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Older Mesozoic *Estherites* from Eastern Asia.

By

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(With I Plate)

More than 9 species of *Estherites* as shown in the table are distinguished in the collection from older Mesozoic formations at eight localities in Eastern Asia. Though their minute ornaments are mostly unpreserved, most of them are quite different from the later ones of Eastern Asia in their outlines. It is especially noteworthy that nearly all specimens are small.

<i>Estherites</i>	Asa (1)	Rampo (2)	Kimpo (3)	Kenjiho (4)	Heijo (5)	Heitingshan (6)	Hsiahuayuan (7)	Matienling (8)
<i>E. kawasaki</i> (OZAWA and WTANABE)	x		x					
<i>E. koreanica</i> (OZAWA and WATANABE)	x		x					
<i>E. rampoensis</i> KOBAYASHI, (nov.)		x	x					(x)
<i>E. khinganensis</i> KOBAYASHI, (nov.)						x		
<i>E. shimamurai</i> KOBAYASHI (nov.)				x				x
<i>E. tanii</i> KOBAYASHI, (nov.)					x			
<i>E. cycloides</i> KOBAYASHI, (nov.)					x			
<i>E. cfr. transbaikica</i> (CHERNYCHEW)					x			
<i>E. aff. reticulata</i> (CHERNYCHEW)					x			
Indeterminable species		x					x	x

1) The Kamosho formation at Hikiji, in the Asa area, in Prov. Nagato (Yamaguchi Pref.), Japan. Coll. by M. DOI and D. OKUBO. (See KOBAYASHI and the Second Year Class Students, 1939, HASE, 1947 and KOBAYASHI, 1949 for Geology).

2) The Gabisan (峨嵋山) formation of the Daido series at Kinkoan (金崗庵) in the Rampo (藍浦) area, Central Korea. Coll. by S. SHIMAMURA. (See SHIMAMURA, 1931 for Geology.)

3) The Tonjin (通津) formation of the Kimpo (金浦) area in Central Korea which belongs to the Daido series lies on granite and metamorphics and is overlain by the younger Mesozoic Mushasan (文殊山) conglomerate, 850 m. thick. According to T. WATANABE, the Tonjin formation consists of the Koyangni (高陽里) sandstone, 75 m.

thick, yielding the estherians in its lower part, Pyokagai (表峴) alternations of slate and sandstone, 250 m. thick, Sungmasan (乘馬山) green sandstone, 270-500 m. thick and Urganmi (東岩里) sandstone and conglomerate, 180 to 200 m. thick, in descending order.

4) The Chudo (中洞) formation of the Daido series at Shindo (新洞) in the Kenjiho (兼二浦) area, North Korea. (See SHIMAMURA, 1920.) Coll. by S. SHIMAMURA and Tomomasa MATUMOTO.

5) The upper division of the Daido series in the Kosai (江西) area of Heijo, probably the Kurori beds at the top of the division, at Kakurori (下九老里). (See MATSU-SHITA, 1938). Collected by K. SUZUKI.

6) Heitingshan (黑頂山) is a small dead coal mine on the eastern slope of the central part of the Great Kbingan range, at about the midway between Laoyehmiao (老爺廟) and Lichuan or Tuchuan (醴泉, 突泉) and slightly south of west of Taonan (洮南). Beside estherians, *Cladophlebis*, *Sphenopteris* and *Equisetites* were collected by S. HARUKI in gray shale and mudstone at a cutting 700 m. east of Liutsengtun (劉增屯) between Heitingshantsu and Melantun (萊蘭屯) on the southern slope of Heitingshan hill.

7) In the Hsiahuayuan (下花園) coal-field to the east southeast of Ihua (宜化) between Kalgan and Peking there are, according to RIN (林朝榮), two Mesozoic formations. The lower or his Huayuan formation which is the coal-bearing is separated from the upper or his Yutai (玉帶) by disconformity. The Yutai formation consists of upper andesitic agglomerate and flow, pumiceous tuff of liparite, shale of 15 metres at the maximum thickness, lower andesitic agglomerate and flow, liparitic tuff and shale containing estherians and silicified woods and basal conglomerate.

8) T. KIHARA collected estherians, insects and plants in dark shales at Matienling, Laoyehmiao, (Hsinglunghsien, 興隆縣, 老爺廟, 摩天峯) in Jehol. (See MORITA, 1943.)

