

A review of the Cenozoic north Pacific *Liocyma* (Bivalvia, Veneridae)

Alexander I. Kafanov

Institute of Marine Biology, Far East Branch, Russian Academy of Sciences,
Vladivostok, 690041, Russia

The genus *Liocyma* annotated list of the nominal taxa (21 of species and varieties) is presented. The Recent fauna involves panarctic and circumboreal *L. fluctuosa* (Gould, 1841) only. Within the Japan and Sakhalin Cenozoic deposits *L. fluctuosa* is found beginning from the Miocene formations. In the Paleogene formations one may also find the following species: *L. furtiva* (Yokoyama, 1924), *L. terrena* (Yokoyama, 1924), *L. aomori* Nomura et Hatai, 1936, and *L. nairoensis* L. Krishtofovich, [1957].

Обзор кайнозойских *Liocyma* (Bivalvia, Veneridae) северной Пацифики

А.И. Кафанов

Институт биологии моря ДВО РАН, Владивосток, 690041

Приведен аннотированный перечень номинальных таксонов (21 вид и вариант) рода *Liocyma*. В составе современной фауны присутствует только бореально-арктическая *L. fluctuosa* (Gould, 1841). В кайнозойских отложениях Японии и Сахалина *L. fluctuosa* известна начиная с миоцена. В палеогеновых формациях здесь встречаются также: *L. furtiva* (Yokoyama, 1924), *L. terrena* (Yokoyama, 1924), *L. aomori* Nomura et Hatai, 1936 и *L. nairoensis* L. Krishtofovich, [1957].

INTRODUCTION

The genus *Liocyma* Dall, 1870 species are the only representatives of the family *Veneridae* Rafinesque, 1815, with the home range extending northwards up to the Arctic. Being widely spread either geographically and geochronologically, the genus *Liocyma* appear to be rather important for understanding the Cenozoic history of marine basins, lying to the north from the Equator. Meanwhile the systematic status of the north Pacific Cenozoic *Liocyma* cannot be suspected to be stable enough.

NOMINAL TAXA OF LIOCYMA

For the north Pacific regions and Arctic Ocean the following genus *Liocyma* nominal taxa are known¹:

¹ Unfortunately, the photoplate with illustrations of the type-specimens cannot be reproduced here on the technical reasons.

RECENT

Venus fluctuosa Gould, 1841, p. 87, fig. 50: "Halifax and fishing banks Nahlasik, Greenland"; mentioned as being in Massachusetts State Cabinet 193 and in the Boston Society of Natural History 2333, but both specimens lost (Johnson, 1964). Gould's original illustration is reproduced by Slodkewitsch (1938, pl. 86, fig. 4).

Tapes arctica Reeve, 1864, pl. 10 non [Lightfoot], 1786: "Arctic Seas"; syntypes – possibly at the Natural History Museum [former British Museum (Natural History)]. Synonym of *L. fluctuosa* (Gould, 1841).

Venus astartoides Middendorff, 1849, S. 572 ex Beck, MS non D'Archiac, 1847: White Sea; syntypes do not known, possibly missing. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma beckii Dall, 1870, p. 257; Dall, 1871, p. 145, pl. 14, fig. 7: Plover Bay, East Siberia, and Ounga Island, Alaska; lectotype (herein designated for figured specimen) – U.S. National Museum N 163110. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma scammoni Dall, 1871, p. 145, pl. 14, fig. 9: Fort Simpson, British Columbia, Canada; lectotype – U.S. National Museum N 163121. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma viridis Dall, 1871, p. 146, pl. 14, fig. 8: "Arctic Ocean"; holotype – U.S. National Museum N 163091 (J. Rosewater, pers. comm.). Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma fluctuosa var. *brunnea* Dall, 1902, p. 378: Gulf of St. Lawrence, Canada; syntypes do not fixed. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma aniwana Dall, 1907, p. 172: Aniwana Bay, Sakhalin Island; holotype – U.S. National Museum N 110511 (J. Rosewater, pers. comm.). Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma schefferi Bartsch et Rehder, 1939, p. 111, pl. 8, figs. 1-1b: Chuginadak Island, Aleutian Islands, Alaska; holotype – U.S. National Museum N 535344. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma hokkaidoensis Habe, 1951, p. 179, figs 412-414: Nemuro, Hokkaido; holotype – National Science Museum, Tokyo N 49823. Synonym of *L. fluctuosa* (Gould, 1841).

