

Records of the Auckland Museum

Volume 50 | 2015



TAMAKI PAENGA HIRA

AUCKLAND WAR MEMORIAL MUSEUM

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Cover image: Detail from sampler sewn by Martha Gibbons showing New Zealand and the use of Te Reo placenames. 1784. Image courtesy of the Auckland War Memorial Museum, Tamaki Paenga Hira. 2014.1.1.

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Intertidal records of ‘sea slugs’ (nudibranchs and allied opisthobranch gastropods) from northern North Island, New Zealand

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Abstract

We record the intertidal or shallow subtidal (<2–3 m) occurrence of 78 species of ‘sea slug’ from northern North Island of New Zealand. One (*Goniodoris* n.sp.) is recorded for the first time. The majority are briefly described, illustrated and their records plotted on maps. Three taxa are probably undescribed new species. All except two (*Aphelodoris* sp., *Trinchesia reflexa*) of the species have been recorded from along the east coast (warmer water Aupourian Province) but only 44% (34 spp.) have been recorded from the west coast (cooler Cookian Province). The highest diversity of intertidal/shallow water ‘sea slugs’ has been recorded from the Leigh area (47 spp.), Bay of Islands (42 spp.) and Great Barrier Island (38 spp.) reflecting the intensity of survey (Leigh) and diversity of habitats on the warmer coast (latter two). Of the harbours, 33 spp. are recorded from the Waitemata, 27 spp. from Parengarenga and 24 spp. from the Manukau, reflecting the intensity of survey (Waitemata, Manukau) and unusual warm conditions of far north Parengarenga. Of the ‘sea slugs’ recorded herein, 45% are endemic to New Zealand and nine of these are endemic to northern New Zealand.

Keywords

New Zealand; Hauraki Gulf; Northland; nudibranchs; ‘sea slugs’; biogeography.

INTRODUCTION

The common name ‘sea slug’ conjures up repulsive images of dull, slimy creatures, but in reality, while some are cryptic, many display brilliant colours and dramatic colour combinations more like butterflies. Readers are strongly recommended to complement the black and white images presented here with the coloured images in Willan *et al.* (2010) or online sites (<http://www.seaslugforum.net/>, <http://www.nudipixel.net/>, <http://www.ianskipworth.com/suig/nudis.html>). Detailed descriptions of anatomy, feeding and reproduction are given in Willan and Morton (1984) and Willan *et al.* (2010). Enderby and Enderby (2005) presented an illustrated account of endemic nudibranchs in New Zealand.

Sea slugs seen by scuba divers at subtidal depths down to ~30 m have been well reported (Willan and Morton 1984; Willan *et al.* 2010; <http://www.seaslugforum.net/>), but intertidal and shallow subtidal species from snorkel depths (0–3 m) have not been documented so fully. Those sea slug species that have been recorded from northern New Zealand, but only from subtidal scuba depths (> 3 m) have not been included here. Abundances of some species appear to differ between intertidal and

subtidal populations, e.g. *Ceratosoma amoenum* and aeolids are more common subtidally than intertidally (pers. obs.), so this compilation of our observations over many years compliments what is already well known and helps advance our knowledge of the geographic distribution, ecology and in some instances the life history of sea slugs in northern New Zealand.

What is meant by a ‘sea slug’

The name ‘sea slug’ is usually applied to a number of marine gastropods that are shell-less or outwardly appear to have no shell. It seems that reduction in size or loss of a shell has occurred on a number of occasions in different evolutionary lineages of opisthobranch gastropods. Here we adopt a pragmatic approach for our more general readers and use the term ‘sea slug’ for slug-like marine opisthobranch gastropods that have no shell, or their shell is internal or where their shell is too small for the soft parts to be retracted into it. The largest group numerically is the Nudibranchia, where there is no shell as an adult and the often brightly-coloured animal has external gills. Some of the sea slugs included here (Family Aplysiidae) are also known as sea hares because of their apparent resemblance to a sitting hare.

They usually have a long neck bearing a head with a pair of enrolled rhinophores and enrolled tentacles on each side of the mouth. In addition there is one other common intertidal slug-like gastropod (*Scutus*) in northern New Zealand that is not an opisthobranch but an unrelated fissurellid which we have included.

Survey area, methods and sources of records

The area covered by this study is northern New Zealand and extends northwards from the Manukau Harbour, Firth of Thames and northern Coromandel Peninsula and includes Great Barrier Island, but not the Three Kings or Kermadec Islands (Fig. 1). The majority of the records reported here have been made by MSM and BWH since 1995 while undertaking semi-quantitative assessments of the intertidal biota of different parts of the shoreline of the region (Appendix 1). The surveys

were not specifically targeted for nudibranchs. Each record placed on the maps (Figs 1–24) relates to one or more findings within a coastal stretch of 0.5–2 km that was typically surveyed over a 2–4 hr period either side of a spring low tide. This paper also includes records from major study areas where the total biota has already been documented and published. These are, from north to south: Parengarenga Harbour (Hayward *et al.* 2001), Ahipara (Hayward *et al.* 2004), Kawerua (Hayward *et al.* 1995), Bay of Islands (Morley and Hayward 1999), Whananaki (Hayward *et al.* 2012), Great Barrier Island (Morley and Hayward 2009), Whangapoua, Coromandel Peninsula (Hayward *et al.* 2014), Waitemata Harbour (Hayward *et al.* 1999), Tamaki Estuary (Hayward and Morley 2008), Waitakere Ranges and northern Manukau Harbour (Hayward and Morley 2004). Many additional sites in the southern half of the region have also been

Table 1. Published name combinations used for some intertidal New Zealand sea slugs that have been changed since 1980. For earlier synonymies refer to Powell (1979).

Former name	Present name
<i>Aeolidiella indica</i> (Bergh, 1888)	<i>Anteaeolidiella lurana</i>
<i>Aplysia dactylomela</i> Rang, 1828	<i>Aplysia argus</i>
<i>Archidoris wellingtonense</i> Abraham, 1877	<i>Doris wellingtonensis</i>
<i>Bouvieria ornata</i> (Cheeseman, 1878)	<i>Berthella ornata</i>
<i>Bulla angasi</i>	<i>Bulla vernicosa</i>
<i>Bursatella glauca</i> (Cheeseman, 1878)	<i>Bursatella leachii</i>
<i>Chromodoris amoena</i> Cheeseman, 1886	<i>Ceratosoma amoenum</i>
<i>Chromodoris aureomarginata</i> Cheeseman, 1881	<i>Goniobranchus aureomarginatus</i>
<i>Ctenodoris flabellifera</i> (Cheeseman, 1881)	<i>Doris granulosa</i>
<i>Cuthona beta</i> (Baba & Abe, 1964)	<i>Trinchesia beta</i>
<i>Cuthonia reflexa</i> Miller, 1977	<i>Trinchesia reflexa</i>
<i>Dendrodoris denisoni</i> (Angas, 1864)	<i>Dendrodoris krusensternii</i>
<i>Dendrodoris gemmacea</i> (Alder & Hancock, 1864)	<i>Dendrodoris krusensternii</i>
<i>Dermatobranchus pulcherrimus</i> Miller & Willan, 1986	<i>Dermatobranchus rubidus</i>
<i>Doriopsis flabellifera</i> (Cheeseman, 1881)	<i>Doris granulosa</i>
<i>Glossodoris amoena</i> (Cheeseman, 1886)	<i>Ceratosoma amoena</i>
<i>Glossodoris aureomarginata</i> (Cheeseman, 1881)	<i>Goniobranchus aureomarginatus</i>
<i>Hydatina albocincta</i> (van der Hoeven, 1839)	<i>Hydatina zonata</i>
<i>Okadaia cinnabarea</i> (Ralph, 1944)	<i>Vayssiërea cinnabarea</i>
<i>Placida aoteana</i> (Powell, 1937)	<i>Placida dendritica</i>
<i>Pleurobranchaea novaezealandiae</i> Cheeseman, 1878	<i>Pleurobranchaea maculata</i>
<i>Pupa kirki</i> (Hutton, 1873)	<i>Pupa affinis</i>
<i>Rostanga rubicunda</i> (Cheeseman, 1881)	<i>Rostanga muscula</i>
<i>Scutus antipodes</i> Montfort, 1810	<i>Scutus breviculus</i>
<i>Spurilla drusilla</i> (Bergh, 1900)	<i>Aeolidia drusilla</i>
<i>Trippa molesta</i> Miller, 1989	<i>Atagema molesta</i>
<i>Umbraculum sinicum</i> (Gmelin, 1791)	<i>Umbraculum umbraculum</i>

surveyed by the authors but the results have not yet been published (Appendix 1).

Where the identification of a specimen was not immediately obvious, it was placed in sea water to encourage extension and movement. This allowed observation of its colour, shape, gill, cerata, rhinophores and tentacles. These characteristics were recorded and sometimes the specimen was photographed. A few unfamiliar specimens were collected as vouchers, narcotised, preserved and placed in the wet collections of the Marine Department of the Auckland War Memorial Museum (specimens prefixed by MA in Appendix 1).

Historical locality records dating back to 1980 made by one of us (MSM, Appendix 1) have also been included, and include observations of species made during snorkelling at shallow subtidal depths down to 1–3 m. These unpublished records consist of drawings, photographs and notes. A number of additional locality records have been added from the collection database of the Marine Department, Auckland Museum and Te Papa Museums' web-based database as detailed in Appendix 1.

Drawings

Most of the recorded species are accompanied by a drawing usually by MSM. These are generally based on actual live specimens that were placed in sea water and sketched. In some instances these sketches have then been augmented by observations made on live specimen photographs on the internet. A few species were not available for drawing from either our specimens or notes, and these have been redrawn from Willan and Morton (1984). Where there is no locality given in the caption to a drawing, the specimen drawn was not found live by us, and has been drawn from a photograph from elsewhere.

Previous work

Most of the more common larger sea slugs seen intertidally around northern New Zealand were described in the 19th century. Of particular interest are six that were described by the then Director of Auckland Museum, Thomas Cheeseman between 1878 and 1886. Because it was impossible to preserve their colour, he had his sister Emma Cheeseman draw iconotypes of some of these in 1881–2, which are held by the Museum (Powell 1941). In 1979, Auckland Museum's Arthur 'Baden' Powell recorded a total of 73 species of 'sea slugs' from New Zealand, but some of these have subsequently been synonymised. Since then University of Auckland professor Michael Miller and his graduate students, Derek Challis, Bill Rudman and Richard Willan, have published over twenty papers on the nudibranchs of New Zealand, a number of them described as new. In 1984, Richard Willan and John Morton provided general descriptions and illustrated 150 species of 'sea slugs' from New Zealand. Updated information and colour photographs of 87 New Zealand 'sea slugs' were provided in Willan *et al.* (2010). With molecular studies the taxonomy of sea slugs continues to change and we have tried to use the latest synonymies (Table 1).

SEA SLUGS RECORDED INTERTIDALLY FROM NORTHERN NEW ZEALAND

Classification follows Spencer *et al.* (2014) and the World Register of Marine Species (<http://www.marinespecies.org/>). The species recorded below are summarised in Appendix 2. The known global distribution of species is mostly taken from Willan and Morton (1984) and Willan *et al.* (2010).

Opisthobranchia Acteonidae

Pupa affinis (A. Adams, 1855) Fig. 1

Average animal length 15 mm. The shell is elongate-conic, with narrow punctate spiral grooves cutting the surface into uneven flat-topped ribs. The interstices are crossed by fine axial threads and a double fold is prominent at the base of the columella (Powell 1979, p 269). The animal is translucent and creamy white. This species is rare intertidally, where it lives buried in low tidal sediment. It is more common in dredged material below low tide to depths of 300 m. In our records we have found it on semi-protected and open sandy coasts along the full length of eastern Northland but only off Ahipara (dredged at 40 m) on the west side, although it has been collected by others from off Awhitu Peninsula. Its recorded range extends south to Raglan on the west coast and down to East Cape on the east coast (Te Papa Museum records). It is widespread in the southern hemisphere.

Bullinidae

Bullina lineata (Gray, 1825) Fig. 1

Average animal length 20 mm. The fragile shell is white with delicate red axial and spiral lines and a sculpture of incised spirals. The luminous animal is blue, with its mantle and head shield exquisitely margined by iridescent greenish-blue. It is thought to prey on polychaete worms (Rudman 1998). A pair of live specimens was observed laying spawn at Paua, Parengarenga Harbour at a depth of 2 m. *B. lineata* is rare intertidally in New Zealand, but common in Australia and the Indo-Pacific on fine sandy substrates down to depths of 10 m. Here we record it in sporadic occurrences down the full length of the east coast of Northland and on Great Barrier Island. Its southernmost record is the Aldermen Islands (Te Papa Museum records). Dead shells have washed in at East Cape.

Aplustridae

Hydatina physis (Linnaeus, 1758) Fig. 1

Average animal length 75 mm. Its common name rose-petal bubble shell is well chosen; the pink animal is much larger than its fragile shell and its intense blue margin is exquisitely gathered into numerous ruffles. The ground colour of the globose shell is buff, with thin brown spiral lines and a sunken spire. In August 1986, a

pair was observed mating in channel mud in a depth of 2 m at Paua, Parengarenga Harbour (MSM pers. obs.). In August 2000 over 100 specimens of a range of sizes were found alive over a two day period. Some of these were floating, some crawling on the mud. The animals all had light lemon coloured bodies with a white border to the mantle (Raven 2000). This species lives intertidally down to 10 m in semi-sheltered localities and only rarely washed ashore. We have records of dead shells washed in at four localities along the northeast coast of Northland – Parengarenga, Rangiputa, Bay of Islands and Tutukaka. It is widespread throughout the tropical and subtropical Indo-Pacific and Atlantic Oceans.

Hydatina zonata (Lightfoot, 1786) Fig. 1

Average animal length c. 35 mm. The fragile inflated shell is very variable in coloration. Some have four dark brown radial stripes on a white ground (Powell, 1979), while others have various combinations of narrow brown and white spirals (Rudman 2004). A single empty shell of this species was recorded from Tutukaka in April 1970 by Powell (1979, p. 270). For 3 to 4 years from 2003-2006, extremely rare dead shells were washed in at Rangiputa and Rangaunu Harbour in the Far North (Peter Poortman pers. comm.). The only recorded live specimen in New Zealand was found at Paua, Parengarenga Harbour in 2000 (Raven 2000). The animal was pinkish mauve with a white border. There are no recent records of this species in New Zealand. It is also known from Japan and northern Australia.

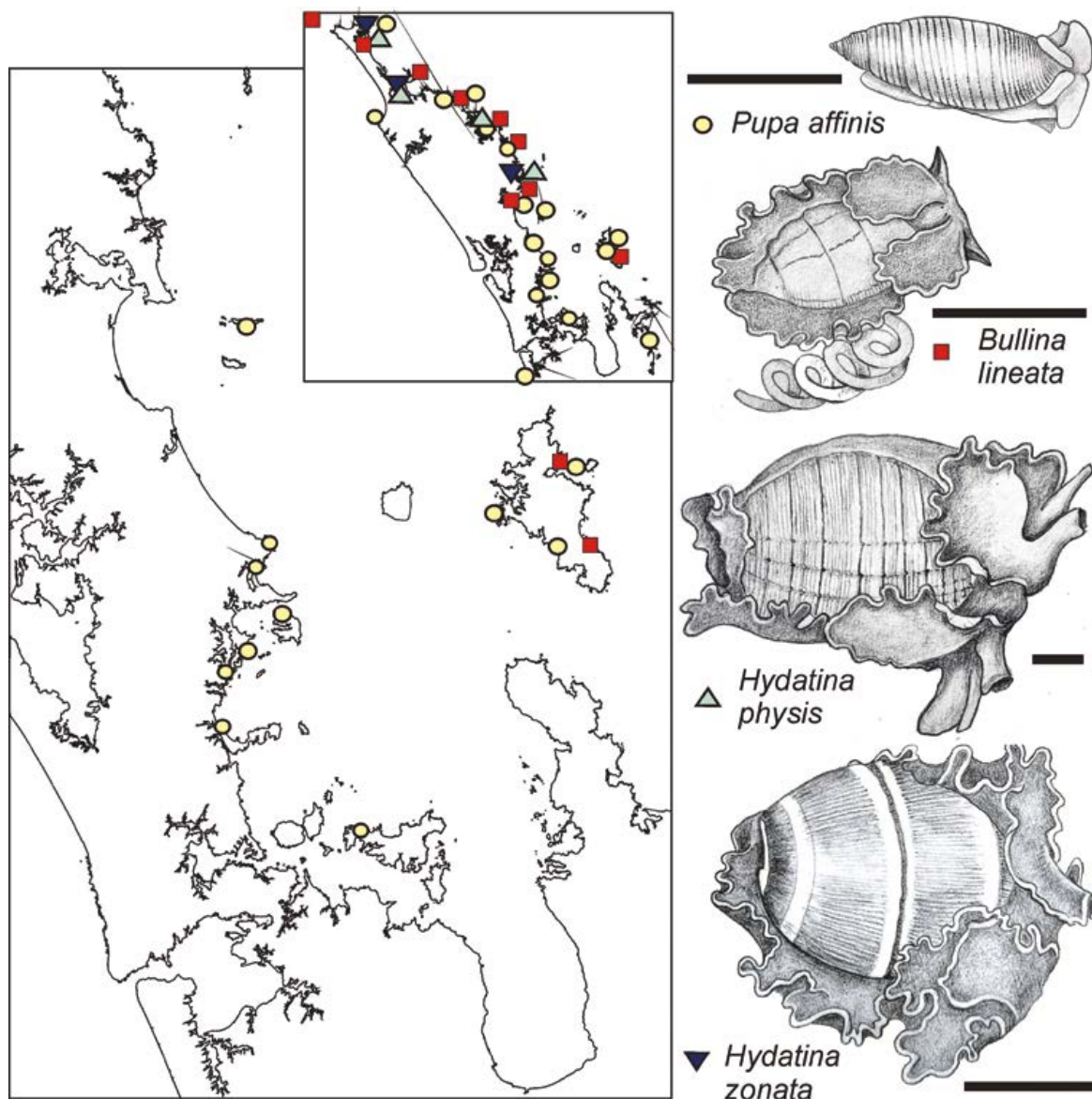


Figure 1. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Pupa affinis* (Great Barrier, Tryphena), *Bullina lineata* (Parengarenga, Paua), *Hydatina zonata* (Northland, Rangiputa) and *Hydatina physis* (Parengarenga, Paua). Scale bars 10 mm long.

Cephalaspidea Cylichnidae

Cylichna thetidis Hedley, 1903 Fig. 2

Average animal length 10 mm. The shell is small, white with sub-parallel sides and a low spire. There are usually fine spiral lines present. It lives in sand intertidally down to 55 m (Willan and Morton 1984). We have found it in low numbers in our surveys in shell sand throughout the east coast of Northland and Auckland, but not in the inner gulf. We have occasionally sieved it alive in low tide sediment. It is also known from further south around the North Island and in Australia.

Philinidae

Philine angasi (Crosse and Fischer, 1865) Fig. 2

Average animal length 50 mm. The animal is a firm, white, carnivorous slug that buries in soft sediment at or below low tide down to 7 m (Willan and Morton 1984). The internal shell is smooth, thin and fragile with a large body whorl. We have found specimens buried in extreme low tidal sandy mud at Cornwallis and Wattle Bay, in the Manukau Harbour. We have scattered records from right around Northland and Auckland with its range extending south to East Cape. It also occurs in Australia.

Philine auriformis Suter, 1909 Fig. 2

Average animal length 25 mm. This smaller relative of *P. angasi* is distinguished from it by delicate spiral

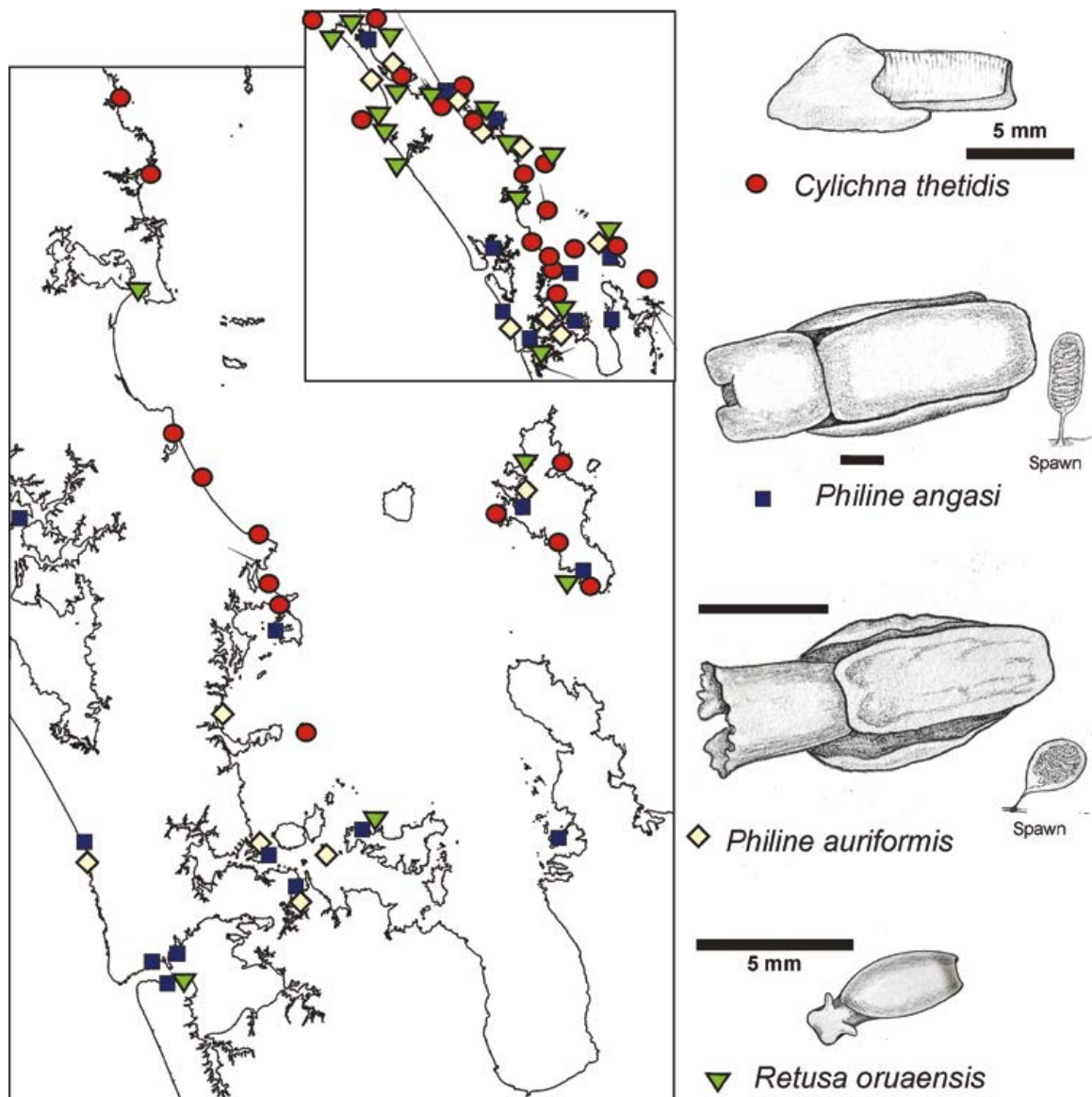


Figure 2. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Cylichna thetidis* (Great Barrier, Whangaparapara), *Philine angasi* (Manukau Harbour, Cornwallis), *Philine auriformis* (Tamaki Estuary, Farm Cove) and *Retusa oruaensis* (Northland, Bland Bay). Scale bars 10 mm long unless stated otherwise.

sculpture on the internal shell. This can be seen under the microscope through the tissues of the living animal. It lives buried in sediment at low tide and deeper. We have scattered records from right around Northland and Auckland. It occurs right around the three largest islands of New Zealand. It is an invader on the west coast of United States of America (Krug *et al.* 2012).

Retusidae

Retusa oruaensis (Webster, 1908) Fig. 2

Average animal length 3 mm. The tiny, white cylindrical shell is parallel-sided, and the animal creamy white. This endemic species lives buried in sediment usually below low tide and down to 200 m (Willan and Morton 1984). At Bland Bay, Northland it was live in sediment

in a water depth of 1 m at low tide. We have records of washed up dead shells from right around northern New Zealand and its range extends around the South Island and out to the Chatham Islands. Type locality is Orua Bay, Manukau Harbour.