As the result of this study some changes are required in the correlation. The Kamosho formation of the Asa area which yielded *E. kawasakii* and *E. koreanica*, is known now to be lower Noric, because *Entomonotis scutiformis* is procured from the Kamosho formation (KOBAYASHI, 1949). Accordingly the Tonjin formation in the Kimpo area whence the two estherian species have first been described (OZAWA and WATANABE, 1921), must be about the same age. It is also probable that the Gabisan formation in the Rampo area may be nearly contemporaneous with the Tonjin because of the common occurrence of *E. rampoensis* between the two formations. Because the estherians collected at Matienling, Laoyehmiao, Hsinglunghsien, Jehol, contains *E. shimamurai* and *E. rampoensis*, this fossil bed may be close to those of Rampo, Kimpo and Kenjiho in age. Similarly, *E. cfr. transbaikalia* and *E. aff. reticulata* suggest that the Kurori beds in the Heijo area might be close to the Karabon horizon in Transbaikalia (KOBAYASHI, 1942a).

Except those from the Rampo area all of the estherians including the ones from Heitingshan, Hsiahuayuan and Matienling are very small, the small size or dwarfing suggesting the unfavourable environ-

ment for the estherians (KOBAYASHI and KIDO, 1943). Furthermore it is noteworthy that the outline of *E. koreanica*, *E. rampoensis*, *E. khinganensis*, *E. cycloides* and also *E. kawasakii* are quite aberrant. The formations in Heitingshan and Hsiahuayuan which yield this kind of estherians are also thought to be older than the Jehol group containing the largest estherians.

The Daido flora, when described from the older Mesozoic formations in Korea thought Liassic by KAWASAKI (1925, 1939), but the occurrence of the above mentioned estherians in the lower Noric formation in the Province Nagato is an evidence vindicating my conclusion (1942 b) that the age of the flora extends from Liassic to Late Triassic.

Incidentally, RAYMOND, 1946, splitted fossil Conchostraca into 25 genera in 6 families including the Leidae, but insofar as the estherians without radial markings are concerned, I cannot convince myself how far his classification bears biological value, because it is known that the outlines and ornaments are so variable among the living estherian genera (KOBAYASHI and HUZITA, 1943). Therefore, until more will be known of these form-genera, all of these species including some resembling *Cyclestheria* are referred here to *Estherites*.

Finally my cordial thanks are due to Messers. S. SHIMAMURA, K. SUZUKI, K. HARUKI, C. RIN, T. KIHARA and others who collected the estherians.

Description of *Estherites*

Estherites koreanica (OZAWA and WATANABE)

MA4740-1-12

Plate I, Figure 12a

1923. *Estheria koreanica* OZAWA and WATANABE, *Japan. Jour. Geol. Geogr.*, vol. 2, p. 41, pl. 5, figs. 3a, 4a.

Description and measurement:—Carapace roundly subtrigonal with a nearly straight dorsal margin corresponding about two-thirds the length of the valve; postero-ventral margin describing a quarter of a circle; anterior margin gently arcuate; umbo located at the frontal end of the dorsal margin; growth lines dense and separated by interspaces of subequal breadth.

The type left valve from Koyangni measures about 6.5mm. in height and length; some 20 lines of growth countable on the surface.

Observation and Comparison.—The subtrigonal outline with the terminal umbo is a unique feature among estherians. The Hikiji specimen about 5 mm. high and long is judged to have growth lines 2 or 3 less and its outline appears somewhat more rounded than the type. Though not well preserved, its best reference is to this species.

Occurrence.—Dark gray sandy shale of the Tonjin formation at Koyangni, Kimpo area, Central Korea; light blue clayey stone of the Kamosho formation at Hikiji, Asa area, Prov, Nagato, West Japan.

MA 4741 - 1

MA 4742 - 2 *Estherites cycloides* KOBAYASHI, new species

Plate I, Figures 1-2

MA 4741 - 1 - 1
MA 4742 - 1 - 2

Description.—Carapace outline subcircular except the antero-dorsal and dorsal margins which are nearly straight; the latter a little longer than a half of the carapace-length, forms a broad angle of about 120 degrees with the former, where a tiny umbo is located; both sides of the bisectrix through the angle almost symmetrical, though somewhat more broadly rounded on the antero-ventral side; 12 or more concentric ridges subequally spaced, narrow and parallel to the postero-ventral margin and bent up abruptly near the antero-dorsal margin; some 10 fine concentric striae seen in the interspace near the periphery.

Observation and measurement.—The holotype right valve is about 4mm. high and 3.5mm. long; its dorsal margin 2.5mm. long; 12 concentric ridges, roof-shaped, sometimes grooved on the top; some of them on the umbonal side thick and somewhat widely spaced; concentric markings composed of rows of strips, seen in the interspace on the postero-ventral side.

