

THE DRAGONETS OF SINGAPORE (ACTINOPTERYGII: PERCIFORMES: CALLIONYMIDAE)

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ABSTRACT. — The dragonets of the family Callionymidae from Singapore waters are reviewed in this study. Eight species of dragonets are recorded from Singapore based on museum material: *Callionymus enneactis*, *Callionymus erythraeus*, *Callionymus hindsii*, *Callionymus melanopterus*, *Callionymus sagitta*, *Callionymus schaapii*, *Dactylopus dactylopus*, and *Synchiropus lineolatus*. *Callionymus erythraeus* is a new record for Singapore, although it is unclear if this species is native here. *Synchiropus lateralis*, previously recorded from Singapore, is here considered to be absent from Singapore waters.

INTRODUCTION

The dragonets of the family Callionymidae are a group of benthic fishes that inhabit shallow marine waters no deeper than 900 m worldwide (Fricke, 2002). Most of the callionymid diversity is restricted to the circumtropical region, and according to the global checklist of dragonets by Fricke (2002), nine species are known to occur in Singapore: *Callionymus enneactis*, *Callionymus filamentosus*, *Callionymus hindsii*, *Callionymus melanopterus*, *Callionymus sagitta*, *Callionymus schaapii*, *Dactylopus dactylopus*, *Synchiropus lateralis*, and *Synchiropus lineolatus*. Most of these records are based on a handful of museum specimens, and a reappraisal of the status of Singapore's dragonets based on additional material is needed.

As part of the Comprehensive Marine Biodiversity Survey of Singapore, the status of the callionymid species found in Singapore waters is re-assessed and an annotated checklist based on museum specimens is presented here.

MATERIAL AND METHODS

The present checklist was compiled from the examination of museum specimens as well as authenticated sighting reports. All specimens listed were collected from Singapore. Unless stated specifically, sizes are given in standard length (SL), which is measured from the snout tip to the caudal base. Nomenclature and classification of the fishes follow Fricke (1983). Institutional abbreviations follow Ferraris (2007).

ANNOTATED CHECKLIST

Callionymus enneactis Bleeker, mangrove dragonet

Fig. 1

Material examined: SU 30665, 56 ex., 17.1–34.2 mm; Singapore. ZRC 36689–36690, 2 ex., 34.0–39.9 mm; ZRC 53140, 6 ex., 46.0–64.0 mm; Changi Beach. ZRC 7530–7539, 10 ex., 35.6–69.4 mm; Punggol. ZRC 30646, 2 ex., 23.6–31.8 mm; ZRC 40707, 1 ex., 42.1 mm; ZRC 41018, 1 ex., 32.2 mm; Pulau Hantu lagoon. ZRC 53173, 3 ex., 31.3–39.0 mm; ZRC 53294, 3 ex., 30.6–36.2 mm; Pulau Semakau. ZRC 41469, 1 ex., 29.4 mm; Pulau Seringat. ZRC 53292, 15 ex., 19.8–34.2 mm; Pulau Ular/Terumbu Bayan. ZRC 17612, 1 ex., 23.5 mm; Sentosa, northwestern shore.

Remarks: This species was originally described from Singapore and has been encountered in Changi, Cyrene Reef, Lazarus Island, Pulau Hantu, Pulau Semakau, Pulau Ular, Sentosa, Tanah Merah (Fig. 2). It is the only species known to be associated with muddy substrates. This species is distinguished from the other dragonets of Singapore in having a combination of a narrow snout, dark saddles on the body, and dark markings on the anal fin.



Fig. 1. *Callionymus enneactis*, ZRC 53173, 38.2 mm SL; Singapore; Pulau Semakau.