Aglajidae

Melanochlamys cylindrica Cheeseman, 1881 Fig. 3

Average animal length 25 mm. This black cylindrical slug looks like a twig, making it easily overlooked as it crawls on coralline turf. The parapodia are closely wrapped round the body. It preys on nereid worms (Willan and Morton 1984). There is a small, vestigial, internal shell. This endemic slug is often found in low numbers during our searches in mid to low intertidal

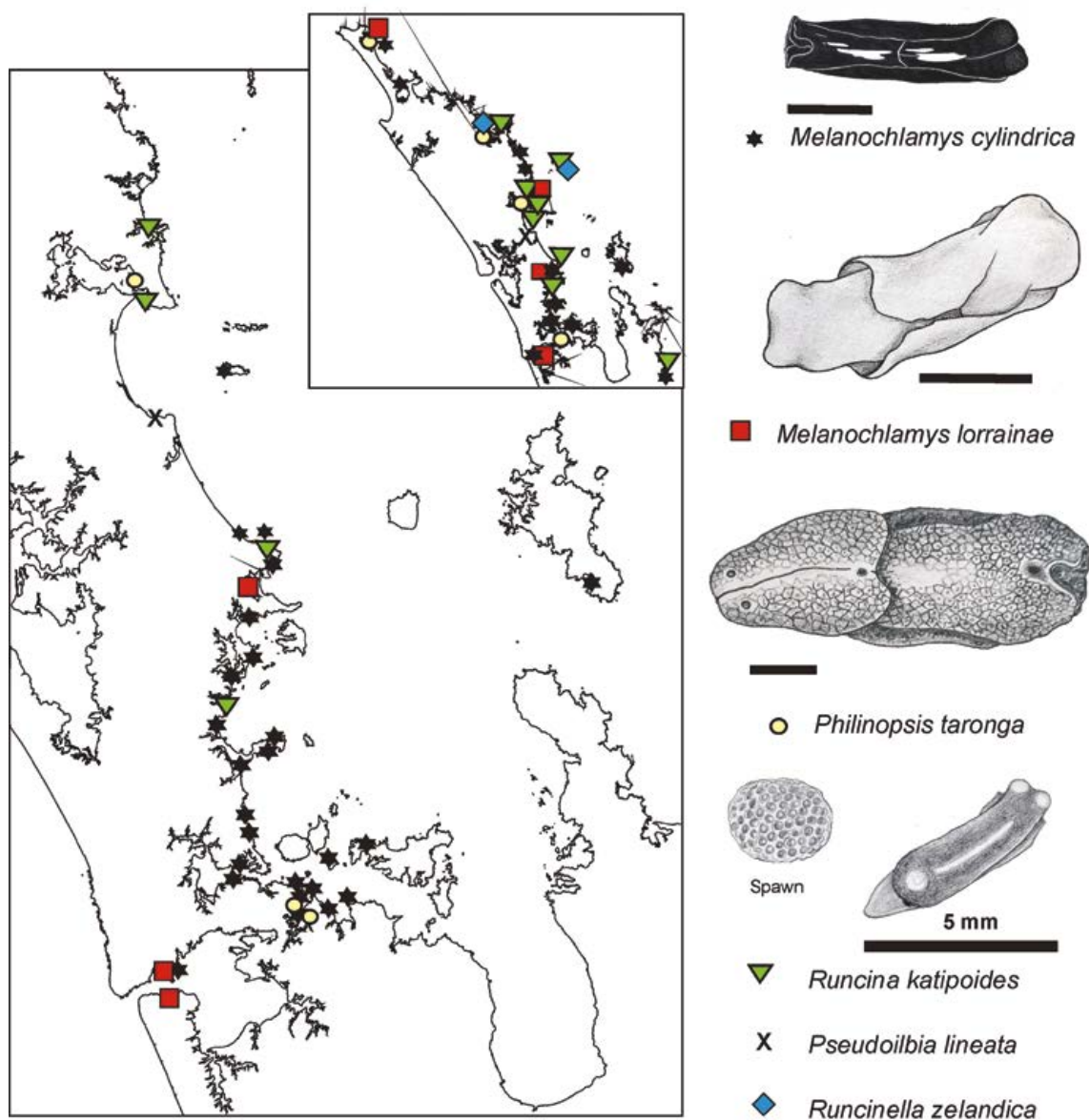


Figure 3. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Melanochlamys cylindrica* (Whangaparaoa, Fishermans Rock), *Melanochlamys lorrainae* (Parengarenga, Paua), *Philinopsis taronga* (Tamaki Estuary, Farm Cove), *Runcina katipoides* (Northland, Pataua), *Pseudoilbia lineata* and *Runcinella zelandica*. Scale bars 10 mm long unless stated otherwise.

pools both on muddy shore platforms and on the open coast. We have scattered records along the east coast of Northland and Auckland and in Manukau Harbour, with its most common occurrence on the west coast of the Hauraki Gulf. It occurs right around both main islands of New Zealand.

Melanochlamys lorrainae (Rudman, 1968) Fig. 3

Average animal length 25 mm. Unlike *M. cylindrica*, *M. lorrainae* is rare. The animal is white to grey with yellowish tinges and has only been recorded in soft sediment. The type locality is from dredged sediment off Wattle Bay, Awhitu Peninsula, Manukau Harbour. A specimen, observed by MSM at Paua, Parengarenga Harbour, emerged covered in mucus from the low tidal muddy sand on the turning tide. Molecular phylogenetic analysis on another specimen collected from low tide sand at Wattle Bay showed that this is a distinct species from *M. cylindrica* (Krug *et al.* 2008). The endemic *M. lorrainae* has been recorded in harbour sediment from scattered localities down the east side of northern New Zealand and in Manukau Harbour. Its southern most record is in the Marlborough Sounds (Te Papa Museum database).

Philineopsis taronga Allan, 1933 Fig. 3

Average animal length 30 mm. This uncommon aglajid is brown with an irregular, black, reticulated pattern enclosing yellow spots. The parapodia and head shield are edged with yellow to orange. The body is often folded centrally resulting in a semi-curved position. There is an internal shell. It is found living in low tide mud or sand on sheltered beaches. A possible prey species is *Haminoea zelandiae* which is common in the same area of the Tamaki Estuary. We have sporadic records from the east coast of northern New Zealand. It is also known from Australia.

Runcinidae

Pseudoilbia lineata Miller and Rudman, 1968 Fig. 3

Average animal length 3 mm. The front and back of the animal are pale white and the remainder has fine black longitudinal bands. There is a narrow orange-red bar behind these bands. It lacks a gill, shell and gizzard plates. The holotype was found in an intertidal pool on coralline turf at Langs Beach, Bream Tail, in 1963 (Miller and Rudman 1968). No further specimens have been found.

Runcina katipoides (Miller and Rudman, 1968) Fig. 3

Average animal length 5 mm. This tiny elongate nudibranch is seldom seen unless its habitat in coralline turf is carefully examined. It is a herbivore (Sea Slug Forum). The digestive gland shows as a bright red, central stripe on the dorsum of the dark grey body. At the rear of the notum a white patch denotes the internal shell. The anterior area around the eyes is clear. The margin of the body has a narrow blue phosphorescent border (MSM pers. obs.). This species is a direct developer. Spawn is laid, with the black centred eggs in a ball of clear jelly with a diameter of 2 mm (MSM

pers. obs.). It is found on hard substrates from protected harbours to open coastal localities intertidally down to 14 m depth (Willan and Morton 1984). This endemic species is only known from the east coast of northern Northland between the Bay of Islands and Opoutere on the east coast of Coromandel Peninsula. Its type locality is Taurikura Bay, Whangarei Harbour.

Runcinella zelandica Odhner, 1924

Average animal length 5 mm. The animal has a dark green background with irregular salmon pink longitudinal bands and sometimes irregular white patches. Corners of the head are folded into tentacular processes that give it a bilobed appearance. It has large gills that project out from under the posterior edge of the mantle. This endemic species is most commonly seen feeding on the green alga *Codium dichotomum* in the sublittoral fringe down to about 3 m depth (Willan 1981). It was described from Cape Brett (Bay of Islands) but is most commonly seen at the Poor Knights Islands.

Bullidae

Bulla quoyii Gray, 1843 Fig. 4

Average animal length 50 mm. The distinguishing features of this brown shell are the spiral grooves at the anterior end. It is common and widespread in our study area on sheltered beaches buried in muddy pockets among coralline algae or in seagrass. Empty, brown shells are often washed up on beaches, but the animal is seen less often since it is nocturnal. It occurs right around northern New Zealand, being most abundant on the more sheltered harbour shores. It is also known from southern Australia.

Bulla vernicosa Gould, 1859 Fig. 4

Average animal length 30 mm. The shell is more solid than *B. quoyii* and has a glossy surface. There are no spiral striations around the base of the shell and the outer lip is flattened to slightly concave rather than convex. The dark speckles often form two or three spirals bands on the shell (Willan *et al.* 2010). It lives subtidally at 2–10 m depth on semi-exposed soft shores with rare empty shells washed ashore on Northland's east coast. It also occurs at the Three Kings and Kermadec Islands and elsewhere in the subtropical Pacific.

Haminoeidae

Haminoea zelandiae (Gray, 1843) Fig. 5

Average animal length 30 mm. The dark grey animal shows through the thin, fragile, white shell, so living specimens often go unnoticed. This intertidal grazer is common on protected harbour shores. It lives in muddy patches between coralline turf and also in eel grass *Zostera*, feeding among filamentous algae, probably on their epiphytic diatoms (Willan and Morton 1984). This endemic species is widespread on sheltered coasts right around northern New Zealand as far south as the northern South Island.

Aplysiomorpha Aplysiidae

Aplysia argus (Ruppell and Leuckart, 1830) Fig. 6
Average animal length 300 mm, internal shell 70 mm. This large handsome sea hare is olive green with a network of black reticulating lines. Its distinguishing feature is the black patch on the tail. The erect parapodia are connected low down posteriorly (Willan *et al.* 2010). It lives predominantly intertidally on open rocky coasts where it grazes on red and green algae (Willan 1979a). The animal secretes purple ink if disturbed. We have sporadic records of single specimens on the east coast of northern New Zealand and from Ahipara on the west coast. It is cosmopolitan in warm temperate and tropical seas.

Aplysia juliana (Quoy and Gaimard, 1832) Fig. 6
Average animal length to 250 mm, internal shell 30 mm. This uncommon sea hare varies in colour from chocolate brown to black with a scattering of white spots on the external surface of the parapodia, head and tail. It crawls like an inch worm and lives from low tide to 3 m. We have tidal pool records of several specimens at Sentinel Rock, Mangawhai Heads and several snorkelling records also from the east coast of northern New Zealand as far south as Wellington (Te Papa Museum database). It is cosmopolitan in warm temperate and tropical seas.

Aplysia keraudreni Rang, 1828 Fig. 6
Average animal length 250 mm. This large sea hare is kelp-brown with white streaks and mottles overlaid by a black netted pattern. There is a small internal shell.

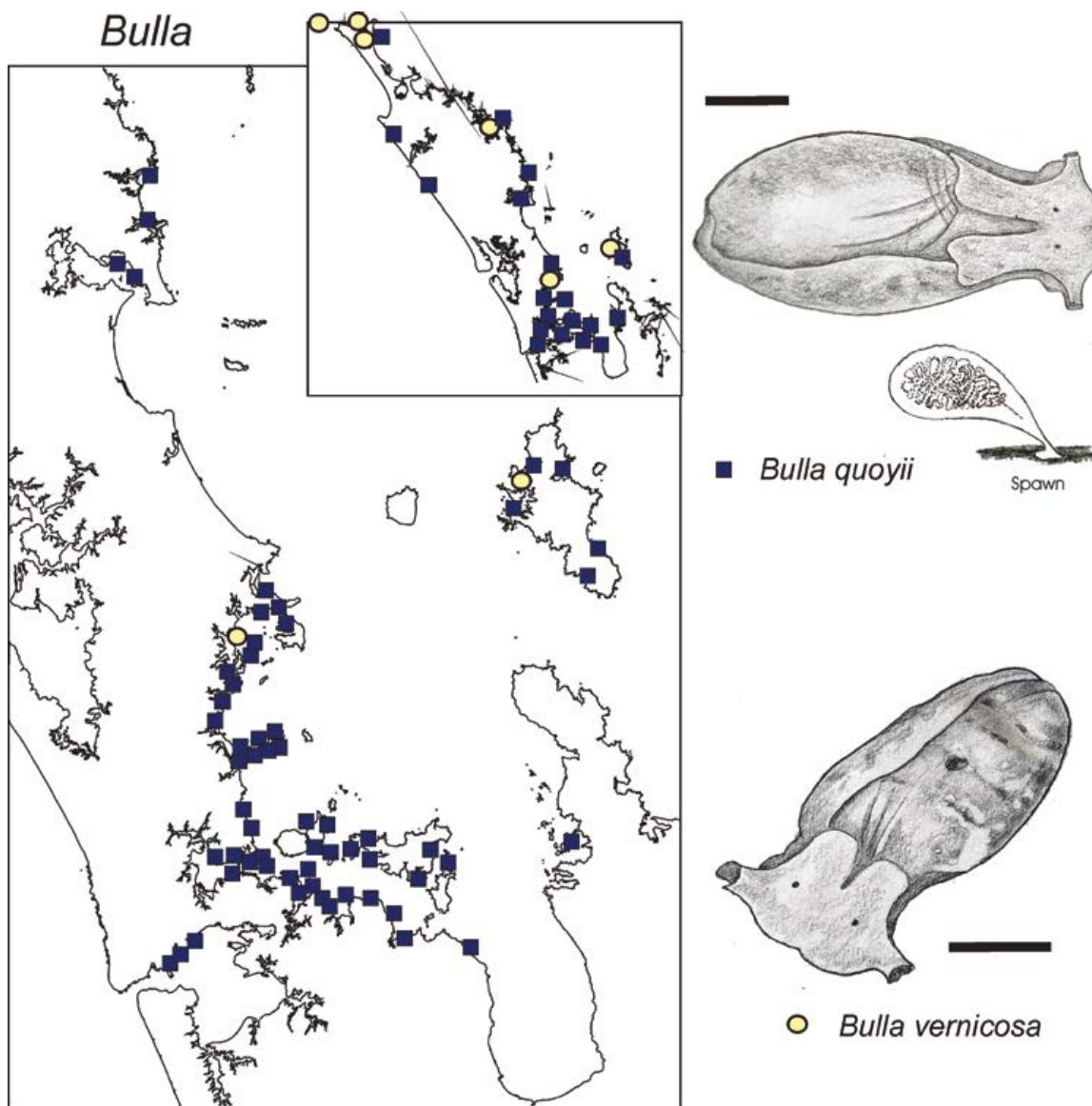


Figure 4. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Bulla quoyii* (Waitemata Harbour, Musick Pt) and *Bulla vernicosa* (Northland, Spirits Bay). Scale bars 10 mm long.

Its habitat is on open rocky coasts and harbour mouths from intertidal down to 18 m depth. It feeds on red algae. We have scattered intertidal records from the east coast of northern New Zealand, but it also occurs in central and southern parts of the country. Its range is the south-western Pacific, including Australia.

Aplysia parvula Guilding, 1863 Fig. 6

Average animal length 60 mm. This is the smallest sea hare in New Zealand. It is kelp-brown dotted with white, and the parapodia, rhinophores and oral tentacles are edged with a narrow black line. The parapodia are continuous forming a cup, only open in the front. It has the largest eye spots of all the *Aplysia* species. All our records are from the east coast of northern New Zealand but it is known from right around the two main islands. It is cosmopolitan in warm temperate and tropical seas.

Bursatella leachii Blainville, 1817 Fig. 7

Average animal length 80 mm. This common sea hare is camouflaged by feather-like processes. The body is brownish-green, decorated with black speckles and vivid emerald green patches. It can be found in high numbers in protected situations such as harbours, estuaries and on *Zostera* beds, especially in summer when they come inshore to breed (Willan and Morton 1984). All our records are from the east coast of northern New Zealand, particularly around the inner Hauraki Gulf. In 2000 there was a population explosion at Howick Beach, Waitemata Harbour following a major algal bloom (Morley *et al.* 2001 p.16). Its southernmost New Zealand record is Cape Kidnappers, Hawkes Bay (Te Papa Museum database). Its range includes tropical and subtropical waters of the South Pacific.

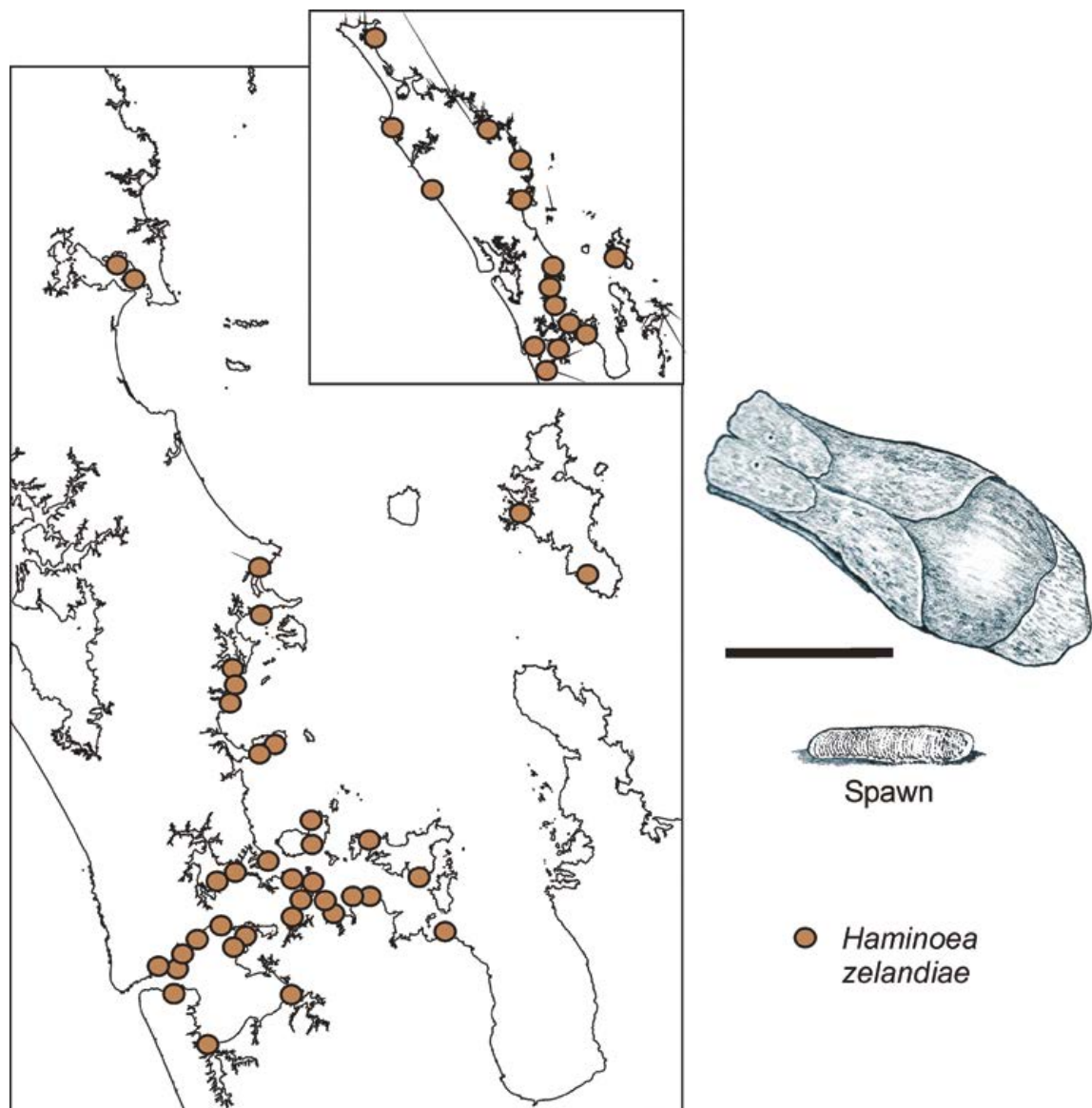


Figure 5. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Haminoea zelandiae* (Tamaki Estuary, Farm Cove). Scale bars 10 mm long.

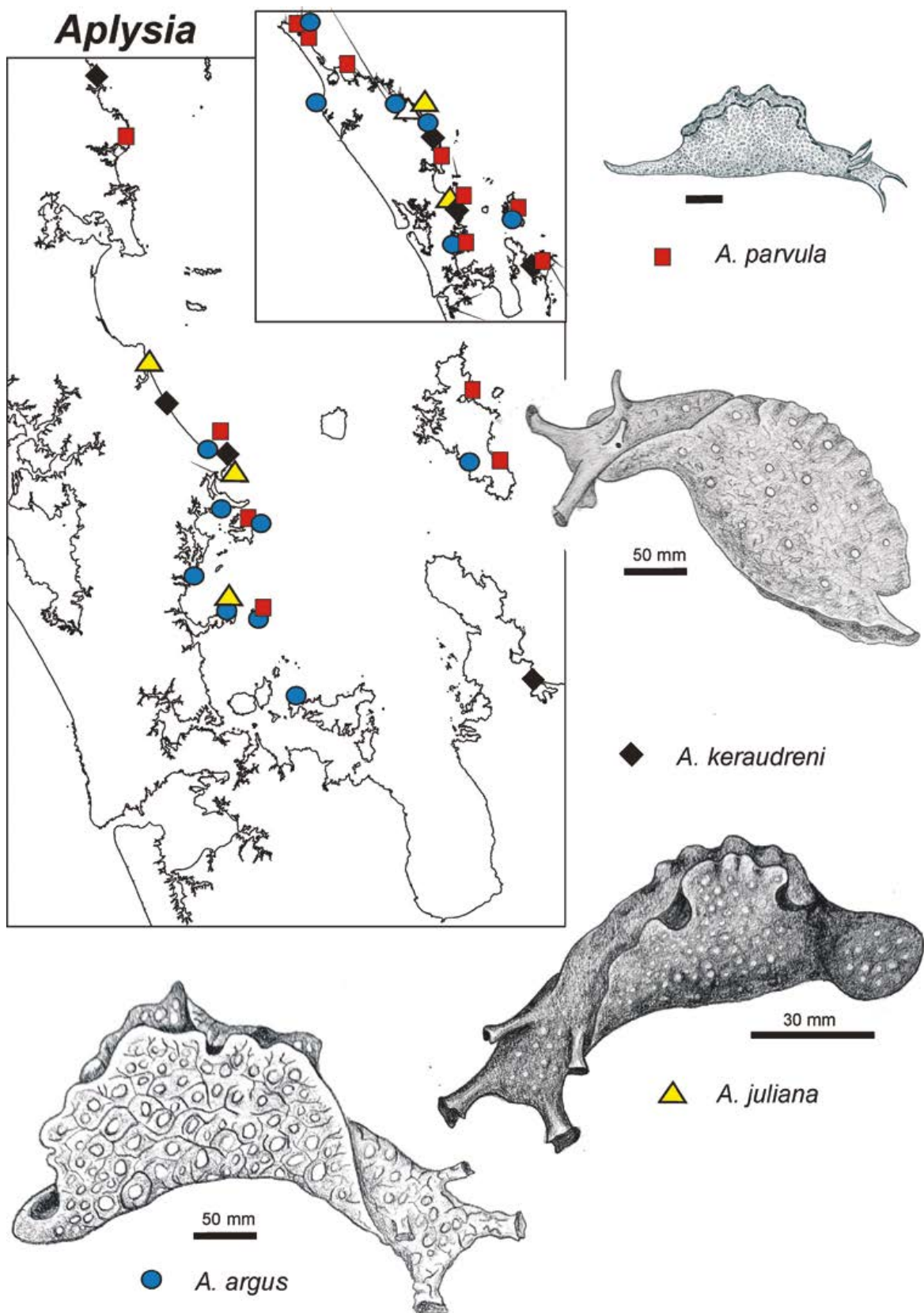


Figure 6. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Aplysia argus* (Waiheke Is, W Bay), *Aplysia juliana* (Northland, Mangawhai Heads), *Aplysia keraudreni* (after Willan and Morton, 1984, p. 32) and *Aplysia parvula* (Northland, Bland Bay). Scale bars 10 mm long unless stated otherwise.

Dolabrifera brazieri G.B. Sowerby II, 1870 Fig. 7

Average animal length 80 mm, shell 8 mm. A distinguishing feature of this sea hare is its flattened shape and wide foot allowing it to closely conform to the rock, often in intertidal pools. Its green body is marbled with brown, white and pink on low rounded papilli (Willan and Morton 1984). It has only been found on the open eastern coast of northern New Zealand. This tropical species arrived in New Zealand in the 1970s (Willan and Morton 1984, p 37)).

Stylocheilus longicauda (Quoy and Gaimard, 1825) Fig. 7

Average animal length 60 mm. This is a rare sea hare with an elongate body and a long narrow tail. It can occur with *Bursatella leachii* and has similar dendritic

processes. The green body has fine longitudinal brown lines and spots that are ringed with black. It lives intertidally down to 30 m, on protected to semi-exposed coasts where it feeds on filamentous green and blue green algae. It occurs rarely along Northland and Auckland's east coast (Willan and Morton 1984). It is cosmopolitan in warm temperate and tropical seas.

Sacoglossa

Sacoglossans are suctorial herbivores on green algae (Powell 1979, p. 283). Most sacoglossans are green, the pigment being derived from their food. The radula is adapted into a single line of teeth ideal for piercing the algal cells.

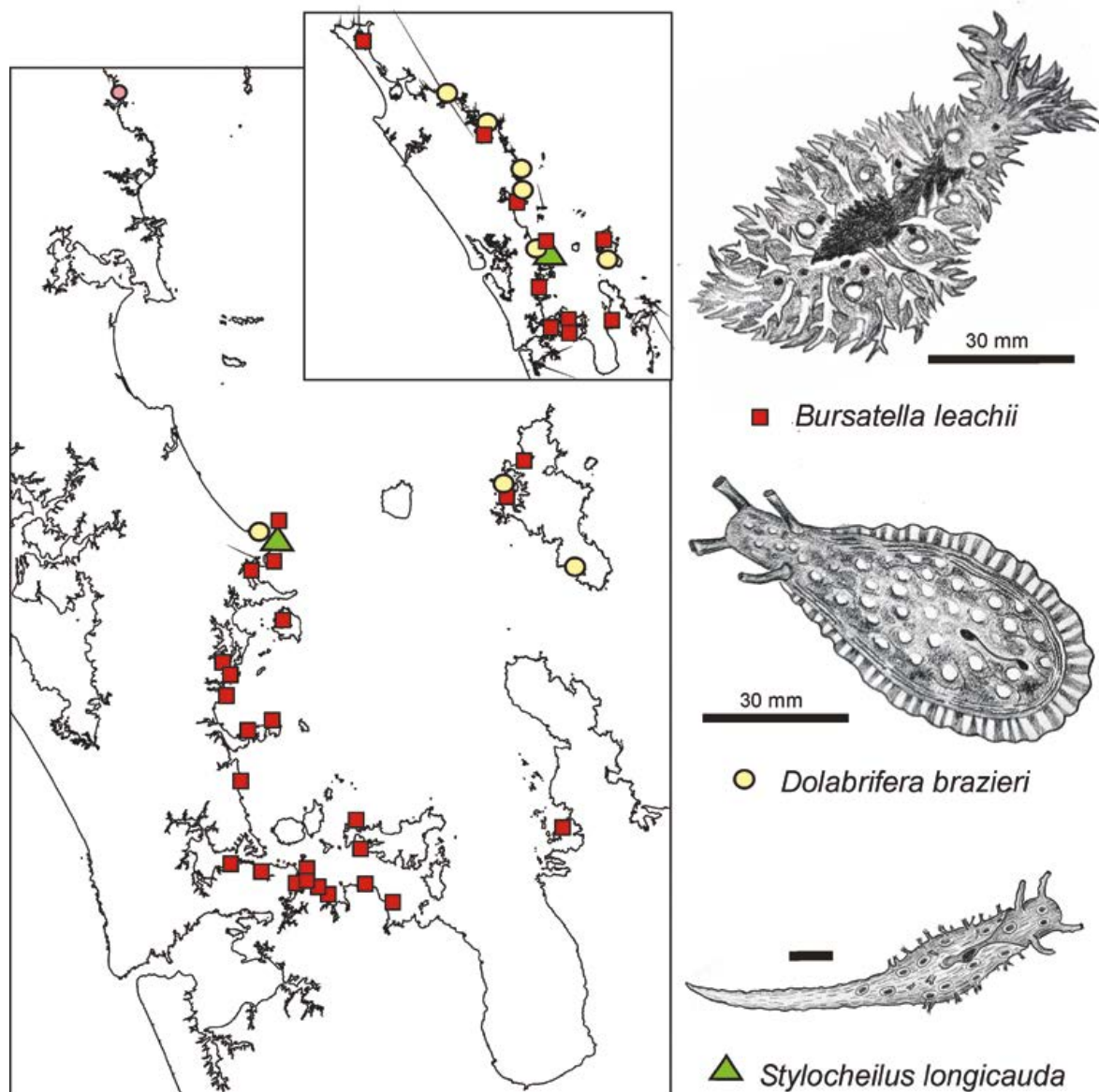


Figure 7. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Bursatella leachii* (Tamaki Estuary, Bucklands Beach), *Dolabrifera brazieri* (Northland, Taupo Bay) and *Stylocheilus longicauda* (after Willan and Morton, 1984). Scale bars 10 mm long unless stated otherwise.

