# STUDIES ON THE MOLLUSCAN FOSSILS FROM HOKKAIDO

## Part II. Genera *Yoldia* and *Portlandia*

By

Satoru UOZUMI

(With 7 Plate and 3 Text-Figure)

Contribution from the Department of Geology and Mineralogy, Faculty of Science, Hokkaido University, Sapporo; No. 677

CONTENTS



Part I: Fossil species of Genus *Mercenaria* from the Cenozoic Deposits of Hokkaido; *Trans. Proc. Palaeont. Soc. Japan, N.S. No. 19.*

## I. Introduction

Although a considerable number of fossil species belonging to the genera *Yoldia* and *Portlandia* have been already described from the Cretaceous and the Cenozoic formations in Japan, many are probably still to be reported; especially in Hokkaido such a group of pelecypods has yet been little known. Besides, it seems to the writer, that there is considerable confusion, not only in the formerly presented classification in concern with the fossil species of this group, but also in their geological range.

Now, in the Department of Geology and Mineralogy, Faculty of Science, Hokkaido University, there are stored numerous Molluscan fossils which have been collected from various localities in Hokkaido by the constant efforts of the members of the Department of Geology and Mineralogy, Hokkaido University, including the present writer himself and also sent by the courtesy of numerous geologists, in the Sapporo Branch, Geological Survey of Tokyo, the Sumitomo Coal Mining Company and the Mitsui Coal Mining Company.

In the course of the present writer's study on these fossils, it became quite evident that the species assignable into the genera *Yoldia* and *Portlandia* may be quite reliable for the stratigraphical correlation of the Tertiary sediments in Hokkaido, because they are so abundantly found in the various horizons both specifically and individually. It is on this phase of the subject that the writer wishes here to treat.

The species to be described in this paper count as many as 24, in which 7 species, 1 subspecies and 2 variety are new to science, but five forms are specifically indeterminable.

## II. Systematic arrangement of Hokkaido species

Genus *Yoldia* MÖRCH
- Subgenus *Yoldia* (*sensu stricto*)
  - *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA
  - *Yoldia* (*Yoldia*) *beremis* UOZUMI n. sp.
  - *Yoldia* (*Yoldia*) *biremis* UOZUMI n. sp.
  - *Yoldia* (*Yoldia*) *saitoi* UOZUMI n. sp.
  - *Yoldia* (*Yoldia*) *akanensis* UOZUMI n. sp.
  - *Yoldia* (*Yoldia*) sp.
- Subgenus *Cnesterium* DALL
  - *Yoldia* (*Cnesterium*) *notabilis* YOKOYAMA
- Subgenus *Orthoyoldia* VERILL et BUSH
  - *Yoldia* (*Orthoyoldia*) *haborensis* UOZUMI n. sp.
  - *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA
- Subgenus *Tepidoleda* IREDALE
  - *Yoldia* (*Tepidolea*) *sobrina* TAKEDA
- Subgenus *Kalayoldia* GRANT and GALE
  - *Yoldia* (*Kalayoldia*) *macroschema* UOZUMI n. sp.

Genus *Portlandia* MÖRCH
- Subgenus *Portlandella* STEWART
  - *Portlandia* (*Portlandella*) *watasei* (KANEHARA)

Prior to the writer's present study, species of *Yoldia* and *Portlandia* have been classified by T. KURODA (1929), K. OYAMA (1951), T. HABE (1950), T. MIZUNO (1953) and the author (1955) himself into the following subgenera:

Genus *Yoldia* MÖRCH 1857
- Subgenus *Yoldia* (s. s.)
- *Cnesterium* DALL 1898
- *Orthoyoldia* VERILL & BUSH 1897
- *Tepidoleda* IREDALE 1939
- *Kalayoldia* GRANT & GALE 1931

Genus *Portlandia* MÖRCH 1857
- Subgenus *Portlandella* STEWART 1930
- *Yoldiella* VERILL & BUSH 1897
- *Megayoldia* VERILL & BUSH 1897.

*Portlandia* (*Portlandella*) *watasei* var. *semiovata* UOZUMI n. var.
*Portlandia* (*Portlandella*) *watasei* subsp. *ogasawarai* UOZUMI n. subsp.
*Portlandia* (*Portlandella*) *hakobutiensis* (NAGAO et OTATUME)
*Portlandia* (*Portlandella*) *kakimii* UOZUMI n. sp.
*Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* UOZUMI n. var.
*Portlandia* (*Portlandelle*) cfr. *japonica* (ADAMS et REEVE)
*Portlandia* (*Portlandella*) sp.
*Portlandia* (*Portlandella*) sp.

Subgenus *Megayoldia* VERILL et BUSH
*Portlandia* (*Megayoldia*) *thraciaeformis* (STORNER)
*Portlandia* (*Megayoldia*) *breviscapha* (YOKOYAMA)
*Portlandia* (*Megayoldia*) *ovata* (TAKEDA)
*Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI n. sp.
*Portlandia* (*Megayoldia*) sp.

## III. Geological distribution of genera and species

Of this group of pelecypods, the subgenus *Portlandella* may be the first in appearance in Hokkaido: NAGAO and OTATUME described three species belonging to this subgenus from the Upper Cretaceous Hakobuchi formation, although representatives are also abundantly found either in Palaeogene or Neogene deposits and further, a number of species are known to live in the present sea around Hokkaido.

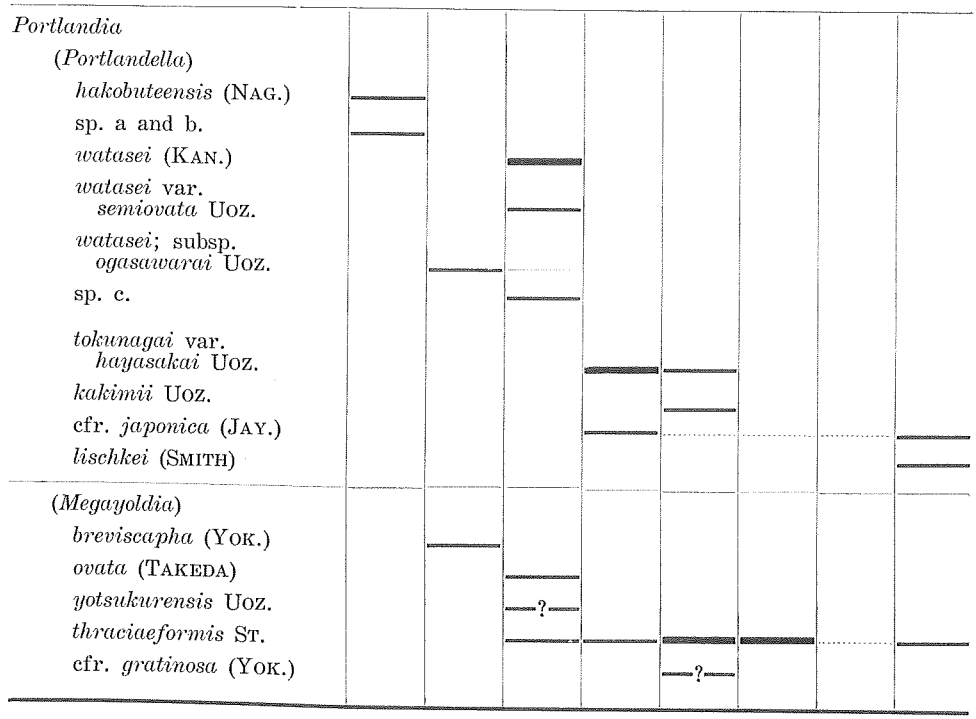
The representatives of *Megayoldia*, also a subgenus of *Portlandia*, show similar geological distribution to the preceeding subgenus, except for the Cretaceous in age. Specimens of this subgenus are found most abundantly in the Pliocene deposits in Hokkaido in respect to both number of species and of individuals. The subgenus *Yoldia* first appeared in the Poronai age and shows a long geological range until the present day, at least in Hokkaido: the subgenus *Tepidoleda* also appeared in the Poronai age but no representative of the latter has ever been found from the Tertiary formations later than the Poronai age in Hokkaido, although one species referable in this subgenus is believed now to live in the sea around the Japanese islands.

*Portlandella* and *Yoldia* (s.s.) which may have been guite flourishing in Hokkaido prior to the Neogene age as above stated, seem to have somewhat declined. They were replaced by the species of such subgenera as *Cnesterium* or *Orthoyoldia* since the early Miocene, which ranging from Miocene to the present day.

While *Kalayoldia* is known to occur only from the Pliocene deposits in Hokkaido at least at the present moment, the genotype of this subgenus,

TABLE 1. Geological distribution of species in Hokkaido

| Geological Occurrence / Species and Varieties | Hetonaian (Cretaceous) | Ishikarian (Eocene?) | Poronaian (Oligocene) | Kawabataian (Lower-Middle Miocene) | Wakkanian (Upper Miocene) | Takikawaian (Pliocene) | Shishinaian (Pleistocene) | Recent |
|---|---|---|---|---|---|---|---|---|
| *Yoldia* | | | | | | | | |
| (*Yoldia*) | | | | | | | | |
| *laudabilis* YOK. | | | ▬ | | | | | |
| *akanensis* UOZ. | | | ▬ | | | | | |
| *saitoi* UOZUMI | | | ▬ | | | | | |
| *biremis* UOZUMI | | | | ▬ | | | | |
| *uranoi* UOZUMI | | | | ▬ | | | | |
| *amygdalea* (VAL.) | | | | | | | | ▬ |
| *limatula* SAY | | | | | | | | ▬ |
| *kikuchii* KUR. | | | | | | | | ▬ |
| (*Orthoyoldia*) | | | | | | | | |
| *haborensis* UOZ. | | | | ▬ | | | | |
| *sagittaria* YOK. | | | | | ▬ | | | |
| (*Tepidoleda*) | | | | | | | | |
| *sobrina* TAKEDA | | | ▬ | | | | | |
| (*Kalayoldia*) | | | | | | | | |
| *macroschema* UOZ. | | | | | | ▬ | | |
| (*Cnesterium*) | | | | | | | | |
| *notabilis* YOK. | | | | ▬ | | | | ▬ |
| *sissurata* DALL | | | | | | | | ▬ |
| *johanni* DALL | | | | | | | | ▬ |
| *excavata* DALL | | | | | | | | ▬ |
| *seminuda* DALL | | | | | | | | ▬ |




*Yoldia* (*Kalayoldia*) *cooperi* is said to have lived only on the northwestern coast of California.

Before going further, the present writer wishes briefly to recount the characteristic feature of this group of species for each geological age:

Cretaceous—Eocene (Upper Cretaceous—Lower Ishikari formation) species are characterized by the possession of comparatively smaller sized shells as a whole. The representatives are the following: *Portlandia* (*Portlandella*) *hakobutiensis* (NAGAO et OTATUME), *Portlandia* (*Megayoldia*) *breviscapha* (YOKOYAMA) and *Portlandia* (*Portlandella*) *watasei* subsp. *ogasawarai* UOZUMI.

In the Oligocene (Poronai formation) age, this group of pelecypods have been much differentiated either subgenerically or specifically in the sea water in and around Hokkaido. They were specifically quite few in number and relatively smaller in sizes in the Cretaceous and Eocene age, while since the Poronai age, a great number of new forms have appeared with a considerable number of individuals; moreover, these species of this age seem to show fairly large variations in every respect. The representatives of this age are the following; *Portlandia* (*Portlandella*) *watasei*

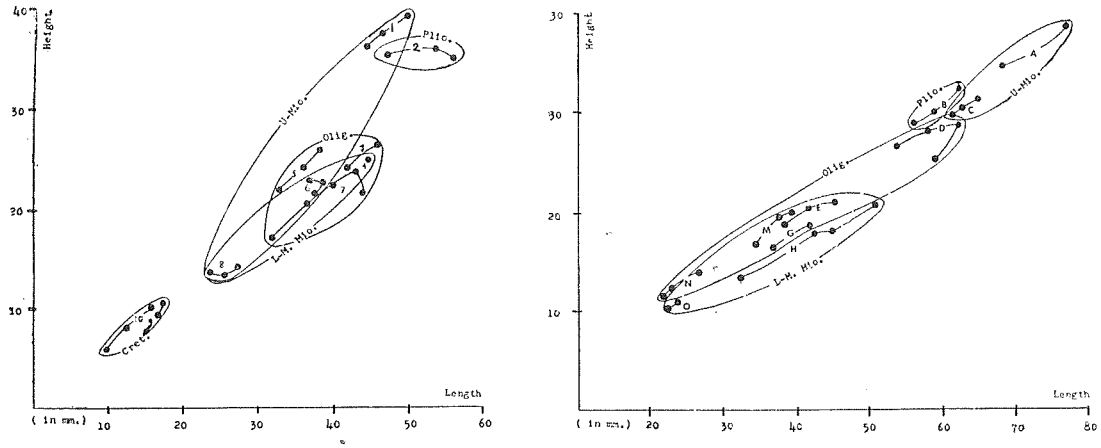
(KANEHARA), *Portlandia* (*Portlandella*) *watasei* var. *semiovata* UOZUMI, *Portlandia* (*Megayoldia*) *ovata* (TAKADA), *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI, *Yoldia* (s.s.) *laudabilis* YOKOYAMA, *Yoldia* (s.s.) *saitoi* UOZUMI, and *Yoldia* (*Tepidoleda*) *sobrina* TAKEDA.

On the early and middle Miocene species, the most characteristic representatives are such forms as those which shells ornamented by quite peculiar sculptures like *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* UOZUMI as well as *Portlandia* (*Portlandella*) *kakimii* UOZUMI, and a few species of *Cresterium*.

The first mentioned new variety of Miocene species is the form having a shell decorated by divaricated ribs, while *Portlandia* (*Portlandella*) *kakimii* UOZUMI and species of *Cnesterium* are characterized in having shells sculptured by concentric ribs, somewhat oblique to the growth lines.

At present the former two species above-mentioned are known to occur in Hokkaido only from early to later Miocene deposits.

Subgenus *Cnesterium* has numerous representatives in the Younger Neogene deposits, besides the early and middle Miocene forms; further




**Text-Fig. 1.** Diagrams showing the size of species of *Yoldia* (Right) and *Portlandia* (Left) in representive horizons of Hokkaido.

The size of specimens are taken the average dimension of adult specimens and dimensions of largest one among the writer's collection.

Cret.: Cretaceous; Oligo.: Oligocene; L-M. Mio.: Lower-Middle Miocene; U. Mio.: Upper Miocene; Plio: Pliocene.

1: *Portlandia* (*M.*) cfr. *gratinosa;* 2: *P.* (*M.*) *thraciaeformis;* 3: *P.*(*M.*) *yotsukurensis;* 4: *P.* (*M.*) *thracfaeformis;* 5: *P.* (*M.*) *ovata;* 6: *P.* (*P.*) *tokunagai hayasakai;* 7: *P.* (*P.*) *watasei;* 8: *P.* (*P.*) *kakimii;* 9: *P.* (*P.*) *hakobutiensis* 10: *P.* (*P.*) *sp.* a and b.; A: *Y.* (*Y.*) *sp.;* B: *Y.* (*Y.*) *macroschema;* C: *Y.* (*O.*) *sagittaria;* D: *Y.* (*T.*) *sobrina;* E: *Y.* (*Y.*) *laudabilis;* G: *Y.* (*Y.*) *uranoi;* H: *Y.* (*Y.*) *biremis;* M: *Y.* (*C.*) *notabilis* and *Y.* (*Y.*) *saitoi;* N: *Y.* (*Y.*) *akanensis;* O: *Y.* (*O.*) *haborensis.*

living species belonging to this subgenus are also known in the Okhotsk sea to the north of Hokkaido.

Late Miocene—Early Pliocene (Wakkanai—Takikawa formation) species are characteristic in having shells quite large in size; among them are such species as *Yoldia* (*Kalayoldia*) *macroschema* UOZUMI and *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA. The former denotes the Early Pliocene (Takikawa formation) in age, while the latter Late Miocene (the so-called hard shale formation, Wakkanai series).

*Megayoldia thraciaeformis*, likewise abundantly found in deposits ranging from Late Miocene to Early Pliocene in age, is also a quite large-sized species, although it is known to thrive in the present day.

Pleistocene (Shishinai and Kushiro formations) species of this group seem to be quite rare, only *Yoldia sagittaria* YOKOYAMA was once listed by some geologists in a collection of molluscs from the Shishinai formation, but this species may perhaps be *Yoldia* (s.s.) *limatula* SAY or *Yoldia amygdalea* (VAL.). It is quite doubtful whether *Yoldia sagittaria* YOKOYAMA was actually found from this formation.

## IV. Acknowledgments

Here the writer wishes to record his warmest thanks to Professor MASAO MINATO of Hokkaido University for constant encouragement and for kindly reading this manuscript. Acknowledgements are also due to Dr. TADASHIGE HABE of Kyoto University, HIDEZO TAKEDA of Imperial Petroleum Co. Ltd. and to Dr. TOKUYUKI MIZUNO of the Geological Survey of Japan, Tokyo, for their kind advice relative to this study. Thanks are also due to Professors JIRO MAKIYAMA of Kyoto University, KAZUO HUJIOKA of Akita College, Assistant Professor YASUHIKO KAMADA of Nagasaki College, Dr. ISAMU KOBAYASHI, TOSHIHIRO KAKIMI, and TAKESHI UEMURA of the Geological Survey of Japan, for kindly placing their specimens at the writer's disposal for study, and to Messrs. MASARU MATSUI and TSUTOMU FUJIE of Hokkaido University for generously affording good opportunities for fruitful discussions and for allowing the free use of their private collections.

## V. Description of species

Genus *Yoldia* MÖRCH 1857

Subgenus *Yoldia*

## *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA

Pl. 5, Fig. 1, 1a, 4, 5, 9, 9a.

1924. *Yoldia laudabilis* YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 3, p. 22, pl. 4, figs. 11, 12.
1928. *Yoldia* sp. NAGAO: Sci. Rep. Tohoku Imp. Univ. Ser. 2, Vol. 12, no. 1, p. 24, pl. 20, figs. 5, 6, 9.
1934. *Yoldia asagaiensis* MAKIYAMA: Mem. Coll. Sci. Kyoto Imp. Univ. Art. B, Vol. 10, no. 2, pt. 6, pp. 129–130, pl. 3, figs. 1–4.
1954. *Yoldia laudabilis* MIZUNO: Shinseidai no Kenkyu (Studies of the Cenozoic) No. 20, pp. 13–19, pl. 1, figs. 8–21.
1955. *Yoldia asagaiensis* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku Vol. 4, Ser. C, no. 29, pp. 80–81, pl. 1, figs. 16, 17, 21.
non. 1934. *Yoldia laudabilis* MAKIYAMA: Mem. Coll. Sci. Kyoto Imp. Univ. Art. B, Vol. 10, no. 2, pt. 6, pp. 131–132, pl. 3, figs. 2, 5, 6.
non. 1955. *Yoldia laudabilis* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku Vol. 4, Sec. C, no. 29, pp. 79–80, pl. 1, figs. 20, 22.

*Discussion of synonymy*:—It was YOKOYAMA who first established this species, on the basis of rather imperfect specimens which were collected from the Asagai formation in the Jo-ban coal-field. His description was as follows; "Shell transversely elongated, shortly lanceolate, compressed, nearly equilateral, with the anterior side slightly shorter than the posterior, rounded in front, subrostrate and obliquely truncate behind, with the postero-dorsal corner pointed; postero-dorsal border slightly concave, ventral broadly arched and going over gradually into anterior as well as posterior border without making any perceptiable angle. Surface smooth, only with concentric lines of growth. Beaks small. Lunula longly lanceolate. Length, height and thickness in the ratio of 10:5.3:2.6. the specimens figured is about 40 millim. long."

MAKIYAMA (1934) supplemented YOKOYAMA's description for this species basing this additions on specimens brought from the same formation; he assigned this species into the group of *Yoldia lischei*. In the same paper, MAKIYAMA proposed to establish a new species under the name of *Yoldia asagaiensis*, specimens collected in association with *Yoldia laudabilis* supplying the type. Since then MAKIYAMA's species *"asagaiensis"* has usually been regarded to be quite like *Yoldia laudabilis*, nevertheless each of them have been long accepted in the circle of Japanese palaeontologists as a distinct species, until the time when MIZUNO in 1954 claimed specific identity between *Yoldia laudabilis* YOKOYAMA and *Yoldia asagaiensis* MAKIYAMA.

Recently the writer has examined several specimens collected by him-

self from the Asagai formation at the type locality, which are recognizable with certainty to be conspecific with *Yoldia laudabilis*, as will be explained later. Further, the present writer directly compared them with two specimens which were kindly sent to hem by Dr. MAKIYAMA who also named them as *Yoldia laudabilis*. According to the accompanying label, these two specimens are a part of material basing on which Dr. MAKIYAMA in 1934 described the so-called *Yoldia laudabilis* YOKOYAMA.

However, the fossils designated by MAKIYAMA to be *Yoldia laudabilis* seem to the writer to be considerably different from the holotype of that species in some important points and may be specifically different from the writer's specimens now under consideration.

The so-called *Yoldia laudabilis* of MAKIYAMA should be assigned into subgenus *Megayoldia* of genus *Portlandia*, while the holotype of YOKOYAMA's species must be regarded to belong to the Genus *Yoldia* (s.s.).

Such being the case, the shells of MAKIYAMA's *Yoldia laudabilis* should be distinguished either generically or specifically from *Yoldia laudabilis* of YOKOYAMA and should have their own specific name, for which the present writer proposed the new name, *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI.

As before mentioned, *Yoldia asagaiensis* MAKIYAMA was considered by MIZUNO to be nothing but *Yoldia laudabilis* of YOKOYAMA, and the present writer was and is now of the same opinion in this respect.

Notwithstanding all this, HIRAYAMA in 1955 claimed that *Yoldia asagaiensis* of MAKIYAMA is specifically distinguishable from *Yoldia laudabilis* YOKOYAMA. Besides this, there seems to be much confusion in the specific conception of HIRAYAMA regarding *Yoldia laudabilis* YOKOYAMA, because he considered such forms as the so-called *Yoldia laudabilis* of MAKIYAMA to be specifically identical with *Yoldia laudabilis* of YOKOYAMA on the one hand, while on the other hand, he also grouped such forms as those specifically indistinguishable from YOKOYAMA's *laudabilis* into the *Yoldia asagaiensis* of MAKIYAMA. Indeed there is certainly a considerable variation in the so-called *Yoldia asagaiensis* of HIRAYAMA, but the *Yoldia asagaiensis* of MAKIYAMA should be specifically not separable from YOKOYAMA's *laudabilis*. Further HIRAYAMA's conception regarding *Yoldia laudabilis* is by no means acceptable: YOKOYAMA's *laudabilis* should be considered to belong to Genus *Yoldia* (s.s.), while HIRAYAMA's *laudabilis* definitely belongs to Genus *Portlandia* (*Megayoldia*).

Thus the present writer believes that the specimens, listed as *Yoldia laudabilis* or *asagaiensis* in the various publications must be divided into two species, *laudabilis* and *yotsukurensis* respectively, and "*asagaiensis*"

must be regarded synonymous with *laudabilis* as repeatedly stated .

*Description of Topotype*:—The following description is based upon the well-preserved topotype specimen collected at the sea-cliff near Yotsukura.