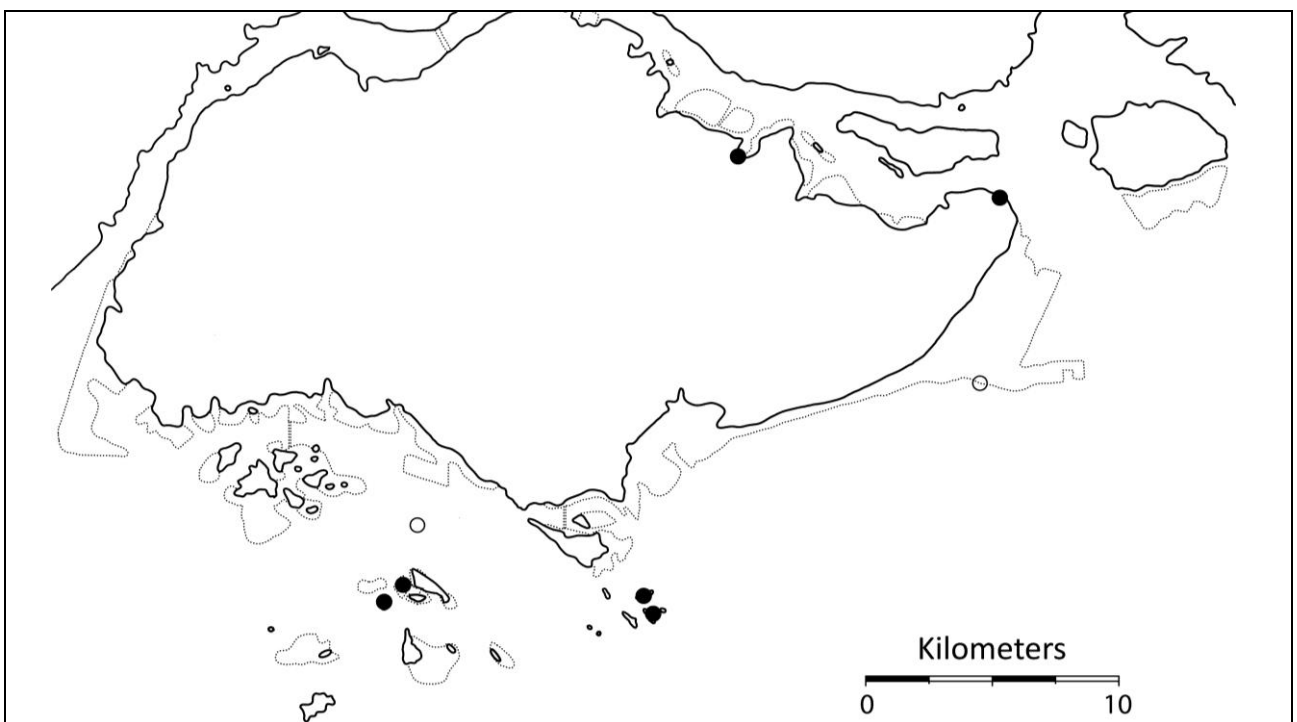


Fig. 2. Localities where *Callionymus enneactis* has been encountered. Open symbols indicate records from authenticated sightings, while closed symbols indicate records from specimens. Solid outline of Singapore indicates the original coastline, while dotted lines indicate the reclaimed coastline ca. 2010.

Callionymus erythraeus Ninni, smallhead dragonet
Figs. 3, 4

Material examined: ZRC 40675, 2 ex., 63.4–70.9 mm; ZRC 40707, 1 ex., 42.1 mm; ZRC 47815, 5 ex., 18.1–54.5 mm; ZRC 53287, 1 ex., 69.5 mm; ZRC 53295, 2 ex., 59.3–62.6 mm; ZRC 53296, 2 ex., 64.9–76.7 mm; ZRC 53297, 1 ex., 62.6 mm; ZRC 53336, 5 ex., 51.3–69.6 mm; ZRC 53337, 2 ex., 44.5–54.9 mm; ZRC 53338, 3 ex., 29.4–52.2 mm; Changi Beach. ZRC 53279, 1 ex., 74.1 mm; Punggol.

Remarks: This species has been encountered in Changi and Punggol (Fig. 5). Previously known only from the Persian Gulf and the Gulf of Mannar (Fricke, 2002), it is recorded from Singapore waters for the first time here. As it has not been previously recorded from this part of the world, its presence in Singapore might possibly have been from introductions via the discharge of ballast water from commercial shipping (R. Fricke, pers. comm.). As the first specimen from Singapore was obtained in 1968, this may represent an early introduction that has remained undetected. However, it is also possible that the species is native to the region, but had been overlooked as the marine fish fauna of Singapore has not been sampled adequately. This is also supported by the fact that other callionymid species (e.g., *Callionymus hindsii*) are known to have a similar distribution. Therefore, without evidence from more extensive surveys throughout the region, it is difficult to ascertain if this species is, indeed, an alien in Singapore.

