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## A New Species of *Abudefduf* (Pisces: Pomacentridae) from the East Coast of South Africa

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**T**HE FAMILY Pomacentridae (damselfishes) is one of the most diverse and ecologically significant fish groups in tropical and warm-temperate shelf ichthyofaunas. Research on the systematics of these fishes is by no means complete, and it will be some time before the definitive classification is attained. The preponderance of genera and species is found in the Indo-West Pacific region, and it is here that most current research on the family is centered.

The generic classification of damselfishes has undergone considerable revision in recent years. The work of Allen (1975) is especially useful for generic identifications in light of recent studies. Among the more significant changes is the more restricted definition of the genus *Abudefduf* Forsskål. It is now equivalent to Bleeker's (1877) subgenus *Glyphidodon*. Hensley (1978) redefined the genus and recognized 11 Indo-West Pacific species. In the present paper we describe an additional species recently discovered on the east coast of South Africa.

### MATERIALS AND METHODS

All measurements were made with dial calipers and recorded to the nearest 0.1 mm. Methods for counts and measurements generally follow those of Hubbs and Lagler (1949) with the following additions and qualifications: body depth—from midventral point between ventral fins to base of first dorsal spine; interorbital width—least bony width of interorbital; upper caudal lobe length—from bases of upper caudal rays to tip of longest upper caudal ray; lower caudal lobe length—from bases of lower caudal rays to tip of longest lower caudal ray; transverse scale rows—number of scale rows from upper end of gill opening to end of hypural plate; upper lateral-line scales—number of tube-bearing scales, not counting any pore-bearing scales following last tube-bearing scale. Lengths of specimens are standard length (SL). The description is based mainly on adults. Adults are defined as those 80 mm SL or longer. This definition is based

on the observation that most adult characters are developed by the time this size is reached; it is not meant to imply that these individuals are reproductively mature. Juveniles are those less than 80 mm SL. Where characters differ between juveniles and adults, these differences are discussed under Developmental Variation. "Angulate," used in describing fin shapes, refers to a condition between rounded and pointed. "Bar" refers to vertical and "band" to longitudinal or oblique color markings.

The following institutional abbreviations are used: BM(NH)—British Museum (Natural History), London; BPBM—Bernice P. Bishop Museum, Honolulu; CAS—California Academy of Sciences, San Francisco; MNHN—Muséum National d'Histoire Naturelle, Paris; RUSI—J. L. B. Smith Institute of Ichthyology, Grahamstown; USNM—National Museum of Natural History, Washington, D. C.; WAM—Western Australian Museum, Perth.

### *Abudefduf natalensis* new species

Figs. 1, 2, 3A; Tables 1 and 2

*Abudefduf sexfasciatus* (not Lacepède, 1802), Smith (part), 1960:332 (not Plate 29C; Durban). Smith (part), 1961:283 (Durban).

[?] *Abudefduf sexfasciatus* (not Lacepède, 1802), Winterbottom, 1976:66 (Transkei).

**Holotype:** BPBM 22734 (130.9 mm), South Africa, Kwazulu, off Sodwana Bay, reef at depth of 12 m, rotenone, J. E. Randall, G. R. Allen, M. N. Bruton, and M. Smale, 24 April 1979.

**Paratypes:** BM(NH) 1917.5.1:6 (80.2 mm), South Africa, Natal, Durban, Marley (collector). BM(NH) 1980.11.5.1 (72.2 mm), South Africa, Kwazulu, 2.5 km south of Boteler Point, Winterbottom et al. BPBM 22732 (56.6 mm), South Africa, Kwazulu, 9.7 km south of Sodwana Bay, rocky shore with tidepools and small lagoon, 0-2 m, rotenone, J. E. Randall, G. R. Allen, P. C. Heemstra, M. M. Smith, M. Smale, and R. Stobbs, 15 April 1979. BPBM 22733 (136.8 mm), South Africa, Kwazulu, off Sodwana Bay, reef at depth of 23 m, rotenone, J. E. Randall, G. R. Allen, M. Smale, and R. van der Elst, 19 April 1979. CAS 47104 (73.4 mm), MNHN 1980-1498 (56.8 mm), RUSI 76-16 (27: 40.7-74.0 mm), collected with BM(NH) 1980.11.5.1. RUSI 9121 (120.1 mm), RUSI 9914 (137.6 mm), South Africa, Kwazulu, Sodwana. USNM 223079 (130.0 mm), WAM P26529-001 (2: 130.1-132.1 mm), collected with holotype.

