An illustrated key to the species of the genus *Narella* (Cnidaria, Octocorallia, Primnoidae)

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Abstract

A history of the description of the 50 valid species of *Narella* is given, beginning with the first species described in 1860. To help differentiate the various species, a tabular and a polychotomous key are provided. The species in the keys are arranged using nine characters or character sets that are believed to be of value at the species level. New characters or new significance given to previously described characters used in our keys include: 1) the nature of the dorsolateral edge of the basal scale, being ridged or not, 2) the thickness of the body wall scales, and 3) the arrangement of the coenenchymal scales (imbricate or mosaic), their thickness (thin or massive), and their outer surface ornamentation (ridged or not). All characters used in the keys are illustrated.

Keywords
Alcyonacea, Calcaxonia, dichotomous key, Primnoidae, tabular key

Introduction

The first species of *Narella* was described as *Primnoa regularis* by Duchassaing and Michelotti (1860) collected off Guadeloupe, Lesser Antilles at an unknown depth. This is somewhat remarkable in that 366 m is the shallowest depth from which this species is known, and it was thus collected at a time when deep-water animals were not thought to occur below approximately 200 m. *Primnoa regularis* was made the type (by monotypy)
of the newly described genus *Narella* by Gray (1870), calling it that name perhaps because the polyps resembled a series of small noses (Latin *naris* = nostril). The holotype is deposited at the Turin Museum (Volpi and Benvenuti 2003) but because of its poor condition was set aside to be replaced by a neotype (Cairns and Bayer 2004; ICZN 2005).

The next species to be described in the genus, *Stachyodes regularis* Wright & Studer, 1889, from the Kermadec Islands, was unfortunately also called *regularis*, but placed in the newly described genus *Stachyodes* Wright & Studer, 1887 in Studer (1887), a junior synonym of *Narella*. Because Versluys (1906) considered it and *P. regularis* of Duchassaing and Michelotti (1860) to be in the same genus, the Wright & Studer species was thought to be a junior homonym and thus it required a new name, which he gave as *S. studeri* Versluys, 1906. It also became the type species of *Stachyodes*. Yet another genus name that was subsequently synonymized with *Narella* was proposed by Wright and Studer (1889) as *Calypterinus*, the type species being *C. allmani* Wright & Studer, 1889 (Fiji).

In the first of several species to be described based on specimens collected by the US Fish and Wildlife Service vessel *Albatross*, Studer (1894) described *Stachyodes* (= *Narella*) *ambigua* from off the Galapagos Islands.

Next followed Versluys’ (1906) beautifully illustrated and finely described revision of the deep-water octocorals of the *Siboga* Expedition from Indonesia, which included the description of seven new species, all of which he also placed in *Stachyodes*. This work set the standard for future morphological descriptions within the genus.

In the next ten years a flurry of new species were described from around the world: four from off Japan (Kinoshita 1907), one from off Sumatra (Kükenthal 1907), one from the Hawaiian Islands (Nutting 1908), three from the North Atlantic (Hickson 1909; Kükenthal 1912, 1915), and one from the southwest Indian Ocean (Thomson 1911). *Narella elegans* Tixier-Durivault & Lafargue, 1968 is believed to be a junior synonym of *N. versluysi* (Hickson, 1909), originally described in Stephens and Hickson (1909). Thomson also described a species from the southwest Indian Ocean, *S. capensis* Thomson, 1917, which was later synonymized with *N. gilchristi* (Thomson, 1911). But most notable from this time period was Kükenthal’s (1919) report on the deep-water octocorals of the *Siboga* expedition, in which he re-described all the species of *Narella* (as *Stachyodes*) and provided a morphological key to the 18 valid species. One hundred years later these are still the characters used to discriminate species and form the basis for the keys presented herein.

