SYNOPSIS OF PARELEDONE AND MEGALELEDONE SPECIES, WITH DESCRIPTION OF TWO NEW SPECIES FROM EAST ANTARCTICA (CEPHALOPODA: OCTOPODIDAE)

BY C.C. LU AND T.N. STRANKS

Department of Invertebrate Zoology, Museum of Victoria
285–321 Russell Street, Melbourne, Victoria 3000, Australia

Abstract


A synopsis is given for species of the genus Pareledone from Prydz Bay, Antarctica: P. adeliadna (Berry, 1917), P. charcoti (Joubin, 1905), and P. harrissoni (Berry, 1917). Two new species of Pareledone are described and illustrated: P. framensis from Fram Bank, off MacRobertson Land, and P. prydzensis from Prydz Bay, off the Amery Ice Shelf, Antarctica. A comparative description of Megaleledone senoi Taki, 1961, from Antarctica is also provided.

Introduction

The taxonomy of Antarctic eledoneine octopuses is poorly known. A literature review revealed that eight nominal species of Pareledone have been previously described from Antarctic waters (latitudes greater than 60°S). Several of the species (e.g., Pareledone antarctica (Thiele, 1920), P. aurorae (Berry, 1917), and P. umitakae Taki, 1961) were known only from type material, and most other species have not been reviewed in detail since Robson's (1932) monograph. Much of the past work on Antarctic octopods has concentrated on material from the Antarctic Peninsula vicinity, and little information has been published on the fauna of East Antarctica.

A study is now being undertaken to provide systematic information on octopods of the Prydz Bay region (around 68°S, 75°E). While attempting to identify the Pareledone specimens, it became clear that two previously undescribed species existed among the specimens collected. This paper describes the new species and provides a comparison with existing valid species of Pareledone from the region.

Voss (in Palacio, 1978) considered that Megaleledone (a monotypic genus) was a synonym of Pareledone, so the new species here diagnosed are also contrasted with Megaleledone senoi Taki, 1961. Further systematic information on the Pareledone and Megaleledone species will be provided with the future publication of a larger revision of the Octopodidae of the Prydz Bay region.

Material and methods

A collection of 125 eledoneine octopuses from 41 stations on the continental shelf (water depths less than 1000 m) has been accumulated during benthic surveys conducted by the Australian National Antarctic Research Expeditions (ANARE). Fauna has been sampled by beam or otter trawls and epibenthic sleds, during cruises of the MS Nella Dan (1985-1987) and RSV Aurora Australis (1990 onwards). Live octopuses were observed during the 1991 cruise of RSV Aurora Australis to Prydz Bay; these animals were then sacrificed using fresh water, fixed in formalin, and preserved in ethanol. A number of animals were autopsied for parasites and the material has been forwarded to appropriate researchers for identification and description.

Holotypes and most paratypes have been deposited at the Museum of Victoria; paratypes and other voucher specimens were deposited at the Australian Museum, and the National Museum of Natural History, Smithsonian Institution.

Efforts were made to verify most of the previous type and nontype records. Where specimens have not yet been available for study, or descriptions are not clear, the relevant entry in the synonymy has been denoted with a question mark (?).

Where there is sufficient material, counts and measurements are included for a representative 10 females and 10 males. Counts, measurements and indices were defined by Roper and Voss (1983) and Toll (1988) with the following exception: OASC — opposite arm sucker count in
males, or sucker count on either arm L3 or R3 in females. Materials studied, including type specimens, are from: The Australian Museum, Sydney (AM); Muséum National d’Histoire Naturelle, Paris (MNHN); Museum of Victoria, Melbourne (NMV); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Octopodidae

Pareledone Robson, 1932

Type species. *Eledone charcoti* Joubin, 1905.

Diagnosis. Benthic octopodids. Mantle saccular, without fins. Eight arms lacking cirri, arms with small uniserial suckers, third right arm of males hectocotylised with end of arm clearly differentiated into ligula and calamus, arms tips not otherwise modified. Web well developed. Funnel organ VV- or W-shaped. Gills well developed, with 6–9 lamellae. Ink sac present. Crop well developed. Radula normal, with multicuspid rhachidian, lateral teeth and marginal plates well defined. Cartilaginous styles absent.

**Pareledone adelieana** (Berry)

Figures 1, 9a–d

*Moschites adelieana* Berry, 1917: 17, text figs 10–13, pl. 11 fig. 5, pl. 12 figs 6–8. 

Pareledone adelieana. — Robson, 1932: 278. 


— Voss, 1988: 300 [designation of *nomen dubium*].

Pareledone unitala Taki, 1961: 308, text figs 9–16, pl. 3.

Material examined. Holotype: Antarctica, off Mertz Glacier (66°55’S, 145°21’E), 288–300 fm [527–549 m], SY Aurora, Stn 2, Australasian Antarctic Expedition, 28 Dec 1913, AM C40889 (submature (?), 29.5 mm ML).

Other material examined: Antarctica, off Enderby Land: 65°50’S, 50°34’E, 540 m, MS Nella Dan, Stn HRD-011, ANARE, M. D. Norman, 20 Nov 1985, NMV F65629 (submature (?), 17.7 mm ML); 65°56’S, 50°52’E, 386–400 m, MS Nella Dan, Stn HRD-010, ANARE, M. D. Norman, 15 Nov 1985, NMV F65628 (mature (?), 54.5 mm ML).

Off MacRobertson Coast: 67°15’S, 68°56’E, 139 m, RSV Aurora Australis, Stn AA91-99, ANARE, C. C. Lu and T. N. Stranks, 25 Feb 1991, NMV F66511 (immature (?), 36.0 mm ML); 67°15’S, 70°07’E, 172–182 m, RSV Aurora Australis, Stn AA91-95, ANARE, C. C. Lu and T. N. Stranks, 26 Feb 1991, NMV F65670 (immature (?), 24.8 mm ML); 67°07’S, 70°17’E, 256 m, ANARE, 2 Feb 1986, NMV F65627 (mature (?), 59.0 mm ML); 67°03’S, 70°24’E, 242–244 m, RSV Aurora Australis, Stn AA91-96, ANARE, C. C. Lu and T. N. Stranks, 26 Feb 1991, NMV F65669 (immature (?), 28.4 mm ML); 66°53’S, 70°44’E, 444–453 m, RSV Aurora Australis, Stn AA91-97, ANARE, C. C. Lu and T. N. Stranks, 26 Feb 1991, NMV F65668 (submature (?), 26.7 mm ML).

Off Amery Ice Shelf, Prydz Bay: 71°42’S, 71°56’E, 667–676 m, RSV *Aurora Australis*, Stn AA91-92, ANARE, C. C. Lu and T. N. Stranks, 25 Feb 1991, NMV F65613 (immature (?), 29.0 and 31.4 mm ML); 66°48’S, 72°33’E, 526–532 m, RSV *Aurora Australis*, Stn AA91-89(2), ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F65630 (submature (?), 21.7, 23.5, 27.1, 30.5, 35.1, 35.7, 39.6 mm ML; mature (?), 46.8 mm ML; spent (?), 43.1 mm ML; immature (?), 25.4, 27.6, 29.7, 47.4 mm ML; mature (?), 38.3, 40.8 mm ML); USNM 8844248 (mature (?), 44.8 mm ML); 66°59’S, 72°37’E, 532–536 m, RSV *Aurora Australis*, Stn AA91-90, ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F65671 (submature (?), 23.3 mm ML); 67°56’S, 76°24’E, 436–441 m, RSV *Aurora Australis*, Stn AA91-77, ANARE, C. C. Lu and T. N. Stranks, 18 Feb 1991, NMV F65612 (immature (?), 40.5 mm ML).

