A preliminary checklist of the cardinalfishes (Actinopterygii: Gobiiformes: Apogonidae) of Singapore

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ABSTRACT: We record the presence of 35 cardinalfish species from the marine waters of Singapore based on a review of existing literature and examination of museum specimens. Another 13 species previously recorded as occurring in Singapore are considered doubtful records. Five of the 35 species reported here (Apogon crassiceps, Apogonichthyoides timorensis, Jaydia lineata, Nectamia similis, and Siphamia tubifer) are new records for Singapore, while another four species have not been encountered in more than a century.

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INTRODUCTION

The family Apogonidae (cardinalfishes) is a circum-tropical group found primarily in marine environments. They are one of the largest groups of reef fishes in the Indo-Pacific, with about two-thirds of the 270 or so species known in the family being found there. Cardinalfishes are easily distinguished by their distinctly separate dorsal fins (with the first consisting of six to eight spines), two anal spines, relatively large eyes and mouth, and preopercle with a ridge preceding the margin. They are primarily nocturnal, and predominantly consist of micropredators or piscivores.

Despite its ubiquity in Indo-Pacific waters, the cardinalfishes of Singapore have been poorly studied, with the only comprehensive checklist being those of Bleeker (1860b), who recorded 30 species, and Fowler (1938), who recorded 32 species. The objective of this study is to reassess the status of Singapore's cardinalfish fauna with the view of producing an annotated checklist that incorporates recent changes to cardinalfish classification.

MATERIAL AND METHODS

The present checklist was compiled from the examination of museum specimens (deposited in the Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore), correspondence with local divers, as well as specimen-based records in the literature. Nomenclature and classifications of the fishes follow Mabuchi et al. (2014), with common names following those of Kuiter and Kozawa (2001). All material examined in this study is deposited in the Zoological Reference Collection, Raffles Museum of Biodiversity Research, Singapore (ZRC).

We consider records to be verifiable only if there is physical evidence such as specimen(s), drawing(s) or photograph(s) to substantiate the presence of a cardinalfish species in Singapore. Records based on specimens not readily identifiable as coming from Singapore, and those based on specimens of unknown provenance are considered separately in Table 1. We also did not use unpublished museum records for which the provenance of the specimens could not be identified (i.e. the specimens could have been purchased from markets or ornamental fish exporters, but not necessarily caught, in Singapore).

RESULTS

We record 35 species of cardinalfishes from Singapore waters, with another 13 species being considered doubtfully occurring (Table 1). Five species are recorded from Singapore for the first time: Apogon crassiceps, Apogonichthyoides timorensis, Jaydia lineata, Nectamia similis, and Siphamia tubifer. The degree of uncertainty surrounding the occurrence and identity of some of the cardinalfish species treated here renders further survey and study of Singapore’s cardinalfish fauna necessary.

Annotated checklist of the cardinalfishes of Singapore

1. Apogon crassiceps Garman, 1903.
   Dusky Red Cardinalfish
   Figure 1
   Material examined: ZRC 29504 (n=1); ZRC 40666 (n=2); Pulau Hantu.
   Remarks: Apogon crassiceps was described as having two scales between the lateral line and the first dorsal fin. Our specimen exhibits one large scale and one smaller scale between the lateral line and first dorsal fin, a character found in most members of the A. coccineus species complex (to which A. crassiceps belongs; Greenfield and Schaefer, 2001; Greenfield and Randall, 2004). This species is known from the eastern Andaman Sea to the Line and Tuamotu islands, and from Australia to Japan and the Ogasawara Islands (Allen and Erdmann 2012), and represents a new record for Singapore.
TABLE 1. Dubious records of cardinalfishes from Singapore.

