

# Notes on the genus *Amphiprion* Bloch & Schneider, 1801 (Teleostei: Pomacentridae) and its host sea anemones in the Seychelles

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The genus *Amphiprion* Bloch & Schneider, 1801, is represented in the Seychelles by two species, *A. akallopisos* Bleeker, 1853, and the endemic *A. fuscocaudatus* Allen, 1972.

Throughout its distributional range *Amphiprion akallopisos* has exclusively been recorded to associate with the clownfish anemones *Heteractis magnifica* (Quoy & Gaimard, 1833) and *Stichodactyla mertensii* Brandt, 1835. During the Netherlands Indian Ocean Programme (NIOP) Seychelles Expedition 1992-1993 this was confirmed for the Seychelles, although the species was predominantly found with *H. magnifica*, the most common host anemone in the islands.

So far, *Amphiprion fuscocaudatus* had exclusively been reported as a symbiont of *Stichodactyla mertensii*. During the NIOP Seychelles Expedition three additional hosts were recorded: *Entacmaea quadricolor* (Rüppell & Leuckart, 1828), *Heteractis aurora* Quoy & Gaimard, 1833 (a smooth tentacled form) and *S. haddoni* (Saville-Kent, 1893).

The two *Amphiprion* species occurring in the Seychelles seem hardly competitive. *A. akallopisos* predominantly associates with *Heteractis magnifica*, whereas *A. fuscocaudatus* associates with at least four other, less common anemone species.

It is striking that *Heteractis crispa* (Ehrenberg, 1834), the second common host anemone in the Seychelles, was never found associated with fish excepting juvenile *Dascyllus trimaculatus* Rüppell, 1829, while elsewhere in its range it associates commonly with an array of *Amphiprion* spp.

## Introduction

In a recent, authoritative field guide on the anemonefishes and their hosts, Fautin & Allen (1992; a revised edition is in press, Fautin pers. comm.) provide descriptions and photographs of all known species of clownfish and host anemone, and they also list the known associations for each species. Unfortunately, the guide contains only marginal information on the frequency of these associations, although certain combinations are positively much more common than others and some are truly exceptional. It is true that the situation may differ somewhat from one geographical region to another, notably when the distributional ranges of fish and host anemone species do not fully overlap, but this does not change the general picture of which are usual and unusual associations.

Host specific and semi-host specific species invariably occupy the same host(s), or, if this is impossible due to the absence of such anemones or possibly to competition, they will simply be absent in a certain locality or region. The best example of this group is *Premnas biaculeatus* (Bloch, 1790) which associates exclusively with *Entacmaea quadricolor* (Rüppell & Leuckart, 1828), even though all 10 species of clownfish anemone currently recognized occur in its distributional range.

Other species, notably some members of the *Amphiprion clarkii*-complex, associate

with several anemone species. *Amphiprion clarkii* (Bennett, 1830) is the most widespread and least host specific representative of these generalists. It is known to associate with all 10 species of clownfish anemone (Fautin & Allen, 1992: 74). However, the frequency of these associations varies a great deal. Basing myself on my own experience in central and eastern Indonesia, I have observed it to associate most frequently with *Heteractis crispa* (Ehrenberg, 1834) and *H. aurora* Quoy & Gaimard, 1833, less so with *Entacmaea quadricolor*, *Stichodactyla mertensii* Brandt, 1835, and *Macrodactyla doreensis* (Quoy & Gaimard, 1833), only occasionally with *S. haddoni* (Saville-Kent, 1893) and *Heteractis malu* (Haddon & Shackleton, 1893), and never with *Cryptodendrum adhaesivum* Klunzinger, 1877, *H. magnifica* (Quoy & Gaimard, 1833) and *S. gigantea* (Forskål, 1775). Presumably this is because the anemone population in this region is so rich in species and individuals that symbiotic fishes don't generally have to resort to an obviously little appreciated species. This last-named qualification definitely applies to *C. adhaesivum*, which has never been recorded as host of a clownfish species other than *A. clarkii* (and which therefore may be referred to as an emergency host). The fact too that I never found *A. clarkii* associated with *H. magnifica* and *S. gigantea* might be a matter of its low appreciation of these anemones (ecologically or otherwise), but might also be due to their being the principal hosts of *A. ocellaris* Cuvier, 1830, one of the most competitive and territorial sympatric clownfish species.

