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GENUS CREUSIA LEACH, 1817, (CIRRIPEDIA) IN THE CROATIAN MIOCENE

With 2 figures in text and 2 plates

The genus *Creusia*, Leach 1817, in the Croatian Miocene (Tortonian) is represented by two species. The first, *Creusia miocaenica* Procházka 1893, occurs at Dvor, where 8 separate individuals of one community have been found. Their morphology is discussed in comparison with hitherto known specimens; as a new fact, i. a., the terga of the species are presented. The second species, *Creusia krambergeri* sp. n., is created for the specimens described by Kramberger-Gorjanović from Podsused.

INTRODUCTION

During the investigation of rare, aberrant cirripeds, eclusively domiciling in corals, and belonging to the genus *Creusia* Leach, 1817, the authors paid attention to the knowledge of these animals in various countries. One of them is Croatia (Yugoslavia), where these cirripeds have been known since the paper by Kramberger-Gorjanović (1889a). The specimens described by Professor D. Kramberger-Gorjanović have been mentioned many times in literature, and an illustration of the better preserved one has been reprinted several times, as typifying all the fossil cirripeds of the *Creusia-Pyrgoma* group.

Professor V. Kochansky-Devidé of the Geological and Paleontological Department, the University of Zagreb, has kindly offered the authors a new material from Croatia for examination. It was collected at Dvor on the Una by her student Mr. M. Brkić. It differs from Kramberger-Gorjanović's specimens, and represents one species, *Creusia miocaenica* Procházka 1893, described in the first part of the present paper.

The analysis of all the bibliography on *Creusia* species leads to the conclusion that the specimen studied by Kramberger-Gorjanović had been named by himself and his followers erronously. A discussion of this matter and, consequently, founding a new specific name, *Creusia krambergeri* sp. n., constitutes the second part of the paper.

The authors offer their most sincere thanks to Professor V. Kochansky-Devidé for rendering them accessible the very interesting material to be investigated, as well as for all her information, kindness, and help during the preparation of the present paper. Thanks are also offered to Doc. Dr. A. Urbanek, Chief of the Paleontological Departement, University of Warsaw, for critical reading of the manuscript, as well as to K. Wrocławski, M. Sc., for translation of the summary into Serbo-Croatian.

DESCRIPTION OF THE MATERIAL

Subclassis *Cirripedia* (Lamarck) Burmeister, 1834
Ordo *Thoracica* Darwin, 1854
Subordo *Balanomorpha* Pilsbry, 1916
Family *Balanidae* Gray, 1825
Genus *Creusia* Leach, 1817

1. *Creusia miocaenica* Procházka, 1893

Fig. 1, Plates I–II

Creusia miocaenica nov. spec. – Procházka, 1893, Rozpr. České Akad. třida II, 2/1, p. 22, pl. 2, fig. 3a–d.

Pyrgoma cfr. *anglicum* Sow. – de Alessandri, 1910, Abhandl. Geol. R. A. 22/1, pp. 125–126, pl. 48, fig. 14 (non fig. 15a–b).

Morphology

The general shape of the shell is thick-lenticular while the convexity of both sides is diverse (pl. I). In the equatorial section the outline of the shell is nearly circular. The whole shell is equally sculptured with distinct ribs, generally speaking, straight and relatively regular ones Dimensions of shell characters and their proportions are given in chart I.

The lower part of the shell, the basis, is usually flattened at the bottom. Radial ribs develop from a point usually situated at the lowermost part of the basis, and continue upwardly (compare pl. I, figs. »b« and »c«). The number of the ribs increases in such a manner that new ribs appear between the presently existing ones, and they never bifurcate.

The upper part of the shell, the crown, is roughly low conical. It is composed of four compartments and apically open by an orificium. Individual compartments in a specimen contact externally either by

their central part (parietes) or by lateral appendages (alae and radii), of which only the radii may be visible on the external side of the shell. In the first case, a linear suture may be hardly detectable (pl. I, fig. 1a; pl. II, figs. 4a and 5a), in the second one, usually broad »external« radii are uniformly developed from the orificium, narrowing to the lower edge of the crown (pl. I, fig. 3a; pl. II, fig. 6a). All the compartments are furnished with radial ribs, increasing in number in the same manner as on the basis.

Of the four compartments, the rostrum is broadest, but the least sloped. On the contrary, most elevated is the carina. The lenticular orificium is elongated in the carino-rostral direction, more or less displaced from the central point into the carinal part; it runs obliquely toward the rostrum, leaning in this direction (pl. I, figs. 1b, 2b, 3b).