**Diagnosis:** A species of *Abudefduf* with the following combination of characters: gill rakers 6-8 + 16-18, totaling 22-26. Preorbital and suborbital series scaled in specimens larger than ca. 70 mm; interorbital scales extending anteriorly to level between nostrils and snout tip in specimens larger than ca. 45 mm; 4 rows of preopercular scales, inferior preopercular margin scaled. Color pattern of 5 dark bars, each 4-4.5 transverse scale rows in width and 2 dark caudal bands; anteriormost bar below dorsal spines I through V or VI, posteriormost bar at posterior end of caudal peduncle; caudal bands covering upper and lower margins of caudal fin; margin between caudal bands and light central area of caudal fin not sharply defined; both upper and lower caudal bands contiguous with bar on caudal peduncle in specimens larger than ca. 75 mm.

**Description:** Data from the holotype are presented, followed in parentheses by the range and, for morphometrics, the mean for the holotype and 38 paratypes. Morphometrics expressed as % SL are presented in Table 1.

Dorsal rays XIII,13 (XIII,12-13, except one specimen with XII spines, usually XIII,13); anal rays II,12 (II,12-13, usually II,12); total pectoral rays 19 (18-20, usually 19); transverse





Figure 1. Holotype of *Abudefduf natalensis*, 130.9 mm SL, BPBM 22734.



Figure 2. Underwater photo of *Abudefduf natalensis*, Sodwana Bay, Kwazulu.

TABLE 1  
MORPHOMETRIC PROPORTIONS OF HOLOTYPE AND PARATYPES IN SIZE RANGE OF *ABUDEFDUF NATALENSIS*  
EXPRESSED AS A PERCENTAGE OF STANDARD LENGTH

	HOLOTYPE				PARATYPES					
		$\bar{x}$	Range	N	$\bar{x}$	Range	N	$\bar{x}$	Range	N
Standard length (mm)	130.9									
Body depth	53.9	55.5	51.2-57.7	26	56.1	55.1-59.8	6	54.5	52.3-56.5	7
Head length	29.5	32.8	31.3-34.8	26	31.9	30.5-33.9	6	29.5	29.4-30.2	7
Snout length	8.3	7.9	6.8-9.2	26	8.1	7.9-8.4	6	7.9	7.7-8.3	7
Orbit length	9.0	12.8	11.4-13.9	26	11.2	10.9-11.6	6	9.1	8.6-9.8	7
Upper jaw length	9.3	9.6	8.9-10.3	26	9.1	8.7-9.4	6	9.1	8.8-9.4	7
Interorbital width	11.5	9.7	8.7-10.4	26	9.7	9.3-10.5	6	10.8	10.3-11.5	7
Caudal peduncle depth	16.7	16.8	16.1-17.6	26	16.9	16.3-17.3	6	16.8	16.4-17.1	7
Caudal peduncle length	18.9	17.9	15.9-19.2	26	17.8	17.0-18.8	6	18.1	17.1-19.1	7
Upper caudal lobe length	37.6	40.0	35.3-42.7	26	39.9	38.3-40.9	4	39.0	37.0-43.0	6
Lower caudal lobe length	35.9	36.2	31.7-39.1	26	36.2	35.0-37.0	5	35.0	32.4-36.2	6
Pectoral fin length	34.2	32.2	29.6-33.8	26	32.3	30.9-33.9	6	33.1	31.5-34.7	7
Pelvic fin length	29.2	29.3	26.4-31.4	25	28.8	26.0-30.6	6	28.9	27.2-30.4	7
First dorsal spine length	7.7	9.2	7.3-11.1	26	8.4	7.5-10.0	6	7.4	6.8-8.3	7
Sixth dorsal spine length	17.4	16.7	14.2-19.2	26	16.3	14.8-17.4	6	16.2	15.5-17.4	5
Thirteenth dorsal spine length	19.1	14.6	13.3-16.4	24	15.5	14.6-16.6	6	18.1	16.6-19.1	7
First anal spine length	5.9	6.6	5.7-7.7	26	6.6	6.0-7.6	6	7.0	5.9-8.0	7
Second anal spine length	16.0	16.6	15.1-19.2	22	16.7	15.2-18.1	5	17.9	15.2-19.7	7
Longest dorsal ray length	—	23.6	20.8-25.5	25	25.1	23.8-26.9	5	28.2	25.4-31.3	6
Longest anal ray length	—	22.8	19.2-25.0	26	23.8	21.7-25.6	5	23.4	21.9-24.7	5



scale rows 30 (27-30, usually 28 or 29); upper lateral-line scales 21 (20-22, usually 21); gill rakers 8 + 17 (6-8 + 16-18, usually 7 + 17 or 18), totaling 25 (22-26, usually 24 or 25).

