

JÓZEF WIECZOREK

The taxonomy and life environment of the Upper Jurassic nerineid gastropods from genus *Fibuloptygmatiss* Pchelintsev, 1965

Abstract: A description is here given of gastropods from the genus *Fibuloptygmatiss* occurring in the Upper Jurassic deposits of the Mesozoic margin of the Holy Cross Mts and of their life environments. After discussing the taxonomic position of the above genus it has been included into the super-family Itieriacea. The suggestion advanced by Cox (1949) regarding the change of the type species of the genus *Nerinea* has also been given some consideration.

INTRODUCTION

In several Upper Jurassic limestone outcrops in the Mesozoic margin of the Holy Cross Mts the author has found 54 specimens of gastropods from the genus *Fibuloptygmatiss*, very rarely reported in the literature. Of these 29 specimens come from the vicinity of Sulejów on the Pillica, 13 from Skorków, 10 from Bukowa, 2 from Dobrut (Fig. 1).

The Sulejów specimens have all been collected from beds 12 and 14 (see the profile — Barczyk 1961) referred by Kutek (1968) to the Lower Kimmeridgian — at the boundary of the *Sutneria platynota* and *Ataxioceras hypselocyclum* Zones. The specimens from Bukowa and Skorków come from the upper part of the Chalky Limestone member (lower part of the *Sutneria platynota* Zone) while those from Dobrut come from bed III of Dembowska's profile (1953) representing the boundary between the *Idoceras planula* and *Sutneria platynota* Zones (Kutec — personal information).

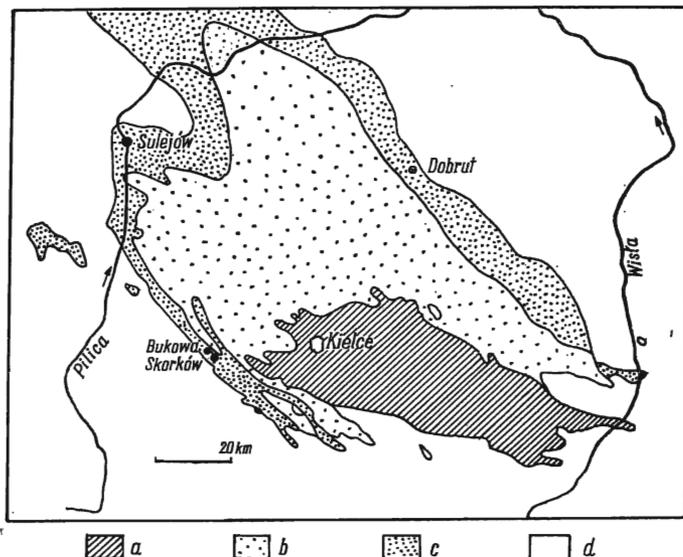


Fig. 1

Geologic sketchmap of the Holy Cross Mts. showing outcrops with *Fibuloptygmatis* sp.
 a Paleozoic; b Triassic, Lower and Middle Jurassic; c Upper Jurassic; d younger deposits

PRESERVATION OF SPECIMENS

In practically all the shells here considered the terminal parts (namely the apical part and the outer lip) are damaged, often the outer ornaments of the whorls are effaced (comp. Pl. 1, Figs 1–5; Pl. 2, Figs 2, 4–6). Several specimens are completely covered by an oncolitic coating (Pl. 1, Figs 3 and 5) while in one specimen the coating covers only a fragment of the last whorl (Pl. 1, Fig. 4). In quite a number of specimens the shells as well as the oncolitic coatings are cut up by boring pelecypods (Pl. 1, Fig. 5), and the encrusting of the shell surface by *Exogyra* sp. is also sporadically observed.

Borings (Fig. 2) visible on the surface of one specimen belong to the ichnogenus *Olkenbachia* probably. They have been interpreted by Solle (1938) as results of the boring activity of sponges. Similar borings on the nerineid shells from the Cretaceous (in the Gosau beds) have been observed by Tiedt (1958).



