

ART. III.—*Revision of the Cirripedia of New Zealand.*

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Communicated by Dr. Charles Chilton.

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INTRODUCTORY NOTE.

THE late Captain L. S. Jennings commenced the study of the New Zealand Cirripedia, a group of animals that had received very little attention from local naturalists, in 1910, and, becoming greatly interested in the subject, he continued his observations with much enthusiasm and great thoroughness, and hoped to be able to prepare a comprehensive paper dealing with the whole group. In 1915 he published a paper on the "Pedunculate Cirripedia of New Zealand and Neighbouring Islands" (*Trans. N.Z. Inst.*, vol. 47, p. 285). In this he gave a revised list of the species known to occur in the New Zealand region, established a new variety of *Lepas anatifera* Linn., and gave a critical discussion of the specific characters of *Lepas anatifera* Linn. and of the New Zealand species *Pollicipes*. He had nearly completed his examination of the sessile Cirripedia when he left for the front, and before his departure he gave into my charge all his specimens and manuscript notes. Though nearly all the essential work of identifying the species had been done, the manuscript was not arranged in a form suitable for publication. Mrs. Jennings has carefully gone over the collection, under my supervision, and has put the notes in order for publication. The paper contains a list of the New Zealand species examined by Captain Jennings, with localities, &c., of the different species.

References have been added to Pilsbry's "Sessile Barnacles (Cirripedia) contained in the Collections of the U.S. National Museum" (1916*), and to Borradaile's "Report on the Cirripedia of the 'Terra Nova' Antarctic Expedition" (1916 and 1917)—works which Captain Jennings had no opportunity of seeing.

In the list given below only those species are included which had been examined by Captain Jennings. Additional species are recorded from New Zealand by Hutton (1879, p. 330), Filhol (1885, p. 485), and Borradaile (1916, p. 128).

Those references only have been given which appear necessary for New Zealand workers.

The collection has been named and arranged in order, and is stored in the Biological Laboratory of Canterbury College. It contains a few specimens added after Captain Jennings left New Zealand, mainly from the collections of Mr. W. R. B. Oliver.

Captain Jennings was killed in action in France on the 15th September, 1916. By his death New Zealand was deprived of one of the most promising of the younger generation of workers in science.

CHAS. CHILTON.

* The references are made by the year of publication to the bibliographical list on p. 63

Family LEPADIDAE.

Lepas anatifera Linnaeus.

Lepas anatifera Linnaeus, 1758, *Systema Naturae*, 10th ed., p. 668; Darwin, 1851, p. 73; Gruvel, 1905, p. 108; Pilsbry, 1907, p. 79; Chilton, 1911A, p. 571; L. S. Jennings, 1915, pp. 285, 288, figs. 1 (a, b, c), 2.

Specific Diagnosis.—"Valves smooth, or delicately striated. Right-hand scutum alone furnished with internal umbonal tooth: uppermost part of peduncle dark-coloured. Filaments, two on each side." (Darwin.)

Var. (a). "Scuta and terga with one or more diagonal lines of dark greenish-brown, square, slightly depressed marks." (Darwin.)

Var. (b). "Carina strongly barbed." (Darwin.)

Var. (c).* "No trace of an umbonal tooth on either scutum. The carina is not barbed and square patches on the capitulum are not visible." (Jennings.)

Localities.—General type: Sunday Island, Kermadecs (Bell and W. R. B. Oliver). Locality unknown—Specimens in Canterbury Museum.

Var. (b): Sunday Island, Kermadecs (W. R. B. Oliver).

Var. (c): Chatham Islands (Miss S. D. Shand); hull of "Terra Nova," Lyttelton (C. Chilton); Waitakerei River, washed up on beach (W. R. B. Oliver).

Lepas hillii Leach.