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Apogonichthyoides taeniatus</em> (Cuvier, 1828)</td>
<td>Two-belt Cardinalfish</td>
<td>Known only from the Red Sea and western Indian Ocean (Gon and Randall 2003); record by Steindachner (1870) is likely misidentification of either <em>A. cantoris</em> or <em>A. timorensis</em></td>
</tr>
<tr>
<td><em>Jaydia poeciloptera</em> (Kuhl &amp; van Hasselt, 1828)</td>
<td>Pearly-finned Cardinalfish</td>
<td>Not encountered in Singapore waters since Károli (1882); likely misidentification of <em>J. lineata</em></td>
</tr>
<tr>
<td><em>Jaydia novaeguineae</em> (Valenciennes, 1832)</td>
<td>New Guinea Cardinalfish</td>
<td>Not encountered in Singapore waters since Bleeker (1860b); likely misidentification of <em>J. lineata</em> (see Gon 1996)</td>
</tr>
<tr>
<td><em>Ostorhinchus apogonoides</em> (Bleeker, 1856)</td>
<td>Plain Cardinalfish</td>
<td>Not encountered in Singapore waters since Károli (1882)</td>
</tr>
<tr>
<td><em>Ostorhinchus aureus</em> (Lacepède, 1802)</td>
<td>Ring-tail Cardinalfish</td>
<td>Record based on photograph of specimen purportedly from Singapore in Debelius (2001), who did not indicate Singapore as a locality from which photographs in the book were taken</td>
</tr>
<tr>
<td><em>Ostorhinchus chrysotaenia</em> (Bleeker, 1851)</td>
<td>High-fin Cardinalfish</td>
<td>Record by Khoo and Tay (1990) not substantiated by photographs or specimens; likely misidentification of <em>O. cavatensis</em></td>
</tr>
<tr>
<td><em>Ostorhinchus cyanosoma</em> (Bleeker, 1853)</td>
<td>Orange-lined Cardinalfish</td>
<td>Record by Low and Chou (1994) not substantiated by photographs or specimens; likely misidentification of <em>O. cavatensis</em></td>
</tr>
<tr>
<td><em>Ostorhinchus hoevenii</em> (Bleeker, 1854)</td>
<td>Flag-fin Cardinalfish</td>
<td>Weber and de Beaufort’s (1929) record not based on material</td>
</tr>
<tr>
<td><em>Ostorhinchus moluccensis</em> (Valenciennes, 1832)</td>
<td>Moluccan Cardinalfish</td>
<td>Not encountered in Singapore waters since Bleeker (1860a)</td>
</tr>
<tr>
<td><em>Ostorhinchus sealei</em> (Fowler, 1918)</td>
<td>Cheek-bar Cardinalfish</td>
<td>Record by Low and Chou (1992) not substantiated by photographs or specimens;</td>
</tr>
<tr>
<td><em>Ostorhinchus thermalis</em> (Cuvier, 1829)</td>
<td>Masked Cardinalfish</td>
<td>Weber and de Beaufort’s (1929) record not based on material</td>
</tr>
<tr>
<td><em>Pristiaphon fraenatus</em> (Valenciennes, 1832)</td>
<td>Tapered-line Cardinalfish</td>
<td>Species recorded as <em>Apogon melanorhynchos</em> by Bleeker (1858); none of extant Bleeker specimens of <em>A. melanorhynchos</em> agree with the illustration of <em>Amia melanorhynchos</em> in Bleeker (1875–76: Pl. 343, Fig. 1), which is that of <em>P. fraenatus</em> (see Fraser &amp; Lachner, 1985); record considered dubious due to uncertainty in identity and lack of corroborating material</td>
</tr>
</tbody>
</table>

Two-belt Cardinalfish

- *Apogon niger* (non Döderlein)—Ng et al. 1994: 326.

Material examined: ZRC 29503 (n=1); ZRC 40994 (n=2); Pulau Hantu. ZRC 35362 (n=1); ZRC 53656 (n=1); Pulau Semakau. ZRC 38119 (n=1); Labrador Beach. ZRC 53645 (n=1); Marina Bay. ZRC 53648 (n=1); Seletar River mouth. ZRC 7660 (n=1); Punggol.

Remarks: The assignment of this species in *Apogonichthyoides* follows that of Mabuchi et al. (2014).

Black Cardinalfish

- *Ostorhinchus niger* (Döderlein in Steindachner & Döderlein, 1883). Black-finned Cardinalfish
- *Ostorhinchus niger*—Gon 2000: 3.

Material examined: None. Material from Singapore listed in Gon (2000).

