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THREE NEW SPECIES OF *LENSIA*, AND DESCRIPTION OF THE EUDOXIA STAGES OF *LENSIA RETICULATA* AND *LENSIA LELOUVETEAU* (CALYCOPHORAE: SIPHONOPHORAE)

Angeles Alvariño and Joan Marie Wojtan

Abstract.—Three new species of *Lensia* are described and illustrated: *Lensia eugenioi, L. eltanin,* and *L. landrumae,* their diagnostic characteristics are discussed and compared with those of other closely related species of *Lensia.* The previously unknown eudoxid stages of *Lensia reticulata* Totton, 1954, and *L. lelouveteau* Totton, 1941, are also described and illustrated. The specimens were observed in plankton collections obtained during the U.S. Antarctic Research Program.

Lensia Totton

Diagnosis.—The genus *Lensia* Totton, 1932 includes diphyid Calycophorae in which the anterior nectophores of the polygastric stage are pentagonal in cross section, but may exhibit 3, 5, 7, 15, or more longitudinal ridges, with or without crests or wings. The somatocyst is usually short. The hydroecium is shallow, and is closed by short, divided mouth plates. The radial canals have no commissures. The nectosac reaches to near the top of the nectophore.

The posterior nectophore is known for only a few species. It is truncate at the top, has a rounded mouth plate, and no conspicuous teeth. The lateral radial canals are not looped, but run in an open S course.

Only a few eudoxid stages of *Lensia* have been described.

There are 24 previously described species of the genus *Lensia,* and with the three new ones there will be 27. The known species of *Lensia* are: *Lensia achilles* Totton, 1941; *L. ajax* Totton, 1941; *L. bary* Totton, 1965; *L. campanella* (Moser, 1925); *L. challengeri* Totton, 1954; *L. conoidea* (Kefferstein and Ehlers, 1860); *L. cordata* Totton, 1965; *L. cossack* Totton; 1941; *L. exeter* Totton, 1941; *L. fowleri* (Bigelow, 1911); *L. grimaldii* Leloup, 1933; *L. hardy* Totton, 1941; *L. havock* Totton, 1941; *L. hostile* Totton, 1941; *L. hotspur* Totton, 1941; *L. hunter* Totton, 1941; *L. leloupi* Totton, 1954; *L. lelouveteau* Totton, 1941; *L. meteori* Leloup, 1934; *L. multicristata* (Moser, 1925); *L. reticulata* Totton, 1954; *L. subtilis* (Chun, 1886); *L. subtiloides* (Lens and van Riemsdijk, 1908); *L. tottoni* Daniel and Daniel, 1963. (See Alvariño 1971 for distributions.)

Material.—Collections in which the new species here described were found, were obtained during the *Eltanin* cruises of the U.S. Antarctic Research Program, using plankton nets: BPS (bathypelagic plankton sampler), MPS (multiple plankton sampler), vertical (V) or oblique (OBL) plankton tows (see Tables 1–5).

Lensia eugenioi, new species

Fig. 1

Material.—(See Table 1.) Holotype: 1 superior nectophore and 1 inferior nectophore, *Eltanin* cruise 26, sta. 1785, USNM 61058: paratype, 2 superior nectophores and 2 inferior nectophores, *Eltanin* cruise 26, sta. 1803, USNM 61059.