Callionymus erythraeus has been collected syntopically with *Callionymus enneactis* and *Callionymus schaapii* at Changi Beach. It superficially resembles the latter species, but can be distinguished in lacking a distinct dark spot at the base of the pectoral fin (Figs. 3, 4) and vii,1 (vs. viii,1) anal-fin rays. It is otherwise distinguished from the other dragonets of Singapore in having a sharply delineated wavy line separating the colour pattern on the dorsal and ventral surfaces of the body, dark markings on the anal fin, and the first dorsal fin of males with elongate second, third, and fourth fin rays.

Callionymus hindsii Richardson, Hinds' dragonet
Fig. 6

Material examined: BMNH 1930.7.9.30–31, 2 ex., 40.0–44.8 mm; BMNH 1981.7.7.5, 1 ex., 38.5 mm: Singapore. ZRC 53274, 1 ex., 46.1 mm; Sungei Punggol.

Remarks: This species has been encountered in Punggol (Fig. 7). The Sungei Punggol has since been dammed and converted into a freshwater reservoir. This species is distinguished from the other dragonets of Singapore in the first dorsal fin having 3 (vs. 4) fin rays. It is additionally distinguished by the strongly depressed head and an extremely protractile upper jaw.



Fig. 3. *Callionymus erythraeus*, male (left) and female (right) from Changi Beach, Singapore. Male: ZRC 53295, 67.1 mm SL; female: ZRC 53297, 62.6 mm SL. Figures not to scale.



Fig. 4. *Callionymus erythraeus*, both male, ca. 60 mm SL, Changi Beach, showing live colouration. (Photographs by: Ria Tan).