Shell thin, moderate in size for this genus, flattened; lanceolote in outline; beaks situated about midway of the length of the shell, not highly elevated; posterior portion attenuated and its end somewhat acuminate; anterior dorsal margin slightly convex, merging smoothly into the anterior margin which is regularly rounded; posterior dorsal margin slightly concave and gently sloped downwards; ventral margin smoothly rounded and on posterior one-half of shell slopes progressively upwards towards the posterior end. Lunule not very distinct, but escutcheon well defined, long and narrow, rather strongly depressed, pouting a dorsal edge; surface of shell smooth, except for fair incremental lines. The pair of lines running from beaks to anterior ventral corner, are rather weak. Anterior adductor indistinct; posterior one deeply impressed, trigonal in outline; pallial sinus deep, extending to about middle of shell. Taxodont teeth about 29 in anterior and 16 in posterior.

Dimensions of topotype illustrated in this paper, 35.8 millim. in length; height 18.5 millim.

*Specimens from Hokkaido*:—The specimens designated to be conspecific with the topotype, come abundantly from the Poronaian (Onbetsu and Shitakara formations in Kushiro coal-field). The writer has collected many specimens from various localities in Kushiro coal-field, most of which are unfortunately fragmentary and much deformed. But a few well preserved specimens are illustrated in this paper.

In general, the shells of this species found in Hokkaido seem to be somewhat larger than the topotype specimen from Asagai, Jo-ban coal-field, and the pair of lines on the anterior surface is seemingly more distinct than that of the Asagai specimen. Besides, there are a few Hokkaido specimens in which the highest portion is situated at the anterior part, although it is usually positioned at nearly the middle of the shell in most specimens.

Dimensions of *Yoldia* (*Yoldia*) *laudabilis* from Hokkaido.

| | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12272 | 39.5 | 19.3 | 7.6 |
| 12213 | 45.0 | 21.4 | 9.1 |
| 12282 | 41.0 | 20.1 | ? |
| 12215 | 39.4 | 17.2 | ? |

| | | | |
|---|---|---|---|
| 12287a | 37.2 | 19.5 | ? |
| b | 36.7 | 18.7 | ? |
| c | 36.4 | 19.0 | ? |
| 12216 | 35.1 | 18.5 | ? |

*Occurrence*:—5 km. upstream of the Charo-gawa above the Kamicharo primary school, Kamicharo, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov.; Upper course of the Nakanosawa, Shin-Machi, Yubetsu coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov. (Loc. No. 164, 163*) ; Middle course of the Teshibetsu-gawa, Shin-Machi, Yubetsu Coal-Mine, Akan-Gun, Akan-Mura, Kushiro Prov. (Loc. No. 146, 148).

Repository:—Holotype (Figured in this paper Pl. 3 Figs. 9; 9a) preserved in the Geological Survey of Japan, was destroyed during World War II.

*Neotype*:—Tokyo University No. ?

*Topotype*, figured in this paper: U. H. Reg. No. 12216.

*Specimens from Hokkaido*:—U. H. Reg. No. 12210-12215, 12260.

*Geological age*:—Onbetsu and Shitakara formations: Oligocene.

*Comparison*:—This species is quite similar to *Yoldia* (*Yoldia*) *kikuchii* KURODA (1929) described from Toyama Bay, off the city of Toyama in respect to the outline of shells. But *Yoldia* (*Yoldia*) *laudabilis* is easily separable from the latter in having larger shells, the anterior ventral margin of which is wrinkled by a pair lines. The escutcheon is relatively smaller and more narrow in *Yoldia* (*Yoldia*) *laudabilis* and more slightly pouting, compared with that of the latter. Besides, *Yoldia* (*Yoldia*) *kikuchii* KURODA seems to have more numerous teeth than *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA. Upon examining the specimens of *Yoldia* (*Yoldia*) *kikuchii*, collected from the Okhotsk sea, the writer found about twenty taxodont teeth in posterior row and about twenty-two teeth in anterior one.

*Yoldia* (*Yoldia*) *saitoi* newly proposed in this paper is also somewhat allied to this species, but the former is specifically distinct from the latter in having shells attenuated in posterior portion, more pointed in posterior end, and almost horizontal in posterior dorsal margin.

### *Yoldia* (*Yoldia*) *akanensis* UOZUMI n. sp.

Pl. 4, Figs. 1, 1a, 2, 3, 10.

Shell thin, small in size, nearly equilateral; anterior dorsal margin

* Locality number, used throughout in this paper, shown on Text-figure 2 which is illustrated by MATSUI, FURUHATA and FUJIE (1953: Geology of Yubetsu Coal-field, Kushiro Province; *Bull. Geol. Committee, Hokkaido* No. 22, p. 5.

slightly convex and sloping downwards towards the anterior end; anterior end regularly rounded and merging into arcuate ventral margin; posterior dorsal, slightly concave; posterior end rostrated and pointed. On the left valve, a narrow and distinct pair of lines runs from beaks to anterior ventral corner which becomes more distinct and is slightly separated near the ventral margin. Surface of the shell is sculptured by concentric incremental lines. Beaks not very prominent; lunule linear; escutcheon very distrinct and lanceolate in form, separated by weak edge from main disk, and it extend from beak to the point 70 per cent of the length of posterior dorsal margin.

| *Dimensions*:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12221 (left valve) | 20.0 | 11.1 | 1.1 |
| 12220 (right valve) | 26.4 | 14.8 | 2.2 |
| 12218 (left valve) | 27.4 | 14.7 | 2.1 |
| 12219 (both valve) | 20.7 | 11.6 | ? |

*Occurrence*:—5 km. upstream from the Kamicharo Primary school, in the Charo-Gawa, Kamicharo, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov. (439°N, 144°E: Type locality); Middle course of the Teshibetsu Gawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov. (Loc. No. 142).

*Repository*:—Holotype: U.H. Reg. No. 12221; Paratype: 12220, 12218, 12219.

*Geological age*:—Onbetsu formation: Oligocene.

*Comparison*:—This species somewhat resembles *Yoldia* (*Yoldia*) *kikuchii* in general appearance but differs from it in exhibiting a more acute posterior termination of the shells and in having a smaller escutcheon than the corresponding features of the latter.

### *Yoldia* (*Yoldia*) *saitoi* UOZUMI n. sp.

Pl. 4, Figs. 8, 8a, 9.

Shell moderate in size, thin, cuneiform in outline; beaks slightly anterior to the middle, not very prominent; anterior dorsal margin short, slightly arched, passing gradually into the anterior margin which is regularly rounded; posterior dorsal margin subhorizontal, or slightly concave, posterior end sharply pointed; ventral margin broadly rounded and on the posterior part, sloping steeply upwards towards posterior end. Surface covered by fine incremental lines; lunule unobservable; escutcheon well defined, narrow-lanceolate in form, bounded by sharp dorsal keels; a pair of lines running from beaks to posterior ventral corners indistinct.

| *Dimensions*:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg .No. 3761 (right valve) | 34.8 | 16.8 | 3.1 |
| 12217 (left valve) | 34.4 | 16.3 | ? |

*Occurrence*:—Middle course of the Honbetsu-Gawa, near Ikushunbetsu primary school, Ikushunbetsu-Machi, Sorachi-gun, Ishikari Prov. (Type locality) ; Cliff of the Ikushunbetsu-Gawa between Ikushunbetsu and Yayoi, Sorachi-Gun, Ishikari Prov.

*Repository*:—Holotype: U.H. Reg. No. 3761; paratype: 12237.

*Geological age*:—Poronai formation: Oligocene.

*Comparison*:—This species bears a shell somewhat like that of the so-called *Yoldia sagittaria* YOKOYAMA, described from Haboro coal-field, Hokkaido. However, the specimens described from Haboro are very imperfect and not to be regarded as conspecific with the holotype of *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA. Yet, they may be specifically identical with *Yoldia* (*Yoldia*) *biremis* UOZUMI, newly proposed by the writer in the present paper, the shell of the latter being transverse elongate in outline and ornamented by fine concentric sculpture.

*Yoldia* (*Yoldia*) *saitoi* also much resembles *Yoldia* (*Yoldia*) *laudabilis* as before mentioned, but this species is also distinguishable from the latter in having the shell subhorizontal in posterior dorsal, highest at the portion anterior to the median line, and more attenuated in the posterior portion. While *Yoldia* (*Kalayoldia*) *macroschema* UOZUMI somewhat resembles the present species, the former is easily separable from the latter in having large shell, distinct pair lines and donwwards sloping posterior dorsal margin. From *Yoldia anastasia* KHOMENKO (1931) described from the Tertiary of eastern Sakhalin, this species is also distinguishable in that the shell form is more inequilateral.

### *Yoldia* (*Yoldia*) *biremis* UOZUMI n. sp.

Pl. 4, Figs. 4, 5, 5a, 6, 12.

?1929. *Yoldia sagittaria* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Ser. 2, Vol. 2, p. 203, pl. 51, fig. 8. (non. YOKOYAMA 1925, 1926a, 1929).

Shell moderate in size, transversely elongate in form; beaks not prominent, situated in about central portion of the shell, opisthogyrate; anterior dorsal margin nearly straight, long and gradually passing into the anterior margin, which is rather narrowly rounded; Ventral margin broadly arched; posterior margin attenuated, and pointed at end; posterior dorsal margin slightly concave, and sloping downwards except for the posterior half of it which is nearly horizontal. Surface of the shell covered

by well-marked concentric lines which are somewhat irregular.

| *Dimensions*:—(in mm) | Length | Height | Thickness | Length/height |
|---|---|---|---|---|
| U.H. Reg. No. 11222 | 51.1 | 20.7 | ? | 2.47 |
| 11210 | 44.1 | 18.1 | ? | 2.44 |
| 6005a | 42.5 | 18.0 | ? | 2.36 |
| b | 32.0 | 12.0 | ? | 2.67 |
| 12291 | 25.7 | 12.6 | 6.0 | |
| 12292 | 31.2 | 13.4 | 3.5 | |

*Occurrence*:—The Maruyama-Sawa, a branch of the Kotanbetsu-gawa, Haboro-Machi, Tomamae-Gun, Teshio Prov. (Type locality); The Poronai-sawa, Asahi Coal-Mine, Iwamisawa-City, Ishikari Prov.

*Repository*:—Holotype. U.H. Reg. No. 12291: paratype: 11210, 1005, 11222.

*Geological age*:—Takinoue and Chikubetsu formations: Lower—Middle Miocene.

*Remarks* and *comparison*:—At first the present writer considered these specimens now under consideration to be assignable into the subgenus *Cnesterium* DALL. A few species of this subgenus were already known to occur from the Neogene deposits of Hokkaido.

Upon minute examination of specimens, however, it becomes evident that the surface of the shell is not ornamented by oblique lines.

These specimens, now at hand, are somewhat like *Yoldia* (*Cnesterium*) *notabilis* in outline, but the shells are more elongate in form and are covered by distinct concentric ribs; shells are not covered by distinct oblique lines, if present as in the case in *Yoldia* (*Cnesterium*) *notabilis*. The ratio of length/height of the shell in *Yoldia* (*Cnesterium*) *notabilis* is about 2.00.

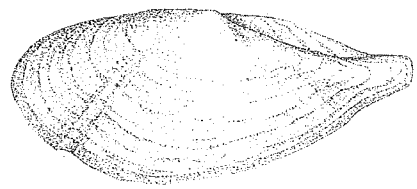
*Yoldia* (*Orthoyoldia*) *iwatensis* HATAI (1940) is also allied with the species now in hand, especially in having shells quite elongate in form, but the former is distinguished from the latter by its rounded posterior extremity.

The specimens described and illustrated by SLODKEWITSCH (1936) under the name *Yoldia longissima* seem to be imperfectly preserved, and accordingly they may be not comparable in detail with any species. However, *Yoldia longissima* apparently somewhat resembles the present specimens on the whole, especially in outline of its shell. However, the Japanese specimens present a slightly more transverse appearance than the Russian species, and may be specifically distinct from the latter.

*Yoldia* (*Yoldia*) *uranoi* UOZUMI n. sp.

Pl. 4, Figs. 11, 14

Shell moderate in size, thin, narrow and abruptly attenuated; beaks opisthogyrate, near the middle of shell; posterior dorsal margin slightly concave, nearly equal in length with anterior dorsal margin, which is gently convex. Posterior end acutely rostrate and pointed; anterior margin regularly rounded; ventral margin, broadly rounded in general appearance, but the ventral margin on the anterior of shell is wrinkled by a distinct pair of lines running from the beaks to anterior ventral corner,



Text.Figure 2. *Yoldia* (*Yoldia*) *uranoi* UOZUMI *nov.*

while ventral margin in portion near the posterior end is slightly concave, thus posterior end assumed to have been produced into a rostrum. Lunule elongate lanceolate in outline, but not very distinct; escutcheon wider and longer than lunule, and pouting prominently. Surface smooth, except for fairly weak lines of growth. Interior not exposed.

| *Dimensions*:—(in mm.) | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12245a | 36.0 | 15.7 | ? | 17/36 |
| b | 41.8 | 18.2 | ? | 18.2/41.8 |

*Occurrence*:—Noya, in middle course of the Shibechari-Gawa, Shizunai-Machi, Hidaka Prov. (Type locality).

*Repository*:—Holotype, U.H. Reg. No. 12245a; paratype: 12245b.

*Geological age*:—Noya formation: Middle Miocene.

*Comparison*:—This species may be quite unique in having shells with characteristic rostrum; it is easily distinguishable from all hitherto known species from Japan. However, the imperfect specimens of the species, especially those lacking the posterior portion of shell, might be mistaken for such species as *Yoldia* (*Yoldia*) *biremis* UOZUMI or *Yoldia* (*Yoldia*) *laudablis* YOKOYAMA. Nevertheless, this species is recognizable as different from the latter two species—even though this view is based on such imperfect material—because the escutcheon area of the former is fairly wider than that of the latter, which is not sharply bounded from the main disk of the shell by the dorsal keel in the present species.

* B. P., abbreviation for beaks-distance (stated as a fraction of the total length). This abbreviation will be used throughout in this paper.

## Subgenus *Cnesterium* DALL

### *Yoldia* (*Cnesterium*) *notabilis* YOKOYAMA

Pl. 6, Figs. 3, 3a, 4, 5.

1906. *Yoldia lanceolate* TOKUNAGA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 21, art. 2, p. 57, Pl. 3, fig. 18.
1922. *Yoldia notabilis* YOKOYAMA: Jour. Coll. Sci. Imp. Univ., Tokyo, Vol. 44, art. 1, p. 196–197, pl. 17, fig. 10.
1929. *Yoldia notabilis* YOKOYAMA: Jour. Fac. Sci. Imp. Univ., Tokyo, Vol. 2, ser. 2, p. 395, pl. 75, fig. 8.
1933. *Yoldia lanceolate* SASAKI: Bull. Sch. Fish. Univ., Hokkaido, Vol. 3, p. 16, pl. 3, figs. 3a–b.
1934. *Yoldia cooperi ochotensis* OTUKA: Bull. Earthq. Res. Inst. Vol. 12, Pt. 3, p. 609, pl. 47, figs. 18, 17.
1936. *Yoldia* (*Cnesterium*) *keppeliana notabilis* OTUKA: Trans. Palaeont. No. 21, pp. 98–99, pl. 41, figs. 4, 5.
1937. *Yoldia notabilis* KINOSHITA: Rep. Fish Surv. Hokkaido, Fish. Exp. Stat., 41, no. 2, p. 19, pl. 6, fig. 36.
1955. *Cnesterium notabile* HABE: Publ. Akkeshi Marine, Biol. Stat., Univ. Hokkaido, no. 4, pp. 2–3.

Yokoyama described this species as follows: "The shell is thin, compressed, transversely elongated, rounded in front, rostrated and pointed behind, inequilateral, the anterior side being much longer than the posterior (about 1.8 times as long). The front dorsal margin is at first somewhat ascending and then very gradually descending, very little arched and going over into the rounded front end. The hinder dorsal margin is sloping, at first straight, but eventually becomes concave, meeting with the convexly ascending posterior margin at about a right angle. The ventral margin is broadly convex, ascending at both ends. The surface is subconcentrically grooved, with grooves narrow, so that, the interspaces appear as broad flat ribs. These grooves and ribs, however, are somewhat oblique and not quite parallel with the ventral margin, so that those situated near it end at its posterior half. Teeth numerous, lamellar, outwardly bent in the middle, not quite thirty in number in the anterior and about half as many in the posterior row. Ligamental pit triangular, broader than high and with a somewhat concave base. Lunule not developing. Area lanceolate, bounded by a sharp carina on both sides and with a high, elevated, very steep carinain the median line, whose lateral faces show only fine sublongitudinal striations. Anterior muscular impression larger than posterior, ovate in shape; posterior transversely oval, bounded within by a strongly rounded ridge descending vertically from below the

posterior end of the ligamental pit. Sinus large, rounded. The largest specimen is a right valve 36 mm. in length (anterior side 23), 18.6 millimeter in height and 4.1 millimeter in depth."

*Fossil specimens from Hokkaido*:—This species abundantly found from the Kawabata-Chikubetsu (Miocene) formations in Hokkaido; it has also been ascertained to be now living in the sea around Hokkaido.

Comparison of the fossil specimens of Hokkaido now in problem with the holotype, shows that their shells seem to be somewhat lower and more equilateral than that of the holotype. However, the fossil shells collected from the Tertiary of Hokkaido quite similar in every respect to the shells described and illustrated by OTUKA (1936) from the Manganzi formation, under the same specific name.

| *Dimensions*:—(in mm.) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12239 (right valve) | 38.6 | 19.5 | 4.0 |
| 5823 | 37.0 | 19.8 | ? |
| 12297 | 34.0 | 16.2 | ? |
| 6003 | 35.8 | 15.6 | ? |
| | 28.6 | 15.5 | 7.8 |

*Occurrence*:—The Shibechari-Gawa, near Noya, Shizunai-Machi, Hidaka Prov.; Near Shiratori on the eastern coast of Sakhaline; Middle course of the Habor-Gawa, Tomamae-Gun, Teshio Prov.; The upper stream of the Horonai-Gawa, Asahi Coal-Mine, Iwamizawa-City, Ishikari Prov.

*Repository*:—Holotype, Tokyo University, Reg. No. ?

*Hokkaido specimens*, U.H. Reg. No. 12239, 12297, 6003.

*Geological age*: — Chikubetsu, Takinoue and Mitsuishi formations: Lower Miocene—Recent.

*Comparison*:—This species is characterized by a narrow posterior end which is turned upwards and by distinct concentric grooves which do not coincide with growth lines. In these respects, this species is easily separable from all other Japanese species of *Cnesterium*.

## Subgenus *Orthoyoldia* VERILL and BUSH

### *Yoldia* (*Orthoyoldia*) *haborensis* UOZUMI n. sp.

Pl. 4, Figs. 7, 7a, 13.

Shell rather small in size, thin, transverse-elliptical in outline; beaks opisthogyrate, near the middle of shell, not approximately produced from dorsal line; posterior dorsal margin nearly straight or slightly arched; anterior dorsal slope, slightly convex; anterior and posterior ends re-

gularly ronuded, but anterior end narrower than the posterior; the ventral margin broadly arched, sloping more obliquely upwards towards the posterior than towards the anterior end. Surface smooth except for very fine concentric growth lines; lunule and escutcheon very narrow and not very clearly defined from the other part of the shell. Taxodont teeth unobserved, but the teeth of posterior row are observed to be separated by a relatively large condrophore from the anterior row.

| *Dimensions*:—(in mm.) | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12255 | 22.3 | 11.0 | 4.5 | 10.8/22.3 |
| 12254 | 21.7 | 11.1 | ? | 11.0/21.7 |

*Occurrence*:—Futamata, in upper stream of the Haboro-Gawa, Haboro-Machi, Tomamae-Gun, Teshio Prov. (Type locality).

*Repository*:—Holotype, U.H. Reg. No. 12255; paratype 12254.

*Geological age*:—Chikubetsu formation: Middle Miocene.

*Comparison*:—This species somewhat resembles *Yoldia* (*Orthoyoldia*) *iwatensis* HATAI (1940), proposed by HATAI for the fossil shells collected at Ninohe, northeastern Honshu, Japan, however, the former is specifically distinct from the latter in having smaller and higher shell, than those of the latter.

*Yoldia* (*Orthoyoldia?*) *ensicula* YOKOYAMA (1926b), also resembles the present species, but differs in possessing high beaks, excavated posterior dorsal margin and obliquely sloped upwards posterior margin.

### *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA

Pl. 6. Figs. 10, 11; Pl. 7. Fig. 25.

1925. *Yoldia sagittaria* YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 7, p. 10, pl. 2, figs. 10, 11.

1955. *Yoldia sagittaria* UOZUMI: Shinseidai no Kenkyu (Studies of the Cenozoic) No. 22, p. 467, pl. 25, fig. 191.
(non. YOKOYAMA, 1926a, p. 247, pl. 32, fig. 4; 1927, p. 203, pl. 51, fig. 8; 1929, p. 395, pl. 75, fig. 7; WATANABE, ARAI et HAYASI, 1950, pl. 1, fig. 9.)

*Discussion of synonymy*:—No comprehensive description has ever been given for this species. Although this species name was first introduced by YOKOYAMA as early as 1925, for the fossil specimens brought from the Miocene deposits, Jo-ban coal-field, the specimen designated as a type was unfortuniately in ill-preservation. YOKOYAMA's description of this species follows:—"Shell thin, strongly compressed, lanceolate, more than twice as long as high, subequilateral, anteriorly rounded, posteriorly narrowed, rostrate and point (?). Surface with distinct concentric impressed lines. Teeth about 25 on the anterior side, a little less on the

posterior. The measures 22 millim. high, 45(?) milim. long. The other is 27 millim. high and more than 50 millim. long."

Furthermore, YOKOYAMA later regarded the specimens collected from such various localites as Embetsu, Etaibetsu and Haboro in Hokkaido and one locality in Sakhalin, to be wholly conspecific with his holotype coming from the Miocene deposits in the Joban coal-field. However, all those specimen from Hokkaido and Sakhalin enumerated above may be specifically distinct from the holotype in the following points. Firstly the holotype which was stored at the Institute of Geology, Tokyo University, prior to World War II, but is now lost, is more large in size; secondly it looks rather transversely elliptical in form, although YOKOYAMA once erroneously claimed his species to have the shells quite attenuated and pointed at the posterior end. Judging from the outer configuration of the holotype, the present writer is of opinion that the holotype of *Yoldia sagittaria* is assingable into subgenus *Orthoyoldia*.

The specimens illustrated by YOKOYAMA from Embetsu and Etabetsu (1926a) were once called by him *Yoldia sagittaria* but they are by no means conspecific with the holotype of *Yoldia* (*Orthoyoldia*) *sagittaria*, as already stated. The present writer also made a collection at the same spots in Embetsu and Etaibetsu, and found numerous shells which are identifiable to the specimens of the so-called *Yoldia sagittaria* of YOKOYAMA, but he could not discover any specimens which are wholly conspecific with the holotype of *Yoldia sagittaria*. The Embetsu and Etaibetsu specimens must be treated for a while as representing an unnamed species under the genus *Yoldia*.