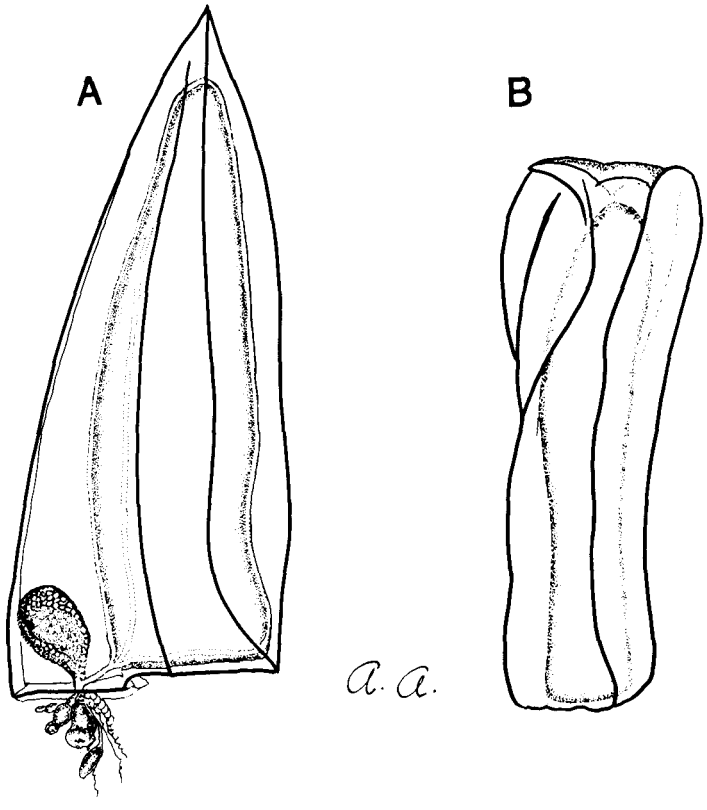

Fig. 1. *Lensia eugenioi*: A, Lateral view of superior nectophore (5 mm long); B, Ventrolateral view of inferior nectophore (4.5 mm long).

Etymology.—Named for Captain Eugenio Leira, the husband of the senior author.

Description.—The length of the superior nectophore is approximately 3 times its width. The nectosac reaches close to the top of the nectophore. There are 5 complete ridges with crests extending from the opening of the nectosac (the ostium), to the top of the nectophore: 2 ventral and 2 lateral (one at each side, corresponding to the dorsoventral), and one dorsal. In addition, 2 other lateral ridges, the ventrolateral, extend from the ostium to near the top of the nectophore, up to the level of the top of the nectosac, but do not reach the top of the bell. These incomplete ventrolateral ridges are similar to those in *L. multicristata*, although in the latter the ridges do not reach either the apex or the marginal base of the nectophore. In *L. eugenioi* they reach to the basical margin of the ostium, but not to the apex. The dorsolateral ridges of *L. eugenioi* bend sharply at the low part near the ostium region, reaching the dorsal edge of the nectophore at this point joining the dorsal ridge.

The hydroecium is very shallow, tapering to the ventral side. Two very small flaps close the opening of the hydroecium at the side of the ostium.

Table 1.—Distribution of *Lensia eugenioi* in the Antarctic-Subantarctic region.

Cruise	Station	Gear/tow	Location	Depth of haul	Date	Local time
26	1785	MPS	39°47′S, 160°30′E	250–100 m	5 Dec 1966	1112–1117
	1790	V	41°58′S, 160°06′E	200–0 m	7 Dec 1966	1351–1412
	1794	BPS	41°58′S, 160°06′E	1000–500 m	7 Dec 1966	1425–1449
	1803	BPS	47°37′S, 161°49′E	1000–500 m	13 Dec 1966	1052–1112

The somatocyst is thick, short, and pear-shaped.

The radial canals extend along the dorsal and ventral edges of the nectosac to join the circular canal, and other branches extend along each of the sides of the nectosac, from the pedicular canal to near the top of the nectosac. These branches probably bend, to run down to reach the circular canal (Fig. 1A).

The inferior nectophore (Fig. 1B) is prismatic, with 5 longitudinal ridges. The region of the hydroecium is closed at the upper part by the flaps extending from the ridges, which cover each other to form the hydroecial tunnel. There are no teeth or prolongations at the ostium region. The lateral radial canals follow a sigmoid course.

Eudoxid phase: Unknown.

Lensia eltanin, new species
Fig. 2

Material.—(See Table 2.) Holotype: 1 superior nectophore, 1 inferior nectophore, *Eltanin* cruise 11, sta. 263, USNM 61060; paratype: 1 superior nectophore and 2 inferior nectophores, *Eltanin* cruise 11, sta. 263 and 308, USNM 61061.

Etymology.—Named for the USNS *Eltanin,* which for many years has surveyed the Antarctic Ocean and adjacent oceanic regions; the present collections were obtained during this vessel's cruises in Antarctic and Subantarctic waters.