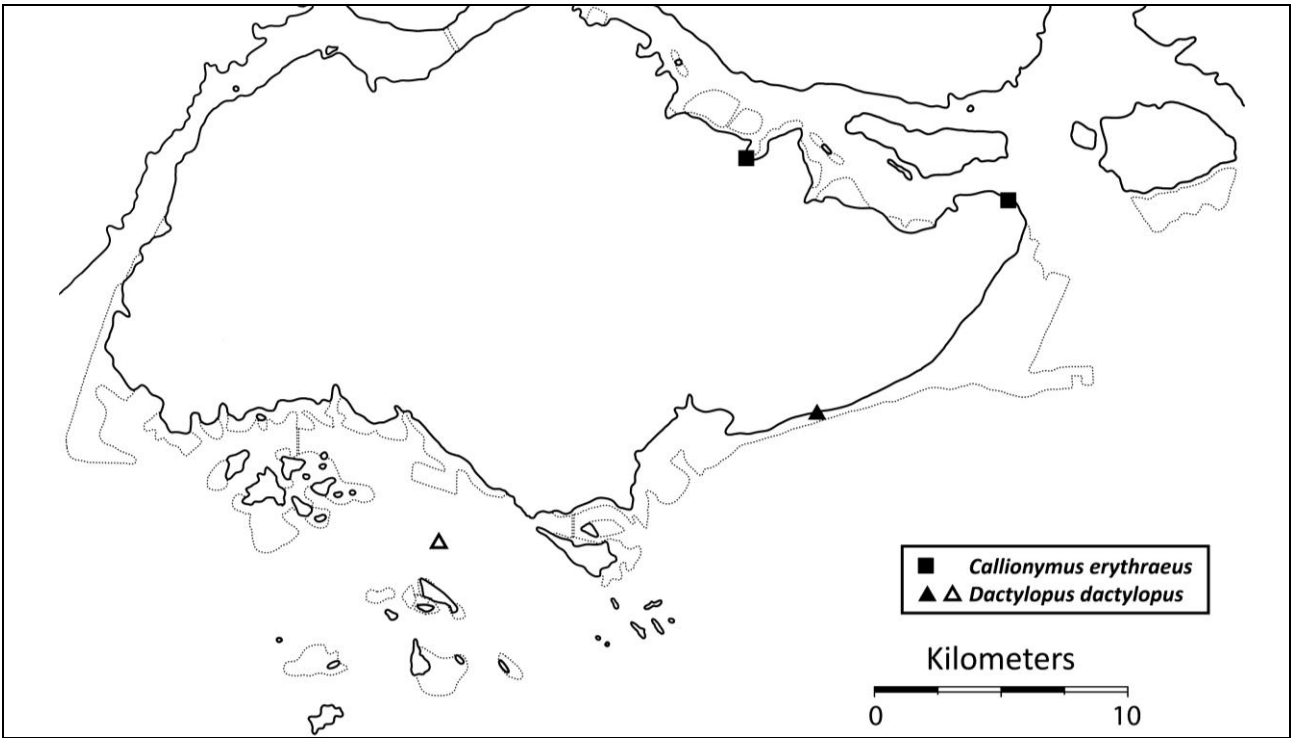


Fig. 5. Localities where *Callionymus erythraeus* and *Dactylopus dactylopus* have been encountered. Open symbols indicate records from authenticated sightings, while closed symbols indicate records from specimens. The solid outline of Singapore indicates the original coastline, while dotted lines indicate the reclaimed coastline ca. 2010.



Fig. 6. *Callionymus hindсии*, ZRC 53274, 46.1 mm SL; Singapore; Sungei Punggol.