Limapontiidae

Ercolania felina (Hutton, 1882) Fig. 8

Average animal length 10 mm. This small sacoglossan is grey to black with a central white strip on the dorsum and around the eyes. There are two rows of club-shaped appendages similar to cerata down each side of the body. Grooves are present on the underside of the head, body and rhinophores to secure it to the bright green strands of the green alga *Chaetomorpha aerea* on which it feeds and lays its spawn coils (Morley 2004). It lives in high tidal rock pools on exposed coasts. In northern New Zealand this endemic species has been recorded from both coasts of Auckland, common at times on the Waitakere coast. It occurs right around both main islands of New Zealand.

Stiliger smaragdinus Baba, 1949 Fig. 8

Average animal length 15 mm. A seldom seen sacoglossan because it is almost invisible on its food source. Its bright green bulbous appendages are a perfect match for the alga *Caulerpa geminata*. The rhinophores have white tips. The algal pigments are retained in the digestive system and help colour the animal. In New Zealand it has only been recorded from Goat Island, Leigh. It is also found in Japan and Australia (Sea Slug Forum).

Placida dendritica (Alder and Hancock, 1843) Fig. 8

Average animal length 10 mm. This small sacoglossan is a suctorial feeder on green alga, most commonly on *Codium convolutum*. It has a flattened green body

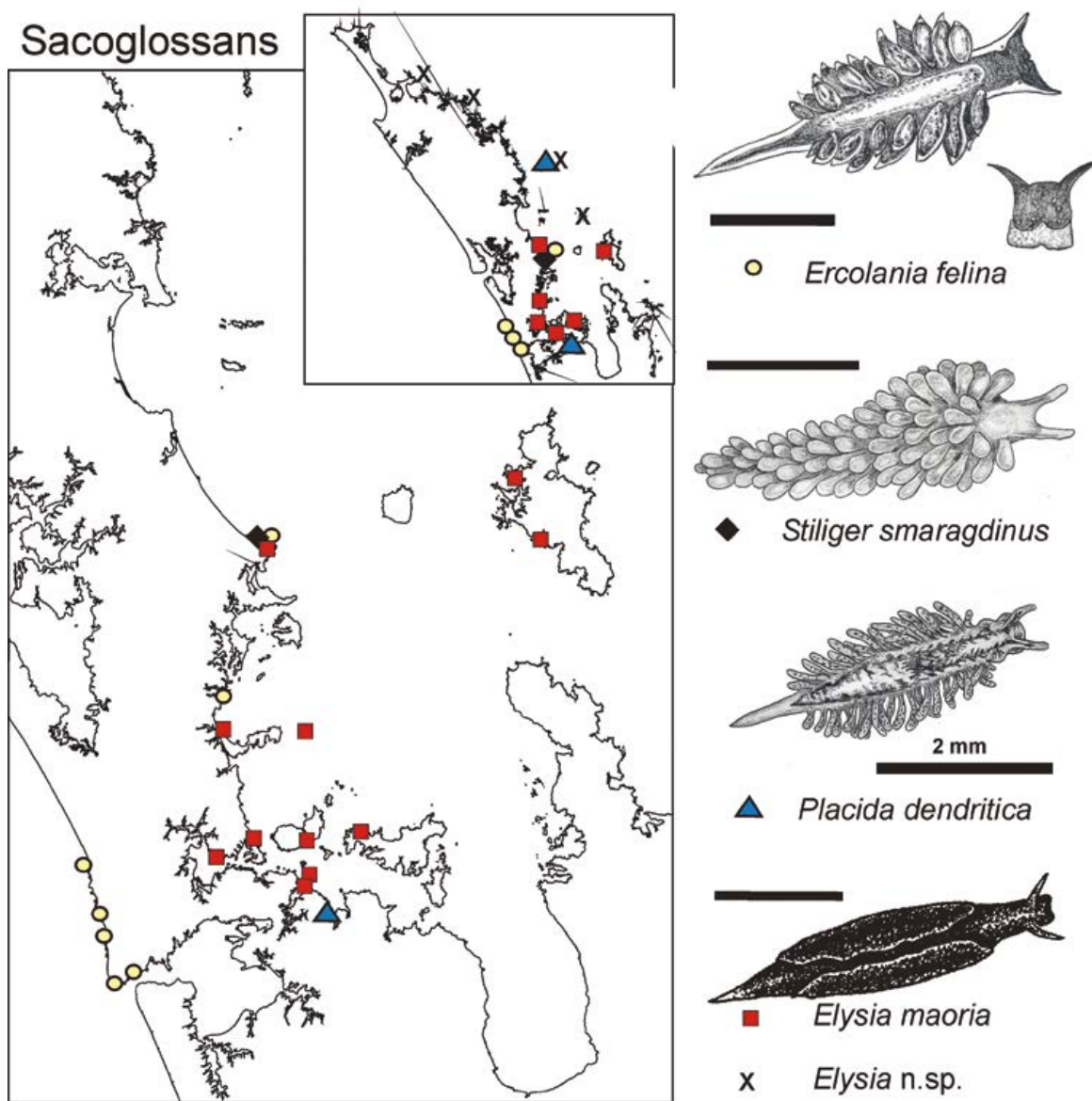


Figure 8. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Ercolania felina* (Waitakere coast, Powell Bay), *Stiliger smaragdinus* (redrawn from Sea Slug Forum web site), *Placida dendritica* (Waitemata Harbour, Mangemangeroa Estuary) and *Elysia maoria* (Kauri Point, Waitemata Harbour) and *Elysia n.sp.* Scale bars 10 mm long unless stated otherwise.

with numerous slender cerata. It lives on rocky reefs in semi-sheltered localities, from low intertidal to 14 m depth (Willan *et al.* 2010). This species occurs right around New Zealand. It is cosmopolitan in warm to cool temperate seas.

Placobranchidae

Elysia maoria Powell, 1937 Fig. 8

Average animal length 16 mm. This sacoglossan is dark green with parapodia that meet in the midline. Under the microscope a detailed pattern of red and white spots is visible. It is found, intertidally to 4 m, on rocky reefs in semi-sheltered localities where it lives on and under *Codium convolutum* and *C. fragile* ssp. *tomentosoides*.

The animal blends so well among the green alga it can only be detected by the presence of its white spiral spawn coil. In our studies we have found it around the sheltered shores of Hauraki Gulf, being most common in the Waitemata Harbour, especially at Bucklands Beach, Tamaki Estuary. Its range includes Australia.

Elysia n.sp. Fig. 8

This is an undescribed species which differs from *E. maoria* by its colouration of pale green parapodia with blue spots and a brilliant blue-green margin. It is recorded from offshore islands, east of Northland (Fig. 8) by Willan *et al.* (2010; pers. comm.). Also recorded from Australia and Norfolk Island.

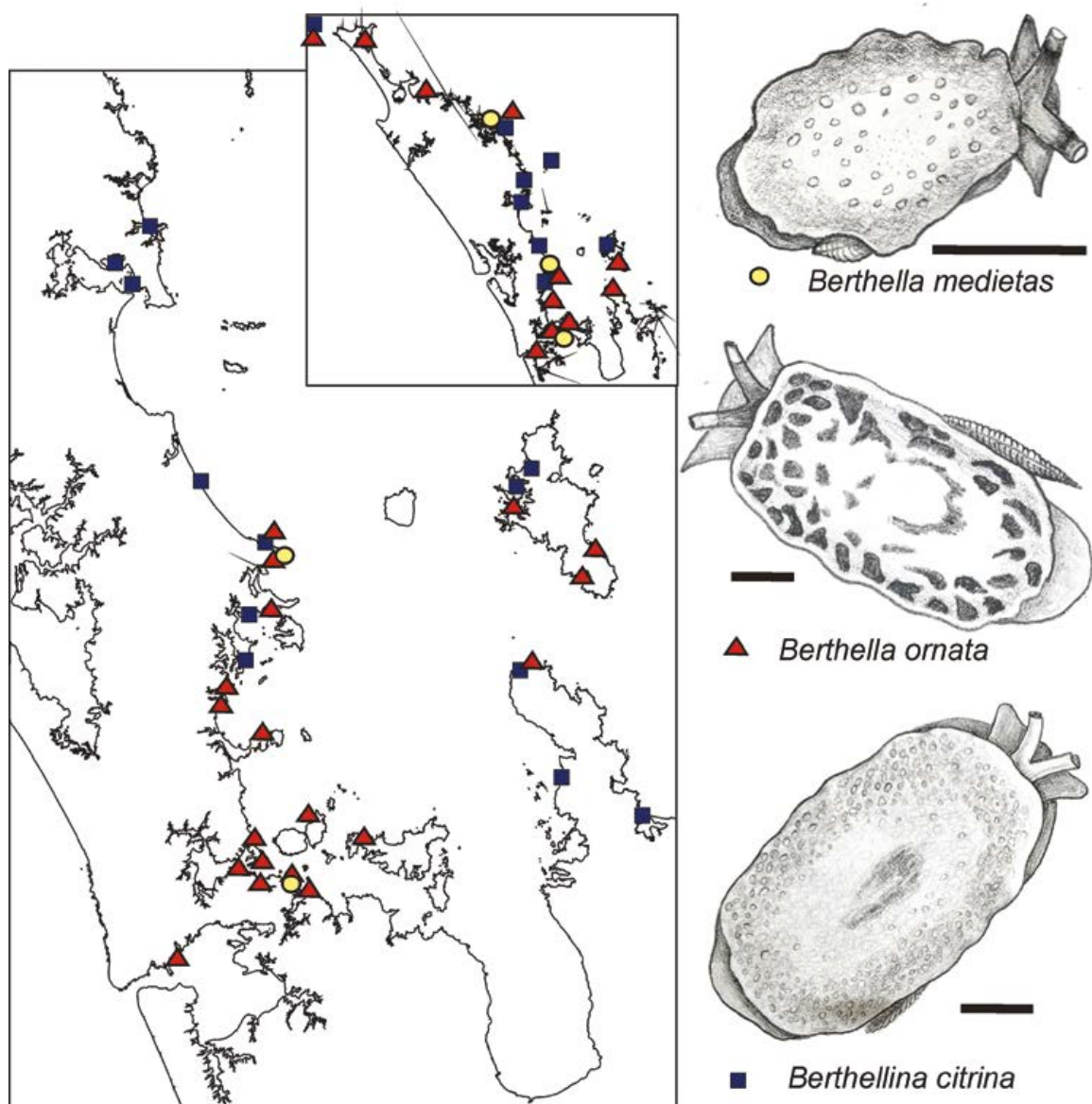


Figure 9. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Berthella medietas* (Waitemata Harbour, Achilles Pt), *Berthella ornata* (Waitemata Harbour, Musick Pt) and *Berthellina citrina* (Coromandel Peninsula, Fletchers Bay). Scale bars 10 mm long.

Pleurobranchomorpha

Pleurobranchidae

Characteristics of pleurobranchs are their triangular oral veil, rolled rhinophores, either arising close together or separated, and a gill on the right side.

Berthella medietas Burn, 1962 Fig. 9

Average animal length 25 mm. It has a small internal shell. This orange to bronze pleurobranch has a characteristic porous texture which distinguishes it from *Berthellina citrina*. Under the microscope glassy spicules can be seen interspersed between the pores. The rhinophores are conjoined above a wide oral veil. It lives on partly sheltered and open rocky coasts, down to depths of 5 m. We have found it in low numbers under

low tidal boulders at several localities on the east coast of northern New Zealand. It occurs throughout New Zealand and also in Australia.

Berthella ornata (Cheeseman, 1878) Fig. 9

Average animal length 60 mm. This large attractive species has a base colour of white to cream and is marked with dark reddish brown blotches. The skin is smooth and slippery to touch, but there are microscopic calcareous spicules present. The large gill is long, extending as far as the tail. There is a small internal shell. The soft spiral spawn coils have a diameter of up to 15 mm, are peach to cream in colour and attached under low tidal rocks (pers. obs.). This endemic pleurobranch is rare intertidally to 6 m, preferring partially sheltered and open coasts, but not harbours (Willan and Morton

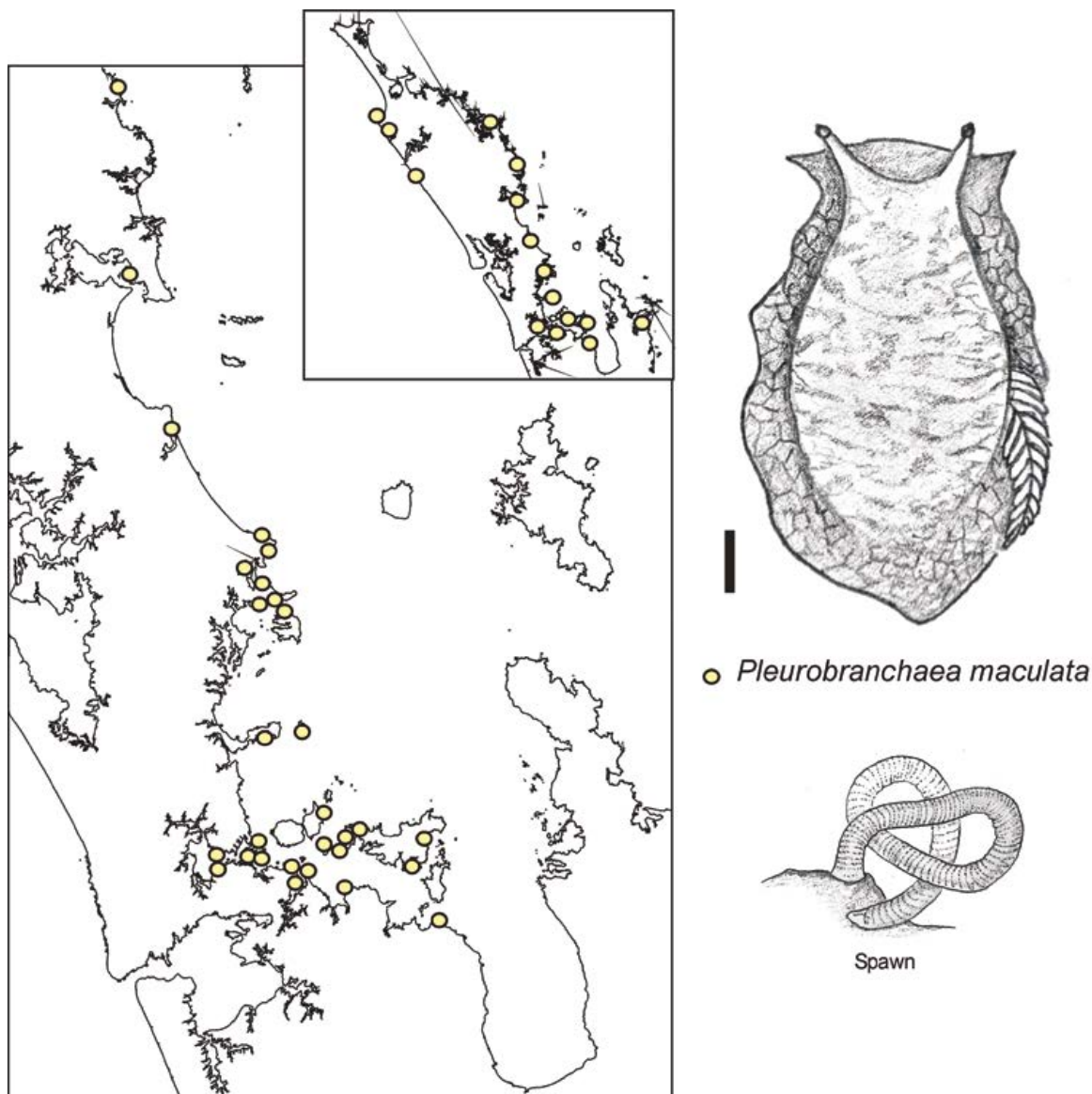


Figure 10. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Pleurobranchaea maculata* (Motuihe Island). Scale bars 10 mm long.

1984). We have found it in low numbers on exposed and sheltered coasts along the east side of northern New Zealand with one record from Manukau Harbour on the north west side. It occurs right around mainland New Zealand and on the Chatham Islands.

Berthellina citrina (Ruppell and Leuckart, 1828) Fig. 9
Average animal length 50 mm. It is usually orange in colour though can range from pale yellow to bright red. The back is covered with small, white gland cells. The animal has a small internal shell. It has been reported feeding on sponges (Willan and Morton 1984) and corals (Sea Slug Forum). We have found occasional specimens under low tidal stones on moderately sheltered coasts on the east coast of northern New Zealand and in Manukau Harbour. It is also known from the Three Kings Islands

and Wellington (Te Papa Museum database) and is common throughout the Indo-Pacific Ocean.

Pleurobranchaea maculata (Quoy and Gaimard, 1832)
Fig. 10

Average animal length 80 mm. This large species is the only pleurobranch without an internal shell. It varies from pale grey to almost black with anastomosing dark wavy lines. It occurs on all substrates from silty harbours to open rocky coasts, even to continental slopes in depths of 250 m (Willan and Morton 1984). Although not common, we have found *P. maculata* widespread on the east and west coasts of Northland, and in many localities along the west side of the Hauraki Gulf and in Waitemata Harbour. In 2009 it washed up in large numbers on the east coast bays of Auckland's North Shore. The population

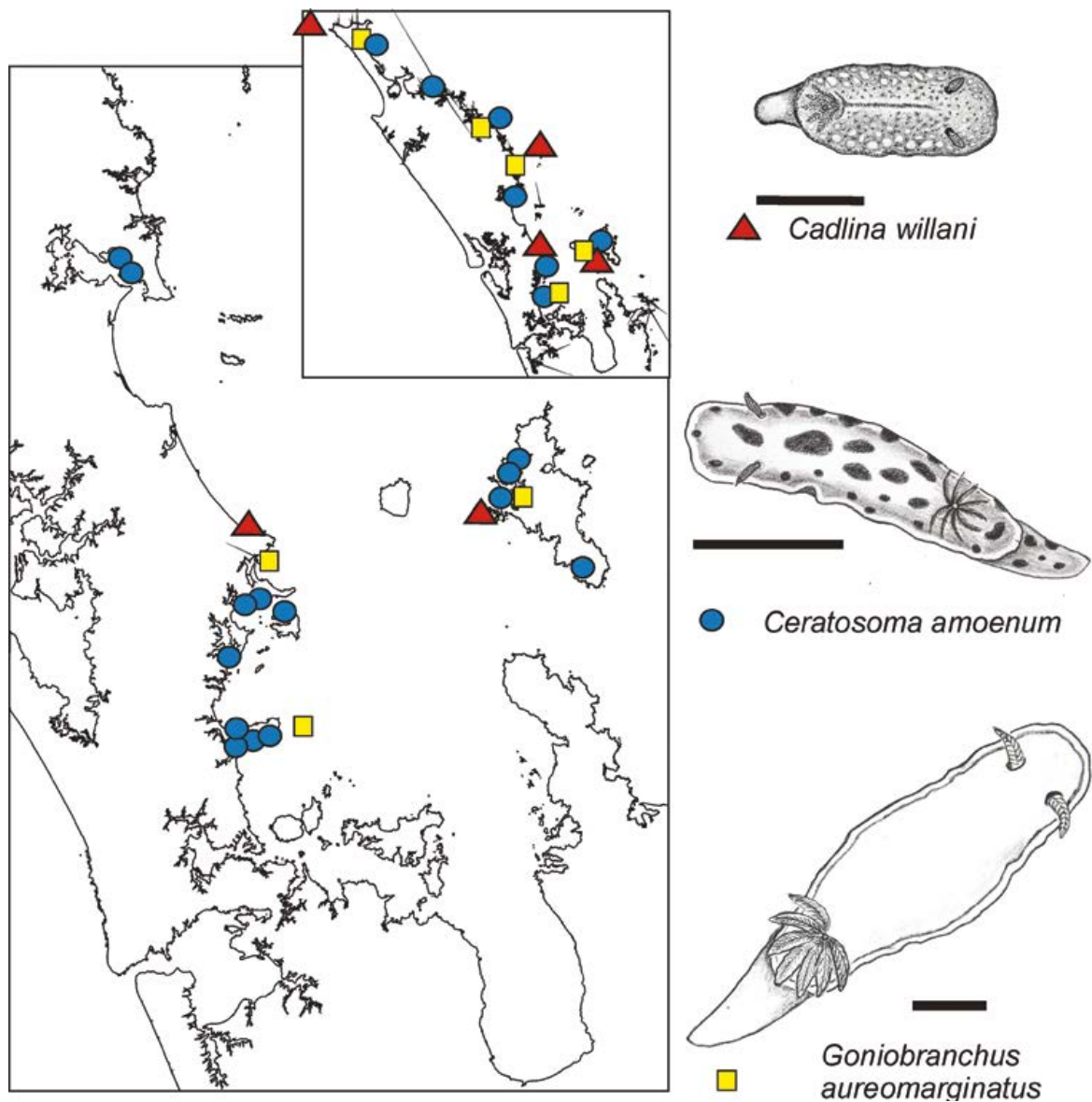


Figure 11. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Cadlina willani* (Great Barrier, Rangiahua Is), *Ceratosoma amoenum* (Sentinel Rock, Mangawhai Heads) and *Goniobranchus aureomarginatus* (Parengarenga Harbour, Paua). Scale bars 10 mm long.

had peaked as a result of feeding on the introduced Asian mussel, *Arcuatula senhousia*. Several dogs died after eating specimens, and subsequent investigations showed that all parts of the slugs contains a neurotoxin, tetrodotoxin (McNabb *et al.* 2010). It is widespread in temperate waters of the Indian and Pacific Oceans.

Nudibranchia

Cadlinidae

Cadlina willani Miller, 1980 Fig. 11

Average animal length 14 mm. This small nudibranch is white with a central yellow stripe and border. It has a rough mantle and the foot extends beyond the body. It lives among encrusting organisms in open localities and channels. It is probably the most common subtidal nudibranch in New Zealand (Willan *et al.* 2010) and extremely rare intertidally, with only one such record from all our studies – Rangiahua Island, off the west coast of Great Barrier Island (Morley 1991). This endemic species occurs around the North Island and south to Banks Peninsula.

Chromodorididae

Ceratosoma amoenum (Cheeseman, 1886) Fig. 11

Average animal length 30 mm. The common name, clown nudibranch, is well chosen as the ground colour of the animal is white with vivid orange patches, purple rhinophores and gill. The details of the design vary with each individual. The body is soft and slippery. Cheeseman's iconotype (MA70169) is from the Waitemata Harbour. We have found it frequently at many locations along the east side of northern New Zealand, with the majority of records from shallow depths of 2–3 m where it appears to be most common. The full depth range is from low tidal to 40 m on semi-sheltered shores (Willan and Morton 1984). The range is the northern half of the North Island to East Cape and Taranaki on the west coast. It also occurs on Lord Howe and Norfolk islands and temperate southern Australia.

Goniobranchus aureomarginatus (Cheeseman, 1881) Fig. 11

Average animal length 35 mm. The body is white with a golden line close to the border of the mantle. It is less common than *Ceratosoma amoenum* and rarely found intertidally where it sometimes crawls exposed on sponges under low tidal rocks. It lives from low tide to 24 m on rocky reefs in open situations (Willan *et al.* 2010). Our records of this endemic species are all from semi-exposed eastern locations, but it has been recorded from around the main islands of New Zealand and the Chatham Islands.

Discodorididae

Alloiodoris lanuginata (Abraham, 1877) Fig. 12

Average animal length 60 mm. This large nudibranch varies from reddish brown to grey with a pattern of brown and white spots. The mantle is rough due to minute tubercles with projecting spicules. The rhinophores are

yellow and the gills greenish with darker markings (Willan and Morton 1984). The spawn coil is yellowish tan (pers. obs.). Its habitat is from sheltered to exposed shores from intertidal down to depths of 10 m where it feeds on sponges. Single specimens or pairs have been found at our study sites on both east and west coasts of northern New Zealand, but not in the Far North. This endemic species occurs around all the main islands and the Chatham Islands.

Atagema molesta (Miller, 1989) Fig. 12

Average animal length 20 mm. This nudibranch is fawn with brown spots and has a soft mantle covered in spiculate tubercles. Those near the mid-dorsal ridge are opaque white. It is uncommon and occurs beneath stones in tide pools on semi-sheltered coasts. It has only been recorded from Goat Island Bay, the type locality, and the Whangaparaoa Peninsula. (Miller 1989, Willan *et al.* 2010).

Hoplodoris nodulosa (Angas, 1864) Fig. 12

Average animal length 35 mm. This uncommon nudibranch is yellow, brown or grey with brown blotches, white pustules, brown gills and rhinophores. There is an unpigmented area around each pustule. We have found this at only three study localities – on the sheltered east and west coasts of Auckland. It was most frequent on the compound ascidian *Alcyonium aurantiacum* at Jenkins Beach, Manukau Harbour. This species also occurs around the main islands of New Zealand and along the coast of southern Australia.

