710. SOME NEW BIVALVE SPECIES FROM THE LOWER GYEONGSANG GROUP, KOREA*

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Abstract. Two new bivalvian species from the Yeonhwadong Formation, the lowermost formation of the Gyeongsang Group are described here. Trigonioides (Koreanaia) bongkyuni sp. nov. is ornamented with large angled V-shape subradial ribs of Koreanaia type and possesses fine crenulated hinge teeth of Wakinoa type. On account of the stratigraphic relation as well as the morphologic characters, T. (K.) bongkyuni is reasonably interpreted as a link-species between T. (K.) cheongi and some species of T. (Wakinoa) in the evolutionary lineage. The other new one, Pseudohyria matsumotoi, may be considered to be an ancestor of other species of Pseudohyria reported from the continental side of Asia in respect of the stratigraphic occurrences.

Introduction

Many species referred to the family Trigonioididae have been reported from the Lower Cretaceous formations in the Asian Continent including the Korea-Japanese region since the genus Trigonioides was first established by Kobayashi and Suzuki (1936) from the Nagdong Subgroup, Korea. They have been known as indices in the non-marine Cretaceous formations of Asia. But, for further precise correlation and the appropriate allocation of their taxonomic position, the construction of their phylogeny is indispensable. The formations yielding these species, unfortunately, are separately distributed here and there, and thus the phylogenetic relations among them have not yet been definitely constructed as mentioned previously (Yang, 1978a).

Ota (1963) regarded Trigonioides (s.s.) as a derivative from Wakinoa observing the degree of the development of median cardinal teeth in the two subgenera. Hayami (in Hayami and Ichikawa, 1965) considered that Wakinoa was a common ancestor of Trigonioides (s.s.) and Nippononaiia or that Trigonioides (s.s.) was derived from Nippononaiia through Wakinoa with regard to the hinge structure and other morphologic characters. After that, I revised the evolutionary lineage such as Koreanaia—Wakinoa Nippononaiia—Trigonioides (s.s.)—Kumamotoa from the stratigraphic relations and their morphologic characters and presented the Koreanaia cheongi as an ultimate ancestor of the trigonioidid species (1976, 1978b). The evolutionary trend was also supported from the comparison of the T. (s.s.) kodairai and T. (s.s.) paucisulcatus (Yang, 1978a).

Recently, I discovered a new fossil locality from the lowermost formation of the Gyeongsang Group, Korea. Among the collection, a new trigoniid species described below presents a fairly inter-

The other new species is referred to *Pseudohyria*, which has not been reported from Koreo-Japanese region. From the stratigraphic occurrence, the new species of *Pseudohyria* is possibly an ancestor of various species of *Pseudohyria* reported from the Asian Continent.

This is to report systematically the two new species with some brief notes on the stratigraphy of the Gyeongsang Group.

Acknowledgements—I would like to express my sincere gratitude to Emeritus Professor Tatsuro MATSUMOTO of the Kyushu University for his kind encouragement and also critical reading of this paper, and to Miss Gumja LEE of the Kyungpook National University for her assistance on field and laboratory works.

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Stratigraphic Notes

There have been different proposals about the stratigraphic subdivision of the Gyeongsang Group by several authors, but I do not give any comments on them in this paper. In this paper, the current scheme of subdivision is used as shown in Table 1.

The Gyeongsang Group is nonconformably underlain by a complex gener-
ally composed of gneisses and granites, but in one small area of the northern margin of the Gyeongsang Basin, the group is in contact with the possibly upper Jurassic Myogog Formation with angular unconformity, from which *Koreanaia cheongi* was described (YANG, 1976). Assuming that the Yeonhwadong Formation next above the regional unconformity is almost of the same age throughout the basin, *K. cheongi* must be chronologically earlier than the present species.

The relation of the two subgroups, the Nagdong and the Sinla, is apparently observed as conformable at least near the type-section. The ruditic rock of the Paldal Formation shows a gradual change from the arenites of the Chilgog Formation lying below generally in the northern area of the basin. However, in the southern area, an abrupt lithologic change at the boundary is observed, which leads us to regard the relation as disconformable. The two subgroups are fairly well distinguishable from each other.

Table 1. Current scheme of subdivision of Gyeongsang Group.