CENOZOIC

Venus furtiva Yokoyama, 1924, p. 15, pl. 2, fig. 6: Kobisa, Obisa-mura, Futaba-gun, Fukushima Prefecture, Honshu; Asagai Formation, Oligocene; syntypes – missing.

Venus terrena [terrera auct.] Yokoyama, 1924, p. 15, pl. 2, fig. 19: Tenguasawa, Oyamada, Obisa-mura, Futaba-gun, Fukushima Prefecture, Honshu; Asagai Formation, Oligocene; syntypes – missing.

Liocyma subfluctuosa Khomenko, 1931, p. 76, pl. 5, figs. 3, 4 (lectotype, designated by Slodkewitsch, 1938, p. 424), 5: a trench on the watershed between Pil'tun and Paromay rivers about 6 km from the mouth, Okha District, Sakhalin; Nadnutovskaya Suite, Pliocene; lectotype – Central Scientific-Research Geological-Exploration Museum named after Academician F.N. Chernychev, St. Petersburg (former – Leningrad), Russia, N 139/3104a. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma subaniwana Khomenko, 1931, p. 78, pl. 5, figs. 6 (lectotype, herein designated), 7, 8: right bank of the Bol'shoy Goromay River, Nogliki District, Sakhalin; Nadnutovskaya Suite, Pliocene; lectotype – Central Scientific-Research Geological-Exploration Museum named after Academician F.N. Chernychev, St. Petersburg (former – Leningrad), Russia, N 154/3104a. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma aomori Nomura et Hatai, 1936, p. 280, pl. 33, fig. 7: middle course of the Komatazawa, a tributary of the Aiuchi-gawa, Aiuchi-mura, Kita-Tsugaru-gun, Aomori Prefecture, Honshu; Isomatsu Formation, Oligocene; holotype – Saito Ho-on Kai Museum, Sendai, N 8480.

Liocyma minuta Nomura et Zinbo, 1937, p. 166, pl. 22, fig. 8: Magarikawa [Magarigawa], Toyoda-mura, Mogami-gun, Yamagata Prefecture, Honshu; Hanezawa Formation, Miocene; holotype – Saito Ho-on Kai Museum, Sendai, N 9302.

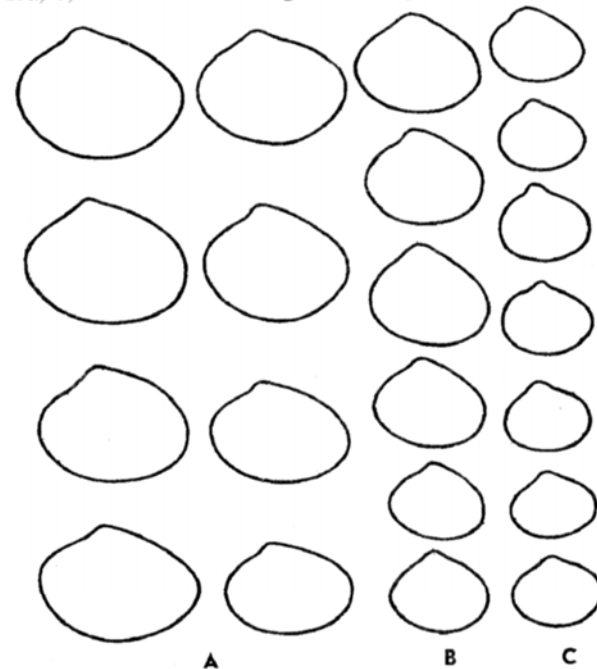
Liocyma ouchiensis Hatai et Nisiyama, 1952, p. 77 (as new name for *Liocyma* sp. indet. in: Nomura et Onisi, 1940, p. 191, pl. 3, fig. 13): Yoshigasawa, Outi-mura, Igu-gun, Miyagi Prefecture, Honshu; Kozai Formation, Miocene; holotype (designated as hypotype) – Saito Ho-on Kai Museum, Sendai, N 21750. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma furtiva var. *nairoensis* L. Krishtofovich [1957], p. 99, pl. 19, figs. 1, 1a: Nairo River, Makarov District, Sakhalin; [Gastellovskaya Suite], Oligocene; holotype – Central Scientific-Research Geological-Exploration Museum named after Academician F.N. Chernychev, St. Petersburg (former – Leningrad), Russia, N 108/6818.