Aurivillius (1931) described one new species from off Japan, and Deichmann (1936) two new species from the northwest Atlantic Ocean. Finally, the “modern” era of *Narella* taxonomy was introduced by Bayer (1951), who finally synonymized *Stachyodes* and *Calypterinus* with *Narella*, and also described a new species from Indonesia. He later described two new species from off the Hawaiian Islands (Bayer 1995, 1997), one of them, *N. nuttingi* Bayer, 1997, later being synonymized with *N. dichotoma* (Cairns & Bayer, 2007). In collaboration with Cairns, Bayer also revised the *Narella* species from the northwest Atlantic (Cairns and Bayer 2003), describing two new species, and from the Hawaiian Islands (Cairns and Bayer 2007), describing six new species. They subsequently also placed the genus in phylogenetic perspective in
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a morphology-based cladogram, and listed the 38 known species at that time (Cairns and Bayer 2009). Also in 2007, Cairns and Baco (2007) described five new species from deep seamounts in the Gulf of Alaska.

Cairns described five more new species from the New Zealand region (Cairns 2012) and six from the northern and central Pacific (Cairns 2018), which prompted the need for this synthetic key to the species. Cairns (2018) also made one previously described species of Narella, N. mesolepis Cairns, 2012, the basis for a new genus, Pseudonarella. Taylor and Rogers (2015) placed Narella in a phylogenetic perspective using molecular data, and listed the 44 species known at that time, although S. regularis should be considered as junior synonym of N. studeri, and Cairns (2018) considered N. irregularis to be a junior synonym of N. horrida. Finally, Taylor and Rogers (2017) described three new species from the southwest Indian Ocean, and listed all species known at that time.

The genus Narella represents a highly successful adaptive radiation within the primnoids and more species are expected to be discovered. This is the reason why we here present two keys (a tabular and polychotomous key), the first since Kükenthal's (1919) work, i.e., to facilitate comparison of species for identification purposes, and to examine this genus before new species are described.

**Materials and methods**

Many of the descriptions and diagnoses are based on original literature, which is duly cited. Descriptive terms used are found in the trilingual glossary of Bayer et al. (1983). Reviewing holotypes involved preparing sclerites for viewing under a light microscope following procedures well-documented elsewhere (Alderslade 1998; Fabricius and Alderslade 2001; Cairns 2016).

**Taxonomy**

**Subclass Octocorallia**

**Order Alcyonacea**

**Suborder Calcaxonia**

**Family Primnoidae Milne Edwards, 1857**

**Genus Narella Gray, 1870**

Narella Gray, 1870: 49; Cairns and Bayer 2009: 43.
Stachyodes Wright & Studer in Studer 1887: 49.
Calypterinus Wright & Studer in Studer 1887: 49–50.

**Diagnosis.** Colonies branched dichotomously (laterally or equal), pinnately, in a lyrate fashion, or unbranched. Polyps arranged in whorls, all polyps facing downward in
contracted condition. Each polyp covered with three (rarely four) pairs of abaxial body wall scales (i.e., one pair of basals, one or rarely two pairs of medials, and one pair of buccals) and a variable number of pairs of smaller adaxial scales, nonetheless leaving the adaxial face largely naked. Articular ridge not present on basal scales. Paired infrabasal scales often present. Opercular scales keeled on inner surface. Coenenchymal scales thin and imbricate or thick and mosaic in placement, and sometimes prominently ridged.

**Type species.** *Primnoa regularis* Duchassaing & Michelotti, 1860, by monotypy.

**Discussion.** Currently there are 50 valid species in the genus *Narella*, the most speciose in the family Primnoidae (Taylor and Rogers 2015). The species in both keys (tabular (Table 1) and polychotomous, below) are roughly presented in an order that follows the major characters as outlined below, these characters we purport to be valuable in the distinction of species of *Narella*.

**Dorsolateral edge of basal scale ridged or not ridged:** The dorsolateral edge (the point of inflexion of the scale from the dorsal region to the lateral region) of the basal scale is consistently ridged or not ridged (Fig. 1E) in each species, with the only exception of *N. macrocalyx*, which is inconspicuously ridged, and sometimes (rarely) lacks the ridge. This external ridging may help give strength to basal sclerites. The ridge may be single and extend from the base to the tip of the scale (Fig. 1A, B), or partial, occurring only at the base of the scale (Fig. 1C). Or, there may be multiple short ridges occurring in this region of the scale (Fig. 1D). The ridges may be tall or low. This character is relatively easy to observe, but usually requires the removal of a polyp from a whorl, drying the specimen, and then applying a dye to help see the characteristic ridging structure.