Fig. 2

Borings of ichnogenus ?*Olkenbachia* (X 12.5)

The internal structure is readily discernible in the axial sections (Pl. 1, Figs 3—5; Pl. 2, Figs 2, 4—6) of the specimens here described. The walls of the whorls have been re-crystallized, the shells are filled with calcite cement and micro-oncolitic or pellet limestone sediments.

LIFE ENVIRONMENTS

In Dobrut and Sulejów the genus *Fibuloptygmatis* occurs mainly in micro-oncolitic limestones together with other nerineids, mostly of the genera *Ptygmatis*, *Cryptoplocus* and *Phaneroptyxis*. Solenopores, corals and pelecypods are present, too (mostly *Diceras* sp., *Trichites* sp., and *Lima* sp.). These organisms are very often cut up by boring organisms.

At Bukowa and Skorków the gastropods here considered occur in similar deposits and in analogous associations, moreover, in micritic sparry pellet limestones containing micro- and macro-oncoids.

The lithological characters of the deposits as well as the flora and fauna they contain suggest a shallow-sea environment, moderately turbulent. The character of sedimentation of the deposits with *Fibuloptygmatis* reasonably suggest that they correspond to the grapestone facies or partly the pellet-mud facies in the Great Bahama Banks (comp. Kutek 1969, Bathurst 1971).

On the state of the preservation of the specimens it may be supposed that before final burial the shells were bored and often overgrown by blue-green algae but they seldom formed the base for an encrusting fauna. The breaking up of the shells, the common abrasion of their surface, the character of distribution of the borings, also the mode of the encrusting of shells by the oncolitic coatings all indicate their transport over the sea floor. Only very few shells retained more stable position and thus only the part protruding above the sea bottom had been bored or encrusted.

In spite of the shells being undoubtedly transported, it may be reasonably supposed that the environment of the formation of the oncolitic, partly also of the pellet limestones was the life environment of the gastropods *Fibuloptygmatis*. The close connection observed in sections between the occurrence of the oncolitic limestones and the presence of *Fibuloptygmatis* reasonably suggest only a slight probability of the transport of shells from the adjacent environments.

PALEONTOLOGICAL DESCRIPTION

- Order Murchisoniata Pchelintsev, 1965
- Superfamily Itieriacea Pchelintsev, 1965
- Family Phaneroptyxisidae Pchelintsev, 1965
- Genus *FIBULOPTYGMATIS* Pchelintsev, 1965

Type species: Nerinea mosae Deshayes, 1831.

Stratigraphic position. — Middle Oxfordian — Lower Kimmeridgian.

Diagnosis. — Shell fairly big, conical or slenderly coned, whorls slightly concave, suture on sutural ridge. Surface of whorls covered by transversal ribs and minute spiral cords. Sutural ridge with nodules. Aperture rhomboidal, ending in siphonal canal. Five is the maximum number of internal folds in an adult part of shell (2 columellar, 1 parital, 1 palatal and 1 basal fold).

Taxonomic position of the genus Fibuloptygmatis. — In his systematics of the nerineids, Pchelintsev (1965) referred them to the newly created order *Murchisoniata*. Moreover, he differentiated a number of taxonomic units, i.e. the genus *Fibuloptygmatis* and assigned it to the family *Ptygmatisidae* Pchelintsev, 1965, within the superfamily *Nerineacea* Wenz, 1938, emend Pchelintsev, 1965. In view of several non-typical characters not encountered in the *Nerineacea* this author stresses the somewhat uncertain systematic position of the new genus. The conical or slenderly coned shell and the number of folds would suggest the assignment to the family *Ptygmatisidae*, while the character of the base and of the umbilicus as well as the folding pattern of the internal whorl walls are different. Pchelintsev (1965) supposes that the genus *Fibuloptygmatis* evolved from the genus *Ptygmatis* during the Oxfordian and he connects the differences now observable with the transition of gastropods of the genus *Fibuloptygmatis* to a more mobile mode of life.