The Haboro specimens also, treated by YOKOYAMA (1927) under the name *Yoldia sagittaria* are specifically distinct from the holotype of this species, like the case of the material from Embetsu and Etabetsu. From the same place in Haboro district where YOKOYAMA once described the so-called *Yoldia sagittaria*, the present writer also found numerous shells but he could not discover any specimens identifiable with certainty to the holotype of *Yoldia* (*Orthoyoldia*) *sagittaria*; the specimens from Haboro may be divisiable into the following three species: *Yoldia* (*Yoldia*) *biremis* UOZUMI, *Yoldia* (*Cnesterium*) *notabilis* YOKOYAMA, and *Yoldia* (*Orthoyoldia*) *haborensis* UOZUMI. However, owing to the ill-preservation of YOKOYAMA's material, it is not certain to which species enumerated above the specimens illustrated by him under the name *Yoldia sagittaria* from Haboro may actually belong, but it seems highly probable that belong to the writer's new species, *Yoldia* (*Yoldia*) *biremis*.

Meanwhile YOKOYAMA also once described and illustrated a shell from

south Sakhalin which he regarded to be conspecific with his *Yoldia* (*Orthoyoldia*) *sagittaria*, but his view on the specific identification is not acceptable. However, that specimen may perhaps be synonymous with *Yoldia longissima* SLODKEWITSCH (1936) described from Kamchatka or referable to such specimens of the present writer as are treated provisionally under the name *Yoldia* (*Yoldia*) sp. in this paper.

The so-called *Yoldia sagittaria* illustrated by WATANABE in collaboration with ARAI and HAYASI (1950) from the Chichibu district is nothing but *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA, as already pointed out by MIZUNO (1954).

Thus, the specimens, reported from the various localities under the name *Yoldia sagittaria* until the present day, should be classified into the following five species:

| | |
|---|---|
| *Yoldia sagittaria* YOKOYAMA (1925) ..... | *Yoldia* (*O.*) *sagittaria* |
| *Yoldia sagittaria* (from Embetsu et Etaibetsu) . | *Yoldia sp.* |
| *Yoldia sagittaria* (from Haboro) ..... | *Yoldia biremis* UOZUMI |
| *Yoldia sagittaria* (from Sakhalin) ..... | *Yoldia* (*Y.*) sp. |
| *Yoldia sagittaria* (from Chichibu) ..... | *Yoldia* (*Y.*) *laudabilis* YOKOYAMA |

*Description of specimens from Hokkaido*:—Shell rather large in size, elongate in form; beaks low, situated nearly in central portion of shell; anterior dorsal margin slightly arched gradually passing into the anterior margin which is regularly rounded; ventral margin, slightly convex, gradually sloping upwards towards both ends and more steeply in posterior than anterior portion; posterior end subtruncate but not forming any angles; posterior dorsal margin slightly concave, meeting wish the posterior end at a narrowly rounded angle. Surface ornamented by concentric growth lines. The pair of lines running from beaks to anterior ventral corner indistinct; lunule not observed; escutcheon distinct, rather wide and bounded from the main disk by a sharp ridge. Chondrophore rather small, and shallow. Texodont teeth 35 in anterior, 25 in posterior row.

| *Dimensions*:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12264a | 64.3 | 31.0 | 8.0(+) |
| b | 60.0 | 28.7 | ? |

*Occurrence*:—Near Shihoro Machi, Abashiri-Gun, Kitaimi Prov. (unknown in detail).

*Repository*:—Holotype (Pl. 6, Fig. 25 in this paper), preserved in the Tokyo University, was destroyed.

*Hokkaido specimens*:—U.H. Reg. No. 12264a, b.

*Geological age*: — The so-called "Hard-shale formation": Upper Miocene.

*Comparison*:—This species seems to be closely similar to *Yoldia* (*Orthoyoldia*) *iwatensis* HATAI (1940), but the latter has shells more transversely elongate in form than the former. Except for this point, however, the present form is quite resemblent to the latter in every respect, and the present writer was once inclined to treat it as a subspecies or variety of the latter.

Also this species resembles *Yoldia* (*Orthoyoldia*) *haborensis* UOZUMI and *Yoldia* (*Orthoyoldia?*) *ensicula* YOKOYAMA in having both ends rounded, but the former is also specifically distinct from the latter two species in that the former is far larger in size than the latter.

## Subgenus *Tepidoleda* IREDALE

### *Yoldia* (*Tepidoleda*) *sobrina* TAKEDA

Pl. 5, Figs. 7, 8, 10, 11, 12, 13.

1887. *Yoldia* sp. YABE: Jour. Geol. Soc. Tokyo, Vol. 5, no. 6, pp. 604-605, text-figs. i, ro.
1951. *Yoldia* cfr. *sagittaria* MINATO et UOZUMI: Shinseidai no Kenkyu (Study of the Cenozoic), No. 8, pp. 11-12, pl. 11, figs. 97-101.
1953. *Yoldia sobrina* TAKEDA: Hokkaido Assoc. Coal, Min. Technol. Geol. Studies No. 3, pl. 6, figs. 13, 15, pl. 7, figs. 1-4.
1954. *Yoldia sobrina* UOZUMI: Jour. Fac. Sci. Hokkaido Univ. Ser. 4, Vol. 8, no. 4, pl. 25, p. 397, fig. 6.

*Original description*:—"Shell more or less thin, large, elongated, solenoid in shape, somewhat inflated; posterior part compressed and attenuated; surface smooth except for fine concentric growth lines; beaks obtuse, very low, inequilateral; anterior dorsal margin short, slightly descending, posterior one longer, rather straight; posterior end more or less rounded, obliquely subtruncated and making a faint angle with posterior dorsal border; anterior extremity broadly rounded and gradually passing into anterior ventral margin; ventral margin somewhat straight, subparallel to posterior dorsal margin; lunule and escutcheon elongated, narrow linear; pallial sinus wide, deep U-shaped, attenuated to the middle of the shell. A blunt carina running from beaks to posterior ventral corner is observed in good specimens."

The holotype of this species was found in the Poronai formation at Ikushunbetsu, Sorachi-Gun, Ishikari Province and is characterized by having shells very transverse-elongate in outline and much attenuated in

posterior portion, besides umboes which are situated fairly anteriorly. From these features, the present species should referably be grouped under the subgenus *Tepidoleda*, rather than under *Yoldia* (s.s.).

Examining a number of specimens to the writers, this species seems to show rather constant nature in every respect, but there are found certain specimens which slightly deviate in some points from the typical form: the ventral margin of such specimens is somewhat concave in the middle and slopes more steeply upwards towards posterior end, two blunt carinae run from beaks to the anterior ventral corner—there is only one carina in the holotype specimen. The surface of the shells is rather smooth in general; the largest specimen is 62.5 millim. long and its surface is crowded with concentric growth lines near the ventral margin; the most small one is 30.6 millim. long and its surface is smooth excepting for delicate lines of growth. A few specimens are reserved for an examination of the interior structure: anterior adductor rather indefined, subovate in outline, posterior one strongly impressed, smaller than the anterior, trigonal in outline, on it concentric lines are observable. Pallial sinus rather wide and deep.

*Dimensions*:—(in mm.)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 348a | 62.7 | 28.0 | 12.2 | 28.7/62.7 |
| b | 48.5 | 23.7 | 12.0 | 22.0/48.5 |
| c | 49.0 | 26.1 | 12.9 | 18.5/49.0 |
| d | 30.8 | 25.0 | 7.0 | 12.2/30.8 |
| 3760a | 59.0 | 24.7 | 12.5 | 20.0/59.0 |
| b | 52.5 | 22.1 | 12.0 | 22.6/52.5 |
| 6111 | 46.0? | 21.0 | ? | ? |
| 12241a | 57.1 | 26.0 | 12.5 | 24.0/57.1 |
| b | 55.0 | 27.0 | 12.4 | 21.5/55.0 |
| 12302a | 45.1 | 19.0 | ? | 17.7/45.1 |
| b | 55.8 | 25.5 | 13.2 | 19.6/55.8 |
| c | 53.2 | 25.5 | 13.2 | 19.6/53.2 |
| 12242a | 50.5 | 25.5 | 12.7 | 18.2/50.5 |
| b | 48.5 | 26.4 | 10.3 | 19.5/48.5 |
| c | 48.0 | 21.8 | ? | 20.5/48.0 |
| d | 46.5? | 23.2 | 11.0 | ? |
| 928a | 62.4 | 30.7 | ? | 20.5/62.4 |
| b | 62.1 | 24.6 | 11.6 | 27.2/62.1 |

*Occurrence*:—300 m south from the railroad bridge on the Ikushunbetsu-gawa, Mikasa Machi, Ishikari Prov. (Type locality); Tomatsu and

Yayoi in Ikushunbetsu-gawa, Mikasa Machi, Sorachi-Gun, Ishikari Prov.; Middle course of the Teshibetsu-gawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov. (Loc. No. 146).

*Repository*:—Holotype, U.H. Reg. No. 348a; other specimens, U.H. Reg. No. 348b-d, 12241a-b, 12302a-c, 928a-b, 6111, 418, 6177.

*Geological age*:—Poronai, Onbetsu and Sitakara formations: Oligocene.

*Comparison*:—This species is very closely allied to the recent Japanese species *Yoldia* (*Tepidoleda*) *similis* KURODA et HABE (Pl. 7, fig. 16=*Yoldia naganumana* KURODA 1929, non, YOKOYAMA) in both outline and sculpture, but the former has a more attenuated posterior part, and a rather horizontal anterior dorsal margin. *Yoldia kawadai* HIRAYAMA (1954) described from the Miocene of Tochigi Prefecture, is somewhat like the present species, now under consideration, but the latter is different from the former, because the highest postion of the latter is always situated anteriorly from the median line of the shell and moreover the ventral margin of the latter slopes more steeply upwards towards the posterior end.

## Subgenus *Kalayoldia* GRANT and GALE

### *Yoldia* (*Kalayoldia*) *macroschema* UOZUMI n. sp.

Pl. 6, Figs. 6, 7, 7a, 8, 8a, 9.

Shell large, rather flattened, elongate-ovate in outline; inequilateral, anterior longer than posterior; anterior dorsal margin slightly arcuated, sloping gently downwards and then passing gradually into the anterior end which is regularly rounded; ventral margin very broadly arched, and sloping upwards towards the posterior end; posterior dorsal margin slightly concave and teminates at the posterior end which is rostrate in form. Umbones rather low, and curved inwards. Surface ornamented by crowded fine incremental lines. The pair lines running from beaks to anterior ventral corner is distinct and widely separated near the ventral margin. Escutcheon distinct and bounded by sharp ridges; lunule indistinct but present. Hinge rather long; anterior row longer and larger than posterior one; 29 anterior and 19 posterior teeth. Pallial sinus deep and U-shaped; posterior adductor strongly impressed and transversely elongate-ovate in form; anterior adductor not observable.

*Dimensions*:—(in mm.)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12243 | 58.1 | 29.7 | ? | 33.6/58.1 |

| | | | | |
|---|---|---|---|---|
| 12249 | 55.0 | 28.4 | 11.1 | 27.6/55.0 |
| 12247 | 61.7 | 31.6 | ? | 31.6/61.7 |
| 12246 | 52.0 | 29.4 | ? | 29.1/52.0 |
| 12244 | ? | 34.7 | ? | ? |

*Occurrence*:—Upper stream of the Okuyokunnui-sawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov. (Loc. No. 183) (Type locality); Cliff under the railroad bridge on the Tachibetsu-gawa, Numata-Machi, Uryu-Gun, Ishikari Prov.

*Repository*:—Holotype, U.H. Reg. No. 12243; paratype, 13349, 12235, 12247, 12244, 12224, 12225, 122238.

*Geological age*:—Takikawa and Honbetsu formations: Pliocene.

*Comparison*:—Of the species of Genus *Yoldia* hitherto known from Cenozoic deposits in and around Japan, the large forms are extremely rare; there are only two species: *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA (195a) and *Yoldia* (*Orthoyoldia*) *iwatensis* HATAI (1940).

In the large size, the two species just mentioned are allied to *Yoldia* (*Kalayoldia*) *macroschema*, but they are quite different from the latter. For one thing, *Yoldia* (*Orthoyoldia*) *sagittaria* must be regarded to belong to subgenus *Orthoyoldia* as will be discussed elsewhere, because this species has shells without rostrated posterior, as is also the case in *Yoldia* (*Orthoyoldia*) *iwatensis*.

The present form seems to be closely related to the group of such species as *Yoldia oregona* (SHUMARD), *Yoldia sammamishensis* WEAVER (1912), *Yoldia cooperii* GABB (1865) and *Yoldia tenisima* CLARK (1925). Of these American species, *Yoldia oregona* is most nearly like the present species, but the latter is distinguishable from the former in its more narrowly rounded anterior end, and its less acute posterior termination of shell. Besides, this species somewhat also resembles some species of *Cnesterium* in outer appearance as a whole, but the former lacks the oblique concentric lines which characterize the latter.

## Genus *Portlandia* MÖRCH

## Subgenus *Portlandella* STEWART

### *Portlandia* (*Portlandella*) *watasei* (KANEHARA).

Pl. 3, Figs. 4, 4a, 6, 6a, 7, 7a, 8, 12.

1887. *Yoldia* sp. YABE: Jour. Geol. Soc. Tokyo, Vol. 5, p. 604, Text-fig. i.
1937. *Yoldia watasei* KANEHARA: Jour. Geol. Geogr. Vol. 14, nos. 3–4, p. 158, pl. 15, figs. 5-9.

1951. *Yoldia watasei* MINATO et UOZUMI: Shinseidai no Kenkyu (Studies of the Cenozoic) No. 8, pp. 10.11, pl. 11, figs. 92a–b, 95.
1953. *Yoldia watasei* TAKEDA: Hokkaido Assoc. Geol. Mining. Tech., Geol. Sec. No. 3, p. 71, pl. 6, figs. 3–6.
1954. *Portlandia watasei* MIZUNO: Shinseidai no Kenkyu (Studies of the Cenozoic.) No. 20, p. 2, pl. 1, figs. 3a–b, 5.
1955. *Portlandia (Portlandella) watasei* UOZUMI: Shinseidai no Kenkyu (Studies of the Cenozoic), pl. 33, figs. 184a–b.

This species is abundantly found in the Poronai formation in Ishikari Province, Hokkaido, and it was established by KANEHARA as a new species. The holotype specimen preserved by the Geological Survey of Japan, was destroyed during World War II, so the specimen U.H. Reg. No. 12330 is designated here as the Neotype.

The following description is based upon many well preserved specimens collected from the Poronai formation of Ikushunbetsu and its neighbourhood.

*Description Neotype*:—Shell moderate in size, rather inflated, transversely elongate, somewhat elliptical in outline; the ratio of height to length of shell nearly constant, the mean value being about 55/100; beaks situated at the anterior portion: the ratio of posterior/anterior ranges from 189/100 to 110/100, but 140/100 in common form; anterior dorsal margin sloping nearly straight or slightly arched; anterior margin, regularly rounded, smoothly merges into the ventral margin, which is very broadly rounded and more steeply sloping upwards towards the anterior end than the posterior end; posterior end subtruncate, but not forming any angles with the ventral margin; posterior dorsal long, nearly straight except for behind the umbo, and forming an angle of about 80° with the posterior margin. Surface ornamented only by the rugose concentric growth lines in mature stage, while the young shell is rather smooth in general. Escutcheon and lunule distinct, narrowly lanceolate: the former is more distinct than the latter, and is separated from the main disk by a sharp ridge.

*Dimensions*:—(in mm)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12330a | 42.2 | 24.7 | 17.9 | 14.6/42.2 |
| b | 30.0 | 15.6 | 11.6 | 11.4/30.0 |
| 12228 | 43.1 | 21.0 | 18.5 | 15.1/43.1 |
| 12240a | 26.3 | 15.8 | 11.4 | 9.3/26.3 |
| b | 29.3 | 16.7 | 11.3 | 10.0/29.3 |
| 11188a | 37.2 | 22.0 | 17.7 | 11.8/37.2 |
| b | 33.5 | 19.5 | 19.0 | 19.0/33.5 |

*Occurrence*: — Shihorokabetsu, Yubari-City, Ishikari Prov. (Type locality); Kawamukai in the Yubari-gawa, Yubari-City, Ishikari Prov.; The Yubari-gawa between Shimizusawa and Enhoro, Yubari-City, Ishikari Prov.; Cliff of the Ikushunbetsu-gawa, in Yayoi, Tomatsu and Ikushunbetsu, Mikasa-Machi, Sorachi-Gun, Ishikari Prov.; Kansosawa, Okuyubetsu, Akan-Gun Kushiro Prov.; Cliff of the Charo-gawa, near the Kamicharo primary school, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov.

*Repository*:—Holotype, Geological survey of Japan, Reg. No. ? Neotype, U.H. Reg. No. 12330; other specimens, U.H. Reg. No. 12226-12228, 12312-12314, 12307, 12309, 11188, 12218, 12230.

*Geological age*:—Poronai, Onbetsu and Takinoue formations; Oligocene—Early Miocene.

*Comparison*: — Owing to the inadequate description for *Yoldia* (*Yoldia*) *laudabilis*, which was established by YOKOYAMA (1924), this species has been misunderstood to be closely allied with *Portlandia* (*Portlandella*) *watasei* by some palaeontologists. However, this view is by no means acceptable, because these two species should be regarded as belonging different genera, not as congeneric. Further, the specimens, treated by MAKIYAMA as assignable into *Yoldia* (*Yoldia*) *laudabilis* and described by him from the Asagai formation, Jo-ban coal-field, are unfortunately not conspecific with the holotype of this species, as the present writer has already pointed out in the foregoing pages. Those specimens should be placed in the present writer's *yotsukurensis*.

The specimens, so-called *Yoldia watasei*, described by HIRAYAMA (1954), including his so-called *Yoldia laudabilis*, should be also regarded as conspecific with the *Portlandia* (*Megayoldia*) *yotsukurensis* of the present writer.

*Portlandia* (*Portlandella*) *watasei* (KANEHARA) is quite distinct from *Portlandia* (*Megayoldia*) *yotsukurensis* in the following points: firstly the present species has shells more broadly rounded in ventral margin which smoothly passes into the posterior corner, to be more obliquely sub-truncate in posterior margin and less depressed in posterior dorsal area in comparison with *Portlandia* (*Megayoldia*) *yotsukurensis*. Secondly, the characters of the chondrophores of these two species are essentially different: namely *Portlandia* (*Portlandella*) *watasei* has a rather small chondrophore, the surface of which is ornamented by radial lines like that of *Portlandia* (*Portlandella*) *japonica; Portlandia* (*Megayoldia*) *yotsukurensis* has rather large chondrophore, the surface of which is sculptured by distinct concentric lines.

The present species shows somewhat of similarity to the recent species, *Portlandia* (*Portlandella*) *japonica*, but the shells of the latter are smaller and higher, and further the test of the latter is thinner. *Yoldia hurukutiensis* NOMURA and ZINBO (1935) also closely resembles this species, but the former has shells more equilateral and more rounded in ventral margin.

*Yoldia olympiana* CLARK (1926) known from Oligocene of Western North America, is an another species closely approaching to the present form, now under discussion and it may be almost impossible specifically to distinguish these two forms from each other. However, the present writer could not directly compare the American species with the Japanese form and so he would withholt final judgment concerning the identification of these two species.

*Portlandia* (*Portlandella*) *watasei* var. *semiovata* UOZUMI n. var.

Pl. 3, Figs. 5, 9.

Shell moderate in size, elongate ovate in outline; beaks rather low, situated anteriorly from the middle of shell; anterior dorsal margin nearly straight, sloping downwards and merging smoothly into the anterior margin which is regularly rounded; ventral margin smoothly rounded without any angles from anterior end to posterior pointed corner; posterior dorsal margin concave; surface ornamented by somewhat irregularly concentric incremental lines. Lunule and escutechen distinct, the latter demarcated by sharp ridge from the main disk.

*Dimensions*:—(in mm)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12294 | 38.5 | 22.3 | 6.0 | 14.5/38.5 |
| 12290 | 38.2 | 21.8 | 6.5 | 17.6/38.2 |

*Occurrence*:—Upper stream of the Teshibetsu-gawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov. (Loc. No. 147) (Type locality); The Ikushunbetsu-gawa, near Tomatsu, Mikasa-Machi, Sorachi-Gun, Ishikari Prov.

*Repository*:—Holotype, U.H. Reg. No. 12294; paratype, No. 12290.

*Geological age*:—Onbetsu and Poronai formations: Oligocene.

*Comparison*:—This species is a close ally to *Portlandia* (*Portlandella*) *watasei* (KANEHARA) and has been usually collected in association with the latter, from the Poronai series. However, it is specifically distinguishable from the latter in having a shell in which the ventral margin is

regularly rounded on the posterior and the posterior end is pointed. *Portlandia* (*Megayoldia*) *ovata* (TAKEDA) also somewhat resembles this species, but the former is distinct from the latter in having a shell higher and more angulated in outline.

Also the present species is comparable to *Yoldia pachardi* (CLARK) (1918) known from North America, but this species differs from the latter in the following points: the angles between the posterior dorsal and posterior margin are narrower, and the posterior dorsal margin is more concave.

*Portlandia* (*Portlandella*) *watasei* subsp. *ogasawarai* UOZUMI n. subsp.

Pl. 1, Figs. 9—11

Shell rather thin, and small in size, transversely subrhomboid in outline; inflated, maximum convexity situated near middle of height of shell; beaks situated slightly anterior to the median line of shell, moderately arising above the general line of the dorsal margin; anterior dorsal margin sloping downwards, slightly convex or nearly straight, and passing into the regularly rounded anterior end. Ventral margin evenly arched in its middle and then slopes smoothly upwards towards anterior end; posterior margin subtruncate, and forming a semicircle with posterior dorsal margin which is slightly concave; posterior dorsal area rather strongly depressed. The surface rather smooth, excepting for feeble concnetric growth lines. Lunule invisible but may be present, escutcheon deeply impressed, elongate-lanceolate, and separated by sharp ridges from main disk.

| *Dimensions*:—(in mm.) | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 122703 (left valve) | 26.2 | 24.7 | 4.6 | 10.0/26.2 |
| 122704 (right valve) | 19.3 | 12.0 | 2.9 | 7.0/19.3 |
| 122705 (right valve) | 23.5 | 12.8 | 4.0 | 11.5/23.5 |
| 122706 (right valve) | 19.0 | 11.0 | 2.8 | 7.0/19.0 |

*Occurrence*:—From the boring-well of the Sumitomo Coal Mining Company in the Sankonosawa, Akabira City, Ishikari Prov. (Type locality); From the boring-well of the Mitsui Coal Mining Company in the Tanzan-gawa, Ashibetsu-City, Ishikari Prov.

*Repository*:—Holotype, U.H. Reg. No. 122703; paratype, No. 122704-122706.

*Geological age*:—Lower Corbicula (Akabira) formation: Oligocene?

*Comparison*:—At first it seemed that these specimens now at hand

may be some abnormal form of *Portlandia* (*Portlandella*) *watasei* (KANEHARA), because the former are slightly different from the typical form of *Portlandia* (*Portlandella*) *watasei* but are frequently found in association with the latter in the Poronai formation. Recently, the present writer became the fact by his own study, however, that the present form now under consideration indicates not only the Poronai formation but also a still lower horizon like the Lower *Corbicula* (Akabira) formation of the Ishikari group, while the typical form of *Portlandia* (*Portlandella*) *watasei* is only found to occur from the Poronai formation. Consequently, the fact that a distinction is recognizable between these two forms should be regarded as of more importance than the present writer once considered; therefore, he wishes to establish a new subspecies, *ogasawarai,* one of the specimens derived from the Lower *Corbicula* formation being taken as the type.