The suture between the crown and the basis, along the so-called equatorial line, is distinct but very narrow (see figs. 2b and 3b on pl. I, where it is hardly detectable) and visible, but only under greater magnification. Along the equatorial line every rib of the crown matches the corresponding one of the basis (pl. I, figs. 1b, 2b, 3b). At the first glance it seems like the ribs of the crown continue without a break into the basis. Thus, the fact of the absence of any ribs developed exclusively either on the crown or on the basis must be stressed. This is quite evident, since the equatorial line marks the growth zone of the shell, from where it enlarges both downward (basis) and upward (crown) during the life of the animal. Any of new ribs must have been developing in both directions. Notes on the different number of ribs on the crown and on the basis, mentioned in older bibliography, are erroneous.

The shape of ribs on the whole shell is identical. They are distinct, sharply marked, with vertical or even overhung edges. Usually they are straight and regular, although some of them are flexed in side directions or rippled up and down. Ribs are separated by interareas of the same width or a little broader. The number of ribs on individual specimens varies. Specimens of the same diameter bear different number of ribs, although smaller forms usually show a smaller number than the bigger ones (chart I). The growth lines are more remarkable, as if more swollen on the basis than on the crown. On the latter they are furnished with minute warts visible under higher magnifications.

Internally, the sheath is short and developed only half-way along the length of compartments. It runs more steeply than the inner surface of parietes, which causes a free space between them. In this space septa develop and gradually enlarge downward, and reach a little deeper than the lower edge of the crown. The septa are fine-ridged parallelly to the sheath, and thus obliquely to the inner surface of parietes. The ridges, situated in the same position on both sides of the septa, are

greatly swelled, and they nearly touch, which causes a beaded view of a section of the septa. Growth lines of the sheath are distinct, while those on the septa are rather faintly marked.

All the septa introduce themselves into grooves of the inner surface of parietes, corresponding to the ribs of the outer surface and outline them. Thus, the so-called ribs of the bibliography are in fact rippels or folds (plicae) of compartmental walls and not ledges (costae). Septal endings, growing down beneath the lower edge of the internal side of the crown, match and enter into analogous grooves of the internal side of the basis, corresponding to the external ribs of the latter.

Opercular plates, preserved in a very fragmentary, marly infilling of the bottom of the basis, may be easily extracted. When the shell is filled with secondary calcite, they cannot be brought out. Generally, opercular plates are balanid, two scuta and two terga free (not fused). Terga, thinner and more fragile, are not entirely isolated.

Scuta are triangular, externally (pl. II, figs. 4d, 4f, 5b, 6b) furnished with regular growth ridges. The basal margin is moderately arched and a little inflected near to the basi-tergal angle. The occludent margin is pectinated with growth-ridge teeth, thick, rather straight, very little inflected toward the tergal margin, and therefore the apex is rather rounded. The articular ridge is prominent and juts out of the margin line. Striae of the articular ridge are poorly developed and do not form a crest. The articular furrow is short and amounts to approximately one third of the tergal-margin length; it bears growth ridges of the external sides, which end here. The adductor ridge is prominent (fig. 1b; pl. II, figs. 4e, 4g, 5c, 6c), highly developed, arcuately running from the apex region (half the distance between the occludent and the tergal margins) to near the basal margin. It reaches neither the apex nor the basal mar-

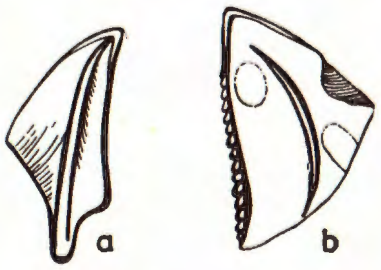

Fig. 1. The interior of opercular plates of *Creusia miocaenica* Procházka collected at Dvor-on-the-Una, Tortonian. × 15.

a – tergum, reconstructed on the basis of few preserved fragments, *b* – scutum.

Sl. 1. Unutrašnjost operkularnih pločica vrste *Creusia miocaenica* Procházka, sabranih u Dvoru na Uni, torton. × 15.

a – tergum, rekonstruiran od nekoliko sačuvanih dijelova, *b* – scutum.

gin, but vanishes in these directions – far from the apex and very close to the basal margin. It is not quite regular, but somewhat wavy at various points of individual specimens. The adductor muscle pit is oval, with its center at about one third of the distance from the apex. In one specimen it is furnished with indistinct radial ridges and grooves. The lateral-depressor-muscle pit is of an elongated horseshoe shape, much deeper than the preceding one and extending to the basal margin.

The individual variation of scutal shape is visible in the waving of the adductor ridge, and, in one specimen (pl. II, fig. 4g), in a much longer articular furrow, and thus the articular ridge extends only along one fourth of the distance from the apex. The latter scutum (a right one) belongs to an abnormal individual with a pathologic, a little dwarfed, left scutum (see a remark later on).