Pchelintsev's (1965) opinion seems controversial in the light shed by the study of the ontogeny of forms from the margin of the Holy Cross Mts. Adult individuals from the genera *Ptygmatis* and *Fibuloptygmatis* are characterized by a decidedly different internal structure, the only character in common being the number of the main folds (comp. Fig. 4, b, c, and Pl. 2, Figs 1, 2). No features characteristic of the *Ptygmatis* are observable in the initial whorls of *Fibuloptygmatis* sp. (Figs 3 and 4), while some are typical rather of the itierid gastropods (comp. Figs 3a and 4a, also Pl. 2, Fig. 3). This also applies to the pattern and structure of folds as well as of the siphonal canal and the umbilicus. No overlap of successive whorls so characteristic of the itierids has been noted in *Fibuloptygmatis* sp. However, the base of the shell being more inclined to its axis in the initial part of the shell than it is in the terminal part may possibly suggest that during the earliest ontogenetic stages the overlap of successive whorls did actually occur.

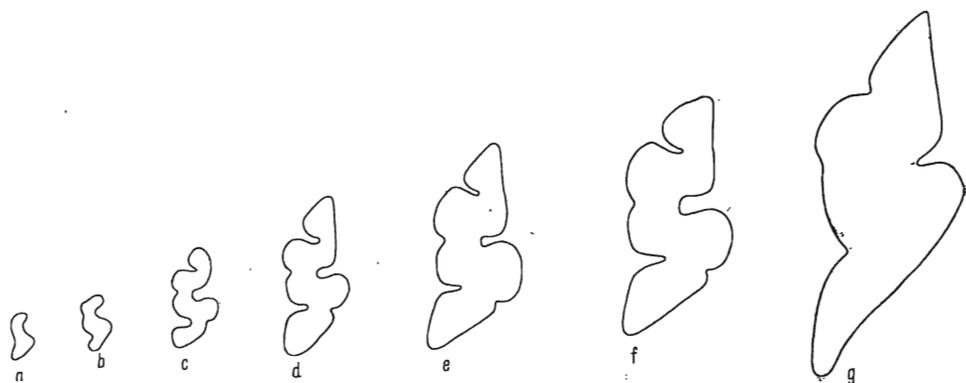


Fig. 3

Diagram showing changes in the internal structure during the ontogenetic development of *Fibuloptygmatis* sp.

a-g cavities of successive whorls in specimen S-59; other explanations in the text

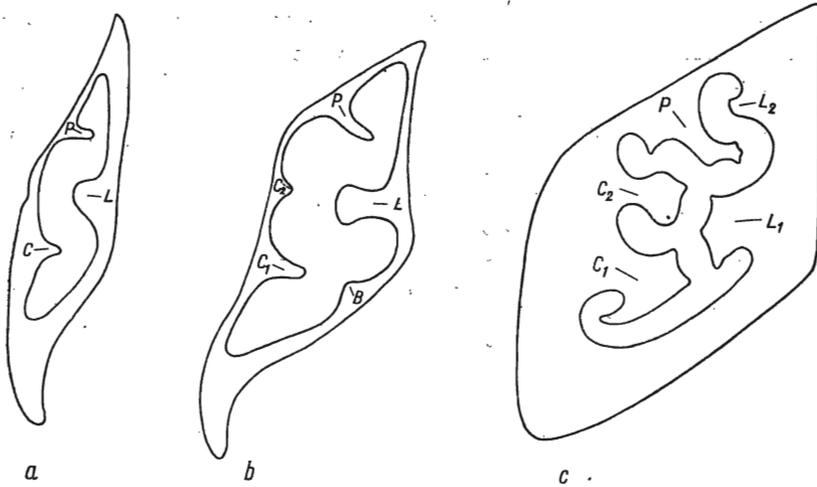


Fig. 4

Cross section through whorls of a mature part of the shell

a *Phaneroptyxis* aff. *moreana* (d'Orb. 1841) ($\times 1.5$); b *Fibuloptygmatis* sp. ($\times 1.5$); c *Ptygmatis bruntrutana* (Thurmann 1832) ($\times 4$).