This subspecies, now under discussion, is distinguishable from *Portlandia* (*Portlandella*) *watasei* in having a shell of larger convexity, its maximum being situated near the middle of the height of shell. It is more strongly depressed on the posterior dorsal area, although the beak position of this subspecies is variable and its ration of anterior/posterior is about 10/15-10/11 as in the case of the typical form of *Portlandia* (*Portlandella*) *watasei* (KANEHARA).

### *Portlandia* (*Portlandella*) *hakobutiensis* (NAGAO et OTATUME)

Pl. 2, Figs. 11.

1938. *Yoldia hakobutiensis* NAGAO et OTATUME: Jour. Fac. Sci. Hokkaido Univ., Vol. 4, nos. 1–2, pp. 37–38, pl. 1, figs. 2–6.

Original description as follows: "Shell small, subovate, slightly inequilateral, the anterior side being a little shorter than the posterior; moderately inflated near the umbo. Dorsal margin inclined both anteriorly and posteriorly, the postero-dorsal one longer, more steeply sloping downwards near the umbo and slightly excavated; anterior margin semicircular and the posterior one narrowly rounded, forming a nearly right angle with the postero-margin or pointed at the postero-dorsal end; ventral margin very broadly arcuate, gradually passing into both anterior and posterior margins. Umbo small, not prominent, situated a little in advance of the middle. Surface ornamented with numerous concentric incremental lines. Test relatively thick. Hinge with its anterior row composed of about fifteen teeth and its posterior one slightly longer."

| *Dimensions*: (in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 5941 | 16.0 | 8.0 | 3.0 |
| 5940 | 17.0 | 11.0 | ? |

*Occurrence*:—Osachinai, Saru-Gun, Hidaka Prov. (Type locality); Penkemobetsu, Shimo-Hobetsu, Yubetsu-Gun, Iburi Prov.

*Repository*:—Holotype, U.H. Reg. No. 5941; paratype 5940.

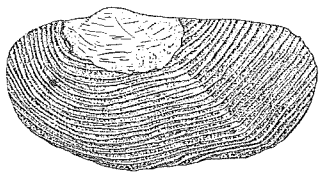
*Geological age*:—Hokobuchi formation: Upper Cretaceous.

*Comparison*: — This species has been occasionally found in the Cretaceous deposits. The shells are generally quite small in size, and the specimens now at hand are somewhat imperfect in preservation, their interior being almost unobservable. Consequently, the generic status of this species is somewhat doubtful to the present writer, but it may be preferable to place it in the genus *Portlandia* (*Portlandella*) rather than in *Yoldia* (s.s.).

### *Portlandia* (*Portlandella*) *kakimii* UOZUMI n. sp.

Pl. 2, Figs. 1, 1a-b.

Shell thin, elongate-oblong in outline; inequilateral, beaks situated 28 per cent the length of the shell from the anterior end, rather inconspicuous, not far extruded above the general line of the dorsal margin; ventral and dorsal margins subparallel; anterior dorsal margin short, gradually sloping, and running below into the anterior end, which is regularly rounded; ventral margin on the anterior half of shell sloping progressively upwards towards the anterior end, while the margin on the posterior portion is nearly straight, and merges into the posterior end at a blunt angle; posterior dorsal straight and horizontal, terminating at



**Text-Figs. 3.** *Portlandia* (*Portlandella*) *kakimii* UOZUMI *nov.*

about angles of 70° with the posterior end which is subtruncated. Posterior dorsal area somewhat depressed, definitely set off from adjacent surface of valves by a blunt ridge running from the beaks to the posterior ventral corner. Lunule invisible, escutcheon deeply impressed, elongate-lanceolate

and bounded by sharp ridges forming angles of about 90° with the surface of valve. Surface ornamented by numerous sharp, slightly elevated, and flexuous ridges. These ridges are oblique to the incremental lines which are not clearly impressed, as shown in Text-Figure 3. Internal characters unknown.

*Dimensions*:—(in mm.)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12252 | 26.1 | 13.6 | 8.5 | 7.4/26.1 |
| | 27.2 | 14.3 | ? | |
| | 22.8 | 13.6 | 11.0 | |

*Occurrence*:—The junction of the Nakayama-zawa and Tobetsu-gawa, Tobetsu-Machi, Ishikari-Gun, Ishikari Prov. (Type locality) ; The Katsura-sawa, a branch of the Niban-gawa, Tobetsu-Machi, Ishikari-Gun, Ishikari Prov.; Middle course of the Sasaki-sawa, a branch of the Tachibetsu-gawa, Numata-Mura, Uryu-Gun, Ishikari Prov.

*Repository*:—Holotype, U.H. Reg. No. 12252; paratype, No. 12251.

*Geological age*:—Morai and Sasakizawa formations (so-called "Hard shale formation") : Miocene.

*Comparison*:—The external features of this species excepting for the sculpture are seemingly much like those of some forms belonging to the genus *Portlandia*. However, this species is characteristic in the shells ornamented by oblique concentric lines which are quite analogous with the lines of the shell belonging to the subgenus *Cnesterium*.

This feature is quite peculiar; it has been note detected on any hitherto known Japanese species of *Portlandia*. The present form now under consideration, however, should never be considered congeneric with *Cnesterium*: the shell of the present species is elongate-oblong in outline, with remarkable depression at the posterior area.

### *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* UOZUMI n. var.

Pl. 2, Figs. 6, 7-9, 15, 15a.

?1937. *Yoldia tokunagai* KANEHARA: Jour. Geol. Soc. Japan, Vol. 44, no. 527, pp. 793–794, pl. 25, figs. 6, 7. (non YOKOYAMA 1925)

Shell thin, sub-rhomboid in outline, rather inflated; beaks situated about middle of the shell, slightly opisthogyrate and moderately high; anterior dorsal margin sloping downwards, slightly convex, and passing into the regularly rounded anterior end. Ventral margin straight for some distance and then slopes upwards at posterior; posterior end sub-

truncate; posterior dorsal straight or nearly so, and subparallel to the ventral margin; blunt ridges extending from beaks to posterior ventral corner; posterior dorsal area fairly depressed. The surface ornamentation consists in irregular incremental lines which are somewhat rugosed at ventral side, besides divaricate sculpture which seems to be more definitely impressed in the central portion of shell, but becomes rather faint at the posterior depression area as well as the anterior portion; the incremental lines are more prominent and more densely arranged near the ventral margin. Escutcheon narrow, elongate and depressed almost at right angles to the main surface of shell. Lunule narrow and smaller than the escutcheon. Pallial sinus large and deep, extending beyond middle of the shell; taxodont teeth counted as many as about 22 in anterior and 24 in posterior row.

*Dimensions*:—(in mm.)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12253 | 33.0 | 20.2 | 13.5 | 13.8/33.0 |
| 11207a | 32.1 | 19.0 | 13.1 | 14.1/32.1 |
| b | 39.7 | 22.1 | 15.0 | 18.6/39.7 |
| c | 27.0 | 18.2 | 12.7 | 11.7/27.0 |
| 12253 | 36.2 | 23.3 | 16.8 | 16.6/36.2 |
| 12257 | 25.0 | 24.4 | ? | 13.2/25.0 |
| 12234 | 37.0 | 21.7 | ? | 18.2/37.0 |

*Occurrence*:—Upper stream of the Horonai-gawa, Asahi Coal-Mine, Iwamizawa-City, Ishikari Prov. (Type locality); Road cliff in Misumai, Toyohira-Machi, Sapporo-Gun, Ishikari Prov.; The Hirano-sawa, a branch of the Katanbetsu-gawa, Atsuta-Mura, Atsuta-Gun, Ishikari Prov.; Right branch of the Subetsu-gawa, Tsukigata-Mura, Kabato-Gun, Ishikari Prov.

*Repository*:—Holotype, U.H. Reg. No. 12253, paratype, No. 12257, 12250, 11207, 12234.

*Geological age*:—Takinoue, Kawabata, Oiwake, Morai, Atsuta, and Misumi formations: Miocene.

*Comparison*:—The peculiar surface features of this species are quite similar to those of *Portlandia tokunagai* (YOKOYAMA) (1925a). Such extraordinary ornamentation has never been detected in the shell of any species belonging to either the genus *Yoldia* or *Portlandia*, except for *Portlandia tokunagai*. Yet the present specimens, now at hand, are distinguishable from YOKOYAMA's species in having the shell higher and more inflated and with two blunt ridges running from beaks to the posterior ventral corner; further the beaks of present species seem to be situated

more posteriorly than those of latter.

The few specimens of *Yoldia tokunagai* YOKOYAMA, obtained from the Kamenoo formation at Nakoso, Joban coal-field and were kindly sent by Dr. KAMADA for this study, were directly compared by the writer with the present form. These specimens sent by KAMADA should be regarded to be wholly conspecific with *Yoldia tokunagai* as KAMADA considered, but they are quite distinct from the described specimens of *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* UOZUMI.

In spite of relatively numerous specimens at hand, all of them assignable into the new variety show quite constant character in respect to the outline and thickness of the shell. Probably the form of the Hokkaido specimens may represent a geographical variety of *Yoldia tokunagai* (YOKOYAMA).

The new variety as well as the typical form of *Yoldia tokunagai* should be safely included into genus *Portlandia* (*Portlandella*) from the outer form of the shell and nature of the hinge, although they have shells sculptured by quite peculiar ornamentation on their outer surface.

### *Portlandia* (*Portlandella*) cfr. *japonica* (ADAMS et REEVE)

Pl. 3, Figs. 10, 10a.

1850. *Nuculana japonica* ADAMS et REEVE: Smarang Zool. Moll. p. 75, pl. 21, fig. 9.
1871. *Yoldia japonica* SOWERBY: SOWERBY Icon. spp. 8, 20.
1928. *Yoldia japonica* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Art. 2, Vol. 2, p. 349, pl. LXVII, fig. 12.

Formerly this species has been believed to be alive only in the sea to the southward off Kii, Wakayama Prefecture. The same species was reported to occur from the Neogene deposits of Huga district.

The material for this species was, however, collected from the Yakumo formation in Hokkaido; the material is in good state of preservation, although there is only a single specimen.

*Description*:—Shell moderate in size; inequilateral, beaks situated anteriorly about 1/4 the length of the shell; subelliptical in outline; rather inflated; anterior dorsal straight; anterior margin regularly rounded and merges into the ventral margin which is nearly straight in the middle of it and sloping upwards towards both ends; posterior end, subtruncate; posterior dorsal margin nearly straight or very slightly concave; umbo not very prominent. Surface smooth except for incremental line which are very fine and delicate; escutcheon well-defined, lanceolate in form; lunule linear.

*Dimensions*: 30.2 mm. length, 18.1 mm. in height and 12.2 mm. in thickness.

*Occurrence*:—Upper stream of the Nigari-kawa, Date, Assabu-Mura, Hiyama-Gun, Hiyama Prov.

*Geological age*:—Yakumo formation: Miocene.

*Repository*:—U.H. Reg. No. 12231.

*Comparison*:—The fossil specimen, now in hand, strongly resembles the shells of *Portlandia* (*Portlandella*) *japonica*, collected from the sea off Kii in every respect; but the Hokkaido specimen is larger in size than the latter and besides, the posterior dorsal margin in the former is not so concave as in Kii specimens.

Such being the case, further study may be needed to settle finally the identification of the Hokkaido specimens as *Portlandia* (*Portlandella*) *japonica*.

## *Portlandia* (*Portlandella*) sp. *a* and *P.* (*P.*) sp. *b*.

Pl. 2, Figs. 12, 13, and Pl. 2, Fig. 3, 4, 5.

1938. *Yoldia* sp. NAGAO: Jour. Fac. Sci. Hokkaido Univ. Ser. 4, Vol. 4, nos. 1–2, pp. 123–124, pl. XLV, figs. 14, 11–13.

There are stored several Creaceous specimens in the Geology Department of the Faculty of Science, Hokkaido University, which have been regarded by NAGAO to belong to the genus *Yoldia*. Unfortunately they are all quite imperfect specimens and the writer could not examine them in detail, although they may probably belong to the genus *Portlandia*, because the shells of them are inflated, subtruncate in posterior extremity and slightly depressed in posterior dorsal area.

| *Dimensions*:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| | ca. 16.0 | 10.0 | 10 |
| | ca. 12.0 | 7.0 | ? |
| | ca. 9.5 | 5.5 | ? |

*Occurrence*:—The eastern wing of the Ikushunbetsu Cretaceous syncline along the Ikushunbetsu-gawa, Ishikari Prov.; Asahi-Machi, Yubari-City, Ishikari Prov.

*Repository*:—U.H. Reg. No. 8240, 8244.

*Geological age*:—Trigonia sandstone formation, and Upper Ammonit formation: Upper Cretaceous.

*Portlandia* (*Portlandella*) sp. *c*

Pl. 3, Figs. 11, 11a, 13, 13a.

Shell moderate in size, inflated; inequilateral, beaks situated anteriorly; anterior dorsal margin nearly straight and sloping downwards; anterior extremity rather sharply rounded, and merging into the ventral margin which is regularly arched; posterior end subtruncate or narrowly rounded; posterior dorsal fairly concave; beaks moderately elevated; lunule faintly developed; escutcheon more deeply impressed than the lunule; surface smooth except for the concentric growth lines which are weak and delicate; pallial sinus *U*-shape.

| *Dimensions*:—(in mm.) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12237 | 38.0 | 22.7 | 17.3 |
| | 34.0 | 20.5 | 16.1 |

*Occurrence*:—Cliff of the Ikushunbetsu-gawa, near Tomatsu, Mikasa-Machi, Sorachi-Gun, Ishikari Prov.

*Repository*:—U.H. Reg. No. 12237a, b.

*Geological age*:—Poronai formation: Oligocene.

*Comparison*:—These specimesn now at hand, are in very ill-preservation, but show some similarity to *Portlandia* (*Portlandella*) *watasei*, the latter of which is generally found in the Poronai formation in association with the former.

Notwithstanding this, the former is specifically distinguishable from the latter in having more inflated shells; besides, the posterior dorsal margin with deeply sunken escutcheon is more concave than the latter. Further the pallial sinus of the present species shows *U*-shape, against ℧-shape in the latter.

## Subgenus *Megayoldia* VERILL et BUSH

*Portlandia* (*Megayoldia*) *thraciaeformis* (STORER)

Pl. 1, Figs. 5, 5a, 7, 8, 8a; Pl. 7, Figs. 23, 28.

1938. *Yoldia thraciaeformis* STORER: Boston Jour. N. H. Vol. 2, p. 122.
1871. *Yoldia thraciaeformis* SOWERBY: SOWERBY Conch. Icon. sp. 1.
1926. *Yoldia scapha* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo Vol. 1, pt. 7, p. 247, pl. 31, figs. 7–11. (non pl. 35, fig. 6).
1929. *Yoldia scapha* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Vol. 2, pt. 9, pp. 394–395, pl. LXXV, figs. 5, 6.
1934. *Yoldia thraciaeformis* OTUKA: Bull. Earthq. Res. Inst. Vol. 12, pt. 3, p. 609, pl. XLVII, fig. 16.

1937. *Yoldia thraciaeformis* KANEHARA: Bull. Geol. Surv. Jap. Vol. 27, no. 1, pp. 20–21, pl. 5, fig. 4.
1937. *Yoldia thraciaeformis* NOMURA: Sci. Rep. Tohoku Imp. Univ. Ser. 2, Vol. 18, p. 33, pl. 4, fig. 10.
1951. *Yoldia thraciaeformis* MINATO et UOZUMI: Shinseidai no Kenkyu (Study of the Cenozoic) no. 8, p. 11, figs. 103–104.
1955. *Portlandia* (*Megayoldia*) *thraciaeformis* UOZUMI: Shinseidai no Kenkyu (Study of the Cenozoic) no. 22, pl. 23, figs. 189a–b.

*Discussion of synonymy*:—YOKOYAMA once described the fossil specimens derived from the Miocene hard shale beds, developed in Embetsu and Etaibetsu district under the specific name of *Yoldia scapha* in 1926. On that occasion he regarded the specimens to be a new species and described them as follows:—"Shell large, rather thin, moderately compressed, transversely oblong-subquadrate inequilateral; anterior side being somewhat shorter than posterior. Anterior and posterior borders rounded, though the latter more broadly than the former, anterior dorsal only slightly arched, posterior dorsal straight, making a rounded angle with posterior margin; ventral almost straight in the middle, gradually increasing in curvature on both sides. Surface smooth, with a blunt edge running from beaks to postero-ventral corner."

Since then, YOKOYAMA (1926c) reported this species also from Sado. However, the protograph of Sado specimens seems to the present writer to be much different from the Hokkaido specimens illustrated by him as a type for this species.

The writer is now of opinion with certainty that the Sado specimens are assignable into the subgenus *Portlandella*.

The specimens, quite indistinguishable from the shells of the so-called *Yoldia scapha*, have been rather abundantly found in the Tertiary deposits in Hokkaido, not only in Embetsu and Etaibetsu districts but also everywhere through this Island, especially in the Pliocene deposits. However, all of them including the holotype of *Yoldia scapha* YOKOYAMA, should be regarded as quite indistinct from the recent species *Portlandia* (*Megayoldia*) *thraciaeformis* (STORER) in every respect. Thus the specific name *Yoldia scapha* YOKOYAMA should be abandoned, althugh there is recognizable a considerable individual variation in *Portlandia* (*Megayoldia*) *thraciaeformis* in respect to the size and outline of shells.

*Description of Hokkaido specimens*:—Shell large, subquadrate in form, inequilateral; anterior part slightly shorter than the posterior one; anterior dorsal margin fairly arched, sloping rather steeply downwards, and passing into the round anterior margin; ventral margin evenly arched or nearly straight; the ventral margin on the posterior wrinkled once or

twice by the one or two blunt ridges running from beaks to posterior ventral corner; one ridge running from beaks to posterior ventral corner is stronger than the other; the other ridge runs from beaks to the middle of posterior margin; posterior margin obliquely truncate, making angles of about 70°-90° with posterior dorsal margin; posterior dorsal margin, concave, and its dorsal margin near the posterior end is somewhat sloping upwards, thus the posterior portion tends to the expanded appearance. Surface ornamented by numerous concentric growth lines; posterior dorsal area strongly compressed. The shells of the young specimen are somewhat higher than those of the adult specimens, and the posterior portion of them in the young stage not so expanded as in the adult stage.

*Dimensions*:—(in mm.)

| | Length | Height | Thickness | B.P. |
|---|---|---|---|---|
| U.H. Reg. No. 12295a | 53.0 | 36.7 | 22.3 | 20.3/53.0 |
| b | 55.7 | 35.0 | 24.5 | 21.8/55.7 |
| 12289 | 45.6 | 27.2 | ? | 16.7/45.7 |
| | 46.0 | 37.0 | ? | 18.0/46.0 |
| | 37.5? | 27.7 | 15.0 | ? |
| | 31.6 | 22.0 | ? | 14.8/31.6 |
| | 29.6 | 20.7 | 14.9 | 11.8/29.6 |

*Occurrence*:—The Yoroku-sawa, Tobetsu-Mura, Ishikari-Gun, Ishikari Prov.; Upper stream of the Haboro-gawa, near Hutamata, Haboro-Machi, Tomamae-Gun, Teshio Prov.; Ebishima, Hokuryu-Mura, Uryu-Gun, Ishikari Prov.; The Okuyokunnai-zawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Prov.; Left cliff of the Obirarika-gawa, near Mitsuhashi, Uryu-Mura, Uryu-Gun, Ishikari Prov.

*Repository*:—Holotype of *scapha*, preserved in Tokyo University was destroyed. (Figured in this paper Pl. 7, Figs. 23, 28.)

Hokkaido specimens, U.H. Reg. No. 12248, 12289, 12296, 395.

*Geological age*:—Chikubetsu, Takikawa, Rumoe, Honbetsu and Morai formations: Early Miocene—Recent.

### *Portlandia* (*Megayoldia*) *breviscapha* (YOKOYAMA)

Pl. 1, Figs. 12.

1932. *Yoldia breviscapha* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Vol. 3, Ser. 2, p. 245, pl. 4, fig. 5.

The specimens described by YOKOYAMA as the type-form of this species, were in an imperfect state of preservation. They were found

firmly embedded in a sandstone, belonging to the Tertiary deposits, in the Uryu coal-field in Hokkaido. But all those type specimens were unfortunately lost during World War II.

However, the illustrations figured by YOKOYAMA for this typical form show the shells to be rather high, rounded in general outline, and concave in the posterior dorsal margins. His descripition was as follows:—"The shell resembles *Yoldia scapha* YOKOYAMA, in general outline, subtruncate in front and behind. A blunt edge, runs from the beaks to posterior ventral corner. The surface seems to have been concentrically straiated. The beak is prominent, behind which the margin is somewhat excavated."

According to YOKOYAMA, the holotype of this species reaches about 29 mm in length, and 23 mm in height. Although no specimens of this species are at the present writer's disposal for study, on the basis of the original illustrations and description, the present species may be safely assignable into the genus *Portlandia* (*Megayoldia*) especially since they have shells considerably high with subtruncate posterior end and with blunt ridges running from the beaks to the posterior ventral corner.

*Occurrence*:—The Showa-gawa, near Showa Coal-Mine, Numata-Mura, Uryu-Gun, Ishikari Prov. (Type locality).

*Repository*:—Holotype, Tokyo University Reg. No. ?

*Geological age*:—Shiraki formation: Eocene.

*Comparison*:—The present species may be more nearly allied to *Portlandia* (*Megayoldia*) *ovata* than to *Portlandia* (*Megayoldia*) *thraciaeformis*, but may be specifically distinct from it, in that it shows the posterior dorsal margin to be somewhat excavate and sloping downwards, and in having more distinct blunt ridges, running from beaks to posterior ventral corner.

### *Portlandia* (*Megayoldia*) *ovata* (TAKEDA)

Pl. 3, Figs. 1, 2, 3, 14, 15, 15a.

1953. *Yoldia ovata* TAKEDA: Hokkaido Assoc. Coal. Min. Technol. Geol. Sec. 3, pp. 70–71, pl. 6, figs. 23, 24. pl. 7, figs. 5–7.

1954. *Portlandia* (*Portandella*) *ovata* (TAKEDA) UOZUMI: Jour. Fac. Sci. Hokkaido Univ., Ser. 4, Vol. 8, p. 297, pl. 25, fig. 9.

TAKEDA defined this species on the basis of quite imperfect specimens; the specimens designated by him as a holotype is a cast of the internal left valve, from which the test is wholly exfoliated. So the present writer wishes here to emend and supplement the former diagnosis for this species

presented by TAKEDA in the following lines: Shell moderate in size, subquadrangular in general outline, but slightly compressed, and rather high: the ratio of height/length about 2/3; anterior dorsal margin very short, gradually passing into regularly rounded anterior extremity without any angles and then smoothly merging into the ventral margin which is broadly arched with the most produced portion of it near middle of the shells; posterior margin subtruncate, forming angles of about 80° to the posterior dorsal margin which is nearly straight and subhorizontal. Umbones not very high, situated slightly anterior to the middle. Surface of the shell ornamented by numerous concentric lines, especially on the shells of the young stage, but this ornamentation seems to be less distinct in the mature stage. Although the hinge structure of this species is unknown at the present moment, it is highly probable that this form belongs to the subgenus *Megayoldia* from the general outlines of shells.