<table>
<thead>
<tr>
<th>GYEONGSANG GROUP</th>
<th>Sinla Subgroup</th>
<th>Nagdong Subgroup</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bulgugsa intrusives</td>
<td>Dongmyeong Fm.*</td>
</tr>
<tr>
<td></td>
<td>intrusive</td>
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<tr>
<td></td>
<td>Jusasan andesites</td>
<td></td>
</tr>
<tr>
<td>Geoncheonri Fm.</td>
<td>T. (s.s.) <em>paucisulcatus</em> or Jindong Fm.</td>
<td></td>
</tr>
<tr>
<td>Chaeyagsan basalts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banyaweol Fm.</td>
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<td></td>
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<tr>
<td>Haman Fm.</td>
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<td></td>
</tr>
<tr>
<td>Hagbong basalts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paldal Fm.*</td>
<td>conformity (or disconformity)</td>
<td></td>
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<tr>
<td>Chilgog Fm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dongmyeong Fm.*</td>
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<tr>
<td>Hasandong Fm.—T. (s.s.) <em>kodairai</em></td>
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<tr>
<td>Yeonhwadong Fm.*—<em>Nippononaia ryosekiana</em>, T. (K.) <em>bongkyuni</em>, <em>Ps. matsumotoi</em></td>
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<td></td>
<td>un conformity</td>
<td></td>
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<tr>
<td></td>
<td>Pre-Gyeongsang complex (granites, gneisses) or Myogog Fm.—T. (K.) <em>cheongi</em></td>
<td></td>
</tr>
</tbody>
</table>

In spite of CHANG's withdrawal (1975) of his own proposal (1966) of *Yeonhwadong and *Dongmyeong formations for Nagdong and Jinju formations, respectively, I prefer to use the Yeonhwadong and Dongmyeong formations, as the name Nagdong has been familiar to geologists broadly meaning the lower part of the Gyeongsang Group such as Nagdong flora and Nagdong fauna since YABE (1905), and above all, the Nagdong is also used to the subgroup, and the name Jinju is derived from the remote distance from the type-section. The *Paldal formation has been occasionally used for the Sinla conglomerate since SUZUKI (1943), and seems more desirable than the latter on the same reason as above. The Paldal is derived from the Paldal-gyo (Paldal bridge) at the type-locality near Daegu.
other by different lithology, that is, the Nagdong is composed of rudites, arenites and lutites, while the Sinla contains predominantly lutites and subordinately arenites besides the basal conglomerate of the Paldal Formation. Therefore, it seems to be more reasonable to divide the group into the two subgroups than any other schemes of subdivision. And there is no problem in stratigraphic comparison between Geoncheonri Formation (with T. (s.s.) paucisulcatus) and Hasandong Formation (with T. (s.s.) kodairai).

The subgroups are divided into formations generally on the grounds whether the reddish beds are intercalated or not. However, on account of discontinuity of the reddish beds, they can not be considered as appropriate key beds (YANG, 1972). Therefore, it is quite difficult to draw chronology in detail from the lithologic units, formations, especially in correlation of the two areas of a great distance apart. For instance, no one can say, in the present state of knowledge, whether the lower Lower Yeonhwadong Formation near Goryeong be in fact lower than the middle Lower Yeonhwadong Formation near Waegwan. And so the locality of Nippononai ryosekiana near Waegwan is hardly comparable with that of the present fossil locality. However, the Lower Yeonhwadong Formation and the Middle Hasandong Formation can be compared with each other with some chronologic sense. The present locality falls under the Lower Yeonhwadong Formation. While the occurrences of T. (s.s.) kodairai are confined to the Middle Hasandong Formation even though the fossils occur very sporadically. Thus, the present locality can be said to be stratigraphically lower than those of T. (s.s.) kodairai.

The geology around the present fossil locality was mapped by CHOI and KWON (1975), and Text-figure 1 is adapted from their geological map with some modification made by me. The area is located on the western margin of the central part of the Gyeongsang Basin and consists of the pre-Gyeongsang complex, the lower part of the Gyeongsang Group and the acidic dyke as illustrated in Text-figure 1.
Systematic Description

Superfamily Unionacea
Family Trigoniodidae COX, 1952
Subfamily Trigoniodiidae COX, 1952
Genus Trigonoides KOBAYASHI & SUZUKI, 1936
Subgenus Koreanaia YANG, 1976

Type-species—Koreanaia cheongi YANG, 1976.

