

# Recent and fossil Clinocardiinae (Bivalvia, Cardiidae) of the World. VIII. Addenda et corrigenda. Nomina dubia.

Alexander I. Kafanov

Institute of Marine Biology, Far East Branch of the Russian Academy of Sciences, 17 Palchevsky Str.,  
Vladivostok 690041, Russia <kafanov@mail.primorye.ru>

## Abstract

Final part of the paper. The taxonomical and geochronological additions and corrections are given. The taxonomical position of three nominal species belonging to Clinocardiinae - *Cardium decoratum* Grewingk, 1850, *C. boreale* Broderip et Sowerby I, 1829 non Reeve, 1845 and *C. nanum* Khomenko, 1931 - remains uncertain; they are referred to as nomina dubia.

*Key words:* Bivalvia, Cardiidae, Clinocardiinae, Recent, Cenozoic, Arctic Ocean, North Pacific, North Atlantic

This taxonomical review (Kafanov, 1998a, b-2003) began published seven years ago. One should take into account a number of additions and revisions that have been proposed since that time.

1. By courtesy of Prof. Kenshiro Ogasawara (Institute of Geoscience, University of Tsukuba), I had an occasion to reexamine virtually all type specimens of Clinocardiinae from Cenozoic deposits in Japan (Geological Institute, Faculty of Science, University of Tokyo; Institute of Geology and Paleontology, Faculty of Science, Tohoku University, Sendai; Department of Geology and Mineralogy, Faculty of Science, Kyoto University, Kyoto; Saito Ho-on Kai Museum, Sendai). This study confirmed most of the taxonomic decisions that had been made by that time. The only exception was *Cardium (Cerastoderma) iwasiroense* Nomura, 1935, which should be regarded as *Ciliatocardium* Kafanov, 1974, rather than *Keenocardium* Kafanov, 1974.

2. Schneider (1992, 1995) performed a cladistic analysis of Cardioidea Lamarck, 1809, which was based on 54 characters and 170 character states of the external shell morphology, its microstructure, and anatomy (the structure of labial palps, ctenidia, feet, siphons, tentacles, gut, and stomach). Unfortunately, the fossil members of the family Lymnocardiidae Stoliczka, 1870 were not considered in this analysis. On the other hand, lymnocardiid supraspecific taxa constitute more than a half of the total number of the supraspecific taxa of Cardioidea. That is why the conclusions on the subfamily rank of Lymnocardiinae and Tridacninae (Schneider, 1998) and on possible paraphyly of Cardiinae (Schneider, 2002) seem to be dubious.

3. A number of authors are inclined to regard *Ciliatocardium* Kafanov, 1974 and *Keenocardium* Kafanov, 1974 as subgenera

within the genus *Clinocardium* Keen, 1936, and *Yagudinella* Kafanov, 1975 as a subgenus of *Serripes* Gould, 1841. Since there are no objective criteria for assigning ranks to supraspecific taxa, this is entirely a matter of taste. However, one should keep in mind the Occam's razor, "Entities are not to be multiplied beyond necessity" ["Entia non sunt multiplicanda praeter necessitatem"] (Ueberweg, Heinze, 1898, s. 307). In any case, *Ciliatocardium*, *Keenocardium*, and *Yagudinella* constitute well-defined monophyletic lineages that have more distinct sets of diagnostic characters than *Clinocardium* s.l. and *Serripes* s.l.

4. Kafanov et al. (1999, 2000, 2001) provided a complete synonymy for all Clinocardiinae taxa described from the Cenozoic deposits of the Russian Far East.

5. *Clinocardium nuttallii* (Conrad, 1837): for the bibliography see also Evans (1972), Morris et al. (1980), and Jones and Jacobs (1992).

6. *Clinocardium pseudofastosum* (Nomura, 1937) described from the Pakhachinskaya Suite, layer 8 ("Ezhovy Horizon") of Korfa Bay (Gladenkov et al., 1987, pl. 14, fig. 2) is *Clinocardium nuttallii* (Conrad, 1837).