Diagnosis. Medium sized animals (ML to 55 mm; TL to 160 mm) (fig. 1); mantle elongate ovoid (MWI 62.7–76.1–91.1); head wide, usually slightly wider than mantle (HWI 67.8–77.3–91.6), demarked from mantle by moderate constriction; eyes very large, project above surface of head. Funnel large, stout, bluntly tapered (FuLI 29.1–34.4–41.3); funnel organ W-shaped, limbs thick, outer limbs as long as median limbs (fig. 9c). Mantle aperture very wide (PAI 93.6–104.3–128.2). Arms short (MAI 45.3–58.4–81.5) (1.9–2.2 times ML in mature animals), stout, tapering to narrow tips. Arm lengths subequal, arm order usually 4.3.2.1 (ALI, arm 1: 112.9–154.6–205.2; arm 2: 115.0–161.8–216.5; arm 3: 117.6–165.0–214.2; arm 4: 112.4–168.1–221.0). Arm suckers uniserial, raised from arm surface, small (ASI 4.3–6.8–10.1), without sucker enlargement. Third right arm of males hectocotylised, shorter than its opposite number (OAI 81.2–91.5–98.0; HeAI 131.0–156.1–171.0); ligula medium size, 9–15% of third right arm length in mature animals (LLI 9.7–12.8–15.0); ligula groove long, well marked and deep, with approximately 8 transverse ridges; calamus long, pointed (CaLI 45.1–45.4–46.6) (figs 9a, b); hectocotylised arm with 22–28 suckers; opposite arm with 26–46 suckers. Web moderately deep (WDI 21.2–27.1–32.5), web formula usually B=C=DAE. Ink sac present. Gill lamellae 6–7. Mature ovarian eggs, from female with enlarged ovary, large (8–9 mm long; 3–4 mm wide) (EgLI 17.3–17.9–18.4; EgWI 7.1–7.3–7.5). Male with long penis (PLI 25.7–29.9–39.5), with single coiled diverticulum (fig. 9d); spermatoophores moderately long (SpLI 58.7–66.9–78.7), slender (SpWI 4.9–5.5–6.2), with large, coiled sperm reservoir (SpRI 33.3–40.0–45.0).

Integumental sculpture consists of pattern of fine, rounded and widely scattered papillae on
Figure 1. *Pareledone adelieana* (Berry): a, dorsal, and b, lateral, view of USNM 884248, ♂, 44.8 mm ML.
dorsal surface; papillae absent from ventral surface. Large unbranched primary papillae present in ocular region, with one large supraocular papilla. Two short, longitudinal integumentary ridges present on mid-dorsal posterior mantle. Ventrolateral integumentary ridge around mantle circumference present. In life, colour of resting animals uniformly purple–pink to purple–grey dorsally, white to cream–white ventrally. When stimulated, animals become darker in colour, uniformly purple–red to purple–brown dorsally, cream–white ventrally. White spots consist of one spot on mid-dorsal brachial crown, and one broad spot on mid-dorsal mantle. White transverse bar present between eyes. Ocelli absent.

Males mature at approximately 40 mm ML. Females attain ovarian maturity at about 45 mm ML.

**Distribution.** East Antarctica, from off Dronning Maud Land (67°52'S, 33°14'E) (Taki, 1961); from off Enderby Land (65°50'S to 65°56'S, 50°34'E to 50°52'E), off MacRobertson Land (66°53'S to 67°15'S, 68°56'E to 70°44'E), off the Amery Ice Shelf, Prydz Bay (66°48'S to 67°56'S, 71°56'E to 76°24'E) (this study); and from off the Mertz Glacier (66°55'S, 14°52'E) (Berry, 1917). Other published records need to be verified, but the species is probably restricted in distribution to East Antarctic waters. The species has been collected from the Antarctic continental shelf at depths ranging from 139–680 m, with temperatures from −2.2 to −1.7°C, on mud and sand bottoms with pebbles and rocks, and among sponges, bryozoans and gorgonaceans.

**Remarks.** Voss' (1988) designation of *Pareledone adieleana* as a *nomen dubium* appeared without justification for the decision, and it is unclear whether he studied material first-hand. The holotype of *P. adieleana* (Berry) was examined for the present study. The mantle was found to be distorted through preservation and contracted longitudinally, resulting in the mantle length being much shorter (and the mantle width much wider) than would have existed in the five animal. The typical morphology, with the very large eyes, wide head and narrow elongate mantle, is shown in Fig. 1. Additional morphological measurements and counts of the type have permitted the species to be clearly characterised. The two syntypes of *P. umitakae* Taki have not been available for study. The material may still be extant in the Taki family collection at Kyoto, Japan (T. Kubodera, National Science Museum, Tokyo, pers. comm.). However, Taki's (1961) detailed description leaves us in no doubt that *P. umitakae* is a junior synonym of *P. adieleana*.

*P. adieleana* does not appear to be closely related to the other species of *Pareledone* described here. The elongate mantle, wide head, very large eyes, W-shaped funnel organ, short and stout arms, and ribbed ligula groove of *P. adieleana* are at the extremes of the morphological ranges of *Pareledone* species in general. In the future, removal of this species from the *Pareledone* genus may be justified.

**Pareledone charcoi (Joubin)**

**Figures 2, 9c–h**


*Moschites aurorae* Berry, 1917: 20, text figs 14–20, pl. 12 figs 9, pl. 13 figs 10–12 [also refer to postscript, 1918].

*Pareledone charcoi*. — Robson, 1930: 388.


**Material examined.** Lectotype (designated by Robson, 1932): Antarctica, off Graham Land, Booth Island [65°05'S, 63°55'W] [as 'le Wandel, Antarctique'], on the beach among algae and pebbles, 'Francais,' Expedition Antarcitque Francais, 3 Sep 1904, MNHN 5–7–1095 (submature ♀, 33.8 mm ML).

Other material examined: Antarctica, off Queen Mary Land (66°00'S, 94°17'E), 120 m, [220 m], SY Aurora, Stn 8, Australasian Antarctic Expedition, 27 Jan 1914, AM C40891 (immature ♀, 27.7 mm ML) (holotype of *Moschites aurorae* Berry, 1917).

Off Enderby Land: 65°56'S, 50°52'E, 386–400 m, MS Nella Dan, Stn HIRD-10, ANARE, M. D. Norman, 15 Nov 1985, NMV F65688 (submature ♀, 16.4 and 31.3 mm ML; immature ♂, 16.7 and 18.4 mm ML).

Off MacRobertson Land: 66°59'S, 62°49'E, 117 m, ANARE, 6 Feb 1986, NMV F65689 (submature ♀, 38.7 and 39.6 mm ML; immature ♀, 30.6 mm ML; mature ♂, 46.8 and 65.1 mm ML); Horseshoe Harbour, Gawson Station [67°40'S, 63°00'E], ANARE, J. S. Bunt, 16 Jan 1957, NMV F23493 (♂, 40.2 mm ML); Horseshoe Harbour, Gawson Station [67°40'S, 63°00'E], ANARE, 10 Mar 1960, NMV F22685 (mature ♀, 52.8 mm ML); 67°18'S, 65°34'E, 110 m, ANARE, 3 Dec 1982, NMV F65690 (submature ♀, 26.5 mm ML); 67°07'S, 70°17'E, 256 m, ANARE, 2 Feb 1986, NMV F65691 (mature ♂, 47.7 mm ML).