There are two other specimens, one being more depressed in outline and the other more rounded and its growth lines denser, but they agree with the type in the outline symmetrical in regard to the above mentioned bisectrix. The former specimen of the two has a very distinct median groove on the top of the ridge, as seen in *Cyzicus* (?) *newcombi* (BRAID), (DEDAY (1915), p. 324, fig. 75).

Comparison.—In the outline this species resembles *Cyclestheria* rather than any fossil estherians. Compared with *Cyclestheria histopi*, however, the umbo is tiny and no sinuation is seen in front of it in this species.

Occurrence.—black shale of Kurori beds, at Kakurori near Heijo.

Estherites rampoensis KOBAYASHI, new species

MA 4751-1-13 - 1/2 C P

Plates I, Figures 12c, 13

MA 4746-1-12

Description and measurement:—Carapace subcircular, nearly as long as high; dorsal margin nearly straight and occupying about a half of the carapace-length in the middle part; umbo terminal.

Dimension \ Specimen	Kinkoan	Koyangni
Height of carapace	9 mm.	6 mm.
Length of carapace	10.4 mm.	5.7 mm.
Length of dorsal margin	4.9 mm.	2.8 mm.

Observation:—The type is the Kinkoan specimen which is more abruptly rounding on the anterior than on the posterior side. The Koyangni specimen which is different from the type on this account, appears to be deformed to some extent. Nevertheless the two agree in the diagnostic characters. A specimen from Matienling is 4.2mm. in height and length. Because 24 lines of growth can be counted in the anti-umbonal 2.6 mm. the total number of the lines may be 40.

Occurrence:—Black shale of the Gabisan formation at Kinkoan, Rampo area and dark gray sandy shale of the Tonjin formation at Koyangni, Kimpo area, both in Korea; (?) dark gray shale at Matienling, Jehol.

Estherites khinganensis KOBAYASHI, new species

Plate I, Figure 3

MA 4743-1-3

Description and measurement:—Carapace moderately convex, the convexity increasing near the umbo, slightly longer than high, roundly subquadrate, more or less equilateral; anterior margin nearly straight, but ventral and posterior ones are fairly rounded; dorsal margin slightly arcuate and a little shorter than the length of the carapace; umbo located on the dorsal margin at a point a little less than one-third its length from its frontal end; behind the umbo the carapace somewhat depressed; 17 lines of growth which are narrow ridges, equidistant except in the inner band of the outer half where they are

close-set; outline indicated by the lines near the umbo subtriangular and narrowing backward.

The type specimen is 6.5mm. long and 6mm. high; ventral margin 5.5mm. long and the umbonal position 1.6mm across from its frontal end.

Comparison.—Beside a fragmentary one there is an external mould of a right valve on which the preceding description and measurement are based. This species is somewhat similar in the immature stage to *E. koreanica* in the outline and subterminal umbo, but quite distinct in the mature stage. Compared to *E. kantoensis* KOBAYASHI and KIDO, 1947, it is taller, more quadrate, its dorsal margin longer and gently convex, instead of concave in that species. The growth lines are not so fine and no accessory ones discernible.

Occurrence.—Gray mudstone of Heitingshan in the Great Khingan range.

Estherites kawasakii (OZAWA and WATANABE)

Plate I, Figure 12b

MA 4740-1-12

1923. *Estheria kawasakii* OZAWA and WATANABE, *Japan. Jour. Geol. Geogr.*, vol. 2, p. 41, pl. 5, figs. 3b, 4b.

Description and measurement.—Carapace valve transversely elongated, highest in the median part, quite inequilateral and gradually dilated backward; dorsal margin nearly straight and broadly arcuate; anterior margin more abruptly rounded than the posterior; umbo terminal on the dorsal margin; growth lines distributed with uniform intervals.

The type specimen from Koyangni is 3.5mm. high and 8.3mm. long, its dorsal margin being about 5.5mm. long. The umbo lies at a distance of 1.5mm. from the frontal end of the valve. Concentric ridges become obscure near the umbo as well as the ventral periphery but, because 13 of them are countable in the middle two-thirds, the total number may be about 20.

Observation.—Two valves on the Hikiji specimen having a elongately elliptical outline with a terminal umbo, belong most probably to this species.

Occurrence.—Dark gray sandy shale of the Tonjin formation at Koyangni, Kimpo area, Central Korea; light blue clayey stone of the Kamosho formation at Hikiji, Asa area, Prov. Nagato.