Description.—This species also belongs to the group of the previously described species, based on the characteristics of the lateral ridges.

The superior nectophore (Fig. 2A) reaches a length of about 6 to 7 mm, with a maximum width of 3 mm at the ostium. It has 5 complete ridges extending from the tip of the nectophore to the ostium. All the ridges have a narrow crest. The dorsal ridge forms a small tooth at the margin of the ostium, but does not form a marked tooth-like projection, due in part to the crest of the ridge covering that area. The lateral ridges bend sharply to the ventral side and then to the dorsal side at the lowest part of the nectophore, and reach the margin of the nectophore at about midlength of the ostium opening, between the hydroecium and the dorsal ridge.

The nectosac reaches close to the top of the nectophore.

The hydroecium is deeper than in *Lensia conoidea.* The hydroecial cavity is large, reaching to a point slightly higher than the level of the ostium, and wide, as in *L. conoidea.* The hydroecium is slightly shallower than a hemisphere, and is closed at the dorsal side, adjacent to the ostium, by 2 flaps. There is a wide distance from the ventral edge of the nectosac to the ventral edge of the nectophore, as is seen in *L. conoidea.*

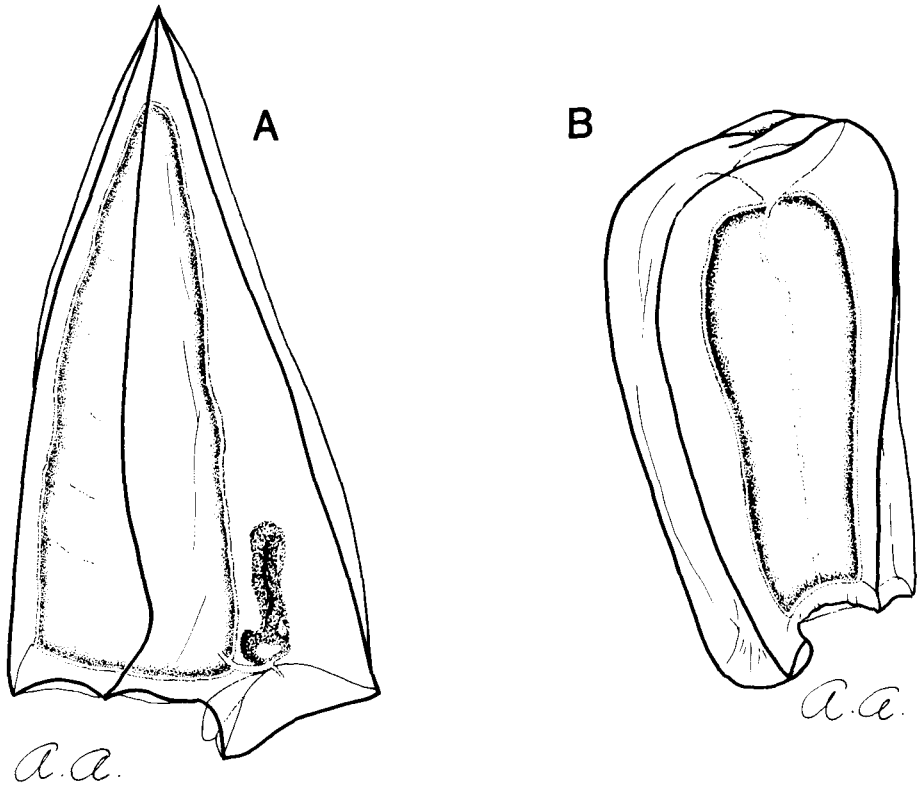

Fig. 2. *Lensia eltanin*: A, Lateral view of superior nectophore (6–7 mm long); B, Lateral view of inferior nectophore (4.7 mm long).

The somatocyst is of medium length, reaching about ⅕ of the total length of the nectophore. The somatocyst is wider at the base, and the branch that goes up is about ½ the width of the basal part of the somatocyst.