The geographical ranges of the majority of host anemone species largely overlap and extend widely throughout the tropical Indo-West Pacific. Only two species, viz. *Heteractis malu* and *Macrodactyla doreensis* have a relatively restricted range and are absent from the Indian Ocean. The overall distribution of anemonefishes is by definition fully determined by the range of the host anemones, but unlike their hosts, the distribution of most fish symbionts is much more restricted, and especially in the periphery of the geographical range of the group as a whole, species are often confined to a limited area or a single archipelago or island. The actinian fauna of many of these areas is poorly known, even with respect to the conspicuous clownfish anemones. Hence it is plausible that our information on fish/host combinations in such areas is also imperfect. In this perspective one should view that Fautin & Allen (1992: 80) mentioned only a single host, *Stichodactyla mertensii* for the endemic Seychelles anemonefish, *Amphiprion fuscocaudatus* Allen, 1972. For that reason some special attention was paid to the occurrence of both clownfish anemones and fish symbionts in the Seychelles during the Netherlands Indian Ocean Programme (NIOP) Seychelles Expedition 1992-1993. For a general introduction to this expedition and a list of stations I refer to van der Land (1994a, 1994b). For a preliminary survey of the Actinaria, see den Hartog (1994).

### The situation in the Seychelles

#### Notes on the clownfish anemones

Observations made during the expedition revealed the presence of at least seven species of clownfish anemone in the Seychelles (cf. table 1). The newly recorded species are: *Stichodactyla haddoni*, *Entacmaea quadricolor*, *Heteractis aurora*, *H. magnifica*, *H. crispa*, and *Cryptodendrum adhaesivum*. Of these only *H. crispa* and *Cryptodendrum*

*adhaesivum* were not found to host anemonefish symbionts.

Table 1. Species of clownfish anemone in the Seychelles with number of specimens (in parentheses) and their depth ranges as recorded during NIOP Seychelles Expedition 1992-1993, with localities and station numbers.

Host anemone species	Depth range	Localities	Sta
<i>Cryptodendrum adhaesivum</i> (5)	3-15 m	St François/St François	792/792
<i>Entacmaea quadricolor</i> (2)	10-18 m	St François/St Joseph	792/759
<i>Heteractis magnifica</i> (many)	1-20 m	Moyenne/Platte	749/796
<i>Heteractis crispa</i> (24)	3-25 m	St François/Alphonse	792/789
<i>Heteractis aurora</i> (6)	3-15 m	St François/Poivre	792/797
<i>Stichodactyla mertensii</i> (9)	4-15 m	Moyenne/Poivre and St Joseph	749/754 and 767
<i>Stichodactyla haddoni</i> (1)	7 m	Platte	796

In the Seychelles specimens of *Heteractis crispa* and *H. aurora* were found to be smallish compared to their relatives in the central Indo-West Pacific and somewhat unusual in appearance. Specimens of *H. crispa* invariably show a beautiful, "frosted" tentacle pattern (predominantly grey or whitish, but sometimes with a pinkish cast) also reported from the Maldives (see e.g. Fautin & Allen, 1992: 31; Nahke & Wirtz, 1992). It is noticeable that this species was never found associated with fish symbionts except for juvenile *Dascyllus trimaculatus* Rüppell, 1829. This is striking as (with 24 specimens recorded during the NIOP Seychelles Expedition; table 1) it is the most common clownfish anemone in the Seychelles next to *H. magnifica* (the latter first of all being more numerous due to its often clonal character and not because it is more widely distributed in the islands) and as elsewhere in its wide range *H. crispa* generally hosts clownfish symbionts; Fautin & Allen (1992: 30-31) list no less than 14 species that have been recorded to associate with it.

Specimens of *Heteractis aurora* from the Seychelles are peculiar by the absence of the elevated crossbars so characteristic of this species and by the presence of a longitudinal stripe on the upper tentacular surface. Elsewhere I have never come across such specimens, but a photograph in Fautin & Allen (1992: 117) taken in Mauritius (Mascarenes; ca 1500 km south of the Seychelles) shows one of which a few tentacles bear faint indications of cross-bars (incorrectly referred to as *Macrodactyla doreensis*, a species which is absent in the Indian Ocean).