Estherites tanii KBAYASHI, new speciesMA4744-1-5, 15
MA4745-1-11

Plate I, Figures 5, 11, 15

Description.—Carapace subovate and obliquely elongated; dorsal margin nearly straight and about half as long as the carapace, the height of which attaining the maximum through the posterior end of the dorsal margin where it corresponds to about three-fourths the carapace-length; umbo subterminal on the dorsal margin; surface marked by some 27 growth-ridges mostly roof-shaped; interspace irregularly reticulated.

Observation.—The holotype left valve is 5.4mm. high and 7.8mm. long, the ratio being 1 : 1.3. No less than 27 concentric ridges countable on the surface tend to be denser toward the periphery; the interspace about the same as the ridge in breadth.

The paratype is an external mould of a left valve the rear part of which is broken off. There are no less than 25 concentric ridges some of which are medially grooved. A few fine accessory ridges are seen to exist in some intervals, but they are easy to die out laterally. The interspace in the medio-ventral part is irregularly and densely tuberculated. As it is a mould, the surface ornament must be very fine irregular mesh of the *calcarta* type or the like. (KOBAYASHI and HUZITA, 1943).

Comparison.—Like *E. kawasakii* the outline of the species is elongately ovate, but is much taller and its dorsal margin shorter. The outline is, however, more expanded backward in it than in *E. reticulata* (CHERNYCHEV), 1930. Compared to *E. singkiangensis* (CHI), 1931, the concentric ridges are much denser.

Occurrence.—Black shale of the Kurori beds at Kakurori near Heijo.

MA4746-1-6

Estherites shimamurai KOBAYASHI, new species

MA4747-1-7

MA4748-1-8

Plate I, Figures 6-8, 14

MA4749-1-14

Description.—Carapace subelliptical, but more expanded on the rear side; lateral margins well rounded, the posterior curvature being more gradual; ventral margin curved still more broadly; dorsal margin nearly straight and a little longer than a half the carapace-length; umbo on it terminal or almost so on the dorsal margin; growth ridges or grooves widely and almost equidistantly spaced except near the

periphery where they are relatively close-set; fine polygonal reticulation seen in the interspace.

A right valve (S_3) selected for the holotype is 5.4mm. long and 3.4mm. high, and has 13 lines of growth; its dorsal margin 3.3mm. long.

Observation.—Innumeral carapaces on the slabs before hand are all dismembered, the largest specimen attaining 6.4mm. or so in length. Their outline is variable to some extent and accordingly the height-length proportion varies from 1.2 to 1.7, but nevertheless the outline is always expanded on the posterior side and the umbo terminal almost exactly. The number of growth lines are generally 13 to 15, but attains 17 in a few valves. In some specimens the lines are practically obsolete in the umbonal region. At Matienling this species is more common than *E. rampoensis* and a specimen of this species measures 3.9mm. long and 2.6mm. high.

Comparison.—This species looks similar to *Estherites zeili* (MANSUY), 1912, but the outline is more expanded on the anterior and the umbo subterminal in that species. The posterior dilation is however not so remarkable and the interval between the growth lines broader in this than in *E. kawasakii*. The outline of a specimen (S_1), in particular, is close to *Estherites singkiangensis* (CHI), 1931, but no punctuation can be seen in this species.

Occurrence.—Black estherian shale at Shindo, Kenjiho area; dark gray shale at Matienling in Jehol.

Estherites cfr. *transbaikalica* (CHERNYCHEV)

Plate I, Figure 4

MA 4744-1-4

1930. cfr. *Estheria transbaikalica* CHERNYCHEV, *Bull. Geol. Prosp. Serv. USSR.* p. 77, pl. 1, figs. 15-16.

Carapace a little inequilateral and roundly quadrate, or better to say, subelliptical but truncated by a nearly straight dorsal margin which is as long as two-thirds the carapace-length; umbo terminal, relatively large and protruded above it; growth ridges to be counted about 14, very narrow and rounded on the top; interspace wide, flat or a little concave.

A right valve at hand is 5.3mm. high and 6.5mm. long, the ratio being 1 to 1.2; dorsal margin about 4mm. long. Crossed by irregular subvertical wrinkles, nodes come out on the ridges secondarily and the original ornament obscured.

The specimen is closely allied to *E. transbaikalica* in size and outline, but is a little taller and concentric ridges less in number, if compared with CHERNYCHEV's specimen in fig. 16. The terminal umbo easily distinguishes this species from *E. khinganensis*.