Remarks—Koreanaia was originally proposed as an independent genus on account of its large angle of the V-sculptures on the median part and lamellar hinge teeth. Such a combination of characters had been unknown in the trigonioidid genera, i.e., Trigonoides, H offetrigonia, Nippononaia and Wakinoa. However, a new species described below is certainly referred to Koreanaia on account of its similar surface ornamentation and outline, but the hinge teeth are not lamellar but finely crenulated like Wakinoa. It can be regarded as a member of Koreanaia with dentition of Wakinoa or a member of Wakinoa with sculpture of Koreanaia. Therefore, it is considered as an intermediate species between Koreanaia and Wakinoa, that is, a link-species in the lineage from Koreanaia to Wakinoa. If Wakinoa is considered as one of the subgenera of Trigonoides (OTA, 1975; HAYAMI, 1975), it is reasonable to treat Koreanaia also as another subgenus of Trigonoides.

Subgeneric diagnosis (emend.)—Hinge plate moderate in breadth, provided with opisthoclinc pseudocardinal and posterolateral teeth; the pseudocardinal ones two or three in left valve, two in right valve, and the posterolateral teeth two in left valve, one in right valve. The hinge teeth typically lamellar but may be crenulated in some species. Other characters same as the original diagnosis (YANG, 1976, p. 320).

Trigonoides (Koreanaia)
bongkyuni, sp. nov.
Pt. 27, Figs. 1–12; Text-fig. 3

Etymology—The specific name is dedicated to Professor Bong Kyun KIM of the Seoul National University who has contributed much to the paleontology of Korea.

Material—Holotype (KPE 2190, Pt. 27, Fig. 9) and forty six paratypes (KPE 2180–89, 2191–2226), collected from a horizon in the lower part of the Yeonhwadong Formation, Nagdong Subgroup, Gyeongsang Group (Coll. S.Y. YANG).

Description—Shell medium in size (about 10–60 mm in length) generally suboval or subquadrat in outline subequilateral and equivalent, moderate in inflation; anterior margin well rounded, posterior one rather straight, ventral margin broadly arcuate; ratio of L/H about 1.3; test of moderate thickness; umbo slightly prosogyrous, placed at about two-fifths of the shell length from the anterior extremity, projected slightly above the hinge line; escutcheon and lunule indistinct.

Surface ornamented with V-shaped ribs in the median part and reversed V-ribs on both of the anterior and the posterior sides. The angles of the median V-ribs about 30–45 degrees and those of the reversed V-ribs on both sides about 50–60 degrees. The line linking the apices of the median V-ribs prosocline, forming about 80 degrees with the ventral margin. The ribs and grooves on the posterior half stronger and wider than those on the anterior half; the former ones run downward and gently curved forward, while the latter ones run rather
interval and prominence. Posterior ridge running from the umbo to the postero-ventral corner.

Hinge plate: moderate in breadth, provided with pseudocardinal and postero-lateral teeth; the pseudocardinal ones two on each valve, the postero-lateral ones one on right valve, two on left valve, forming the following dental formula:

<table>
<thead>
<tr>
<th>P5</th>
<th>P4</th>
<th>P3</th>
<th>PII</th>
<th>PIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

where 5: narrow and elongated with fine transverse crenulations on the ventral (lower) side only, parallel to the antero-dorsal margin,

3: stout and high, with fine transverse crenulations on both sides, subparallel to the anterodorsal margin,

PII: narrow and elongated, with very fine transverse crenulations on both sides, parallel to the postero-dorsal margin,

4: stout and high, with fine transverse crenulations on both sides, parallel to the antero-dorsal margin,

2: narrow and low, with fine transverse crenulations on dorsal (upper) side only, subparallel to the antero-dorsal margin,

PIII: narrow and elongated, with very fine transverse crenulations on dorsal side only, parallel to the postero-dorsal margin,

PIV: narrow and elongated, more or less lower and shorter than PII, with very fine transverse crenulations on ventral side only, parallel to the postero-dorsal margin.

Two adductor scars subequal in size; anterior one semicircular, strongly impressed, accompanied with a minute distinct pedal scar; posterior one sub-circular and larger, but not so distinct. The internal mould provided with impression of V-shaped ornaments on the flank and with crenulations around the ventral margin. Umbonal cavity moderately deep.