Pentalasmis hillii Leach, 1818, *Tuckey's Congo Exped.*, p. 413. *Lepas hillii* Darwin, 1851, p. 77, pl. i, fig. 2; Gruvel, 1905, p. 110, figs. 124, 125; Pilsbry, 1907, p. 80, pl. viii, figs. 2, 7; Jennings, 1915, p. 287.

Specific Diagnosis.—"Valves smooth: scuta destitute of internal umbonal teeth; carina standing a little separate from the other valves, with the fork not close to the basal margin of the scuta; uppermost part of the peduncle either pale or orange coloured. Filaments three on each side." (Darwin.)

Locality.—Hull of "Terra Nova," Lyttelton Harbour (C. Chilton).

Lepas pectinata Spengler.

Lepas pectinata Spengler, 1793, *Skrifter Naturhist. Selbskabet*, 2 B., 2 H., Tab. x, fig. 2; Darwin, 1851, p. 85, pl. i, figs. 3, 3a; Hutton, 1878, p. 329; Gruvel, 1905, p. 107, fig. 119; Pilsbry, 1907, p. 81, pl. viii, figs. 4-8; Chilton, 1911A, p. 571; Jennings, 1915, p. 286; Borradaile, 1916, p. 131.

Specific Diagnosis.—"Valves thin, coarsely furrowed, often pectinated. Scuta with a prominent ridge extending, from the umbo to the apex, close to the occludent margin; fork of the carina with the prongs diverging at an angle of from 135° to 180°. Filaments absent, or only one on each side." (Darwin.)

Var. (a). "Upper part of the terga (bounded by the two occludent margins) produced and sharp; surface of all the valves often coarsely pectinated, and with the carina barbed." (Darwin.)

* This variety has been described as a new species by Borradaile, under the name *L. affinis* (see Borradaile, 1916, p. 131, and 1917, p. 229).—C. C.

Localities.—General type: Chatham Islands (A. Dendy).

Var. (a): Kermadec Islands (W. R. B. Oliver); Waitakerei River, washed up on beach (W. R. B. Oliver); off Three Kings Islands (L. A. Borradaile).

Lepas australis Darwin.

Lepas australis Darwin, 1851, p. 89, pl. i, fig. 5; Hutton, 1879, p. 329; Gruvel, 1905, p. 109, fig. 122; L. S. Jennings, 1915, p. 285.

Specific Diagnosis.—"Valves smooth, thin, brittle; scuta with internal umbonal teeth on both sides. Carina with upper part broad, flat; much constricted above the fork, which has wide, flat, thin, pointed prongs, with the intermediate rim, not reflexed. Filaments two on each side." (Darwin.)

Localities.—New Plymouth beach (Mrs. B. D. Jennings); Sumner (A. F. Barrell); New Brighton (G. E. Archey and L. S. Jennings); hull of "Terra Nova," Lyttelton Harbour (C. Chilton); Cape Campbell (T. McAlpine).

Lepas fascicularis Ellis and Solander.

Lepas fascicularis Ellis and Solander, 1786, Zoophytes, Tab. xv, fig. 5; Darwin, 1851, p. 92, pl. i, fig. 6; Hutton, 1879, p. 329; Gruvel, 1905, p. 105, fig. 116; Pilsbry, 1907, p. 81, pl. ix, fig. 6; Chilton, 1911A, p. 572; Jennings, 1915, p. 286.

Specific Diagnosis.—"Valves smooth, thin, transparent; carina rectangularly bent, with the lower part expanded into a flat oblong disc. Filaments, five on each side; segments of the three posterior cirri with triangular brushes of spines." (Darwin.)

Localities.—New Brighton (A. Dendy); Sunday Island, Kermadecs (W. R. B. Oliver); Waitakerei River, washed up on beach (W. R. B. Oliver).

Lepas denticulata Gruvel, 1900.

Lepas denticulata Gruvel, 1905, p. 106, fig. 118; Chilton, 1911A, p. 571; Jennings, 1915, p. 286.