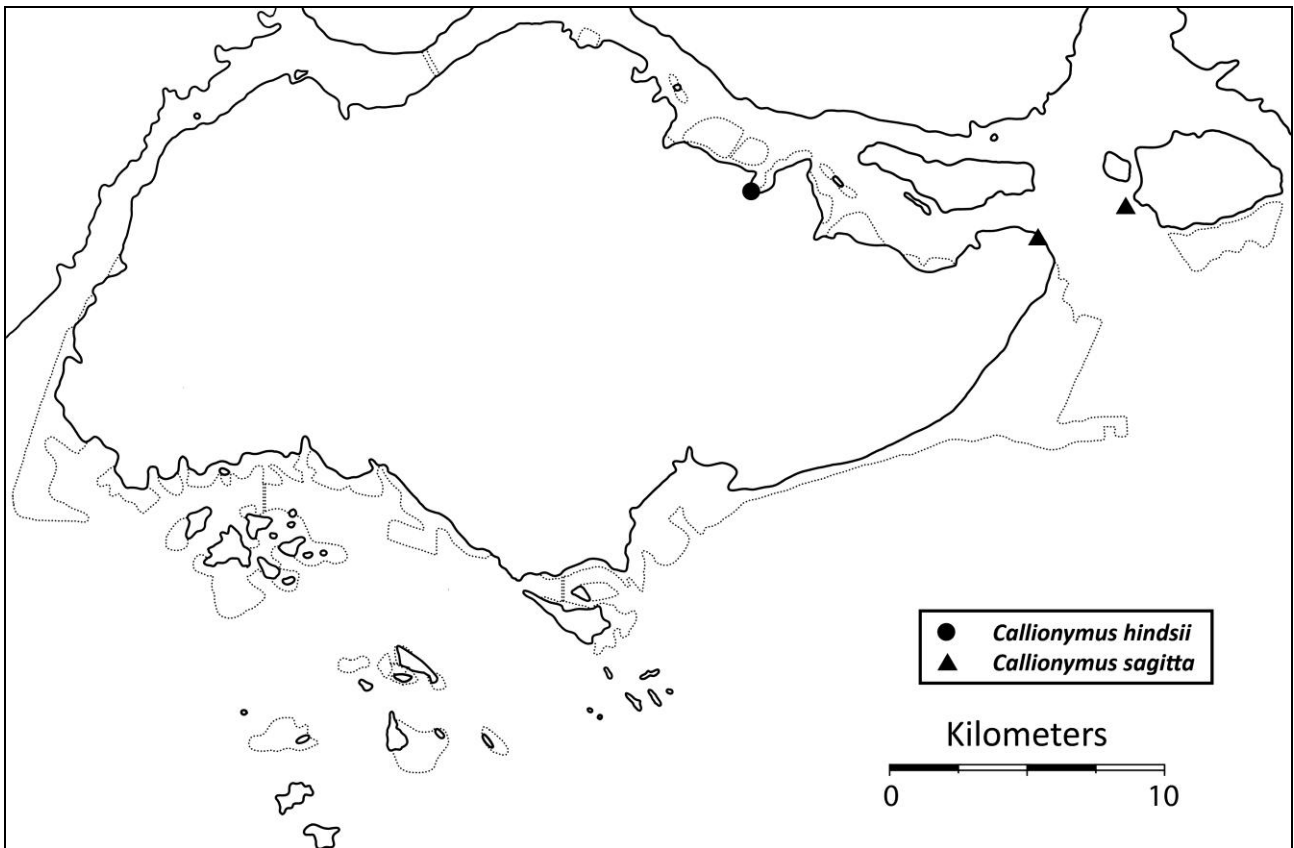


Fig. 7. Localities where *Callionymus hindsii* and *Callionymus sagitta* have been encountered. The solid outline of Singapore indicates the original coastline, while dotted lines indicate the reclaimed coastline ca. 2010.

Callionymus melanopterus Bleeker, blackfin dragonet

Fig. 8

Material examined: ZRC 7540–7541, 2 ex., 55.9–78.4 mm; ZRC 40569, 1 ex., 44.8 mm; ZRC 53281, 2 ex., 60.1–76.9 mm; ZRC 53282, 1 ex., 69.7 mm; Punggol. ZRC 40603, 1 ex., 29.9 mm; ZRC 53283, 2 ex., 67.1–73.8 mm; ZRC 53284, 1 ex., 57.5 mm; Sungei Punggol. ZRC 53288, 1 ex., 54.9 mm; Sungei Buloh. ZRC 53280, 5 ex., 46.2–62.6 mm; ZRC 53285, 2 ex., 47.4–54.8 mm; Sungei Seletar.

Remarks: This species has been encountered in Punggol, Sungei Buloh and Sungei Seletar (Fig. 9). Both the Sungei Punggol and Sungei Seletar have since been dammed and converted to freshwater reservoirs. This species is distinguished from the other dragonets of Singapore in having a combination of a distally dark first dorsal fin, distally dusky anal fin, the first dorsal fin with the first fin ray longest and not filamentous in males, a series of dark blotches on the sides of the body, and the absence of a distinct dark spot at the base of the pectoral fin.

Callionymus sagitta Pallas, arrow dragonet

Fig. 10

Material examined: SU 35688, 3 ex., 60.4–71.5 mm; Singapore. ZRC 41766, 1 ex., 75.6 mm; Changi Beach. ZRC 4277, 1 ex., 64.0 mm; off Pulau Tekong Besar.

Remarks: This species has been encountered in Changi and off Pulau Tekong Besar (Fig. 7). This species is distinguished from the other dragonets of Singapore in having the combination of a black or dark brown first dorsal fin that is lower than the second dorsal fin in both sexes, and a broadly triangular head.



Fig. 8. *Callionymus melanopterus*, ZRC 7541, 78.4 mm SL; Singapore: Punggol.