Marking of folds: C — columellar fold, C₁ — lower columellar fold, C₂ — upper columellar fold, P — parietal fold, L — palatal fold, L₁ — lower palatal fold, L₂ — upper palatal fold, B — basal fold

In view of the above data, the assignment of the genus *Fibuloptygmatis* to the family Phaneroptyxisidae seems better founded than to the Ptygmatisidae.

Remarks. — Pchelintsev (1965) has referred two species to the genus *Fibuloptygmatis*: *F. mosae* (Deshayes) and *F. costulata* (Etallon). Previously these forms used to be assigned by earlier authors to various other genera.

Like Deshayes, d'Orbigny (1850–52) assigned *F. mosae* to the genus *Nerinea*, while Zittel (1837) and, after him, Loriol (1886–1888, 1889–1892) also included it into genus *Itieria*. Cossmann (1898) took a different view and assigned the species *F. mosae* to the genus *Ptygmatis* on the shape of the shell, the number of folds and the mode of the coiling of the shell. Pchelintsev (1931) and Levasseur (1934) acted similarly while Dietrich (1925) and Karczewski (1960) included the species *F. mosae* (Deshayes) to the genus *Ptygmatis*. Their assignment was not, however, quite doubtless and they stressed the difference in the folding pattern of the whorl walls though the number of folds coincided. On the other hand, Cox (1949) believed this species as typical of the genus *Nerinea*.

Into the species *Fibuloptygmatis costulata* (Etallon) have been included the forms (Thurmann & Etallon 1861) described by d'Orbigny (1850–1852) as a variety of the species *F. mosae* (Deshayes). The newly established species was included by Etallon (Thurmann & Etallon 1861) into the genus *Nerinea*. On the other hand, forms undoubtedly belonging to the species *F. costulata* (Etallon) and figured by Loriol in Pl. VI, Fig. 3 of his work under the specific name of *F. mosae* (Deshayes) were by Loriol (1886–1888) assigned to the genus *Itieria*. Species *F. costulata* (Etallon) was referred to the genus *Ptygmatis* by Cossmann (1898) and Dietrich (1925).

It should be stressed that the frequent changes in the generic assignment of the two above species did not contribute to any extent to the knowledge of their morphological characters or ontogenetic development. The creation by Pchelintsev (1965) for these species of a new genus seems justified by the presence of a number of particular features, specially in the internal structure, in which they differ from the other nerineids.

In the present author's opinion the species *Nerinea diozoptygmatidis* Delpy (comp. Delpy 1939) should also be included into the genus *Fibuloptygmatis*.

The problem of the species for the genus *Nerinea* is closely connected with the questions here discussed. When establishing this genus, Defrance (comp. Cossmann 1898) figured only one specimen giving it the specific name *Nerinea tuberculosa*. This has been accepted by Cossmann (1898) as the type species for the genus *Nerinea*. Because of the poor state of preservation (internal cast) of the described specimen, Cossmann (1898) selected the neotype from among the specimens which he had himself identified as *Nerinea tuberculosa* Defrance. According to Levasseur (1934), however, this specimen (comp. Cossmann 1898, Pl. III, Fig. 5) had been incorrectly identified and probably belongs to *Cossmannea desvoidyi* (d'Orb.).

Cox (1949) demonstrated that *Nerinea mosae* Deshayes is the first correctly described species from among the nerineids and he accepted it as the type species for the genus *Nerinea*. Since the above species had been referred by Cossmann (1898) to the genus *Ptygmatis*, Cox (1949) recognized the generic names *Ptygmatis* and *Nerinea* as synonyms, with *Nerinea* as the valid name because of its priority. At the same time, species so far referred to the genus *Nerinea* have been included into the new subgenus *Eunerinea* Cox (with the type *Nerinea castor* d'Orb.) within the genus *Cossmannea*.

The suggestion advanced by Cox (1949) led to the various interpretations of the generic position of the same species by different authors.