The posterior nectophore (Fig. 2B) presents 5 ridges: 2 ventral, 1 dorsal, and 2 lateral. Those forming the hydroecium are wide, wing-like; they bend, closing that area, and extend down to the level of the ostium, where they are connected

Table 2.—Distribution of *Lensia eltanin* in the Antarctic-Subantarctic region.

Cruise	Station	Gear/tow	Location	Depth of haul	Date	Local time
11	257	MPS	60°56′S, 114°43′W	500–250 m	5 Jan 1964	1451–1532
	263	BPS	61°58′S, 115°11′W	1000–500 m	7 Jan 1964	0835–0949
	308	MPS	70°07′S, 102°55′W	500–250 m	20 Jan 1964	2019–2044
	309	BPS	70°07′S, 102°52′W	1000–500 m	20 Jan 1964	2202–2308
	310	OBL	70°25′S, 99°21′W	550–0 m	22 Jan 1964	0332–0435
15	864	BPS	54°00′S, 145°17′W	1000–500 m	18 Nov 1964	~1000
16	900	MPS	51°09′S, 162°00′E	500–250 m	8 Feb 1965	1525–1535

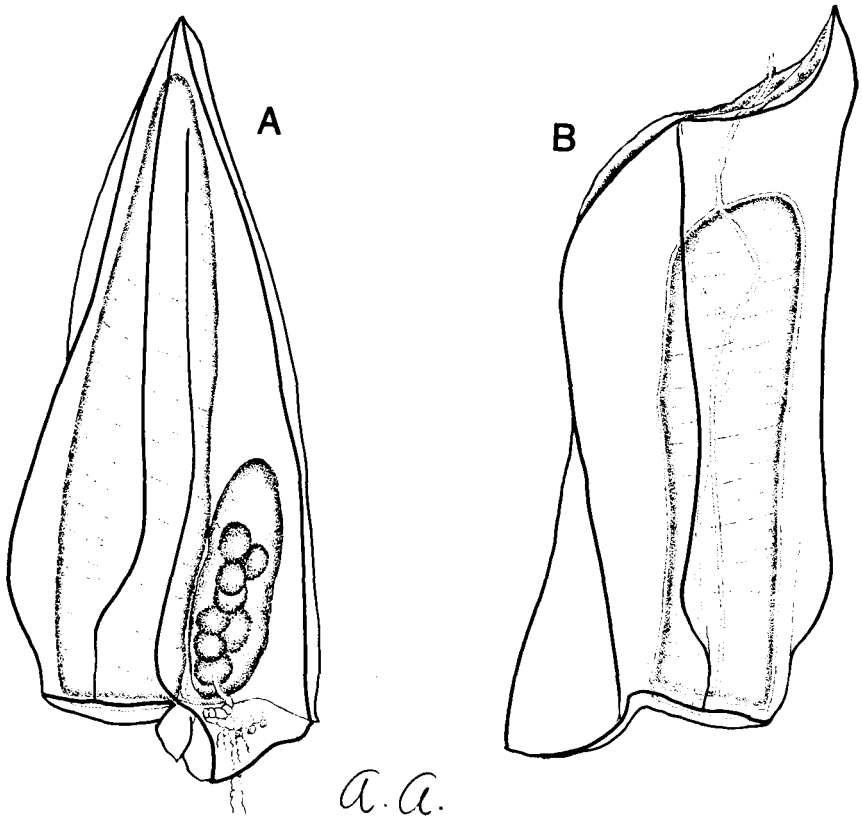

Fig. 3. *Lensia landrumae*: A, Lateral view of superior nectophore (6 mm long); B, Lateral view of inferior nectophore (4.8 mm long).

by the basal wing which is slightly lower than the ostium level. The posterior and lateral ridges are also crested, and end in small, tooth-like formations.

The radial canals follow the typical sigmoid pattern for the genus, and join the circular canal.

The apex of the posterior nectophore is roundish, with the dorsal side higher than the ventral, fitting perfectly in the hydroecium of the first nectophore.

Eudoxid phase: Unknown.