Body depth 1.8 (1.7-2.0, 1.8), head length 3.4 (2.9-3.5, 3.1), both in SL. Snout length 3.5 (3.5-4.7, 4.0); orbit length 3.3 (2.7-3.5, 3.2 in specimens larger than 80 mm);\* upper jaw length 3.2 (3.1-3.6, 3.4); interorbital width 2.6 (2.6-2.9, 2.8 in specimens larger than 80 mm);\* caudal peduncle length 1.5 (1.5-2.1, 1.8); caudal peduncle depth 1.8 (1.7-2.0, 1.9); length of first dorsal spine 3.8 (2.9-4.4, 3.7), of sixth dorsal spine 1.7 (1.7-2.3, 1.9), of thirteenth dorsal spine 1.5 (1.5-1.8, 1.6 in specimens larger than 80 mm),\* of longest dorsal ray (fourth or fifth) (1.0-1.6, 1.3), of first anal spine 5.0 (3.7-5.8, 4.8), of second anal spine 1.8 (1.5-2.2, 1.9), of longest anal ray (fifth or sixth) (1.2-1.7, 1.4), of upper caudal lobe 0.8 (0.7-0.9, 0.8), of lower caudal lobe 0.8 (0.8-1.0, 0.9), of pectoral fin 0.9 (0.9-1.2, 1.0), of pelvic fin 1.0 (1.0-1.3, 1.1), all in head length. Depth of caudal peduncle in its length 1.1 (0.9-1.2, 1.0).

Jaw teeth with compressed tips and bicuspid or entire margins. Interorbital scales extending anteriorly to area between nostrils and snout tip. Preorbital and suborbitals scaled. Preopercle with 4 rows of scales; ventral preopercular margin scaled.\*

Dorsal spines increasing in length from first to fifth, sixth, or seventh; fifth, sixth, or seventh through twelfth subequal, thirteenth slightly longer than twelfth.\* Soft dorsal, anal, and lobes of caudal fins pointed to slightly filamentous. Pectoral fins angulate to pointed, when adpressed reaching to transverse level of eleventh or twelfth dorsal spines. Ventral fins with anterior ray filamentous, when retracted reaching to area between tip of urogenital papilla and first anal ray, usually to anal spines.

*Coloration of preserved specimens:* Ground color of body countershaded from bluish-gray to blackish dorsally to tan or silver on sides and ventral surfaces. Dorsal areas of head (snout, interorbital, and nuchal areas) dark, ventral surfaces (opercles, preopercles, and infraorbitals) usually lighter. Four dark bars present, each bar 4-4.5 transverse scale rows wide; bars located as follows (anterior to posterior): 1) from bases of first through fifth or sixth dorsal spines to level of pectoral-fin base, 2) from area of dorsal fin supported by seventh or eighth through tenth or eleventh dorsal spines to lower abdomen, 3) from proximal areas of dorsal rays to bases of posterior anal rays, 4) on posterior  $\frac{1}{2}$ - $\frac{3}{4}$  of caudal peduncle. One dark band present on each caudal lobe, completely covering upper and lower caudal-fin margins and continuous with dark bar on caudal peduncle;\* margin between caudal bands and lighter central area of caudal fin not sharply defined. Spinous portion of dorsal fin gray to blackish, usually with extensions of first and second dark bars from body onto fin. Soft portion of dorsal fin usually with anterior rays and basal areas of posterior rays darkened, sometimes entire soft portion of dorsal fin darkened. Anal fin usually with anterior rays darkened, sometimes entire anal fin darkened. Pectoral fins hyaline with basal areas of rays and fin base somewhat darkened.\* Ventral fins usually dark gray to blackish, less frequently with spine and anterior ray dark and remainder of fin tan to hyaline.