Observation—The holotype (KPE 2190) is an external mould of right valve. The paratypes are also external or inter-

Text-figure 3. *Trigonioides (Koreanaia) bongkyuni*, sp. nov. a: surface ornamentation and the outline of left valve, b: internal structure of right valve, c: internal structure of left valve. The sculpture impressed on the internal surface is probably due to the erosion of the inner layer.
nal moulds. The tests were mostly dissolved out. The internal structures can be observed on some internal moulds. Among the type-specimens, seven are conjoined, twenty four are right valves and fifteen are left valves. The specimens at hand are mostly deformed to some extent. Besides the type-specimens, many fragmentary specimens were collected.

**Occurrence**—The specimens described here were collected from the black shale at Woelimdong, Ssangrim-myeon, Goryeong-gun, Gyeongsangbug-do, Korea (see Text-figure 1). The black shale contains abundantly the following molluscan species besides the described one and fragmental remains of plants.

* *Nippononaia ryosekiana* (see Yang, 1978a)
* Nagdongia cf. soni Yang*
* Pseudohyria sp. (described below)*
* Micromelania? katoensis Suzuki*
* Viviparus sp.*

**Measurements** (in mm)—

<table>
<thead>
<tr>
<th>Specimens</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right valve (KPE 2180)</td>
<td>15.3̅</td>
<td>13.1+</td>
</tr>
<tr>
<td>Left valve (KPE 2182)</td>
<td>56.2+</td>
<td>42.9+</td>
</tr>
<tr>
<td>Left valve (KPE 2183)</td>
<td>17.0+</td>
<td>9.6+</td>
</tr>
<tr>
<td>Right valve (KPE 2184)</td>
<td>28.7+</td>
<td>22.2</td>
</tr>
<tr>
<td>Right valve (KPE 2185)</td>
<td>25.9+</td>
<td>19.0+</td>
</tr>
<tr>
<td>Conjoined valves (KPE 2187)</td>
<td>57.6</td>
<td>—</td>
</tr>
<tr>
<td>Right valve (KPE 2189)</td>
<td>33.9+</td>
<td>24.2+</td>
</tr>
<tr>
<td>Right valve (KPE 2190)*</td>
<td>56.6</td>
<td>38.1+</td>
</tr>
<tr>
<td>Left valve (KPE 2192)</td>
<td>38.8+</td>
<td>31.3</td>
</tr>
<tr>
<td>Right valve (KPE 2202)</td>
<td>43.4</td>
<td>32.3+</td>
</tr>
<tr>
<td>Right valve (KPE 2220)</td>
<td>10.8</td>
<td>6.3+</td>
</tr>
</tbody>
</table>

* holotype

**Comparison**—The present species is similar to *Koreanaia cheongi* Yang, 1976 in the surface ornamentation and outline, but its ribs and grooves are much stronger and wider than those of the latter. The subradial ribs of the present species number about 13 in the anterior half and 9 in the posterior, while those of *K. cheongi* number 17 in the anterior half and 13 in the posterior. Above all, the hinge teeth of the present species are clearly crenulated, while those of *K. cheongi* are not crenulated, rather lamellar. The crenulations of the hinge teeth are quite similar to those of *Wakinoa wakinoensis*, but the surface ornamentation distinctly differs from that of the latter. In short, the present species may be comparable with *Wakinoa* in the hinge while it resembles *Koreanaia* in the surface ornamentation, especially in the large angle of the V-sculptures. In other words, the present species belongs neither to typical *Wakinoa* nor to typical *Koreanaia*. But it is rather reasonable to assign the present species to one of the two subgenera than to propose another independent genus or subgenus. In this case it is practically more convenient to classify the fossil species on the basis of the surface ornamentation rather than the internal structures for the future identification.

*Hoffetrigonia diversicostatus* (Hoffet, 1937) and *H. robusta* (Kobayashi, 1968) are similar to the present species in the large angle of V-sculpture on the median surface, but differ in their opisthogyrous umbo, finer subradial ribs on the anterior half and stronger inflation.

If the phylogenetic series of *Koreanaia-Wakinoa-Trigonioides* (s.s.)-*Kumamotoa* is assumed (Ota, 1963; Hayami and Ichikawa, 1965; and Yang, 1976), the present species can be inserted between *K. cheongi* and *W. wakinoensis*.