**Number of pairs of body wall scales:** Most species of *Narella* have three pairs of abaxial body wall scales (basal, medial, and buccal, Fig. 1F), but in three species there is consistently an extra pair of medial scales (Fig. 1G). Also, specimens of some species that have otherwise three pairs of body wall scales will have occasional polyps with four pairs of body wall scales. This is a fairly easily observed character when using a dissecting microscope.

**Worm commensalism:** The commensal association with a polychaete worm, usually a polynoid (Cairns and Bayer 2008, Cairns 2012, Britayev et al. 2014, Serpetti et al. 2017), is considered to be characteristic of the species, and is easily observed even without a microscope. The facing basal scales of two adjacent polyps are greatly enlarged and modified (reflexed) in order to make an elongate cylindrical tube for the worm (Fig. 1H, I).

**Branching mode:** The mode of branching, and thus colony shape, is considered to be characteristic of the species. Modes include: unbranched (Fig. 1J), branching from a common basal coenenchyme or bolus (Fig. 1K, L), sparse equal dichotomous branching (Fig. 1M), equal dichotomous branching (Fig. 1N), and lyrate (Fig. 1O), which is often followed by dichotomous branching. Lyrate branching might be considered as a special case of dichotomous branching in which the outer component of each bifurcation maintains a straight line while the inner branches remain roughly parallel to one another.

**Body wall scale thickness:** In some species the body wall scales are quite thick, or massive (Figs 1P, 2A). This trait is often correlated with having thick coenenchymals as well (see next character). This character is best seen using scanning electron microscopy of individual sclerites.
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Figure 2. A massive basal scales of *N. clavata* B thin, imbricate coenenchymal scales of *N. fordi* C thick, mosaic arranged coenenchymal scales of *N. mosatica* D individual thick coenenchymal scale of *N. mosatica* with a finely granular outer surface E complexly ridged coenenchymal scale of *N. muzikae* F single medial coenenchymal ridge of *N. pauciflora* G sail scale of *N. spectabilis* H serrate distal margin of body wall scales of *N. bowersi* I spinose body wall scales of *N. horrida* J adaxial body wall scales of *N. dampieri* K polyp pair of *N. leilae* showing extensive cowl and serrate distal edges of body wall scales (from Bayer, 1951).

**Coenenchymal scales arrangement and ornamentation:** The coenenchymal scales of most species are relatively thin, having the same thickness as a body wall scale, and have edges that slightly overlap those of other adjacent coenenchymal scales (Fig. 2B). But some species have quite thick scales (Fig. 2C–D) that are so massive that they cannot overlap adjacent scales and thus produce a mosaic, polygonal, or tessellate pattern, also called “cobblestone” (Williams 1992). The term mosaic is used herein. Coenenchymal scales usually have a finely granular outer surface (Fig. 2D), but many
### Table 1. Tabular Key to the species of the genus *Narella*.