Differences in the morphology of scuta discussed in comparison to a specimen illustrated by P r o c h á z k a (1893, pl. 2, fig. 3e-d) may be seen in the development of the adductor ridge and in the situation of the adductor pit. P r o c h á z k a's specimen has the adductor ridge running from the very apex to the very basal margin, and the adductor pit is situated at a lower place along the occludent margin, being on the other hand, much smaller. The illustration discussed is a sketch drawing and thus it may not be as authentic as the specimen itself.

Terga have not been hitherto known in this species. In the investigated material they are very poorly preserved (pl. II, figs. 4b-c), and their general shape and morphology may be only reconstructed (fig. 1a) on the basis of a few fragments preserved.

Their general shape is broad arrowy. The scutal margin is nearly straight, a little concave, especially at the apex. The carinal margin is regularly convex, somewhat inflected near the apex. The basal margin extends concavely from both sides into a spur situated at about one third of the distance from the scutal margin. The spur is moderately wide and long. Externally, growth ridges parallel the basal margin with the spur. The longitudinal furrow is of a leaning V shape, with its carinal lip overhung, while the scutal one is open. The articular ridge is thin, distinct, and bent inwardly, but not reflexed. Morphological features of the inner side are very variable. An auxiliary ridge arising in a half of the longitudinal ridge runs out a small distance toward the region between the scutal side of the spur and the basi-scutal angle. Depressor crests are poorly developed, highly variable, and arranged in a pattern arcuately running away from the longitudinal ridge direction, toward the basi-carinal angle. One specimen bears a single, more prominent and longer crest among the much smaller others. Most of them reach the basal margin at their distal end.

Chart I

Characters and their Proportions	Number of the specimen							
	1	2	3	4	5	6	7	8
Shell height	*3.1*	4.6	5.0	3.4	*(6.0)*	(5.8)	*(6.0)*	(3.8)
Crown height	*1.2*	2.6	3.0	2.1	2.1	*3.5*	1.4	2.0
Crown/shell height	0.39	0.56	0.60	*0.62*	0.35	0.60	*0.23*	0.53
Shell length (= crown l.)	6.5	7.2	*8.8*	*5.6*	8.3	8.4	8.4	7.8
Shell width (= crown w.)	6.3	7.1	*8.3*	*6.0**	7.4	7.9	6.9	(7.0)
Shell length/width	1.03	1.01	1.06	*0.93**	1.12	1.06	*1.22*	1.11
Crown height/width	*0.19*	0.37	0.36	0.35*	0.28	*0.44*	0.20	0.28
Aperture length	1.5	1.8	*2.2*	*1.2*	*2.2*	2.1	2.0	2.0
Aperture width	1.0	1.0	*1.7*	*0.8*	1.4	1.2	1.4	(1.2)
Number of ribs (along the equatorial line)	33	44	49	38	36	*56*	47	?

Notes – Number of the specimen corresponds to that given in pls. I–II.
– minimal and maximal values are cursived,
– calculated values of partially damaged specimens are in brackets,
– specimen no. 4 displays abnormality (characters influenced by pathological changes are marked with asterisk).

Remarks

Cirripeds of the genus *Creusia* Leach, ranging from the Miocene to the Recent, have been very rarely under a more detailed investigation and description. Many opinions concerning them are very much diversified. On the basis of the up-to-date bibliography, the authors state that both fossil and recent forms need a smaller or greater revision. While Dr. A. Ross and Dr. W. A. Newman have concerned themselves with recent forms (personal communication), the authors have betaken themselves to similar problems in connection with fossil, mainly Tertiary materials.

The study of *Creusia miocaenica* from Dvor, the species represented by 8 individuals of one population, leads to a few conclusions and remarks also acceptable in the case of other extinct species of the genus.

1. The specific variability of such features as the general shape and dimensions of shell, proportions of shells and crowns, the outline of crowns, characters of the orificium, the number of ribs, is so great (chart I) that they may not be regarded as taxonomically important.

2. The morphology of opercular plates may be mainly as a stable feature stated, which is evident as a result of their growth inside the shell of the animal, where the influence of substratum was rather absent. Such an influence of the substratum on shell morphology is, on the other hand doubtful (Bałuk & Radwański 1966). The variability of shell morphology depends rather on the individual variation

and plasticity of characters in specimens belonging to a community and, consequently, to the species. Of these features, only the general pattern of the ribbing is stable, which is demonstrated by the shape of ribs and their relations to interareas.

3. A correction is necessary of some opinions on the taxonomic significance of such features as the development of »external« radii, the equatorial prominence and the shape of opercular plates.