4. *Apogonichthyoides timorensis* (Bleeker, 1854).

Timor Cardinalfish

- *Ostorhinchus melas* (non Bleeker)—Tan et al. 2010: 139.

Material examined: ZRC 53595 (n=1); ZRC 53596 (n=1); Marina Bay.

Remarks: This species was previously misidentified as *A. melas* by Tan et al. (2010), but *A. timorensis* can be distinguished from *A. melas* in lacking (vs. having) the pale-edged black spot at the base of the second dorsal fin (Allen and Erdmann 2012). This is the first record of this species from Singapore.

- *Ostorhinchus timorensis* (Bleeker, 1854). Timor Cardinalfish
- *Ostorhinchus timorensis*—Tan et al. 2010: 139.

Material examined: ZRC 53595 (n=1); ZRC 53596 (n=1); Marina Bay.

Remarks: This species was previously misidentified as *A. melas* by Tan et al. (2010), but *A. timorensis* can be distinguished from *A. melas* in lacking (vs. having) the pale-edged black spot at the base of the second dorsal fin (Allen and Erdmann 2012). This is the first record of this species from Singapore.
5. *Archamia bleekeri* (Gunther, 1859). Bleeker’s Cardinalfish

*Figure 4.* *Archamia bleekeri*, ZRC 53655, 54.3 mm SL; Marina East. Photograph courtesy of Tan Heok Hui.

*Apogon macropterus* (*non* Cuvier)—Bleeker 1860b: 31, 48.
*Apogon lineolatus* (*non* Cuvier)—Weber and de Beaufort 1929: 347.
*Archamia lineolata* (*non* Cuvier)—Herre and Myers 1937: 25; Fowler 1938: 133.
*Archamia goni*—Gon and Randall 2003: 19; Allen and Erdmann 2012: 373.

Material examined: ZRC 53655 (n=2); ZRC 53657 (n=4); Marina East. ZRC 53589 (n=1); East Coast Park. ZRC 46479 (n=4); Pulau Ubin: Tanjong Chek Jawa. ZRC 36679–36681 (n=3); ZRC 41760 (n=1); ZRC 46538 (n=1); ZRC 46660 (n=1); ZRC 47805 (n=13); Changi Point beach.


*Cheilodipterus artus*—Gon 1993: 19; Ng 2009: 108; Heng and Lim, 2013: 65, Figs 2, 3.

Material examined: None. Material from Singapore listed in Gon (1993).

Remarks: Some of the records of this species from Singapore may be referable to *C. macrodon* instead (see remarks for that species).

7. *Cheilodipterus macrodon* (Lacepède 1801). Indian Tiger Cardinalfish

*Figure 5.* *Cheilodipterus macrodon*, ca. 30 mm SL infested with parasitic copepods; Sisters’ Islands. Specimen not preserved. Photograph courtesy of Eunice Khoo.

*Apogon melanurus* Bleeker 1860a: 454 (type locality: Singapore); 1860b: 48; Weber and de Beaufort 1929: 349; Russell *et al.* 2010: 95 (possibly synonym of *Cheilodipterus macrodon*).

*Cheilodipterus lineatus* (*non* Forsskål)—Bleeker 1860b: 47.
*Apogon macrodon*—Weber and de Beaufort 1929: 363.
*Amia melanurus*—Fowler 1938: 130.
*Cheilodipterus lineatus*—Fowler 1938: 134.

Material examined: None. Based on photographs taken in Singapore waters (Figure 5).

Remarks: The identification of this species is tentative, following the records by Bleeker (1860a, 1860b) and photographs of both juveniles and adults taken by divers in Singapore waters. It is possible that the records of this species in Singapore may refer to *C. artus* instead as both it and *C. macrodon* have a very similar color pattern. The only way to reliably distinguish the two is to count the developed gill rakers (11–15 in *C. artus* and 7–10 in *C. macrodon*; Gon 1993) or to observe the morphology of the posterior margin of the preopercle (smooth in *C. artus* and serrate in *C. macrodon*; Gon 1993). However, we were unable to obtain specimens from Singapore to verify if both species are present here. We retain the record of this species on the basis of a photograph illustrating a juvenile specimen (from Sisters’ Island; Figure 6) because it possesses a large caudal peduncle spot (the juveniles of *C. artus* have a small caudal peduncle spot; Gon 1993).