| Species | Dorsolateral edge of basal scale | Polychaete commensalism | Branching mode | Body wall scale thickness | Coenenchymal scales; imbricate, thickness ridged | Polyps/whorl; whorl diameter (mm) | Polyp length (mm) | Distal edge of basal scales | Other characters | Geographic and depth range |
|---------|---------------------------------|-------------------------|-----------------|--------------------------|-----------------------------------------------|-----------------------------------|------------------|-----------------------------|------------------|----------------------------|
| *N. macrocalyx* Cairns & Bayer, 2007 | Small ridge | 3 | Present | Sparse. | Thin | Thin, imbricate; rarely ridged | 4–6; 7–11 | 4.5–9.5 | Lobate, smooth | Hawai’i Islands, 1206–1807 m |
| *N. gilchristi* (Thomson, 1911) | Small ridge | 3 | Present | lyrate, secondarily dichotomous | Thin | Thick, mosaic; unridged | 4–8; 4–9 | 2.5–3 | Lobate, smooth | Southwest Indian Ocean, 90–1365 m |
| *N. ferula* Cairns, 2018 | Multi-ridged | 3 | Absent | Unbranched | Thin | Thin, imbricate; ridged | 2–3; 3.6 | 2.3–2.5 | Serrate cowl, spurs | Hawaiian Islands, Palmyra Atoll, 1023 m |
| *N. hawaiinensis* Cairns & Bayer, 2007 | Incorruptuous basal ridge | 3 | Absent | Common coenosteum (bolus) | Thin | Thin, imbricate; ridged | 3–6; 3–4 | 1.7–2.2 | Lobate, serrate | Hawaiian Islands, 326–381 m |
| *N. muzikae* Cairns & Bayer, 2007 | Multi-ridged | 3 | Absent | Common coenosteum (bolus) | Thin | Thin, imbricate; ridged | 2–4; 3.4 | 2.3–2.5 | Serrate cowl, spurs | Hawaiian Islands, Palmyra Atoll, 1023 m |
| *N. fordi* Cairns, 2018 | Multi-ridged | 3 | Absent | Y-shaped | Thin | Thin, imbricate; ridged | 3–4.4 | 4 | Lobate (short cowl) | Wake Island, 2575 m |
| *N. cristata* Cairns & Baco, 2007 | Single ridge | 3 | Absent | Sparse, equal dichotomous | Thin | Thin, imbricate; ridged | 3–4.3 | 2.1–2.6 | Lobate, smooth | Gulf of Alaska seamounts, 3385 m |
| *N. alvisae* Cairns & Bayer, 2003 | Single ridge | 3 | Absent | Sparse, equal dichotomous | Thin | Thin, imbricate; ridged | 2–5; 3.5 | 2.2–3.4 | Lobate, smooth | Gulf of Alaska seamounts, 3385 m |
| *N. alaskensis* Cairns & Baco, 2007 | Low ridge | 3 | Absent | Sparse, equal dichotomous | Thin | Thin, imbricate; ridged | 5–9; 7.5 | 2.7–3.2 | Lobate (narrow), smooth | Gulf of Alaska seamounts, 2377–3075 m |
| *N. arbuscula* Cairns & Baco, 2007 | Tall, short ridge | 3 | Absent | Sparse, equal dichotomous | Thin | Thin, imbricate; ridged | 6–7; 6.8 | 3.4–4.7 | Lobate, smooth | Gulf of Alaska seamounts, 2775–3465 m |
| *N. pacifica* Deichmann, 1936 | Multi-ridged | 3 | Absent | Equal dichotomous | Thin | Thin, imbricate; complex ridging | 2–5; 4 | 2.6–2.8 | Lobate, smooth | Northwest Atlantic, 738–1473 m |
| *N. bowersi* (Nutting, 1908) | One ridge | 3 | Absent | Equal dichotomous | Thin | Thin, imbricate; ridged | 3–4; 4.5 | 2.5–3.2 | Tall, serrate | Hawaiian islands, 1218–1758 m |
| *N. gaussi* (Kükenthal, 1912) | Multi-ridged | 3 | Absent | Equal dichotomous | Thin | Thin, imbricate; ridged | 4–5; 3 | 2.1–3.0 | Lobate (low), smooth | Antarctica, 2450 m |
| *N. perca* (Versluys, 1906) | Multi-ridged | 3 | Absent | Equal dichotomous | Thin | Thin, imbricate; ridged | 4–6; 2.5–3.2 | 2.0–2.4 | Tall, narrow, smooth | Southwest Pacific, 920–2400 m |
| Species | Dorsolateral edge of basal scale | Pairs of body wall scales | Polychaete commensalism | Branching mode | Body wall scale thickness | Coenenchymal scales: imbricate, thickness ridged | Polyp/whorl; whorl diameter (mm) | Polyp length (mm) | Distal edge of basal scales | Other characters | Geographic and depth range |