**Subfamily Pseudohyriinae**

Kobayashi, 1968

**Genus Pseudohyria** MacNeil, 1936

**Type-species**—*Pseudohyria gobiensis* MacNeil, 1936
Pseudohyria matsumotoi, sp. nov.
Pl. 28, Figs. 1-8, Text-fig. 4

Etymology—The specific name is dedicated to Professor Tatsuro MATSUMOTO of the Kyushu University who has greatly contributed to the Cretaceous stratigraphy.

Material—Holotype (KPE 2163, Pl. 28, Fig. 1) and twenty eight paratypes (KPE 2151-62, 2164-79), collected from the lower horizon of the Yeonhwadong Formation, Nagdong Subgroup, Gyeongsang Group, Korea (Coll. S.Y. YANG).

Description—Shell fairly large in size (about 60-85 mm in length), trigonally suboval or suborbicular in outline, fairly inflated; subequilateral and equivalent; anterior margin well rounded, posterodorsal one rather straight, postero-ventral corner rather angulate, ventral margin broadly arcuate; ratio of L/H about 1.2; umbo fairly high and prominent, slightly prosogyrous, situated nearly centrally, escutcheon and lunule indistinct; test moderately thick.

Surface ornamented with radial costae and concentric growth-lines; the costae indistinct near the umbo and on the anterior half, but becoming gradually prominent toward postero-ventral side. The costae on the postero-dorsal periphery being widely separated tangentially from the posterior ridge. The radial costae number 13 or more. Posterior ridge fairly prominent.

Hinge plate moderate in breadth, provided with opisthocl ine pseudocardinal teeth and postero-lateral teeth; the pseudocardinal ones three or four on right valve, three on left valve, the postero-lateral teeth one on right valve, two on left valve, forming the following dental formula:

\[
(5) \quad 3 \quad 1a \quad 1b \quad \text{PII} \\
4 \quad 2 \quad 1'a \quad \text{PII} \quad \text{PIV}
\]

where 5: narrow and elongated, parallel to the antero-dorsal margin, occasionally indistinct,
2: stout and elongated, parallel to the antero-dorsal margin,
1a: low and short, immediately below the umbo, nearly vertical,
1b: low and short, smallest in the right valve, immediately below the umbo, nearly vertical,

PIII: distinct and elongated, parallel to the postero-dorsal margin,
4: stout and prominent, parallel to the antero-dorsal margin,
2: stout and high, subparallel to the antero-dorsal margin,
1'a: low and short, nearly vertical,
PII and PIV: narrow and elongated, parallel to the postero-dorsal margin.

These hinge teeth neither crenulated nor striated, but rather lamellar.

Two adductor scars subequal in size, anterior one semicircular, strongly impressed, accompanied with a minute but distinct pedal scar, posterior one subcircular and larger, but not so distinct. The internal mould provided with impression of the surface radial costae on the flank, especially distinct on the posterial part. Ventral crenulation on the inner side not so distinct. Umbonal cavity moderately deep.

Measurements (in mm)—

<table>
<thead>
<tr>
<th>Specimens</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left valve (KPE 2151)</td>
<td>67.7+</td>
<td>58.3+</td>
</tr>
<tr>
<td>Right valve (KPE 2152)</td>
<td>30.1+</td>
<td>26.4+</td>
</tr>
<tr>
<td>Right valve (KPE 2153)</td>
<td>75.5+</td>
<td>60.6+</td>
</tr>
<tr>
<td>Right valve (KPE 2154)</td>
<td>85.5+</td>
<td>-</td>
</tr>
<tr>
<td>Left valve (KPE 2160)</td>
<td>80.2+</td>
<td>62.2+</td>
</tr>
<tr>
<td>Left valve (KPE 2163)*</td>
<td>69.3+</td>
<td>52.7+</td>
</tr>
<tr>
<td>Left valve (KPE 2166)</td>
<td>12.0+</td>
<td>10.9+</td>
</tr>
<tr>
<td>Right valve (KPE 2174)</td>
<td>65.1+</td>
<td>55.7+</td>
</tr>
</tbody>
</table>

* holotype

Observation—The holotype (KPE 2163) is an internal mould of left valve. Many of the other specimens are also
7.10. New bivalves from Gyeongsang Group

![Diagram of bivalve shells](image)

Text-figure 4. *Pseudohyria matsumotoi*, sp. nov. a: surface ornamentation and outline of left valve, b: internal structure of right valve, c: internal structure of left valve.