3a. The development of radii on the external side of the crown, is of no taxonomic value, despite some data in the literature concerned. It took place when the enlarging of the orificium or changes in crown steepness were necessary in a specimen. It usually happened in more slender and more conical crowns. Of the 8 specimens discussed, only two bear externally broad and well developed radii (specimens No. 3 and 6) while the others display narrower (specimen No. 2) or vanishing ones. Narrow radii may be completely hidden in rib interareas and, therefore, undetectable with naked eyes; the same takes place in other densely ribbed species of the genus. On the other hand, when external radii are lacking, the individuality of compartments is not lost because their parietal parts accomplish a contact of compartments. Thus, the presence or absence of external radii does not solve the question of the quantity of compartments, which is of great importance in cirripeds of the *Creusia-Pyrgoma* group, but simultaneously leading to great perplexity and very diversified opinions. In regards to the coalescence of compartments, neither the development of broad external radii nor their appearance in rib interareas decides, but only the presence of vaginal sutures. The discussed specimens of *Creusia miocaenica* bear 4 sutures in the sheath, regardless of the development of the detectable radii on the outer side of the crown.

3b. Development of the equatorial prominence depends presumably on the local stopping of corallite growth. Thus it is of no taxonomical value despite the opinion expressed by Kolosváry (1962), who on such a basis created a new variety within the *Creusia* of the Bulgarian Tortonian. Such a prominence in the discussed specimens of *Creusia miocaenica* appears sporadically in some of them, in a more evident manner in only one specimen (Pl. I, fig. 3b).

3c. The shape and sculpture of opercular plates, as it has been already stressed, are stable. The same is evident in the much greater material from Poland (Bałuk & Radwański 1966). Thus it seems that opercular plates in individual species of *Creusia* are not so variable as stated by Kolosváry (1962, Table I), who described really a definite species as various »formae« of another species plus one other species (discussion in: Bałuk & Radwański 1966).

4. The variability of some characters in certain specimens may be an effect of pathological changes. One of the specimens examined (pl. II, fig. 4a) bears evidently pathological changes in the form of a swelling

of a part of the crown, including mainly the left lateral compartment, and on the other hand, a rather strongly degenerated left scutum (pl. II, figs. 4d-e). The latter fact is well demonstrated when compared with the rather normal scutum of the right side (pl. II, figs. 4g-f). These pathological changes were probably caused by a sickness of intestines in this part of the animal body, the stomach infected supposedly by a parasite.

5. Cirripeds of the *Creusia-Pyrgoma* group are often demonstrated as homeomorph examples of various coral- or rudist-shaped animals. The very low conical (both on basis and crown sides) discussed specimens of *Creusia miocaenica* point out that such a similarity is not a general feature of all the *Creusia-Pyrgoma* cirripeds. The specimens discussed could be rather regarded as homeomorphs of inarticulatic brachiopods of the genus *Crania* Retzius.

Discussion

At the present time the specimens collected at Dvor represent the biggest assemblage of *Creusia miocaenica*. Their morphology agrees with *Creusia miocaenica* described by Procházka from Miocene deposits of the Vienna Basin (2 specimens from Wöllersdorf, one from Mannersdorf). The specimens from Dvor, in comparison with those of Procházka, exhibit a much smaller elongation of the basis, the reason why they are more flattened. Scuta are also similar, differing a little only in some unimportant details.

One specimen from the Miocene of Eggenburg, Austria, illustrated by de Alessandri (1910, pl. 48, fig. 14) ought to be included into the species *Creusia miocaenica* Procházka. It is morphologically identical, and de Alessandri named it erronously *Pyrgoma* cfr. *anglicum* Sow. Another specimen, illustrated by de Alessandri (1910, pl. 48, figs. 15a-b) under the same name, belongs to quite a different species (Bałuk & Radwański 1966). There are no bibliographical data on the occurrence of this species in Switzerland as mentioned by Brooks & Ross (1960, p. 362).

Occurrence

Mr. M. Brkić collected the specimens of *Creusia miocaenica* Procházka at Dvor-on-Una (Croatia) while working on his geological graduation paper for the Department of Geology and Paleontology, the University of Zagreb. He found them within a sandy layer of sand-marly Tortonian deposits with *Lithothamnium* (Leitha-limestone facies). The outcrop, situated on the right bank, near the bridge of the Žirovac brook, a tributary to the Una River, has been known for a long

time as very rich in Tortonian fauna (Štur 1863, Vukasović 1879, Ćurčić 1898, Brkić 1966). Mr. Brkić (1966) determined the specimens as *Pyrgoma* sp.