*Dimensions*:—(in mm)

| | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 11276 | 36.1 | 24.0 | ? |
| 11165 | 28.6 | 19.0 | ? |
| 12261a | 31.8 | 21.7 | 10.1 |
| b | 38.7 | 26.0 | 14.6 |
| | 22.7 | 15.0 | ? |
| | 31.2 | 22.0 | ? |
| | 34.0 | 23.0 | ? |
| | 29.0 | 19.0 | ? |

*Occurrence*:—Upper stream of the Chikupenninai-gawa, a right branch of the Charo-gawa, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov. 43°15′ N, 143°54′ E (Type locality); The Koizuminosawa, a branch of the Azuma-gawa, Azuma-Mura, Iburi Prov; 5 km upstream from the Kamicharo primary school, in the Charo-gawa, Kamicharo, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov.; Upper stream of the Shikerebezawa, a branch of the Charo-gawa, Shiranuka-Machi, Shiranuka-Gun, Kushiro Prov.

*Repository*:—Holotype, U.H. Reg. No. 11165; other specimens: No. 11276, 11163, 11177, 11164.

*Geological age*:—Onbetsu and Poronai formations: Oligocene.

*Comparison*:—In respect to the high shell form, the present species may be somewhat comparable to *Portlandia aokii* (NOMURA et ZINBO), described by them from the Tertiary, at Hurukuti, Yamagata Prefecture, northeastern Honshu, but the former is characterized by the smoothly rounded ventral margin, nearly straight posterior dorsal margin, besides

rather low beaks, in contrast to the shell of the latter which have nearly straight ventral margin, slightly concave dorsal margin and rather high beaks.

Also *Portlandia* (*Megayoldia*) *thraciaeformis* and *Portlandia* (*Megagoldia*) *yotsukurensis* show some similarities to the present form in the general outline of shells but the former two species are specifically distinct from the latter in having more transversely elongate shells with more steeply sloping downwards anterior dorsal margin.

### *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI n. sp.

Pl. 1, Figs. 3, 4; Pl. 7, 13.

1934. *Yoldia laudabilis* MAKIYAMA: Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, Vol. 10, no. 2, pp. 131-132, pl. 3, figs. 2, 5, 6.

1955. *Yoldia watasei* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku, Ser. C, no. 29, p. 82, pl. 1, fig. 18.

1955. *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI (MS): Shinseidai no Kenkyu (Studies of the Cenozoic), no. 20, p. 492, pl. 23, fig. 180.

*Discussion of synonymy*:—It has already been reported that there are distinguishable such four species among the so-called *Yoldia*, found in the Asagai formation, in Joban coal-field, as *Yoldia asagaiensis* MAKIYAMA, *Yoldia laudabilis* YOKOYAMA, *Yoldia watasei* KANEHARA and *Yoldia yabei* NOMURA.

In the former identification of these just enumerated species, there was unfortunately considerable confusion as has already been discussed in the foregoing pages, viz., the so-called *Yoldia asagaiensis* MAKIYAMA is nothing but *Yoldia* (*Yoldia*) *laudabilis* of YOKOYAMA, while the specimens called by MAKIYAMA under the name of *Yoldia laudabilis* are not conspecific with the holotype of this species, but belong certainly to the present writer's new species, *Portlandia* (*Megayoldia*) *yotsukurensis*. Evidently the so-called *Yoldia laudabilis* of MAKIYAMA should not be regarded as conspecific with *Portlandia* (*Portlandella*) *watasei* (KANEHARA), although HIRAYAMA (1954) once claimed specific identity between such forms as *Yoldia laudabilis* of MAKIYAMA and *Portlandia* (*Portlandella*) *watasei* (KANEHARA).

*Description of this species*:—Shell moderate in size, subquaderate in form, rather inflated; beaks rather inconspicuous, slightly posterior, anterior dorsal gently sloping, slightly convex; posterior dorsal slightly concave, nearly horizontal; anterior end regularly rounded; posteroir end

very broadly rounded and its most produced portion situated in dorsal side; ventral margin slightly arched, passing steeply into the posterior end; posterior dorsal area strongly depressed. Surface ornamented by numerous concentric incremental lines. Lunule and escutcheon distinct; chondrophore rather large, its upper surface ornamented by distinct concentric lines; hinge 24 taxodont teeth in anterior row and 16 in posterior row.

| *Dimensions*:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 931a (right valve) | 37.0 | 21.4 | 7.4 |
| b | 28.4 | 18.1 | 12.0 |
| 12256 | 46.1 | 26.7 | 15.1 |

*Occurrence*:—Sea-cliff of Takura-Machi, Iwaki-Gun, Fukushima Prefecture (Type locality); Near the Yasaka Shrine, Tuzura, Uchigo-Mura, Iwaki-Gun, Fukushima Prefecture; Sea cliff of Yotsukura-Machi, Iwaki-Gun, Fukushima Prefecture.

*Repository*:—Holotype, U.H. Reg. No. 931; paratype, no. 12256.

*Geological age*:—Asagai and Onbetsu formations: Oligocene.

*Comparison*:—This species is somewhat allied to *Portlandia* (*Portlandella*) *watasei* (KANEHARA) in general outline of shells, but differs from the latter in having the shells more swollen with more depressed posterior dorsal area, besides, the posteroior margin of the present form is soemwhat truncate. Further, the chondrophore of this species is quite different from that of the latter both in size, and in ornamentation: the former is larger in general, clearly impressed by concentric lines, against the relatively smaller chondrophore of the latter, on which only quite weak radial lines are observable like the chondrophore to be observed in *Portlandia* (*Portlandella*) *japonica*.

As was stated by MAKIYAMA, the existence of a close relationship between this species now in problem and *Portlandia* (*Megayoldia*) *thraciaeformis* is indubiteble, but the present form does not bear any kind of distinct ridges running from beaks to the posterior ventral corner, while they are distinctly developed in the latter, besides the latter is quite characteristic in the posterior portion of shell which is expanded, against the non-expanded posterior of the former.

In the following, the number of the taxodont teeth of each species is tabulated:

| Specific Name | Anterior | Posterior | |
|---|---|---|---|
| *Portlandia* (*Portlandella*) *japonica* | 27 | 22 | (Recent specimen) |
| *Portlandia* (*Portlandella*) *lischei* | 25 | 16 | ( ,, ) |
| *Portladdia* (*Portlandella*) *toyamaensis* | 17 | 13 | ( ,, ) |
| *Portlandia* (*Portlandella*) *watasei* | 26 | 23–24 | (Oligocene specimen) |
| *Portlandia* (*Megayoldia*) *yotsukurensis* | 24 | 16(+) | ( ,, ) |
| *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* | 22 | 24 | (Miocene specimen) |
| *Portlandia* (*Megayolaid*) *thraciaeformis* | 21? | 16? | (Pliocene specimen) |

### *Portlandia* (*Megayoldia*) cfr. *gratiosa* (YOKOYAMA)

Pl. 2, Figs. 10, 10a, 14, 14a.

1923. *Yoldia gratiosa* YOKOYAMA: Jour. Geol. Geogr. Vol. 2, p. 8, pl. 2, fig. 5.
1925. *Yoldia gratiosa* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Ser. 2, Vol. 1, pt. 3, p. 125, pl. 16, fig. 13.

YOKOYAMA first described this species on the basis of rather imperfect specimens taken from the Neogene deposits in Izumo, which show considerable similarity to *Portlandia* (*Megayoldia*) *thraciaeformis* in every respect.

The specimens now at the writer's disposal for study of this species are only two imperfect internal molds of the shell, which are apparently resemblent to *Portlandia* (*Megayoldia*) *gratiosa* (YOKOYAMA), but seem to be more elongated and more inflated than the typical form of this species, so the present writer hesitates to give them YOKOYAMA's name. If more perfect specimens should be obtained in future, the present specimens may probably be determined to be a new species; however, they are doubtlessly closely related to the species *Portlandia* (*Megayoldia*) *gratiosa* of YOKOYAMA.

*Description specimens from Hokkaido*:—Shell rather large for this genus; transversely elliptical in outline; inflated; anterior dorsal margin straight or nearly so, and steeply sloped downwards; anterior extremity probably sharply rounded; ventral margin slightly arched, and sloping steeply upwards towards the anterior end; posterior extremity regularly rounded; posterior dorsal margin concave in portion behind the umbo; beaks moderately elevated from posteiror dorsal line, and situated in front of the middle line of shell. Sculpture of shell unknown; pallial sinus wide and deep, reaching to the middle of shell. Hinge about 21 taxodont teeth in anterior row and 22 in posterior row.

| Dimensions:—(in mm) | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12234a | 49.6 | 39.5 | 19.2 |
| b | 43.7 | 26.1 | 20.0 |

*Occurrence*:—Sea-cliff of Ishikari Bay, near Morai, Ishikari-Gun, Ishikari Prov.

*Repository*:—U.H. Reg. No. 12232.

*Geological age*:—Morai formation: Miocene.

---

## TERTIARY SPECIES OF "*Yoldia*" FROM JAPAN, OUTSIDE HOKKAIDO

Although the present writer has not examined all the species belonging to the genera *Yoldia* and *Portlandia* known from the Tertiary deposits in Japan, outside the island of Hokkaido, he wishes to mention all of them with a brief note in the following pages. He also wishes to revise the generic and subgeneric status formerly assigned to some species.

Hitherto described fossil species of "*Yoldia*" from Japan are as follows:

*Yoldia aokii* NOMURA et ZINBO ..... [*Portlandia* (*Megayoldia*)]
*asagaiensis* MAKIYAMA ..... [*Yoldia* (*Y.*) *laudabilis* YOKOYAMA]
**breviscapha* YOKOYAMA ..... [*Portlandia* (*Megayoldia*)]
*ensicula* YOKOYAMA ..... [*Yoldia* (*Orthoyoldia*)]
**gratiosa* YOKOYAMA ..... [*Portlandia* (*Megayoldia*)]
*hurukutiensis* NOMURA et ZINBO. [*Portlandia* (*Portlandella*)]
*hikoshimensis* HIRAYAMA ..... [*Portlandia?*]
*iwatensis* HATAI ..... [*Yoldia* (*Orthoyoldia*)]
**japonica* ADAMES et REEVE ..... [*Portlandia* (*Portlandella*)]
*johanii* DALL ..... [*Yoldia* (*Cnesterium*)]
*kawadai* HIRAYAMA ..... [*Yoldia* (*Tepidoleda*)]
**laudabilis* YOKOYAMA ..... [*Yoldia* (*Yoldia*)]
**laudabilis* MAKIYAMA ..... [*Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI]
cfr. *laudabilis* KANEHARA ..... [*Portlandia* (*Portlandella*) sp. nov. ?]
**lischei* SMITH ..... [*Portlandia* (*Portlandella*)]
*lucidaeformis* NOMURA et ZINBO. [*Portlandia* (*Portlandella*)]
**notabilis* YOKOYAMA ..... [*Yoldia Cnesterium*)]

* Species were already re-examined and discussed in this paper, and others are from Japanese Tertiary deposits, outside Hokkaido. Here the corrections and new interpretations are placed in brackets.

*omorii* AOKI ..... [*Nuculana* ? sp.]
**sagittaria* YOKOYAMA *acut* ..... [*Yoldia* (*Orthoyoldia*)]
**sagittaria* YOKOYAMA 1926a .... [*Yoldia* (*Yoldia*) sp.]
**sagittaria* YOKOYAMA 1927 ..... [*Yoldia* (*Yoldia*) *biremis* UOZUMI]
**sagittaria* YOKOYAMA 1929 ..... [*Yoldia* (*Yoldia*) sp. aff. *longissima* KHOMENKO]
**scapha* YOKOYAMA ..... [*Portlandia* (*Megayoldia*) *thraciaeformis* (STORER)]
**scapha* YOKOYAMA 1926c ..... [*Portlandia* (*Portlandella*) *lischei* (SMITH)]
*scaphoides* NAGAO ..... [*Portlandia* (*Megayoldia?*)]
**thraciaeformis* STORER ..... [*Portlandia* (*Megayoldia*)]
**tokunagai* YOKOYAMA ..... [*Portlandia* (*Portlandella*)]
**watasei* KANEHARA ..... [*Portlandia* (*Portlandella*)]
*yabei* YOKOYAMA ..... [*Yoldia* (*Cnesterium*)]
*yabei* HIRAYAMA ..... [*Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA?]
*yamagatana* NOMURA et ZINBO.. [*Yoldia* (*Cnesterium*)]

## *Yoldia* (*Cnesterium*) *yabei* (YOKOYAMA)

Pl. 7, Figs. 5, 6.

1924. *Leda yabei* YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 3, p. 22, pl. 4, figs. 9.10.
1934. *Yoldia yabei* MAKIYAMA: Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, Vol. 10, Art. 6, no. 2, p. 132.
1936. *Yoldia yabei* NOMURA et HATAI: Saito Ho-on Kai, Mus, Res. Bull., No. 10, p. 117, pl. 13, figs. 6, 7. (non HIRAYAMA 1954, pl. 1, fig. 9.)

*Original description*:—"Shell small, thin compressed, transversely elongate-ovate, rounded in front, subrostrate and bluntly pointed behind; antero-dorsal border slightly arched, posterio-dorsal straight or shallowly excavate. Surface concentrically furrowed. The length is about twice the height and the thickness about one-half of the latter."

*Occurrence*:—Tengasawa, Oyamada, the entrance-side of the Tatsuta Coal-Mine, Futaba-Gun, Fukushima Prefecture (Type locality); Road cliff about 2 km. NW, of Nishigoto on road leading to Kubota, Tsunetoya-Mura, Higashishirakawa-Gun, Fukui Prefecture, Honshu.

*Repository*:—Holotype, Tokyo University Reg. No. ?

*Geological age*:—Asagai formation and Tanagura formation: Oligocene-Miocene.

*Remarks*:—This species seems to be safely assignable into the subgenus *Cnesterium*, as has already been pointed out by MAKIYAMA (1934), and NOMURA and HATAI (1936).

HIRAYAMA's species reported under the name of *Yoldia* cfr. *yabei* in his 1954 paper, may be not identical with this species, but should be identified with the species *Yoldia* (*Yoldia*) *laudabilis*.

### *Yoldia* (*Cnesterium*) *yamagatana* NOMURA et ZINBO

Pl. 7, Figs. 3, 4.

1937. *Yoldia yamagatana* NOMURA et ZINBO: Saito Ho-on Kai Mus. Res. Bull. No. 13, p. 165, pl. 22, figs. 1–2.

*Original description*:—"Rather small, sublanceolate, in outline, compressed, rounded in front, angular behind; sculpture by many distinct grooves which are almost in harmony with the incremental lines. Length of type ca. 25, height 12 mm."

*Occurrence*:—River-side cliff along the Magari-kawa, about 250 m. SW of the primary school at Magari-kawa, Toyoda-Mura, Mogami-Gun, Yamagata Prefecture, Honshu.

*Repository*:—Saito Ho-on Kai Mus. Reg. No. 9301.

*Geological age*:—Hanezawa formation: Miocene.

*Remarks*:—According to HATAI and NISHIYAMA (1952), this species belongs to the subgenus *Cnesterium*.

This species may be easily distinguishable from all other species of *Cnesterium*, from the peculiar feature of grooves on the outer surface of the shell, the arrangement of which is almost in harmony with that of the incremental lines.

### *Yoldia* (*Orthoyoldia*) *iwatensis* HATAI

Pl. 7, Figs. 14, 15.

1940. *Yoldia iwatensis* HATAI: Bull. Biogeogr. Soc. Japan, Vol. 10, no. 9, p. 121, pl. 1, figs. 5, 6.

*Original description*: — "Shell rather large in size, about 43 mm long, 17 high and nearly 8 mm in depth of a right valve; elongate-ovate in outline with both anterior and posterior sides nearly evenly rounded; ventral margin nearly straight, curving only anteriorly and posteriorly; strongly convex, surface provided with numerous, very fine, growth lines only; antero-dorsal border nearly straight, rather sharply curving into anterior margin; postero-dorsal border also nearly straight, broadly curving into posterior margin; hinge provided with many, sharp chevron teeth; other features unknown."

*Occurrence*:—Cliff of the valley below Kadanosawa, Nisatai-Mura, Ninohe-Gun, Iwate Prefecture, Honshu.

*Repository*:—Holotype, Tohoku University, Reg. No. 61348.

*Geological age*:—Kadonosawa formation: Miocene.

*Remarks*:—The distinguishing character of this species and the relationship between it and *Yoldia* (*Orthoyoldia*) *sagittaria* are fully discussed in the description above for *Yoldia* (*Orthoyoldia*) *sagittaria* in this paper. A large-sized shell, rounded anterior and posterior margin, and straight dorsal and ventral border, seem to be significant features for this species.

### *Yoldia* (*Orthoyoldia*?) *ensicula* YOKOYAMA

Pl. 7, Figs. 21.

1926. *Yoldia ensicula* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Vol. 1, p. 137, pl. 16, fig. 6.

*Original description*:—"Shell small, transversely elongated, short-lanceolate, strongly compressed, somewhat inequilateral, with posterior side shorter than anterior, sharply rounded both in front and behind, broadly arched at ventre, antero-dorsal border only slightly arched, postero-dorsal excated. Surface concentrically and shallowly furrowed. Beaks small but pointed. Length 23 millim. Height 11 millim. Thickness 4 millim."

*Occurrence*:—Northeastern slope of the Masugata-yama, near the head of the valley about 1 km. NE of the summit, Hokine-Mura, Tochigi Prefecture, Honshu.

*Repository*:—Holotype, Tokyo University Reg. No. ?

*Geological age*:—Kanomatasawa formation: Miocene.

*Remarks*:—The present species is characteristic in having the shell very elongate in form, with rounded anterior and posterior margin, besides, the posterior dorsal and ventral margin show quite extraordinary curvature.

It is not clear to the present writer just where the present species belongs whether to the genus *Cnesterium* or *Orthoyoldia*; judging from th original description and figure of this species, however, the rounded both ends of the shell suggest that it is assignable into subgenus *Orthoyoldia*, while the general outline of the shell shows this species to be nearly related to some forms of *Cnesterium*. The writer believes this species should be provisionally treated under the subgenus *Orthoyoldia* with some doubt.

## *Yoldia* (*Tepidoleda*) *kawadai* HIRAYAMA

Pl. 7, Figs. 12.

1954. *Yoldia kawadai* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, no. 18, pp. 48–49, pl. 3, fig. 1.

*Original description*:—"Shell of moderate size, transversely elongate, beaks situated at posteiror one-third shell length, swollen, incurved, directed posteriorly, blunt ridge extending from behind the beaks to antero-ventral border; posterior side narrowly rounded, the anterior more broadly arcuate, whole shell considerably convex; ventral margin very broad, rounded only at anterior and posterior sides; surface with faint concentric lines only; antero-dorsal border short, gently sloping into narrowly rounded posterior side, postero-dorsal border long, nearly straight abruptly passing into posterior margin which is slightly protruded: hinge povided with numerous teeth, more on the anterior than on the posterior side. Dimensions (in mm) of holotype, height 13.0, length 26.2, thickness 5.5, position of beak from anterior margin 12.3, position of blunt ridge from anterior margin 17.0."

*Occurrence*:—The Mishino-sawa, Oyamada-shimogo, Oyamada-Mura, Tochigi Prefecture, Honshu.

*Repository*:—Holotype, Tokyo Kyoiku Daigaku Reg. No. 10105.

*Geological age*:—Kobana formation: Miocene.

*Remarks*:—This species is characteristic in its transversely elongate shell form, so HIRAYAMA once compared it to *Portlandia* (*Portlandella*) *tokunagai* and *Yoldia* (*Orthoyoldia*) *iwatensis*. However, it may not be identified congenerically with the latter two species.

The present form, now in problem, may be rather closely related to *Yoldia* (*Tepidoleda*) *similis* (=*Yoldia naganumana* KURODA 1929) and *Yoldia* (*Tepidoleda*) *sobrina*, although the specific validity of the former should not be denied.

## *Yoldia* (*Tepidoleda*) *naganumana* (YOKOYAMA)

Pl. 7, Figs. 18, 19.

1920. *Leda naganumana* YOKOYAMA: Coll. Sci. Imp. Univ. Tokyo, Vol. 39, Art. 6, p. 178, pl. 19, fig. 6 (non KURODA 1929).

*Original description*:—"Shell thin, transversely elongate-ovate, tolerably compressed, slightly inequilateral, the anterior side being shorter than the posterior. Anterior margin sharply rounded, the posterior obtusely pointed; antero-dorsal margin weakly convex, the postero-dorsal weakly concave. Ventral margin broadly arcuate, going over to the posterior without any distinct angle. On the surface there is a single sharp keel running from the beak to the posterior angle and forming the boundary of the lanceolate area with puting lips. The sculpture consists only of coarse unequal lines of growth. Lunula lanceolate, distinct, with the lips pouting like those of the

area. The surface of the lunula as well as of the area is furnished with sublongitudinal striations. Length about 19 millim.; height 9.5 millim.; thickness 5 millim."

*Occurrence*:—Road-side cutting at Naganuma, Totsuka-Ward, Yokohama-City, Kanagawa Prefecture, Honshu.

*Repository*:—Holotype, Tokyo University Reg. No. ?

*Geological age*:—"Lower Musashino" formation: Pliocene.

*Remarks*:—Many conchologists have long accepted that a species in the collection dregged by the Soya-maru, is the same as the species now in problem which was established by YOKOYAMA based upon the specimen brought from the "Lower Musashino" formation developing widely in Kanagawa Prefecture.

However, T. KURODA and T. HABE stated in 1952 that the name *naganumana* is not available for recent specimens as above mentioned, and they proposed the new name *"similis"* (Pl. 7, Fig 16 in this paper) this species seem assignable into the subgenus *Tepidoleda* as was already pointed out by K. OYAMA (1951).

## *Yoldia* (*Yoldia*) sp. nov. ?

Pl. 4, Figs. 15, 16.

?1930. *Yoldia sagittaria* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 2, p. 395, pl. 75, fig. 7. (non YOKOYAMA 1925, 1927, 1929).

Shell large in size, lanceolate in outline; beaks rather low, situated in middle of shell; anterior margin slightly arched, gradually passing into the regularly rounded anterior margin; ventral margin broadly rounded; posterior portion attenuated and its end pointed; posterior dorsal margin slightly concave. Surface ornamented by numerous concentric incremental lines; a pair of lines running from beaks to posterior ventral margin, indistinct.

*Dimensions*:—(in mm)

| | Length | Height | Thickness |
|---|---|---|---|
| U.H. Reg. No. 12229 | 67.4(+) | 34.5 | ? |
| 12228 | 78.0 | 38.7 | 12.0(+) |

*Occurrence*:—Sea-cliff on the southern coast of the Asase, Shisuka-Shicho, Southern Sakhalin.

*Repository*:—U.H. Reg. No. 12229, 12298.

*Geological age*:—Asase formation: Miocene.

*Comparison*:—The specimens here treated were collected by Y. SASA from the Asase formation in southern Sakhalin. They are now stored

in the Department of Geology, Faculty of Science, Hokkaido University. The specimens are unfortunately in poor state of preservation, but seem to the present writer to be wholly conspecific with the shells from southern Sakhalin reported by YOKOYAMA under the name of *Yoldai sagittaria*. The Sakhalin specimens above noted, including YOKOYAMA's material, may be not conspecific with the holotype of *Yoldia* (*Orthoyoldia*) *sagittaria*.

At least, the specimens now under consideration are specifically quite different from species known in Japan, especially in respect to outer configurations of their shell and their large size but they seemingly somewhat resembled *Yoldia longissima*, reported by SLODKEWITSCH (1936) from the Belessovataya series, Kamchatka. However, at hand there are only two ill-preservated specimens and the writer hesitates to propose a new name for it before some better material of this species can be obtained for study.