Since the assignment of the species *F. mosae* (Deshayes) to the genus *Ptygmatis* is not justifiable, this genus may not be accepted as a synonym of the genus *Nerinea*. Moreover, the subgenus *Eunerinea* may not be included into the genus *Cossmannea* because of distinct differences in internal structure, in the ontogenetic development as well as in external characters (Pchelintsev 1965; also the writer's unpublished data). If Cox's suggestion (1949) to recognize *F. mosae* (Deshayes) as the type species for the genus *Nerinea* were to be accepted, *F. costulata* (Etallon) and *Nerinea diozoptygmatidis* Delpy are the only species assignable to that genus besides *F. mosae* (Deshayes). The genus *Fibuloptygmatis* would then be a synonym of the genus *Nerinea*.

In view of this very complex taxonomic situation of the nerineid gastropods, the acceptance of the systematics proposed by Pchelintsev (1965) would seem more soundly grounded, whereas the suggestions of Cox proposing several amendments, not justified by the present state of knowledge of the nerineids, are hardly acceptable.

Fibuloptygmatis sp.

(Fig. 3a—g, 4b; Pl. 1, Figs 1—5; Pl. 2, Figs 2, 4—6)

Material. — 54 specimens, of which 47 are axial sections.

Dimensions. — as in Table 1.

Description. — Shell slenderly coned, whorls slightly concave, somewhat step-like connected (comp. Pl. 1, Figs 1—5; Pl. 2, Figs 2, 4—6). The lower, but much more the upper part of whorls protuberant near the sutures, as stressed by the presence of nodules on the satural ridge (Pl. 1, Fig. 1). The suture running at a 75° to the shell axis. Surface of whorls cut by transversal, slightly slanting flattened ribs. Growth lines slanting, deflected to the real in the upper part of whorls. Solenizone extremely narrow. Aperture rhomboidal (Pl. 1, Fig. 1) with 3 folds: lower axial — C₁, parietal — P and palatal — L, descending in a fairly long siphonal canal. Umbilicus narrow, in the last whorl hidden by the projecting lower part of the internal wall of whorl. Base slightly convex, sharply delimited, from the

lateral surface of last whorl, running at an angle of a. 55 degrees to the shell axis. Surface of base covered by spiral ribs and growth lines.

Table 1

Specimen No.	No. of whorls n	Height of shell Hn	Height to diameter ratio h/D	Diameter D	Pleural angle
S-59	6	49	0.48	25	25
S-390	5	75	0.53	40	22
S-392	6	48	0.55	27	26
Buk-6	3	37	0.58	30	25
Skr-1	10	72	0.50	33	28
Do-1	5	42	0.48	25	30

Internal structures. — The internal structure of shell differs in the various ontogenetic stages (comp. Fig. 3a–g, also Pl. 1, Figs 3–5 and Pl. 2, Figs 2, 4–6). In the initial part of shell (Fig. 3a) the cavity of whorls is partly occupied by the lower columellar fold (C_1) and the palatal fold (L) — both very broad and poorly distinguishable. The re-crystallization of the upper part of whorl reasonably suggests that the absence of the parietal fold (P) in this part of shell is not primordial.

In the successive whorls of the middle and terminal parts of shell the internal whorl walls are much more strongly folded. The most complicated inner spiral folding (Figs 3d, e, 4b; Pl. 1, Figs 3–5; Pl. 2, Figs 2, 4–6) contains:

lower columellar fold (C_1) — narrow, elongated, a. 3.5 mm high,

upper columellar fold (C_2) — small, triangular, a. 1 mm high,

parietal fold (P) — slightly curved, narrow, a. 4 mm high,

palatal fold (L) — the most strongly developed one — icicle-like in shape, a. 4.5 mm high,

basal fold (B) shaped like a broadly based triangle, a. 1.5 mm high.

The terminal part of the last whorl lacks fold B , fold C_2 being very faintly indicated (comp. Fig. 3g, also Pl. 1, Figs 4, 5 and Pl. 2, Fig. 2). The remaining folds are much smaller and distinctly differ in shape from the earlier whorls. It should be stressed that, depending on the extent of damage in the outer lip, the shape and even the number of folds in the last whorl — as many as five — (comp. Pl. 2, Figs. 4, 4) are variable.