Off Amery Ice Shelf, Prydz Bay: 67°19'S, 71°25'E, 562–567 m, MS Nella Dan, Stn Prydz-87-27, ANARE, T. G. Cochran, 22 Feb 1987, NMV F65693 (submature ♀, 36.0 mm ML); 66°48'S, 72°33'E, 526–532 m, RSV Aurora Australis, Stn AA91-89(2), ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F67885 (immature ♂, 29.2 and 34.6 mm ML).
SYNOPSIS OF PARELEDONE AND MEGALELEDONE SPECIES

68°03'S, 73°13'E, 680–683 m, RSV Aurora Australis, Stn AA91-84, ANARE, C. C. Lu and T. N. Stranks, 21 Feb 1991, NMV F65698 (mature δ, 64.5 mm ML); 68°26'S, 75°24'E, 616–622 m, RSV Aurora Australis, Stn AA91-78, ANARE, C. C. Lu and T. N. Stranks, 19 Feb 1991, NMV F65695 (mature δ, 52.7 mm ML); 67°56'S, 76°24'E, 436–441 m, RSV Aurora Australis, Stn AA91-77, ANARE, C. C. Lu and T. N. Stranks, 18 Feb 1991, NMV F65697 (mature δ, 35.5 mm ML); 67°21'S, 77°19'E, 333–341 m, RSV Aurora Australis, Stn AA91-75, ANARE, C. C. Lu and T. N. Stranks, 17 Feb 1991, NMV F65696 (submature δ, 18.7 mm ML; immature δ, 23.1 mm ML); 67°21'S, 77°20'E, 337–343 m, MS Nella Dan, Stn Prydz-87-40, ANARE, T. G. Cochran, 27 Feb 1987, NMV F65694 (mature δ, 53.3 mm ML), USNM 884247 (mature δ, 45.7 mm ML); 67°33'S, 77°30'E, 298–301 m, RSV Aurora Australis, Stn AA91-76, ANARE, C. C. Lu and T. N. Stranks, 18 Feb 1991, NMV F67888 (submature δ, 24.7 mm ML; immature δ, 18.3 mm ML); 67°02'S, 78°15'E, 251–266 m, RSV Aurora Australis, Stn AA91-74, ANARE, C. C. Lu and T. N. Stranks, 17 Feb 1991, NMV F67887 (mature δ, 34.6 mm ML).

Diagnosis. Medium sized animals (ML to 65 mm; TL to 210 mm) (fig. 2); mantle spherical (MWI 83.3–92.7–101.2); head moderately wide, narrower than mantle (HWI 55.5–69.8–82.6), demarcated from mantle by moderate constriction; eyes large, project above surface of head. Funnel large, stout, bluntly tapered (FuLI 35.6–40.9–47.6); funnel organ VV-shaped, limbs thick, outer limbs as long as median limbs (fig. 9g). Mantle aperture very wide (PAI 80.9–100.6–122.2). Arms short (MAI 48.1–57.3–74.2) (1.5–2.3 times ML in mature animals), stout, tapering to fine tips. Arm lengths subequal, arm order usually 4.3.2.1 (ALI, arm 1: 118.8–159.3–187.3; arm 2: 119.6–166.0–200.0; arm 3: 129.8–169.9–204.2; arm 4: 128.0–173.5–207.8). Arms suckerless uniserial, raised from arm surface, small (ASI 4.9–6.6–10.9), without sucker enlargement. Third right arm of males hectocotylised, shorter than its opposite number (OAI 87.6–90.3–92.4; HCaI 124.7–158.3–177.5); ligula medium size, 5–9% of third right arm length in mature animals (LLI 5.0–6.6–8.1); ligula groove long, well marked and shallow, without transverse ridges; calamus long, pointed (CaLI 34.8–47.5–66.7) (figs 9e, f); hectocotylised arm with 31–38 suckers; opposite arm with 37–54 suckers. Web moderately deep (WDI 23.0–30.6–44.8), web formula usually B=C=DAE. Ink sac present. Gill lamellae 7–8. Mature ovarian eggs, from females with enlarged ovaries, large (11–14 mm long, 5–7 mm wide) (EgLI 18.1–21.1–23.8; EgWI 7.9–9.9–11.4). Male with long penis (PLI 21.7–37.4–46.5), with single coiled diverticulum (fig. 9h); spermatophores long (SpLI 55.5–139.7–164.5), slender (SpWI 4.0–4.5–5.0), with large, coiled sperm reservoir (SpRI 26.4–30.3–32.8).

Integumental sculpture consists of pattern of fine, rounded and closely set papillae on dorsal surface; papillae absent from ventral surface. Large unbranched primary papillae present in ocular region, with one supraocular papilla. Ventrolateral integumentary ridge present. In life, colour of resting animals uniformly pink-brown to purple-brown dorsally, cream-white ventrally. When stimulated, animals become darker in colour, dark purple-brown dorsally, cream-white ventrally. Papillae on dorsum usually slightly darker than background, giving spotted appearance. White spots consist of one spot on mid-dorsal branchial crown, and one broad spot on mid-dorsal posterior mantle. White transverse bar present between eyes. Ocelli absent.

Males mature at approximately 35 mm ML. Females attain ovarian maturity at about 55 mm ML.

Distribution. East Antarctica, from off Enderby Land (65°56'S, 50°52'E), off MacRobertson Land (66°59'S to 67°40'S, 62°49'E to 65°34'E), off the Amery Ice Shelf, Prydz Bay (66°48'S to 68°26'S, 71°25'E to 78°15'E) (this study); and off Queen Mary Land (66°08'S, 94°17'E) (Berry, 1917). West Antarctica, from off Graham Land (65°05'S, 63°55'W) (Joubin, 1905). Other distributional records remain to be verified, but the species probably has a circumpolar distribution. The species has been collected on the Antarctic continental shelf at depths ranging from 110–683 m, with temperatures from -2.1 to -1.6°C, on mud and sand bottoms with pebbles and rocks, and among sponges, gorgonaceans and bryozoans.

Remarks. P. charcoti, along with P. harrissoni (Berry), are probably the most commonly-occurring eledonines in East Antarctic waters. The present material provides a comprehensive series of life history stages, including mature males and females.

Examination of the type specimen of P. auro- rae (Berry) allowed us to check Berry's (1918 postscript) suspicion that the species was conspecific with P. charcoti. The holotype of P. auro- rae is an immature male, not a mature animal as Berry (1917) stated. Through dehydration of the type specimen over time, some shrivelling of the arm tips including the hectocotylised arm tip has occurred. Our present study has shown that the morphological counts and measurements for P. auro- rae fall within the ranges of variation known for P. charcoti, and we therefore confirm that the two species are synonymous.
Figure 2. *Pareledone charcoti* (Joubin): a, dorsal, and b, lateral, view of NMV F65695, ♂, 52.7 mm ML.
**Pareledone framensis** sp. nov.

Figures 3, 4, 9i–l

**Material examined.** Holotype: Antarctica, off MacRobertson Land, Fram Bank (67°29'S, 68°50'E), 145–150 m, RSV Aurora Australis, Stn AA91-100, ANARE, C. C. Lu and T. N. Stranks, 28 Feb 1991, NVM F65665 (mature δ, 58.9 mm ML) (preserved in ethyl alcohol).

Paratypes: locality as above, AM C173818 (mature δ, 67.6 mm ML), NVM F65667 (mature δ, 62.9 mm ML), USNM 884250 (mature δ, 53.8 mm ML).

Other material examined: Antarctica, off MacRobertson Land, Fram Bank: 67°29'S, 68°50'E, 145–150 m, RSV Aurora Australis, Stn AA91-100, ANARE, C. C. Lu and T. N. Stranks, 28 Feb 1991, NVM F65618 (immature δ, 18.4 mm ML); 67°11'S, 69°15'E, 307–319 m, MS Nella Dan, Stn Prydz-87-23, ANARE, T. G. Cochran, 21 Feb 1987, NVM F65619 (submature η, 33.4 mm ML; mature δ, 61.0 mm ML); 67°15'S, 70°06'E, 172–182 m, RSV Aurora Australis, Stn AA91-95, ANARE, C. C. Lu and T. N. Stranks, 26 Feb 1991, NVM F65621 (submature η, 17.7 mm ML); 67°25'S, 70°20'E, 161–165 m, RSV Aurora Australis, Stn AA91-94, ANARE, C. C. Lu and T. N. Stranks, 26 Feb 1991, NVM F65620 (immature δ, 25.2 mm ML).