Lensia landrumae, new species
Fig. 3

Material.—(See Table 3.) Holotype: 1 superior nectophore and 1 inferior nectophore, *Eltanin* cruise 21, sta. 1403, USNM 61062; paratype: 2 superior nectophores and 2 inferior nectophores, *Eltanin* cruise 16, sta. 925, and cruise 26, sta. 1794, USNM 61063.

Etymology.—Named for Elizabeth Landrum, in recognition of her dedication throughout the years to advancing plankton studies, and her encouragement and valuable assistance to this research.

Table 3.—Distribution of *Lensia landrumae* in the Antarctic-Subantarctic region.

Cruise	Station	Gear/tow	Location	Depth of haul	Date	Local time
10	192	V	56°57′S, 74°58′W	992–0 m	11 Nov 1963	1651–1739
16	884	BPS	44°21′S, 162°00′E	1000–500 m	4 Feb 1965	1350–1406
	895	MPS	49°17′S, 162°00′E	500–250 m	7 Feb 1965	1110–1124
	925	MPS	52°26′S, 166°42′E	250–100 m	18 Feb 1965	1552–1558
21	1403	MPS	54°06′S, 119°54′W	500–250 m	20 Dec 1965	0035–0045
26	1794	BPS	41°58′S, 160°06′E	1000–500 m	7 Dec 1966	1425–1449
	1803	BPS	47°37′S, 161°49′E	1000–500 m	13 Dec 1966	1052–1112

Description.—The superior nectophore (Fig. 3A) is about 6 mm high and 2.5 mm in width. There are 5 complete ridges extending from tip of the nectophore to the region of the ostium: 2 ventral, 1 dorsal, and 2 dorsolateral. Another pair of ridges, the ventrolateral, extend from the region of the pedicel (where the margin of the nectosac is adjacent to the hydroecium), up to near the top of the nectophore. The ventrolateral ridges do not reach the top of the nectophore. The dorsal ridge and the dorsolateral ridges have crests, which are widest at the low part of the ridge, but the crests disappear from this region to the level of the ostium. This low portion of the ridge has no crest; the portion with no crest is about $\frac{1}{8}$ of the length of the nectophore. The ventrolateral ridges present a round crest at the lowest part, that is, at the ostium region, diminishing in width as they reach the upper part of the nectophore.

The somatocyst is large, massive and globular-oval in shape, in contact with ventral wall of the nectosac.

The hydroecium is deep, but reaches to the level of the ostium, and is closed by two flaps on the dorsal side.

The region of the somatocyst between the nectosac and the ventral ridges is filled with mesoglea, as is seen in *L. conoidea.*

The posterior nectophore (Fig. 3B) is prismatic, with 5 ridges having the same characteristic features as the superior nectophore. The upper part of the nectophore extends in a triangular peak on the dorsal side. The crests of the dorsal and lateral ridges widen near the ostial region, but the lowest part has no crest, showing a pattern similar to that of the superior nectophore. The ventral ridges are wing-like, closing the hydroecium, which resembles a tunnel.

The anterior and posterior radial canals are straight, running from the pedicel at the top of the nectophore, to the ring canal. The lateral radial canals bend in a step-like shape at the upper part of the nectosac, and run down straight to the ring canal.

Because the characteristics of the ridges and crests of this inferior nectophore are similar to those in the superior nectophore of *L. landrumae* n. sp., it is assumed that these inferior nectophores correspond to that species.

The eudoxid phase is unknown.

Discussion.—The species closely related to *L. eugenioi* and *L. eltanin* are *L. achilles, L. bary,* and *L. cordata.* In *L. achilles* the somatocyst is a somewhat elongate spindle-shaped club. The lateral ridges are just at midwidth of the lateral sides, bending ventrally and then dorsally to reach to the dorsal $\frac{1}{3}$ of the ostium