### *Portlandia* (*Megayoldia ?*) *scaphoides* (NAGAO)

Pl. 7, Figs. 7–10.

1928. *Yoldia scaphoides* NAGAO: Sci. Rep. Tohoku Imp. Univ. Ser. 2, Vol. 12, no. 1, p. 23, pl. 2, figs. 29–31.

"*Original description*:—"Shell rather small, moderately inflated, acuminated near both ends; transversely elongate-subquadrate; slightly inequilateral, the anterior side being a little shorter than the posterior; anterior margin rounded, and the posterior obliquely truncated, forming a rounded angle with the postero-dorsal margin; antero-dorsal margin faintly arcuated, inclining forward very gently, the postero-dorsal one nearly straight and slightly excavated behind the umbo; ventral margin very broadly arched, passing gradually into the anterior and forming a rounded obtuse angle with the posterior margin; umbones low, curved inward, and approximate, with a very indistinct ridge extending from them to the postero-ventral end; the posterior area thus delimited faintly concave; lunule and escutcheon narrow-lanceolate, excavated, and bounded by sharp ridges. Pallial sinus very broad, rounded and deep, reaching to the median vertical line of the shell. Test thin.

Surface smooth except for crowded, fine concentric incremental lines. Hinge cannot be well observed, but the posterior teeth number more than 18, and the anterior teeth more than 24. Dimensions:—Length 21 mm, height 12 mm."

*Occurrence*:—Taya, Ashiya-Machi, Onga-Gun, Chikuzen Prefecture, Kyushu.

*Repository*:—Holotype, Tohoku University, Reg. No. 35987.

*Geological age*:—Yamaga formation: Oligocene.

*Remarks*:—This species was proposed on the basis of poorly preserved material with posterior end broken.

Judging from the original description and illustrations presented by NAGAO, this species somewhat resembles some form of *Portlandia* (*Portlandella*) *watasei* (KANEHARA) from the type locality of the Poronai formation of Hokkaido. According to the information of Dr. MIZUNO, however, this species as a result of his examination, should be regarded as belonging to subgenus *Megayoldia*, while the latter belongs to the subgenus *Portlandella*.

### *Portlandia* (*Portlandella*) *tokunagai* (YOKOYAMA)

Pl. 7, Figs. 26, 27.

1925. *Yoldia tokunagai* YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 7, p. 10, pl. 2, figs. 12–18.

*Original description*: — "Shell medium-sized, thin, compressed, transversely suboblong, nearly twice as long as high, inequilateral with the anterior side almost double the length of the posterior, rounded in front, subrostrate and rounded behind; antero-dorsal border nearly staight, postero-dorsal slightly excated, ventral broadly arched and obliquely ascending behind. Surface with fine divaricating lines. Anterior teeth a little over 20 in number, posterior a little less and coarser."

*Occurrence*:—Ishimoriyama, Kami-kabeya, Saku, Takinosaku, Miyanosaku, Honya (Izumi), and Shimoyunagaya (Yumoto), Iwaki-Gun, Fukushima Prefecture, Honshu.

*Repository*:—Tokyo University, Reg. No. ?

*Geological age*:—Kamenoo formation: Miocene.

*Remarks*:—It is quite worthy of note that this species with peculiar sculpture on the outer surface of the shells, together with *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* and *Portlandia* (*Portlandella*) *kakimii* show such a relatively short geological range as only Miocene in age.

### *Portlandia* (*Portlandella*) *hurukutiensis* (NOMURA et ZINBO)

Pl. 7, Figs. 17.

1935. *Yoldia hurukutiensis* NOMURA et ZINBO: Saito Ho-on Kai Mus. Res. Bull. No. 6, p. 3, pl. 3, pl. 1, fig. 11.

*Original description*: — "Shell medium in size, transversely elongare-ovate in outline, moderately convex, especially in the umbonal region; subequilateral, the anterior part being a little shorter than the posterior; both extremities almost equally and narrowly rounded; dorsal margin descending from beak with a slight convexity, or almost straight in front, and a rather distinct concave curve behind; ventral margin

broadly and regularly curved in the anterior three-fourths and more rapidly ascending in the posterior fourth. Beak small, obtuse, apparently almost in contact, placed subcenteal or a little anteriorly. Escutcheon lanceolate, bounded by an indistinct (?) ridge behind. Surface marked by numerous, irregular concentric lines, some of which are apparently periodically larger. Teeth numerous, but exact number unknown. Test may have been thin. Dimensions:—Length 21 mm, height 13, depth ca 5 mm."

*Occurrence*:—Northeastern side cliff of a small valley, about 170 m W of the Furukuchi railway station on the Western Riku-u-line, and about 70 m S of the primary school at Furukuchi, Furukuchi-Mura, Mogami-Gun, Yamagata Prefecture, Honshu.

*Repository*:—Saito Ho-on Kai Mus. Reg. No. 5701.

*Geological age*:—Hurukuchi formation: Miocene.

*Remarks*:—This species characterized by its equilateral shell with smoothly rounded curvature of the ventral margin, is very like *Portlandia* (*Portlandella*) *japonica*, now living in the sea around Japan, they may be closely related to each other.

## *Portlandia* (*Portlandella*) *lucidaeformis* (NOMURA et ZINBO)

Pl. 7, Figs. 1.

1935. *Yoldia lucidaeformis* NOMURA et ZINBO: Saito Ho-on Kai Mus. Res. Bull. No. 6, pp. 4–5, pl. 1, fig. 9.

*Original description*: — "Shell slightly smaller than the preceding (*Portlandia* (*P.*) *hurukutiensis*), elongate-ovate in outline with a rather inflated disc; the most convex part lies in the center and umbonal regions; valve strongly inequilateral with the posterior part much larger and more compressed than that of the anterior; posterior extremity obliquely subtruncated, the anterior rather narrowly rounded; ventral margin subparallel to the cardinal border along the middle, but not in front and behind where it is rather rapidly arched. Beak small and obtuse being almost in contact, situated at the anterior third of the shell-length. Surface nearly smooth except for fine, somewhat irregular lines of growth. Escutcheon narrow and elongate. Teeth apparently numerous, but not well exposed. Pallial sinus unknown. Dimensions:—Length, 18.5 mm, height, 10.8 mm, depth 4 mm."

*Occurrence*:—Northeastern side cliff of the small valley about 180 m W of the Furukuchi railway station on the western Riku-u-line, and about 70 m S of the primary school at Furukuchi, Furukuchi-Mura, Mogami-Gun, Yamagata Prefecture, Honshu.

*Repository*:—Saito Ho-on Kai Mus. Reg. No. 5751.

*Geological age*:—Furukuchi formation: Miocene.

*Remarks*:—Judging from the description and figure given by NOMURA

and ZINBO, it is suggested that this species may be assignable into the genus *Portlandia* rather than into *Yoldia*.

### *Portlandia* (*Megayoldia*) *aokii* (NOMURA et ZINBO)

Pl. 7, Figs. 2.

1935. *Yoldia aokii* NOMURA et ZINBO: Saito Ho-on Kai Mus. Res. Bull. No. 6, pp. 5–6, pl. 1, fig. 10.

*Original description*: — "Shell rather small, less than 20 mm in length, transversely elongate-ovate, compressed, subequilateral, anterior part being very slightly shorter than that of the posterior, anterior end broadly rounded; posterior end more or less angular, and probably beaked (posterior extremity lost); ventral margin broadly arcuate in the middle, and more abrupt in both extremities; dorsal margin convexly sloping in front of the beak, descending in a concave curve behind. Beak small, rather high, not prominent and almost in contact (?), situated very slightly anterior to the middle line of the shell-length, or almost central. Surface apparently smooth, except for very obscure traces of fine, somewhat irregular concentric striae. Hinge with about 15, small teeth on each side of it. Pallial sinus and escutcheon are not well exposed in the specimens. Dimensions:—Length, ca. 18 mm, height, 11.5, depth 6 mm."

*Occurrence*:—Northeastern side cliff of the small valley about 170 m W of the Furukuchi railway station on the Western Riku-u-line, and about 70 m S of the primary school at Furukuchi, Furukuchi-Mura, Mogami-Gun, Yamagata Prefecture, Honshu.

*Repository*:—Holotype, Saito Ho-on Kai Mus. Reg. No. 5791.

*Geological age*:—Furukuchi formation: Miocene.

*Remarks*:—The form of this species is closely similar to *Portlandia* (*Megayoldia*) *thraciaeformis*. Surely this specimen belongs to *Portlandia* (*Megayoldia*), putting aside for the present whether this species is valid or may perhaps be synymous with *Portlandia*, (*Megayoldia*) *thraciaeformis*.

### *Portlandia* (*Megayoldia*) *gratiosa* (YOKOYAMA)

Pl. 7, Figs. 20.

1923. *Yoldia gratiosa* YOKOYAMA: Jour. Geol. Geogr. Vol. 2, no. 1, pp. 8–9, pl. 2, fig. 5.

1925. *Yoldia gratiosa* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 1, pt. 3, p. 125, pl. 15, fig. 13.

*Original description*: — "Shell moderate in size, thin, compressed, transversely elliptical, about one and a half times as long as high, equivalve and almost

equilateral, rounded at both ends. Surface smooth with two faint very obtuse edges running from the beaks, one to the posterior part of the ventral margin and the other to the lower half of the posterior margin, the surface behind the hinge edge being more or less flattened. Beaks small. Length 33 mm, height 22 mm, thickness 13.5 mm."

*Occurrence*:—Lake coast about 200 m W of the meeting of the two roads N of Kagami, Kimachi-Mura, Yatsuka-Gun, Shimane Prefecture, Honshu.

*Repository*:—Holotype, Tokyo University, Reg. No. ?

*Geological age*:—Fujina formation: Miocene; Inuga formation Pliocene.

*Remarks*:—The specimens illustrated in YOKOYAMA's reports (1923, 1925c) are all quite imperfect ones, which seem to be closely allies to *Portlandia* (*Megayoldia*) *thraciaeformis* (STORER) rather than to *Portlandia* (*Portlandella*) *japonica* or *lischkei*, although YOKOYAMA regarded it to resemble the two species of the latter. It may be rather preferable to treat *Portlandia* (*Megayoldia*) *gratiosa* as a variety of *Portlandia* (*Megayoldia*) *thraciaeformis*.

### "*Yoldia*" *hikoshimensis* HIRAYAMA

Pl. 7. Figs. 24.

1956. *Yoldia hikoshimensis* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, no. 45, pp. 102–103, pl. 6, fig. 1.

*Original description*:—"Shell rather large in size, transversely oblong, inequilateral, moderately inflated, blunt beak situated a trifle in front of the middle, swollen, slightly incurved, directed posteriorly. Antero-dorsal border nearly straight, gently sloping into narrowly rounded anterior side, postero-dorsal border more or less concave, abruptly passing into slightly protruded posterior margin. Anterior and posterior sides rounded, the former broadly and the latter acutely, both somewhat produced. Ventral margin arched. Area of maximum convexity extending from umbo to near middle of the height. Surface nearly smooth. Dimensions:—Length 37 mm, height 18 mm, depth 6 mm."

*Occurrence*:—Sea-cliff, a little south of Watase, Hikoshima, Yamaguchi Prefecture, Honshu.

*Repository*:—Holotype, Tokyo Kyoiku Daigaku, Reg. No. 10432.

*Geological age*:—Yamaga formation: Oligocene.

*Remarks*:—The holotype of this species is an imperfectly preserved left valve, the test of which is wholly exfoliated. It may be said, though this may be somewhat venturesome, that this species may be referable into

the genus *Portlandia*, although the present writer would withhold final judgment on the genric status of this species.

### *"Nuculana omorii"* (AOKI)

Pl. 7, Fig. 11.

1954. *Yoldia omorii* AOKI: Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, No. 17, pp. 30–31, pl. 2, fig. 18.

In the original description, made on the basis of an imperfect specimen, Dr. AOKI compared this species with *Yoldia* (*Tepidoleda*) *naganumana* (YOKOYAMA), described from the Pio-Pleistocene Naganuma formation, Kanagawa Prefecture. However, judging from the description and figure, this species seems assignable into neither *Yoldia* nor *Portlandia* but may be *Nuculana*.

The present writer informed Dr. AOKI by letter that this species may not belong to *"Yoldia"* but to *Nuculana*, and he accepted that opinion after having re-examined this specimens.

## References


ADAMIS A. et REEVE L. (1905): Mollusca in Zool. *Voy. H.M.S. Samarang, Zool.*

CLARK B. L. (1918): The San Lorenzo Series of Middle California; *Univ. Calif. Publ. Bull. Dept. Geol. Soc. Vol. II, no. 2, p. 125, pl. 12, fig. 3, pl. 14, figs 5,6.*

—— (1925): Pelecypoda from the Marine Oligocene of Western North America; *Bull. Dept. Geol. Sci. Univ. California, Vol. 15, no. 4, p. 78, pl. 8, figs. 5, 9.*

DALL W. H. (1909): Contribution to the Tertiary Paleontology of the Pacific Coast. 1, The Miocene of Astoria and Coas Bay, Oregon; *U.S. Geol. Surv. Prof. Paper, Vol. 59, p. 105, pl. 19, fig. 4.*

GABB W. H. (1865): On the Subdivisions of the Cretaceous Formation in California; *Proc. Calif. Acad. Nat. Sci. Vol. 3, p. 189.*

HABE T. (1905): Genera of Japanese Shells, No. 1.

HABE T. (1955): Fauna of Akkeshi Bay; *Publ. Akkeshi Biol. Station, Hokkaido Univ.* No. 4.

HATAI K. (1940): On Some Fossils from the Ninohe District, Mutsu Province, Northeastern Honsyu, Japan; *Bull. Biogeogr. Soc. Jap. Vol. 10, no. 9, pp. 119–118.*

HATAI K. et NISHIYAMA S. (1952): Chick List of Japanese Tertiary Marine Mollusca; *Sci. Rep. Tohoku Univ. Ser. 2, Special Vol., No. 3.*

HAYASAKA I. et UOZUMI S. (1954): Molluscan Fauna of the so-called "Momijiyama Transitional Formation"; *Jour. Fac. Sci. Hokkaido, Univ. Ser. 4, Vol. 8.*

HIRAYAMA K. (1954): Miocene Mollusca from Arakawa Group, Tochigi Prefecture, Japan (Part 1); *Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, No. 18, pp. 48–49, pl. 3, fig. 1.*

—— (1955): The Asagai Formation and its Molluscan Fossils in the Northern Region Jo-ban, Coal-Field, Fukushima Prefecture, Japan; *Sci. Rep. Tokyo Kyoiku Daigaku, Vol. 4, Sec. C, no. 29.*

—— (1956): Tertiary Mollusca from Hikoshima, Yamaguchi Prefecture, Japan, With Remarks on the Geological Age of the Ashiya Fauna; *Sci. Rep. Tokyo Kyoiku Daigaku, Sci. C, Vol. 5, no. 45.*

KANEHARA K. (1937): On Some Tertiary Fossil Shells from Hokkaido (Yesso); *Jap. Jour. Geol. Geogr. Vol. 14, nos. 3–4.*

—— (1937b): Miocene Shells from the Jo-ban Coal-Field; *Bull. Geol. Surv. Jap. Vol. 27, no. 1.*

—— (1937c): Pliocene Shells from the Teshio Oil-Field, Hokkaido; *Jour. Geol. Soc. Jap. Vol. 44, no. 526.*

KHOMENKO J. (1931): Materials on the Stratigraphy of the Tertiary beds of the Eastern Sakhalin Oilfield; *Trans. Geol. Prosp. Service, U.S.S.R. Fas. 79, p. 62, pl. 3, figs. 5–7.*

KINOSHITA T. (1937): Catalogue of the Shell-bearing Molluscs from Hokkaido, No. 2.

KURODA T. (1929): An illustrated Catalogue of Japanese Shells; *Venus No. 1.*

KURODA T. et HABE T. (1952): Check list and Bibliography of the Recent Marine Mollusca of Japan.

MAKIYAMA J. (1934): The Asagaian Molluscs of Yotukura and Matchgar; *Mem. Coll. Sci. Kyoto. Imp. Univ. Art. B. Vol. 10, no. 2.*

MINATO M. et UOZUMI S. (1951): Explanation of Cenozoic Fossils from Northern Japan; *Shinseidai no Kenkyu (Studies of the Cenozoic), No. 8.*

MIZUNO T. (1954): On *Yoldia laudabilis* Yokoyama; *Shinseidai no Kenkyu (Studies of the Cenozoic), No. 20, pp. 13–19.*

NAGAO T. (1928): Palaeogene fossils of the Island of Kyushu Japan; *Sci. Rep. Tohoku Imp. Univ., Ser. 2, Vol. 12, no. 1.*

—— et OTATUME K. (1938): Molluscan Fossils of the Hakobuti Sandstone of Hokkaido; *Jour. Fac. Sci. Hokkaido Imp. Univ. Ser. 4, Vol. 4, nos. 1–2, p. 37, pl. 1, figs. 2–6.*

NAGAO T. (1938): Some Molluscan Fossils from the Cretaceous Deposits of Hokkaido and Japanese Saghlien; *Jour. Fac. Sci. Hokkaido Univ. Ser. 4, Vol. 4, nos. 1–2, pp. 123–124, pl. 14, figs. 11–14.*

NOMURA S. et ZINBO N. (1935): Fossil Mollusca from the Vicinity of Hurukuti, Mogami-gun, Yamagata-Ken, Northeast Honshu, Japan; *Saito Ho-on Kai Mus. Res. Bull. No. 6, pp. 3–4, pl. 1, fig. 11.*

NOMURA S. et HATAI K. (1936): Fossils from the Tanagura Beds in the Vicinity of the Town Tanagmura, Hukushima-Ken, Northeast Honshu, Japan; *Saito Ho-on Kai Mus. Bull. No. 10.*

NOMURA S. et ZINBO N. (1937): On Some Neogene Mollusca from Yamagata Prefecture; *Saito Ho-on Kai Mus. Res. Bull. No. 13.*

NOMURA S. (1937): A Note on Some Fossil Mollusca from the Takikawa Bed; *Rep. Sci. Tohoku Imp. Univ. Ser. 2, Vol. 18.*

OTUKA Y. (1934): Tertiary Structure of the Northwestern End of the Kitakami Mountain Land, Iwate Prefecture, Japan; *Bull. Earthq. Res. Inst. Vol. 12, pt. 3.*

—— (1936): A Pliocene Mollusca from Manganzi in Kotomo-mura, Akita Prefecture, Japan; *Jour. Geol. Soc. Jap. Vol. 43, no. 516.*

OYAMA K. (1951): An Attemp at the Classification of Taxodonta of Japanese Neogene; *Mineralogy and Geology, Vol. 4.*

SASAKI M. (1933): A List of Lammellibranchs from Hokkaido and Saghalin; *Bull. Sch. Fish. Hokkaido Univ. Vol. 3.*

SOWERBY G. H. (1871): Conchologia Iconica.

STORER H. D. (1837): Description of New Species of Nucula from Massachusets Bay; *Boston Jour. Nat. Hist, Vol. 2.*

SLODKEWITSCH W. S. (1936): Stratigraphy and Fauna of the Tertiary Deposits of Western Coast of Kamchatka, Part 1; *Trans. Geol. Oil. Inst. Ser. A, Fasc. 79, p. 158, pl. 2, figs. 6a, 7.*

TAKEDA H. (1953): The Poronai Formation (Oligoeene) of Hokkaido and South Sakhalin; *Hokkaido Assoc. Coal-Mine, Technol. Geol. Studies No. 3.*

TOKUNAGA S. (1906): Fossils from the Environs of Tokyo; *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 21, Art. 2.*

UOZUMI S. (1955): Explanation of Cenozoic Fossils from Northern Japan; Shinseidai no Kenkyu (Studies of the Cenozoic) No. 22. pp. 24–31.

WATANABE K. et AL. (1905): Tertiary Geology of the Chichibu Basin; *Bull. Chichibu Mus. Nat. History, No. 1, p. 80.*

WEAVER G. E. (1912): A Preliminary Report on the Tertiary Paleontology of Western Washington; *Wash. Surv. Bull. No. 15, p. 56, pl. 13, fig. 106.*

—— (1942): Paleontology of the Marine Tertiary Formation of Oregon and Washington; *Univ. Washington Publ. Geol. Vol. 5, I, II, III.*

YABE H. (1887): Notes on Fossils; *Jour. Geol. Soc. Tokyo, Vol 5, no. 6.*

YOKOYAMA M. (1920): Fossils from the Miura Peninsula and its Immediate North; *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 39, Art. 6, p. 178, pl. 19, fig. 6.*

—— (1922): Fossils from the Upper Musashino of Kazusa and Shimosa; *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 44, Art. 1.*

—— (1923): On Some Fossil Mollusca from the Neogene of Izumo; *Jap. Jour. Geol. Geogr. Vol. 2, no. 1.*

—— (1924): Molluscan Remains from the Lowest part of the Jo-ban Coal-Field; *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 3.*

—— (1925a): Molluscan Remains from the Middle Part of the Jo-ban Coal-Field; *Jour. Coll. Sci Imp. Univ. Tokyo, Vol. 45, Art. 7.*

—— (1925b): Molluscan Remains from the Upper-most part of Jo-ban Coal-Field; *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45, Art. 7.*

—— (1925c): Mollusca from the Tertiary Basin of Chichibu; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sed. 2, Vol. 1.*

—— (1926a): Tertiary Mollusca from the Oil-Fields of Embetsu and Etaibetsu; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2.*

—— (1926b): Tertiary Mollusca from Shiobara in Shimotsuke; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 1. pt. 4.*

—— (1926c): Fossil Shells from Sado; *Jour. Fac, Sci. Imp. Univ. Tokyo. Sec, 2, Vol. 1, pt. 8.*

—— (1927): Tertiary Shells from the Coal-Field of Haboro, Teshio; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 2, pt. 4.*

—— (1928): Shells from Hyuga; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 2, pt. 7.*

—— (1929): Molluscan Fossils from Karafuto; *Jour. Fac. Sci. Imp. Univ. Tokyo, Sec. 2, Vol. 2.*

—— (1932): Tertiary Mollusca from the Coal-Field of Uryu, Ishikari; *Jour. Fac. Imp. Univ. Tokyo, Sec. 2, Vol. 3, pt. 6.*

# Explanation of Plate 1

## Explanation of Plate 1

**Figs. 1, 1a, 1b, 2, 2a.** *Portlandia* (*Portlandella*) *lischkei* (SMITH): Exterior and interior left and right valves, and dorsal right valve, length 24.7 mm. × 1.5, U. H. Reg. No. 12986; from 200 fathoms off the Cape Erimo of Hokkaido.

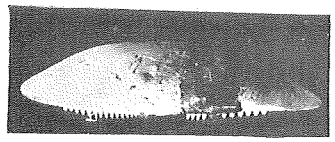
**Figs. 3, 4.** *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI n. sp.: 3. Exterior right valve of holotype, length 37.0mm×1, U. H. Reg. No. 931; from the Asagai formation, sea cliff of Yotukura-Machi, Iwaki-Gun, Fukushima Prefecture. 4. Exterior left valve, length 46.1mm×1, U. H. Reg. No. 12256; from the Asagai formation, near the Yasaka-Shrine, Tuzura, Uchigo-Mura, Iwaki-Gun, Fukushima Prefecture.