7. *Keenocardium californiense* (Deshayes, 1839): According to Lutaenko et al. (2003: 164-165), there are several known records of this species in both the Chinese (Xu, 1964, 1997; Qi et al., 1989; Huang, 1994) and Korean coasts (Yoo, 1976; Je et al., 1988; Kwon et al., 1993; Kwon and Lee, 1999) of the Yellow Sea. Xu (1964: 98) mentioned that *Clinocardium californiense* "... is a boreal form widely distributed in the North Pacific, and is found only in the deeper waters of the Yellow Sea occupied by the cold water mass...". Lutaenko et al. (2003) refer to some of these records

as being, in fact, individuals of *Clinocardium* (*Keenocardium*) *buelowi* (Rolle, 1896), which differs clearly from *C. californiense* in that it lacks a keel twist on the posterior area of the valve and has less numerous ribs (37-38). At least the figures provided by Qi et al. (1989, text-fig. 141), Yoo (1976, pl. 29, figs. 10-11), Kwon and Lee (1999, text-fig. on p.75) seem to show individuals of the former species and, on the other hand, the individual of *C. buelowi* depicted by Lee (1958, pl. 5, fig. 3, specimen from Yusu, Korea) resembles *C. californiense*. Coan et al. (2000) suggested that the relationship of *C. californiense uchidai* Habe, 1955 to *C. buelowi* has yet to be fully resolved. Specimens collected from Yeongil Bay, Korean coast of the Sea of Japan (East Sea) (Lutaenko et al., 2003, pl. 2, figs. 2, 4, as *Clinocardium* (*Keenocardium*) *californiense*), differ from *C. californiense uchidai* in that their shells are thin, interiorly colored, bear a lesser number (32-34) of sparsely spaced radial ribs, and the convexity/length ratio ranges from 0.52 to 0.72 (averaging 0.59). Lutaenko et al. (2003: 165) suggest that the Korean population may belong to a new species. I do not rule out this possibility and I am sure that the taxonomy of the southern populations of *Keenocardium californiense* (including its relationship to *K. buelowi*) requires more careful consideration. It is well known from the literature on genetics that relatively small isolated populations most commonly occur at the periphery of the species range. This augments the probability of segregation and progressive homozygosity for recessive mutations (Mayr, 1963).

8. ***Keenocardium californiense* (Deshayes, 1839)**: for a voluminous synonymy of the Japanese Neogene, the reader is referred to Noda et al. (1993).

9. *Clinocardium californiense buellowi* Rolle is reported for the Upper Pliocene Nakatsu Formation in the middle part of the Sagami River, Kanagawa Prefecture, Japan (Okumura and Ueda, 1998: 77, pl. 11, fig. 11).

10. ***Keenocardium blandum* (Gould, 1850)**: for additional bibliography see Semenov, 1965.

11. ***Ciliatocardium ciliatum* (Fabricius, 1970)**: for additional bibliography see Jones and Jacobs (1992).

12. ***Ciliatocardium likharevi* Kafanov in Scarlato, 1981**: Lutaenko (2002: 51, pl. 3, fig. 4) reports that this species occurs in Amursky Bay (Sea of Japan) at the average density of up to 2 specimens per m<sup>2</sup> and average biomass of 7.6 g per m<sup>2</sup>.

13. *Papyridea sertunayana* Slodkewitsch, 1938 ex Kogan, MS: must be considered as ***Ciliatocardium cf. ciliatum* (Fabricius, 1970)**.

The taxonomic position of three nominal species belonging to Clinocardiinae remains uncertain; they are referred to as nomina dubia below.

### *Cardium decoratum* Grewingk, 1850

(Fig. 1, A-D)

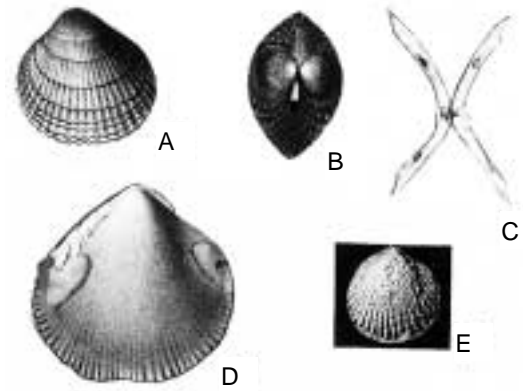


Fig. 1. A-D - *Cardium decoratum* Grewingk, 1850: reproduction of original figures (Grewingk, 1850, taf. 4, Fig. 3); left valve exterior (A), paired shell above (B), hinge (C) and left valve interior (D). E - *Cardium nanum* Khomenko, 1931: possible syntype CNIGRM no. 28 / 3456, × 2; gypsum cast of the right valve imprint.