Ontogeny. — In the course of ontogenetic development, the shape of shell passes from a conical one (apical angle a. 50°) to slenderly conical (pleural angle a. 25°). The inclination angle of the base of shell changes from 45 degrees in the initial whorls to 55 degrees in the terminal ones. The thickness of the whorl walls decreases, too.

The character of the inner spiral folding of whorls becomes strongly modified. During the ontogenetic development the internal structure becomes gradually and progressively more complicated (Fig. 3a–g). In addition to the 2 folds present in the earliest of the extant whorls 3 more appear in the next whorls. There is a change in the outward appearance of all the folds in the successive whorls. Fold C_1 grows narrower, elongated, sometimes gently curved. Fold C_2 — initially represented by a slight thickening of the whorl wall — becomes more strongly differentiated. Fold P grows gradually longer while in fold L we can observe a basal narrowing and an apical broadening. Fold B does not change much in shape.

In the last whorl the internal structure is simplified, the cavity of the whorl increases distinctly (comp. Fig. 3g, also Pl. 1, Figs 3–5; Pl. 2, Figs 4–6). Folds C_2

and *B* gradually disappear while the remaining folds strongly change in shape and size. This process is observable both in adult and juvenile individuals, testifying that the simpler internal structure of the last whorl is connected with the mode of formation of folds and does not indicate the end of the growth of the shell.

Variability. — The particular specimens differ from each other in size of the pleural angle, the height-width ratio of whorls, distinctness of ornaments, also some slight differences in the structure of folds (comp. table 1; Pl. 1, Figs 1–5; Pl. 2, Figs. 4–6).

Remarks. — Forms from the margin of the Holy Cross Mts show the closest resemblance with *F. costulata* (Etallon). Differences in the pleural angle and in ornamentation may possibly be referred to intraspecific variability. The lack of reliable information as to the details of the internal structure of this species (see Cossmann 1898) does not, however, allow the doubtless identification of the Polish forms with *F. costulata* (Etallon). Moreover, the specimens from the Upper Jurassic of Poland may possibly represent transition forms from *F. mosae* (Deshayes) to *F. costulata* (Etallon). This is suggested by their occurrence in sediments slightly older than those containing the last named species but younger than those containing the former species. The Upper Jurassic forms of Poland also display several transitional characters (comp. table 2).

The Dobrut specimens, the oldest among the Polish forms, have the greatest pleural angle (28–30°) and this was probably the basis for their assignment by Karczewski (1960) to the species *F. mosae* (Deshayes) in spite of a distinctly greater *h/d* ratio.

A more accurate determination of the taxonomic position of forms from the margin of the Holy Cross Mts may be attainable by a detailed study of the French forms, including their internal structure and taking into consideration changes affecting the particular characters during the ontogenetic and phylogenetic development.

It might also be stressed here that Cossmann's (1898) inclusion of the species *Nerinea dilatata* d'Orbigny into the synonymics of the species *F. costulata* (Etallon) seems strongly controversial. The acceptance of the form *Nerinea dilatata* d'Orbigny as juvenile individuals of *F. costulata* (Etallon) is hardly justifiable, if only because of the nature of the internal structure in *Nerinea dilatata* d'Orbigny as figured by d'Orbigny (1850–52, Pl. 278, Fig. 3) and the lack of detailed knowledge of the internal structure in *F. costulata* (Etallon).

Table 2

Species	Age	Pleural angle	Height to diameter ratio	Delimitation of base	Ornamentation
<i>Fibuloptegmatis costulata</i>	Lower Kimmeridgian "pteroceran"	20–23	ca. 0.5	sharp	nodules indistinct, oblique ridges and spiral cords distinct
<i>Fibuloptegmatis</i> sp.	Lowermost Kimmeridgian	22–30	ca. 0.5	fairly sharp	nodules fairly distinct, oblique ridges distinct, spiral cords indistinct
<i>Fibuloptegmatis mosae</i>	Oxfordian middle-upper, "Rauracian"	28–35	0.3–0.4	poor	nodules distinct, oblique ridges distinct, spiral cords indistinct

Occurrence. — Dobrut, Skorków, Bukowa, Sulejów; Uppermost Oxfordian — Lower Kimmeridgian.

