

STEGASTES; A SENIOR SYNONYM FOR THE DAMSELFISH GENUS *EUPOMACENTRUS*; OSTEOLOGICAL AND OTHER EVIDENCE, WITH COMMENTS ON OTHER GENERA

ALAN R. EMERY*

&

GERALD R. ALLEN†

ABSTRACT

Caribbean and Indo-Pacific damselfishes that are presently placed in the genus *Eupomacentrus* share diagnostic generic characters with Eastern Atlantic species of *Stegastes*. *Eupomacentrus* Bleeker, 1877 is therefore considered to be a junior synonym of *Stegastes* Jenyns, 1842. *Stegastes* is clearly separable from *Pomacentrus*, its most similar relative, on the basis of external morphology and osteology.

INTRODUCTION

The damselfishes (Pisces: Pomacentridae) have had a long history of confused generic limits, beginning with Linnaeus (1758) who placed *Abudefduf saxatilis* in the genus *Chaetodon*, and continuing to the last decades when taxonomists (e.g. Rivas, 1960) placed members of the genus *Eupomacentrus* (*sensu* Bleeker, 1877) into the genus *Pomacentrus* (originally described by Lacépède, 1892). In the course of investigations of type specimens of many pomacentrid fishes, we examined the holotype of *Stegastes imbricatus* Jenyns, 1842. This paper defends the position that the genera *Stegastes* and *Eupomacentrus* are synonymous.

MATERIALS AND METHODS

Osteological information was gathered from radiographs and specimens cleared and stained using trypsin and alizarin red. Skeletal drawings were made from a camera lucida image. A total of 250 specimens representing

* Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada.

† Western Australian Museum, Francis Street, Perth, Western Australia 6000.

94 species and 21 pomacentrid genera from the collections of the following institutions was examined: Academy of Natural Sciences (Philadelphia), Bernice P. Bishop Museum (Hawaii), British Museum of Natural History (London), California Academy of Sciences (San Francisco), Department of Agriculture Stock and Fisheries (Papua-New Guinea), Field Museum of Natural History (Chicago), Florida State Museum (Gainesville), J.L.B. Smith Institute of Ichthyology (Grahamstown, South Africa), Museum National d'Histoire Naturelle (Paris), Rosenteil School of Marine and Atmospheric Science (Miami), Royal Ontario Museum (Toronto), Smithsonian Oceanographic Sorting Centre (Washington, D.C.), National Museum of Natural History (Washington, D.C.) and Western Australian Museum (Perth).

We have also examined the holotype (BMNH 1917.7.14.45), 58.5 mm SL, of *Stegastes imbricatus* collected off Quail Island, Porto Praya, Cape Verde Islands by Charles Darwin aboard *Beagle*. In addition, we have studied numerous examples representing all known species of *Stegastes* (*sensu novum*). We are presently preparing a revision of this genus which contains approximately 35 species distributed mainly in the tropical eastern and western Atlantic, eastern Pacific and Indo-West Pacific faunal provinces.

Definition of *Eupomacentrus* Bleeker

Bleeker's original description of *Eupomacentrus* in 1877, based on the species *Chaetodon lividus* Bloch & Schneider, 1801, noted the following distinguishing features:

- 1 Maxillary teeth uniserial and truncate.
- 2 Scaled rostrum.
- 3 Suborbital bones and preoperculum serrated (only anterior three suborbital bones have serrae in type species).
- 4 Suboperculum edentate.
- 5 A single spine at the angle of the operculum.
- 6 Dorsal spines XII, rays 14 to 17.
- 7 Anal rays 12 to 14.

In the same publication, Bleeker stated that *Pomacentrus punctatus* and *P. albifasciatus* from the Pacific, and *P. fuscus* and *P. variabilis* from the Caribbean were referable to the new genus. He further remarked that the species *Pomacentrus pictus* which ' . . . M. de Castelnau supposed could well be a variety of *Pomacentrus variabilis* appears to me more likely [to be] a species of *Glyphisodon*, in the subgenus *Stegastes*.' (:73 — translation). Bleeker, therefore, inferred a close relationship between *Stegastes* and *Eupomacentrus*.

Definition of *Stegastes* Jenyns

Jenyns (1824) described *Stegastes* based on the species *S. imbricatus* and included the following characters which correspond to those Bleeker later used to define the genus *Eupomacentrus*:

- 1 Maxillary teeth all uniserial.
- 2 Rostrum scaled.
- 3 Suborbital bones and preoperculum denticulated.
- 4 Suboperculum denticulated.
- 5 Opercle unarmed (Jenyns noted in his description of *imbricatus* that '... The opercle terminates posteriorly in a very obtuse angle, and shows some indication of two very minute flattened points which however do not project beyond the membrane').
- 6 Dorsal spines XII, rays 16.
- 7 Anal rays 12.