*Cardium decoratum* Grewingk, 1850: 347, taf. 4, figs. 3a-g.

**Type-material:** The type series (partly from Voznessensky's collection) is probably deposited in Zisp. However, its identification is highly problematic, the main trouble being the absence of a separate collection of type specimens in the Zisp collection of marine molluscs, amounting to over 2000 species of Bivalvia.

**Type-locality** - Not given. It is specified from the "jüngste Tertiärformation" [the youngest Tertiary formation] of the Alaska Peninsula (Pawlow Bight), Atka, St. Paul, Unga (Sacharow Bight) and Kodiak (Igatskoj Bight) Islands. Eichwald (1871: 129) erroneously attributes Grewingk's original specimens to the Cretaceous and thinks they might be the same as *Pectunculus umbonatus* Sowerby.

**Description** (Grewingk, 1850: 347-348): "Schale gleichklappig, kreisförmig bis schief eiförmig, Buckel seitlich (um 1/7 der halben Breite) nach vorne gerückt, wenig vorstehend und etwas eingerollt. Grösste Dicke etwas über der Mitte. Lunula herzförmig, Ligament äusserlich, Schlosszähne undeutlich und gewöhnlich nur eine verdickte Wulst bemerkbar... 28-30 wenig erhobene, flache (nicht abgerundete), glatte Radiarippen sind am Buckel ein wenig schmaler als die ebenfalls glatten Zwischenfurchen, erweitern sich aber nach unten, bis sie am ausgezackten Rande die Breite der Zwischenfurchen (an alten Individuen 1.3/4 mm.) haben. Die Anwachsstreifen treten an Exemplaren von verschiedenem Alter symmetrisch auf stehen zum Rande hin dichter und folgen nach dem 7ten Anwachsstreifen fast unmittelbar aufeinander. Sie beschreiben wellenförmig oder (bei alten Individuen) winkelige Linien dadurch, dass sie auf den Rippen hinauf und in den Furchen hinabsteigen. Schale selten über 1 mm. dick, Innenseite deutlich längsgestreift und am Rand mit tieferen Furchen. Muskeleindrücke und

Manteleindruck undeutlich... "Shell equivalve, circular or oblique egg-shaped, angular posteriorly with greatest convexity at the middle of the shell. Lunula heart-shaped, ligament superficial. Teeth poorly developed and one is usual only a thickened cardinal tooth is meaning unclear. ... Radial ribs number 28-30; ribs low, flattened (not rounded), smooth. Ribs absent in umbonal area. Closer to the edges of the valve, ribs are divided by intercostae, which are 1.75 mm wide in adult specimens. Growth lines wavy, cross ribs and interspaces. The thickness of the valves is usually less than or equal to 1 mm. Ventral margin of valve crenulate. Muscle scars and pallial line poorly developed.

"Maassverhältnisse [dimensions]:

Länge [length]	Breite [height]	Dicke [convexity]	Ratio
45 mm.	48 mm.	31 mm.	1 : 1.06 : 0.66.
25 mm.	27 mm.	18 mm.	1 : 1.08 : 0.72 "