Internal or external moulds and fragments. Therfore, the description is supplemented by the paratypes.

The immature small specimens are generally suborbicular in outline, but gradually become trigonally suboval with growth. The posterior costae or plications are not distinct in the small specimens but become distinct with growth.

*Occurrence*—Same as described above (*Koreanaia bongkyuni*).

*Comparison*—At a glance, the present species looks similar to some species of *Plicatotrigonioides* from U.S.S.R. (*Martinson, 1965, pl. 3, fig. 6*) and from Thailand (*Kobayashi, 1968, pl. 20, fig. 1*) in the trigonally suboval outline and surface ornamentation. But those species are generally ornamented with rather strong costae nearly on the whole surface, and the costae on the postero-dorsal part start directly from the last posterior radial costa which runs from the umbo to the postero-ventral corner. The ventral crenulation on the inner margin is rather regular and subquadrated in that genus (*Martinson, 1965, pl. 6, fig. 2*) unlike other trigonioidid species.

The present species is very similar to *Pseudohyria cardiiformis ferganensis* *Martinson* in the surface ornamentation and internal structures. But in the latter the radial costae climb up to near the umbo, and are well developed even on the anterior half. So far as the illustration is relied upon (*Martinson, 1965, pl. 2, fig. 2*), *P. c. ferganensis* possesses two or three pseudocardinal teeth on the right valve, while the present species possesses three or four ones on the right valve. With respect to the surface ornamentation, the present species is rather similar to *P. cf. cardiiformis* (*Martinson, 1965, pl. 2, fig. 4*) from U.S.S.R., but the latter is more elongated laterally, and not so high.

*Remarks*—Many species referred to the genus *Pseudohyria* have been reported from Southeastern U.S.S.R. and China. They are generally of upper Cretaceous as illustrated in Table 2, while the present species is probably of lower Cretaceous (see Yang, 1978b).
Table 2. Stratigraphic occurrences of *Pseudohyria* spp.  
(original data after Martinson, 1965, 1969; Ku, 1976)

<table>
<thead>
<tr>
<th><strong>Pseudohyria</strong> SPECIES</th>
<th>NEOC.</th>
<th>APT.</th>
<th>ALB.</th>
<th>CEN.</th>
<th>TUR.</th>
<th>SAN.-DAN.</th>
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<tbody>
<tr>
<td><em>P. javanica</em></td>
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<td><em>P. babatagensis</em></td>
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<td><em>P. mujanica</em></td>
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<td><em>P. plicatensis</em></td>
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<td><em>P. kyzykumaensis</em></td>
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<td><em>P. k. aralica</em></td>
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<td><em>P. ferganensis</em></td>
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<td><em>P. mongolensis radiatus</em></td>
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<td><em>P. tachlamysensis</em></td>
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<td><em>P. gobiensis itemirica</em></td>
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<tr>
<td><em>P. triangulais</em></td>
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<td><em>P. tuberculata</em></td>
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<td><em>P. obliqua</em></td>
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<td><em>P. cardiiformis</em></td>
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<td><em>P. gobiensis</em></td>
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<td><em>P. sinkiangensis</em></td>
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<td><em>P. aralica</em></td>
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<td><em>P. songhuaensis</em></td>
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<td><em>K. matsumotoi</em>, sp. nov.</td>
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K. 1  K. 2