All the specimens were collected within a small area. They were found free in the sediment, without any traces of the corals they had dwelled in. Thus the corals must have completely disintegrated on the sea bottom, and only the hardest, most resistant elements – shells of domiciled cirripeds – had been deposited finally in the sediment.

Individual shells are partially infilled, usually at the bottom of the basis, by a marly sediment in which opercular plates are contained. The remaining part of the shell is empty in one specimen, and filled with secondary calcite in the others.

Collection of the Department of Geology and Paleontology, University Zagreb, Nr. 802.

2. *Creusia krambergeri* sp. n.

Fig. 2.

Ceratoconcha costata Kramb.-Gorj. – Kramberger-Gorjanović, 1889a, Glasn. Hrv. naravosl. dr. 4, pp. 48–55, pl. 1, fig. 1–2.

Pyrgoma [*costata* Kramb.-Gorj.] – Kramberger-Gorjanović, 1889b, Verh. Geol. R. A., No. 6, p. 142.

Creusia costata [Kramb.-Gorj.] [non *Pyrgoma costatum* Seguenza] – Kramberger-Gorjanović, 1889c, Glasn. Hrv. naravosl. dr. 4, pp. 230–231.

Creusia costata Kramb.-Gorjan. – Procházka, 1893, Rozpr. Ceske Akad., třida II, 2, no. 1, p. 19.

Pyrgoma costata Kramberger. – Stromer 1912, Lehrb. Paläozool., Teil II, fig. 232 D.

Pyrgoma costata Kramb. – Abel, 1920, Lehrb. Paläozool., fig. 136 (nach Stromer).

(Balanidenkrebs, *Pyrgoma*). – Dacqué, 1921, Vergleichende biologische Formenkunde der fossilen niederen Tiere, fig. 91 B (aus Gorjanović-Kramberger).

Creusia costata (Kramberger-Gorjanović) non *Pyrgoma costatum* Seguenza. – Withers, 1926, Ann. Mag. Nat. Hist., (9) 17, no. 97, p. 5.

Pyrgoma costatum Seguenza = *Pyrgoma costatum* Kramb.-Gorj. – Abel, 1928, Palaeobiologica, 1, pp. 13–38.

Creusia multicostata Seguenza = *Pyrgoma costatum* (Kramberger-Gorjanović, nec non Seguenza). – Abel, 1935, Vorzeitliche Lebensspuren, p. 535.

Creusia Rangii (des-Moul.) = *Pyrgoma multicostatum* Seguenza = *Pyrgoma costatum* Gorjanović-Kramberger. – Kolosváry, 1949, Földt. Közl. 79. no. 1–4, p. 111.

Pyrgoma costata Kramberger. – Termier & Termier, 1953, Sous-classe des Cirripèdes, in: Piveteau, Traité Paléont. 3, fig. 19 (d'après Gorjanović-Kramberger).

Creusia rangei des Moulins. – Bogsch, 1957, Ann. Univ. Sci. Budapestinensis de R. Eötvös Nom. (sect. geol.) 1, p. 29.

Creusia costatum (Gorjanović-Kramberger). – Brooks & Ross, 1960, Crustaceana, 1, no. 4, p. 362.

Derivation of name

To the memory of Professor D. Kramberger-Gorjanović (1856–1936) who gave the first description of specimens belonging to this species.

Lectotype

The specimen presented by Kramberger-Gorjanović (1889a, pl. 1, figs. 1-1a). Original figures given by Kramberger-Gorjanović, comprising his Plate 1 (a paper of 1889a), are reproduced in the present paper as Text-fig. 2.

Paralectotype

Another, imperfect specimen presented by Kramberger-Gorjanović (1889a, pl. 1, figs. 2-2a).

Type locality

Podsused near Zagreb, Croatia (Yugoslavia).

Type stratum

Tortonian (Leitha-limestone facies); material derived from Tortonian boulders imbedded in a cliff deposit of the Sarmatian age.

Material

Only 2 specimens illustrated by Kramberger-Gorjanović (1889a, pl. 1) and discussed here, may be assigned to this species. No other specimens from the European Miocene show resemblances to these two ones.

General morphology

The shell is strongly elongated, with its basis deeply cup-shaped, nearly tuobidal, and it has a low conical crown. The ribs, in the shape of a low, rounded ridge, cover all the shell surface equally distributed with the same number on the basis and the crown, matching one anohter along a very narrow suture. The latter feature is the same as in the preceding species. The width of the ribs greatly surpasses the width of the interareas that are reduced to narrow grooves, with the result that the ribs are closely packed together.