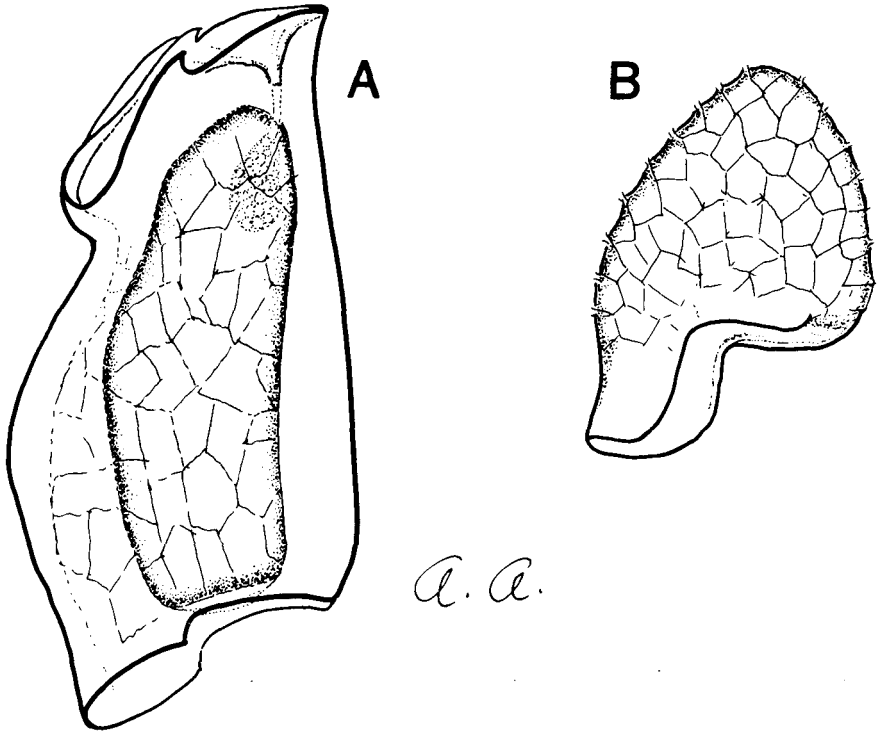

Fig. 4. *Lensia reticulata*: A, Lateral view of gonophore (2.5 mm long); B, Bract (1.6 mm high).

margin. The hydroecial cavity is deep, exhibiting the same depth from the dorsal to the ventral side of the cavity. The top of the hydroecium is level with the ostium; on the dorsal of the proximal part of the ostium, the top of the hydroecium is slightly higher than the ventral side, or distal part of the ostium.

In *Lensia bary* the somatocyst exhibits a large spindle or inverted club shape. There is an elongate globular oval with a small ampullar projection at the top. Lateral ridges are slightly bent at the ostium region (less sharply bent than in *L. achilles*), reaching the middle of the ostium region. The hydroecium is as deep as in *L. achilles,* but shallow toward the ventral side (the part far from the ostium). The top of the hydroecium is level with the ostium.

Lensia cordata has lateral ridges bending sharply to the dorsal side, reaching one-fourth of the dorsal ostium region. The somatocyst is heart-shaped, on top of a short peduncle. The heart-shaped part begins level with or slightly higher than the ostium. The hydroecium is shallower than in *L. achilles* and *L. bary,* ending just at the level of the ventral ridges.

Lensia cordata has longitudinal ridges with crests, while crests are not present in *L. bary* and or *L. achilles.*

One of the main differential characteristics of the above-mentioned group of species of *Lensia* is the position of the end of the lateral ridges at the ostium region. In *L. achilles* that point is at one-third of the dorsal side, in *L. bary* at

Table 4.—Distribution of eudoxids of *Lensia reticulata* in the Antarctic-Subantarctic region.