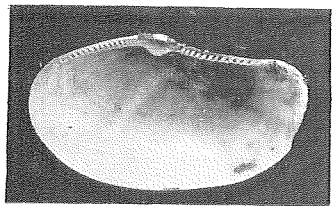
**Figs. 5, 5a, 7, 8, 8a.** *Portlandia* (*Megayoldia*) *thraciaeformis* (STORER): 5, 5a. Exterior right valve and dorsal view, length 55.0mm×1, U. H. Reg. No. 12295; 8, 8a. Exterior left valve and dorsal view, length 55.7mm×1, U. H. Reg. No. 12295b; from the Rumoe formation, cliff of the Obirarika-Gawa, near Mitsuhashi, Uryu-Mura, Uryu-Gun, Ishikari Province. 7. Interior mold of right valve, length 45.6mm×1, U. H. Reg. No. 12289; from the Chikubetsu formation, upstream of the Haboro-Gawa, near Hutamata, Haboro-Machi, Tomamae-Gun, Teshio Province.

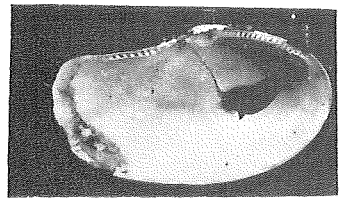
**Figs. 6a-c.** *Portlandia* (*Portlandella*) *japonica* (ADAMS et REEVE): Exterior and interior left and right valves, length, 24.4mm×1, U. H. Reg. No. 12987, from Kii, Recent.

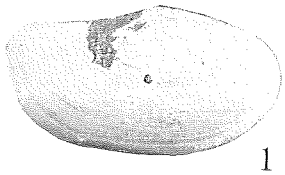
**Figs. 9-11.** *Portlandia* (*Portlandella*) *watasei* subsp. *ogasawarai* UOZUMI n. subsp.: 9. External left valve of paratype, length, 19.3mm.×1, U. H. Reg. No. 122704, from the Upper Corbicula formation (?), upper stream of the Ichino-sawa, Utashinai Machi, Sorachi-Gun, Ishikari Prov.; 10. External left valve of paratype, length, 23.5×1, U. H. Reg. No. 122705; 11. External right valve of holotype, length 26.2×1, U. H. Reg. No. 122703, from the Lower Corbicula formation, in the Sankonosawa, Akabira-City, Ishikari Prov.

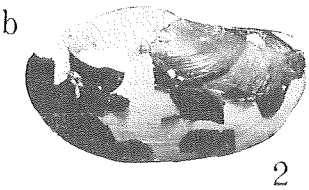
**Fig. 12.** *Portlandia* (*Megayoldia*) *breviscapha* (YOKOYAMA): Figured by Yokoyama (1932), holotype, Tokyo University Reg. No. ?, from the Siraki formation, cliff of the Showa-Gawa, near Showa Coal-Mine, Numata-Mura, Uryu-Gun, Ishikari Province.


1a

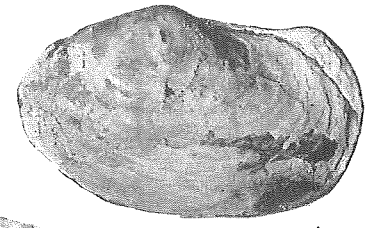

1b

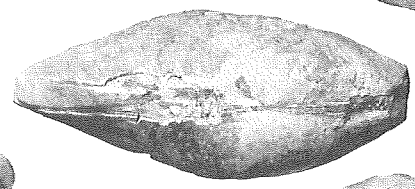

2a


1


2


3


4


5a

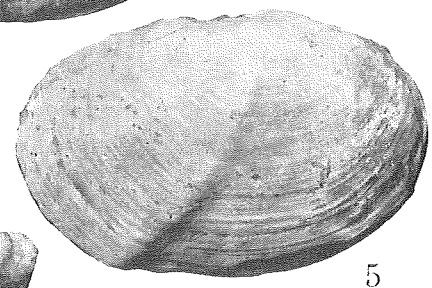

10


11


7

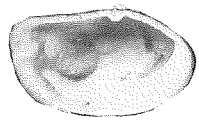

6a

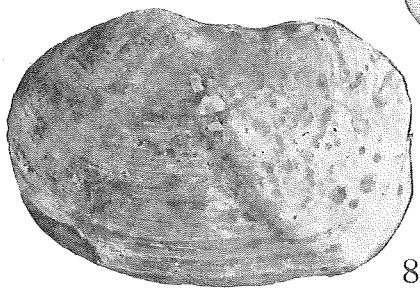

6


5

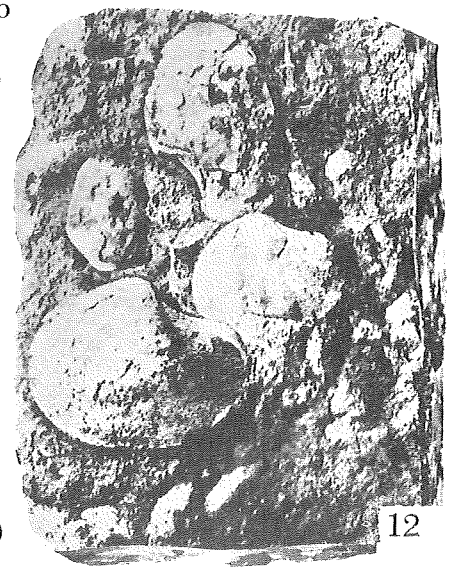

8a


6b


6c


8


9


12

# Explanation of Plate 2

## Explanation of Plate 2

**Figs. 1, 1a-b.** *Portlandia* (*Portlandella*) *kakimii* UOZUMI n. sp.: Exterior, dorsal left valve and right valve of holotype, length 26.1mm.×1.5, U. H. Reg. No. 12252; from the Morai formation, near the junction of the Nakayama-zawa and Tobetsu-Gawa, Tobetsu-Machi, Ishikari-Gun Ishikari Province.

**Figs. 2, 2a-c.** *Portlandia* (*Portlandella*) *toyamaensis* KURODA: 1. Exterior left valve and right valve, and dorsal view of right valve, length 16.9mm.×2.5, U. H. Reg. No. 12985; from 200 fathoms of Toyama Bay, Toyama Prefecture, Recent.

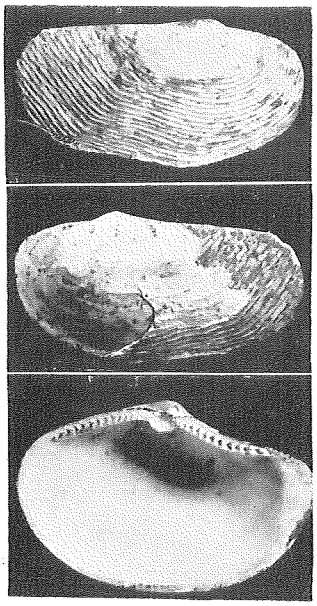
**Figs. 3, 4, 5.** *Portlandia* (*Portlandella*?) sp. b: Figured by Nagao (1938), length 9.0mm.×1 (fig. 3), 12.0mm.×1 (fig. 4) and 9.5mm.×2 (fig. 5), U. H. Reg. No. 824; from the Upper Ammonite bed, Asahi-Machi, Yubari-City, Ishikari Province.

**Figs. 6, 7-9, 15, 15a.** *Portlandia* (*Portlandella*) *tokunagai* var. *hayasakai* UOZUMI var. nov: 6. Exterior left valve, length 32.1mm.×1, U. H. Reg. No. 11207; 7, 7a: Exterior right valve and dorsal view of holotype, length 39.1mm.×1, U. H. Reg. No. 11207; 9. hinge plate view; from the Takinoue formation, upstream of the Horonai-Gawa, Asahi Coal-Mine, Iwamizawa-City, Ishikari Province. 8, 8a. Exterior right valve and dorsal view, length 36.0 mm.×1, U. H. Reg. No. 12266; 15, 15a. Exterior left valve and dorsal view, length 33.0 mm.×1.5, U. H. Reg. No. 112253; from the Atsuta formation, the Hirano-Sawa, a branch of the Kotanbetsu-Gawa, Atsuta-Mura, Atsuta-Gun, Ishikari Province.

**Figs. 10, 10a, 14, 14a.** *Portlandia* (*Megayoldia*) cfr. *gratiosa* (YOKOYAMA): 10, 10a. Exterior mold of left valve and right valve, and dorsal view, length 43.7mm.×1 (fig. 10), 49.6mm.×1 (fig. 14), U. H. Reg. No. 12232; from the Morai formation, Sea-cliff of Ishikari Bay, near Morai, Ishikari-Gun, Ishikari Province.

**Fig. 11.** *Portlandia* (*Portlandella*) *hakobutiensis* (NAGAO et OTATUME): Exterior right valve of holotype, length 16.0mm.×2, U. H. Reg. No. 5941; from the Hakobuchi formation, Osachinai, Saru-Gun, Hidaka Province.

**Figs. 12, 13.** *Portlandia* (*Portlandella*) sp. a: Exterior left valve and dorsal view, length 16.0mm.×1.4, U. H. Reg. No. 8240, from the Trigonia sandstone formation, the eastern wing of the Ikusunbetsu Cretaceous syncline along the Ikusyunbetsu-Gawa, Ishikari Province.



1

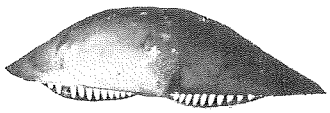


1a



2b

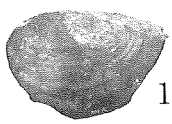
1b



2c

11

12



13

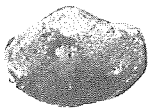
3



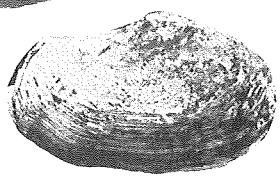
4

6

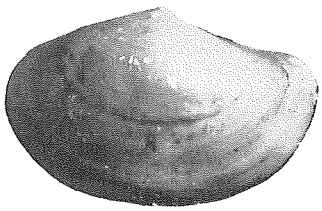
9



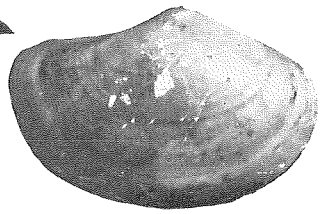
5



7



2

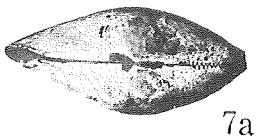


2a

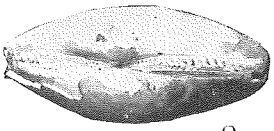


14a

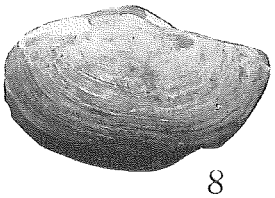
14



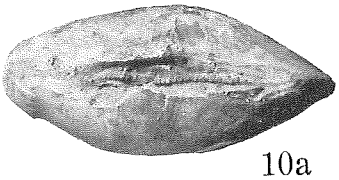
7a



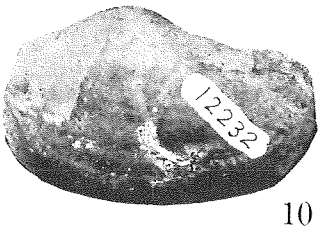
8a



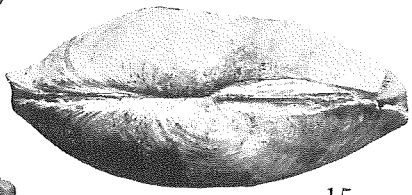
8



10a




10



15a

15

# Explanation of Plate 3

## Explanation of Plate 3

**Figs. 1, 2, 3, 14, 15, 15a.** *Portlandia* (*Megayoldia*) *ovata* (TAKEDA): 1, 2. Exteriar left valve and right valve, length 31.8 mm. ×1; 15, 15a. Exterior right valve and dorsal view, length 38.7 mm. ×1, U. H. Reg. No. 12261a, b; from the Onbetsu formation, 5 km. upstream of the Charo-gawa, from the Kamicharo Primary School, Shiranuka-Machi, Shiranuka-Gun, Kushiro Province. 3. Exterior left valve of holotype, length 29.6 mm. ×1, U. H. Reg. No. 11165; from the Onbetsu formation, upstream of the Chikupenninai-Gawa, a right branch of the Charo-Gawa, Shiranuka-Machi, Shiranuka-Gun, Kushiro Province. 14. Exterior right valve, length 36.1mm. ×1, U. H. Reg. No. 11276; from the Poronai (Momijiyama) formation, the Koizuminosawa, a branch of the Azuma-Gawa, Azuma-Mura, Iburi Province.

**Figs. 4, 4a, 6, 6a, 7, 7a, 8, 12.** *Portlandia* (*Portlandella*) *watasei* (KANEHARA): 4, 4a. Exterior right valve and dorsal view, length 29.3 mm. ×1, U. H. Reg. No. 12240; 6, 6a. Exterior left valve and dorsal view of neotype, length 43.1 mm. ×1, U.H. Reg. No. 12330; 7, 7a. Exterior left valve and dorsal view, length 37.2 mm. × 1, U. H. Reg. No. 11188a; 8. Exterior left valve, length 33.5 mm. ×1, U. H. Reg. No. 11188b.

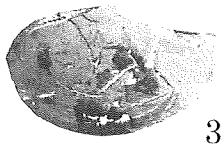
The all specimens, figured here, were collected from the Poronai formation, cliff of the Ikushynbetsu-Gawa, in Yayoi, Tomatsu, Mikasa, and Ikushunbetsu, Mikasa-Machi, Sorachi-Gun, Ishikari Province.

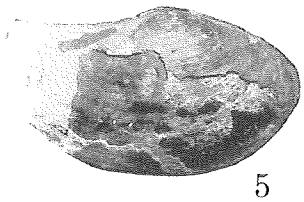
**Figs. 5, 9.** *Portlandia* (*Portlandella*) *watasei* var. *semiovata* UOZUMI, n. var.: 5. Exterior right valve, length 38.2 mm. ×2, U. H. Reg. No. 12290; from the Poronai formation, cliff of the Ikushunbetsu-Gawa, near Tomatsu, Mikasa-Machi, Sorachi-Gun, Ishikari Province. 9. Exterior left valve of holotype, length 38.5 mm. ×1, U. H. Reg. No. 12294, from the Onbetsu formation, upstream of the Teshibetsu-Gawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Province.

**Figs. 10, 10a.** *Portlandia* (*Portlandella*) cfr. *japonica* (ADAMS et REEVE): Exterior right valve and dorsal view, length 18.1 mm. ×1, U. H. Reg. No. 12231; from the Yakumo formation, upstream of the Nigori-Kawa, Date, Assabu-Mura, Hiyama-Gun, Hiyama Province.

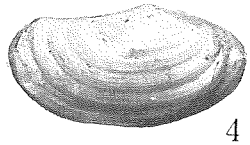
**Figs. 11, 11a, 13, 13a.** *Portlandia* (*Portlandella*) sp. c: 11, 11a. Exterior right valve and dorsal view, length 34.0 mm. ×1; 13, 13a. Exterior left valve, length 38.0mm. ×1, U. H. Reg. No. 112237a, b; from the Poronai formation, cliff of the Ikushunbetsu-Gawa, near Tomatsu, Mikasa-Machi, Sorachi-Gun, Ishikari Province.

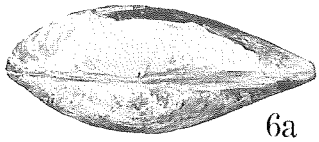

1

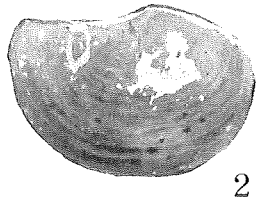

3

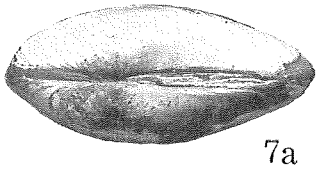

5

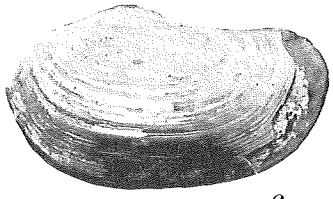

4a

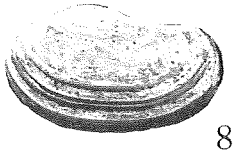

4

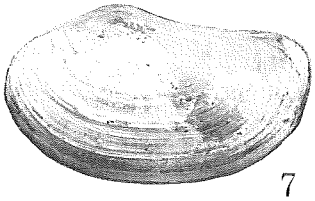

6a

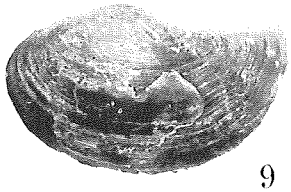

2


7a

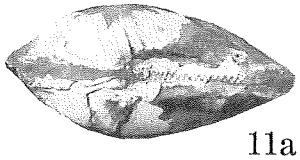

6


8

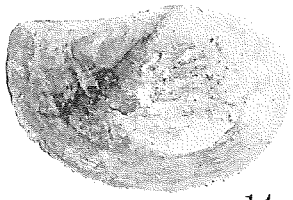

7

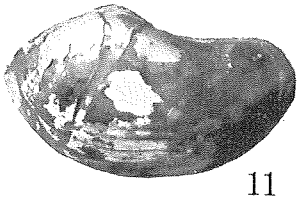

9

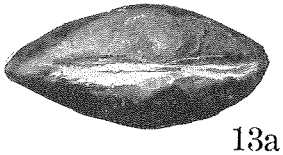

10a

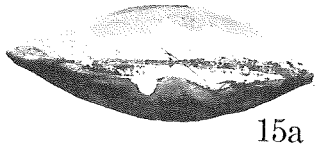

11a

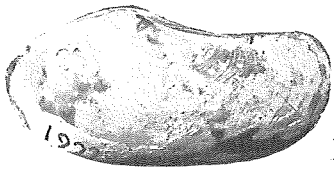
10

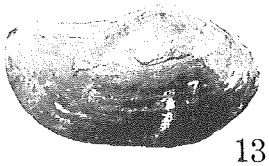

14


11


13a


15a


12


13

15

UOZUMI: *Yoldia* and *Portlandia* KUMANO Photo.

# Explanation of Plate 4

## Explanation of Plate 4

**Figs. 1, 1a, 2, 3, 10.** *Yoldia* (*Yoldia*) *akanensis* UOZUMI n. sp.: 1, 1a. Exterior right valve and dorsal view, length 14.3 mm. ×1.5, U. H. Reg. No. 12301; 10. Exterior left valve of holotype, length, 20.0 mm. ×2, U. H. Reg. No. 12221; from the Onbetsu formation, 5 km. upstream of the Charo-gawa, from the Kamicharo primary school, Kamicharo, Shiranuka-Machi, Shiranuka-Gun, Kushiro Province. 2, 3. Exterior right valves, length 20.7 mm. ×1 (fig. 2), 27.4 mm. ×1 (fig. 3), U.H. Reg. No. 12219, 12218; from the Onbetsu formation, middle coarse of the Teshibetsu-Gawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Province.

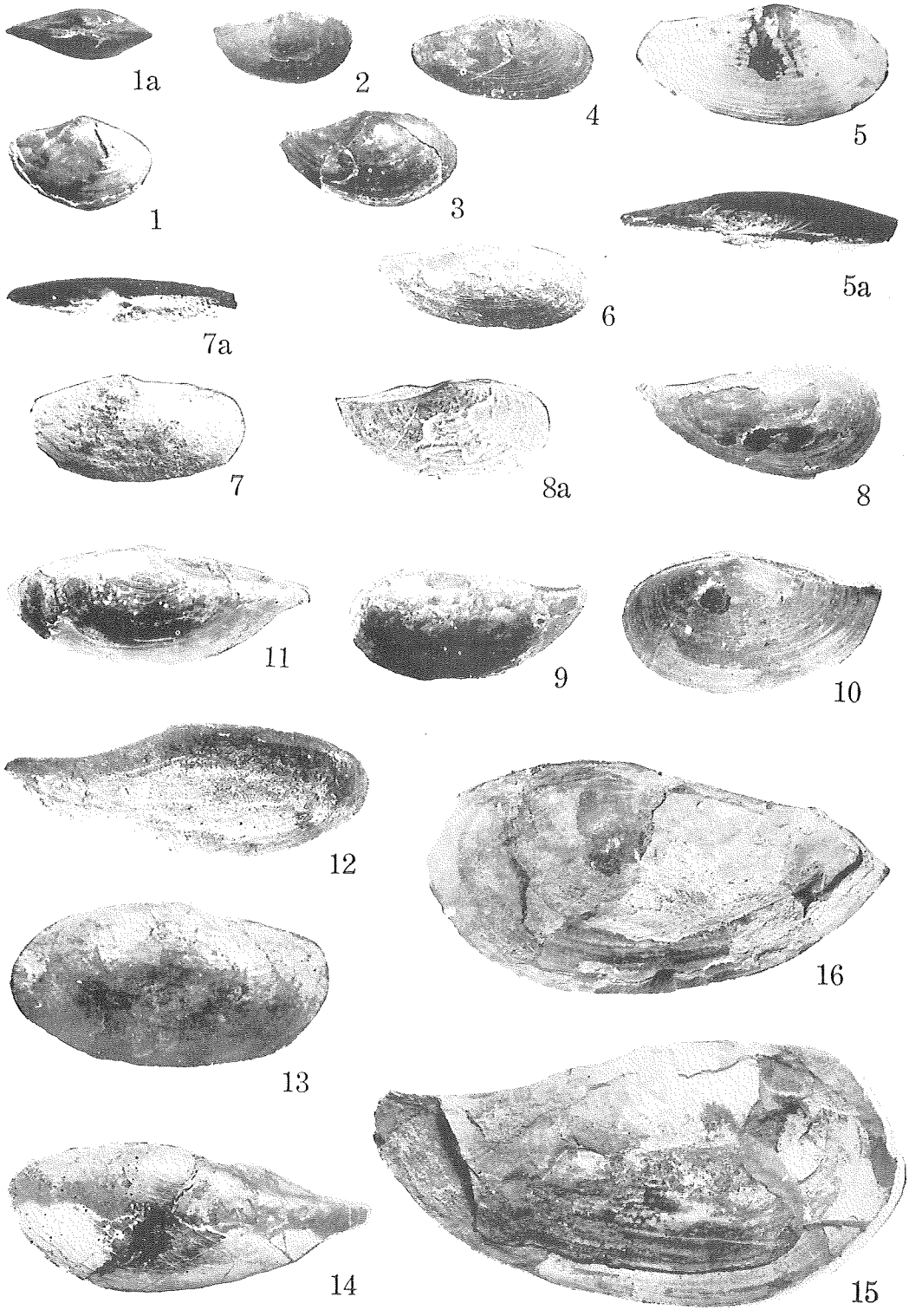
**Figs. 4, 5, 5a, 6, 12.** *Yoldia* (*Yoldia*) *biremis* UOZUMI n. sp.: 4, 6. Exterior right valves, length 26.6 mm. ×1 and 31.2 mm. ×1, U. H. Reg. No. 12292a, b; from the Chikubetsu formation, near Futamata, in upstream of the Haboro-Gawa, Haboro-Machi, Tomanae-Gun, Teshio Province. 5, 5a. Exterior right valve and dorsal view of holotype, length, 25.7 mm. ×1, U. H. Reg. No. 12291; from the Chikubetsu formation, the Maruyama-Sawa, a branch of the Kotanbetsu-Gawa, Haboro-Machi, Tomamae-Gun, Teshio Province. 12. Exterior right valve, length 51.1mm. ×1, U. H. Reg. No. 11222, from Takinoue formation, the Poronai-Sawa, Asahi Coal-Mine, Iwamizawa-City, Ishikari Province.