The shell attains great dimensions. The specimens presented by Kramberger-Gorjanović are 29,5 mm. and ca. 38.5 (the partially damaged one) mm. long, which notably exceeds the dimensions of other Miocene species. Also notable is the number of ribs that, according

to Kramberger-Gorjanović, amounts to 65. His information that there is a different number of ribs on the basis and on the crown is, in the light of present authors' investigations on other *Creusia* species, erroneous. Opercular plates are unknown; specimens presented by Kramberger-Gorjanović are entirely infilled with a strongly lithificated calcareous sediment.

A characteristic feature of the specimens in question, although of no taxonomic value, is a very strong development of external radii, inducing a remarkable enlarging of the orificium.

Remarks

The lectotype of the species, i. e. the better preserved specimen among those figured by Kramberger-Gorjanović, has been demonstrated many times in papers, both as an example of fossil cirripeds of the *Creusia-Pyrgoma* group, as well as an example of homeomorphy with various cup-shaped or coral-shaped animals. On the other hand, the specimens described by Kramberger-Gorjanović, have been metioned in some papers as the definite species of the genus *Creusia,* differently interpreted as to its validity and authorship. Something similar may be told about the explanation of either the original figure by Kramberger-Gorjanović under reproduction or sketch drawings based on this figure. A compilation of all such data has been given above in the synonymy of the species while a discussion of more important ones will be presented later on.

It may be noticeable that schematic drawings, based on the figure given by Kramberger-Gorjanović, have been prepared faultily. Thus Termier & Termier (1953, fig. 19) removed completely the radii, certainly to agre to a statement (op. cit., p. 306) that the crown is composed of one compartment; and these authors quoted Kramberger-Gorjanović as the original source! Another schmatic drawing given by Ziegler (1963, fig. 29) bears as many as 5 faults: a) the radii were removed; b) the orificium was covered with an apex, and the crown topped by a broad cone; c) the number of the basis ribs was much smaller than that of the crown ones; d) the ribs of the basis did not match those of the crown; e) the bottom of the basis was truncated flat.

Discussion

The species discussed was described by Kramberger-Gorjanović (1889a), under a new name, *Ceratoconcha costata,* and he regarded it as a rudist, which M. Neumayr[1] also accepted. During the

[1] It was not the only case of describing cirripeds as rudists. The similar mistake was also committed by Conrad (1856, fide Zullo 1964) when describing, under the name *Tamiosoma gregaria,* some American barnacles (Zullo 1964).

publication of his paper, Kramberger-Gorjanović was acquainted with a monograph by Seguenza (1876) that enabled him to correct his fault. In the first of the two notes on this matter, Kramberger-Gorjanović (1889b) conceded that the specimens in question really belonged to cirripeds, and assigned them to the genus

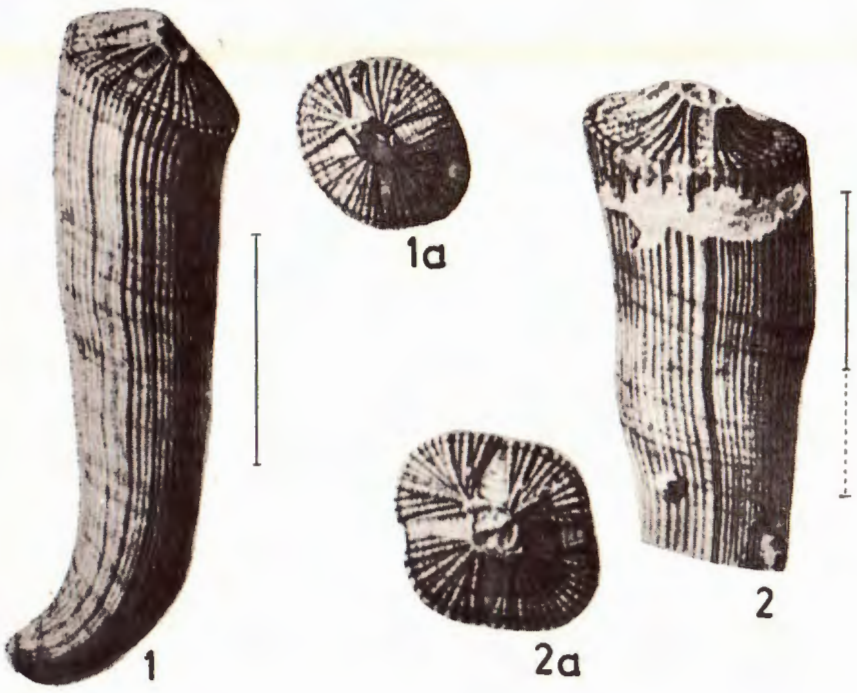

Fig. 2. *Creusia krambergeri* sp. n. A reproduction of the original figures from the paper by Kramberger-Gorjanović (1889a, pl. I). The figures comprise the lectotype of the species (figs. 1–1a) and its paralectotype (figs. 2–2a). The scale is given.