Jorunna pantherina (Angas, 1864) Fig. 12

Average animal length 15 mm. A pale peachy buff nudibranch with marbled ring patches which grade smaller towards the margins. The colour can vary from yellow to black according to the sponge eaten (Willan and Coleman 1984). The gill has overlapping sections like petals on a rose. The dorsum is thickly beset with short tubercles. It has been found in just a few shallow, relatively sheltered locations on the east side of Auckland and southern Northland. We have found only one intertidal specimen – at Meola Reef, Waitemata Harbour on low tidal rocks with a grey sponge. It is also found in Australia (Sea Slug Forum).

Rostanga muscula (Abraham, 1877) Fig. 12

Average animal length 18 mm. This small nudibranch is tomato red with scattered dark spots. It is often found at low tide on its host, a red sponge. It lays a delicate red spawn coil with a diameter of 12 mm. We have found this endemic species in low numbers in a wide range of mid to low tidal semi-sheltered to exposed sites on both sides of northern New Zealand. It has been recorded as far south as the Marlborough Sounds (Willan *et al.* 2010).

Dorididae

Aphelodoris luctuosa (Cheeseman, 1882) Fig. 13

Average animal length 50 mm. A graceful dorid with a ground colour of cream variably ornamented with

radial brown, wide stripes, mid dorsal blotches and fine concentric lines around the mantle edge. The rhinophores and gills are chocolate-brown, rimmed with yellow. The pale peach spawn coil in a depth of 2 m at Rangiputa measured 70 mm in diameter (pers. obs.). It crawls exposed on rocky coasts down to 40 m depth (Willan and Morton 1984) and is only seen occasionally intertidally. The unpublished iconotype from the Waitemata Harbour was painted by Emma Cheeseman (MA70246). We have records from exposed and sheltered shores on both sides of northern New Zealand. This endemic species occurs around the main islands and the Chatham Islands.

Aphelodoris sp. Fig. 13

Average animal length 35 mm. This undescribed dorid has an encircling pattern of tan blotches on cream but

lacks the dark concentric lines of *A. luctuosa*. The gills and rhinophores are white, there is a pinkish tinge on the underside of the mantle edge (pers. obs.). All records of this endemic species are from the exposed to semi-sheltered west coast of northern New Zealand (e.g. Hayward and Morley 2004).

Doris granulosa (Pease, 1860) Fig. 14

Average animal length 25 mm. A distinguishing feature of this yellow nudibranch is the posterior facing, horizontal gill which can be withdrawn under a flap of the mantle. There are low rounded tubercles over the whole of the mantle. It is often found feeding on sponges. It lives from mid to low tide on rocky reefs in semi-protected localities right around New Zealand. It also occurs in New Caledonia and temperate Australia.

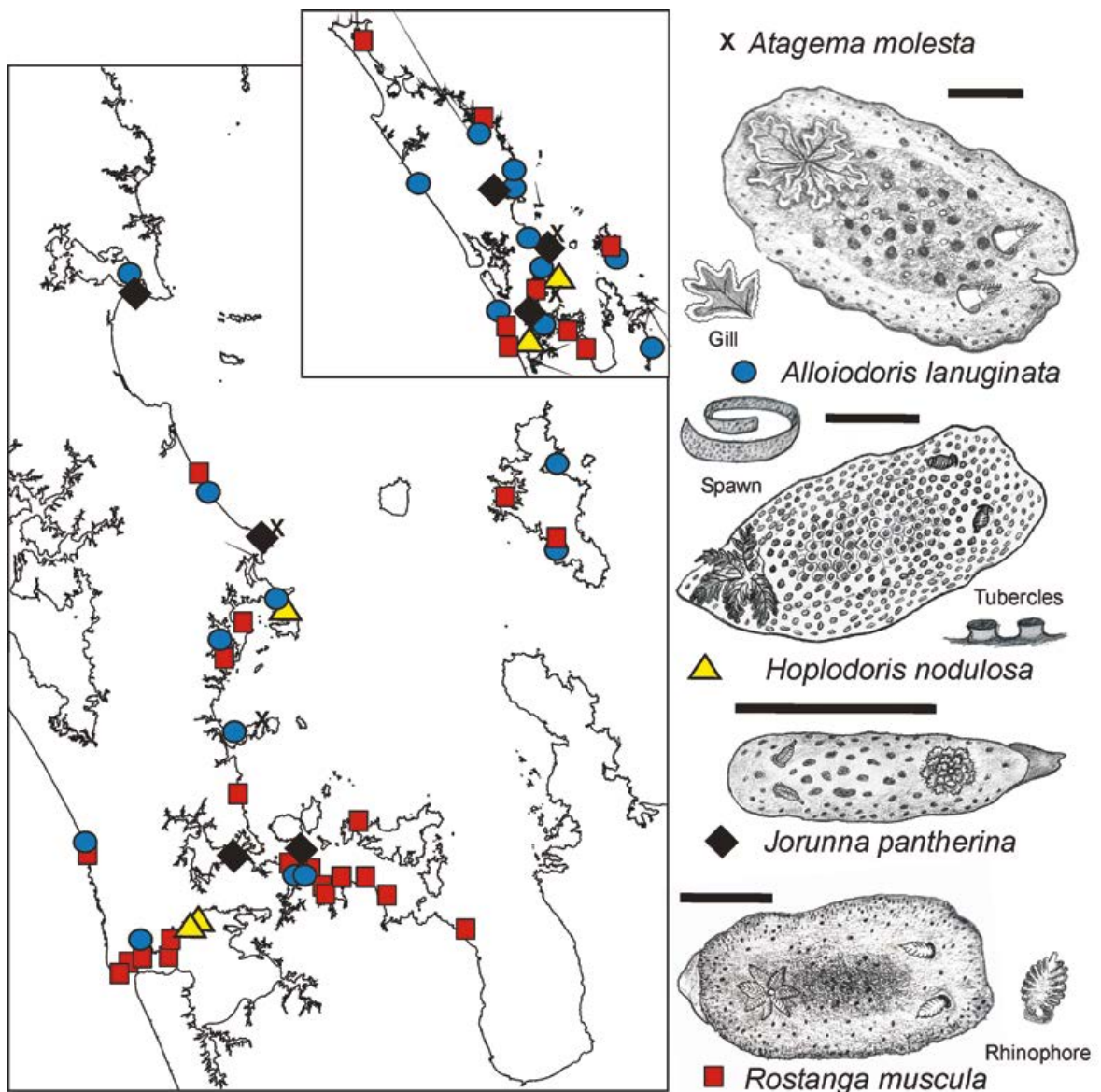


Figure 12. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Atagema molesta*, *Alloiodoris lanuginata* (Kawau Island, Mansion House Bay), *Haplodoris nodulosa* (Manukau Harbour, Jenkins Bay), *Jorunna pantherina* (Waitemata Harbour, Meola Reef) and *Rostanga muscula* (Bay of Islands, Tapeka Pt). Scale bars 10 mm long.

Doris wellingtonensis Abraham, 1877 Fig. 14

Average animal length 100 mm. This is New Zealand's largest dorid. The fleshy body is covered with rounded pustules. It is khaki brown to yellowish above, and the foot and rhinophores are orange (Willan and Morton 1984). We have seen four specimens with three bright orange spawn masses 30–60 mm diameter in low tidal pools at Maori Bay, Waitakere coast. This species lives on exposed to semi-sheltered rocky shores ranging from intertidal down to 20 m, feeding on yellow encrusting sponges. It occurs on both sides of northern New Zealand and around the main islands of New Zealand as well as eastern Australia.

Dendrodoridae*Dendrodoris citrina* (Cheeseman, 1881) Fig. 15

Average animal length 55 mm. This lemon yellow to orange nudibranch is distinguished from all other similarly coloured New Zealand species by the presence of numerous small white dots throughout its length. The unpublished iconotype (MA70244) is a water colour painting by Emma Cheeseman. This is the most commonly encountered and most abundant sea slug in the intertidal zone of northern New Zealand, where it occurs on in more shaded locations on mid-low tide rocky reefs on moderately exposed to harbour shorelines. It has not been recorded from along the exposed west coast. It appears to be most common in the inner Hauraki

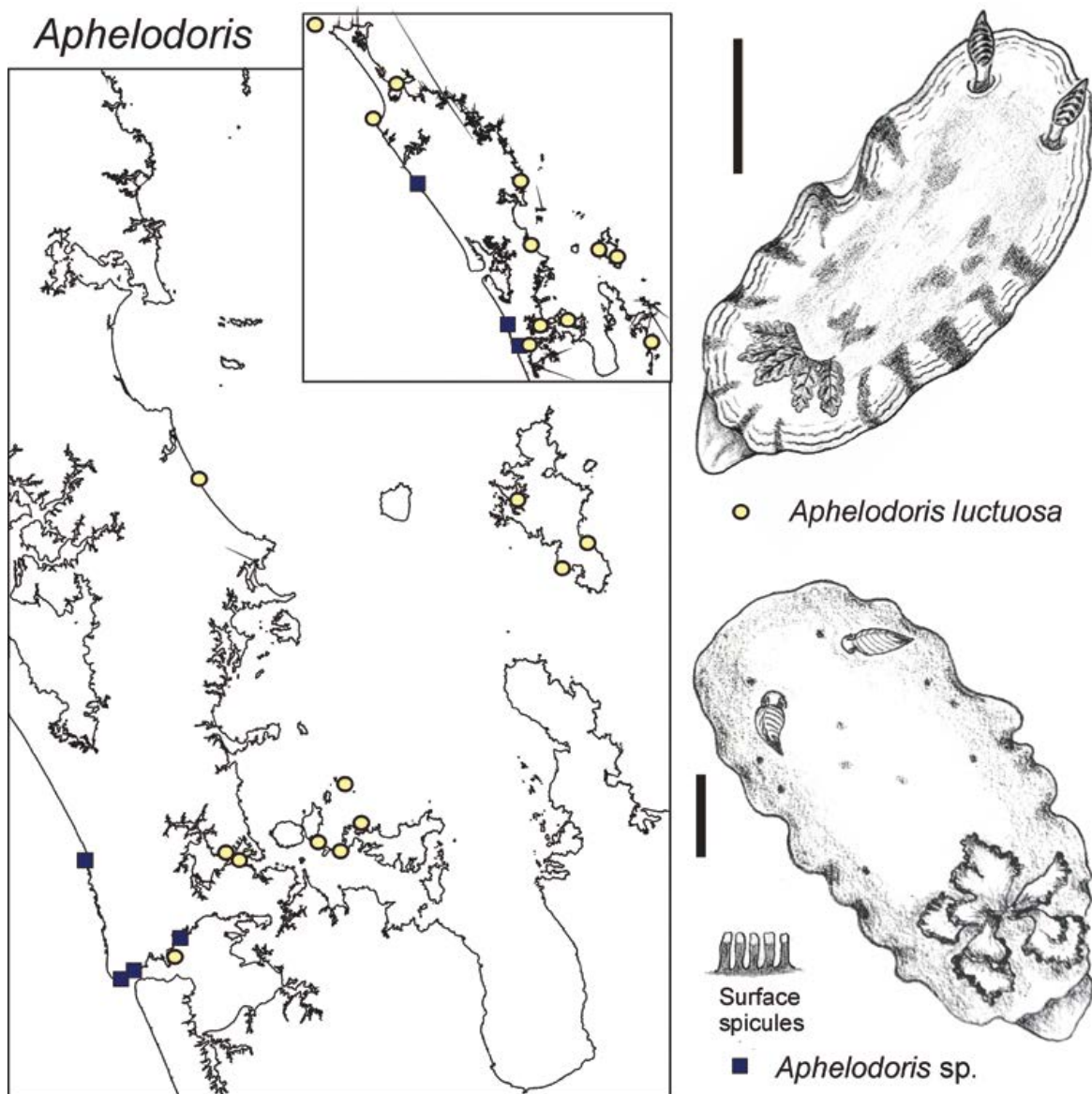


Figure 13. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Aphelodoris luctuosa* (Waiheke Is, Oneroa) and *Aphelodoris* sp. (Muriwai, Maori Bay). Scale bars 10 mm long.

Gulf, especially along the shores of the middle and outer Waitemata Harbour and the Tamaki Estuary. This endemic species is recorded from around the two main islands of New Zealand.

Dendrodoris krusensternii (Gray, 1850) Fig. 16

Average animal length 60 mm. Its vibrant colouring makes this large dorid conspicuous on low tidal rocks down to depths of 5 m. The ground colour of the mantle is light brown with large pale protuberances and folds. Smooth areas between the folds are peacock blue (Willan and Morton, 1984). The pale mantle edge has prominent concentric brown lines. In New Zealand this species occurs on semi-sheltered coasts on the east side of northern New Zealand, mainly in the inner Hauraki

Gulf and Waitemata Harbour. Since 2010 specimens have become more common at more southern localities than previously found, especially in the Waitemata. It is widespread throughout the tropical and subtropical Indo-Pacific Oceans.

Dendrodoris nigra (Stimpson, 1855) Fig. 16

Average animal length 40 mm. This smooth black dorid has rhinophores tipped with white. The edge of the mantle is frilled. It lays spirals of orange spawn. Specimens usually are seen intertidally on sheltered and semi-open rocky shores on the east coast of northern New Zealand, mainly within the Hauraki Gulf. It is widespread throughout the temperate waters of the Indo-Pacific Ocean.

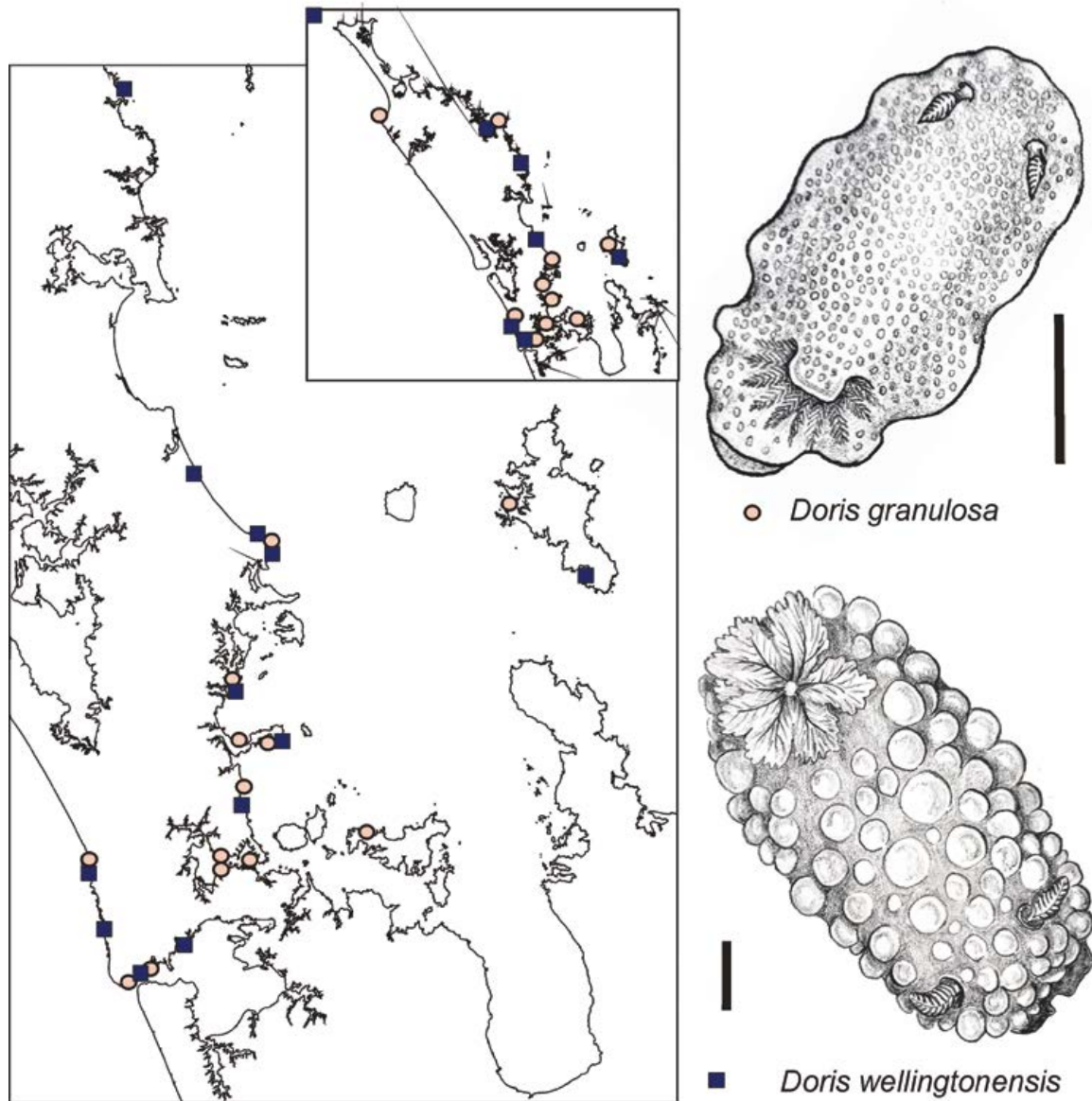


Figure 14. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Doris granulosa* (Auckland, Te Arai Pt) and *Doris wellingtonensis* (North-west Nelson, Tata Bay). Scale bars 10 mm long.

Polyceridae

Plocamopherus imperialis Angas, 1864 Fig. 17

Average animal length 70 mm. This is a large dramatic nudibranch that was first seen in New Zealand about 50 years ago (M. Miller pers. comm.). The animal is scarlet with small dark spots and two longitudinal cream stripes. The rhinophores are a flamboyant orange with bulbous purple tips. Posterior to the gills are two globes, which flash light if the animal is disturbed. The oral shield has small compound papilli around the margin. The large brown brachial plume is attached to the body on a pedestal (Morley 1996). We found this species in low numbers at Dysons Beach, Parengarenga Harbour. One specimen was laying an orange spawn coil on a low tide frond of brown sea weed, *Carpophyllum* sp. Another

pair was crawling on sand flats in depths of 3 m. When disturbed the animal turns sideways and swims strongly with muscular contractions of the body and tail (pers. obs.). This species is widespread throughout the tropical and subtropical Indo-Pacific and is recorded here from the Three Kings Islands and two localities on the east coast of Northland.

Polycera hedgpethi Er. Marcus, 1964 Fig. 17

Average length 13 mm. This long, narrow species has a cream body peppered with black. The head has four elongate papilli and there is a cluster of two or three papilli beside the gills. These are translucent white with a broad gold ring near the centre and a dark zone above. The tip of the tail is also gold (Willan *et al.* 2010, p.438). It is recorded from low intertidal to 10 m depth but mostly

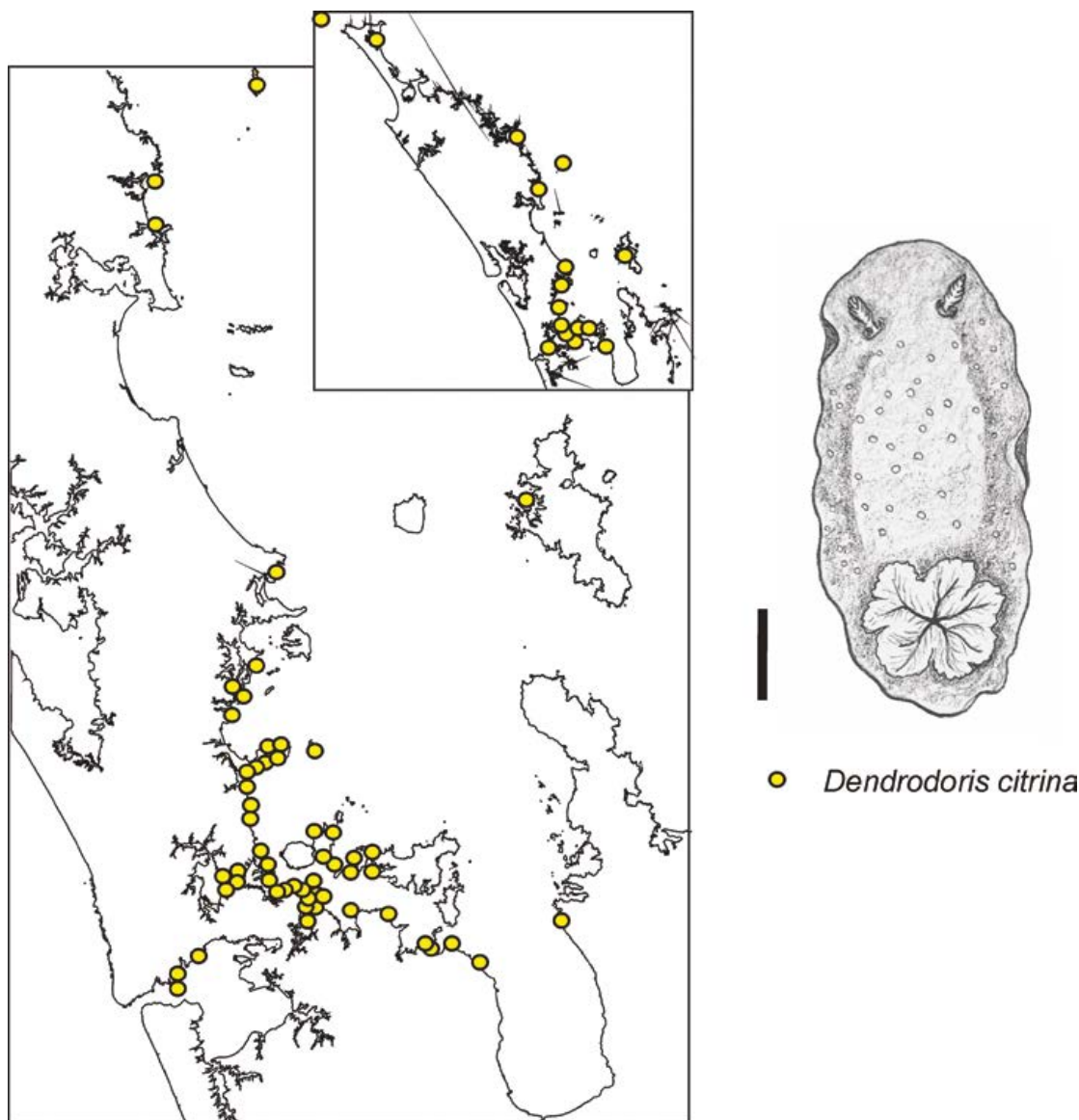


Figure 15. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Dendrodoris citrina* (Waiwera). Scale bar 10 mm long.

from the sublittoral fringe. It was probably introduced into New Zealand in the 1960s living on bryozoa attached to a ship's hull (Willan *et al.* 2010). It is recorded from the Waitemata Harbour, Cavalli Islands and the Marlborough Sounds. It is cosmopolitan in warm temperate seas.

Polycera melanosticta Miller, 1996 Fig. 17

Average animal length 14 mm. This is the species recorded in Morton & Miller (1968) as *Polycera* sp. The body is elongated bearing tubercles on the head veil, gill circlet and variously along the body. It is white, grey or greyish brown patterned with white, black and orange spots widely spaced over the body (Miller 1996). It was formally described by Miller (1996) from a number of specimens collected from a paint raft at the type locality at Devonport naval base, Waitemata Harbour in 1962. It

may have been introduced to New Zealand on a ship's hull. It also occurs in Victoria, Australia (Burn 2006).

Thecacera pennigera (Montagu, 1815) Fig. 17

Average animal length 12 mm. A small high bodied nudibranch with a deep pit in front of each rhinophore. The rhinophores are surrounded by flanged sheaths and two finger-like processes arise behind the gills. Each individual has a unique pattern of orange and black spots on the white body. It was recorded commonly in the upper Waitemata Harbour and Tamaki Estuary in the 1970s, but has not been seen more recently. It was found on hard substrate in the sublittoral fringe and subtidal where it feeds on bryozoa. It is presumed to have been introduced by shipping (Willan 1976) but may not have survived (Willan *et al.* 2010).

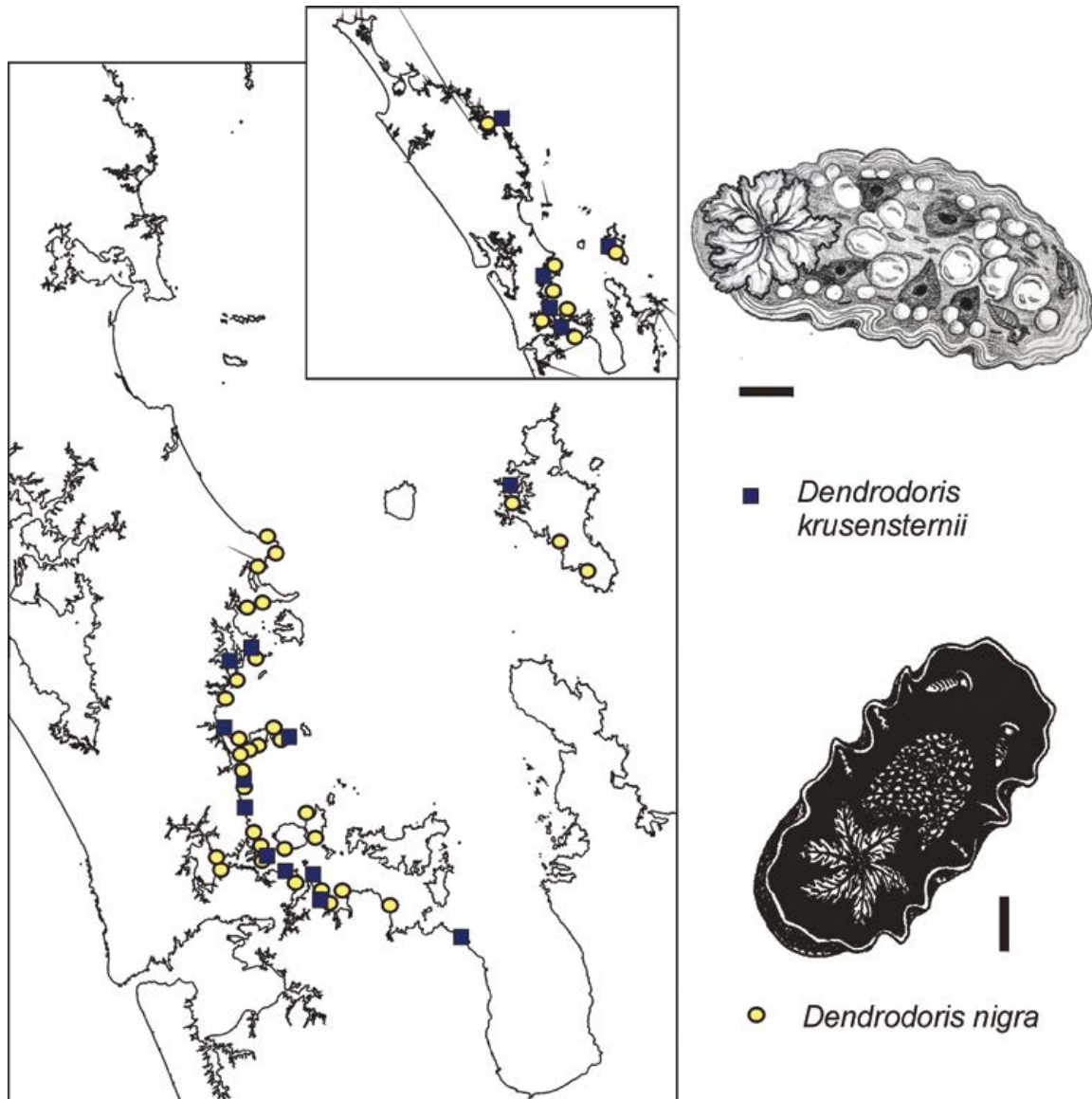


Figure 16. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Dendrodoris krusensternii* (Kohimarama, Waitemata Harbour) and *Dendrodoris nigra* (Mellons Bay). Scale bars 10 mm long.