|---------|---------------------------------|--------------------------|-------------------------|---------------|-------------------------|-----------------------------------------------|-----------------------------|----------------|-----------------------------|----------------|----------------------------|
| *N. regularis* (Duchassaing & Michelotti, 1860) | Multi-ridged | 3 | Absent | Equal dichotomous | Thin | Thin, imbricate; ridged | 4–5; 3.2 | 2.0–2.3 | Lobate, smooth | Medial and buccals ridged | Northwest Atlantic, 366 – 792 m |
| *N. valentinei* Taylor & Rogers, 2017 | One tall ridge | 3 | Absent | Lyrate, secondarily dichotomous | Thin | Thin, imbricate; flat | 4–5; 2.4–2.8 | 1.5–1.8 | Tooth-like apex | Medials ridged | Southwestern Indian Ocean, 383–444 m |
| *N. virgina* Cairns, 2018 | Multi-ridged | 3 | Absent | Lyrate; dichotomous | Thin | Thin, imbricate; ridged (sail scales) | 3–4; 3–4.2 | 2.6–2.8 | Lobate, smooth | Medial and buccals ridged | Hawaiian Islands and Johnston Atoll: 1901–1985 m |
| *N. bellissima* (Kükenthal, 1915) | Low ridge basally | 3 | Absent | Lyrate, secondarily dichotomous and bushy | Thin | Thin, imbricate; ridged (sail scales) | 3–8; 3.15 | 2.0–2.2 | Lobate, smooth | | Amphi-Atlantic, 161–1968 m |
| *N. ornata* Bayer, 1995 | Multi-ridged | 3 | Absent | Unknown | Thin | Thin, imbricate; ridged | 3–4; 3.5 | 3 | Serrate distal margin | All scales, including adaxial buccals, radially ridged | Hawaiian Islands, 748–1007 m |
| *N. spectabilis* Cairns & Bayer, 2007 | One tall ridge | 4 | Absent | Unbranched | Thin | Thin, imbricate; ridged (sail scales) | 3; 2.8 | 3.5 | Lobate, smooth | All body wall scales ridged | Bahamas, 1485 m |
| *N. abygalis* Cairns & Baco, 2007 | Multi-ridged | 4 | Absent | Sparse, dichotomous | Thin | Thin, imbricate; ridged (sail scales) | 2–4; 2.8 | 1.9–2.4 | Lobate, smooth | All body wall scales ridged | Gulf of Alaska seamounts, 4594 m |
| *N. lea* Deichmann, 1936 | Absent | 4 | Absent | Equal dichotomous | Thin | Thin, imbricate; multiple ridges | 3–5; 3.6 | 3 | Lobate, smooth | 3 pairs of adaxial buccal scales | Amphi-North Atlantic, 2980–3186 m |
| *N. borrada* (Versluys, 1906) | Absent | 3 | Present | From common bolus | Massive | Thick, mosaic; unridged | 5–6; 6–9 | 2.0–3.4 | Spinose (massive) | Medial scales also spinose | Indonesia, 204 m |
| *N. byagadex* Cairns, 2012 | Absent | 3 | Present | From common bolus | Thin | Thin, imbricate; unridged | 9; 13 | 2.7 | Tall and serrate | Adaxial buccals elongate | New Zealand, 510–1118 m |
| *N. clavata* (Versluys, 1906) | Absent | 3 | Present | Sparse, dichotomous | Massive | Thick, mosaic; unridged | 4–14; 7–8 | 2–3 | Tall, narrow, smooth | Adaxial buccals numerous | Indonesia, Philippines, 128–335 m |
| *N. ambigua* (Staedt, 1894) | Absent | 3 | Present | Sparse, dichotomous | Thin | Thick, mosaic; unridged | 5–7; 6–7 | 2.5–3.0 | Lobate, tall, smooth | 3 pairs adaxial buccals | Galapagos, Gulf of Panama, 702–1463 m |
| *N. amantica* Cairns, 2018 | Absent | 3 | Present | Sparse, dichotomous | Thin | Thin, interlocking ridged | 4–6; 6.5–7.0 | 2.8–3.2 | Lobate, smooth | | Wake Island, 745 m |
| *N. leda* Bayer, 1951 | Absent | 3 | Present | Sparse, dichotomous | Thin | Thin, imbricate; ridged (sail scales) | 4–6; 5.2–5.6 | 2.0–2.5 | Serrate cowl | Edges of buccals undulate | Indonesia, 740 m |
| *N. alta* Cairns & Bayer, 2007 | Absent | 3 | Present | Equal dichotomous | Thin | Thin, imbricate; medial scale | 4–5; 4.5 | 2.5–3.1 | Lobate, tall (cowl) smooth | Whorls closely spaced | Hawaiian Islands, 477–527 m |
| *N. verrucina* Cairns & Bayer, 2007 | Absent | 3 | Present | Equal dichotomous | Thin | Thick, mosaic; very low ridges | 3–5; 4 | 1.8–2.0 | Lobate, tall, smooth | Buccals in closed position | Hawaiian Islands, 275–527 m |
### An Illustrated Key to the Species of the Genus Narella