Specific Diagnosis.—"Capitulum avec cinq plaques tres serrées, de couleur très blanche et fortement pectinées. Carène terminée en fourche à sa partie inférieure, chacune des branches portant, du côté pédonculaire, deux pointes saillantes, l'interne plus longue que l'externe; crête médiane dorsale avec quatre fortes dents et une série de plus petites entre les premières. Bord occluseur des scuta, convexe et fortement saillant antérieurement. Une dent à l'angle umbonal interne du scutum gauche. Rien à droite. Pas d'appendices filamenteux." (Gruvel.)

Locality.—Kermadecs (Captain Bollons, 1907).

Conchoderma auritum (Linnaeus).

Lepas aurita Linnaeus, 1767, *Systema Naturae*, ed. 12, p. 1110.

Conchoderma aurita Darwin, 1851, p. 141, pl. iii, fig. 4; Chilton, 1911c, p. 132; Jennings, 1915, p. 287. *Conchoderma auritum*, Gruvel, 1905, p. 144, fig. 167; Pilsbry, 1907, p. 99, pl. ix, fig. 2; Pilsbry, 1909, p. 71, pl. viii, figs. 5, 6, 7; Borradaile, 1916, p. 132, and 1917, p. 230.

Specific Diagnosis.—"Capitulum with two tubular ear-like appendages, seated behind the rudimentary and often absent terga; scuta bilobed; carina absent, or quite rudimentary; peduncle long, distinctly separated from the capitulum." (Darwin.)

Localities.—Hull of "Terra Nova," Lyttelton (C. Chilton); from *Megaptera nodosa* in the Bay of Islands and off Cape Brett (L. A. Borradaile); on whales (specimens in Otago and Auckland Museums).

Conchoderma virgatum (Spengler).

Lepas virgata Spengler, 1790, *Skrifter Naturhist. Selskabet*, B. 1, Tab. vi, fig. 9. *Conchoderma virgata* Darwin, 1851, p. 146, pl. iii, fig. 2; pl. ix, fig. 4: Chilton, 1911c, p. 132: Jennings, 1915, p. 287. *Conchoderma virgatum* Gruvel, 1905, p. 144, fig. 168; Pilsbry, 1907, p. 99, pl. ix, fig. 1; Borradaile, 1917, p. 230.

Specific Diagnosis.—"Scuta three-lobed: terga concave internally, with their apices slightly curved inwards: carina moderately developed, slightly curved: peduncle blending into the capitulum." (Darwin.)

Localities.—Hull of "Terra Nova," Lyttelton Harbour (C. Chilton); ship's hull, Dunedin (specimens in Otago Museum).

Scalpellum villosum (Leach).

Scalpellum villosum Leach, 1824, *Encyclop. Brit. Suppl.*, vol. iii, pl. lvii; Darwin, 1851, p. 274, pl. vi, fig. 8; Hutton, 1879, p. 329; Gruvel, 1905, p. 33, fig. 32; Pilsbry, 1907, p. 9; Jennings, 1915, p. 286.

Specific Diagnosis.—"Capitulum with fourteen valves: sub-rostrum present: carina nearly straight: three pair of latera; upper latera triangular. Mandibles with four teeth, of which the second is the smallest: maxillae with a projection near the inferior angle: no caudal appendage.

"Complemental male attached externally between the scuta, below the adductor muscle; pedunculated; capitulum formed of six valves, with the carina not descending much below the basal angles of the terga: mouth and cirri prehensile." (Darwin.)

Localities.—Stewart Island (W. R. B. Oliver); Port Robinson (J. R. Wilkinson); Godley Head (W. R. B. Oliver); Cheltenham Beach, Auckland (W. R. B. Oliver); Oamaru (L. S. Jennings).

Scalpellum spinosum Annandale.

Scalpellum spinosum Annandale, 1911, p. 164, figs. 1-4; Chilton, 1911b, p. 311; Jennings, 1915, p. 286.