*Coloration of live specimens:* Color photographs of the freshly collected holotype and a live specimen are presented in Figs. 1 and 2, respectively. It should be noted that the dark caudal bands encompass the upper and lower margins of the caudal fin, the lower caudal band is contiguous with the dark bar on the caudal peduncle, and the margins between the caudal bands and the lighter central area of the caudal fin are not sharply defined. These characteristics were consistently present in all specimens observed and photographed underwater.

**Developmental Variation:** In specimens less than 80 mm, head length/orbit length has a mean of 2.6 and a range of 2.4-3.1, and head length/interorbital width a mean of 3.4 and a range of 3.1-3.9. There appears to be a change in relative lengths of dorsal spines with growth. In juveniles

\*See also Developmental Variation.



the more posterior dorsal spines (eleventh, twelfth, or thirteenth) tend to be somewhat shorter than those in the middle area of the fin. In adults dorsal spines of the middle and posterior areas of the fin are nearly equal in length, except the thirteenth spine, which is the longest. The thirteenth dorsal spine of juveniles is shorter than those of the middle area of the fin (Table 1). Adult specimens of *Abudefduf* species usually have bicuspid or entire tooth margins. However, all or most of the teeth (except the posteriormost in each jaw, which remain peglike) originate in the tricuspid condition. The bicuspid shape results from the reduction of the central cusp and/or enlargement of the lateral cusps. The entire condition probably results from wear on bicuspid teeth. If one considers tricuspid, bicuspid, and entire tooth margins as early, middle, and late developmental stages, respectively, in any one individual the most advanced tooth type is usually found near the symphyses, earlier types being found more laterally and posteriorly. In *A. natalensis* tricuspid and bicuspid teeth are found in most specimens smaller than the 120.1-mm paratype; larger specimens have the typical adult condition with either a combination of bicuspid and entire teeth (120.1-130.9 mm) or entire teeth only (132.1-137.6 mm). Interorbital scales develop anteriorly with increasing SL. Only one small (43.4 mm) juvenile has interorbital scales developed to a point posterior to the level seen in adults (i.e. to the area between the nostrils and snout tip). The smallest specimens (40.7-49.4 mm) have not developed preorbital scales; most specimens between 49.6 and 60.4 mm have the preorbital partially scaled; all specimens 69.2 mm or larger show the adult condition (i.e. preorbital entirely scaled). Most specimens between 40.7 and 60.4 mm have the suborbital series partially scaled; all specimens 69.2 mm or larger show the adult condition (i.e. a complete row of scales along the suborbital series). All specimens have 4 rows of preopercular scales, with the ventralmost row extending to the ventral margin of the preopercle. In other species of *Abudefduf* with a similar arrangement of scales on the preopercle, the ventralmost scale row does not develop until specimens reach a length of ca. 40 mm. In all adult specimens (80.2-137.6 mm) the dark bar on the caudal peduncle is contiguous with the lower caudal band (Figs. 1, 2, and 3A). However, in most smaller specimens (40.7-74.0 mm) these 2 color markings are not or are only barely connected. In some of these juveniles the relative positions of the caudal bands and the bar on the caudal peduncle approach those seen in juvenile and adult *A. sexfasciatus* (Lacepède) (Fig. 3B). In most juveniles a distinct dark spot covers the dorsal  $\frac{1}{3}$ - $\frac{1}{2}$  of the lateral surface of the pectoral-fin base; this color marking is lost in adults.

**Distribution:** Known only from the coasts of Kwazulu, Natal, and Transkei, South Africa (Fig. 4).

**Habitat and Ecology:** *A. natalensis* is closely tied to rocky substrates for shelter. Juveniles were observed in as little as one meter of water in rocky areas along the Kwazulu coast. Our deepest collection of adults came from 23 m. This species appears to feed primarily on zooplankton, based on underwater observation. Adults may be seen facing upcurrent 2 m or more above the substratum where they seem to be feeding on small animals of the passing water mass. This species is most often observed in what might be termed loose aggregations rather than as isolated individuals.

**Comparisons:** *A. natalensis* is most readily separable from all congeners on the basis of its 4 broad, dark bars. With one exception all other *Abudefduf* species have 5-7 dark bars. *A. sparoides* (Quoy and Gaimard) (southwestern Indian Ocean) is the only species which does not have a barred color pattern at some stage of development.