8. *Cheilodipterus quinquelineatus* (Cuvier in Cuvier & Valenciennes, 1828). Five-line Cardinalfish

*Figure 6.* *Cheilodipterus quinquelineatus*, ZRC 30661, 42.8 mm SL; Pulau Hantu.


Material examined: ZRC 38012 (n=1); Terumbu Pempang Tengah. ZRC 30661 (n=1); Pulau Hantu.


*Figure 7.* *Cheilodipterus singapurensis* Bleeker 1860a: 452 (type locality: Singapore); 1860b: 48; Weber and de Beaufort 1929: 360; Fowler 1938: 134; Russell *et al.* 2010: 95; Allen and Erdmann 2012: 378; Kwik 2012: 95.

*Cheilodipterus [sic] singapurensis*—Tan *et al.* 2010: 139.

Material examined: ZRC 53592 (n=1); Singapore Straits near Sentosa. ZRC 53597 (n=1); ZRC 53644 (n=1); Marina Bay.
10. *Fibramia amboinensis* (Bleeker, 1853).
Ambon Cardinalfish
Figure 8
Material examined: ZRC 53619 (n=4); Sungei Tengeh.
Remarks: This species is very similar to *F. lateralis*, but can be distinguished in having a short, dark lateral streak along the dorsal part of the flanks that the other species lacks. Some of the previous records of this species from Singapore may refer to *F. lateralis* instead, but we are unable to verify this.

11. *Fibramia lateralis* (Valenciennes, 1832).
Coastal Cardinalfish
Figure 9
*Amia ceramensis*—Bleeker 1871–76: 91; 1875–76: Pl. 336, Fig. 1
*Amia laterale*—Fowler 1938: 130 (Serangoon)
*Apogon lateralis*—Chua 2002: 108; Ng 2009: 108.
Material examined: ZRC 53684 (n=3); Raffles Marina. ZRC 2373 (n=23); Sungei Poyan. ZRC 2374 (n=6); Sungei Berih. ZRC 781 (n=52); Sungei Tengeh. ZRC 51087 (n=3); Sarimburn fence. ZRC 2372 (n=5); Sungei Kangkar. ZRC 26429–26433 (n=5); Sungei Sawa. ZRC 26160–26199 (n=40); Sungei Kranji. ZRC 2375 (n=7); Sungei Peng Siang. ZRC 30657–30658 (n=2); ZRC 32582–32588 (n=7); Pulau Hantu. ZRC 53147 (n=1); Pulau Semakau. ZRC 2371(n=1); Pulau Brani. ZRC 27157 (n=1); ZRC 27180 (n=1); Pulau Sakijang Bendera (St. John's Island). ZRC 7197–7203 (n=7); Punggol. ZRC 10525–10528 (n=4); Sungei Punggol. ZRC 1752 (n=54); Sungei Changi. ZRC 46517 (n=6); Pulau Ubin: Tanjong Chek Jawa.

12. *Fowleria variegata* (Valenciennes, 1832).
Variegated Cardinalfish
Figure 10
*Apogonichthys polystigma*—Bleeker 1860b: 31, 48; Fowler 1938: 133.
*Apogonichthys auritus* (non Valenciennes)—Herre and Myers 1937: 25; Tweedie 1940: 70.
Material examined: ZRC 2380 (n=4); ZRC 41008 (n=1); Sultan Shoal. ZRC 37455–37458 (n=4); Pulau Satumu (Raffles Lighthouse). ZRC 30481 (n=1); ZRC 36544 (n=1); Pulau Semakau.

Ten-bar Cardinalfish
Figure 11
Material examined: ZRC 53454 (n=1); Serangoon Harbour; between Pulau Ubin and Pulau Serangoon.
Remarks: We follow Russell *et al.* (2010) and Mabuchi *et al.* (2014) in considering *Jaydia* as a valid genus on the basis of the following synapomorphies outlined in Gon (1996): (1) preopercular edge and ridge weakly serrated; (2) uroneurals reduced or absent; (3) rounded caudal fin; (4) longest dorsal spine supported by third pterygiophore; (5) presence of light organ; and (6) eighth dorsal-spine pterygiophore separated or only partially fused to ninth pterygiophore. There is also support from molecular data for the monophyly of *Jaydia* (Mabuchi *et al.* 2006, 2014).