*Taxonomic notes* (see also: Kafanov, 1979): "*Cardium decoratum*" is commonly referred to in paleontological literature. It has been documented from the lower Miocene of the Alaska Gulf coast area, Miocene of Oregon, Pliocene of Alaska Peninsula and St. Paul Island, Pleistocene of Alaska Gulf coast and British Columbia (Dall, 1900, 1901, 1909, 1921; Grant and Gale, 1931), Neogene deposits of the Russian Far East (Ilyina, 1960; Zhidkova et al., 1969; Gladenkov, 1972; see also: Kafanov et al., 1999, 2000, 2001), and Japan (Nomura, 1935, Nomura and Hatai, 1936; Hatai, 1936, 1939; Kanno, 1960; Kanno and Ogawa, 1964; Amano, 1983; Noda, 1992; Amano and Sato, 1995). A careful examination of figures and descriptions suggests, however, that this name actually refers to a number of distinct forms, some of which have been overlooked by taxonomists. Some authors (Dall, 1901, 1921; Hatai, 1936) do not exclude the possibility that *C. decoratum* has not gone extinct so far, and Zhidkova et al. (1968: 103) write that extant individuals of this species occur in the Barents Sea.

Considerable debate persists concerning the taxonomic status of *Cardium decoratum*. This is largely due to great confusion and controversy over the scope, status, and nomenclature of *Clinocardium nuttallii* (Conrad, 1837), *Ciliocardium ciliatum* (Fabricius, 1780), and *Ciliocardium shinjiense* (Yokoyama, 1923), as well as over taxonomic relationships among them. Having illustrated a specimen of *C. ciliatum*, Yokoyama (1926a) gave on this basis an additional description of *C. shinjiense* from Pliocene deposits of Sado Island, Honshu and, in the same year (1926b), having mistaken a shell from Sado Island for the description of juvenile *Cardium nuttallii* Conrad in Middendorff (1849, Taf. 16), had reduced his species to a synonym of the latter.

The confusion became even greater when Grant and Gale

(1931, pl. 19, fig. 12) published their well-known review, in which they erroneously described *Cardium californiense* var. *comoxense* Dall, a local form of *Ciliocardium ciliatum* (Fabricius, 1780), as *Laevocardium decoratum*. This mistake was later repeated by a number of American, Russian, and Japanese paleontologists. Slodkewitsch (1936, 1938), followed by Ilyina [1957], erroneously identified *C. decoratum* as *C. shinjiense* and Slodkewitsch (1938: 387) came to a conclusion that *Cardium decoratum* should be rejected altogether as "insufficiently clear being inadequately represented and described, and unrestorable due to loss of the original". From the standpoint of the International Code of Zoological Nomenclature, such a procedure is totally unacceptable.

There have been no trustworthy findings of *C. decoratum* since it was described and included into the genus *Clinocardium* (Keen, 1936). It is therefore reasonable to assume that *C. decoratum* is a synonym for another species. This problem is very difficult to solve if one is limited to the data on morphological similarities and differences, since there is no available information concerning Grewingk's material sampled from the Pacific coast of North America. It seems that Grewingk studied samples collected by other persons, particularly Voznessenskiy. There are two paired valves of *Keenocardium* cf. *californiense* (Deshayes, 1839) labeled as "Ins. Kenai [Kenai Peninsula, Gulf of Alaska], Voznessenskiy, 1846" and "Mare Glac. Behringii, Voznessenskiy" (see: Kafanov, 1979, figs. 1d, e) available from the Zisp collection. They definitely match the original description of *C. decoratum*, e. g., they have sufficiently high triangular-rounded valves with highly protruding sharpened umbones, weakened hinge, scarce ribs (35-38), and poorly distinguishable radial depression on the posterior area. The major difference between this form and *C. decoratum* lies in the shape of the valves and umbones as well as in the number of ribs (35-38 against 28-30).

The following members of Clinocardiini are known from the area of Alaska Peninsula and western half of Alaska Bay: *Clinocardium nattallii* (Conrad, 1837), *Keenocardium californiense* (Deshayes, 1839), *K. blandum* (Gould, 1850), *Ciliocardium ciliatum* (Fabricius, 1780), *C. brooksi* (Clark, 1932), *C. yakatagense* (Clark, 1932), and *K. hamiltonense* (Clark, 1932). The three latter are known only from the Upper Oligocene and/or Lower Miocene Poul Creek Formation of the north coast of Alaska Bay (approximately 60 °N and 142 °W). Since, according to the original description, *C. decoratum* possesses 28-30 radial ribs, one can take no account of all the members of the genus *Keenocardium*. Thus, *C. decoratum* can be regarded as a possible synonym for *C. nuttallii* or *C. ciliatum*. It is worth noting that, when comparing *C. decoratum* with other species, Grewingk,

does not mention the two latter species, although he dwells in detail on the comparison between *Cardium decoratum* and *C. californiense* Deshayes.