Two other species of the genus have dark caudal bands: *A. sexfasciatus* (Indian Ocean, including Red Sea, east to Tuamotu Archipelago and Rapa) and *A. whitleyi* Allen and Robertson (Queensland coast, Great Barrier Reef, and New Caledonia). Only juvenile *A. whitleyi* have dark

caudal bands, while they occur in all sizes of *A. sexfasciatus*. *A. natalensis* does not appear to be closely related to *A. whitleyi*. The latter species has a color pattern of 5 dark bars that are only 1-1.5 transverse scale rows wide (vs. 4 bars 4-4.5 transverse scale rows in width in *A. natalensis*; Fig. 3A,C). In addition, with growth the entire caudal fin becomes black in *A. whitleyi*. Color photographs of *A. whitleyi* adults are presented by Allen (1975) and Burgess and Axelrod (1975), and a juvenile by Grant (1975) as *A. coelestinus*.

*A. natalensis* is most closely related to *A. sexfasciatus* and has been confused with this species in the literature (see synonymy and Remarks). Color photographs of live or fresh specimens of *A. sexfasciatus* are presented by Burgess and Axelrod (1973, 1974); Allen (1975) as *A. coelestinus*, and Masuda et al. (1975). These species show several differences in coloration (Fig. 3A,B), the most obvious being the number of dark bars (4 in *A. natalensis*, 5 in *A. sexfasciatus*) and their locations. The anteriormost bar in *A. sexfasciatus* extends from the nuchal area to and including the pectoral-fin base. In *A. natalensis* the anteriormost bar extends from the portion of the dorsal fin supported by dorsal spines I-V or VI to an area posterior to the pectoral-fin base. The caudal bands in *A. sexfasciatus* are sharply defined from both the lighter central area and the lighter upper and lower margins of the caudal fin. In *A. natalensis* the caudal bands shade into the lighter central area of the caudal fin and the upper and lower margins of the fin are dark. The caudal peduncle bar in *A. sexfasciatus* originates on the posterodorsal surface of the caudal peduncle and extends ventrally and slightly anteriorly across the caudal peduncle; it is contiguous with the upper caudal band but distinctly separate from the lower caudal band. In adult *A. natalensis* the caudal peduncle bar is vertical and contiguous with both caudal bands. Juveniles of *A. natalensis* tend to have the caudal peduncle bar separate from the lower caudal band, the pattern of these markings approaching that in *A. sexfasciatus*. Although there is broad overlap, these species also show a difference in total gill-raker counts (Table 2).

**Etymology:** Named for Natal, South Africa.

**Remarks:** The extent of the range of *A. natalensis* is unknown (Fig. 4). The northernmost record for the species are the paratypes collected 2.5 km south of Boteler Point, Kwazulu (27° S). The

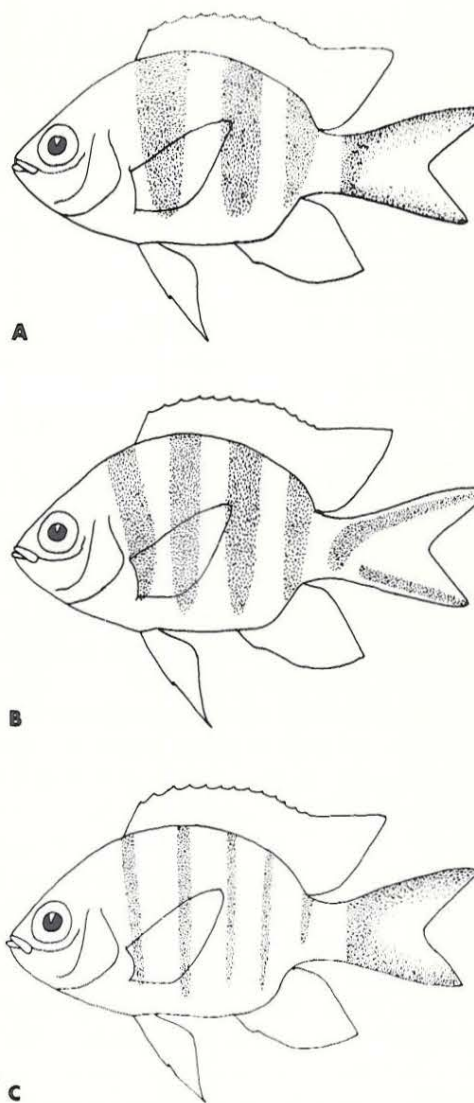


Figure 3. Diagrammatic illustration of color patterns of A, *Abudefduf natalensis*; B, *A. sexfasciatus*; and C, juvenile *A. whitleyi*.