FINAL REMARKS

So far, representatives of the genus *Fibuloptygmatis* have been found only in France, Switzerland, the Crimea, the Liban and Poland. This genus occurs over a relatively short time interval (from the Middle Oxfordian to the Lower Kimmeridgian) and displays readily discernible directed morphological changes. This may prove helpful for stratigraphic purposes on the condition, however, of greater precision in the determination of ontozones of the particular species in relation to ammonite stratigraphy.

In the study of the stratigraphy of the Upper Jurassic of Poland the above genus may be of help in determining the Oxfordian/Kimmeridgian boundary, which generally runs in sediments poor in ammonites but abounding in nerineid gastropods.

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*Laboratory of Young Structures
Institute of Geological Sciences
Polish Academy of Sciences
31-002 Kraków, ul. Senacka 3, Poland
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JÓZEF WIECZOREK

**PROBLEMY TAKSONOMII I ŚRODOWISKO ŻYCIA GÓRNOJURAJSKICH
NERINEII Z RODZAJU *FIBULOPTYGMATIS* PCHELINTSEV, 1965**

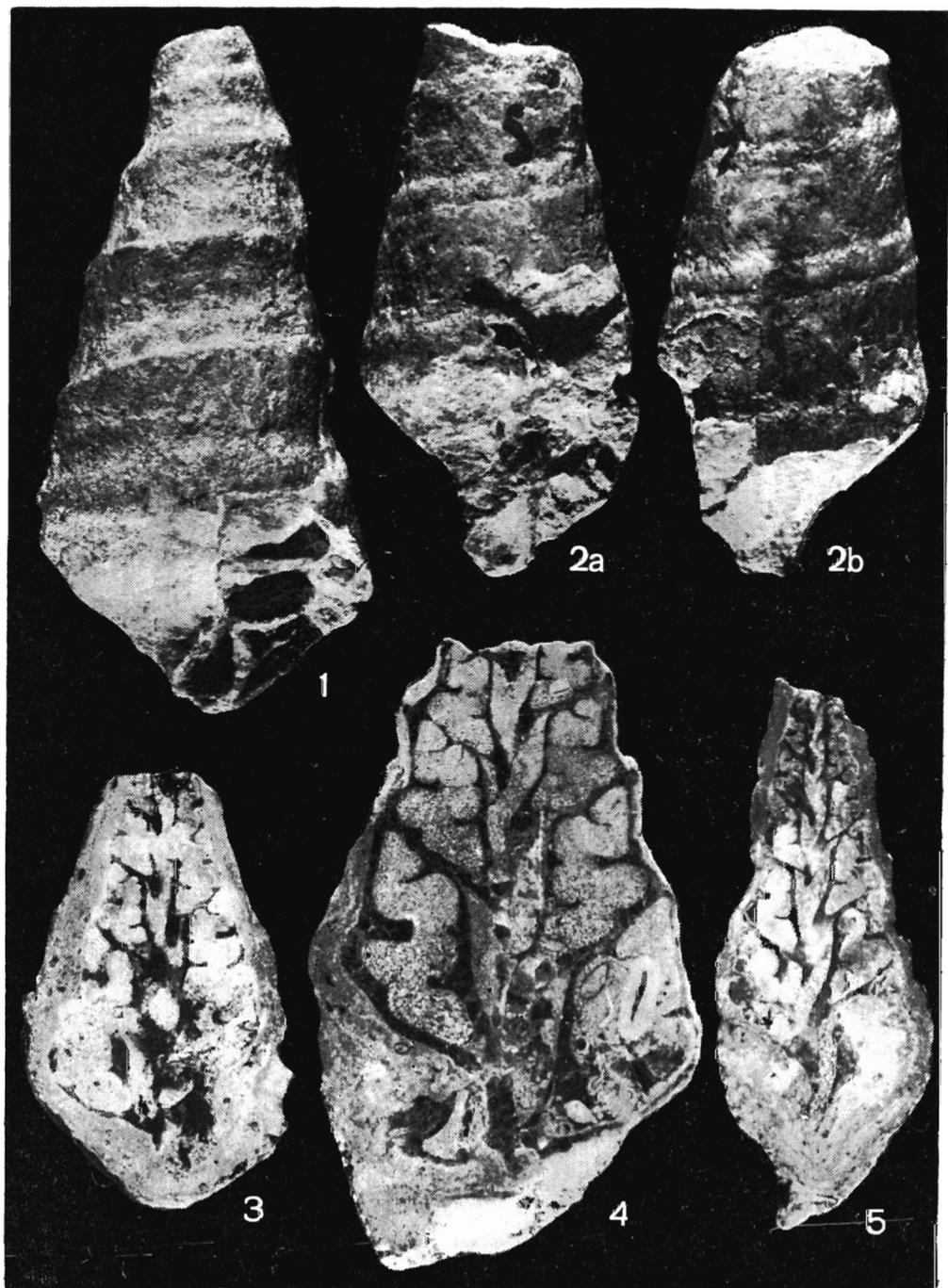
(Streszczenie)