Proctonotidae

Caldukia rubiginosa Miller, 1970 Fig. 17

Average animal length 10 mm. This small reddish-brown nudibranch has cerata on the body and around the head. The upper part of each ceras is yellow and the central section iridescent blue. It is occasionally found among encrusting organisms under stones in the low intertidal and sublittoral zones down to 13 m on open coasts (Willan *et al.* 2010). It was not found in our surveys but this endemic species has been recorded from the Three Kings Islands and sporadically along the east coast of northern New Zealand as far south as Hahei, Coromandel Peninsula. The type locality is Goat Island Bay, Leigh.

Janolus novozealandicus (Eliot, 1907) Fig. 17

Average animal length 20 mm. The translucent body has opaque white marks down the centre and brown and white speckles over the sides. Inside each ceras can be seen the orange and blue digestive diverticulum (Willan *et al.* 2010). This endemic species is found beneath stones on exposed to semi-sheltered reefs and channels at low tide to depths of 15 m along the east coast of northern New Zealand, and has been recorded around all three major islands (Miller and Willan 1986). It is uncommon, but more frequent in South and Stewart Islands (Willan *et al.* 2010).

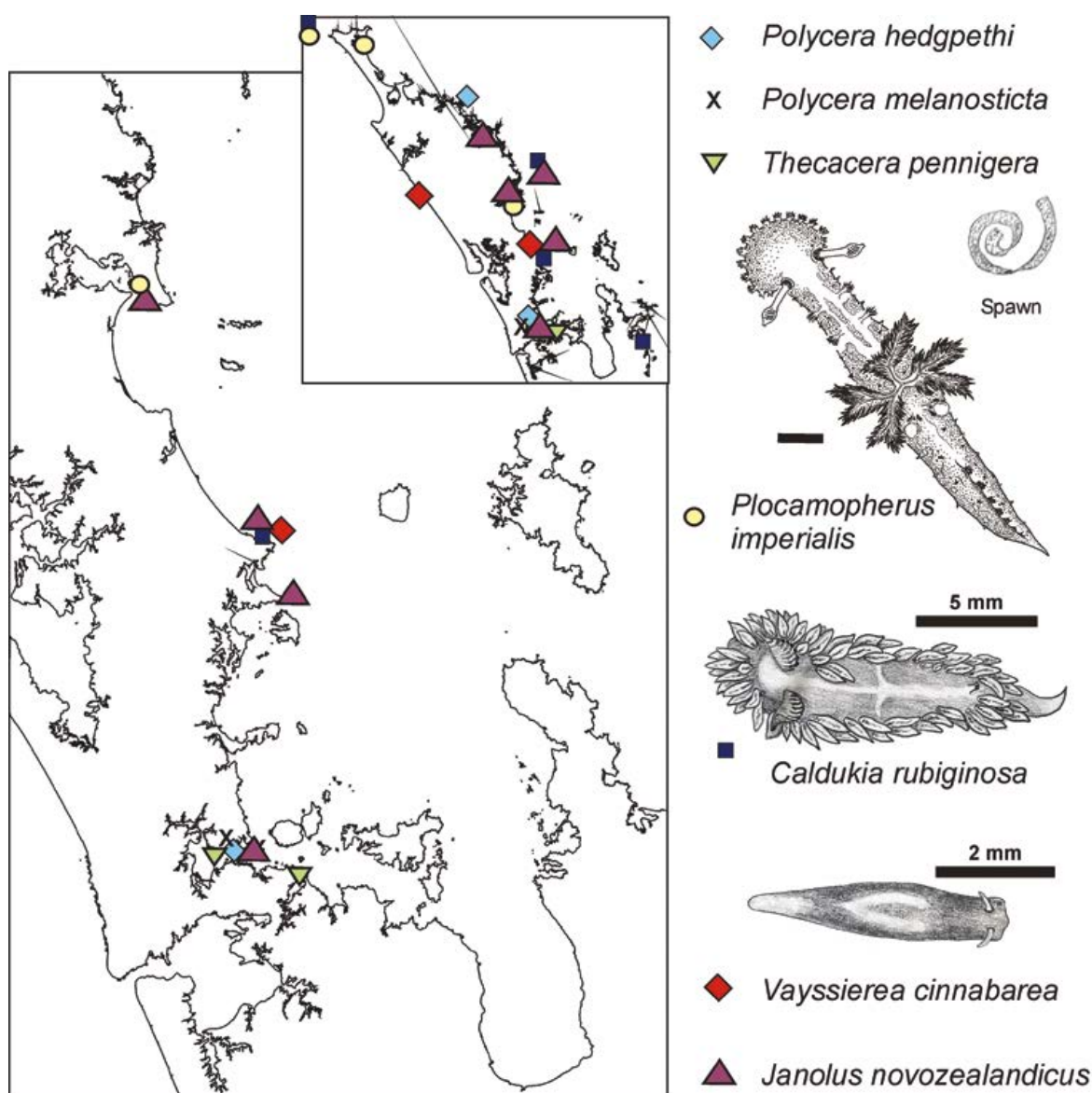


Figure 17. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Plocamopherus imperialis* (Parengarenga, Dysons Beach), *Polycera hedgpethi*, *Polycera melanosticta*, *Thecacera pennigera*, *Caldukia rubiginosa* (redrawn after Willan and Morton, 1984, p. 68; Leigh, Goat Island Bay), *Janolus novozealandicus* and *Vayssiarea cinnabarea* (Northland, Kawerua). Scale bars 10 mm long unless stated otherwise.

Vayssiereidae

Vayssierea cinnabarea (Ralph, 1944) Fig. 17

Average animal length 4 mm. This small slender dorid nudibranch is dull red, it has no gill or retractable rhinophores (Willan and Morton 1984). It lives on the undersurface of intertidal stones on open rocky coasts in the presence of *Spirorbis* tube worms on which it feeds (Willan and Morton 1984). In this study this endemic species is recorded from one locality on either side of northern New Zealand. It is probably more common than this but overlooked due to its small size. Its type locality is Wellington.

Fionidae

Fiona pinnata (Eschscholtz, 1831) Fig. 18

Average animal length 17 mm. This pelagic nudibranch is usually cream or buff in colour with an orange patch between the rhinophores. It becomes blue when feeding on by-the-wind sailor, *Velevella velevella* and Portuguese man-of-war, *Physalia physalis*. The cerata are in oblique rows with a membranous attachment on the inner margin. There are pairs of rhinophores and oral tentacles. It attaches to floating wood or *Durvillaea* kelp which host the barnacles *Lepas* spp. *F. pinnata* can feed on several different species of *Lepas* (Willan 1979b). Amazingly for a pelagic species *F. pinnata* cannot swim. The species

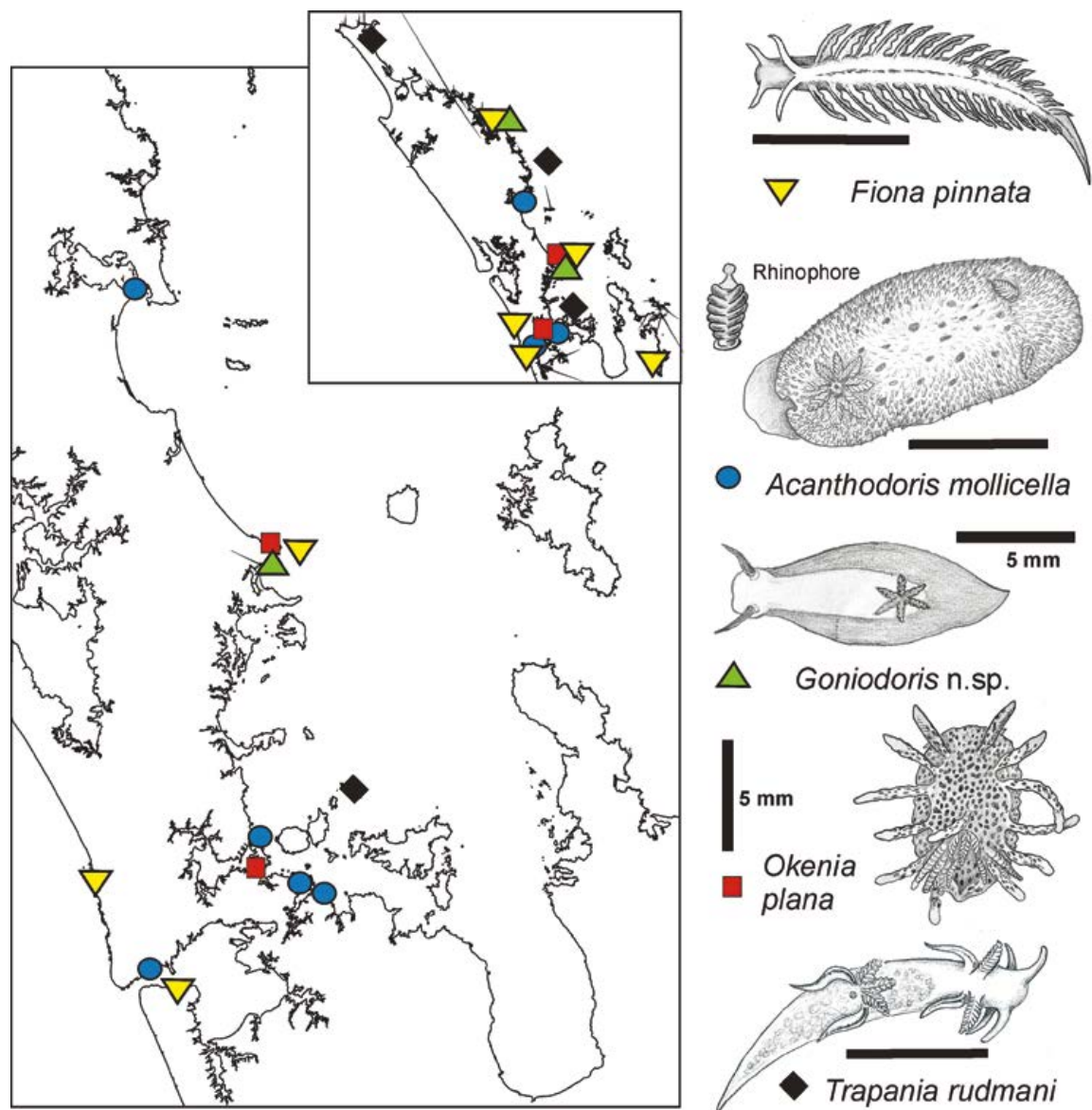


Figure 18. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Fiona pinnata* (redrawn after Willan and Morton, 1984, p. 81), *Acanthodoris mollicella* (Manukau Harbour, Kaiteraki Bay), *Goniodoris* n.sp. (Bay of Islands, Deep Water Cove), *Okenia plana* (redrawn after Willan and Morton, 1984, p. 91) and *Trapania rudmani* (Parengarenga, Paua). Scale bars 10 mm long unless stated otherwise.

has been found occasionally washed up on open coasts following prolonged on-shore winds, right around New Zealand including the Chatham and Subantarctic islands. It is cosmopolitan in tropical and temperate seas.

Onchidorididae

Acanthodoris mollicella Abraham, 1877 Fig. 18
Average animal length 25 mm. This small nudibranch is cryptically coloured in mottled black, brown and ochre yellow. The dorsum is covered in numerous papilli, and it has transparent feathery gills which tend to point backwards. The tips of the rhinophores are white. This endemic species lives in protected channels and harbours. We have found solitary specimens under low tidal rocks in Manukau, Waitemata and Whangarei Harbours. It is also known from around most of New Zealand.

Goniodorididae

Goniodoris n.sp. Fig. 18
Animal length 10 mm. This species has an unusual exposure of the tail and is only known from a single specimen found under a rock in depth of 2 m at low tide in Deep Water Cove, Bay of Islands. The specimen is preserved in ethanol and its original colour is unknown. A second species, *G. castanea*, is also represented by only one specimen, dredged in Otago Harbour, South Island. This North Island record may prove to be a subspecies *G. castanea* (Michael Miller pers. comm.). *Goniodoris* spp. are also found in North America and Japan.

Okenia plana Baba, 1960 Fig. 18
Average animal length 8 mm. This nudibranch has a body copiously spotted with lilac and reddish-brown. It has a broad foot, large rhinophores and a mantle edge with a row of tentacle-like projections. Its habitat is among brown algae and bryozoans in protected situations and silty harbours (Willan and Morton 1984). It has been recorded in the Waitemata Harbour and at Leigh, but has not been found in our studies. It is also found in Australia, Hawaii, Japan and Malaysia (Sea Slug Forum).

Trapania rudmani Miller, 1981 Fig. 18
Average animal length 18 mm. The body of this slender nudibranch gradually tapers to a long tail. There are two pairs of dorso-lateral finger-like processes. The body is translucent white with yellow stripes on the outside of the four processes. It is rare intertidally and often lives on vertical walls among encrusting organisms in open localities down to depths of 20 m (Miller 1981). We record it here from wharf piles at 1 m depth at Paua, Parengarenga Harbour, Northland. This endemic species has been recorded subtidally along the east coast of northern New Zealand (Sea Slug Forum).

Arminidae

Dermatobranchus rubidus (Gould, 1852) Fig. 19
Average animal length 20 mm. The mantle is dark orange while the longitudinal ridges, rhinophores and oral veil

are highlighted in white. The foot is wider than the mantle and has tentacles at the front corners (Willan *et al.* 2010). The species lives in semi-sheltered localities on sand from the sublittoral fringe to 65 m. Only two specimens of this rare nudibranch were previously known from New Zealand. We have found a third specimen in a depth of 2 m at Otupoho Bay, Bay of Islands. There is a record from McDonald Bank, Whangarei Harbour. It is also found in Australia.

Tritoniidae

Tritonia incerta Bergh, 1904 Fig. 19
Average animal length 100 mm. This large uncommon nudibranch has three colour forms, pale rose-pink, apricot orange and red with white gills and foot. The gills consist of tufts along each side of the notal ridge and the oral veil has ten or twelve tentacles (Willan *et al.* 2010). The depth range this endemic species extends down to 250 m. It has been recorded intertidally from the exposed Waitakere coast at Maori Bay, Muriwai (Powell 1979, p. 287) and Whatipu, Manukau Heads. It has not been found in our systematic surveys. It also occurs further south in New Zealand on both the east and west coasts of the North Island and the west coast of the South Island as far south as Westport (Te Papa Museum database).

Dotidae

Doto pita Er. Marcus, 1955 Fig. 19
Average animal length 8 mm. This small slender nudibranch has up to seven pairs of finger-like cerata on either side of its body. The body is translucent white mottled with yellow, brown and lilac spots (Willan *et al.* 2010). It is mostly found feeding on hydroids and can be common at low tide on open rocky reefs and in semi-sheltered locations. It also extends to depths of 30 m. It is known in New Zealand from the east coast, north of Auckland and elsewhere from Brazil, Japan and Australia (Willan *et al.* 2010).

Flabellinidae

Flabellina albomarginata (Miller, 1971) Fig. 19
Average animal length 18 mm. This species has a transparent whitish body with a white border on the foot, and red cerata tipped with white. It lives from intertidal down to depths of 20 m in open to semi-sheltered localities. In northern New Zealand this endemic species has been found intertidally on the Waitakeres' west coast between Whatipu and Muriwai, but not on our systematic surveys. The type locality is Piha. This endemic species is more common on the Canterbury and Otago coast of the South Island.

Tularia bractea (Burn, 1962) Fig. 19
Average animal length 15 mm. This nudibranch has a white to yellowish brown body with pointed corners to the anterior of the foot, long rhinophores and oral tentacles. The seven clusters of cerata arise from brackets. The red spots along the edge of the cerata perfectly match the

lolly-pink of coralline algae on which we have found it living. It lives intertidally down to depths of 25 m and is more common subtidally. We have found one specimen at Musick Point, Tamaki Estuary on coralline algae in mid-tidal pools. It occurs around both North and South Islands and is also known from Victoria, Australia (Willan *et al.* 2010).

Eubranchidae

Eubranchus agrius Er. Marcus, 1959 Fig. 19

Average animal length 6 mm. The body of this small transparent nudibranch has small patches of gold, yellow, brownish-orange, pale ruby or purplish red. It lives on hydroids in tidal pools on open coasts. We have not

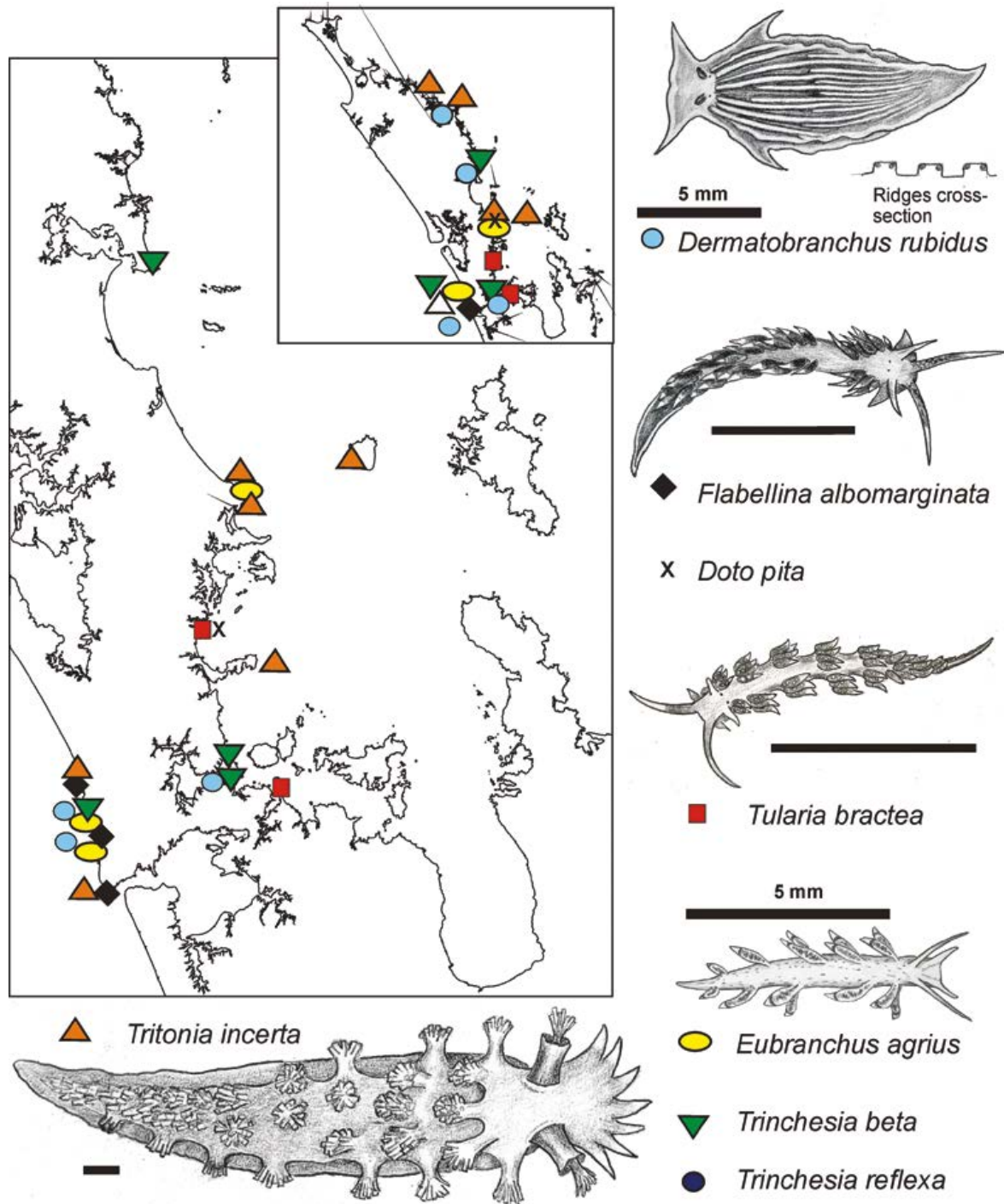


Figure 19. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Dermatobranchus rubidus* (Bay of Islands), *Flabellina albomarginata* (Waitakere coast, Piha), *Doto pita*, *Tularia bractea* (Waitemata Harbour, Musick Pt), *Eubranchus agrius* (after Willan and Morton, 1984, p. 79), *Trinchesia beta*, *Trinchesia reflexa* and *Tritonia incerta* (Waitakere coast, Whatipu). Scale bars 10 mm long unless stated otherwise.

found this species in our studies, but it has been reported from both the west and east sides of the Auckland region and occurs around both main islands of New Zealand. It is also known from Chile.

Tergipedidae

Trinchesia beta (Baba & Abe, 1964) Fig. 19

Average animal length 6 mm. The wide foot extends beyond the visceral part of the body. The anterior corners have arc-shaped flanges. There are eleven rows of cerata. The body is translucent, finely spotted with purple. The cerata are also purple except for a gold or orange band below the translucent tips (Miller 1977). It has been recorded in tidal pools, under stones, and on hydroids

in the sublittoral fringe from Whangarei Heads to the Waitemata Harbour on the east coast and the Waitakeres on the west (Miller 1977). It was possibly more common in the 1950s-1960s than it was around northern New Zealand in the 1990s-2000s, as we did not see it in our surveys. It is also known from Japan (Miller 1977).

Trinchesia reflexa (Miller, 1977)

Average animal length 7 mm. The foot is wide, extending beyond the visceral part of the body. The anterior corners are produced as semicircular processes (Miller 1977). There are nine rows of cerata. The body is transparent or pale yellow with the viscera clearly visible. The diverticula are fawn to black. It is usually found living on hydroids in mid-low tide pools on

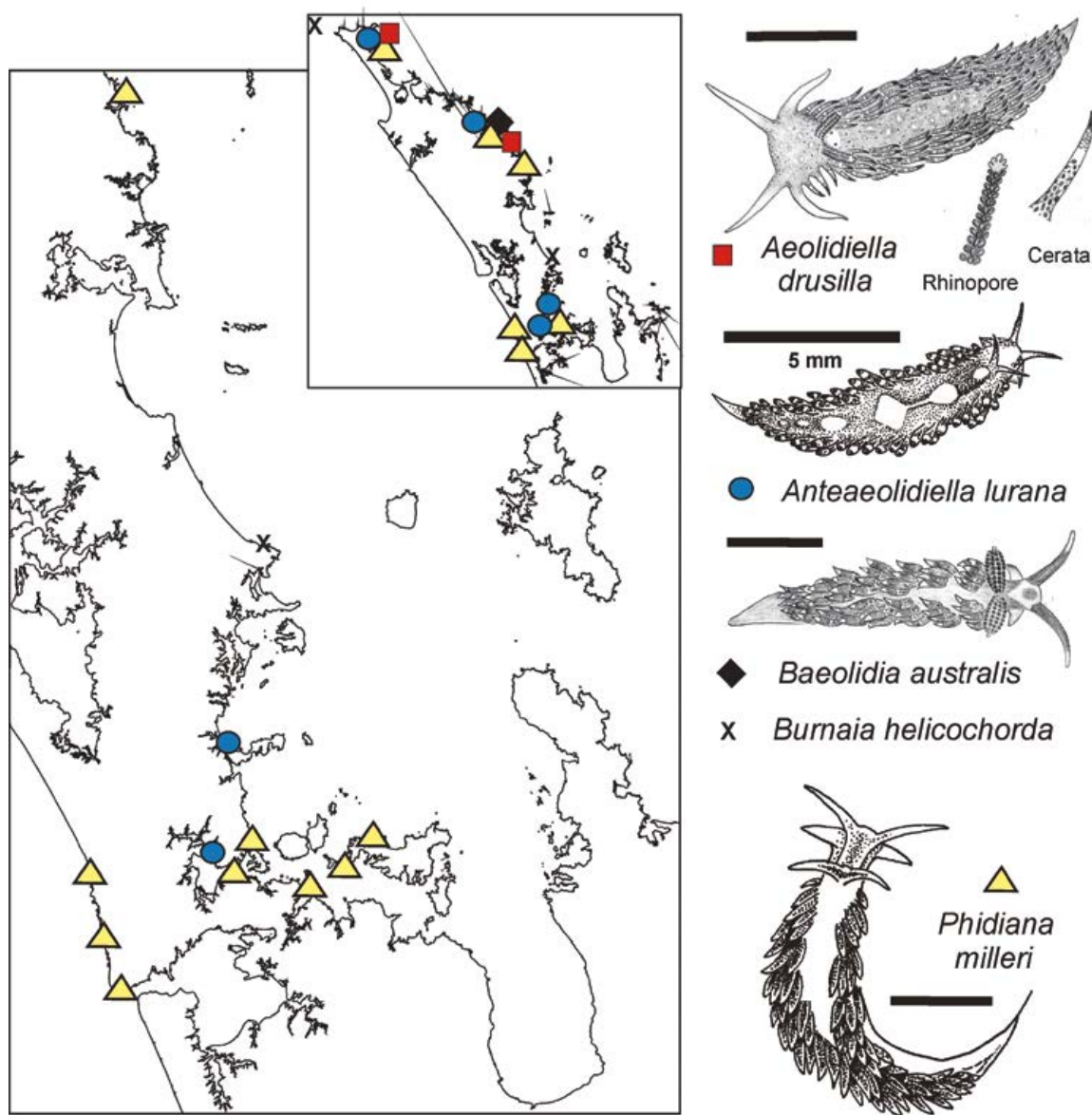


Figure 20. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Aeolidiella drusilla* (Northland, Whangamumu), *Anteaeolidiella lurana* (Parengarenga, Dog Is), *Baeolidia australis* (Bay of Islands, Tapeka Pt), *Burnaia helicochorda* and *Phidiana milleri* (Oneroa, Waiheke Island). Scale bars 10 mm long unless stated otherwise.

exposed rocky shores. This endemic species has been recorded from the Waitakere west coast and Manukau Harbour (type locality); and further south on Banks and Otago Peninsulas in the South Island (Miller 1977).