**Diagnosis.** Medium sized animals (ML to 70 mm; TL to 280 mm) (figs 3, 4a); mantle spherical (MWI 80.7–91.2–99.6); head moderately wide, narrower than mantle (HWI 52.7–63.4–75.0), demarked from mantle by moderate constriction; eyes large, project above surface of head. Funnel large, stout, bluntly tapered (FuLI 35.2–39.5–43.5); funnel organ VV-shaped, limbs thick, outer limbs three-quarters as long as median limbs (fig. 9k). Mantle aperture wide (PAI 76.2–90.0–106.3). Arms long (MAI 29.0–34.2–38.3) (2.7–3.4 times ML in mature animals), stout, tapering to fine tips. Arm lengths subequal, arm order usually 4.3.2.1 (ALL, arm 1: 195.9–261.3–312.9; arm 2: 218.0–265.7–321.0; arm 3: 227.5–268.4–310.0; arm 4: 258.9–285.4–345.1). Arm suckers uniserial, raised from arm surface, small (ASI 4.7–6.5–9.9), without sucker enlargement. Third right arm of males hectocotylised, shorter than its opposite number (OAI 74.2–80.5–91.4; HcAl 178.4–210.2–241.8) (fig. 4b); ligula medium size, 5–8% of third right arm length in mature animals (LLI 5.9–6.4–7.5); ligula groove long, well marked and shallow, without transverse ridges; calamus long, pointed (CaLI 35.6–47.9–56.5) (figs 9i, j); hectocotylised arm with 44–51 suckers; opposite arm with 61–80 suckers. Web shallow (WDI 12.2–17.4–22.6), web formula usually DCBAE. Radula with A₃₋₅ seriation of the rhachidian (fig. 4f). Ink sac present. Gill lamellae 7–8. Size of mature eggs unknown. Male with long penis (PLI 38.9–40.9–43.1), with single coiled diverticulum (fig. 9i); spermatophores long (SpLI 123.2–138.7–167.7), slender (SpWI 3.8–4.5–5.5), with large, coiled sperm reservoir (SpRI 39.4–41.7–43.8).

**Integumental sculpture** consists of pattern of coarse, rounded and closely set papillae evenly covering dorsum, ventrum, and oral surface of web and lateral surfaces of arms. Large unbranched primary papillae present in ocular region, with one very large supraocular papilla, and on dorsal mantle with four papillae in diamond pattern. Ventrolateral integumentary ridge absent. In life, colour of resting animals uniformly yellow-brown to gold dorsally, white to cream-white ventrally. When stimulated, animals become darker in colour, uniformly golden-brown dorsally, and yellow-brown ventrally. White spots consist of one spot on lateral head, just ventral to each eye; and streak on the lateral mantle, posterior to each eye. White transverse bar present between eyes. Dorsal mantle and frontal white spots absent. Lateral head white spots and head bar conspicuous in live animals, often faded and inconspicuous in preserved animals. Ocelli absent.

**Males** mature at approximately 50–55 mm ML. No mature females were encountered.

**Distribution.** Known only from Fram Bank, off MacRobertson Land, East Antarctica (67°11'S to 67°29'S, 68°50'E to 70°20'E). An inshore species collected at depths ranging from 145–319 m, with temperatures from -2.2 to -2.1°C, on mud bottom with pebbles and rocks, and among sponges and ascidians.

**Etymology.** Named after the type locality, Fram Bank.

**Remarks.** This new species can be distinguished from all other valid congeners of Pareledone (listed in Table 1) by, among other characters, coarse papillation over the entire surface, and the colour pattern of gold with white spots and streaks. Additionally, this species can be distinguished from *P. adelieana* (Berry, 1917) by the narrower head width, the longer relative arm length, a higher sucker count on the hectocotylised arm (HASC) and opposite arm (OASC), the shorter ligula length index, the ligula groove without transverse ridges, and a VV- rather than W-shaped funnel organ. *P. framensis* also differs from *P. charcoti* (Joubin, 1905) by the longer relative arm length, a higher HASC and OASC, and the lack of a ventrolateral
Figure 3. *Pareledone framensis* sp. nov.: a, dorsal, and b, lateral, view of USNM 884250, paratype, *δ*, 53.8 mm ML.
Figure 4. *Pareledone framensis* sp. nov.: a, dorsal view of holotype, NMV F65665, ♂, 58.9 mm ML (scale bar = 20 mm); b, hectocotylised arm of NMV F65619, 61.0 mm ML (scale bar = 10 mm); c, upper beak, d and e, lower beak (scale bar = 2 mm), and f, radula (scale bar = 0.5 mm), of paratype, AM C173818, ♂, 67.6 mm ML.
integumentary ridge. It also differs from *P. harrissoni* (Berry, 1917) by having a narrower head width (see fig. 9; Tables 2, 3).

*P. framensis* can be distinguished easily from other eledoneine species by a combined suite of characters including: a broadly ovoid mantle; skin with a characteristic pattern of coarse papillation on the dorsal, ventral and oral surfaces, but no ventrolateral ridge; large and prominent eyes; long, subequal arms (2.7–3.4 times ML in mature animals); small suckers; a shallow web (12–23% of arm length); a medium sized ligula (5–8% of third right arm length in mature animals), and 7–8 gill lamellae.

**Pareledone harrissoni** (Berry)

**Figures 5, 9m–p**

*M. harrissoni* Berry, 1917: 24, text figs 21–25, pl. 13 fig. 13, pl. 14 figs 14–16.

**M. antarcticus** Thiele, 1920; 434, pl. 52 figs 1, 2.


**Pareledone antarctica.** — Robson, 1932: 279.

**Pareledone harrissoni** [sic]. — Voss, 1988: 300 [designation of *nomen dubium*].

**Material examined.** Holotype: Antarctica, off Shackleton Ice Shelf (65°06’S, 96°13’E), 325 fm [595m], *SY Aurora*, Stn 10.

Paratypes: Antarctica, ‘Western Base’ [66°20’S, 95°00’E], 270 fm [494m], *Australasian Antarctic Expedition*, 29 Jan 1914, AM C40892 (submarine ?; 53.8 mm ML).

**Paratypes.** Antarctica, ‘Western Base’ [66°20’S, 95°00’E], 270 fm [494m], *Australasian Antarctic Expedition*, 29 Jan 1914, AM C40892 (submarine ?; 62.2 mm ML); off Shackleton Ice Shelf (66°44’S, 97°28’E), 358 fm [654m], *Aurora*, Stn 11, *Australasian Antarctic Expedition*, 31 Jan 1914, USNM 815724 (?) 54 mm ML, not seen.

**Other material examined:** Antarctica, off MacRobertson Land: 66°59’S, 62°49’E, 117 m, ANARE, 6 Feb 1986, NMF F667E8 (submarine ?; 74.5 mm ML); 67°18’S, 65°34’E, 110 m, ANARE, 3 Dec 1982, NMF F6676 (submarine ?; 23.2 and 59.7 mm ML); 67°29’S, 68°50’E, 145–150 m, RSV *Aurora Australis*, Stn AA1-100, ANARE, C. C. Lu and T. N. Sparks, 28 Feb 1991, NMF F66800 (mature ?; 91.6 mm ML); 67°15’S, 68°56’E, 139 m, RSV *Aurora Australis*, Stn AA1-99, ANARE, C. C. Lu and T. N. Sparks, 28 Feb 1991, USNM 884251 (mature ?; 70.7 mm ML).