Sl. 2. *Creusia krambergeri* sp. n. Reprodukcija originalnih slika iz rada Kramberger-Gorjanovića (1889a, tab. I). Slike obuhvaćaju lektotip vrste (sl. 1–1a) i njegov paralektotip (sl. 2–2a). Mjerilo je urisano.

Pyrgoma Leach. In the second note, Kramberger-Gorjanović (1889c) assigned them to *Creusia* Leach, which has been right till now. In both of his notes Kramberger-Gorjanović (1889 b, c) supported the specific name *costata* Kramberger-Gorjanović. Thus, the final determination of the species, made by this author, was: *Creusia costata* (Kramberger-Gorjanović).

The problem was, however, complicated by the fact that the same specific name, *costata,* was used by Seguenza (1876) for a species of the genus *Pyrgoma.* Kramberger-Gorjanović, regarding his specimens as belonging to another genus, *Creusia* Leach, did not see the necessity to change the name *costata.* However the many further students have identified both of these genera, *Creusia* Leach and *Pyrgoma* Leach. They have been disoriented by the fact that two quite different species with the same specific name *costata* were included into such a single genus, named either *Pyrgoma* or *Creusia* (Abel 1920, 1928, 1935; Kolosváry 1949; Termier & Termier 1953: Brooks & Ross 1960). In this way, the mentioned authors, have been confused not only by the authorship of the specific name *costata,* but also by the mutual relation of both species identically named. A short compilation of their opinions is comprised in the synonymy, while a full explanation of this matter will be given in another paper (Bałuk & Radwański 1966).

An analysis of all recent and fossil species of the *Creusia – Pyrgoma* group of cirripeds, made by the authors (Bałuk & Radwański 1966) shows that the genera *Pyrgoma* Leach and *Creusia* Leach are separate, and all the species known from the European Miocene belong exclusively to the genus *Creusia* Leach. Both the specimens described by Kramberger-Gorjanović (1889a, b, c), as well as those by Seguenza (1876), belong to this genus. Thus in the genus *Creusia* Leach there are two different species with the same specific name *costata,* as follows: *costata* Seguenza 1876 and *costata* Kramberger-Gorjanović 1889, of which the first has evidently the priority. The second one, used by Kramberger-Gorjanović for the specimens from Podsused, must be dropped. For these latter specimens, being dealt with here, a new specific name is demanded. The authors propose it as *Creusia krambergeri* sp. n.

FINAL REMARKS

The occurrence of the genus *Creusia,* represented by two species, in the Croatian Miocene is an interesting example of the distribution of these aberrant cirripeds in the European Miocene. Although rare indeed, various species of these cirripeds are widely distributed in Miocene deposits of Southern and Central Europe. They appear on the Balkan and Apenine Peninsulas, Malta, Sicily, Sardinia, in Aquitania, Provence, Northern Italy, Austria, Hungary, Moravia, and, most northwardly, they inhabit the southern slopes o the Holy Cross Mountains in Central Poland (see Bałuk & Radwański 1966). Their relative scarcity results presumably from facial reasons – a lack of greater coralliferous deposits in the European Miocene. On the other hand, it

most probably also results from a lack of a special insight into coral materials, for these animal have live corals for their only habitat. These cirripeds are usually found mainly within corallites. Both Croatian localities, where the *Creusia* specimens were found free in a sediment, are rather exceptional in this matter. Finally the authors hope that this contribution will be of some interest and help during further searches for these rare fossils in the Miocene of Europe.

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W. BAŁUK i A. RADWAŃSKI

ROD CREUSIA LEACH, 1817, (CIRRIPEDIA) U MIOCENU HRVATSKE

Aberantni Cirripedia (raci vitičari) roda *Creusia* Leach, 1817, prilagođeni isključivo životu u koraljima predstavljeni su u hrvatskom miocenu dvjema vrstama.

Prva od njih, *Creusia miocaenica* Procházka, 1893, pojavljuje se u tortonskom litavcu Dvora na Uni, gdje je 8 primjeraka našao M. Brkić pri izradi diplomskog rada u Geološko-paleontološkom zavodu Sveučilišta u Zagrebu. Obradu ovog materijala omogućila je autorima prof. dr V. Kochansky-Devidé iz spomenutog zavoda.