Aeolidiidae

Aeolidiella drusilla Bergh, 1900 Fig. 20

Average animal length 30 mm. The body of this nudibranch is buff with white blotches. The brown and orange cerata are tipped with orange, and the papillose grey-brown rhinophores are white-tipped (MSM pers. obs.). Although considered rare (Powell 1979, p 289 as *A. faustina*) thirty to forty specimens were seen at low tide on ascidians on Paua wharf piles, Parengarenga Harbour in 1992. We also record a pair found under a rock in 1 m depth at Whangamumu, east Northland. It has also been found around the main New Zealand islands and the Chatham Islands, and it occurs in south-eastern Australia.

Anteaeolidiella lurana (Bergh, 1888) Fig. 20

Average animal length 15 mm. Individuals vary from orange to brown with orange stripes on the head and a series of white blotches down the back. It lives from mid-tide to depths of 11 m on rocky reefs in semi-sheltered localities. We have found it curled up with bryozoa under low tidal stones at Dog Island, Parengarenga Harbour. All our records are from the east side of northern New Zealand as far south as Birkdale and West Tamaki Head, Waitemata Harbour (Miller 1977). It is widespread in tropical and subtropical seas and is possibly an introduced species to New Zealand (Willan *et al.* 2010).

Baeolidia australis (Rudman, 1982) Fig. 20

Average animal length 20 mm. This colourful nudibranch has a brown body with numerous white spots. The white tipped cerata are banded with brown, crimson and gold. It can be identified by the white hexagonal marking on the head between the oral tentacles. The cerata are large and bulbous. It is found on open coasts on seaweeds where it likes to feed on the anemone *Cricophorus nutrix* (Willan & Morton 1984). We have one record from Tapeka Point, Bay of Islands on the brown seaweed *Carpophyllum*. It is also found in Australia.

Burnaia helicochorda (Miller, 1988) Fig. 20

Average animal length 20 mm. The body is translucent brown with horseshoe-shaped clusters of cerata. A distinctive feature is the pair of large club-like rhinophores. Only two specimens have been found in New Zealand, one at the Three Kings Islands and one at the type locality Goat Island Bay, Leigh. The habitat is on exposed rocky shores at low tide to 20 m depth (Willan *et al.* 2010). It also occurs in Australia.

Facelinidae

Phidiana milleri Rudman, 1980 Fig. 20

Average animal length 30 mm. An attractive nudibranch that is frequently noticed because it moves rapidly and

often crawls on exposed surfaces. The slender, translucent body has orange around the head and tentacles. The orange cerata have white tips and are darkened centrally by branches of the digestive gland. This endemic species is predominantly intertidal, frequently found in intertidal pools, but extends to depths of 21 m (Willan and Morton 1984). We have scattered records from the east coast of Northland and it is more common around the Waitemata Harbour and on the Waitakere west coast. It occurs right around the North Island and south to Banks Peninsula.

Babakinidae

Babakina caprinsulensis (Miller, 1974) Fig. 21

Average animal length 15 mm. The body is pale mauve with an iridescent white rectangle on the head. The oral tentacles are white tipped with yellow. The club shaped-rhinophores arise from a common pedicle and are orange-brown also tipped with yellow. There is a narrow white line on the tail (MSM pers. obs.). The cerata are white, tipped with yellowish green (Miller 1974, as *Babaina*). All records of this endemic species are from the east coast of northern Northland. The type locality of this rare species is Goat Island Bay, Leigh. A second specimen was found under a stone in an intertidal pool at nearby Mathesons Bay (Morley 1987). We know of records from Tapeka Point, Bay of Islands in a depth of 17 m where a specimen was spawning, and Whangaroa Harbour, Northland (Kevin Burch pers. comm.).

Glauciniidae

Glaucus atlanticus Forster, 1777 Fig. 21

Average animal length 20 mm. This pelagic nudibranch amazes with its glowing colours of blue, silver and purple. The cerata are clustered on three pairs of lateral lobes, which assist its buoyancy. It floats upside-down on the surface of the water and remains afloat by periodically gulping air into its stomach. It feeds on Portuguese man-of-war, *Physalia physalis*, by-the-wind sailor *Velella velella* and the hydrozoan *Porpita porpita* (Willan and Morton 1984). It has been recorded washed up on both coasts of northern New Zealand. It is seasonally frequent in the Kermadec Islands and occurs world-wide in tropical and warm temperate zones.

Umbraculidae

Umbraculum umbraculum (Lightfoot, 1786) Fig. 21

Average animal length 120 mm. This uncommon side-gilled sea slug has a massively thiumbraculuckened body covered in tubercles. The body colour varies from grey to brown, yellow, reddish and orange (Willan *et al.* 2010). The flattened, oval shell perches on top. Its habitat is on open rocky reefs from intertidal down to 40 m. It has been found on the east coast of northern New Zealand as far south as East Cape (Te Papa Museum database). It is also found in all tropical and subtropical seas.

Velutinidae

Lamellaria ophione Gray, 1850 Fig. 22

Average animal length 18 mm. Although the soft body of this species is similar externally to a nudibranch it is not related (Powell 1979, p.150). The smooth body varies in colour from yellowish, orange, grey to white, to blend with its prey of ascidians and sponges. It has a fragile internal shell which is occasionally found in shell sand. This endemic species lives under rocks at low tide on exposed to sheltered coasts and is frequently seen on both sides of northern New Zealand. It appears to be most common in the Manukau Harbour, especially at Jenkins Bay, where it was found on the compound ascidian *Alyconium aurantium*. We know of one South Island record from Haast (Te Papa Museum database).

Onchidiidae

Onchidella nigricans (Quoy & Gaimard, 1835) Fig. 23

Average animal length 20 mm. The leathery sea slug is a pulmonate, it has no shell and as the common name suggests, has a tough granulated outer skin, often with papilli. It varies in colour from black to grey and maybe mottled with white, black, orange, green or yellowish-green (Willan *et al.* 2010). There are white marginal glands. It secretes a noxious fluid to deter predators. We have found it widespread in our studies on both coasts of Northland where it is most common on shaded muddy surfaces from mid to low tide. Occasionally on semi-exposed beaches it seeks shelter in disused isopod burrows (pers. obs.). It grazes on diatoms and other organic debris (Morton & Miller 1968, p 830). It is

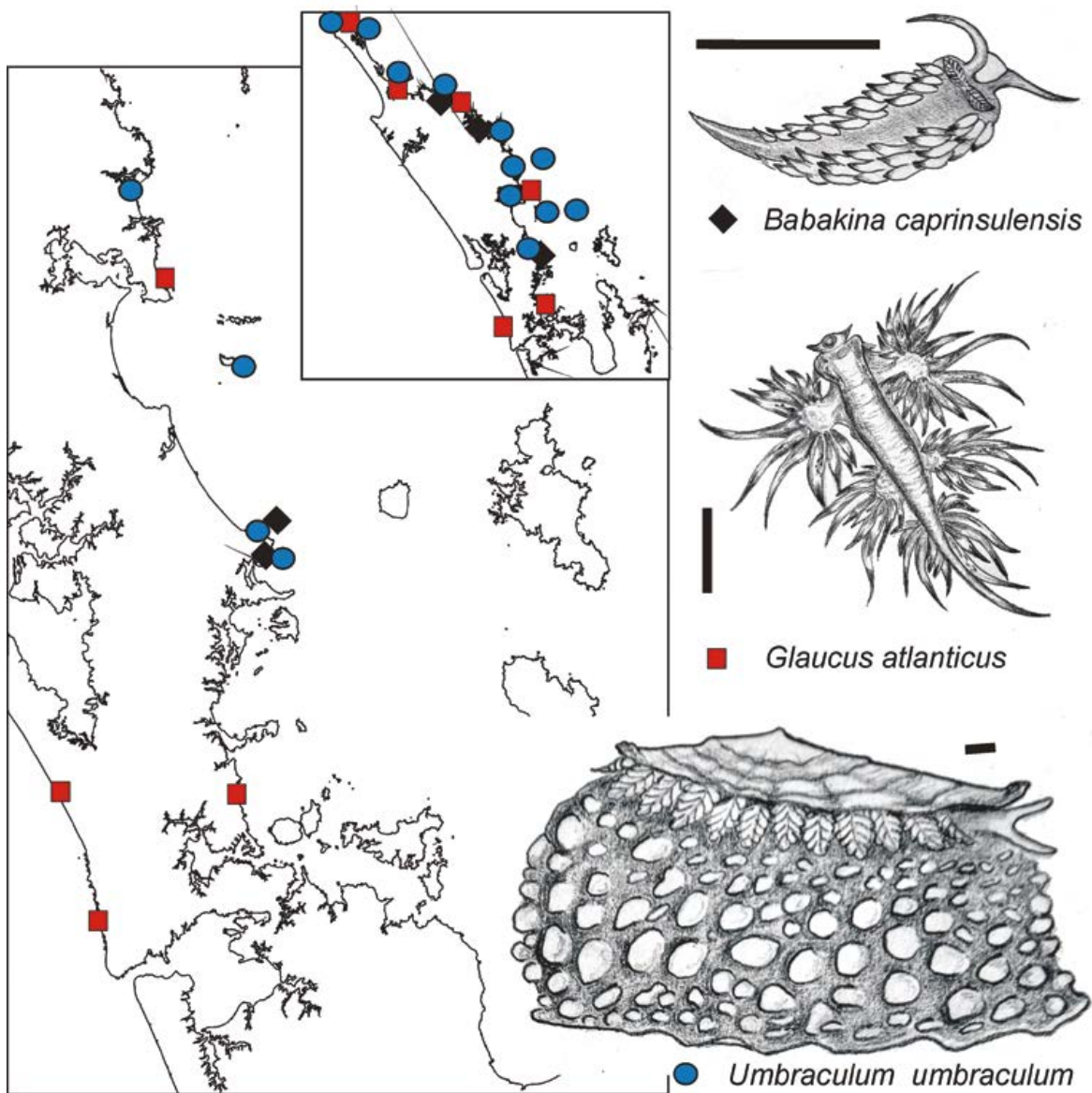


Figure 21. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Babakina caprinsulensis* (Leigh, Mathesons Bay), *Glaucus atlanticus* (Northland, Spirits Bay) and *Umbraculum umbraculum* (Bay of Islands, Long Beach). Scale bars 10 mm long.

found throughout New Zealand and also occurs on the southeast coast of Australia and Tasmania (Willan *et al.* 2010).

Fissurellidae

Scutus breviculus (Blainville, 1817) Fig. 24

A mollusc specialist would not class this as a 'sea-slug', but to the layperson it has a slug-like appearance and so we have included it here for completeness.

Average animal length 120 mm. The velvety black slug-like animal has a flattened, thickened shell which is almost entirely concealed by the mantle (Powell 1979). This shell is shield shaped and protects the heart and other vital organs. The eyes are at the outer bases of long tentacles. It can be found occasionally under boulders,

in deep crevices or overhangs at low tide on open to semi-exposed beaches. It is widespread throughout our study area on the east and west coasts. It is endemic, recorded from North, South and Chatham Islands.

DISCUSSION

Several small species of sea slug (less than 10 mm across) that have been recorded by others from the intertidal or shallow subtidal of northern New Zealand (e.g. *Okenia plana*, *Caldukia rubiginosa*) were not found in our surveys as their specific habitats were not targeted. Had they been present they may have gone unnoticed on account of their small size.

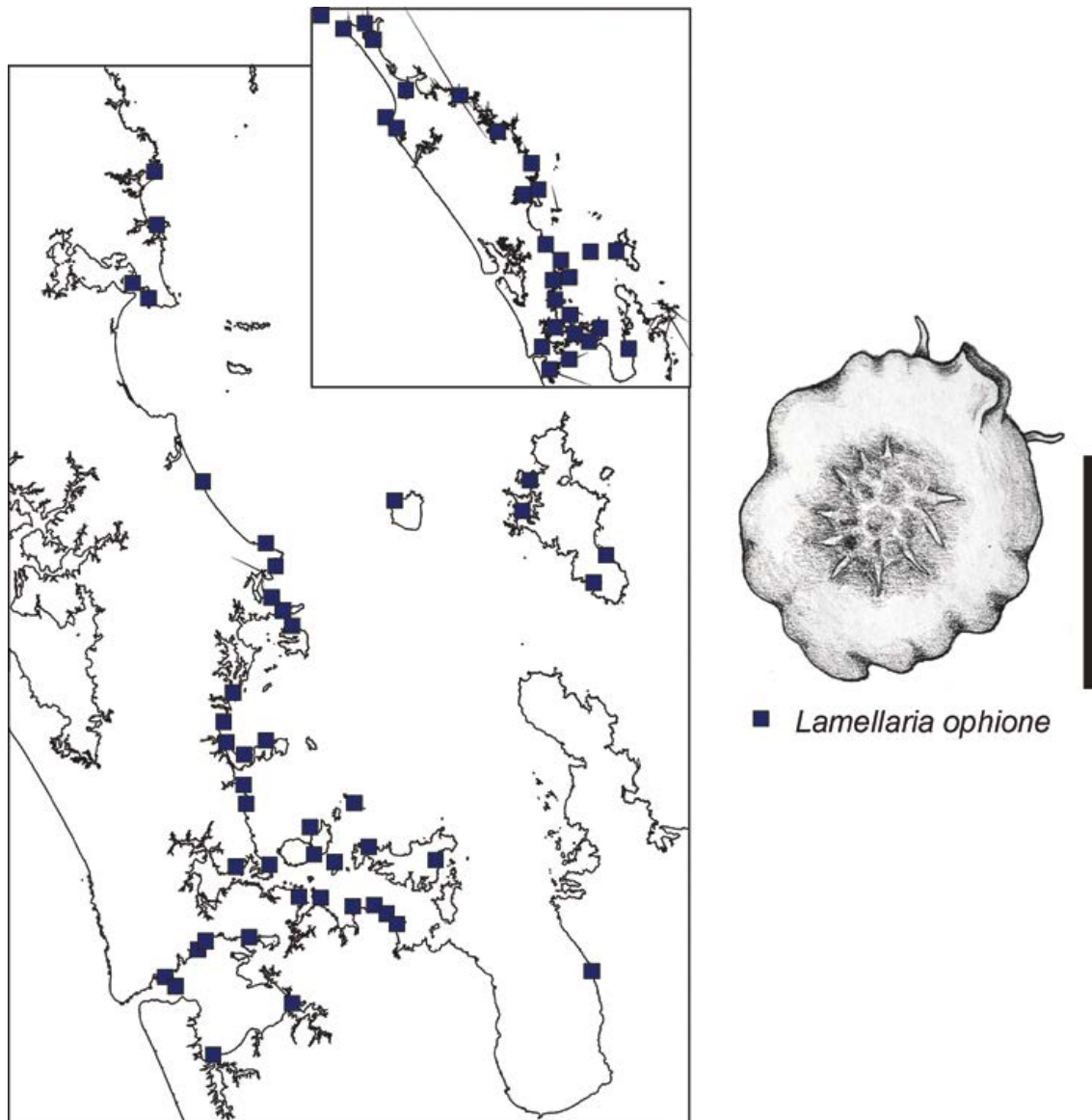


Figure 22. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Lamellaria ophione* (Whangaparaoa Peninsula, Red Beach). Scale bars 10 mm long.

Sporadic abundances

Our surveys confirm the observations of others about the unpredictability of the presence and size of populations of sea slugs at any one time or place (e.g., Enderby and Enderby 2005). The most frequently encountered intertidal nudibranch around northern New Zealand is *Dendrodoris citrina*, often as closely associated pairs or in numbers fewer than 20 on any one shore (pers. obs.).

Occasionally there have been short periods when large numbers of one sea slug species has been present along a short section of coastline. This has been the case for the green sea hare *Bursatella leachii* which has been seen in large numbers at intertidal and shallow subtidal depths on a number of occasions, often with wash ups of dying seaweed and cyanobacteria – e.g., Orakei Basin, autumn 1996 (Hayward and Hayward 1999); Blackpool and Whakanewha, Waiheke Island,

March 1999 (MSM pers. obs.); Beachlands to the North Shore, Auckland, March–July 2000 (Morley *et al.* 2001); Tindalls Beach, Whangaparaoa, Feb 2015 (this study). The well-camouflaged *B. leachii* are first noticed by their bright green spawn, like tangled balls of knitting wool, which may lead to the discovery of the recently dead bodies of this sea hare, as they die after spawning (Morton and Miller 1968). Sea hares of the genus *Aplysia* are also known to occur sometimes in large numbers intertidally – e.g., *A. argus* and *A. keraudreni*, Mathesons Bay and Echinoderm Reef, Goat Island, Feb–March 1992 (A. Enderby, pers. comm. 2015); *A. parvula* grazing on brown algae at Leigh Marine Reserve in 1991, 1997, 1998, and 2004 (A. Enderby, pers. comm. 2015). Another sea slug to occur periodically in large numbers and that may result in dog poisonings when eaten by them, is *Pleurobranchaea*

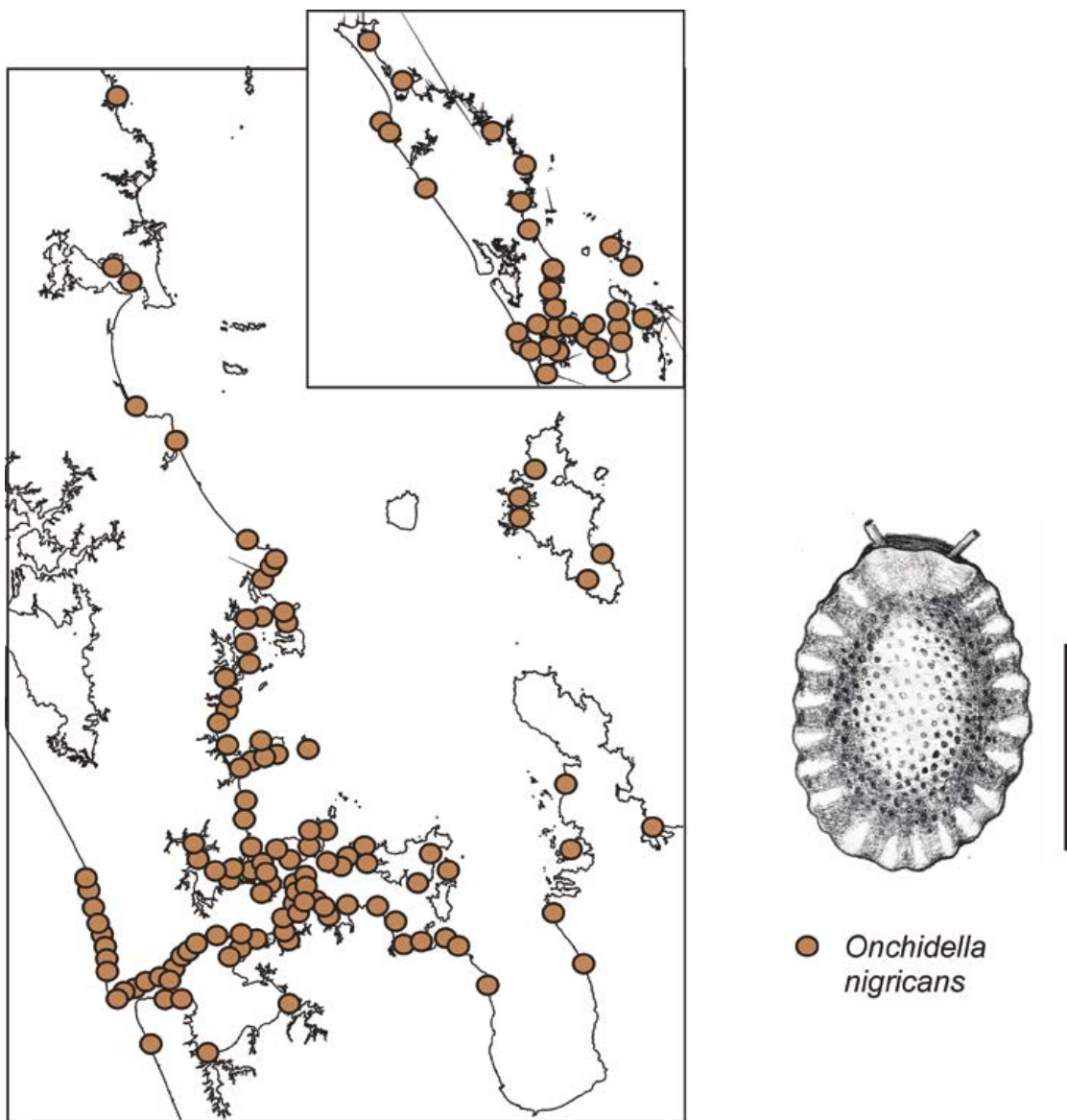


Figure 23. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Onchidella nigricans* (Waitemata Harbour, Eastern Beach). Scale bars 10 mm long.

maculata (Khor *et al.* 2014), which had a major increase in numbers along Auckland's North Shore beaches (pers. obs.) in the summer of 2009-2010 possibly as a result of an abundance of Asian date mussels just offshore (W. Blom pers. comm.). One other sea slug to be reported in large numbers is *Tritonia incerta* feeding on dead-man's fingers, *Alcyonium auranticum*, at Mathesons Bay and along the Leigh Marine Reserve coast in Feb 1992-1993 and again in Feb 2004 (A. Enderby, pers. comm. 2015).

Biodiversity

A total of 78 intertidal and shallow marine 'sea slug' species are recorded here from northern New Zealand. The majority are named but three rare taxa (e.g. *Aphelodoris* sp., *Elysia* n.sp., *Goniodoris* n.sp.) are probably undescribed new species. All species, except for *Goniodoris* n.sp., have been recorded from New Zealand previously.

Many other unnamed species of opisthobranch gastropods from New Zealand are recorded in Spencer *et al.* (2009). Of the 78 sea slug species, only three (*Aphelodoris* sp., *Flabellina albomarginata*, *Trinchesia reflexa*) have no intertidal record from the east coast of northern New Zealand and just 34 (44%) of the species are recorded from the west coast. The highest diversities from smaller geographic areas are 47 from around Leigh; 42 from the Bay of Islands; 38 from Great Barrier Island; 31 from Waitemata Harbour; 27 from Parengarenga Harbour; 24 from the Manukau Harbour; 19 from the Waitakere coast and 20 from Waiheke Island. The greater diversity in some areas reflects the intensity of survey (Leigh, Waitemata and Manukau Harbours, Waitakere coast) or diversity of habitats on the warmer east coast (Leigh area, Bay of Islands, Great Barrier and Parengarenga). Not surprisingly the

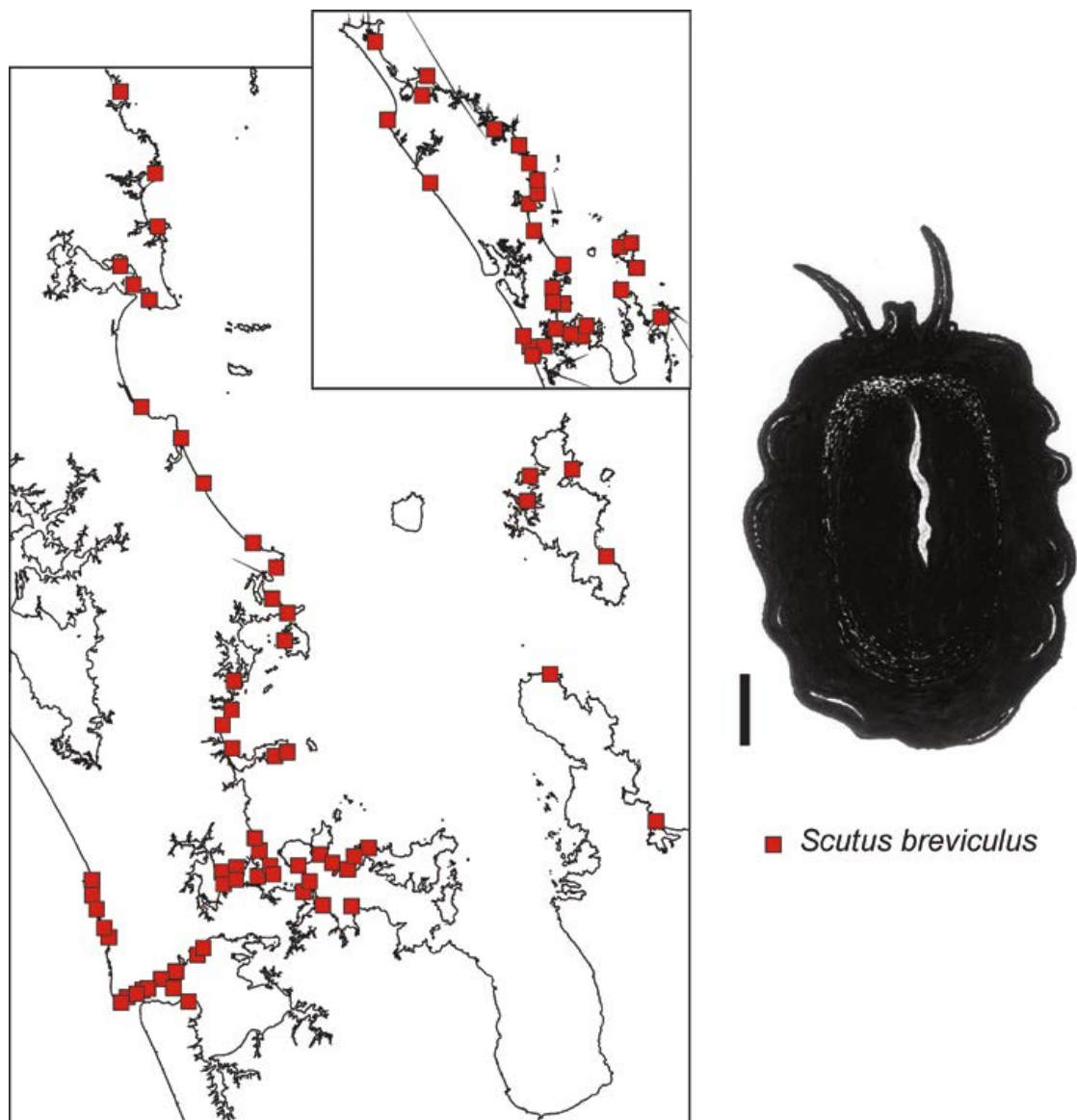


Figure 24. Intertidal and shallow subtidal (down to 2 m) distribution records around northern New Zealand of *Scutus breviculus* (Waitemata Harbour, Stanley Bay). Scale bars 10 mm long.

lowest diversities of sea slugs are around the sediment-dominated inner reaches of the major harbours and Firth of Thames where there is reduced habitat diversity (fewer hard rock substrates, seaweeds and sponges) and often a smothering with fine sediment.