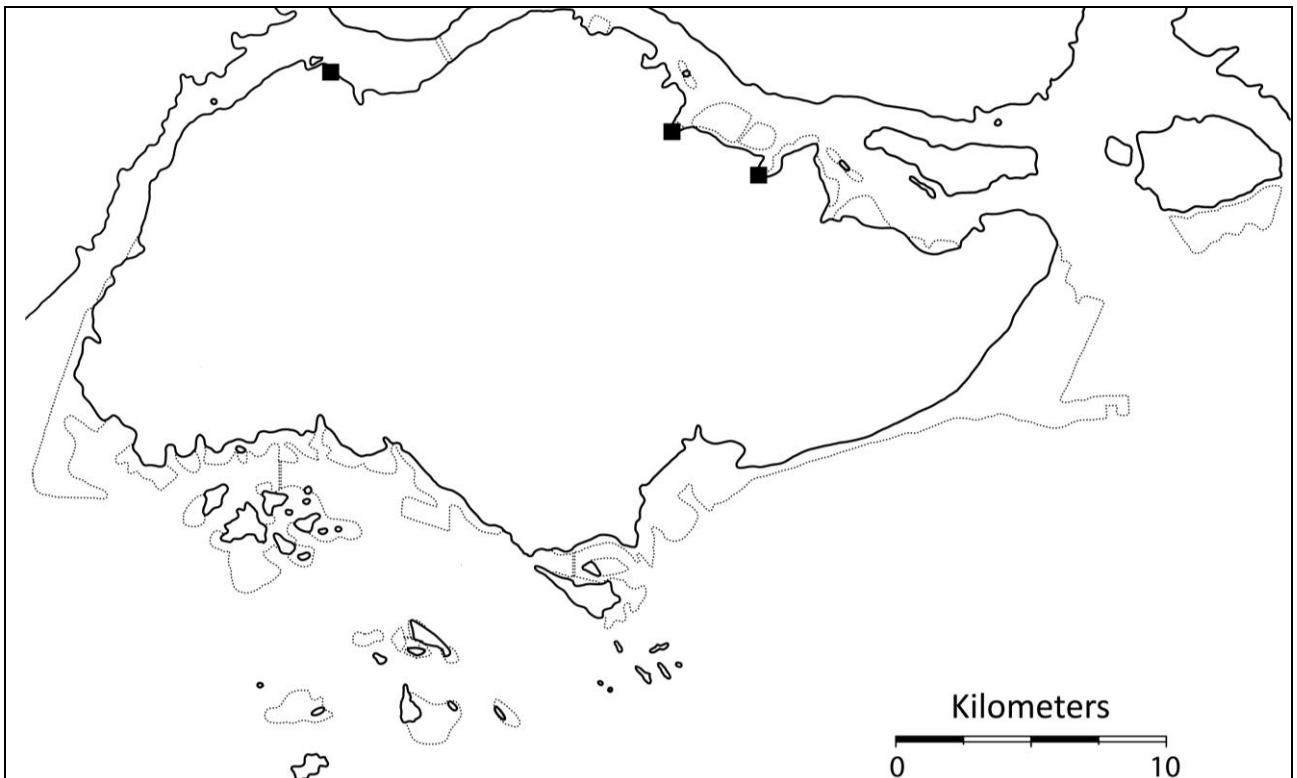


Fig. 9. Localities where *Callionymus melanopterus* have been encountered. The solid outline of Singapore indicates the original coastline, while dotted lines indicate the reclaimed coastline ca. 2010.



Fig. 10. *Callionymus sagitta*, ZRC 41766, 75.6 mm SL; Singapore: Changi Beach.

Callionymus schaapii Bleeker, short-snout sand-dragonet

Fig. 11

Material examined: ZRC 3509, 1 ex., 57.8 mm; ZRC 36684–36688, 5 ex., 39.4–64.0 mm; ZRC 40706, 3 ex., 42.8–63.4 mm; ZRC 47814, 3 ex., 64.0–71.4 mm; ZRC 53262, 4 ex., 55.8–70.1 mm; ZRC 53300, 1 ex., 39.9 mm; ZRC 53319, 1 ex., 59.3 mm; ZRC 53335, 3 ex., 38.5–68.1 mm; Changi Beach. ZRC 53306, 4 ex., 18.5–65.3 mm; Marina East (1°17'37"N, 103°53'38"E). ZRC 10564–10566, 3 ex., 60.4–64.9 mm; ZRC 53261, 1 ex., 62.9 mm; ZRC 53277, 3 ex., 60.3–69.5 mm; ZRC 53299, 1 ex., 48.3 mm; ZRC 53301, 2 ex., 55.4–68.8 mm; ZRC 53303, 1 ex., 66.6 mm; Punggol. ZRC 10564–10566, 3 ex., 60.4–64.9 mm; ZRC 53275, 6 ex., 52.9–73.1 mm; ZRC 53307, 3 ex., 49.7–62.8 mm; Sungei Punggol. ZRC 53276, 1 ex., 69.7 mm; Sungei Seletar. SU 39487, 1 ex., 40.0 mm; Siglap. ZRC 47884, 2 ex., 49.1–71.8 mm; Sungei Simpang Kanan, east bank at river mouth. ZRC 47970, 6 ex., 59.0–69.0 mm; Sungei Simpang Kanan, west bank near river mouth (1°27'9.8"N, 103°51'7.6"E).