**Off Anery Ice Shelf, Prydz Bay:** 68°00’S, 71°18’E, 515–523 m, *MS Nella Dan*, Stn Prydz-87-20, ANARE, T. G. Cochran, 20 Feb 1987, NMF F66819 (submarine ?; 37.1 and 45.2 mm ML); 66°48’S, 72°33’E, 526–532 m, RSV *Aurora Australis*, Stn AA1-89(2), ANARE, C. C. Lu and T. N. Sparks, 24 Feb 1991, NMF F66615 (submarine ?; 61.1 mm ML; immature ?; 33.5 mm ML); 66°46’S, 72°37’E, 530 m, RSV *Aurora Australis*, Stn AA1-89, ANARE, C. C. Lu and T. N. Sparks, 24 Feb 1991, NMF F66615 (submarine ?; 61.1 mm ML; immature ?; 33.5 mm ML); 66°46’S, 72°37’E, 530 m, RSV *Aurora Australis*, Stn AA1-89, ANARE, C. C. Lu and T. N. Sparks, 24 Feb 1991, NMF F66615 (submarine ?; 61.1 mm ML; immature ?; 33.5 mm ML); 66°46’S, 72°37’E, 530 m, RSV *Aurora Australis*, Stn AA1-89, ANARE, C. C. Lu and T. N. Sparks, 24 Feb 1991, NMF F66615 (submarine ?; 61.1 mm ML; immature ?; 33.5 mm ML); 68°30’S, 73°14’E, 743 m, RSV *Aurora Australis*, Stn AA1-90, ANARE, C. C. Lu and T. N. Sparks, 24 Feb 1991, NMF F66886 (submarine ?; 27.5 and 47.6 mm ML; immature ?; 27.9 mm ML); 66°48’S, 73°31’E, 696–732 m, *MS Nella Dan*, Stn Prydz-87-30, ANARE, T. G. Cochran, 24 Feb 1987, NMF F66838 (mature ?; 57.3 mm ML); 67°25’S, 74°34’E, 460 m, ANARE, 26 Jan 1986, NMF F66581 (mature ?; 84.9 mm ML); 67°00’S, 75°01’E, 385–388 m, RSV *Aurora Australis*, Stn AA91-86, ANARE, C. C. Lu and T. N. Sparks, 22 Feb 1991, NMF F67890 (submarine ?; 20.6 and 31.8 mm ML; immature ?; 23.8 mm ML); 68°26’S, 75°24’E, 616–622 m, RSV *Aurora Australis*, Stn AA91-78, ANARE, C. C. Lu and T. N. Sparks, 19 Feb 1991, NMF F65686 (submarine ?; 35.0 mm ML); 67°01’S, 76°25’E, 327–332 m, RSV *Aurora Australis*, Stn AA91-85, ANARE, C. C. Lu and T. N. Sparks, 19 Feb 1991, NMF F67890 (submarine ?; 24.8 mm ML); 67°21’S, 77°20’E, 337–343 m, *MS Nella Dan*, Stn Prydz-87-40, ANARE, T. G. Cochran, 27 Feb 1987, NMF F65685 (mature ?; 99.5 mm ML); 67°11’S, 78°16’E, 188–208 m, *MS Nella Dan*, Stn Prydz-87-31, ANARE, T. G. Cochran, 25 Feb 1987, NMF F65684 (submarine ?; 76.3 mm ML).

**Diagnosis.** Medium sized animals (ML to 100 mm; TL to 350 mm) (fig. 5); mantle spherical to ovoid (MWI 73.6–88.2–100.3); head moderately wide, slightly narrower than mantle (HWI 51.9–72.9–91.0), demarked from mantle by moderate constriction; eyes large, project above surface of head. Funnel large, stout, bluntly tapered (FuL 26.2–35.8–44.5); funnel organ V-shaped, limbs thick, outer limbs as long as median limbs (fig. 9b). Mantle aperture wide (PAI 72.6–99.5–114.6). Arms long (MAI 29.9–44.8–56.0) (1.8–3.6 times ML in mature animals), stout, tapers to fine tips. Arm lengths subequal, arm order usually 4.3.2.1 (ALI, arm 1: 168.5–205.6–289.7; arm 2: 169.7–213.1–321.8; arm 3: 175.9–216.8–334.5; arm 4: 170.2–221.4–329.1). Arm suckers uniserial, raised from arm surface, small (ASI 5.1–7.5–10.3), without sucker enlargement. Third right arm of males hectocotylised, shorter than its opposite number (OAI 77.6–85.6–89.0; HC Al 181.2–211.2–259.5), ligula small, 4–11% of third right arm length in mature animals (LLI 4.7–6.5–10.1); ligula groove long, well marked and shallow, without transverse ridges; calamus long, pointed (Ca Li 31.4–43.3–56.4) (figs 9m, n); hectocotylised arm with 36–50 suckers; opposite arm with 37–79 suckers. Web moderately deep (WDI 21.5–24.5–32.1), web formula usually B=C=DAE. Ink sac present. Gill lamellae 8–9. Mature ovarian eggs, from female with enlarged ovary, large (12–14 mm long, 6–7 mm wide) (EGI 12.6–13.5–14.3; EGWI 6.3–6.7–7.0). Male with long penis (PLI 11.9–13.7–44.5), with single coiled diverticulum (fig. 9p); spermatozoids long (Sp Li 70.1–118.1–141.4), slender (Sp Wi 3.8–4.7–6.2), with large, coiled sperm reservoir (Sp Ri 38.5–44.8–51.3).
Figure 5. Pareledone harrissoni (Berry): a, dorsal, and b, lateral, view of USNM 884251, ♂, 70.7 mm ML.
Integument loose and wrinkled, sometimes with gelatinous consistency. Integumental sculpture consists of pattern of fine, rounded and widely scattered papillae on dorsal surface; papillae absent from ventral surface. Large unbranched primary papillae present in ocular region, with one large supraocular papilla. Ventrolateral integumentary ridge absent. In life, colour of resting animals uniformly pink to purple–pink dorsally, cream–white to pale pink ventrally. When stimulated, animals become darker in colour, uniformly brown–pink to brown–purple dorsally, purple–pink ventrally. White spots consist of one spot on mid–dorsal brachial crown. White transverse bar present between eyes. Ocelli absent.

Males mature at approximately 50 mm ML. Females attain ovarian maturity at about 90 mm ML.

**Distribution.** East Antarctica, from off Mac-Robertson Land (66°59’S to 67°29’S, 62°49’E to 68°56’E), off the Amery Ice Shelf, Prydz Bay (66°46’S to 68°30’S, 71°18’E to 78°16’E) (this study); and off the Shackleton Ice Shelf (65°06’S to 66°44’S, 95°00’E to 97°28’E) (Berry, 1917). Other distributional records remain to be verified, but the species is probably restricted in distribution to East Antarctic waters. The species has been collected on the Antarctic continental shelf at depths ranging from 25–743 m, with temperatures from -2.1 to -0.6°C, on mud and sand bottoms with pebbles and rocks, and among sponges, gorgonaceans and bryozoa.

**Remarks.** Apart from Megaleledone senoi, *Pareledone harrissoni* is the largest eledonein occurring in East Antarctic waters. The present material comprises a comprehensive growth series from smaller juveniles to mature males and females. The morphology of the species is somewhat variable in terms of mantle shape, mantle length relative to arm length, and sucker count (e.g. the specimen in fig. 5, USNM 884251, has a relatively low mantle–arm index), although in some cases the variation may be an artefact of preservation techniques.

Voss (1988) designated *P. harrissoni* (Berry) as a *nomem dubium*, but reasons for his decision were not given, nor is it clear whether he personally examined the type specimens. Type material of *P. harrissoni* was examined for this study and although two of the specimens are in a deteriorated condition, the species does have valid characters that may be assessed.