The single specimen of *Jaydia* obtained from Serangoon Harbour is identified as *J. lineata* (and not the very similar *J. novaeguineae*) following Gon (1996) on the account of the following characters: 15 pectoral-fin rays (*vs.* 16 in *J. novaeguineae*), 11 gill rakers on the lower limb of the first gill arch (*vs.* 9–10 in *J. novaeguineae*)
and 3 predorsal scales (vs. 4 in *J. novaeguineae*). This is a new record for Singapore, representing a considerable southward extension of its range (it is otherwise known only from China and Japan southwards to Taiwan; Gon 1996).


*Apogonichthys taeniopterus* Bleeker 1860b: 48 (type locality: Singapore); Russell et al. 2010: 94 (synonymy with *Apogon truncatus*).


*Apogonichthys elliottii*—Fowler 1938: 132.

Material examined: None. Based on Castelnau painting (Russell et al. 2010: Figs. 1 and 2).

Remarks: The description of *A. taeniopterus* was based on two paintings of a specimen collected from Singapore by Castelnau (illustrated in Russell et al. 2010: Figs. 1 and 2), which has been identified as *J. truncata* by Russell et al. (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860b).

15. *Lepidamia kalosoma* (Bleeker, 1852). Pinstripe Cardinalfish

*Figure 12. Lepidamia kalosoma*, ZRC 53594, 96.2 mm SL; Marina Bay. Photograph courtesy of Tan Heok Hui.

Remarks: This species was recorded from Singapore for the first time by Tan et al. (2010).


*Nectamia savayensis*—Fraser 2008: 33.

Material examined: None. Material from Singapore listed in Fraser (2008).

17. *Nectamia similis* Fraser, 2008. Ghost Cardinalfish

*Figures 13, 14*


*Amia bandanensis* (non Bleeker)—Fowler 1938: 128.

Material examined: ZRC 31694 (n=1); Pulau Salu.

Remarks: This species has been previously misidentified as *N. bandanensis*, which has a completely different color pattern consisting of two dark saddles with the absence of any pale bars on the body (Fraser 2008). This is the first record of this species from Singapore.

18. *Ostorhinchus cavitensis* (Jordan & Seale, 1907). Cavite Cardinalfish

*Figures 14, 15*


*Ostorhinchus cavitensis*—Allen and Erdmann 2012: 388; Heng and Lim 2013: 65, Fig. 1.

Material examined: ZRC 31726–31729 (n=4); Pulau Salu. ZRC 40985 (n=2); Terumbu Pempang Tengah. ZRC 7204 (n=1); ZRC 53609 (n=12); Punggol.

Remarks: The presence of this species in Singapore has been known for some time (Russell et al. 2010).

19. *Ostorhinchus chrysopomus* (Bleeker, 1854). Cheek-spot Cardinalfish


Material examined: None.

Remarks: Confirmation of the presence of this species in Singapore is based on an in situ photograph of a live individual from Singapore (Kuiter and Kozawa 2001).

20. *Ostorhinchus compressus* (Smith & Radcliffe, 1911). Blue-eyed Cardinalfish

*Figure 16*

*Apogonichthys macrophthalmus* Bleeker 1860a: 455
(type locality: Singapore); 1860b: 48; Fowler 1938: 132; Russell et al. 2010: 97 (nomen oblitum).
*Apogon macrophthalmus*—Weber and de Beaufort 1929: 350.

Material examined: ZRC 30522 (n=1); Singapore Straits. ZRC 31641–31643 (n=3); ZRC 31758–31759 (n=2); Pulau Salu.