In his comments on the holotype of *S. imbricatus*, Jenyns stated that his new genus *Stegastes* was unlike *Pomacentrus* in having very scaly fins. It is true that *Stegastes* does have scaled fins, but this feature is also found in *Pomacentrus*. He also stated '... this genus further shows itself an affinity to *Glyphisodon*, in the filamentous prolongation of the first soft rays in the ventrals. This character is not, I believe, found in *Pomacentrus*.' However, in contrast to Jenyns' statement, species of *Pomacentrus* often possess ventral fins which are prolonged into a filament. Therefore, in view of the prevailing taxonomy of pomacentrids Jenyns was not justified in splitting *Stegastes* from *Pomacentrus*, at least not on the basis of the characters he presented. Thus, his recognition of this discrete generic unit was really 'accidental'.

Although the original definitions of *Eupomacentrus* and *Stegastes* include the presence of only 12 dorsal spines, a number of Indo-Pacific species have subsequently been assigned to this group which have 13 spines and one species, *S. gascoynei*, has 14 dorsal spines (Allen, 1975, chapter on *Eupomacentrus*).

Glyphisodon was described by Lacépède (1802, type species = *G. moucharra*) and since then numerous species have been referred to this genus (e.g. Cuvier & Valenciennes, 1830). Recently, the name has been recognised as a junior synonym of *Abudefduf* (Forsskal, 1775). It would appear that Jordan & Seal (1906), in their review of the fishes of Samoa, were among the first to adopt *Abudefduf* as a general synonym for Lacépède's name. The replacement of *Glyphisodon* by *Abudefduf* was first resisted not only on taxonomic grounds, but on etymological principles. Ogilby (1913), for instance, stated '... I am unable to accept Forsskal's *Abudefduf*, both because of its manifest barbarity, and ... [because Forsskal] employed it as a stop-gap measure until he should decide on a more suitable name.' Still, *Abudefduf* has been widely accepted by recent workers (Allen, 1975). Both

Jenyns (1842) and Bleeker (1877) suggested a close relationship between *Glyphisodon* (= *Abudefduf*) and *Stegastes*. *Abudefduf* as currently recognised is, however, easily separated and very distinct from *Stegastes*. In contrast to *Stegastes*, *Abudefduf* has: no serrations on the suborbitals, preopercle or subopercle; notched teeth in the upper jaw, and a colour pattern usually composed of dark vertical bars on a paler background.

The genus most easily confused with *Eupomacentrus-Stegastes* is *Pomacentrus* Lacépède. Bleeker (1877) gave an accurate definition of the latter genus which is generally followed by current taxonomists. Using his definition *Pomacentrus* is restricted to those species having two rows of teeth in the upper jaw (the second a row of small, inner buttress teeth), a notch in the suborbital series, and 13 to 14 dorsal spines. Thus, the two can be separated with no overlap.

Bleeker's suggestion that '*Pomacentrus pictus*' belonged in Jenyns' genus *Stegastes* is surprising. This Brazilian species and its Caribbean geminate *Stegastes partitus* are essentially equivalent to Bleeker's description of *Eupomacentrus*. Had Bleeker examined Jenyns' specimens, he would have been unlikely to have created the genus *Eupomacentrus*. The only readily recognisable difference (one not mentioned by Bleeker) between the *partitus-pictus* pair and other species of *Stegastes* is the presence of three instead of four rows of cheek scales respectively. It is our opinion that both *partitus* and *pictus* belong in the genus *Stegastes*.

Osteology

In the course of osteological investigations of damselfishes, differences in the number and arrangement of predorsal bones were observed. The most common number of predorsal bones in damselfishes is three, although one or two predorsals also occur. A single predorsal bone (as occurs in *Pristotis* and *Teixeirichthys*) may be the result of a fusion of all three elements, or may represent the enlargement of a single bone following loss of the other two (Fig. 1B). The number of predorsal bones is usually consistent within a damselfish genus, although three exceptions have been noted to date: *Neopomacentrus* normally has three predorsal bones, but the single specimen examined of *N. cyanomos* had only two; *Amphiprion* is quite variable with specimens of *A. ocellaris* having either three or two predorsal bones (the characteristic of having two predorsal bones therefore is not unique to *Premnas* in the Amphiprioninae as Allen, 1972, suggested); *Pomacentrus* includes species that have two predorsal bones.