**Figs. 8, 8a, 9.** *Yoldia* (*Yoldia*) *saitoi* UOZUMI n. sp.: 8, 8a. Exterior right valves, of holotype length 34.8 mm. ×1, U. H. Reg. No. 3761, from the Poronai formation, middle coarse of the Honbetsu-Gawa, near Ikushunbetsu primary school, Ikushunbetsu-Machi, Sorachi-Gun, Ishikari Province. 9. Exterior mold of left valve, length 34.4 mm. ×1, U. H. Reg. No. 12217; from the Poronai formation, cliff of the Ikushunbetsu-Gawa, between Ikushunbetsu and Yayoi, Sorachi-Gun, Ishikari Province.

**Figs. 11, 14.** *Yoldia* (*Yoldia*) *uranoi* UOZUMI n. sp.: 11. Exterior left valve, length 41.8 mm. ×1, U. H. Reg. No. 12245b; 14. Exterior left valve of holotype, length 36.0 mm. ×1.5, U. H. Reg. No. 12254a; from the Noya formation, middle coarse of the Shibechari-Gawa, near Noya, Shizunai-Machi, Hidaka Province.

**Figs. 7, 7a, 13.** *Yoldia* (*Orthoyoldia*) *haborensis* UOZUMI n. sp.: 7.7a. Exterior left valve and dorsal view of holotype, length 21.7 mm. ×1.6, U. H. Reg. No. 12255; 13. Exterior left valve, length 22.3 mm. ×2, U. H. Reg. No. 12243; from the Chikubetsu formation, upstream of the Haboro-Gawa, near Futamata, Haboro-Machi, Tomamae-Gun, Teshio Province.

**Figs. 15, 16.** *Yoldia* (*Yoldia*) sp. nov.?: 16. Exterior left valve, length 66.4(+) mm. ×1, U. H. Reg. No. 12229; 15. Exterior right valve, length 78.0 mm. ×1, U.H. Reg. No. 12298; from the Asase formation, Sea cliff in southern coast of Asase, Shisuka-Shicho, Southern Sakhalin.




UOZUMI: *Yoldia* and *Portlandia* KMANO Photo.

# Explanation of Plate 5

## Explanation of Plate 5

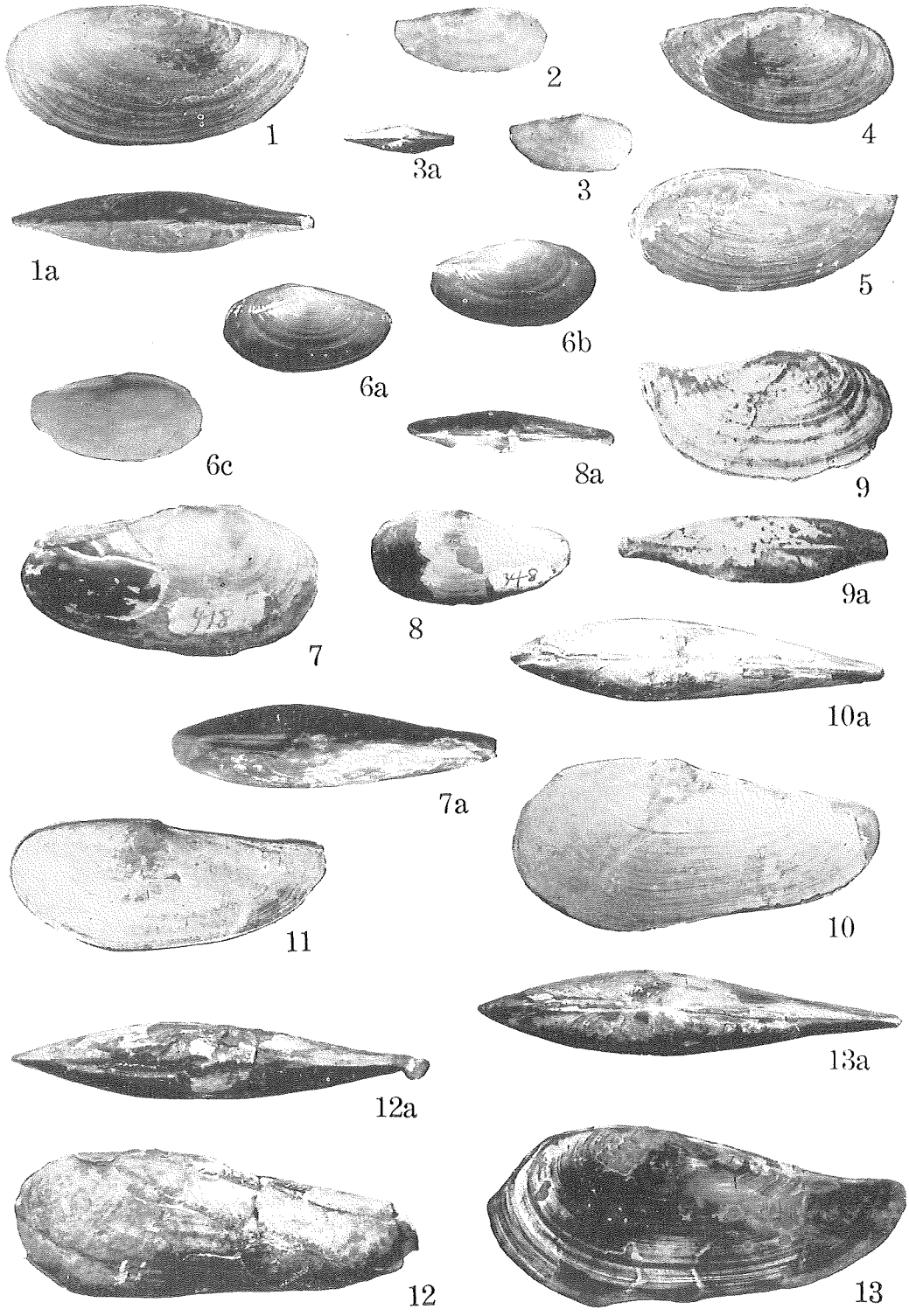
**Figs. 1, 1a, 4, 5, 9, 9a.** *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA: 1, 1a. Exterior left valve and dorsal view, length 45.0 mm. ×1, U. H. Reg. No. 12213; from the Onbetsu formation, middle coarse of the Teshibetsu-Gawa, Shin-Machi, Yubetsu Coal-Mine, Akan-Gun, Akan-Mura, Kushiro Province. 4. Exterior right valve, length, 35.1 mm. ×1, U. H. Reg. No. 12216; from the Asagai formation, Sea-Cliff of Takura-Machi, Iwaki-Gun, Fukushima Prefecture. 5. Exterior left valve, length 39.4 mm. ×1, U. H. Reg. No. 12215; from the Onbetsu formation, 5 km. upstream of the Charo-Gawa, from the Kamicharo Primary school, Kamicharo, Shiranuka-Gun, Kushiro Province. 9, 9a. Exterior right valve and dorsal view of holotype, figured by Yokoyama (1924).

**Figs. 2, 3, 3a.** *Yoldia* (*Yoldia*) *limatula* SAY: Figured by Mizuno (1954). 2. Exterior right valve; 3, 3a. Exterior right valve and dorsal view, from Vineyard sound, Recent.

**Figs. 6a-c.** *Yoldia* (*Yoldia*) *kikuchii* KURODA: Exterior left and right valves, and interior left valve, length 21.0 mm. ×1, U. H. Reg. No. 12310; from 235 m. of Ohotsuku-Sea, Recent.

**Figs. 7, 8, 10, 11, 12, 13.** *Yoldia* (*Tepidoleda*) *sobrina* TAKEDA: 7, 7a. Exterior right valve and dorsal view, length 50.0(+) mm. ×1, U. H. Reg. No. 418; 8, 8a. Exterior left valve and dorsal view, length 30.8 mm. ×1, U. H. Reg. No. 348d; 10, 10a. Exterior left valve and dorsal view, length 57.1 mm. ×1, U. H. Reg. No. 12241a; 11. Exterior left valve, length 45.1 mm. ×1, U. H. Reg. No. 12302, 12. Exterior left valve and dorsal view, length, 62.1 mm. ×1, U. H. Reg. No. 928; 13. Exterior left valve and dorsal view of holotype, length 62.7 mm. ×1, U. H. Reg. No. 348a.

The all specimens, figured here, were collected from the Poronai formation of river-cliff of the Ikushunbetsu-Gawa, Mikasa-Machi, Sorachi-Gun, Ishikari Province.


1
2
4
3a
3
1a
5
6b
6a
6c
8a
9
7
8
9a
10a
7a
11
10
13a
12a
12
13

# Explanation of Plate 6

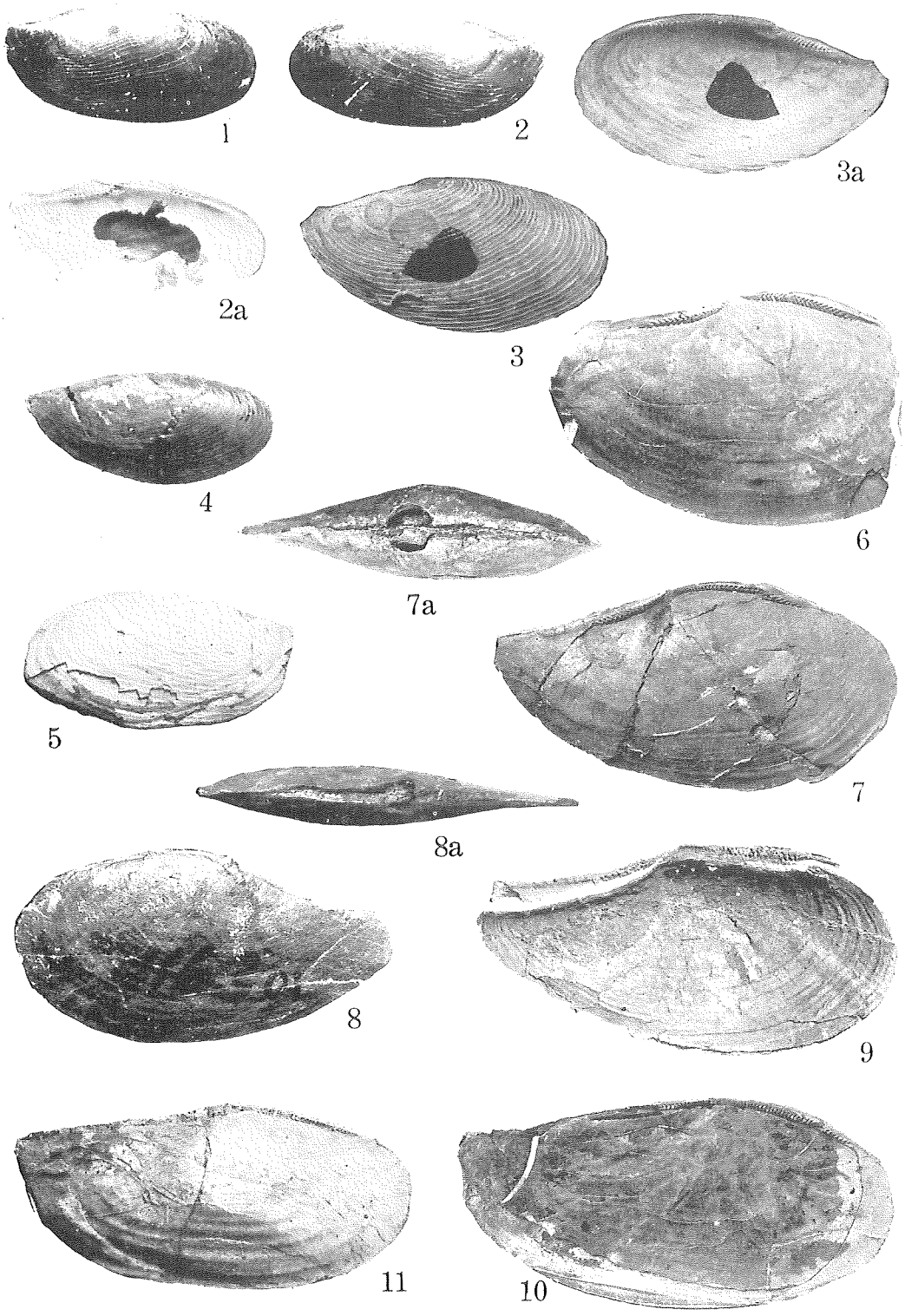
## Explanation of Plate 6

Figs. 1, 2, 2a. *Yoldia* (*Cnesterium*) *johanii* DALL: Exterior left and right valves, and interior left valve, length 39.0 mm. ×1, U. H. Reg. No. 12236; from sea coast of Nemuro, Recent.

Figs. 3, 3a, 4, 5. *Yoldia* (*Cnesterium*) *notabilis* YOKOYAMA: 3, 3a. Exterior and interior right valve, length 38.6 mm. ×1, U. H. Reg. No. 12239; from sea coast of Nemuro, Recent. 4. Exterior right valve, length 34.0 mm. ×1; from the Chikubetsu formation, middle coarse of the Haboro-Gawa, Tomamae-Gun, Teshio Province. 5. Exterior left valve, length 28.6 mm. ×1.5, U. H. Reg. No. 6003; from near Shiretori in the eastern coast of Sakhalin.

Figs. 6, 7, 7a, 8, 8a, 9. *Yoldia* (*Kalayoldia*) *macroshema* UOZUMI n. sp.: 6. Interior mold right valve, U. H. Reg. No. 12244; 7, 7a. Interior mold of right valve and dorsal view of holotype, length 58.1 mm. ×1, U. H. Reg. No. 12243; 9. Exterior right valve, length 61.7mm. ×1, U. H. Reg. No. 12247; from the Honbetsu formation, upstream of the Okuyokunnai-Sawa, Yubetsu Coal-Mine, Akan-Mura, Akan-Gun, Kushiro Province. 8, 8a. Exterior left valve and dorsal view, length 58.5 (+) mm. ×1, U. H. Reg. No. 12320; from the Honbetsu formation, upstream of the Akan-Gawa, near Piritaneppu, Akanbetsu-Mura, Akan-Gun, Kushiro Province.

Figs. 10, 11. *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA: Exterior right valves, length 64.3 mm. ×1, and 60.0 mm. ×1, U. H. Reg. No. 12264a, b; from the so-called "Hard-shale" formation, Bihoro-Machi, Abashiri-Gun, Kitami Province. (in detail unknown).




UOZUMI: *Yoldia* and *Portlandia* KUMANO Photo.

# Explanation of Plate 7

## Explanation of Plate 7

**Fig. 1.** *Portlandia* (*Portlandella*) *lucidaeformis* (NOMURA et ZINBO): Saito Ho-on Kai Mus. Res. Bull. No. 6. From NOMURA et ZINBO's type figure. Length 18.5 mm., height 10.8 mm., depth 4 mm. ×1.

**Fig. 2.** *Portlandia* (*Megayoldia*) *aokii* (NOMURA et ZINBO): Saito Ho-on Kai Mus. Res. Bull. No. 6. From NOMURA et ZINBO's type figure. Length ca. 18 mm., height 11.5 mm., depth 6 mm. ×1.

**Figs. 3, 4.** *Yoldia* (*Cnesterium*) *yamagatana* NOMURA et ZINBO: Saito Ho-on Kai Mus. Res. Bull. No. 13. From NOMURA et ZINBO's type figures. Holotype; dimensions: length ca. 25 mm., height 13 mm. ×1 (Holotype: Fig. 3; paratype: Fig. 4).

**Figs. 5, 6.** *Yoldia* (*Cnesterium*) *yabei* (YOKOYAMA): Jour. Coll. Sci. Imp. Univ. Tokyo Vol. 45. From YOKOYAMA's type figures. Natural size.

**Figs. 7-10.** *Portlandia* (*Megayoldia*?) *scaphoides* (NAGAO): Sci. Rep. Tohoku Imp. Univ. 2 Ser. Vol. 12. From NAGAO's type figures. Length 21, height 12 mm. × 1. (Holotype: Figs. 7, 10).

**Fig. 11.** "*Nuculana omorii*" (AOKII): Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, No. 17. From AOKI's figure, reported as *Yoldia omorii*.

**Fig. 12.** *Yoldia* (*Tepodoleda*) *kawadai* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku Sec. C, No. 18. From HIRAYAMA's type figure. Length 26.2 mm., Height 13.0 mm., thickness 5.5 mm. ×1.

**Fig. 13.** *Portlandia* (*Megayoldia*) *yotsukurensis* UOZUMI: Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, Vol. 10. From MAKIYAMA's figure, reported under the name "*laudabilis*". Natural size.

**Figs. 14, 15.** *Yoldia* (*Orthoyoldia*) *iwatensis* HATAI: Bull. Biogeogr. Soc. Jap. Vol. 10. From HATAI's type figures. Length 43 mm., height 17 mm., depth 8 mm. ×0.8.

**Fig. 16.** *Yoldia* (*Tepidoleda*) *similis* KURODA et HABE: Venus Vol. 1. From *Kuroda's* type figure, reported under the name "*nagamurana*". Length 24 mm. ×1.9.

**Fig. 17.** *Portlandia* (*Portlandella*) *hurukutiensis* (NOMURA et ZINBO): Saito Ho-on Kai Mus. Res. Bull. No. 6. From NOMURA et ZINBO's type figure. Length 21 mm., height 13 mm., depth ca. 5 mm. ×1.

**Figs. 18, 19.** *Yoldia* (*Tepidoleda*) *naganumana* (YOKOYAMA): Jour. Coll. Sci. Imp. Univ. Tokyo Vol. 39. From Yokoyama's type figures, reported under the name "*Leda naganumana*". Natural size.

**Fig. 20.** *Portlandia* (*Megayoldia*) *gratiosa* (YOKOYAMA): Jour. Geol. Geogr. Vol. 2. From YOKOYAMA's type figure. Length 33 mm., height 22 mm., thickness 13.5 mm. ×1.

**Fig. 21.** *Yoldia* (*Orthoyoldia*?) *ensicula* YOKOYAMA: Jour. Fac. Sci. Imp. Univ. Tokyo Vol. 1. From YOKOYAMA's type figure. Length 23 mm., height 11 mm., thickness 4 mm. ×1.

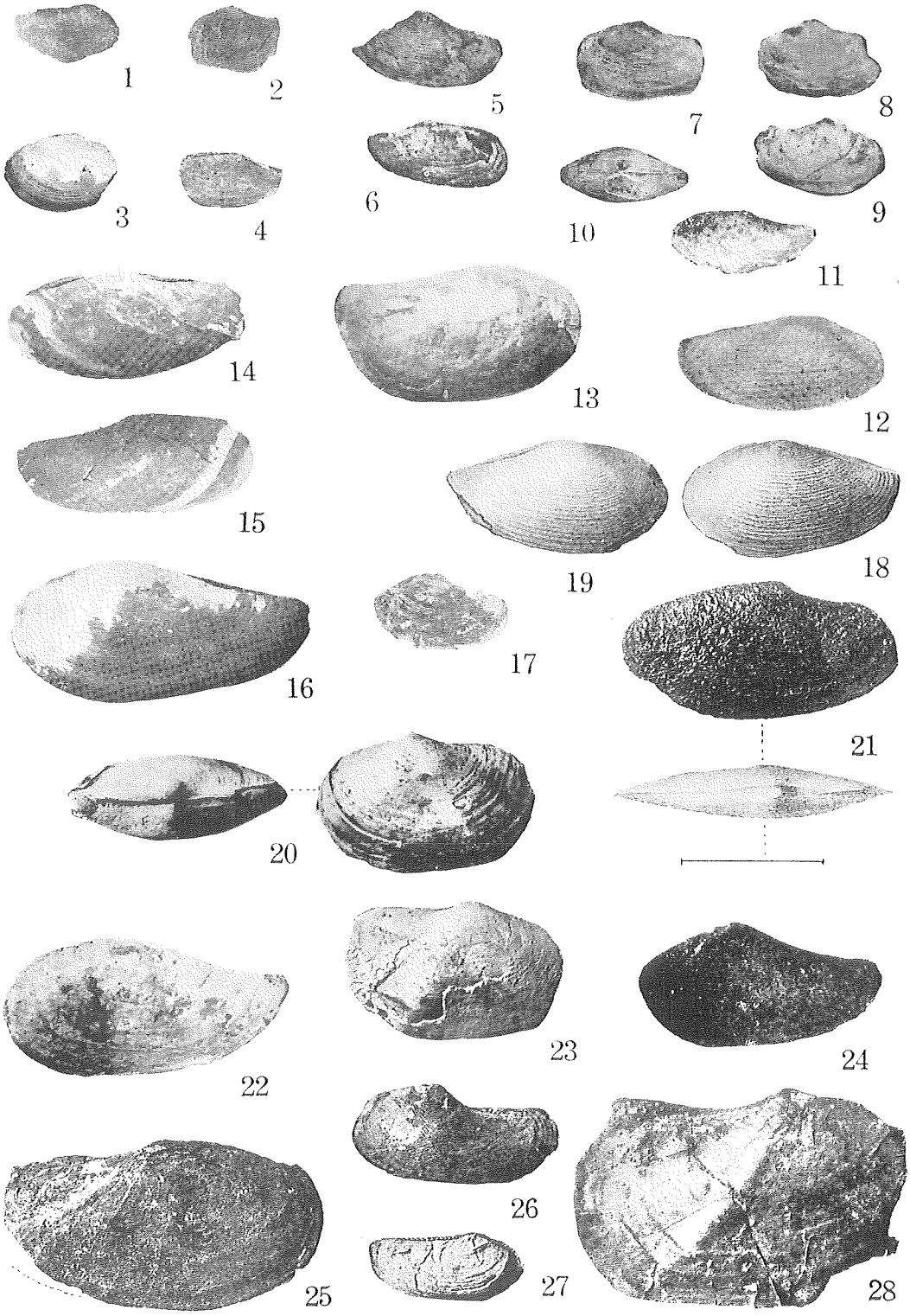
**Fig. 22.** *Yoldia* (*Yoldia*) *laudabilis* YOKOYAMA: Mem. Coll. Sci. Kyoto Imp. Univ. Vol. 10. From MAKIYAMA's figure, reported under the name "*asagaiensis*". Length 42 mm., height 21 mm. ×1.

**Figs. 23, 28.** *Portlandia thraciaeformis* (STORER): Jour. Fac. Sci. Imp. Univ. Tokyo, Vol. 1. From YOKOYAMA's type figure, named "*scapha*" by him. Natural size.

**Fig. 24.** "*Yoldia*" *hikoshimensis* HIRAYAMA: Sci. Rep. Tokyo Kyoiku Daigaku, Sec. C, No. 45. From HIRAYAMA's type figure. Length 27 mm., height 18 mm., depth 6 mm. ×1.

**Figs. 26, 27.** *Portlandia* (*Portlandella*) *tokunagai* (YOKOYAMA): Jour. Coll. Sci. Imp. Univ. Tokyo Vol. 45. From YOKOYAMA's type figures. Natural size.

**Fig. 25.** *Yoldia* (*Orthoyoldia*) *sagittaria* YOKOYAMA: Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 45. From YOKOYAMA's type figure. Length 50 mm., height 27mm. ×1.




UOZUMI: *Yoldia* and *Portlandia* KUMANO Photo.