Cruise	Station	Gear/tow	Location	Depth of haul	Date	Local time
10	165	V	65°00′S, 74°58′W	2035–0 m	1 Nov 1963	0350–0455
11	249	BPS	58°57′S, 114°45′W	1000–500 m	3 Jan 1964	0132–0233
	253	MPS	59°56′S, 114°56′W	480–250 m	4 Jan 1964	0220–0304
	254	BPS	59°55′S, 114°56′W	1000–250 m	4 Jan 1964	0350–0502
	257	MPS	60°56′S, 114°42′W	500–250 m	5 Jan 1964	1451–1532
	262	MPS	61°56′S, 115°12′W	500–250 m	7 Jan 1964	0714–0754
	268	MPS	62°57′S, 115°16′W	500–250 m	8 Jan 1964	0738–0821
	292	BPS	68°20′S, 114°47′W	unknown	15 Jan 1964	2237–0000
	303	BPS	70°09′S, 106°40′W	1000–500 m	19 Jan 1964	1946–2103
	308	MPS	70°08′S, 102°55′W	500–250 m	20 Jan 1964	2019–2044
	320	BPS	67°58′S, 90°54′W	1000–500 m	26 Jan 1964	0822–0929
	326	BPS	65°55′S, 89°06′W	1000–500 m	28 Jan 1964	0625–0730
15	881	MPS	57°00′S, 150°08′W	500–250 m	21 Nov 1964	2112–2131
16	895	MPS	49°17′S, 162°00′E	500–250 m	7 Feb 1965	1110–1124

about the middle of the ostial opening, in *L. cordata* at one-fourth of the dorsal side, in *L. eugenioi* at the dorsal side, and in *L. eltanin* at about midlength of the ostium.

The hydroecium is different in shape and size for all five closely related species, and the shape and size of the somatocyst is also different in each of the species.

Lensia eugenioi is the only one in the group with five complete ridges and two additional ridges (ventrolateral), which go from the ostium to near the top of the nectophore, not reaching the apex.

Lensia landrumae is different from any of the previously described species of the genus *Lensia* in the shape of ridges and crests, hydroecium, and somatocyst.

Lensia reticulata Totton, 1954
Fig. 4

Diagnosis.—The nectophores are multicristate, with cross-connecting ridges forming an irregular meshwork.

The superior nectophore of the polygastric phase has been described (Totton 1954). The eudoxid phase has not been previously described.

Material.—Specimens of the eudoxid phase of *Lensia reticulata* were observed in collections from *Eltanin* cruises listed in Table 4. Voucher material of eudoxid phase, 1 bract and 1 gonophore, cruise 11, sta. 308, USNM 61068; 1 bract, 2 gonophores, cruise 11, sta. 326, and cruise 15, sta. 881, USNM 61069.

Description.—The gonophore (Fig. 4A) is an oval, with a roundish area at the top where the bract is attached. The walls of the gonophore are thin, and have a reticular pattern similar to that of the polygastric nectophore.

The bract (Fig. 4B) is like a cap, formed by two parts; the top or hemispherical cover is of thick mesoglea, covered by a thick network of ridges, like a honeycomb; the visor part is wide. The visor part attaches to the groove at the top of the gonophore.