The pattern of interpenetration of the predorsal bones between the neural spines of anterior vertebrae is quite consistent within a genus. Where three predorsal bones are present, the penetration of the first bone is into the

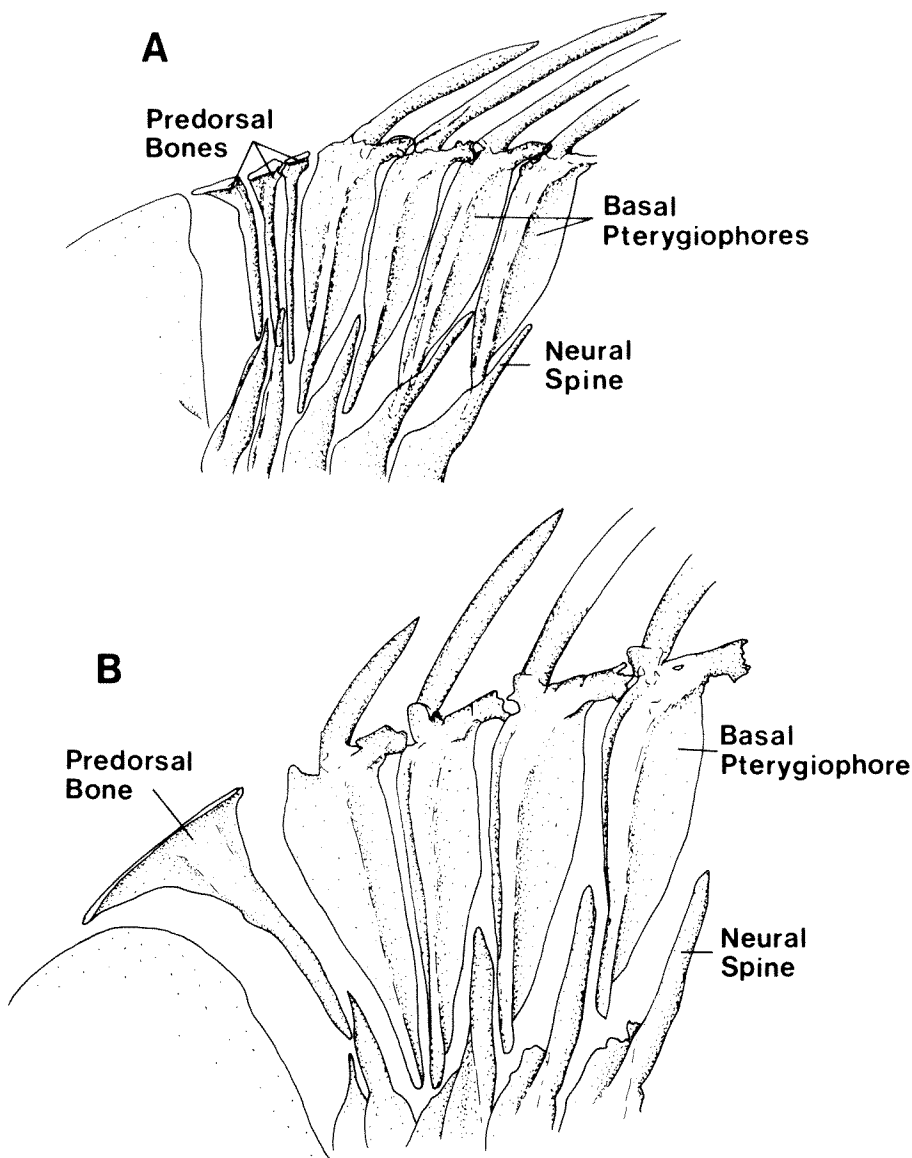


Fig. 1: The predorsal bone and pterygiophore interpenetration of the interspaces formed by the vertebral neural spines in two species of damselfishes (A — *Stegastes variabilis*; Caribbean. B — *Pristotis jerdoni*; Indo-west Pacific). Predorsal bones in A penetrate the first three spaces (coded 1,1,1); in B the single predorsal bone penetrates the second space only (coded 0,1,0). Pterygiophores in A penetrate spaces singly, beginning with the third space (coded 0,0,1,1,1 . . .); in B two pterygiophores penetrate the third space, but penetrate singly thereafter (coded 0,0,2,1,1 . . .).

space between the cranium and first neural spine, the second bone penetrates between the first and second neural spine, and the third penetrates between the second and third neural spine. The arrangements of the interpenetration can be expressed as 1,1,1; or 1,2,0; or 0,2,1. We know of no other combinations. When there are two predorsal bones they seem consistently to penetrate the first two interspaces (1,1,0). Where there is a single predorsal bone (*Pristotis*, *Teixeirichthys*) the pattern is 0,1,0 (Fig. 1B).

Pterygiophores also interpenetrate the spaces between neural spines, but beginning at the third interspace. Only two pterygiophore patterns have been found in pomacentrids: 0,0,2,1,1,1 . . . 0,0,1,2,1,1 . . . (Fig. 1A, B). The pattern in *Stegastes* and *Abudefduf* is: predorsal bones 1,1,1; pterygiophores 0,0,2,1,1 . . . (Table 1). A total of 13 genera were found to have a pterygiophore interpenetration of 0,0,2,1,1,1 . . . , while eight genera have a pattern of 0,0,1,2,1,1 . . . The combination of predorsal and pterygiophore patterns for various pomacentrid genera are listed in Table 1.