A comparable situation exists with regard to the Caribbean *Epicystis crucifer* (Le Sueur, 1817) (cf. Cairns et al., 1986: 179, col. pl. 6 figs 9-10), a species accommodated in the family Phymanthidae, which in several respects is closely similar to *Heteractis aurora*, and ecologically vicarious. This species too is usually characterized by tentacles with swollen cross-bars, but there is also a smooth-tentacled form. However, these two forms of *E. crucifer*, as well as more or less intermediate individuals, may be found side by side throughout the area of distribution (I have found them in localities as far apart as Curaçao and Bermuda), whereas in the Seychelles the smooth tentacled form of *H. aurora* seems to replace its widely distributed cross-barred counterpart.

Clownfishes and clownfish/host associations  
(figs 1-6)

Only two species of *Amphiprion*, namely *A. akallopisos* Bleeker, 1853, and *A. fuscocaudatus*, are known from the Seychelles and the outlying islands (Amirantes, Aldabra). For the records of these species and host/symbiont combinations encountered during the NIOP Expedition, see table 2.

The minimal recorded depths for each host anemone species and its fish symbionts was generally the same for host and fish (tables 1 & 2), except in the case of *Heteractis magnifica* and *Stichodactyla mertensii*. In the channel between St Anne and Moyenne, two offshore islets situated northeast of Mahé, the former species was found on the reef fringe of Moyenne, in water as shallow as about 1 m, whereas fish symbionts did not appear until 2-3 m depth, possibly due to relatively strong tidal movements of the surface layer, affecting anemones and fishes differently. The absence of fish symbionts in a (smallish) specimen of *S. mertensii* at about 4 m depth, if not by chance, may have been due to its size, and/or to its being situated on the more exposed east side of the islet.

Table 2. Documented records of clownfish anemones from the NIOP Seychelles Expedition 1992-1993. Phot. = photographic documentation only; Obs. = observation; A = adult, with standard length (SL) 60 mm or more; S = subadult, with SL less than 60 mm but exceeding 40 mm; J = juvenile, with SL less than 40 mm. Number of observed and collected anemone and fish specimens added in square brackets and parentheses, respectively.

A query-mark with the name *D. trimaculatus* indicates that the presence or absence of this species was not recorded.

Anemone species	RMNH Coel. no	Sta.	Locality	Depth	Symbiotic fish species	RMNH Pisces no
<i>Cryptodendrum adhaesivum</i>	18690 [1](1)	792	St François	12-15 m	none	—
	18691 [1](1)	792	St François	3 m	none	—
	18702 [2](1)	786	Alphonse	8 m	none	—
	18705 [1](1)	797	Platte	3-4 m	none	—
<i>Entacmaea quadricolor</i> (figs 2-3)	Phot. [1]	759	St Joseph	18 m	<i>A. fuscocaudatus</i>	[≥ 1S]
	Phot. [1]	792	St François	10 m	<i>A. fuscocaudatus</i>	[2 A]
<i>Heteractis magnifica</i> (fig. 1)	18700 (1)	739	Mahé	15 m	<i>A. akallopisos</i>	31815 [?](2S+2J)
	18707 (2)	605	Mahé	4 m	<i>A. akallopisos</i>	31811 [many](6A+2S+1J)
	Obs.	606	Moyenne	1-3 m	<i>A. akallopisos</i>	31812 [many](4A)
	18708 (1)	767	Poivre	10 m	<i>A. akallopisos</i>	31814 [?](1A)
	18710 (3)	749	Moyenne	1-3-m	<i>A. akallopisos</i>	31813 [?](2A)
	Phot.	—	Mahé	?	<i>A. akallopisos</i>	[≥ 1A]
	Phot.	747	St. Anne	10 m	<i>A. akallopisos</i>	[2A]
	Phot.	774	Desroches	15 m	<i>A. akallopisos</i>	[2A]
	Phot.	796	Platte	15 m	<i>A. akallopisos</i>	[≥ 1A]
	Phot.	796	Platte	20 m	<i>A. akallopisos</i>	[≥ 3A]
					+ <i>D. trimaculatus</i>	[ca 50A+S+J]
<i>Heteractis crista</i>	18670 [3](3)	767	Poivre	15-20 m	<i>D. trimaculatus</i> ?	—
	18672 [2](2)	792	St François	10-15 m	<i>D. trimaculatus</i> ?	—
	18697 [1](1)	792	St Francois	?	<i>D. trimaculatus</i>	[several]