TABLE 2  
TOTAL GILL-RAKER COUNTS FOR *ABUDEDFUF NATALENSIS* AND *A. SEXFASCIATUS*

SPECIES/LOCALITY	TOTAL GILL RAKERS								
	22	23	24	25	26	27	28	29	30
<i>Abudefduf natalensis</i>									
Kwazulu and Natal, South Africa	1	6	18	11	2				
<i>Abudefduf sexfasciatus</i>									
Southwestern Indian Ocean									
Offshore island groups <sup>1</sup>			10	33	44	18	2		
Mainland localities <sup>2</sup>		2	1	2	6	3			
Combined Indo-West Pacific localities		2	17	72	94	65	20	4	3

1. Seychelles, Amirantes, Mauritius, Madagascar, Aldabra, Comoro Islands, Farquhar Islands

2. Kenya and Zanzibar

paratype from Durban is the southernmost record for specimens examined. However, Winterbottom (1976) observed an *Abudefduf* species at Coffee Bay, Transkei (32° S) with a barred color pattern and dark margins on the caudal lobes. Since it appears that *A. sexfasciatus* does not occur on the South African coast, Winterbottom's observation was probably of *A. natalensis*. Most literature for the southwestern Indian Ocean cannot be used for mainland records of *A. natalensis* or *A. sexfasciatus*. Most authors previous to Smith (1960), e.g. Gilchrist and Thompson (1917), Barnard (1927, 1947), confused *A. sexfasciatus*, *A. saxatilis* (Linnaeus), and probably *A. natalensis* under the names *Glyphidodon* or *Glyphisodon saxatilis* or *coelestinus*. *A. coelestinus* (Solander in Cuvier & Valenciennes) is a junior synonym of *A. sexfasciatus* (Allen et al. 1978, Hensley 1978). In his accounts of *A. sexfasciatus*, Smith (1960, 1961) apparently included *A. natalensis*. Thus, in both accounts he gives Durban as the southernmost locality record. Specimens from this locality were probably *A. natalensis*. It should be noted that the painting (Plate 29C) in Smith (1960) has coloration characteristic of *A. sexfasciatus*; there are 5 dark bars, dark caudal bands that are sharply defined from the central area of the fin, and light upper and lower caudal-fin margins. However, the dark bar on the caudal peduncle is contiguous with both caudal bands as in *A. natalensis*; this may be due to an artifact of preservation in the specimen used as the model or an error in the painting. We interpret this painting as being of *A. sexfasciatus*, since the remainder of the coloration is typical of that species.

Although *A. sexfasciatus* is found in all island groups of the southwestern Indian Ocean, including southern Madagascar and apparently islands of the Mozambique Channel (Fourmanoir 1957), the southern extent of its range on the coast of Africa is uncertain (Fig. 4). The specimen illustrated in Smith's (1960) Plate 29C is from Pinda, Mozambique (14° S); this is the southernmost record for this species on the African mainland. We do not know the northern or southern distributional limits of *A. natalensis* or *A. sexfasciatus*, respectively. Specimens identified as *A. sexfasciatus* have been collected from various localities along the Mozambique coast and were deposited at the J. L. B. Smith Institute of Ichthyology. Unfortunately, all of these specimens were lost during shipment to the senior author. Attempts to obtain specimens from Direccao Nacional de Pescas in Maputo, Mozambique were unsuccessful. Because we have no specimens from an area of sympatry, if indeed one exists, and because these 2 species are obviously closely related, it is possible that intergradation occurs along the Mozambique coast. If later collections from this area indicate intergradation, *A. natalensis* should be considered a subspecies of *A. sexfasciatus*.