| Species                  | Dorsolateral edge of basal scale | Pairs of body wall scales | Polychaete commensalism | Branching mode | Body wall scale thickness | Coenenchymal scales: imbricate, thickness ridged | Polyps/whorl, wheel diameter (mm) | Polyp length (mm) | Distal edge of basal scales | Other characters | Geographic and depth range |
|--------------------------|----------------------------------|---------------------------|-------------------------|-----------------|---------------------------|-----------------------------------------------|----------------------------------|------------------|----------------------------|------------------|--------------------------|
| N. allmani (Wright & Studer, 1889) | Absent                           | 3                         | Present                 | Equal dichotomous | Thin                       | Thick, mosaic; unridged                        | 4–7; 5                           | 3                | Tall, serrate               |                  | Fiji, depth unknown       |
| N. obscura (Versluys, 1906)        | Absent                           | 3                         | Present                 | Equal dichotomous | Thin                       | Thick, mosaic; unridged                        | 4–6; 6–7                         | 2.7–2.8          | Lobate (undulate), smooth (cowl) | Indonesia, 984 m |
| N. dampieri Cairns, 2012           | Absent                           | 3                         | Present                 | Equal dichotomous | Thin                       | Thick, mosaic; unridged                        | 5–8; 7                           | 1.4–1.9          | Lobate, tall, narrow         | New Zealand, 342 m|
| N. mosaica Cairns, 2012            | Absent                           | 3                         | Present                 | Equal dichotomous | Massive                    | Thick, mosaic; unridged                        | 3–5; 5–6                         | 2.7–3.1          | Lobate, slender, smooth      | New Zealand, 335–1165 m |
| N. vulgaris Cairns, 2012           | Absent                           | 3                         | Present                 | Equal dichotomous | Massive                    | Thick, mosaic; unridged                        | 4–6; 4–5                         | 2.0–2.4          | Lobate, smooth               | New Zealand, 335–1165 m |
| N. orientalis (Versluys, 1906)     | Absent                           | 3                         | Present                 | Unknown          | Thin                       | Imbricate, unridged                            | 6; 5.8                           | 2.2–3.0          | Lobate, smooth               | Indonesia, 520 m  |
| N. calamus Cairns, 2018            | Absent                           | 3                         | Absent                  | Unbranched       | Thin                       | Imbricate, ridged (sail scales)               | 4; 5                             | 4.5–5.0          | Serrate, blunt               | Wake Island, 2073 m |
| N. versluysi (Hickson, 1909)       | Absent                           | 3                         | Absent                  | Unbranched       | Thin                       | Imbricate, medial ridge                       | 4–7; 5–7                         | 3.2–3.7          | Lobate, smooth               | Basal scale ridged internally | Amphi-North Atlantic, 550–3100 m |
| N. spraithi Taylor & Rogers, 2017  | Absent                           | 3                         | Absent                  | Sparse, dichotomous | Thin                       | Imbricate, unridged                            | 3–4; 2.5–3.6                    | 2.0–2.2          | Lobate (slender), smooth     | Southwest Indian Ocean, 870 m |
| N. grandiflora (Kükenthal, 1907)   | Absent                           | 3                         | Absent                  | Sparse, dichotomous | Thin                       | Thick, mosaic; unridged                        | 4–5; 4.5                         | 3                | Lobate, smooth               | Indonesia, 805 m |
| N. studeri (Versluys, 1906)         | Absent                           | 3                         | Absent                  | Sparse, dichotomous | Massive                    | Thick, mosaic; unridged                        | 4–8; 4–5                         | 3.0–3.3          | Lobate, smooth               | New Zealand, Indonesia, 732–1392 m |
| N. biannulata (Kinoshita, 1907)    | Absent                           | 3                         | Absent                  | Equal dichotomous | Massive                    | Thick, mosaic; unridged                        | 6–7; 4.8                         | 1.8–2.0          | Lobate, smooth               | Adaxial buccals absent; medial scales closed | Japan, depth unknown |
| N. candidae Taylor & Rogers, 2017  | Absent                           | 3                         | Absent                  | Equal dichotomous | Thin                       | Thick, mosaic; unridged                        | 4–6; 4–5                         | 2.0–2.4          | Lobate, smooth               | Southwest Indian Ocean, 763 m |
| N. japonensis (Aurivillius, 1931)   | Absent                           | 3                         | Absent                  | Equal dichotomous | Thin                       | Imbricate, unridged                            | 3–6; 3.5–4.0                    | 2–3              | Lobate, smooth               | Stem stiff        | Japan, 732 m               |
| N. giga Cairns & Bayer, 2007       | Absent                           | 3                         | Absent                  | Equal dichotomous | Thin                       | Imbricate, ridged                              | 10–14; 9–12                     | 2.5–3.0          | Lobate, tall, narrow, smooth | Hawaiian Islands, 362–399 m |
| N. dichotoma (Versluys, 1906)      | Absent                           | 3                         | Absent                  | Equal dichotomous | Thin                       | Imbricate, low ridges                          | 3–5; 4–5                         | 2.8–3.1          | Lobate, smooth               | Hawaiian Islands, 204–1448 m |
| N. megadepa (Kinoshita, 1908)      | Absent                           | 3                         | Absent                  | Equal dichotomous | Thin                       | Imbricate, ridged                              | 5–8; 6–7                         | 2.5–3.0          | Lobate, smooth               | Numerous small adaxial buccal scales | Japan, depth unknown |
| N. comprensa (Kinoshita, 1908)     | Absent                           | 3                         | Absent                  | Lyrate           | Massive                    | Thick, mosaic; unridged                        | 7–8; 3                           | 2                | Lobate, smooth               | Japan, Phoenix Islands, 501 m |