	Obs. [1]	792	St François	3-4 m	<i>D. trimaculatus</i>	[few J]
	Obs. [1]	792	St François	3-4 m	none	—
	Phot. [1]	792	St François	10 m	<i>D. trimaculatus</i>	[8J]
	18692 [1](1)	797	Platte	4 m	<i>D. trimaculatus</i>	[ca 10J]
	18693 [2](2)	759	St Joseph	10 m	<i>D. trimaculatus?</i>	—
	18694 [4](4)	786	Alphonse	10-15 m	<i>D. trimaculatus?</i>	—
	18695 [1](1)	796	Platte	?	<i>D. trimaculatus?</i>	—
	18696 [1](1)	737	La Dique	12 m	<i>D. trimaculatus?</i>	—
	18698 [1](1)	739	Mahé	15 m	<i>D. trimaculatus?</i>	—
	Phot. [1]	789	Alphonse	25 m	none	—
	Phot. [1]	741	Mahé	10 m	none	—
	Phot. [1]	741	Mahé	12 m	none	—
	Phot. [1]	792	St François	10 m	<i>D. trimaculatus</i>	[ca 8-10J]
	Phot. [1]	796	Platte	7 m	<i>D. trimaculatus</i>	[1J]
<i>Heteractis</i>	18671 [1](1)	797	Platte	3 m	<i>A. fuscocaudatus</i>	31919 [1S+1J](1S+1J)
<i>aurora</i>	18699 [1](1)	783	Desnoefs	11-13 m	<i>A. fuscocaudatus</i>	[1J]
(fig. 6)	18687 [1](1)	796	Platte	10-15 m	<i>A. fuscocaudatus</i>	31818 [?](2J)
	18701 [1](1)	723	Bird Isl.	10 m	<i>A. fuscocaudatus</i>	31817 [?](2S)
	18704 [1](1)	792	St François	3 m	<i>A. fuscocaudatus</i>	[1S]
	Phot. [1]	767	Poivre	15 m	none	—
<i>Stichodactyla</i>	18703 [1](1)	723	Bird Isl.	12 m	<i>A. fuscocaudatus</i>	31816 [2A+3J](2A+3J)
<i>mertensii</i>	18709 [1](1)	749	Moyenne	4 m	none	—
(fig. 5)	18711 [1]	792	St François	?	<i>A. fuscocaudatus</i>	31821 [?](2J)
	Phot. [1]	754	St Joseph	15 m	<i>A. akallopisos</i>	[2A]
					+ <i>D. trimaculatus</i>	[≥ 6J]
	Phot. [1]	767	Poivre	15 m	<i>A. fuscocaudatus</i>	[2A]
					+ <i>D. trimaculatus</i>	[≥ 4J]
	Phot. [1]	792	St François	10 m	<i>D. trimaculatus</i>	[≥ 6J]
	Phot. [1]	—	Mahé	?	<i>A. fuscocaudatus</i>	[2A]
					+ <i>A. akallopisos</i>	[1J]
	Obs. [1]	786	Alphonse	?	<i>A. fuscocaudatus</i>	[?]
	Obs. [4]	796	Platte	10-15 m	<i>A. fuscocaudatus</i>	31820 [?](1A)
<i>Stichodactyla</i>	Phot. [1]	796	Platte	7 m	<i>A. fuscocaudatus</i>	[2A]
<i>haddoni</i> (fig. 4)						

*Amphiprion fuscocaudatus*.— This species is a member of the *Amphiprion clarkii*-complex, and as such it is not surprising that it associates in the Seychelles with at least four host anemone species and that it does not seem to favour *Heteractis magnifica* (although some members of the *A. clarkii*-complex do not avoid this anemone; see below). The striking absence of this species in *H. crispa* has already been discussed in the former chapter.

