below it; soft dorsal and anal dark edged, at least anteriorly, often dark spotted basally; caudal with dark posterior margin and with dark spots or a band parallel to posterior edge; soft dorsal, anal, and upper and lower margins of caudal often narrowly edged with white; pelvics sometimes spotted.

Malay Archipelago and South Pacific.

Numerous examples, 75 to 160 mm. in total length, including the types of *D. leuciscus*, kindly lent to me by Mr. L. Doncaster.

Some examples are almost covered with spots, others are silvery with scarcely a trace of spots, the variation in this respect recalling our British Trout; probably the silvery examples are marine, whilst the strongly spotted ones may have been for a long time in fresh water.

6. KUHLIA BONINENSIS.

Kuhlia caudovittata (part.) Bouleng. Cat. Fish. i. p. 41 (1895).

Dules marginatus boninensis Fowler, Proc. Acad. Philad. lviii. 1906, p. 510, fig.

Depth of the body nearly 3 in length, length of head $3\frac{3}{4}$. Snout

$\frac{3}{4}$ diameter of eye, which is 3 in length of head; interorbital width $3\frac{1}{4}$. Maxillary extending to below anterior $\frac{1}{4}$ of eye. 22 gill-rakers on lower part of anterior arch. 52 scales in lateral line, 5 from sheath at base of spinous dorsal to arch of lateral line, 12 thence to base of pelvic fin. Dorsal X 11; fifth spine longest, a little more than $\frac{1}{2}$ length of head; last as long as eighth, $\frac{1}{3}$ length of head. Anal III 12; base as long as head or $1\frac{1}{2}$ as long as caudal peduncle. Pectoral $\frac{2}{3}$ length of head. Caudal forked, the middle rays $\frac{1}{2}$ as long as the longest. Caudal peduncle $1\frac{2}{3}$ as long as deep. Silvery; back darker; caudal with dark posterior edge and pale intramarginal band.

Eastern Pacific.

Here described from a specimen of 190 mm. from Tahiti; this is not so deep in the body as Fowler's type, a specimen of about 115 mm. from the Bonin Islands. Otherwise, making allowance for differences due to size, the two examples agree perfectly.

7. KUHLLIA CAUDOVITTATA.

Holocentrus caudovittatus Lacep. Hist. Nat. Poiss. iv. pp. 332, 367 (1802).

Dules caudovittatus Cuv. & Val. Hist. Nat. Poiss. iii. p. 117 (1829) and vii. p. 475 (1835); Sauv. Hist. Madag., Poiss. p. 151, pl. xviii. f. 3 (1891).

Kuhllia caudovittata (part.) Bouleng. Cat. Fish. i. p. 41 (1895).

Evidently related to *K. humilis*, *sandvicensis*, etc., but distinguished by a small head, the subequal ninth and tenth dorsal spines, and the increased number of soft rays, 13 or 14 in the dorsal, 12 or 13 in the anal.

Madagascar and Mauritius.

Total length 225 mm.

8. KUHLLIA SPLENDENS, sp. n. (Text-fig. 69 B.)

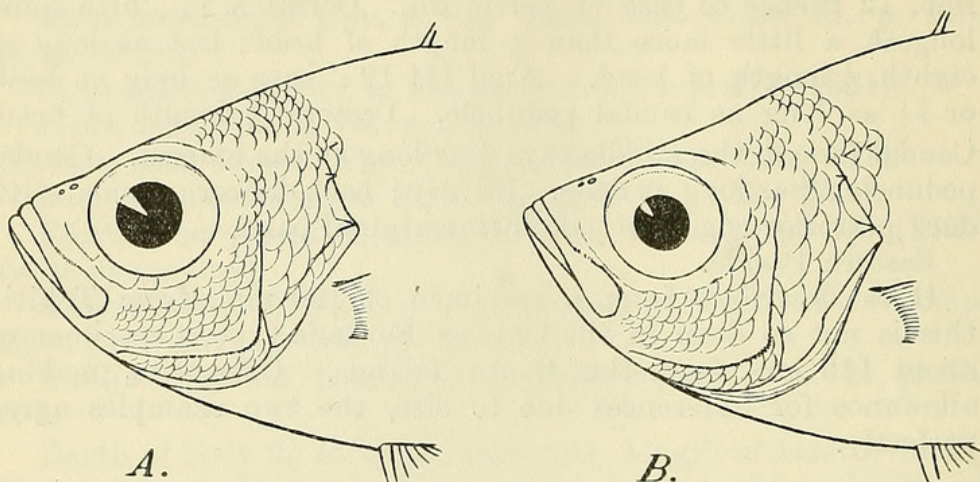
Kuhllia malo (part.) Bouleng. Cat. Fish. i. p. 40 (1895).

Depth of body $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length, length of head 3 to $3\frac{1}{3}$. Snout $\frac{2}{3}$ to $\frac{2}{3}$ diameter of eye, which is 3 in length of head; interorbital width about $3\frac{1}{2}$. Maxillary extending to below anterior $\frac{1}{4}$ of eye. 26 or 27 gill-rakers on lower part of anterior arch. 48 to 50 scales in lateral line, 4 from sheath at base of spinous dorsal to arch of lateral line, 11 thence to base of pelvic fin. Dorsal X 11; fourth or fifth spine longest, nearly $\frac{2}{3}$ length of head; last as long as or longer than eighth, nearly $\frac{1}{2}$ length of head. Anal III 11; third spine a little shorter than tenth dorsal; base a little shorter than head or $1\frac{2}{3}$ as long as caudal peduncle. Pectoral $\frac{2}{3}$ length of head. Caudal deeply emarginate, but middle rays more than $\frac{1}{2}$ as long as the longest. Caudal peduncle longer than deep. Silvery; back darker; caudal with blackish posterior edge.