21. **Ostorhinchus endekataenia** (Bleeker, 1852).
Many-striped Cardinalfish

*Apogon singapurensis* Bleeker 1860a: 454 (type locality: Singapore); 1860b: 48; Weber and de Beaufort 1929: 349; Russell et al. 2010: 96 (possibly synonym of *Apogon endekataenia*).
*Amia singapurensis*—Fowler 1938: 132.
*Ostorhinchus endekataenia*—Allen & Erdmann 2012: 391.
*Amia endekataenia*—Fowler 1938: 129.

Material examined: ZRC 41009 (n=2); Sultan Shoal. ZRC 30523 (n=1); Singapore Straits. ZRC 43368 (n=1); off Kusu Island. ZRC 53654 (n=1); Marina East. ZRC 10530 (n=1); Sungei Punggol. ZRC 53600 (n=7); Punggol.

22. **Ostorhinchus fasciatus** (White, 1790).
Australian Striped Cardinalfish


Material examined: None. Material from Singapore listed in Fraser (2005).

23. **Ostorhinchus margaritophorus** (Bleeker, 1854).
Pearly Cardinalfish

*Amia margaritophora*—Fowler 1938: 130 (Pulau Brani, Serangoon).

Material examined: ZRC 49710 (n=1); Johor Straits off Seletar Dam. ZRC 53649 (n=2); mouth of Seletar River. ZRC 47820 (n=8); Changi Point beach.

24. **Ostorhinchus novemfasciatus** (Cuvier in Cuvier & Valenciennes, 1828). Nine-line Cardinalfish


Material examined: None. Based on an in situ photograph of a live individual from Singapore waters (Kuiert and Kozawa 2001).

25. **Ostorhinchus pleuron** (Fraser, 2005). Rib-bar Cardinalfish

*Amia quadri fasciata* (non Cuvier)—Fowler 1938: 131, 261.

Remarks: The much more commonly encountered *O. pleuron* has often been misidentified as this species (see remarks for *O. pleuron*). It has not been encountered in recent surveys, with the last verified record dating from 1953 (Fraser 2005).


Material examined: ZRC 53682 (n=6); Raffles Marina. ZRC 30651–30656 (n=1); Pulau Hantu. ZRC 53182 (n=4); Pulau Semakau. ZRC 38132 (n=5); Labrador Beach. ZRC 41479 (n=1); Pulau Seringat. ZRC 7544–7561 (n=18); Punggol. ZRC 46478 (n=22); Pulau Ubin; Tanjong Chek Jawa. ZRC 47820 (n=8); Changi Point beach.

27. **Ostorhinchus pleuron** (Fraser, 2005). Rib-bar Cardinalfish

*Amia quadri fasciata* (non Cuvier)—Fowler 1938: 131, 261.

Material examined: ZRC 49710 (n=1); Johor Straits off Seletar Dam. ZRC 53649 (n=2); mouth of Seletar River ZRC 7205–7210 (n=6); Punggol. ZRC 40697 (n=1); ZRC 40698 (n=4); ZRC 47804 (n=2); Changi Point beach. ZRC 40298 (n=2); Johor Straits, northwest of Pulau Tekong Kechil.

Figure 16. *Ostorhinchus compressus*, ZRC 31758, 82.3 mm SL; Pulau Salu.

Figure 17. *Ostorhinchus endekataenia*, ZRC 53654, 50.1 mm SL; Marina East. Photograph courtesy of Tan Heok Hui.

Figure 18. *Ostorhinchus margaritophorus*, ZRC 53182, 27.4 mm SL; Pulau Semakau. Photograph courtesy of Tan Heok Hui.
Remarks: This species has often been misidentified as *O. quadrifasciatus* [itself a synonym of *O. fasciatus* (White, 1790)], but is distinguished from it in having the lower edge of the median dark stripe on the body developing into narrow vertical bars (vs. uniform), a pigmented (vs. unpigmented) roof of the mouth 15 (vs. 16) pectoral-fin rays, and 17–20 (vs. 14–17) well developed gill rakers (Fraser 2005).

26. **Ostorhinchus urostigmus** (Bleeker, 1874).
Spiny-head Cardinalfish

*Amia urostigma* Bleeker, 1874: 51 (type locality: Singapore).

Material examined: None.

Remarks: This species has not been recorded from Singapore since its original description.