Robson (1932) postulated that *P. antarctica* (Thiele) was the same species as *P. harrissoni*. The type material of *P. antarctica* was not available for examination, but comparison of the type description and illustrations of *P. antarctica* by Thiele (1920) with the present material suggests that the species is conspecific with *P. harrissoni*. *P. antarctica* is thus a probable junior synonym of *P. harrissoni*.

**Pareledone prydzensis** sp. nov.

**Figures 6, 7, 9q–t**

**Material examined.** Holotype: Antarctica, off Amery Ice Shelf, Prydz Bay (66°48’S, 72°33’E), 526–532 m, RSV Aurora Australis, Stn AA91-89(2), ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F65666 (mature δ, 29.4 mm ML) (preserved in ethyl alcohol).

Paratypes: locality as above, AM C173819 (submature ♀, 25.7 mm ML), NMV F65625 (submature ♀, 20.7 mm ML; mature δ, 28.2 mm ML), USNM 884249 (mature δ, 25.8 mm ML).

Other material examined: Antarctica, off Amery Ice Shelf, Prydz Bay: 66°42’S, 71°56’E, 667–676 m, RSV Aurora Australis, Stn AA91-92, ANARE, C. C. Lu and T. N. Stranks, 25 Feb 1991, NMV F65614 (immature δ, 20.9 mm ML); 66°46’S, 72°37’E, 530 m, RSV Aurora Australis, Stn AA91-89, ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F65624 (submature ♀, 15.0 mm ML).

**Diagnosis.** Small animals (ML to 30 mm; TL to 95 mm) (figs 6, 7a); mantle spherical (MWI 78.0–94.0–102.7); head wide, slightly narrower than mantle (HWI 80.4–83.9–87.4), demarked from mantle by slight constriction; eyes large, do not project far above surface of head. Funnel large, stout, bluntly tapered (FuLI 41.3–46.7–51.4); funnel organ VV-shaped, limbs thick, outer limbs three-quarters as long as median limbs (fig. 9s). Mantle aperture very wide (PAI 83.7–106.3–122.2). Arms short (MAI 51.7–58.6–69.4) (1.9–2.3 times ML in mature animals), stout, tapering to narrow tips. Arm lengths subequal, arm order 4=3=2=1 (ALI, arm 1: 134.6–160.0–179.1; arm 2: 140.7–163.5–193.3; arm 3: 138.0–163.8–180.1; arm 4: 137.3–166.6–180.9). Arm suckers uniserial, short, without arm surface, small (ASI 6.0–6.8–7.7), without sucker enlargement. Third right arm of males hectocotylised, slightly shorter than its opposite number (OAI 90.7–94.9–102.0; HeAI 155.4–160.1–169.5) (fig. 7b); ligula medium size, 6–9% of third right arm in mature animals (LLI 6.5–7.5–8.2); ligula groove long, well marked and shallow, without transverse ridges; calamus long, pointed (CaLI 48.5–52.0–54.8) (figs 9q, r); hectocotylised arm with 26–29 suckers; opposite arm with 29–36 suckers. Web deep (43.5–47.4–51.1), web formula usually B=C=DAE. Radula with A2–3 seri-
ation of the rhachidian (fig. 7f). Ink sac present. Gill lamellae 6–7. Size of mature eggs unknown. Male with long penis (PLI 39.4–41.1–43.9), with single coiled diverticulum (fig. 9); spermatophores long (SpLI 119.9–123.6–130.6), slender (SpWI 6.0–6.1–6.2), with large, coiled sperm reservoir (SpRI 27.1–30.4–34.3).

Integumental sculpture consists of pattern of fine, rounded and closely set papillae on dorsal surface; ventral surface smooth; no larger papillae appear to be present in ocular region or on dorsal mantle. Ventrolateral integumentary ridge present. In life, colour of resting animals grey–purple to pink–purple on the dorsal mantle and head; darker pink–purple on dorsal brachial crown, web and arms; and cream–white to pink–white ventrally. When stimulated, animals become darker in colour, dark purple–pink on dorsal mantle and head; dark purple–brown to black on dorsal brachial crown, web and arms; and light pink–purple ventrally. White spots consist of one spot on mid-dorsal brachial crown, and one broad spot on mid-dorsal posterior mantle. White transverse bar present between eyes. Ocelli absent.

Males mature at approximately 25 mm ML. No mature females were encountered.

Distribution. Known only from Prydz Bay, off the Amery Ice Shelf, East Antarctica (66°42'S to 66°48'S, 71°56'E to 72°37'E). An inshore species collected at depths ranging from 526–676 m, with temperatures from -2.1 to -0.6°C, on mud and sand bottoms with rocks, and among sponges and gorgonaceans.

Etymology. Named after the type locality, Prydz Bay.

Remarks. This new species can be readily distinguished from the other valid species of Pareledone recognised in this paper (see Table 1). It can be distinguished from P. charcoti by its smaller absolute size at maturity, the much deeper web comprising about 45% of arm length, and the striking colour pattern of the very dark brachial crown, web and arms. P. prydzensis also differs from P. adelieana by having the head narrower rather than wider than the mantle, the shorter ligula length index, the ligula groove without transverse ridges, the VV—rather than W-shaped funnel organ, a differently shaped penis, and a papillate rather than smooth integument. It can also be distinguished from P. harrisoni by the lower gill count, and papillate rather than smooth integumental sculpture. P. prydzensis may also be distinguished from the other new species described above, P. framenesis, by a relatively wider head, the shorter relative arm length, and a lower hectocotylised arm sucker count and opposite arm sucker count (see fig. 9, Tables 2, 3).

P. prydzensis can be easily distinguished from other eleidone species on the basis of a combination of characters: a broadly ovoid mantle; skin with a characteristic pattern of fine papillae on the dorsum, and a ventrolateral integumentary ridge; large but not prominent eyes; short, subequal arms (1.9–2.3 times ML in mature animals); small suckers; a deep web (43–51% of arm length); a medium sized ligula (6–9% of third right arm length in mature animals); and 6–7 gill lamellae.

Megaleledone Taki, 1961

Type species. Megaleledone senoi Taki, 1961.

Diagnosis. Benthic octopodids. Mantle saccular, without fins. Eight arms lacking cirri, arms with large uniserial suckers, third right arm of males hectocotylised with end of arm clearly differentiated into ligula and calamus, arms tips not otherwise modified. Web very deep and well developed. Funnel organ VV-shaped. Gills well developed, with 10–11 lamellae. Ink sac present. Crop absent. Radula reduced, with unicuspid rhachidian and lateral teeth present, and marginal plates absent.

Megaleledone senoi Taki

Figures 8, 9–u–x

Megaleledone senoi Taki, 1961: 297, text figs 1–8, 16, pls 1, 2. — Kubodera and Okutani, 1986: 133, text fig. 2, pl. 2.

Material examined. Antarctica, off Amery Ice Shelf, Prydz Bay; 66°48’S, 72°33’E, 526–532 m, RSV Aurora Australis, Stn AA91-89(2), ANARE, C. C. Lu and T. N. Stranks, 24 Feb 1991, NMV F65529 (submature ♀, 23.6 mm ML); 68°50’S, 73°23’E, 748–761 m, MS Nella Dan, Stn Prydz-87-16, ANARE, T. G. Cochran, 20 Feb 1987, NMV F65527 (submature ♀, 131.0 mm ML); 67°19’S, 74°16’E, 464–465 m, MS Nella Dan, Stn Prydz-87-47, ANARE, T. G. Cochran, 28 Feb 1987, NMV F65528 (mature ♀, 234.0 mm ML); 67°00’S, 74°23’E, 431–439 m, RSV Aurora Australis, Stn AA91-87, ANARE, C. C. Lu and T. N. Stranks, 23 Feb 1991, NMV F60488 (mature δ, 207.0 mm ML); 67°25’S, 74°34’E, 460 m, ANARE, 26 Jan 1986, NMV F65699 (submature ♀, 30.9 mm ML); 67°00’S, 75°01’E, 385–388 m, RSV Aurora Australis, Stn AA91-86, ANARE, C. C. Lu and T. N. Stranks, 22 Feb 1991, NMV F60487 (immature δ, 169.0 mm ML); 67°54’S, 76°37’E, 431 m, MS Nella Dan, Stn Prydz-87-2, ANARE, T. G. Cochran, 16 Feb 1987, NMV F65526 (submature ♀, 181.0 mm ML); 67°21’S, 77°19’E, 333–341 m, RSV Aurora
Figure 6. *Pareledone prydzensis* sp. nov.: a, dorsal, and b, lateral, view of NMV F65666, holotype, δ, 29.4 mm ML.