Occurrence:—Black shale of the Kurori formation at Kakurori, near Heijo.

Estherites sp. aff. *E. reticulata* (CHERNYCHEV)

MA4744-1-7

✓ Plate I, Figure 9

1930 aff. *Estheria reticulata* CHERNYCHEV, *Bull. Geol. Prosp. Serv. USSR*, p. 77, figs. 13, 13a, 14.

Carapace somewhat elliptical, elongated diagonally; dorsal margin nearly straight, about half as long as the carapace; umbo located close to its anterior extremity; surface marked by no less than 14 concentric ridges.

A right valve from Kakurori is 3.7mm. high and 5mm. long. It has the outline very similar to that of *E. reticulata*, the number of growth lines being also not much different, but the peculiar intercrossing of the ridges as seen in the posterior part of *E. reticulata* can not be recognized in this specimen.

Occurrence:—Black shale of Kurori formation at Kakurori near Heijo.

MA4750-1-10

MA 4750 *Estherites* sp. indet. aff. *E.*
nanpocensis Kobayashi, Pl. 1, fig. 10

References.

- CHERNYCHEV, B. (1950), *Estheria* from Siberia and the Far East Province. *Bull. Geol. Prosp. Surv. USSR*, vol. 49.
- CHI, Y. S. (1931), On the Occurrence of Fossil *Estheria* in China and its Geological Significance. *Bull. Geol. Soc. China*, vol. 11.
- DEDAY de Dee's (1915-23), Monographie systématique de Phyllopoques conchostraces. Pts. 1-2. *Ann. Sci. Nat. Zool., sér. 9, tom. 9, sér. 10, tom. 6.*
- KOBAYASHI, T. (1942a), The Sakawa Orogenic Cycle in the Amur Geosyncline. *Proc. Imp. Acad. Tokyo*, vol. 18.
- , (1942b), On the Climatic Bearing of the Mesozoic Floras in Eastern Asia. *Japan. Jour. Geol. Geogr.*, vol. 18.
- , (1949), On the Goectonics of the Japanese Islands, vol. 2. Meguro Book Co.
- , and A. HUZITA, (1943), *Estherites* and its Relation to the Genera of Living *Estherites*. *Proc. Imp. Acad.*, vol. 19.
- , and Y. KIDO, (1943), Climatic Effect on the Distribution of Living *Estherians* and its Relation to the Morphic Characters of their Carapace. *Jour. Geol. Soc. Japan*, vol. 50.
- , and —, (1947), Cretaceous *Estherites* from the Province of Chientao, Manchuria. *Japan. Jour. Geol. Geogr.*, vol. 20.
- , and the Second Year Class-students of Geol. Inst., Imp. Univ. Tokyo (1939), On the Geology of the Provinces of Nagato and Chikuzen. *Jour. Geogr. Tokyo*, vol. 52.
- HASE, A. (1947), On the Stratigraphic Succession of the Triassic System in the south-western Part of Yamaguchi Prefecture. *Jour. Geol. Soc. Japan*, vol. 53.
- KAWASAKI, S. (1925), Some Older Mesozoic Plants in Korea. *Bull. Geol. Surv. Chosen*, vol. 4, pt. 1.
- , (1939), Second Addition to the Older Mesozoic Plants in Korea. *Bull. Geol. Surv. Chosen*, vol. 4, pt. 3.
- MANSUY, H. (1912), Mission du Laos. *Mém. du Serv. géol. de l'Indochine*, vol. 1, fasc. 4.
- MATSUSHITA, S. (1938), The Southern Coal-field of Heian-nan-do. *Rep. Geol. Surv. Coal-field in Chosen*, vol. 13.
- MORITA, G. (1943), Some Geological Observations in Hsinglunghsien, Jehol Province, Manchoukuo. *Jour. Geol. Soc. Japan*, vol. 50.
- OZAWA, Y. and T. WATANABE, (1921), On two species of *Estheria* from the Mesozoic shale of Korea. *Japan. Jour. Geol. Geogr.*, vol. 2.
- RAYMOND, P. E. (1946), The Genera of Fossil Conchostraca—an Order of bivalved Crustacea. *Bull. Mus. Comp. Zool. Harvard Coll.*, vol. 96, no. 3.
- SHIMAMURA, S. (1920), Geological Atlas of Chosen, no. 8.
- , (1931), Geological Atlas of Chosen, no. 13.

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Older Mesozoic *Estherites* from Eastern Asia.

Plate I

Explanation of Plate I.

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[All of these specimens are kept in the Geological Institute,
University of Tokyo, Japan.]