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species have scales that bear a single longitudinal (Fig. 2F) or multiple complexly arranged ridges (Fig. 2E). If these ridges are quite tall they have been termed sail scales (Cairns 2016)(Fig. 2G). Mosaic coenenchymals are not usually ridged (Fig. 2D). This character is best seen using SEM.

**Polyps/whorl, whorl diameter:** Although every specimen and species has a range of polyps/whorl and whorl diameter, sometimes these numbers help to differentiate species. This character is easily determined using a dissecting microscope.

**Polypl length:** As above, this character has a range for every specimen and species, but can sometimes differentiate among species. The polypl length is essentially the horizontal length of the polyp, which consist of the length of the buccal scale and whatever part of the operculars protrude from the buccal scale. This character is easily determined using a dissecting microscope.

**Shape of the distal edge of basal scales:** The distal edge of the basal scales are usually slightly lobate and smooth (Fig. 1E), but in some species are serrate (Fig. 2H, K) or even spinose (e.g., *N. horrida*, Fig. 2I). It may extend far beyond its junction with the proximal edge of the medial scales as a cowl (Fig. 2K) or be quite short (Fig. 1D). This character is also easily determined using a dissecting microscope.

**Other characters:** Other characters that are used to describe and differentiate species but are not consistently addressed in the keys include: shape and number of adaxial body wall scales (Fig. 2J), external ridging of the medial and buccal scales, closure of the body wall rings, aspects of the opercular scales, body wall formula (i.e., ratio of length of basal: medial: buccal scales), and number of polyps per cm.

**Geographic and depth range.** All ocean basins, 128–4594 m (Cairns 2012).

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**Polychotomous key to the species of the genus *Narella***

1a Dorsolateral edge of basal scale bears a longitudinal ridge or ridges (Fig. 1A, D)........................................................................................................2

1b Dorsolateral edge of basal scale unridged (smooth) (Fig. 1F)....................9

2a Three pairs of body wall scales per polyp (Fig. 1A, B, F) .......................3

2b Four pairs of body wall scales per polyp (Fig. 1G).................................18

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3b Polychaete commensalism absent (no tubes) .......................................5

4a Colony branching sparse (Fig. 1M); coenenchymal scales thin and imbricate in arrangement (Fig. 2B); Hawaiian Islands ......................... *N. macrocalyx*

4b Colony branching lyrate (Fig. 1O); coenenchymal scales thick and mosaic in arrangement (Fig. 2C, D); South West Indian Ocean ............. *N. gilchristi*

5a Colonies unbranched (Fig. 1J) ..................................................................6

5b Branches of colony originate from a common base or from a basal bolus (Fig. 1K, L).............................................................. *N. muzikae*

5c Branching in a Y-shape ......................................................................... *N. merga*
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