Five out of the six specimens of *Heteractis aurora* found during the expedition were associated with juvenile and semi-adult fishes only, undoubtedly in relation to the small size of the host anemones (with an estimated maximal size of 12 cm across the expanded oral disc). Occupation of *H. aurora* by juvenile and semi-adult fish symbionts is also well-known from the rest of the anemone's distributional range, and consequently the species has been termed a "nursery anemone" (e.g. Dunn, 1981: 107; Fautin, 1991: 37). However, in the central Indo-West Pacific the species may reach

considerable dimensions, up to at least 30 cm across the oral disc, and adult clownfishes are positively not rare in such sizeable anemones.

The moderate abundance of *Amphiprion fuscocaudatus* is definitely related to the relative sparsity of large, suitable host anemones. Large anemones belonging to *Entacmaea quadricolor*, *Stichodactyla mertensii* and *S. haddoni* were found to harbour one pair of adult fishes; in two specimens of *S. mertensii* a few juveniles were recorded in addition to one adult pair.

The three adult specimens that were collected (RMNH Pisces 31816 and 31820) measured 89, 89 and 96 mm in standard length.

One adult specimen was photographically documented to be attended by a small cleaner wrasse, identified as *Labroides dimidiatus* (Valenciennes, 1839) (Poivre, sta. 767, 15 m depth).

*Amphiprion akallopisos*.— Throughout its area of distribution this species associates only with *Stichodactyla mertensii* and *Heteractis magnifica*. In the Seychelles too it was exclusively found with these two hosts, though predominantly with *H. magnifica*. Only one pair was recorded to have occupied a specimen of *S. mertensii*, and a single additional juvenile was recorded in another specimen of the same species, in the company of a pair of adult *A. fuscocaudatus* (Mahé; cf. fig. 5).

The species proved relatively more common than *Amphiprion fuscocaudatus*, undoubtedly because its main host, *Heteractis magnifica*, in particular the clonal form (cf. Dunn, 1981: 45-46; and Fautin & Allen, 1992: 32-33), is by far the commonest clownfish anemone in the Seychelles both in surface cover and absolute numbers. Clones not rarely cover patches one meter or more in diameter. Such patches, depending on their size, often harbour small groups of fish symbionts, generally two or more adults and a few semi-adults and/or juveniles. Detailed countings were not made (cf. table 2), for one reason because small specimens are often obscured between the long tentacles of the host anemone.

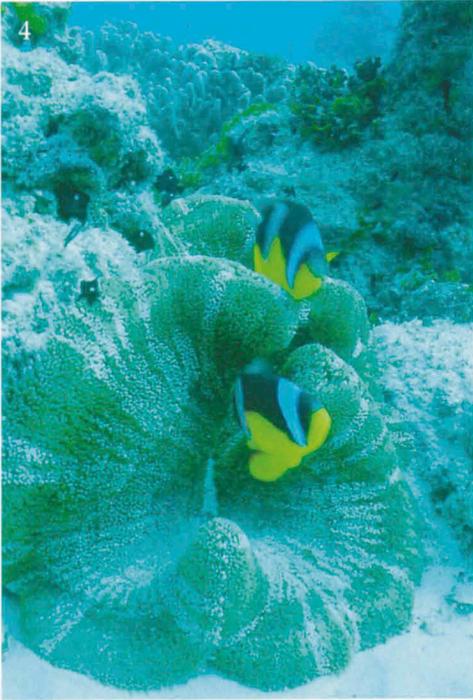
The largest specimen of *Amphiprion akallopisos* present in each of the four collected samples containing adults (RMNH Pisces 31811-31814) measured 80, 84, 85 and 86 mm in standard length.