Gomphina (*Liocyma*) *fluctuosa* var. *praecluctuosa* L. Krishtofovich in Zhidkova et al., 1968, p. 112, pl. 19, fig. 1 (lectotype, herein designated); pl. 11, fig. 14; pl. 20, fig. 10: Severnaya River, Makarov District, Sakhalin; upper part of Maruyamskaya Suite, Pliocene; lectotype – All-Russia (former – All-Union) Petroleum Scientific-Research Geological-Exploration Institute (VNIGRI), St. Petersburg (former – Leningrad), Russia, coll. N 412. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma sachalinensis Arkhipova et al., [1994], p. 227, pl. 42, fig. 3 ex Lautenschldger, MS: Noyami River, Aleksandrovsk-Sakhalinsky District, Sakhalin; Sertunayskaya Suite, Miocene; holotype – Central Scientific-Research Geological-Exploration Museum named after Academician F.N. Chernychev, St. Petersburg (former – Leningrad), Russia, N 1/6199. Synonym of *L. fluctuosa* (Gould, 1841).

Liocyma okobikaensis Popova in Arkhipova et al., [1994], p. 229, pl. 42, figs. 13a, b, 14: Vostochnoe Dagi field, Nogliki District, Sakhalin; lower



Liocyma fluctuosa, shell outline variability in samples: A – southern Kurile Islands, Yuriy Island, Kraternaya Bight, sandy intertidal; The Institute Museum, Institute of Marine Biology (IBM) reg. N 304/34738; B – Sea of Okhotsk, Shantar Islands, Bolishoy Shantar Island, intertidal, IBM reg. N 58/14759; C – Sea of Japan, Tatar Strait, depth 60 m, IBM reg. N 101/31252. All in natural size

Внутривыборочная изменчивость формы раковины у *Liocyma fluctuosa*: А – южные Курильские острова, остров Юрий, бухта Кратерная, песчаная литораль; Музей Института биологии моря ДВО РАН (ИБМ) № 304/34738; В – Охотское море, Шантарские острова, остров Большой Шантар, литораль, ИБМ № 58/14759; С – Японское море, Татарский пролив, глубина 60 м, ИБМ № 101/31252. Все – в натуральную величину

part of Okobykayskaya Suite, Miocene; holotype – All-Russia (former – All-Union) Petroleum Scientific-Research Geological-Exploration Institute (VNIGRI), St. Petersburg (former – Leningrad), Russia, N 235/825.

TAXONOMIC COMMENTS

Nearly all the present day researchers point out only one species – *Liocyma fluctuosa* (Gould, 1841) – to be common for the Recent fauna. But following Savizky [1980] the species *L. hokkaidoensis* Habe, 1951, *L. aniwana* Dall, 1907, and *L. viridis* Dall, 1871 might be validly viewed, as separate ones; the shell shape and valves' outer surface sculpture pattern are considered to be the main indications. Kaseno and Matsuura [1965, pl. 14, fig. 10] think *L. aniwana* to be a separate species, too.

Like many other panarctic-circumboreal bivalves *L. fluctuosa* appear to be strongly variable. If the samples are numerous enough, the specimen variations (S.: fig.) of the shell shape and sculptural pattern (the commarginal ribs' width and height) involve the whole spectrum of indicative characters revealed for all the Recent *Liocyma*'s nominal taxa. Therefore all the latter species should be viewed as synonymous with *L. fluctuosa* (Gould, 1841). The same is true for *L. subfluctuosa* Khomenko, 1931, *L. subaniwana* Khomenko, 1931, and *Gomphina* (*Liocyma*) *fluctuosa* var. *prae fluctuosa* L. Kristofovich in Zhidkova et al., 1968, that were described in the Pliocene deposits of the Sakhalin Island, as well as for the *L. ouchiensis* Hatai et Nisiyama, 1952, and *L. sachalinensis* Arkhipova et al., [1994] from the Miocene deposits.

On the contrary the Paleogene species of *Liocyma* are easily identified and validly differ either from each other or from *L. fluctuosa*.

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