Specific Diagnosis.—Capitulum broad, fifteen smooth pinkish valves present, covered with a minutely hairy translucent brownish membrane. Terga large, lozenge-shaped; scuta broadly triangular. Carina short, nearly straight, ridged dorsally but not laterally. Upper latera narrowly triangular. Rostrum, latera of the basal whorl, and subcarina prominent, pointed, spine-like. (Abridged from Annandale.)

Localities.—Farewell Spit, Nelson (W. B. Benham); "Nora Niven" Expedition, Station 5, off Stewart Island.

Pollicipes* spinosus (Quoy and Gaimard).

Anatifa spinosa Quoy and Gaimard, *Voyage de l'Astrolabe*, pl. xciii, fig. 17. *Pollicipes spinosus* Darwin, 1851, p. 324, pl. vii, fig. 4; Hutton, 1879, p. 329; Gruvel, 1905, p. 20, fig. 24; Jennings, 1915, pp. 286, 291, figs. 3a, 3b. *Pollicipes sertus* Darwin, 1851, p. 327, pl. vii, fig. 5; Gruvel, 1905, p. 22, fig. 25; Jennings, 1915, pp. 286, 291. *Pollicipes darwini* Hutton, 1879, p. 329; Gruvel, 1905, p. 21; Jennings, 1915, pp. 286, 291.

Specific Diagnosis.—"Capitulum with one or more whorls of valves under the rostrum: upper pair of latera only slightly larger than lower latera: membrane covering the valves (when dried) light yellowish-brown: scales of the peduncle of unequal sizes, unsymmetrical, arranged in rather distant whorls." (Darwin.)

Localities.—Kaikoura (collector unknown); Port Pegasus, Stewart Island (collector unknown); Russell, Bay of Islands (W. R. B. Oliver); Tauranga (W. R. B. Oliver); Godley Heads (W. R. B. Oliver); Stewart Island (W. Trail); Kaikoura (L. S. Jennings); Oamaru (L. S. Jennings); St. Clair, Dunedin (L. S. Jennings); Taylor's Mistake, Banks Peninsula (L. S. Jennings).

The reasons for considering *P. sertus* Darwin and *P. darwini* Hutton to be synonyms of *P. spinosus* Quoy and Gaimard have already been fully discussed. (See *Trans. N.Z. Inst.*, vol. 47, p. 291, 1915.)

Family BALANIDAE.

Balanus tintinnabulum (Linnaeus).

Lepas tintinnabulum Linnaeus, 1758, *Systema Naturae*, ed. 10, p. 668.

Balanus tintinnabulum Darwin, 1854, p. 194, pl. i, figs. a-l; pl. ii, figs. 1a-1o; Gruvel, 1905, p. 211, figs. 230-33; Pilsbry, 1916, p. 54.

Specific Diagnosis.—"Shell varying from pink to blackish-purple, often striped and ribbed longitudinally: orifice generally entire, sometimes toothed. Scutum with the articular ridge broad and reflexed. Tergum with the basal margin generally forming a straight line on opposite sides of the spur."

"Var. (8) *concinus*: Globulo-conical; walls finely ribbed: dull purple, tinged and freckled with white; scutum, with a broad, hooked, articular ridge, with an extremely sharp plate-like adductor ridge, and with a cavity, bordered by a plate, for the rostral depressor muscle." (Darwin.)

Locality.—Hull of "Terra Nova," Lyttelton Harbour (C. Chilton).

Balanus decorus Darwin.

Balanus decorus Darwin, 1854, p. 212, pl. 2, figs. 6a, 6b; Gruvel, 1905, p. 214; Chilton, 1909, p. 670, and 1911, p. 311, pl. 58, figs. 1-3; Pilsbry, 1916, pp. 53, 77.