Figure 7. *Pareledone prydzensis* sp. nov.: a, dorsal view (scale bar = 10 mm), and b, hectocotylised arm (scale bar = 5 mm), of paratype, USNM 884249, 25.8 mm ML; c, upper beak, d and e, lower beak, of paratype, NMV F65625, δ, 28.2 mm ML (scale bar = 2 mm); and f, radula of NMV F65614, δ, 20.9 mm ML (scale bar = 0.2 mm).
SYNOPSIS OF PARELEDONE AND MEGALELEDONE SPECIES
Females attain ovarian maturity at about 230 mm ML.

Type. Holotype, female, 135 mm ML. The specimen has not been located, but may be extant in the Taki family collection, Kyoto, Japan (T. Kubodera, National Science Museum, Tokyo, pers. comm.).

Type locality. Antarctica, off Dronning Maud Land (67°51.5'S, 33°13.5'E), 630–680 m.

Distribution. East Antarctica, from off the Amery Ice Shelf, Prydz Bay (66°48'S to 68°50'S, 72°33'E to 77°19'E) (this study); and from the type locality. West Antarctica, from off the Antarctic Peninsula (61°10'S, 55°55'W) (Kubodera and Okutani, 1986). This species appears to have a circumpolar distribution. The species has been collected on the Antarctic continental shelf at depths ranging from 120–761 m, with temperatures from -1.9 to -1.4°C, on mud and sand bottoms with pebbles and rocks, and among sponges and bryozoans.

Remarks. This collection consists of a large number of specimens of M. senoi, from immature to mature male and female specimens. Taki (1961) and Nesis and Propp (1968) reported on mature female specimens, but mature males have not been previously described. The large size of the species clearly sets it apart from the other Antarctic eleodids.

The present material from Prydz Bay does not differ from those specimens described by Taki (1961) or Kubodera and Okutani (1986). Taki (1961) noted the resemblance of M. senoi to Graneledone (?) setebos Robson, 1932. The latter species is known only from a "single very mangled and decayed specimen" (Robson, 1932: 313), and has not been well diagnosed to date. The holotype from the BMNH collection has not been available for this study, and the validity of the species cannot be presently determined. If G. setebos can be adequately characterised, and is found to be conspecific with Megaleledone senoi, there are implications for the correct name of the present species as the former name will have priority over Taki's senoi.

The diagnostic features of Megaleledone (particularly the broad mantle, narrow head, short arms, deep web, high number of gill lamellae, ribbed ligula groove, and absence of crop) distinguish the genus from Pareledone. There does not appear to be any good basis for synonymising Megaleledone with Pareledone, as...
Figure 8. *Megaleledone senoi* Taki: a, dorsal, and b, lateral, view of NMV F60487, ♂, 169.0 mm ML.
suggested by Voss (in a personal communication to Palacio, 1978: 289).

**Discussion**

A large series of specimens, including types of species described by Joubin (1905) and Berry (1917) plus mature males of each species from our collection, has facilitated the present study. Live observations of skin and colour patterns on each described species also benefited our investigation.

Among the 12 nominal species of Pareledone currently known, 10 are described from the Southern Ocean, and another two are from the Atlantic Ocean. Of the Atlantic species, P. nigra (Hoyle, 1910) was originally described from specimens collected at Lüderitz Bay, Namibia (around 27°S, 15°E). Hoyle (1910) originally placed nigra in the Moschites genus, but Robson (1932) transferred the species to Pareledone. The second Atlantic species, Pareledone carlsgreni Thore, 1945, was originally diagnosed from material collected at Cape Peninsula, Sea Point, Cape Town, South Africa (~34°S, 15°30'E). Both P. nigra and P. carlsgreni are now being systematically reviewed by Roper and Mangold (in prep.) and should properly be placed in the genus Aphrodotoctopus (C. F. E. Roper, USNM, pers. comm.).

Once the two Atlantic Ocean species are removed from Pareledone, the genus may be considered to have only Antarctic and subantarctic representatives. The 10 nominal species of Pareledone from the Southern Ocean are listed in Table 1, with recommendations on their taxonomic status. After examination of available relevant type specimens, additional material and existing published descriptions, five valid species are recognised as occurring in Prydz Bay, East Antarctica: *P. adelieana*, *P. charcoti*, *P. framensis*, *P. harrissoni* and *P. prydzensis* (see fig. 9 and Tables 2 and 3 for comparative information). Detailed taxonomic information and full descriptions of these five species, and a key to the species, will be provided with the future publication of a review of the octopods known from the Prydz Bay region.

At an octopod systematics workshop held during the Symposium on Southern Ocean Cephalopods (Cambridge, England, July 1993), two other distinct and separate species of Pareledone, *P. polymorpha* and *P. turqueti*, were recognised from West Antarctic waters. These species are not known to occur in waters of East Antarctica.

The present material of Pareledone and Megaleledone was collected from water depths shallower than 1000m, corresponding with the outer edge of the continental shelf in the Prydz Bay vicinity. Although the collecting effort in deeper waters has in the past been poor, from the very limited data available it is doubtful that the range of either genus extends onto the deeper continental slope. The species were all distributed on soft sandy mud substrates and variously among sponge, gorgonian and bryozoan faunal communities, in waters approximately -1 to -2°C in temperature.

The absolute and relative sizes of mature eggs in Pareledone adelieana, *P. charcoti*, *P. harrissoni* and Megaleledone senoi were large. Mature eggs of *Pareledone framensis* and *P. prydzensis* were not observed, but judging by the egg development seen in ovaries of submature females, we expect these species to also produce large eggs. Accordingly, we predict that each species will have hatchlings with benthic rather than planktonic development, and thus no potential for long range dispersal (i.e. beyond the Antarctic continent). Ideally this hypothesis would be confirmed.

---

**Figure 9.** *Pareledone adelieana* Berry: a, oral, and b, lateral, detail of hectocotylus (scale bar = 5 mm), c, funnel organ (scale = 5 mm), and d, penis (scale bar = 5 mm), of USNM 884248, 44.8 mm ML. *Pareledone charcoti* (Joubin): e, oral, and f, lateral, detail of hectocotylus (scale bar = 5 mm), g, funnel organ (scale bar = 5 mm), and h, penis (scale bar = 10 mm), of NMV F65695, 52.7 mm ML. *Pareledone framensis* sp. nov.: i, oral, and j, lateral, detail of hectocotylus (scale bar = 5 mm), k, funnel organ (scale bar = 5 mm), and l, penis (scale bar = 10 mm), of holotype, NMV F65665, 58.9 mm ML. *Pareledone harrissoni* (Berry): m, oral, and n, lateral, detail, of hectocotylus (scale bar = 5 mm), o, funnel organ (scale bar = 5 mm), of USNM 884251, 70.7 mm ML; p, penis of NMV F65680, 91.6 mm ML (scale bar = 20 mm). *Pareledone prydzensis* sp. nov.: q, oral, and r, lateral, detail of hectocotylus (scale bar = 2 mm), s, funnel organ (scale bar = 5 mm), and t, penis (scale bar = 5 mm), of holotype, NMV F65666, 29.4 mm ML. *Megaleledone senoi* Taki: u, oral, and v, lateral, detail of hectocotylus (scale bar = 10 mm), w, funnel organ (scale bar = 20 mm), and x, penis (scale bar = 20 mm), of NMV F60488, 207.0 mm ML.
Table 1. Taxonomic status of nominal species of *Pareledone* and *Megaleledone* from the Southern Ocean