Biogeography

Thirty-five species (45%) of the sea slugs recorded here from northern New Zealand are apparently endemic to New Zealand. Seven of these endemic species are restricted in their known occurrence to the north-east coast of northern New Zealand (Aupourian Province; Powell 1955). The next largest biogeographic groups are those whose distribution is Australasian (24%), cosmopolitan (18%) and IndoPacific (8%). A total of 39 species (50%) are restricted in their New Zealand occurrence to northern New Zealand (this study area), possibly including the Kermadec and Three Kings islands. Twenty-seven species (35%) of the sea slugs recorded here are restricted in their New Zealand occurrence to the warmer Aupourian or Aupourian and Kermadecian provinces. A similar number (25 species) of sea slugs recorded here occur all around the main islands of New Zealand (Aupourian, Cookian and Forsterian provinces).

Many sea slugs appear to be well adapted to hitching lifts on boats and in the last few centuries many have extended their natural range by successfully establishing new populations in far off waters. In a number of instances it is difficult to be sure which sea slugs are native to New Zealand and which may be recent invasives. An example of definite human-assisted introduced sea slugs to northern New Zealand is *Dolabrifera brazieri* and possible human-assisted introduced are *Anteaeolidiella lurana* and *Polycera melanosticta*. At least one of our endemic species (*Philine auriformis*) has been introduced overseas (California, USA; Krug *et al.* 2012).

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APPENDIX 1: (starts over the page) **List of intertidal sites surveyed in northern New Zealand and their sea slug records.** * = Date of observations by MSM other than surveys; ** = observers other than the authors. Numbers prefixed with MA are specimens lodged in the Marine Department, Auckland War Memorial Museum. TP ** = records from the on-line Te Papa Museum database.

West Coast (north to south)

- Cape Maria van Diemen, Jan 1969**. *L. ophione*
- Twilight Beach, Dec 1983*. *R. oruaensis*
- 90 Mile Beach, Jan 1965**. *P. auriformis* (MA32954)
- Ahipara, Nov 1994*, May 1999*, TP**. *A. luctuosa*, *A. argus* (MA140688), *C. thetidis*, *D. granulosa* (MA91075), *L. ophione*, *M. cylindrica* (MA29498), *O. nigricans*, *P. affinis*, *P. maculata*, *R. oruaensis* (MA140618), *S. breviculus*
- Herekino, May 1999*. *B. quoyi*, *H. zelandiae*, *L. ophione*, *P. maculata* (MA140737), *O. nigricans* (MA140533), *R. oruaensis*
- Hokianga, TP**. *R. oruaensis*
- Kawerua, Jun 1993. *A. lanuginata* (MA79338), *Aphelodoris* sp. (MA131144), *B. quoyi*, *H. zelandiae*, *O. nigricans*, *P. maculata*, *S. breviculus*, *V. cinnabarea*
- Muriwai-Collins Bay, Aug 1999, Sep 2000*, Jan 2002, Dec 2007*. *A. lanuginata* (MA118232), *Aphelodoris* sp., *D. granulosa* (MA103379), *D. wellingtonensis* (MA11824), *E. felina*, *F. albomarginata*, *G. atlanticus*, *O. nigricans*, *P. milleri*, *P. angasi*, *P. auriformis*, *R. muscula* (MA118233), *S. breviculus*, *T. incerta*
- Powell Bay-Tirikohua Pt, Mar 1998, Aug 2003, May 2008. *Aphelodoris* sp., *D. wellingtonensis*, *E. felina* (MA115243, MA119044), *O. nigricans*, *S. breviculus*
- Te Waharoa Bay, Jan 2001. *O. nigricans*, *S. breviculus*
- Te Henga-O'Neills Bay, Jun 1999, Jun 2001. *O. nigricans* (MA140833), *S. breviculus*
- Anawhata-Fishermens Rock Pt, Sep 1960**, Sep 1999. *E. agrius*, *O. nigricans*, *S. breviculus*, *T. beta*, *T. reflexa*
- Whites Beach, Mar 2000. *E. felina*, *O. nigricans*, *S. breviculus*
- North Piha, Nov 1962**, May 2001. *F. albomarginata*, *O. nigricans*, *T. reflexa*
- South Piha-Lion Rock, Mar 1998, May 2001, TP**. *D. wellingtonensis*, *E. felina*, *E. agrius*, *F. albomarginata*, *F. pinnata*, *G. atlanticus*, *O. nigricans*, *P. milleri*, *T. reflexa*
- Mercer Bay, Feb 1998. *O. nigricans*
- Karekare Beach, Oct 1999. *O. nigricans*
- Whatipu-Paratutae, Jan 2000, Sep 2001, Mar 2006, Sep 2006, Dec 2008. *Aphelodoris* sp. (MA81258, MA119060), *E. felina* (MA108533), *F. albomarginata*, *H. zelandiae*, *O. nigricans*, *P. milleri* (MA108532), *R. muscula* (MA10851), *S. breviculus* (MA141950), *T. incerta*
- Boulder Bay, Mar 2002, *D. granulosa*, *O. nigricans*, *R. muscula*, *S. breviculus*
- Destruction Gully-Kaiteke Pt, May 1998, Jul 2000, Apr 2001. *A. lanuginata*, *Aphelodoris* sp. (MA103518), *D. wellingtonensis*, *E. felina* (MA117874), *O. nigricans*, *R. muscula*, *S. breviculus*
- Huia Bay, Mar 1999*, May 2001, Dec 2001*, TP**. *A. lanuginata* (MA139473), *D. granulosa* (MA103381), *H. zelandiae*, *O. nigricans*, *P. angasi*, *R. muscula*, *S. breviculus*
- Huia Pt-Kaitarakahi, Feb 1999, Sep 2001. *A. mollicella* (MA140815), *B. quoyi*, *H. zelandiae*, *L. ophione* (MA108534), *O. nigricans*, *S. breviculus*
- Puponga Pt and Te Tau Bank, Nov 1994, May 2000, Aug 2001, TP**. *A. luctuosa*, *D. citrina*, *L. ophione*, *M. lorrainae*, *O. nigricans*, *P. angasi* (MA90365), *R. muscula*, *S. breviculus*
- Cornwallis-Mill Bay, Feb 1996, May 1997**, Jul 2000, May 2008. *B. ornata*, *B. quoyii* (MA28094), *D. citrina* (MA102568, MA136851, MA142813), *H. zelandiae*, *O. nigricans*, *P. angasi* (MA142809), *R. muscula* (MA102575), *S. breviculus*
- Mill Bay-Lawry Pt, Jul 2000. *Aphelodoris* sp., *D. citrina*, *M. cylindrica*, *H. zelandiae*, *O. nigricans*, *R. muscula*
- Big Muddy Creek, Dec 2001. *B. quoyi*, *H. zelandiae*, *O. nigricans*
- Laingholm, Kauri Pt, Botel Bay, Sep 2006, Nov 2008, Aug 2013. *E. maoria* (MA117913), *H. zelandiae*, *O. nigricans*
- Jenkins Bay, Nov 2008. *B. quoyi*, *D. citrina*, *H. nodulosa* (MA118680), *L. ophione*, *O. nigricans*, *S. breviculus*
- French Bay, June 2013. *H. nodulosa*, *H. zelandiae*, *O. nigricans*, *S. breviculus*
- Oatoru Bay, Nov 2014. *L. ophione*, *O. nigricans*
- Waikowhai, TP**. *H. zelandiae*, *O. nigricans*
- White Bluff, Nov 2010. *O. nigricans*
- Onehunga, Nov 2010, TP**. *L. ophione*, *O. nigricans*
- Mangere Bridge, Mar 2013. *O. nigricans*
- Ambury Park, Mar 2013, Nov 1994. *D. citrina* (MA90367), *H. zelandiae*, *O. nigricans*
- Puketutu Is, Mar 2010. *H. zelandiae*, *O. nigricans*
- Weymouth, Jun 2014. *H. zelandiae*, *L. ophione*, *O. nigricans*
- Clarks Beach, Jan 2014. *H. zelandiae*, *L. ophione*, *O. nigricans*
- Wattle Bay, 1995**, Oct 2005*. *H. zelandiae*, *M. lorrainae* (holotype MA 71314, paratypes MA73138; MA116833), *O. nigricans*, *P. angasi*
- Orua Bay, 1956, Jan 1994**, TP**. *F. pinnata* (MA118314), *R. oruaensis* (paratype, MA71977), *S. breviculus*
- Big Bay, Feb 2015. *O. nigricans*, *S. breviculus*
- Hamiltons Gap, Awhitu Peninsula, Mar 2004. *O. nigricans*
- Kariotahi, TP**. *P. affinis*

East Coast (north to south)

Te Werahi, Dec 1983*. *U. umbraculum*

Spirits Bay, Dec 1950**, Mar 1996*, TP**. *A. argus*, *A. parvula*, *B. vernicosa*, *G. atlanticus* (MA130217), *L. ophione*, *R. oruaensis* (MA31522)

North Cape, TP**, *P. affinis*

Waikuku Beach, **. *U. umbraculum*

Parengarenga Harbour, Mar 1986*, Mar, Oct 1992*, Mar 1995**, Mar 1996, Sep 2005. *A. drusilla*, *A. lurana* (MA130006), *A. parvula*, *B. vernicosa*, *B. lineata* (MA16926), *B. leachii* (MA104386), *B. ornata*, *B. quoyi*, *C. amoenum*, *C. thetidis* (MA104435), *D. citrina* (MA77192), *G. aureomarginatus*, *H. physis*, *H. zelandiae*, *H. zonata*, *L. ophione*, *M. cylindrica*, *M. lorrainae* (MA116817), *O. nigricans*, *P. milleri* (MA77191), *P. angasi* (MA73137), *P. imperialis* (MA104471, MA104385), *P. taronga*, *R. muscula* (MA77193), *R. oruaensis* (MA130147), *S. breviculus*, (MA104449), *T. rudmani* (MA77194)

Rangauun Bay, Nov 1999*, Feb 2001**, TP**. *C. thetidis*, *G. atlanticus* (MA105456), *H. physis* (MA30942), *H. zonata*, *L. ophione*, *O. nigricans*, *P. auriformis*, *R. oruaensis*

Rangiputa, Jul 1994**, Dec 1996**, Oct 2003. *A. luctuosa*, *H. physis* (MA139472), *H. zonata*, *M. cylindrica*, *U. umbraculum*

Cape Karikari, Feb 1978**, Apr 1987**, TP**. *A. parvula*, *B. lineata*, *B. quoyi*, *Elysia* n.sp., *G. atlanticus*, *S. breviculus*

Doubtless Bay, 1994**, TP**. *B. ornata*, *H. physis* (MA139472), *S. breviculus*

Taemaro Bay, **. *C. amoenum*

Taupo Bay, Apr 1988*. *D. brazieri*, *U. umbraculum*

Stephensons Island, TP**. *P. angasi*

Whangaroa, Aug 1961**, TP**. *B. caprinsulensis*, *C. thetidis*, *H. physis* (MA79668), *P. affinis*, *P. auriformis*, *R. oruaensis*

Tauranga Bay, TP**. *L. ophione*, *S. breviculus*

Mahinepua, **. *B. lineata*

Cavalli Islands, Nov 1974**, Jan 1979*, Feb 2004**, TP**. *B. lineata*, *C. thetidis*, *Elysia* n.sp., *F. pinnata*, *P. affinis*, *T. incerta*

Matauri Bay, May 1995. *G. atlanticus* (MA133953)

Bay of Islands, 1971**, Oct 1975**, 1992, Aug 1993, Oct 1994, Nov 1995, Aug 1996, Nov 1997, Dec 1998, TP**. *A. argus* (MA88892), *A. lanuginata* (MA77697), *A. luctuosa*, *A. lurana* (MA130006), *A. juliana*, *B. vernicosa*, *B. australis* (MA77695), *B. caprinsulensis*, *B. citrina*, *B. leachii*, *B. lineata*, *B. medietas* (MA140814), *B. ornata* (MA94796), *B. quoyii* (MA140242), *C. amoenum*, *C. thetidis*, *D. nigra* (MA90186), *D. brazieri*, *D. krusensternii*, *D. granulosa* (MA89607), *D. rubidus* (MA90186), *D. wellingtonensis*, *G. aureomarginatus*, *Goniadoris* n.sp., *H. physis*, *H. zelandiae* (MA133273), *J. novozealandicus*; *L. ophione* (MA133193), *O. nigricans*, *P. affinis*, *P. angasi*, *P. auriformis*, *P. milleri*, *P. powelli*, *P. taronga*, *P. maculata*, *R. muscula* (MA888831), *R. katipoides*, *R. oruaensis*, *R. zelandica*, *S. breviculus*, *T. incerta*

Whangamumu Harbour, Dec 1991*. *A. drusilla*, *A. juliana*, *D. citrina*

Taupiri, Apr 1979. *U. umbraculum* (MA32634)

Bland Bay, Jul 2003*. *A. argus*, *B. lineata*, *M. cylindrica*, *P. affinis*, *R. oruaensis*

Whangaruru, TP**. *M. cylindrica*, *P. auriformis*, *S. breviculus*

Whananaki, Dec 2000. *A. keraudreni* (MA104949), *B. citrina* (MA105891), *C. amoenum*, *C. thetidis* (MA165995), *D. brazieri*, *D. wellingtonensis*, *G. aureomarginatus* (MA105888), *H. zelandiae*, *L. ophione*, *O. nigricans*, *P. powelli*, *P. maculata* (MA105883), *S. breviculus*

Matapouri Bay, Feb 2003*, TP**. *B. lineata*, *A. parvula* (MA113509), *A. lanuginata* (MA113511)

Tutukaka, Feb 2003**, TP**. *A. luctuosa* (MA113513), *A. parvula* (MA113509), *B. lineata*, *H. physis*, *S. breviculus*, *U. umbraculum*

Poor Knights Islands, Dec 1977**, 1980*, Mar 1984**, TP**. *B. citrina*, *C. rubiginosa*, *C. thetidis*, *C. willani*, *D. citrina*, *Elysia* n.sp., *J. novozealandicus*, *P. dendritica*, *R. katipoides*, *R. oruaensis*, *R. zelandica*, *T. rudmani*

Whangamumu Bay, Dec 1991*, May 2013. *Aeolidiella* sp., *B. quoyi*, *C. thetidis*, *D. citrina*, *R. katipoides*

Pataua, Sep 2013 *B. citrina*, *B. quoyi*, *D. citrina*, *L. ophione*, *R. katipoides*, *S. breviculus*,

Taiharuru, TP**. *D. brazieri*, *M. lorrainae*

Ocean Beach, TP**. *G. atlanticus*, *T. beta*

Whangarei Harbour, 1931**, May 1962**, May 1967**, Apr 2012, TP**. *A. lanuginata*, *A. mollicella* (MA114018), *B. citrina*, *B. leachii*, *B. lineata*, *B. quoyi*, *C. amoenum*, *D. citrina*, *D. rubidus*, *H. zelandiae*, *J. novozealandicus*, *J. pantherina*, *L. ophione*, *O. nigricans*, *P. imperialis* (MA79667), *P. maculata*, *R. katipoides*, *R. muscula* (MA114017), *R. oruaensis*, *S. breviculus*, *U. umbraculum*

Whangarei Heads, TP**. *P. affinis*

Hen Island, TP**. *M. cylindrica*, *U. umbraculum*

Chicken Islands, Jan 1982*. *C. thetidis*, *P. affinis*

Mokohinau Islands, Dec 1977**, TP**. *Elysia* n.sp., *U. umbraculum*

Waipu Cove, May 2013. *O. nigricans*, *S. breviculus*

Mangawhai Heads, Mar 2014. *C. thetidis*, *A. juliana* (MA120614), *O. nigricans*, *P. maculata*, *S. breviculus*,

Te Arai Pt, Sep 2012, TP**. *A. keraudreni*, *A. luctuosa* (MA120094), *C. thetidis*, *D. wellingtonensis*, *L. ophione*, *P. affinis*, *S. breviculus*

- Little Barrier Island, 1992**, TP**. *C. thetidis*, *L. ophione*, *T. incerta*
- South Pakiri Beach, Mar 2011. *O. nigricans*, *S. breviculus*
- Goat Island Bay, Leigh, Oct 1961**, Sep 1972, Sep 1991**, May 1999, TP**. *A. argus*, *A. keraudreni*, *A. luctuosa*, *A. lanuginata*, *A. molesta*, *A. parvula*, *B. caprinsulensis*, *B. citrina*, *B. helicochorda*, *B. leachii*, *B. ornata*, *C. amoenum*, *C. rubiginosa*, *C. thetidis*, *C. willani*, *D. brazieri*, *D. granulosa*, *D. nigra*, *D. wellingtonensis*, *E. agrius* (MA83724), *E. felina*, *E. maoria*, *G. aureomarginatus*, *J. novozealandicus*, *J. pantherina*, *M. cylindrica*, *O. plana*, *P. affinis*, *P. maculata*, *R. katipoides*, *R. muscula*, *S. longicauda*, *S. smaragdinus*, *T. incerta*, *U. umbraculum*, *V. cinnabarea*
- Mathesons Bay, 1980s*, Feb 1992**, May 1999**, Jul 2000. *A. argus*, *A. juliana*, *A. keraudreni*, *A. molesta*, *B. vernicosa*, *B. caprinsulensis*, *B. leachii*, *B. medietas* (MA118906), *B. ornata*, *B. quoyi*, *D. brazieri*, *D. citrina*, *D. wellingtonensis*, *G. aureomarginatus*, *L. ophione*, *M. cylindrica*, *O. nigricans*, *P. maculata*, *S. breviculus*, *T. incerta*, *U. umbraculum*
- Ti Pt-Whangateau Harbour, May 1999**, Mar 2010**, May 2012, Sep 2012, Jan 2013. *B. leachii*, *F. pinnata* (MA120397), *H. zelandiae*, *M. lorrainae*, *O. nigricans*, *P. affinis*, *P. maculata* (MA30818)
- Sth end Omaha Beach, Nov 2010. *B. quoyi*, *C. thetidis*, *L. ophione*, *P. maculata*, *S. breviculus*, Takatu Peninsula, Nov 1977**. *J. novozealandicus*
- Jones Bay to Scow Pt, Tawharanui, Aug 2011. *A. lanuginata* (MA119611), *B. ornata* (MA119612), *B. quoyi*, *C. thetidis*, *L. ophione*, *O. nigricans*, *P. maculata*, *S. breviculus*
- Christian Bay, Feb 2014. *A. argus*, *B. citrina*, *B. quoyi*, *C. amoenum*, *D. nigra*, *H. zelandiae*, *O. nigricans*, *P. maculata*
- West Baddeleys Beach, Oct 2012. *B. ornata*, *B. quoyi*, *C. amoenum*, *D. nigra*, *M. cylindrica*, *O. nigricans*
- Kawau Island, 1994*, Sep 2011, TP**. *A. argus*, *A. lanuginata*, *A. parvula*, *B. leachii* (MA79648), *B. quoyi*, *C. amoenum*, *H. nodulosa*, *L. ophione*, *O. nigricans*, *P. affinis*, *P. angasi*, *P. maculata*, *S. breviculus*
- Snells-Algies Bays, Sep 2014. *B. vernicosa*, *O. nigricans*, *R. muscula*
- Martins Bay, Sep 2014. *B. quoyi*, *M. cylindrica* (MA120699), *O. nigricans*, *P. affinis*
- Scott Pt, Mahurangi Harbour, Jun 2001*, Jun 2011. *B. quoyii* (MA107140), *C. amoenum*, *D. krusensternii*, *H. zelandiae*, *M. cylindrica*, *O. nigricans*
- Opahi, Mahurangi Harbour, Aug 2013. *A. argus* (MA140688), *B. leachii*, *B. quoyi*, *D. citrina*, *L. ophione*, *O. nigricans*, *R. muscula*, *S. breviculus*
- Cudlip Pt, Mahurangi Heads, Aug 2005, Jan 2010. *B. ornata* (MA116813), *B. leachii*, *B. quoyi*, *D. citrina*, *D. nigra*, *D. granulosa* (MA116814)
- Te Muri Beach, Jan 2012. *A. argus*, *B. quoyi*, *H. zelandiae*, *O. nigricans*, *P. affinis*
- Wenderholm-Waiwera, Jun 1963**, Sep 1974**, Jun 2001, Aug 2006, Jun 2012. *B. ornata* (MA107049) *B. leachii*, *B. quoyi*, *D. citrina* (MA119986), *D. krusensternii*, *D. nigra* (MA107050), *D. pita*, *E. felina* (MA117912), *H. zelandiae*, *L. ophione*, *O. nigricans*, *R. katipoides* (MA117915), *S. breviculus*, *T. bractea*
- Nth Orewa Beach, Jun 2000. *B. quoyi*, *L. ophione*, *M. cylindrica*, *O. nigricans*, *P. auriformis*, *S. breviculus*
- Red Beach, Jun 2008, Jul 2014. *A. lurana* (MA118987), *D. krusensternii*, *E. maoria*, *L. ophione*, *O. nigricans*, *P. affinis*, *R. muscula* (MA119020), *S. breviculus*
- Manly-Stanmore Bay Pt, Jun 2005. *A. lanuginata*, *B. quoyi*, *C. amoenum*, *D. nigra*, *D. granulosa*
- Tindalls Beach, 2002*, Feb 2015. *B. leachii* (MA110910)
- Fishermans Rock-Coalmine Bay, Jul 2006, Jun 2007. *B. ornata*, *B. quoyi*, *D. citrina*, *L. ophione*, *O. nigricans*
- Army Bay, Whangaparaoa Peninsula, May 1999. *A. argus*, *A. juliana*, *B. leachii*, *B. quoyi*, *D. citrina*, *D. nigra*, *M. cylindrica*
- Tiritiri Island, Apr 1931**, Mar 2011, TP**. *A. argus*, *A. parvula*, *C. thetidis*, *D. citrina*, *E. maoria* (MA78488), *G. aureomarginatus*, *O. nigricans*, *P. maculata*, *T. incerta*, (MA78598)
- East Shakespeare Bay, Feb 2010. *B. quoyi*, *D. krusensternii*, *D. nigra*, *O. nigricans*, *S. breviculus*
- West Okoromai Bay, Dec 2011. *B. quoyi*, *C. amoenum*, *D. citrina*, *D. granulosa* (MA119768), *H. zelandiae*, *O. nigricans*, *S. breviculus*
- Matakatia Bay and islet, Aug 2010. *B. quoyi*, *C. amoenum*, *D. citrina*, *D. nigra*, *H. zelandiae*, *M. cylindrica*, *O. nigricans*, *P. maculata*
- Little Manly, May 2006. *B. quoyi*, *D. citrina*, *D. nigra*, *O. nigricans*
- Arkles Bay, Oct 2010. *B. ornata*, *B. quoyi*, *C. amoenum*, *D. citrina*, *D. nigra*, *M. cylindrica*, *O. nigricans*
- Long Bay, TP**. *L. ophione*
- Nth end Torbay, Oct 2003, Apr 2001, TP**. *B. ornata*, *B. leachii*, *D. citrina*, *D. krusensternii*, *D. nigra*, *D. granulosa*, *L. ophione*, *O. nigricans*
- Murrays Bay-Tarata Pt, Jun 2007. *B. quoyi*, *D. citrina*, *D. krusensternii*, *M. cylindrica* (MA117883), *O. nigricans*, *R. muscula*
- Mairangi Bay, *. *G. atlanticus*
- Castor Bay, Feb 1998. *B. quoyi*, *M. cylindrica*, *S. breviculus*
- Takapuna Reef, 1931**, Oct 1937**, Oct 1960**, Apr 1997, 1999, Jul 2010, TP**. *A. mollicella* (MA118714), *B. ornata*, *D. citrina*, *D. krusensternii*, *D. nigra* (MA135666), *E. maoria* (MA70259), *M. cylindrica* (MA70455), *O. nigricans*, *P. milleri*, *S. breviculus*, *T. beta*
- Nth Narrow Neck Beach, Dec 1958**, Feb 2009. *B. quoyi*, *D. citrina*, *D. nigra*, *L. ophione*, *O. nigricans*, *P. maculata*, *S. breviculus*, *T. beta*
- Takapuna Head, Aug 2006, Feb 2009. *A. mollicella*, *B. quoyi*, *O. nigricans*, *S. breviculus*