The analysis of the geochronological status is also important for establishing the taxonomy of *C. decoratum*. Together with *C. decoratum*, Grewingk also found *Mya crassa* Grewingk, 1850, *M. arenaria* Linnaeus, and *Mytilus middendorffi* Grewingk, 1850. Having analyzed the Recent and Neogene *Mya* from the North Pacific, MacNeil (1965), in his monograph, drew the conclusion that *Mya crassa* Grewingk, 1850 and *M. arenaria* Linnaeus are synonyms for *Mya elegans* (Eichwald, 1871) that have been widespread from the Upper Miocene to the present. *Mytilus middendorffi* Grewingk, 1850 is a zonal species in the Middle Miocene deposits of the Pacific coast of North America (MacNeil, 1973; Addicott, 1974; Allison and Addicott, 1976). It can be therefore estimated that *C. decoratum* existed from the Middle through Upper Miocene. The earliest occurrences of *Clinocardium nuttallii* and *Keenocardium californiense* in the Cenozoic Pacific section of North America are from the Middle to Upper Miocene: the first species was found in the San Pablo Group ("Margaritan" stage, northern California), while the second one was recorded in the Empire Formation of Oregon. Thus, if one takes into account the above reasoning, *Cardium decoratum* might be considered synonymous to one of these two species. The number of "flattened (not rounded)" ribs (28-30) suggests that *C. decoratum* is more closely related to *Clinocardium nuttallii* (31-39) than to *Keenocardium californiense* (45-51); it is reasonable to classify *Cardium decoratum* Grewingk, 1850 as *Clinocardium nuttallii* (Conrad, 1837). Coan et al. (2000) also treated *C. decoratum* as a possible synonym of *Cl. nuttallii*.

#### ***Cardium boreale* Broderip et Soverby I, 1829**

*Cardium boreale* Broderip et Soverby I, 1829: 368 non Reeve, 1845, sp. 131, pl. 22.

*Type-material*: unknown. The description of this nominal species was given in the paper, whose title suggests that the type-specimens of *C. boreale* were initially deposited in the collection of the Zoological Society of London. According to Mitchell (1929), in 1851, this collection was fragmented and scattered among the British Museum (Natural History) and a number of other institutions, none of which were named. P. Russell (in his letter dated April 6, 1973), quoting one of "the oldest employees of the Department of Mollusca, British Museum (Natural History)", reported that the specimens that had been described by Broderip and Sowerby I (1829) were absent from the museum's collection. It is worth mentioning that one of the persons who studied the collections identified one of the specimens as a possible type of *C. boreale*. However, this material had been collected later (RV "Herald") and, therefore, had

no relation to the type-series (A. Blake, the letter dated October 13, 1975).

*Type-locality* - Icy Cape, Arctic coast of Alaska.

*Description* (Broderip and Sowerby I, 1829: 368): "Shell white, with a dirty brown epidermis and numerous close-set rounded ribs: the two ends nearly equal in length, the posterior being slightly angulated".

*Dimensions*:\* L = 39.4; H = 32.0; B = 11.1.

*Taxonomic notes*: It is clear that if one is limited to the description cited above and if no figures are available, a reliable identification of this nominal species is completely impossible. Nevertheless, a number of authors follow Dall (1901, p. 3) in considering this species to be synonymous to *Cardium ciliatum* Fabricius, 1780.