Table 1: Summary of the predorsal bone number and predorsal bone and pterygiophore interpenetration with the interspaces formed by vertebral neural spines for various pomacentrid genera (see text and figures for the explanation of the code used).

Pterygiophore Predorsal Bones	0,0,1,2,1,1 . . .	0,0,2,1,1,1 . . .					Number of species examined
	1,1,1	1,1,1	1,2,0	0,2,1	1,1,0	0,1,0	
Genus							* = monotypic
Amphiprion		x			x		4
Neopomacentrus		x			x		4
Dischistodus		x					3
Paraglyphidodon		x					2
Pomacentrus		x	x		x		28
Amblyglyphidodon		x					1
Hemiglyphidodon		x					1*
Cheiloprion			x				1*
Chrysiptera				x			4
Acanthochromis					x		1*
Premnas					x		1*
Teixeirichthys						x	1*
Pristotis						x	1*
Stegastes	x						17
Chromis	x						10
Plectroglyphidodon	x						3
Abudefduf	x						2
Mecaenichthys	x						1*
Dascyllus	x						4
Lepidozygus	x						1*
Microspathodon	x						1

SUMMARY

We conclude that the status of the above mentioned genera is as follows:

Abudefduf Forsskal, 1775 (valid)

Glyphisodon Lacépède, 1802 (= *Abudefduf*)

Stegastes Jenyns, 1842 (valid)

Pomacentrus Lacépède, 1802 (valid)

Eupomacentrus Bleeker, 1877 (= *Stegastes*)

The gender of *Stegastes* and of *Eupomacentrus* are both masculine, thus no change is required in the endings of trivials of the binomen when species formerly placed in *Eupomacentrus* are referred to *Stegastes*.

ACKNOWLEDGEMENTS

We give special thanks to the following people who have made substantial contributions in criticising early drafts of the manuscript: Dr R. Winterbottom, Dr E.J. Crossman (both of the Royal Ontario Museum, Toronto), and Dr J.E. Randall (Bernice P. Bishop Museum, Hawaii). Mrs C.J. Allen prepared the final typescript.

Because the pomacentrids represent a large and diverse group of tropical and subtropical species with many easily investigated ecological and behavioural characteristics, they have been popular subjects for investigation by non-systematists. We appreciate the many suggestions we have received from these scientists and have weighed them carefully in coming to the decision suggested here.

REFERENCES

- ALLEN, G.R. (1972)—*The anemonefishes, their classification and biology*. Neptune City, N.J.: T.F.H. Publications.
- ALLEN, G.R. (1975)—*Damselfishes of the South Seas*. Neptune City, N.J.: T.F.H. Publications.
- BLOCH, M.E. (1801)—*M.E. Blochii systema ichthyologiae iconibus ex illustratum. Post orbitum . . . opus . . . interpolavit J.G. Schneider*. Berlin.
- BLEEKER, P. (1877)—Mémoire sur les chromides marins ou pomacentroïdes de l'Inde Archipelagique. *Natuurk. Verh. holland. Maatsch. Wet. Haarlem* 2 (6): 1-116.
- CUVIER, G. & VALENCIENNES, A. (1830)—*Histoire naturelle des poissons*. Vol. 5. Paris: F.G. Leureaux.

- FORSSKAL, P. (1775)—*Descriptiones animalium: avium, amphibiorum, piscium, insectorum, vermium; quae in itinere oreintali observavit P. Forsskål. . . edidit C. Niebuhr.* Havniae: Möller.
- JENYNS, L. (1842)—*The zoology of the voyage of H.M.S. Beagle, under the command of Captain Fitzroy R.M. during the years 1832 to 1836. Part IV. Fish.* London: Smith, Elder.
- JORDAN, D.S. & SEALE, A. (1906)—The fishes of Samoa. Description of the species found in the archipelago, with a provisional checklist of the fishes of Oceania. *Bull. Bur. Fish., Wash.* no. 25: 173-455.
- LACÉPÈDE, G.B. (1802)—*Histoire naturelle des poissons.* III. Paris: Plassan.
- LINNAEUS, C. (1758)—*Systema naturae sive regna tria naturae systematice proposita per classes, ordines, genera et species.* Volume 1. 10th ed. Holmiae: Laurentius Salvius.
- OGILBY, J.D. (1913)—On six new or rare Queensland fishes. *Mem. Qd Mus.* 2: 81-89.
- RIVAS, L.R. (1960)—The fishes of the genus *Pomacentrus* in Florida and the western Bahamas. *Q. Jl Fla Acad. Sci.* 23: 130-163.