W utworach najniższego kimerydu mezozoicznego obrzeżenia Gór Świętokrzyskich autor znalazł kilkadziesiąt okazów nerineii z rodzaju *Fibuloptygmatis*. Występują one głównie w wapieniach mikroonkolitowych (Sulejów, Dobrut, Bukowa, Skorków) oraz gruzełkowych (Bukowa, Skorków) (Fig. 1). Na podstawie litologii i współwystępującego świata organicznego można wnioskować, że ślimaki *Fibuloptygmatis* żyły w warunkach podobnych do obecnie panujących na obszarze facji grudkowej i gruzełkowo-mułowej Wielkiej Ławicy Bahamskiej (por. Kutek 1969, Bathurst 1971).

Okazy *Fibuloptygmatis* sp. z górnej jury Polski wykazują szereg cech pośrednich (por. tabele 1, 2) między *Fibuloptygmatis mosae* (Deshayes) a *F. costulata* (Etallon) i dokładne sprecyzowanie ich pozycji taksonomicznej nie jest obecnie możliwe.

Poznanie zmian budowy wewnętrznej w rozwoju ontogenetycznym *Fibuloptygmatis* sp. (por. Fig. 3, Pl. 1, Fig. 3–5; Pl. 2, 4–6) spowodowało zakwestionowanie przynależności rodzaju *Fibuloptygmatis* do rodziny Ptygmatisidae. Porównanie rozwoju ontogenetycznego i budowy wewnętrznej przedstawicieli rodziny Ptygmatisidae i Phaneroptyxisidae z rodzajem *Fibuloptygmatis* (por. Fig. 3a–g, 4a–c, i Pl. 2, Fig. 1–3) uzasadnia, zdaniem autora, zaliczenie omawianego rodzaju do rodziny Phaneroptyxisidae.

Przedyskutowano także złożone problemy taksonomii nerineii związane z propozycją Coxa (1949) dotyczącą zmiany gatunku typowego dla rodzaju *Nerinea*.



Fibuloptygmatis sp.

1 — specimen S-390, seen from aperture side, Sulejów (X 1). 2 — specimen 3-51, Sulejów (X 1.5); a — view from aperture, b — view from opposite side. 3 — specimen Do-1, Dobrut (X 1). 4 — specimen S-394, Sulejów (X 1.5). 5 — specimen S-59, Sulejów (X 1).
Specimens 3—5 in axial section, coated by oncolitic envelopes, specimen 3 bored by boring pelecypods.



1 — *Ptygmatis bruntrutana* (Thurmann 1832), specimen S-1849, Sulejów (X 1).
 3 — *Phaneroptyxis* aff. *moreana* (d'Orb. 1841), specimen S-163, Sulejów (X 1).
 2, 4, 5, 6 — *Fibuloptygmatis* sp., axial sections: 2 — specimen S-140, Sulejów (X 1); 4 — specimen S-392, Sulejów (X 1.5); 5 — specimen Buk-6, Bukowa (X 1.5); 6 — specimen S-391, Sulejów (X 1).