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pareledone adelieana</em> (Berry, 1917)</td>
<td>Valid (previously designated a nomen dubium by Voss, 1988)</td>
</tr>
<tr>
<td><em>Pareledone antarctica</em> (Thiele, 1920)</td>
<td>Probable junior synonym of <em>Pareledone turqueti</em> (Joubin, 1905)</td>
</tr>
<tr>
<td><em>Pareledone aurorae</em> (Berry, 1917)</td>
<td>Junior synonym of <em>Pareledone charcoti</em> (Joubin, 1905)</td>
</tr>
<tr>
<td><em>Pareledone charcoti</em> (Joubin, 1905)</td>
<td>Valid</td>
</tr>
<tr>
<td><em>Pareledone framensis</em> (this paper)</td>
<td>Valid</td>
</tr>
<tr>
<td><em>Pareledone harrissoni</em> (Berry, 1917)</td>
<td>Valid (previously designated a nomen dubium by Voss, 1988)</td>
</tr>
<tr>
<td><em>Pareledone polymorpha</em> (Robson, 1930)</td>
<td>Valid</td>
</tr>
<tr>
<td><em>Pareledone pydzensis</em> (this paper)</td>
<td>Valid</td>
</tr>
<tr>
<td><em>Pareledone turqueti</em> (Joubin, 1905)</td>
<td>Valid</td>
</tr>
<tr>
<td><em>Pareledone unitakae</em> Taki, 1961</td>
<td>Junior synonym of <em>Pareledone adelieana</em> (Berry, 1917)</td>
</tr>
<tr>
<td><em>Megaleledone senoi</em> Taki, 1961</td>
<td>Valid</td>
</tr>
</tbody>
</table>

Table 2. Comparison of species of *Pareledone* and *Megaleledone* from Prydz Bay vicinity, Antarctica.

<table>
<thead>
<tr>
<th>Species</th>
<th><em>P. adelieana</em></th>
<th><em>P. charcoti</em></th>
<th><em>P. framensis</em></th>
<th><em>P. harrissoni</em></th>
<th><em>P. pydzensis</em></th>
<th><em>M. senoi</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size at Maturity:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>&gt;40 mm ML</td>
<td>&gt;35 mm ML</td>
<td>&gt;50 mm ML</td>
<td>&gt;50 mm ML</td>
<td>&gt;25 mm ML</td>
<td>&gt;200 mm ML</td>
</tr>
<tr>
<td>Female</td>
<td>&gt;45 mm ML</td>
<td>&gt;55 mm ML</td>
<td>&gt;50 mm ML</td>
<td>&gt;90 mm ML</td>
<td>&gt;200 mm ML</td>
<td>&gt;230 mm ML</td>
</tr>
<tr>
<td>Arm Formula</td>
<td>4.3.2.1</td>
<td>4.3.2.1</td>
<td>4.3.2.1</td>
<td>4.3.2.1</td>
<td>4=3=2.1</td>
<td>4=3=2.1</td>
</tr>
<tr>
<td>Arm Length (% of TL)</td>
<td>65–69</td>
<td>60–70</td>
<td>73–77</td>
<td>65–78</td>
<td>66–70</td>
<td>66–72</td>
</tr>
<tr>
<td>Ligula Length Index (LLI)</td>
<td>9.7–15.0</td>
<td>5.0–8.1</td>
<td>5.9–7.5</td>
<td>4.7–10.1</td>
<td>6.5–8.2</td>
<td>~3.6</td>
</tr>
<tr>
<td>Head Width (% of MW)</td>
<td>88–118</td>
<td>63–72</td>
<td>56–67</td>
<td>68–84</td>
<td>81–83</td>
<td>60–63</td>
</tr>
<tr>
<td>Gill Lamellae Count</td>
<td>6–7</td>
<td>7–8</td>
<td>7–8</td>
<td>8–9</td>
<td>6–7</td>
<td>10–11</td>
</tr>
<tr>
<td>Egg Length (mm)</td>
<td>8–9*</td>
<td>11–14*</td>
<td>?</td>
<td>12–15*</td>
<td>?</td>
<td>18–19*</td>
</tr>
</tbody>
</table>

*Mature ovarian eggs*
<table>
<thead>
<tr>
<th>Species</th>
<th>P. adelieana</th>
<th>P. charcoti</th>
<th>P. framensis</th>
<th>P. prydzensis</th>
<th>P. turqueti</th>
<th>M. senoi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sculpture</td>
<td>Minor papillation; two longitudinal ridges on posterior mantle; traces of ventrolateral ridge</td>
<td>Finely papillate on dorsum; smoother ventrally; traces of ventrolateral ridge</td>
<td>Coarsely papillate all over; diamond pattern of primary papillae on mantle; very large ocular papillae; no ventrolateral ridge</td>
<td>Finely papillate on dorsum; smoother ventrally; traces of ventrolateral ridge</td>
<td>Minor papillation; loose and wrinkled skin; no ventrolateral ridge</td>
<td>Minor papillation; loose and wrinkled skin; fleshy ventrolateral ridge</td>
</tr>
<tr>
<td>Colour</td>
<td>Purplish-red dorsally; paler ventrally</td>
<td>Purplish-brown dorsally; paler ventrally</td>
<td>Golden yellow dorsally; paler ventrally; large white spots and stripes on mantle</td>
<td>Purplish-pink mantle dorsum; dark purplish-brown to black brachial crown, web and arms; paler ventrally</td>
<td>Brownish-pink dorsally; paler ventrally</td>
<td>Dark purplish-pink dorsally; paler ventrally</td>
</tr>
<tr>
<td>Other Remarks</td>
<td>Mantle elongate ovoid; head wider than mantle; eyes very large; arms short and stout</td>
<td>Mantle roundly ovoid; head narrower than mantle; arms short and tapering</td>
<td>Mantle roundly ovoid; head narrower than mantle; arms long and tapering</td>
<td>Mantle roundly ovoid; head narrower than mantle; arms long and tapering; skin loose and sometimes slightly gelatinous</td>
<td>Mantle roundly ovoid; head narrower than mantle; arms moderately long and stout; web very deep</td>
<td>Mantle roundly ovoid; head narrower than mantle; arms short and stout; web very deep; skin loose and gelatinous</td>
</tr>
</tbody>
</table>
by the collection of females with egg broods, and live rearing experiments. The species have not been recorded from regions other than the Antarctic continental shelf, and may be classified as endemic elements of the fauna.

Acknowledgments

We are grateful for the collections and field work made possible through the logistic support of the Australian National Antarctic Research Expeditions by the Australian Antarctic Division (Kingston, Tasmania) (ASAC Project No. 11). We also thank the captain and crew of the RSV Aurora Australis (P&O Polar) for assistance in collecting valuable material. We thank Dr M. D. Norman and Ms T. G. Cochran for collecting important additional material. We also wish to thank Mr I. Loch and Mr P. H. Colman (Australian Museum, Sydney) and Ms A. Tillier and Dr R. Boucher-Rodoni (Muséum National d’Histoire Naturelle, Paris) for making collections available for study. We are grateful to Mr C. Rowley for photographic work. We also thank Drs F. G. Hochberg, M. D. Norman and G. C. B. Poore for kindly commenting on the manuscript.

References