Based on the formal comparison between the original description of *C. boreale* and diagnostic characters of *Ciliatocardium ciliatum* (Fabricius, 1780) and *Keenocardium californiense* (Deshayes, 1839), I have elsewhere stated that *Cardium boreale* Broderip et Sowerby I, 1829 may be referred to as a senior synonym of the latter (Kafanov, 1974). In that regard, I sent a request to the International Commission on Zoological Nomenclature, which was accordingly asked:

- (1) to use its plenary powers to suppress the specific name *boreale* Broderip et Sowerby I, 1829 non Reeve, 1945, as published in the binomen *Cardium boreale*; for the purposes of the Law of Priority but not those of the Law of Homonymy;
- (2) to place the following specific name on the Official List of Specific Names in Zoology: *californiense* Deshayes, 1839, as published in the binomen *Cardium californiense*;
- (3) to place on the Official Index of Rejected and Invalid Specific Names in Zoology the name *boreale* Broderip et Sowerby I, 1829, as suppressed under the plenary powers in (1) above.

A comment by Mayr and Melville (1976) excludes the possibility of using the plenary powers for rejection of the specific name *boreale* for the purposes of the Law of Homonymy. Moreover, Heppell and Melville (1984) expressed their doubts about identifying *Cardium boreale* with *Cardium californiense* and rejected any nomenclatorial changes concerning this problem.

What are the grounds for my suggestions of synonymy between *Cardium boreale* and *Cardium californiense*? *Ciliatocardium ciliatum* (Fabricius, 1780) and *Keenocardium californiense* (Deshayes, 1839) are the only representatives of the recent and late-Quaternary Cardiidae known from the area of Icy Cape that share certain similarities with *Cardium boreale*. The former two species differ from one

\*In the original paper, the dimensions were expressed in pollices [1 pollex = 24.6 mm.].

another in the external shell sculpture. *Ciliatocardium ciliatum* has relatively sparse radial ribs, which are triangular in cross-section and bear a thin periostracal fringe, while *Keenocardium californiense* has numerous radial ribs, rounded in cross-section, without a periostracal fringe. The external sculpture of Clinocardiinae is a stable morphological character that can be used to distinguish taxa even of generic rank (see Kafanov, 1998a). According to the original description, *Cardium boreale* has “numerous close-set rounded ribs”. This allows us to safely identify this species with *Keenocardium californiense*.

What are the grounds for the objections raised by D. Heppell (Heppell and Melvill, 1984)? First, he stresses that before my request (Kafanov, 1974) appeared most authors followed Dall’s (1901) view that *Cardium boreale* Broderip et Sowerby I, 1829 must be considered as a synonym of *Cardium ciliatum* Fabricius, 1780, although there were no sufficient grounds for assuming that synonymy. It is worth noting that Dall himself was not perfectly consistent in treating this problem. A year earlier (Dall, 1900, p. 1096), he considered *C. boreale* as a possible synonym of *C. [= Keenocardium] blandum* Gould, 1850 and referred to the former species as a dubious synonym of *Cardium ciliatum*. However surprising it may seem, some American authors tend to misidentify *Cardium ciliatum* as *C. californiense*, and vice versa. For instance, MacNeil et al. (1943, p. 812, pl. 18, fig. 5) treat a typical specimen of *C. californiense* as *Cardium (Cerastoderma) ciliatum brooksi* (see Kafanov, 1999), and Dall (1900: 1093) establishes *Cardium californiense comoxense*, which is in fact identical to *C. ciliatum* (see Kafanov, 2001). Having compared the figures showing *C.*

*ciliatum* and *C. californiense* in two papers (Grant and Gale, 1931, pl. 19, figs. 11 and 16; Habe and Ito, 1965, pl. 44, figs. 2 and 3), D. Heppell (l.c.) draws the conclusion that these species cannot be clearly distinguished from one another if one uses the number of ribs as a diagnostic character. It is not always possible to accurately count the number of ribs on photographic images, as D. Heppell does, since the ribs are usually very smooth in the posterior area. On the other hand, the difference in the number of ribs is quite clear if one deals with a sufficiently large number of specimens (Table 1). In *C. ciliatum* and *C. californiense*, the cross-section shape of the ribs changes with age and quality of shell preservation. Nevertheless, the external shell sculpture of mature individuals of *C. ciliatum* (possessing shells measuring about 40 cm in length, as in *C. boreale*) can hardly be referred to as featuring “numerous close-set rounded ribs”.