Fig. 11. *Callionymus schaapii*, ZRC 53262, 70.1 mm SL; Singapore: Changi Beach.

Remarks: This species has been encountered in Changi, Marina East, Punggol, Siglap, Sungei Simpang and Sungei Seletar (Fig. 12). The collection locality at Siglap has since been reclaimed, and the one in Sungei Seletar has been dammed and converted into a freshwater reservoir. This species is distinguished from the other dragonets of Singapore in having a short snout, eyes situated close to each other, a series of dark blotches on the sides of the body, a distinct dark spot at the base of the pectoral spine, and the first three dorsal-fin rays filamentous in the males.

Dactylopus dactylopus (Bennett in Cuvier & Valenciennes), fingered dragonet
Fig. 13

Material examined: ZRC 1920, 1 ex., 113.1 mm; Punggol. SU 32898, 3 ex., 55.8–68.0 mm; Siglap.

Remarks: This species has been encountered in Cyrene Reef and Siglap (Fig. 5), although the latter locality has been reclaimed. It is distinguished from the other dragonets of Singapore in having the first pelvic-fin ray elongate and separated from the rest of the fin.

Synchiropus lineolatus (Richardson), lined dragonet
Fig. 14

Material examined: SU 32382, 2 ex., 48.1–49.7 mm; ZMH 18331, 4 ex., 49.6–60.7 mm SL; Singapore.

Remarks: This species has not been encountered since the 1930s, and more intensive surveys are needed to establish whether or not it has been locally extirpated. It is distinguished from the other dragonets of Singapore in having a combination of all dorsal-fin rays branched, gill openings lateral in position, and the first pelvic-fin ray neither elongate nor separated from the rest of the fin.