Specific Diagnosis.—"Parietes pale pink; radii rather darker. Scutum with a small articular ridge. Tergum with longitudinal furrow very shallow and open; basal margin on both sides sloping towards the spur." (Darwin.)

Localities.—British Museum, from New Zealand (type); New Brighton

* In accordance with the rules of priority, Pilsbry uses the generic name *Mitella* in place of *Pollicipes* (see Pilsbry, 1907, p. 4, and 1911, p. 33).—C. C.

Beach (L. S. Jennings); Wanganui (S. H. Drew); Chatham Islands (Dr. E. Kershner); Auckland Islands (C. Chilton).

By the "Nora Niven" Trawling Expedition this species was taken at several localities on the New Zealand coast, many of them growing on the carapace of *Paramithrax longicornis* Thomson, with which crab the cirripede seems to be specially associated.

Balanus trigonus Darwin.

Balanus trigonus Darwin, 1854, p. 223, pl. 3, figs. 7a-7f Hutton, 1879, p. 330; Gruvel, 1905, p. 223, figs. 248, 249; Pilsbry, 1916, p. 111, pl. 26, figs. 1-13e.

Specific Diagnosis.—"Parietes ribbed, mottled purplish-red; orifice broad, trigonal, hardly toothed. Scutum thick, with from one to six longitudinal rows of little pits. Tergum without a longitudinal furrow; spur truncated, fully one-third of width of valve." (Darwin.)

Locality.—Rangitoto Reef, Auckland Harbour (W. R. B. Oliver).

Balanus porcatus Da Costa.*

Balanus porcatus Da Costa, 1778, *Hist. Nat. Test. Brit.*, p. 249; Darwin, 1854, p. 256, pl. 6, figs. 4a-4e; Filhol, 1885, p. 487; Gruvel, 1905, p. 237, fig. 264. *Balanus balanus* Pilsbry, 1916, p. 149.

Specific Diagnosis.—"Shell white, generally sharply ribbed longitudinally: radii with their summits almost parallel to the basis. Scutum longitudinally striated: tergum with the apex produced and purple." (Darwin.)

Localities.—Auckland (H. Suter); New Zealand (locality not stated) (W. R. B. Oliver).

Balanus crenatus Bruguière.

Balanus crenatus Bruguière, 1789, *Encyclop. méthod.* (des Vers), p. 168; Darwin, 1854, p. 261, pl. vi, figs. 6a-6g; Gruvel, 1905, p. 240, figs. 268, 269; Pilsbry, 1916, p. 165, pls. 39, 40.

Specific Diagnosis.—"Shell white: radii with their oblique summits rough and straight. Scutum without an adductor ridge: tergum with spur rounded." (Darwin.)

Localities.—Hull of "Terra Nova," Lyttelton Harbour (C. Chilton). Pilsbry (1916) distinguishes several varieties of this species.

Tetraclita purpurascens (Wood).

Lepas purpurascens Wood, 1815, *General Conchology*, p. 55, pl. 9, fig. 42. *Tetraclita purpurascens* Darwin, 1854, p. 337, pl. xi, figs. 1a-1d; Hutton, 1879, p. 328; Gruvel, 1905, p. 285, fig. 308a; Pilsbry, 1916, p. 249.

Specific Diagnosis.—"Shell depressed, pale purple or dirty-white, with the surface longitudinally ribbed, or corroded and granulated: radii or even sutures none, or radii well developed and broad, with summits parallel to

* According to the rules of priority, this species should be named *Balanus balanus* (Linnaeus), the name adopted by Pilsbry in 1916. For convenience of reference to papers dealing with New Zealand Cirripedia the name used by Jennings in his manuscript notes has been allowed to stand in the text.—C. C.

the basis: basis membranous: scutum transversely elongated: tergum small, with the spur extremely short and rounded." (Darwin.)

Locality.—Otago (W. R. B. Oliver).

Elminius modestus Darwin.