Last but not least, a comparison of basic conchometric parameters among *C. boreale*, *C. californiense*, and *C. ciliatum* clearly suggests that the former two forms are more closely related to each other in terms of morphological characters. Consequently, in contrast to D. Heppell’s statement (Heppell and Melvill, 1984), *Cardium boreale* Broderip et Sowerby I, 1929 can be referred to as a possible synonym of *Cardium californiense* Deshayes, 1839, but not of *C. ciliatum* Fabricius, 1780. As to definite nomenclatorial changes, they would be premature, since there are no reliable data on the distribution of *Keenocardium californiense* (Deshayes, 1839) along the Arctic coast of Alaska.

Table 1. Comparison of the main conchometric parameters in *Cardium boreale* Broderip et Sowerby I, 1829 and related forms.

Taxa	N	H/L	B/L	R
<i>Cardium boreale</i> Broderip et Sowerby I, 1829 (original description)	-	0.81	0.28	-
<i>Cardium californiense</i> Deshayes, 1839 (lectotype)	1	0.84	0.27	47
<i>Keenocardium californiense californiense</i> (Deshayes, 1830)	60	0.88 ± 0.00	0.27 ± 0.00	39-53 (44-46)
<i>Cardium ciliatum</i> Fabricius, 1780 (lectotype)	1	0.92	0.33	35
<i>Ciliatocardium ciliatum ciliatum</i> (Fabricius, 1780)	82	0.95 ± 0.00	0.31 ± 0.00	32-38 (34-36)
<i>Ciliatocardium ciliatum tchukychense</i> Kafanov in Scarlato, 1981 (holotype)	1	0.96	0.30	34
<i>Ciliatocardium ciliatum tchukychense</i> Kafanov in Scarlato, 1981	71	0.95 ± 0.00	0.30 ± 0.00	30-38 (33-35)

Note. N - sample size, L - valve length, H - valve height, B - valve convexity, R - ribs number. For R in brackets average values are given for N, making accordingly 147, 430 and 278 specimens. Quotation of the type H/L = 0.95 ± 0.00 denotes are resulted that SD < 0.001.

***Cardium nanum* Khomenko, 1931**

(Fig. 1, E)

*Cardium nanum* Khomenko, 1931, p. 74, pl. 10, fig. 19.*Type-material*: unknown (see Taxonomical notes).*Type-locality* - Ekhabi, Okha District, northeastern Sakhalin; Nutovskaya or Nadnutovskaya Suite, Pliocene.

*Description* (Khomenko, 1931, p.74): "Shell small, swollen, almost round and equilateral. Posterodorsal margin slightly convex, long; the posterior margin almost straight, forms obtuse angles both with posterodorsal and regularly rounded ventral margin; almost perfectly straight anterior margin also forms obtuse angles both with ventral and slightly convex anterodorsal margin. Umbo small, swollen, bent. The feebly marked crest passes from umbo to posteroventral corner. Ribs, 21 in number, have rounded crests and exhibit a hardly detectable decrease in size behind beforehand [meaning unclear]. Intercostae are significantly narrower than ribs. There are periodical growth-lines."

*Taxonomical notes*. Malchevskaya (1985, p. 218) considered specimen CNIGRM no. 28/3456 as the holotype of this species. This specimen is a gypsum cast of the right valve imprint that bears a label with the legend " *Cardium nanum* sp. nov. "written by Khomenko. In actual fact, it differs significantly from the original description and figure. The most significant difference concerns the body size. The original description contains no indication of size; however, the legend to pl. 10 suggests that fig. 19 is a life-sized image of the animal. Specimen CNIGRM no. 28/3456 is twice smaller: L = 6.4; H = 6.4; D = about 2.5; and A = 2.8 mm. Moreover, when compared to the original description and figure, specimen CNIGRM no. 28/3456 appears to have a higher, more rounded shell, with a clearly seen anterior (but not posterior) keel twist, and more numerous ribs (24-25 versus 21).

In conclusion it may be therefore said that specimen CNIGRM no. 28/3456 cannot be definitely identified as the species described by Khomenko. One can only clearly state that both forms are juveniles of some species of the genus *Clinocardium*.

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