27. **Pristicon rhodopterus** (Bleeker, 1852).
False Three-spot Cardinalfish

*Apogon rhodopterus* Bleeker 1852: 62 (type locality: Singapore); Bleeker 1860: 48; Herre and Myers 1937: 24; Randall and Fraser 1999: 624.

*Apogon trimaculatus* (non-Cuvier)—Weber and de Beaufort 1929: 335 (in part); Khoo and Tay 1990: 76; (?) Low and Chou 1992: 141; Ng *et al.* 1994: 326; Lim and Low 1998: 91

*Amia rhodoptera*—Fowler 1938: 132. (= part of *Apogon trimaculatus*)

**Pristicon rhodopterus**—Allen and Erdmann 2012: 407

Material examined: ZRC 31635–31640 (n=6); ZRC 31679–31682 (n=4); ZRC 31690–31693 (n=4); ZRC 31702–31712 (n=11); ZRC 31723–31725 (n=3); ZRC 36187–36188 (n=2); Pulau Salu. ZRC 45742 (n=2); off Pulau Satumu (Raffles Lighthouse). ZRC 38139 (n=2); patch reef west of Pulau Hantu. ZRC 29501–29502 (n=2); ZRC 40483 (n=1); Pulau Hantu. ZRC 17666 (n=1); Pulau Retan Laut. ZRC 31689 (n=1); Pulau Bukom. ZRC 40325 (n=1); Pulau Sakijang Bendera (St. John’s Island). ZRC 53612 (n=2); off Kusu Island.

Remarks: This species has sometimes been misidentified as *P. trimaculatus*, but can be distinguished from it in lacking (vs. having) a dark spot on the opercle (Randall and Fraser, 1999).

28. **Pristicon trimaculatus** (Cuvier, 1828).
Three-spot Cardinalfish


*Amia koilomatodon*—Fowler 1938: 130.

*Amia trimaculata*—Fowler 1938: 132.

Material examined: None. Material from Singapore listed in Randall and Fraser (1999).

Remarks: Material in the ZRC previously identified as this species have been reidentified as *P. rhodopterus* (see remarks for previous species).

29. **Pseudamia amblyuropterus** (Bleeker, 1856).
White-jaw Cardinalfish

*Cheilodipterus polystigma* Bleeker 1860a: 454 (type locality: Singapore); 1860b: 31, 48; Fowler 1938: 134; Russell *et al.* 2010: 94 (synonymy with *Pseudamia amblyuroptera*).

*Pseudamia polystigma*—Weber and de Beaufort 1929: 370.


*Pseudamia amblyuropterus*—Allen and Erdmann 2012: 408.

Material examined: None. Based on Castelnau painting (Russell *et al.* 2010: Fig. 3).

Remarks: The description of *C. polystigma* was based on a painting of a specimen collected from Singapore by Castelnau, which has been identified as *P. amblyuropterus* by Russell *et al.* (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860a).

Two-spot Urchin Cardinalfish

*Cheilodipterus polystigma* Bleeker 1860a: 454 (type locality: Singapore); 1860b: 31, 48; Fowler 1938: 134; Russell *et al.* 2010: 94 (synonymy with *Pseudamia amblyuroptera*).

*Pseudamia polystigma*—Weber and de Beaufort 1929: 370.


*Pseudamia amblyuropterus*—Allen and Erdmann 2012: 408.

Material examined: None. Based on Castelnau painting (Russell *et al.* 2010: Fig. 3).

Remarks: The description of *C. polystigma* was based on a painting of a specimen collected from Singapore by Castelnau, which has been identified as *P. amblyuropterus* by Russell *et al.* (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860a).

31. **Sphaeramia nematoptera** (Bleeker, 1856).
Pyjama Cardinalfish

**Cheilodipterus polystigma** Bleeker 1860a: 454 (type locality: Singapore); 1860b: 31, 48; Fowler 1938: 134; Russell *et al.* 2010: 94 (synonymy with *Pseudamia amblyuroptera*).

*Pseudamia polystigma*—Weber and de Beaufort 1929: 370.


*Pseudamia amblyuropterus*—Allen and Erdmann 2012: 408.

Material examined: None. Based on Castelnau painting (Russell *et al.* 2010: Fig. 3).