Four specimens, 120 to 180 mm. in total length, from Rodriguez (fresh water) and Mauritius.

A small stuffed specimen from South Africa also belongs to this species.

Text-fig. 69.



Heads of (A) *Kuhlia humilis* and (B) *Kuhlia splendens*, in each case from a specimen 120 mm. in total length.

9. *KUHLIA HUMILIS*. (Text-fig. 69 A.)

Kuhlia humilis De Vis, Proc. Linn. Soc. N. S. Wales, ix. 1884, p. 396; Ogilby, Ann. Queensland Mus. x. 1911, p. 46, pl. vi. f. 1.

Kuhlia malo (part.) Bouleng. Cat. Fish. i. p. 40 (1895).

Kuhlia proxima Kendall & Goldsborough, Mem. Mus. Comp. Zool. xxvi. 1911, p. 282, pl. iii. f. 2.

Depth of body $2\frac{3}{5}$ to 3 in the length, length of head 3 to $3\frac{1}{4}$. Snout $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye, which is $2\frac{1}{2}$ to $2\frac{2}{3}$ in length of head; interorbital width $3\frac{1}{4}$ to $3\frac{1}{2}$. Maxillary extending to below anterior $\frac{1}{4}$ of eye. 25 gill-rakers on lower part of anterior arch. 46 to 50 scales in lateral line, 4 from sheath at base of spinous dorsal to arch of lateral line, 10 or 11 thence to base of pelvic fin. Dorsal X 11; fourth or fifth spine longest, $\frac{2}{3}$ length of head; tenth a little shorter than seventh, more than $\frac{2}{5}$ length of head. Anal III 11; third spine as long as or a little longer than second, as long as tenth dorsal; base of fin nearly $\frac{3}{4}$ as long as head or $1\frac{1}{2}$ as long as caudal peduncle. Pectoral $\frac{2}{3}$ length of head. Caudal deeply emarginate, but middle rays more than $\frac{1}{2}$ as long as longest. Caudal peduncle $1\frac{1}{3}$ as long as deep. Silvery; back darker; caudal with a rather broad dark posterior margin.

Queensland; Fiji Islands.

Three specimens, 90 to 120 mm. in total length, from Fiji, are undoubtedly *K. proxima*, but this seems to be a synonym of the Queensland *K. humilis*. The species is scarcely distinct from the preceding, but has a larger eye, the anal fin a little shorter, and the blackish margin of the caudal fin broader.

10. KUHLIA SANDVICENSIS.

Moronopsis argenteus, var. *sandvicensis* Steind. Sitzungsab. Akad. Wien, lxxiv. 1876, p. 205.

Moronopsis sandvicensis Steind. *ib.* xcvi. 1887, p. 56, pl. i. f. 1.

Kuhlia malo (part.) Bouleng. Cat. Fish. i. p. 40 (1895).

? *Kuhlia xenura* Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 1015.

Depth of body $2\frac{2}{5}$ to $2\frac{4}{5}$ in the length, length of head $3\frac{1}{5}$ to $3\frac{3}{5}$. Snout $\frac{3}{5}$ to $\frac{3}{4}$ diameter of eye, which is $2\frac{3}{5}$ to 3 in length of head; interorbital width $3\frac{1}{3}$ to 4. Maxillary extending to below anterior edge or anterior $\frac{1}{4}$ of eye. 25 to 28 gill-rakers on lower part of anterior arch. 48 to 52 scales in lateral line, 5 or 6 from sheath at base of spinous dorsal to arch of lateral line, 11 to 13 thence to base of pelvic fin. Dorsal X 11; fifth spine longest, $\frac{1}{2}$ to $\frac{2}{3}$ length of head; last a little shorter than seventh, $\frac{1}{3}$ to $\frac{1}{2}$ length of head. Anal III 11; third spine as long as tenth dorsal; base of fin nearly as long as head or $1\frac{3}{5}$ to $1\frac{4}{5}$ as long as caudal peduncle. Pectoral $\frac{2}{3}$ length of head. Caudal deeply forked, middle rays less than $\frac{1}{2}$ as long as longest. Caudal peduncle $1\frac{1}{5}$ to $1\frac{1}{2}$ as long as deep. Silvery; back darker; caudal with narrow blackish posterior edge; dorsal and anal sometimes similarly margined.

Eastern Pacific.

Six specimens, 90 to 240 mm. in total length, from the Sandwich Islands and Tahiti.

11. KUHLIA MUTABUNDA.

Kuhlia mutabunda Kendall & Radcliffe, Mem. Mus. Comp. Zool. xxxv. 1912, p. 105, pl. iii. f. 1.

This species from Easter Island, described above (p. 369, Pl. LVI.), differs from *K. sandvicensis* especially in the shorter anal fin.

12. KUHLIA TENIURA.

Dules taniurus Cuv. & Val. Hist. Nat. Poiss. iii. p. 114 (1829).

Kuhlia taniura Bouleng. Cat. Fish. i. p. 39 (1895) (with synonymy).

Kuhlia sterneckii Steind. Sitzungsab. Akad. Wien, cvii. 1898, p. 461, pl.

This species is at once distinguished by the coloration of the caudal fin, with five black bands, a median longitudinal and two on each lobe. I am unable to regard Steindachner's *K. sterneckii* as distinct, for the relative length of the ninth and tenth dorsal spines varies considerably, and they are equal in 4 or 5 of the 20 specimens I have examined.

The species ranges throughout the Indo-Pacific, from Africa to the Revillagigedo Islands.



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