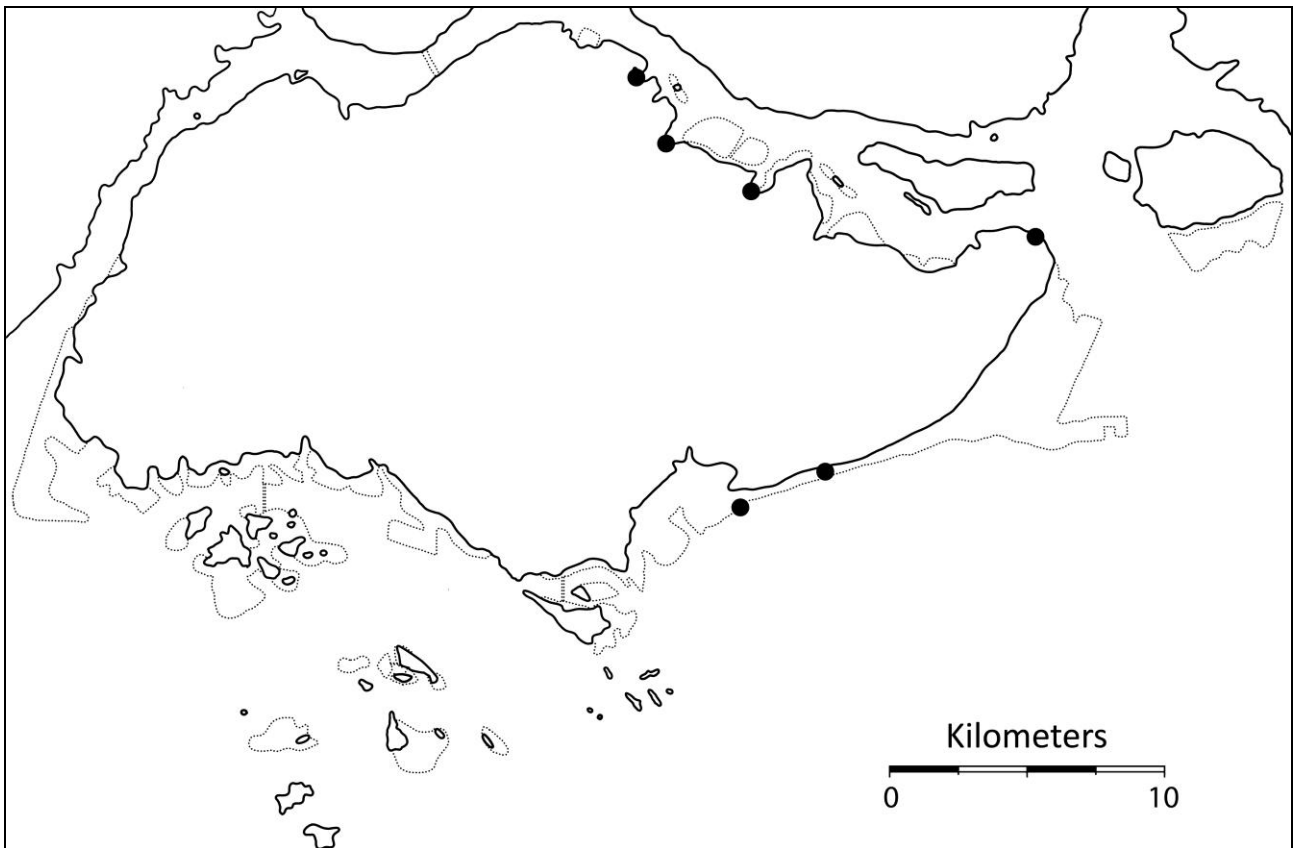


Fig. 12. Localities where *Callionymus schaaipii* have been encountered. The solid outline of Singapore indicates the original coastline, while dotted lines indicate the reclaimed coastline ca. 2010.

DISCUSSION

Based on museum specimens, eight species of dragonets are known with certainty from Singapore: *Callionymus enneactis*, *Callionymus erythraeus*, *Callionymus hindsi*, *Callionymus melanopterus*, *Callionymus sagitta*, *Callionymus schaaipii*, *Dactylopus dactylopus*, and *Synchiropus lineolatus*. The presence of *Callionymus erythraeus* is a new record for Singapore, although its status as a species native to the region remains in some doubt for it is previously known only from the coastal areas of the western Indian Ocean. Two species previously recorded as being from Singapore were not encountered in the preparation of this checklist: *Callionymus filamentosus* and *Synchiropus lateralis*.

Callionymus filamentosus has not been recorded from Singapore since Bleeker (1879) and Károli (1882), and remains unsubstantiated by museum specimens. However, since it is known from surrounding areas (the Malay Peninsula and Greater Sunda Islands among others), it is not inconceivable that the presence of *Callionymus filamentosus* from Singapore would be verified with more intensive sampling efforts, especially since sampling for callionymids around Singapore has been extremely patchy.

The record of *Synchiropus lateralis* from Singapore waters comes from Fricke (1983), who based it on four specimens (ZMH 18331) collected from an unspecified locality in Singapore. However, in the same work, the same four specimens are listed in *Synchiropus lineolatus*, which is the correct identification (R. Fricke, pers. comm. and confirmed by examination of photographs of the specimens). As the listing of ZMH 18331 in *Synchiropus lateralis* is in error, this species (otherwise known from southern China) is here considered absent from Singapore waters.

As mentioned above, sampling for dragonets in Singapore waters has been extremely patchy, and it is likely that more intensive efforts would reveal the presence of additional species. It is also noted that some of the localities where dragonets have been collected have either been reclaimed (Siglap) or converted to freshwater reservoirs (Sungei Seletar and Sungei Punggol). There is, therefore, a need for additional surveys to determine the true extent of callionymid diversity and distribution in Singapore.



Fig. 13. *Dactylopus dactylopus*, ZRC 1920, 113.1 mm SL; Singapore: Punggol.



Fig. 14. *Synchiropus lineolatus*, SU 32382, 48.2 mm SL; Singapore.

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