Explanation of Plate 27

Figures 1-12. *Trigonioides (Koreanaia) bongkyuni*, sp. nov.
1. Left valve (KPE 2197), internal mould, la; side view, showing the impression of the surface ornaments, lb; dorsal view, showing the crenulated hinge teeth.
2. Left valve (KPE 2182), internal mould, side view, showing the crenulation on the antero-ventral margin, the impression of V-shaped ornaments on the posterior flank, the muscle scars and the crenulated hinge teeth partly, the postero-ventral part broken out.
3. Right valve (KPE 2220), internal mould, showing the impression of V-shaped ornaments and the hinge teeth, immature specimen. ×2.
4. Left valve (KPE 2186), internal mould, showing the crenulated pseudocardinal hinge teeth and the muscle scars.
5. Left valve (KPE 2191), external mould of the postero-dorsal part.
6. Left valve (KPE 2192), external mould, showing the crenulated pseudocardinal hinge teeth.
7. Right valve, clayey cast of the external mould (KPE 2184).
8. Right valve (KPE 2194B), antero-dorsal part broken out, 8a; external mould, 8b; clayey cast.
9. Right valve, clayey cast of the external mould (KPE 2190), holotype.
10. Left valve (KPE 2196), external mould, strongly compressed laterally.
11. Right valve, clayey cast of external mould (KPE 2188).
12. Conjoined valve (KPE 2187), external mould, antero-dorsal part broken out, 12a; clayey cast of right valve, 12b; clayey cast of left valve.
All figures are approximately of natural size, unless otherwise stated.
Loc.: Weolmagdong, Ssangrim-myeon, Göyreong-gun, Gyeongsangbug-do, Korea (see Text-figure 1).
YANG: New bivalves from Gyeongsang Group

Plate 27
The hinge teeth of the upper Cretaceous species of *Pseudothyria*, that is, *P. aralica*, *P. tuberculata*, *P. cardiformis* and *P. aff. gobiensis*, are more or less distinctly crenulated and are similar to those of *Wakinoa* and *Plicatounio*, but somewhat different from the regularly crenulated teeth of the species of *Trigonionioidea (T).* and *Kumamotia*. Up to now, *Pseudothyria* is first found from the Lower Cretaceous formation in Far East Asia, and the hinge teeth of *P. matsumotoi* are not crenulated but lamellar as described above. As the phylogenetic relation can be read in the hinge teeth in the series *Koreanaia-Wakinoa-Trigonionioidea (s.s.)*-*Kumamotia*, a similar transformation of hinge teeth may be expected in the phylogeny of the Pseudothyriinae.

References


--- (1976): On the non-marine molluscan fauna from the upper Mesozoic Myogog
Seong Young YANG


Ancheon 安川, Anlimdong 安林洞, Banyaweol 半夜月, Bulgugsa 仏国寺, Chaeyagsan 採藥山, Chilgog 漆谷, Daegu 大邱, Dongmyeong 東明, Geoncheonri 乾川里, Goryeong 高麗, Gujeong 九汀, Gyeongsang 廣尚, Habcheon 河川, Hagbong 胡峰, Haman 咸安, Hasandong 霧山洞, Jinju 晉州, Jusasan 朱砂山, Myogog 慕谷, Nagdong 洛東, Paldal 八達, Sinla 新羅, Ssangrim-n yeon 双林面, Waegwan 倭館, Weolmagdond 月幕洞, Yeonhwadong 萬花洞.

Explanation of Plate 28

Figures 1-8. Pseudohyria matsumotoi sp. nov.
1. Left valve (KPE 2163), internal mould, holotype. 1a; side view, showing the pseudocardinal teeth, the muscle scars, and the impression of radial plicae on the posterior part.
   1b; dorsal view, showing the hinge teeth, 1c; rubber cast, showing the internal structures.
2. Right valve (KPE 2169), internal mould, posterior part broken out, 2a; dorsal view, showing the pseudocardinal hinge teeth, 2b; rubber cast, showing the pseudocardinal teeth and the muscle scars.
3. Left valve (KPE 2166), internal mould, showing the hinge teeth and the muscle scar, immature specimen. x 1.6.
4. Left valve (KPE 2152), internal mould, showing the pseudocardinal tooth.
5. Left valve (KPE 2173), internal mould, dorsal view, showing the hinge teeth.
6. Left valve (KPE 2157), posterior part only, 6a; external mould, showing the radial plicae on the posterior part, 6b; clayey cast.
7. Left valve (KPE 2151), internal mould, showing the hinge teeth, the muscle scar and the impression of posterior plicae.
8. Right valve, clayey cast of KPE 2153, showing the radial plicae antero-dorsal and postero-ventral parts broken out.

All figures are approximately of natural size, unless otherwise stated.
Loc.: Weolmagdong, Ssangrim-myeon, Goryeong-gun, Gyeongsangbug-do, Korea (see Text-figure 1).
YANG: New bivalves from Gyeongsang Group

Plate 28