*Amphiprion akallopisos* is widely distributed in the tropical Indian Ocean, ranging from the continental coast of Africa to the Andaman Islands, the Malay Peninsula, Sumatra, and Java (Fautin & Allen, 1992: 60), and eastward to at least south-east Sulawesi and Komodo (den Hartog & van Egmond, in prep.). However, its range seems discontinuous, no records being available from the continental coast of India and Pakistan, and from Sri Lanka, the Laccadives, Maldives, and Chagos Islands (Allen, 1972, 1974: 80; Fautin & Allen 1992: 60). Whether it is really absent from this region needs confirmation, but it seems likely that its only known hosts (*Heteractis magnifica* and *Stichodactyla mertensii*) do not occur along the predominantly non-reefal continental

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Figs 1-6. *Amphiprion* species of the Seychelles with their recorded hosts. Fig. 1. *Amphiprion akallopisos* with *Heteractis magnifica* (Platte, Sta. 796). Figs 2-6. *Amphiprion fuscocaudatus*; figs 2-3, with *Entacmaea quadricolor* (St Joseph Atoll, Sta. 7.59; St François, Sta 7.92); fig. 4, with *Stichodactyla haddoni* (Platte, Sta. 7.96); fig. 5, with *S. mertensii* (N Mahé, without sta. no; note juvenile of *A. akallopisos* to the left); fig. 6, with *Heteractis aurora* (Platte, Sta. 7.97; RMNH Pisces 31919 and RMNH Coel. 18671).

Figs 1, 3 & 4 by W. Kolvoort; figs 2 & 5 by J. Randall; and fig. 6, laboratory photo by author.



coast of India and Pakistan. Besides, potential stepping stones such as Sri Lanka, the Maldives, and the Chagos Archipelago (like the Seychelles with relatively low densities of host anemones compared to the central Indo-West Pacific) harbour more and/or other clown fish species than the Seychelles. Hence *A. akallopisos* may indeed be absent in these islands too as a result of competition, for instance with *A. nigripes*, a species which is assumed to associate exclusively with the principal host of the former, *H. magnifica* (although, being closely related to *A. akallopisos*, it seems quite possible that it also associates with *S. mertensii*). In this connection it is noteworthy that *A. chrysoaster* Cuvier, 1830, endemic of the Mascarenes and very similar to *A. fuscocaudatus*, unlike that species positively associates with *H. magnifica* (cf. Fautin & Allen, 1992: 70-71), possibly because *A. akallopisos* is absent in the Mascarenes.

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### References

- Allen, G., 1972. The anemonefishes: their classification and biology: 1-288, figs 1-131.— TFH Publications, Inc. Neptune City, New Jersey.
- Allen, G., 1974. The anemonefishes: their classification and biology (second edition): 1-352, figs 1-217.— TFH Publications, Inc. Neptune City, New Jersey.
- Cairns, S., J.C. den Hartog & C. Arneson, 1986. Class Anthozoa (Corals, anemones): 159-194, pls 46-58, col. pl. 5-7. In Sterrer (ed.) Marine Flora and fauna of Bermuda: i-xxx, 1-742, pls 1-228, col. pls 1-16.— John Wiley & Sons, New York, etc.
- Dunn, D.F., 1981. The clownfish sea anemones: Stichodactylidae (Coelenterata: Actiniaria) and other sea anemones symbiotic with pomacentrid fishes.— Trans. Amer. Phil. Soc. Philadelphia 71 (1): 1-115, figs 1-60.
- Fautin, D.G., 1991. The anemonefish symbiosis: What is known and what is not.— Symbiosis 10: 23-46.
- Fautin D.G. & G.R. Allen, 1992. Field guide to anemonefishes and their host sea anemones: i-viii, 1-157.— Western Australian Museum, Perth.
- Hartog, J.C. den, 1994. Sea anemones of the Seychelles. In: J. van der Land (ed.), Netherlands Indian Ocean Programme, Cruise Report 2, Oceanic Reefs of the Seychelles: 75-79.— National Museum of Natural History, Leiden.
- Land, J. van der (ed.), 1994a. Netherlands Indian Ocean Programme, Cruise Report 2, Oceanic Reefs of the Seychelles: 1-192, figs.— National Museum of Natural History, Leiden.
- Land, J. van der, 1994b. The 'Oceanic Reefs' Expedition to the Seychelles (1992-1993). In: J. van der Land (ed.), Results of the 'Oceanic Reefs' Expedition to the Seychelles (1992-1993) vol. 1.— Zool. Verh. 297: 5-36, figs 1-13.
- Nahke, P. & P. Wirtz, 1992. Unterwasserführer Malediven, Fische/Underwater guide Maldives, fish (second edition): 1-168, col. figs.— Verlag Stephanie Naglschmidt, Stuttgart.

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