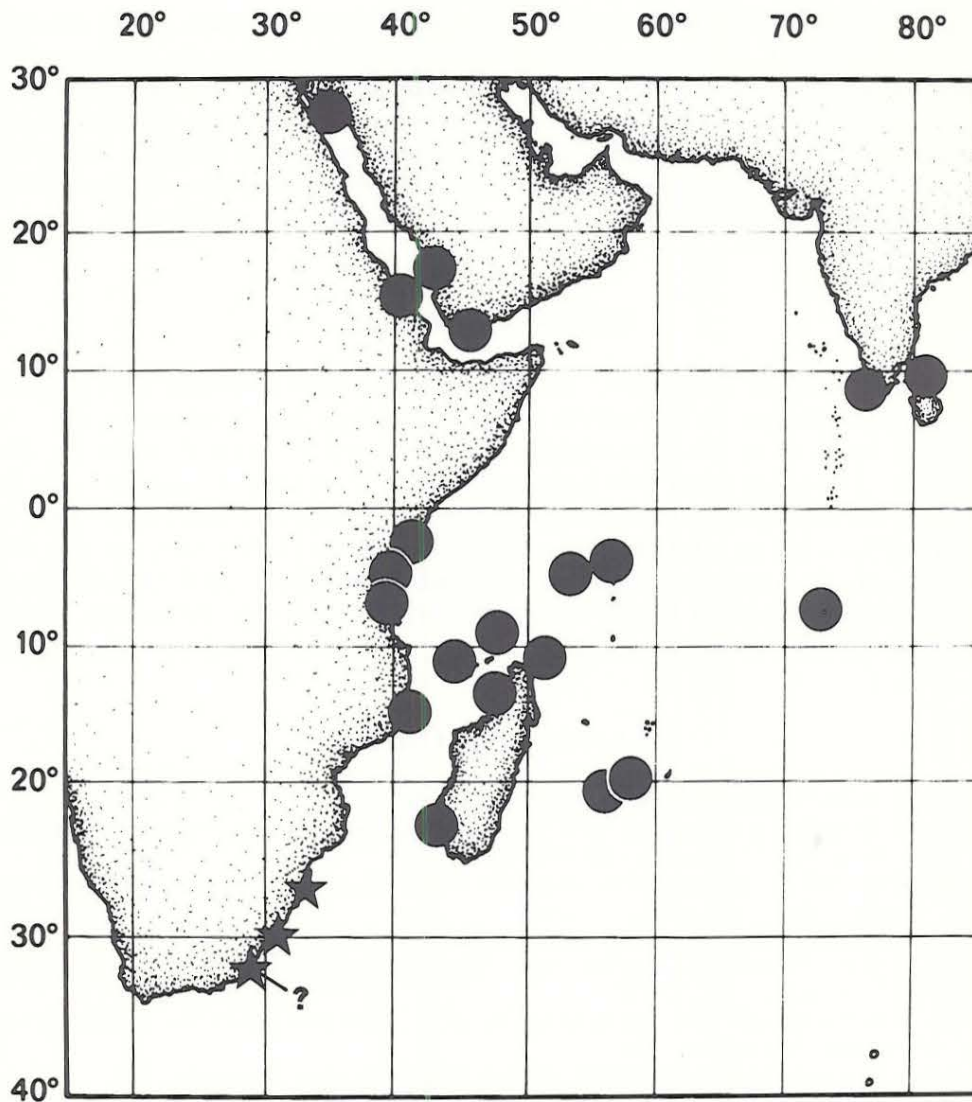


Figure 4. Distributions of *Abudefduf natalensis* (stars) and *A. sexfasciatus* (dots) in the western Indian Ocean.

### SUMMARY

*Abudefduf natalensis* n. sp. occurs on the east coast of South Africa. It is most closely related to *A. sexfasciatus* (*A. coelestinus* is a junior synonym), which is broadly distributed in the Indo-West Pacific from the Red Sea and East Africa to French Polynesia. It differs from *A. sexfasciatus* in having 4 dark, vertical bars (vs. 5), the posteriormost contiguous with a dark, longitudinal band on each caudal lobe (vs. posteriormost bar separate from band on lower lobe), in lacking light upper and lower margins on the caudal lobes, and in having a lower average number of gill rakers.

All literature records for *A. sexfasciatus* from the east coast of South Africa are probably referable to *A. natalensis*. As presently known, its range extends from near Boteler Point,

Kwazulu (27° S) to Durban (30° S), and, based on an unconfirmed observation, possibly to Coffee Bay, Transkei (32° S). The southernmost record for *A. sexfasciatus* along the African coast is Pinda, northern Mozambique (14° S). Thus, to what extent the ranges of these 2 species overlap, if at all, along the Mozambique coast is unknown. Due to the lack of specimens from the coast of Mozambique and the fact that these species are closely related, the possibility exists that intergradation between these forms occurs in this area. If later collections from this area indicate intergradation, *A. natalensis* should be considered a subspecies of *A. sexfasciatus*.

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