- Cheltenham Beach-North Head, 1938**, May 2011, TP**. *B. quoyi*, *D. citrina*, *D. nigra*, *H. zelandiae*, *O. nigricans*, *P. angasi*, *P. auriformis* (MA31507), *S. breviculus*
- Torpedo Bay, 2001*, Sep 2005. *B. ornata*, *D. citrina*, *O. nigricans*, *P. maculata*, *S. breviculus*
- Devonport Naval Base, Jul 1961**, May 1969**. *J. novozealandicus*, *P. melanosticta*, *T. beta*, *T. reflexa*
- Stanley Pt, Jun 1998, Nov 2004. *B. ornata* (MA114106, MA136696), *B. quoyi*, *D. granulosa*, *O. nigricans*, *P. maculata*, *S. breviculus*
- Northcote-Birkenhead, Jul 1996, Mar 2010, Jun 2010. *A. luctuosa*, *B. quoyi*, *D. citrina*, *H. zelandiae*, *L. ophione*, *M. cylindrica*, *O. nigricans*, *S. breviculus*
- Chelsea-Kauri Pt, Aug 2006. *B. quoyi*, *D. citrina* (MA117879), *D. nigra*, *D. granulosa*, *E. maoria* (MA117880), *O. nigricans*, *P. maculata*, *S. breviculus*
- Rangitoto Lighthouse, Mar 2002. *O. nigricans*
- Rangitoto wharf, Jan 2014. *D. nigra*, *O. nigricans*, *S. breviculus*
- Islington Bay, Rangitoto, May 1930**. *B. quoyi*, *D. citrina* (MA76185), *E. maoria* (MA78320), *H. zelandiae*, *O. nigricans*
- Bird Islands, Motutapu Island, Mar 2014. *B. ornata*, *B. quoyi*, *D. citrina*, *D. nigra*, *H. zelandiae*, *L. ophione*, *O. nigricans*
- Emu Bay, Motutapu Island, Apr 2013. *D. citrina*, *D. nigra*, *O. nigricans*, *S. breviculus*
- Station Bay, Motutapu Island, Feb 2012. *B. quoyi*, *D. citrina*, *O. nigricans*, *P. maculata*
- Otata Is, Noises Group, Jun 2007**. *A. luctuosa* (MA36464), *T. rudmani*
- Nth end Motuihe Island, Jan 2000, Mar 2010. *A. luctuosa*, *B. quoyi*, *D. citrina*, *L. ophione*, *O. nigricans*, *P. auriformis* (MA119218), *P. maculata*, *S. breviculus*
- Ocean and West beaches, Motuihe Island, Jun 2010. *M. cylindrica*, *P. maculata*
- Browns Island, Jan 2000. *B. quoyi*, *D. citrina* (MA105071), *O. nigricans*, *S. breviculus*
- Crusoe Island, Sep 2009. *A. luctuosa* (MA118956), *D. citrina*, *O. nigricans*, *P. milleri* (MA118955), *P. maculata*, *S. breviculus*
- Motukaha Island, Waiheke Is, Aug 2009. *Aphleodoris* sp. (MA118998), *D. citrina*, *O. nigricans*, *P. maculata* (MA118947), *S. breviculus*
- Enclosure and W Bays, Waiheke Is, Apr 1995*, Mar 1997*. *A. argus*, *B. leachii*, *B. quoyi*, *L. ophione*, *S. breviculus*
- Church Bay, Waiheke Is, Apr 1995*. *P. maculata*
- Oneroa, Waiheke Is, Jan 1987*, Feb 1988*, Jul 1988*, Dec 1989*, Apr 1995*, Sep 1999*, Aug 2009*, Jan 2014*. *A. luctuosa*, *B. ornata*, *B. quoyi*, *D. citrina*, *D. granulosa*, *E. maoria*, *H. zelandiae*, *L. ophione*, *M. cylindrica* (MA29498), *O. nigricans*, *P. affinis*, *P. milleri*, *P. maculata*, *R. muscula*, *R. oruaensis*, *S. breviculus*
- Kennedy Pt, Waiheke Is, Mar 2009. *B. leachii*, *B. quoyi*, *D. citrina*, *O. nigricans*
- Te Matuku Bay, Waiheke Is, Sep 1996. *B. quoyi*, *H. zelandiae*, *O. nigricans* (MA133334), *P. maculata*
- Man o'War Bay, Waiheke Is, Aug 2009. *B. quoyi*, *L. ophione*, *O. nigricans*, *P. maculata*
- Rotoroa Island, Oct 2007. *P. angasi* (MA119011), *B. quoyi*, *O. nigricans*
- Herald Is, Waitemata Harbour, Mar 2013. *O. nigricans*
- Te Atatu Peninsula, Waitemata Harbour, Mar 2013. *O. nigricans*
- Pt Chevalier, TP**. *H. zelandiae*
- Meola Reef, Waitemata Harbour, May 1930**, Sep 1994, Jun 1996, Oct 2005. *A. luctuosa* (MA78278), *B. ornata*, *B. quoyi*, *D. citrina*, *D. krusensternii*, *D. nigra* (MA130899), *D. granulosa*, *J. pantherina* (MA131859), *O. nigricans*, *P. milleri*, *P. maculata* (MA87095), *S. breviculus*
- Herne Bay, Nov 1994**, Feb 1996**, TP**. *B. leachii* (MA130530), *B. quoyi*, *H. zelandiae* (MA92033), *M. cylindrica*
- Watchman Island, Waitemata Harbour, May 1997. *B. ornata*, *D. citrina*, *O. nigricans*, *S. breviculus*
- Fitzpatrick Bay, Waitemata Harbour, Jun 1996. *A. lurana* (MA131290)
- Hobson Bay, Jun 1998. *B. leachii*, *O. nigricans*
- Orakei Basin, Sep 1991*. *B. leachii* (MA75226)
- Okahu Bay, Jun 1998*. *B. ornata*, *D. citrina*, *O. nigricans*
- Mission Bay-St Heliers, May 1997. *D. citrina*, *D. krusensternii*
- St Heliers-W Tamaki Pt, Oct 1960**, 2004. *B. medietas* (MA115126), *B. ornata*, *D. citrina*, *J. pantherina*, *O. nigricans*, *S. breviculus*
- West Tamaki Pt, Jul 2004, Sep 2004, Mar 2006. *A. lanuginata*, *A. lurana*, *B. quoyi*, *D. citrina*, *M. cylindrica*, *O. nigricans*, *P. maculata*, *R. muscula*
- Karaka Bay-Glendowie, Aug 2002, 2003, 2004, Jul 2010. *A. mollicella* (MA113210), *A. lanuginata* (MA114105), *B. leachii* (MA102567), *B. medietas*, *B. quoyi*, *D. citrina*, *H. zelandiae*, *M. cylindrica* (MA114102), *O. nigricans*, *R. muscula*
- Tahuna Torea-Point England, Tamaki Estuary, Oct 2002, Jan 2003. *B. leachii*, *B. quoyi*, *D. citrina*, *H. zelandiae*, *O. nigricans*, *P. auriformis* (MA112619), *P. maculata*, *P. taronga*
- Upper Tamaki Estuary, Sep 2003. *H. zelandiae*, *O. nigricans*
- Halfmoon Bay, Tamaki Estuary, Jun 2002. *D. citrina* (MA111352), *H. zelandiae*, *O. nigricans*
- Panmure Bridge-Half Moon Bay, Oct 1986*, Sep 1988*, Jul 2002, Jun 2003. *D. citrina*, *H. zelandiae*, *M. cylindrica*, *O. nigricans*, *P. auriformis*, *P. taronga*
- Little Bucklands-Bucklands Beach, Apr 2003. *B. ornata*, *B. leachii*, *B. quoyi*, *D. citrina*, *D. nigra*, *E. maoria*, *H. zelandiae*, *M. cylindrica*, *O. nigricans*, *P. milleri*, *P. maculata*, *R. muscula*

Bucklands Beach-Musick Pt, Feb 1995*, Jul 2000*, Apr 2003, Oct 2003, Mar 2006, Aug 2010. *P. auriformis* (MA119275).
A. lanuginata, *B. leachii*, *B. quoyi*, *D. citrina*, *D. nigra*, *E. maoria* (MA92806), *H. zelandiae*, *M. cylindrica*, *O. nigricans*,
P. auriformis, *P. maculata* (MA102566), *P. taronga*, *R. muscula*
Musick Pt-Eastern Beach, Aug 2004, Sep 2006, Sep 2007*, Dec 2007*, Aug 2010, Apr 2011 *A. mollicella*, *B. ornata*, *B. quoyi*, *D. citrina*, *D. krusensternii* (MA119595), *D. nigra* (MA118313), *L. ophione*, *O. nigricans*, *R. muscula*, *T. bractea* (MA118155)
Eastern Beach Sth end, Jun 2014. *A. mollicella*, *B. leachi*, *D. krusensternii*, *D. nigra*, *M. cylindrica*, *O. nigricans*
Mellons Bay, Feb 2005, 2010**. *A. mollicella*, *B. leachii*, *B. quoyi*, *D. krusensternii*, *D. nigra*, *H. zelandiae*, *O. nigricans*, *S. breviculus*
Howick Beach, May 1954**, Nov 1999, Jan 2000, Oct 2006, Jul, Aug 2012. *B. leachii* (MA142020), *B. quoyi*, *D. densioni* (MA117928), *D. nigra*, *H. zelandiae*, *L. ophione* (MA104746), *O. nigricans*, *P. milleri*, *R. muscula*
Howick Beach-Cockle Bay, Aug 2011. *B. leachii*, *D. krusensternii*, *D. nigra*, *H. zelandiae*, *M. cylindrica*, *O. nigricans*, *R. muscula*
Mangemangeroa Estuary, **. *P. dendritica* (MA120714)
Motukaraka Island, Beachlands, Sep 1997, Feb 2014, *B. quoyi*, *D. citrina*, *D. nigra*, *H. zelandiae*, *L. ophione*, *M. cylindrica*, *O. nigricans*, *P. maculata*, *R. muscula*, *S. breviculus*
Omana, Mar 2003, 2004*. *B. leachii* (MA115213), *B. quoyi*, *D. citrina* (MA115214), *H. zelandiae*
Maraetai Pt, Mar 2001. *B. leachii*, *L. ophione*, *R. muscula*
Maraetai, Magazine Pt, Aug 2014. *B. quoyi*, *D. citrina*, *D. krusensternii*, *L. ophione*, *O. nigricans*, *R. muscula*
Nth side Duders Regional Park, May 2003. *B. leachii*, *B. quoyi*, *D. nigra*, *L. ophione*, *O. nigricans*, *R. muscular*
Mataitai Bay, Mar 2015. *D. citrina*
Pouto Pt, Mar 2007. *O. nigricans*
West end Kawakawa Bay, Mar 2006. *B. quoyi*, *D. citrina*, *O. nigricans*
East end Kawakawa Bay, Jun 2004. *D. citrina*, *H. zelandiae*, *O. nigricans*, *P. maculata*
Nth Orere Pt, Apr 2015. *D. krusensternii*
Sth Orere Pt, May 2005. *B. quoyi*, *D. citrina*, *R. muscula*, *O. nigricans*
Matingarahi Pt, Firth of Thames, Jun 2007. *O. nigricans*

Great Barrier Island and Coromandel Peninsula

Whangapoua, Great Barrier Is, Jun 2000, Mar 2002, TP**. *A. lanuginata* (MA111094), *A. parvula* (MA111092), *B. citrina* (MA111093), *B. lineata*, *B. quoyii* (MA111635), *C. thetidis*, *H. zelandiae* (MA103110), *S. breviculus* (MA110813)
Rakitu Is, Great Barrier, Jan 1981*, TP**. *P. affinis*
Katherine Bay-Kawa, Great Barrier Is, Mar 2002. *B. citrina* (MA110228), *B. leachii*, *B. quoyi*, *C. amoenum*, *O. nigricans*, *R. oruaensis*, *S. breviculus*
Port Abercrombie, Great Barrier Is, Jan 1991*, Dec 1992, Mar 2002. *B. vernicosa*, *B. citrina*, *B. leachii*, *B. quoyi*, *C. amoenum*, *L. ophione*
Fitzroy, Great Barrier Is, Dec 1993. *A. luctuosa* (MA80958), *G. aureomarginatus*, *P. angasi*, *P. auriformis*
Kaikoura Is, Great Barrier Is, 1995*, Dec 2009. *D. brazieri*, *D. citrina*, *D. krusensternii*, *O. nigricans*, *S. breviculus*
Oneura Bay, Great Barrier Is, Mar 2002. *B. ornata*, *B. leachii* (MA1100912), *B. quoyi*, *C. amoenum*, *D. nigra*, *D. granulosa* (MA110922), *H. zelandiae*, *O. nigricans*, *R. muscula*
Rangiahua Is, Great Barrier. Jan 1985*, 1991*. *C. thetidis*, *C. willani*, *P. affinis*
Blind Bay, Great Barrier, Dec 1986*. *A. argus*
Schooner Bay, Great Barrier Is, Nov 2005. *A. luctuosa*, *C. thetidis*, *D. nigra*, *R. muscula*
Tryphena, Great Barrier Is, Feb 1991*, TP**. *A. lanuginata*, *B. ornata*, *B. quoyi*, *C. amoenum*, *C. thetidis*, *D. brazieri*, *D. nigra*, *D. wellingtonensis*, *H. zelandiae*, *L. ophione*, *M. cylindrica*, *O. nigricans*, *R. oruaensis*, *S. breviculus*
Medlands, Great Barrier Is, Dec 1981*, Feb 2004. *A. luctuosa* (MA114993), *A. parvula*, *B. lineata*, *B. ornata* (MA114999), *B. quoyi*, *L. ophione*, *O. nigricans* (MA114997), *R. oruaensis* (MA116696), *S. breviculus*
Cuvier Island, TP**. *C. thetidis*
Whangapoua-Mahurangi, east Coromandel Peninsula, Jun 2000. *A. keraudreni*, *O. nigricans*, *S. breviculus* (MA103156)
Kuaotunu, east Coromandel Peninsula, Mar 1946**. *A. parvula*
Whitianga, east Coromandel Peninsula, 2010**. *P. maculata*
Hahei, east Coromandel Peninsula, Dec 2000**. *A. luctuosa* (MA116991), *C. rubiginosa*
Hot Water Beach, TP**. *P. affinis*
Pauanui, east Coromandel Peninsula, Nov 2007*. *A. lanuginata* (MA30167)
Opoutere, east Coromandel Peninsula, 2005**. *F. pinnata* (MA118314), *M. cylindrica*, *R. katipoides*
Fletchers Bay, Coromandel Peninsula, Dec 2013. *B. ornata*, *B. citrina*
Waitete Bay, west Coromandel Peninsula, Jan 2013. *B. citrina*, *O. nigricans*
Wyuna Bay-Little Passage, west Coromandel Peninsula, Jan 2013. *B. leachii*, *B. quoyi*, *O. nigricans*, *P. angasi*, *P. auriformis* (MA120174)
Wilson Bay, west Coromandel Peninsula, Dec 2013. *D. citrina*, *O. nigricans*
Te Mata, west Coromandel Peninsula, Oct 2014. *L. ophione*, *O. nigricans*

APPENDIX 2: Summary of distribution and features of intertidal and shallow subtidal sea slugs of northern New Zealand. The known New Zealand-wide distribution of each species is given in terms of New Zealand biogeographic provinces of Powell (1955) and listed in Spencer *et al.* (2014). E = Endemic to New Zealand. Biogeography: Aus = Australasian; Cos = cosmopolitan in warm waters; E = NZ endemic; IP = Indo-Pacific; Pac = Pacific; SP = South Pacific; Shell: Ext = easily seen externally; Int = internal and not seen externally

Taxon	Biogeography	Kermadecian	Aupourian	Cookian	Forsterian	Moriorian	Antipodean	Animal colour	Shell	Figure
Acteonidae										
<i>Pupa affinis</i> (Hutton, 1873)	Cos		A	C				Creamy white	Ext	1
Bullinidae										
<i>Bullina lineata</i> (Gray, 1825)	IP	K	A					Cream with blue margin	Ext	1
Aplustridae										
<i>Hydatina zonata</i> (Lightfoot, 1786)	IP		A						Ext	1
<i>Hydatina physis</i> (Linnaeus, 1758)	Cos	K	A					Pink	Ext	1
Cephalaspidea: Cylichnidae										
<i>Cylichna thetidis</i> Hedley, 1903	Aus	K	A	C					Ext	2
Philinidae										
<i>Philine angasi</i> (Crosse and Fischer, 1865)	Aus	K	A	C				White	Int	2
<i>Philine auriformis</i> Suter, 1900	E		A	C	F			White	Int	2
Retusidae										
<i>Retusa oruaensis</i> (Webster, 1908)	E		A	C	F	M		Creamy white		2
Aglajidae										
<i>Melanochlamys cylindrica</i> Cheeseman, 1881	E		A	C	F		An	Black	Int	3
<i>Melanochlamys lorrainae</i> (Rudman, 1968)	E		A	C				White to grey	Int	3
<i>Philinopsis taronga</i> Allan, 1933	Aus		A					Brown with yellow spots	Int	3
Runcinidae										
<i>Pseudoilbia zelandica</i> Miller and Rudman, 1968	E		A					Black longitudinal bands, white front and back	Int	3
<i>Runcina katipoides</i> (Miller and Rudman, 1968)	E		A					Dk grey, with red central stripe	Int	3
<i>Runcinella zelandica</i> Odhner, 1924	E		A					Dk green with irregular pink bands and white splotches	Int	3
Bullidae										
<i>Bulla vernicosa</i> (Pilsbry, 1893)	SP	K	A						Ext	4
<i>Bulla quoyii</i> Gray, 1843	Aus		A	C					Ext	4

Taxon	Biogeography	Kermadecian	Aupourian	Cookian	Forsterian	Moriorian	Antipodean	Animal colour	Shell	Figure
Haminoeidae										
<i>Haminoea zelandiae</i> (Gray, 1843)	E		A	C				Dark grey	Ext	5
Aplysiomorpha: Aplysiidae										
<i>Aplysia argus</i> (Ruppell and Leuckart, 1830)	Cos	K	A					Olive green, with black reticulate lines	Int	6
<i>Aplysia juliana</i> (Quoy and Gaimard, 1832).	Cos		A	C	F			Choc brown to black, with white spots	Int	6
<i>Aplysia keraudreni</i> Rang, 1828	SP		A	C	F			Kelp brown with white mottles, black netted lines	Int	6
<i>Aplysia parvula</i> Guilding, 1863	Cos		A	C	F			Kelp brown with white dots	Int	6
<i>Bursatella leachii</i> Blainville, 1817	Pac		A	C				Brownish-green, black speckles, emerald green patches	No	7
<i>Dolabrifera brazieri</i> G.B. Sowerby, 1870	Aus	K	A					Green marbled brown, white and pink	Int	7
<i>Stylocheilus longicauda</i> Quoy and Gaimard, 1832	Cos		A					Green with brown lines and spots ringed with black	No	7
Sacoglossa: Limapontiidae										
<i>Ercolania felina</i> (Hutton, 1882)	E		A	C	F			Grey-black, central white stripe	No	8
<i>Stiliger smaragdinus</i> Baba, 1949	Pac		A					Bright green	No	8
<i>Placida dendritica</i> (Alder and Hancock, 1843)	Cos		A	C	F		An	Green	No	8
Placobranchidae										
<i>Elysia maoria</i> Powell, 1937	Aus		A	C				Dark green	No	8
<i>Elysia</i> n.sp.	Aus		A					Pale green with blue spots & bright blue-green margin	No	8
Pleurobranchomorpha: Pleurobranchidae										
<i>Berthella medietas</i> Burn, 1962	Aus		A	C	F	M	An	Orange to bronze	Int	9
<i>Berthella ornata</i> (Cheeseman, 1878)	E		A	C	F	M		Cream-white with dark red-brown blotches	Int	9
<i>Berthellina citrina</i> (Ruppell and Leuckart, 1828)	IP		A	C				Orange to pale yellow or red	Int	9
<i>Pleurobranchaea maculata</i> (Quoy and Gaimard, 1832)	IP		A	C	F			Grey to black with dark wavy lines	No	10
Nudibranchia: Cadlinidae										
<i>Cadlina willani</i> Miller, 1980	E		A	C				White with central yellow stripe and border	No	11

Taxon	Biogeography	Kermadecian	Aupourian	Cookian	Forsterian	Moriorian	Antipodean	Animal colour	Shell	Figure
Chromodorididae										
<i>Ceratosoma amoenum</i> (Cheeseman, 1886)	Aus		A	C				White with orange patches and purple gills and rhinophores	No	11
<i>Goniobranchus aureomarginatus</i> (Cheeseman, 1881)	E		A	C	F	M		White bordered with gold line	No	11
Discodorididae										
<i>Alloiodoris lanuginata</i> (Abraham, 1877)	E		A	C	F	M		Red-brown to grey with brown and white spots; green gills	No	12
<i>Atagema molesta</i> (Miller, 1989)	E		A					Fawn brown	No	12
<i>Hoplodoris nodulosa</i> (Angas, 1864)	E		A	C	F			Yellow to grey with brown blotches, gills and rhinophores	No	12
<i>Jorunna pantherina</i> (Angas, 1864)	Aus		A					Peachy, yellow to black with marbled ring patches	No	12
<i>Rostanga muscula</i> (Abraham, 1877)	E		A	C				Tomato red with dark spots	No	12
Dorididae										
<i>Aphelodoris luctuosa</i> (Cheeseman, 1882)	E		A	C	F	M		Cream with brown stripes, blotches and concentric lines	No	13
<i>Aphelodoris</i> sp.	E			C				Cream with tan blotches	No	13
<i>Doris granulosa</i> (Pease, 1860)	Aus		A	C	F	M		Yellow	No	14
<i>Doris wellingtonensis</i> Abraham, 1877	Aus	K	A	C	F	M		Khaki brown to yellow	No	14
Dendrodorididae										
<i>Dendrodoris citrina</i> (Cheeseman, 1881)	E		A	C	F			Lemon yellow to orange with numerous small white dots	No	15
<i>Dendrodoris krusensternii</i> (Gray, 1850)	IP		A					Light brown and peacock blue with concentric brown lines	No	16
<i>Dendrodoris nigra</i> (Stimpson, 1855)	IP		A	C				Black with white tipped rhinophores	No	16
Polyceridae										
<i>Plocamopherus imperialis</i> Angas, 1864	IP		A					Scarlet with sm dk spots, 2 cream stripes; white tipped rhinophores	No	17
<i>Polycera hedgpethi</i> Er. Marcus, 1964	Cos		A	C				Cream peppered with black, white and gold papillae	No	17
<i>Polycera melanosticta</i> Miller, 1996	Aus		A					Translucent white to greyish-brown with black spots	No	17

Taxon	Biogeography	Kermadecian	Aupourian	Cookian	Forsterian	Moriorian	Antipodean	Animal colour	Shell	Figure
<i>Thecacera pennigera</i> (Montagu, 1815)	Cos		A					White with orange and black spots	No	17
Proctonotidae										
<i>Caldukia rubiginosa</i> Miller, 1970	E		A					Reddish-brown; yellow and iridescent blue cerata	No	17
<i>Janolus novozealandicus</i> (Eliot, 1907)	E		A	C	F			Translucent with brown & white speckles; diverticula blue & orange	No	17
Vassieridae										
<i>Vayssiarea cinnabarea</i> Ralph, 1944	E		A	C				Dull red	No	17
Fionidae										
<i>Fiona pinnata</i> (Eschscholtz, 1831)	Cos		A	C	F	M	An	Cream or buff with orange patch	No	17
Onchidorididae										
<i>Acanthodoris mollicella</i> Abraham, 1877	E		A	C	F		An	Mottled black, brown and ochre-yellow	No	18
Goniodorididae										
<i>Goniodoris</i> n.sp.	E		A					Unknown	No	18
<i>Okenia plana</i> Baba, 1960	Pac		A					Lilac and red-brown spotted	No	18
<i>Trapania rudmani</i> Miller, 1981	E		A	C				White with yellow stripes	No	18
Dotidae										
<i>Doto pita</i> Er. Marcus, 1955	Cos		A	C				Translucent white with brown, yellow and lilac spots	No	19
Arminidae										
<i>Dermatobranchus rubidus</i> (Gould, 1852)	Aus		A					Dark orange and white	No	19
Tritoniidae										
<i>Tritonia incerta</i> Bergh, 1904	E		A	C				Rose-pink, apricot or red, with white gills and foot	No	19
Flabellinidae										
<i>Flabellina albomarginata</i> (Miller, 1971)	E		A	C	F			White, with red cerata	No	19
<i>Tularia bractea</i> (Burn, 1962)	Aus		A	C				Transparent white-yellow-brown with white flecks, red-greenish diverticula	No	19
Eubranchidae										
<i>Eubranchus agrius</i> Er. Marcus, 1959	Pac		A	C	F			Transparent with sm patches and stripes of yellow to red	No	19

Taxon	Biogeography	Kermadecian	Aupourian	Cookian	Forsterian	Moriorian	Antipodean	Animal colour	Shell	Figure
Tergipedidae										
<i>Trinchesia beta</i> (Baba and Abe, 1964)	Pac		A	C				Transparent speckled purple, gold band, pink diverticula	No	19
<i>Trinchesia reflexa</i> (Miller, 1977)	E			C	F			Transparent to white, fawn speckled diverticula	No	19
Aeolidiidae										
<i>Aeolidiella drusilla</i> Bergh, 1900	Aus		A	C	F	M		Buff with white blotches with brown and orange cerata	No	20
<i>Anteaeolidiella lurana</i> (Bergh, 1888)	Cos		A					Orange to brown, with orange stripes and white blotches	No	20
<i>Baeolidia australis</i> (Rudman, 1982)	Aus		A					Brown with white spots. Brown, crimson and gold cerata	No	20
<i>Burnaia helicochorda</i> (Miller, 1988)	Aus		A					Transparent orange-brown, white-tipped cerata	No	20
Facelinidae										
<i>Phidiana milleri</i> Rudman, 1980	E		A	C				Translucent with orange head, tentacles and cerata	No	20
Babakinidae										
<i>Babakina caprinsulensis</i> (Miller, 1974)	E		A					Pale mauve with white, yellow and orange features	No	21
Glaucinidae										
<i>Glaucus atlanticus</i> Forster, 1777	Cos	K	A	C				Glowing blue, silver and purple	No	21
Umbraculidae										
<i>Umbraculum umbraculum</i> (Lightfoot, 1786)	Cos	K	A	C				Grey to yellow, brown or red	Ext	21
Velutinidae										
<i>Lamellaria ophione</i> Gray, 1850	E	K	A	C				Yellow, orange, grey or white	Int	22
Onchiidae										
<i>Onchidella nigricans</i> (Quoy & Gaimard, 1835)	Aus		A	C	F	M		Black-grey	No	23
Fissurellidae										
<i>Scutus breviculus</i> (Blainville, 1817)	E		A	C	F			Black	Int	24