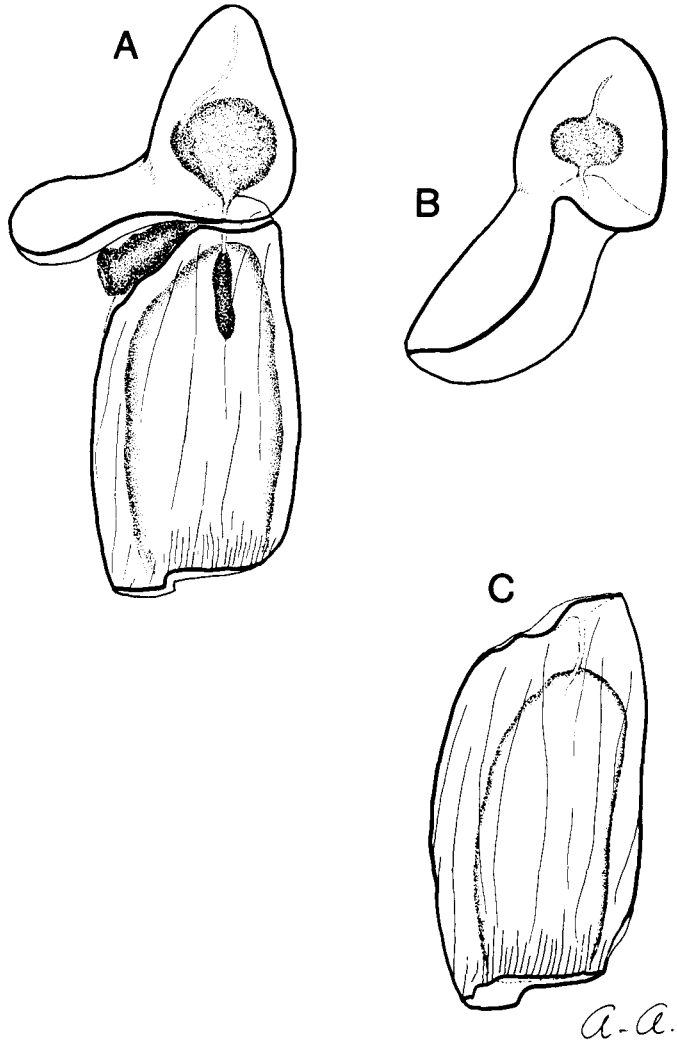

Fig. 5. *Lensia lelouveteau*: A, Complete eudoxid (5 mm long); B, Bract (2.5 mm long); C, Gonophore (3 mm long).

Lensia lelouveteau Totton, 1941
Fig. 5

Diagnosis.—The eudoxid phase of *Lensia lelouveteau* has not been previously described. The specimens found could belong to this species, based on the multicristate pattern of the ridges and the particular feature of a band of ridges at the inferior part of the gonophore, all of which makes this gonophore very similar to the description and characteristics of the superior nectophore of *L. lelouveteau* Totton, 1941.

Table 5.—Distribution of the eudoxid phase of *Lensia lelouveteau* in the Antarctic-Subantarctic region.

Cruise	Station	Gear/tow	Location	Depth of haul	Date	Local time
10	196	V	65°21'S, 75°02'W	2045–0 m	13 Nov 1963	0702–0838
11	253	MPS	59°57'S, 114°57'W	480–250 m	4 Jan 1964	0220–0304
	257	MPS	60°56'S, 114°43'W	500–250 m	5 Jan 1964	1451–1532
	268	MPS	62°58'S, 115°17'W	500–250 m	8 Jan 1964	0738–0821
	308	MPS	70°07'S, 102°55'W	500–250 m	20 Jan 1964	2019–2044
	326	BPS	65°55'S, 89°08'W	1000–500 m	28 Jan 1964	0625–0730
16	900	MPS	51°09'S, 162°01'E	500–250 m	8 Feb 1965	1526–1535
	926	MPS	52°26'S, 166°42'E	500–250 m	18 Feb 1965	1544–1552
21	1403	MPS	54°03'S, 119°54'W	500–250 m	20 Dec 1965	0035–0045
26	1794	BPS	41°58'S, 160°06'E	1000–500 m	7 Dec 1966	1425–1449
	1803	BPS	47°37'S, 161°49'E	1000–500 m	13 Dec 1966	1052–1112

Material.—Complete eudoxid specimens (bract and gonophore attached), and bracts and gonophores free, disentangled, have been observed in plankton collections obtained by *Eltanin* cruises listed in Table 5. Voucher material: 1 complete eudoxid, cruise 16, sta. 900, USNM 61070; 4 eudoxids, 3 bracts, 5 gonophores, cruise 16, sta. 926, and cruise 11, sta. 268, USNM 61071.

Description.—The bract (Fig. 5A, B) has a conical top of thick mesoglea, with wide, round, wing-like shield at the ventral side. At the union of the conical body and the laminar wing or bracteal margin, the body is contracted into a neck-like shape. This laminar wing may cover more than half the height of the gonophore. The phylocyst is globular in shape. The hydroecial cavity is conical and shallow.

The gonophore (Fig. 5C) is cylindrical, with a short top platform which adjusts to the cavity of the bract, extending at the ventral side into a flattened triangular shape, where other parts of the eudoxid are located. The walls of the gonophore are covered by ridges similar to those found in the nectophore of the polygastric form of *Lensia lelouveteau.*

It appears that there is no asexual swimming bell; gonads were observed inside the gonophore, which acts as a swimming bell.

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(AA) National Marine Fisheries Service, NOAA, Southwest Fisheries Center, P.O. Box 271, La Jolla, California 92038; (JMW) University of San Diego, Alcala Park, San Diego, California 92110.