Elminius modestus Darwin, 1854, p. 350, pl. 12, figs. 1a-1e; Hutton, 1879, p. 328; Gruvel, 1905, p. 296, figs. 319-322; Pilsbry, 1916, p. 261. *Elminius sinuatus* Hutton, 1879, p. 328; Gruvel, 1905, p. 295..

Specific Diagnosis.—"Shell folded longitudinally, greenish or white: radii of moderate breadth, smooth-edged: scutum without adductor ridge: tergum narrow, with the spur confluent with basi-scutal angle." (Darwin.)

Localities.—Lyttelton Harbour (L. S. Jennings); Riwaka, Nelson Harbour (L. S. Jennings); Takapuna Beach; Half-moon Bay, Stewart Island (W. R. B. Oliver); Ponui Island, Hauraki Gulf (C. Chilton).

E. sinuatus Hutton is probably only a variety of *E. modestus* Darwin. In groups of *E. modestus* many young specimens have parieties of each valve with two rounded folds, referred to by Hutton in his description of *E. sinuatus*. The two distinct folds show also when specimens are not crowded together.

Elminius plicatus Gray.

Elminius plicatus Gray, 1843, Appendix to Dieffenbach's *Travels in New Zealand*, p. 269; Darwin, 1854, p. 351, pl. 12, figs. 2a-2f; Hutton, 1879, p. 328; Gruvel, 1905, p. 296, figs. 318, 321; Pilsbry, 1907, p. 261.

Specific Diagnosis.—"Shell deeply folded longitudinally, corroded, coloured in parts orange: radii very narrow, with their edges sinuous, and slightly dentated: scutum having an adductor ridge." (Darwin.)

The valves show many variations in elongation of terga, prominence of grooves and ridges, straightness of tergal articular ridge, length and inflexion of tergal furrow, bluntness or beaked nature of apex.

The general appearance of the shell is also extremely variable. When very corroded the walls are extremely thick, by the inward production of the internal ridges, giving an appearance of porosity. These specimens are usually depressed, and are of a grey or dirty-white colour.

Localities.—Kaipara Harbour (Spencer); Shag Point, Otago (W. R. B. Oliver); Lyttelton Harbour (L. S. Jennings); Puhoi Beacon, Auckland Harbour (C. Chilton); Hawera (L. S. Jennings); Ponui Island, Hauraki Gulf (C. Chilton); Oamaru (L. S. Jennings); Takapuna, Auckland (W. R. B. Oliver).

Coronula diadema (Linnaeus).

Lepas diadema Linnaeus, 1767, *Systema Naturae*, ed. 12, p. 1109.

Coronula diadema Darwin, 1854, p. 417, pl. xv, figs. 3, 3a, 3b; pl. xvi, figs. 1, 2, 7; Hutton, 1879, p. 329; Gruvel, 1905, p. 273; Pilsbry, 1916, p. 273, pl. 65, figs. 3, 4.

Specific Diagnosis.—"Shell crown-shaped, with longitudinal convex ribs, having their edges crenated; orifice hexagonal: radii moderately thick, very broad: terga absent or rudimentary." (Darwin.)

Localities.—Waikouaiti, on a whale (F. W. Hutton); on whale (specimens in Auckland Museum).

Chamaesipho columna (Spengler).

Lepas columna Spengler, 1790, *Skifter Naturhist. Selbskabet*, B. 1, Tab. vi, fig. 6. *Chamaesipho columna* Darwin, 1854, p. 470, pl. 19, figs. 3a-3c; Hutton, 1879, p. 329; Gruvel, 1905, p. 282, figs. 306, 307.

Specific Diagnosis.—"Sutures, excepting during early youth, generally obliterated both externally and internally: tergum with small pits for attachment of depressor muscle." (Darwin.)

Localities.—Cuvier Island (Grenfell and Barr); Nelson (L. S. Jennings); Shag Point, Otago (W. R. B. Oliver).

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