Remarks: The description of *C. polystigma* was based on a painting of a specimen collected from Singapore by Castelnau, which has been identified as *P. amblyuropterus* by Russell *et al.* (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860a).

Two-spot Urchin Cardinalfish

Material examined: ZRC 53540 (n=3); Pulau Hantu.

Remarks: This species is recorded in Singapore for the first time here.

31. **Sphaeramia nematoptera** (Bleeker, 1856).
Pyjama Cardinalfish

**Cheilodipterus polystigma** Bleeker 1860a: 454 (type locality: Singapore); 1860b: 31, 48; Fowler 1938: 134; Russell *et al.* 2010: 94 (synonymy with *Pseudamia amblyuroptera*).

*Pseudamia polystigma*—Weber and de Beaufort 1929: 370.


*Pseudamia amblyuropterus*—Allen and Erdmann 2012: 408.

Material examined: None. Based on Castelnau painting (Russell *et al.* 2010: Fig. 3).

Remarks: The description of *C. polystigma* was based on a painting of a specimen collected from Singapore by Castelnau, which has been identified as *P. amblyuropterus* by Russell *et al.* (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860a).

Two-spot Urchin Cardinalfish

Material examined: ZRC 53540 (n=3); Pulau Hantu.

Remarks: This species is recorded in Singapore for the first time here.

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*Pseudamia amblyuropterus*—Allen and Erdmann 2012: 408.

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Remarks: The description of *C. polystigma* was based on a painting of a specimen collected from Singapore by Castelnau, which has been identified as *P. amblyuropterus* by Russell *et al.* (2010). This species has not been encountered in Singapore waters since it was first recorded by Bleeker (1860a).

Two-spot Urchin Cardinalfish

Material examined: ZRC 53540 (n=3); Pulau Hantu.

Remarks: This species is recorded in Singapore for the first time here.
Material examined: None. Based on photographs taken in local waters (Heng and Lim 2013; Low 2013).

32. Sphaeramia orbicularis (Kuhl & van Hasselt, 1828). Polka-dot Cardinalfish

Figure 23. Sphaeramia orbicularis, ZRC 52531, 81.1 mm SL; Raffles Marina.

Material examined: None. Based on photographs taken in local waters (Heng and Lim 2013; Low 2013).

33. Taeniamia fucata (Cantor, 1849). Painted Cardinalfish

Figure 24. Taeniamia fucata, ZRC 29505, 53.7 mm SL; Pulau Hantu.

Material examined: ZRC 29505 (n=1); Pulau Hantu.

34. Yarica hyalosoma (Bleeker, 1852). Hump-backed Cardinalfish

Figure 25. Yarica hyalosoma, ZRC 29505, 91.0 mm SL; Seletar Wet Gap. Photograph courtesy of Tan Heok Hui.

Material examined: ZRC 54065 (n=1); Pulu Tan. ZRC 19631 (n=1); Pulau Ubin. ZRC 48416 (n=5); Pulau Ubin: mouth of Sungei Besar. ZRC 1762 (n=4); Sungei Changi.

35. Zoramia leptacantha (Bleeker, 1856). Long-spine Cardinalfish

Material examined: None. Based on a painting of a specimen collected from Singapore by Castelnau, which has been tentatively identified as Z. leptacantha by Russell et al. (2010).

Remarks: The description of A. arenatus was based on a painting of a specimen collected from Singapore by Castelnau, which has been tentatively identified as Z. leptacantha by Russell et al. (2010). Zoramia leptacantha has not been encountered in Singapore waters since the record by Bleeker (1860a).

Discussion

The record of 35 of cardinalfish species from Singapore waters represents about one quarter of the approximately 120 species found in the region (Randall and Lim 2000). This small number is largely a result of poor sampling, although it is worrying that four of the 35 species (11.4%) have not been encountered in Singapore in over a century. The strong association of many cardinalfish species to live coral (Gardiner and Jones 2005) and the vulnerability...
of coral reef habitats in Singapore to anthropogenic disturbance (Hoeksema and Koh 2009) does not bode well for the future of the cardinalfish fauna of Singapore.

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