Primjerci *Creusia miocaenica* Procházka sačuvani su većinom čitavi. Iz nekoliko primjeraka isprepariranа su operkularia koja se obično nalaze na dnu bazale. Cijela ljuštura uostalom nije prazna – operkularia strše u nevelikoj masi laporovitog materijala sakupljenog na dnu bazale, dok ostatak prostora ispunjava tvrd, krupnozrnast, sekundaran kalcit, sekrecionog porijekla. Ovi su primjerci nađeni slobodni u sedimentu, što znači da je koralit, u kojem su ove ciripedije živjele, morao podleći raspadanju još na dnu mora, nakon čega su u sastav sedimenta ušle samo iz njega isprepariranе tvrde ljušture *Creusia*.

Morfologija ljuštura (tab. I, tab. II, sl. 4a, 5a, 6a) dobro odgovara formama koje je prvi opisao V. J. Procházka (1893) pod imenom *Creusia miocaenica* iz miocena Bečkog bazena Austrije (Wöllersdorf i Mannersdorf). Ova se vrsta pojavljuje u Austriji također u okolici Eggenburga, gdje ju je opisao G. de Alessandri (1910) pod pogrešnim imenom (vidi sinonimiju).

Forme iz Dvora, u poređenju s onima, koje je opisao Procházka, pokazuju manje produljenje bazale, zbog čega su u cjelini više plosnate. Skuta (tab. II, sl. 4d–f,

5b–c, 6b–c) također odgovaraju ilustracijama Pracházke, dok terga (sl. 1, tab. II, sl. 4b–c) u ovoj vrsti nisu bili dosad poznati. Detaljan opis ovih oblika i diskusiju niza njezinih morfoloških odlika navodi engleski tekst.

Drugu vrstu roda *Creusia* iz hrvatskog miocena opisao je D. Kramberger-Gorjanović (1889a) iz valutica litavca koje se nalaze u naslagama sarmata u Podsusedu. Ovaj je autor opisao nađene primjerke kao rudiste pod imenom *Ceratoconcha costata,* novi rod i vrsta; ipak je ubrzo priznao njihovo pripadanje k ciripedijama (Kramberger-Gorjanović 1889b) roda *Creusia* (u paralelnoj bilješci – Kramberger-Gorjanović 1889c) smatrajući konačno ove primjerke vrstom *Creusia costata* (Kramberger-Gorjanović).

Ilustracija boljeg od dva nađena primjerka iz Podsuseda (vidi sl. 2) bila je mnogo puta reproducirana, uostalom većinom pogrešno sa sinonimičkog stanovišta (vidi sinonimiju u engleskom tekstu) kao primjer fosilnih ciripedija iz roda *Pyrgoma.* Ipak u stvari ova vrsta predstavlja rod *Creusia,* što je pravilno odredio već sam Kramberger-Gorjanović (1889c). Ipak rodu *Creusia* pripadaju također posve drugačije forme koje je opisao G. Seguenza (1876) kao *Pyrgoma costatum* Seguenza. Dakle se u okviru roda *Creusia* nalaze dvije posebne vrste sa istim imenom: *costata* Seguenza 1876 i *costata* Kramberger-Gorjanović 1889, od kojih naravno prva ima prioritet. Prema tome ovu vrstu koju predstavljaju oblici iz Podsuseda treba obuhvatiti novim nazivom vrste. Autori predlažu ovdje ime *Creusia krambergeri* sp. n., u čast njihova istraživača. Potpunije razmatranje pitanja sinonimike ove vrste nalazi se u engleskom tekstu i u posebnom radu autora (Bałuk & Radwański 1966) koji obrađuje kritičnu analizu svih vrsta roda *Creusia* Leach iz evropskog miocena.

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Zavod za paleozoologiju i Zavod za dinamsku geologiju Sveučilišta Varšava
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PLATE –TABLA I

Creusia miocaenica Procházka. Three individuals, numbered 1, 2, 3, (the same as in chart I):
1a, 2a, 3a – upper view (the crowns); the carina rising upward,
1b, 2b, 3b – side view; the carina from the left,
1c, 2c, 3c – lower view (the basis); the same orientation as the upper view.
Note the development of broad external radii in the specimen No. 3 (Fig. 3a), and the suture between the crown and the basis (especially well visible in Fig. 2b).
Tortonian (Leitha-limestone facies) at Dvor-on-the-Una, Croatia.
All figures × 5, taken by M. Czarnocka.

Creusia miocaenica Procházka, Tri individua, označena 1, 2, 3 (jednako kao u tabeli I):
1a, 2a, 3a – pogled odozgo (krune); carina dižući se uvis,
1b, 2b, 3b – sa strane; carina s lijeva,
1c, 2c, 3c – izgled odozdo (baza); ista orijentacija kao odozgo.
Upozoruje se na razvoj širokih vanjskih radija na primjerku 3 (sl. 3a) i na suturu između krune i baze (osobito lijepo vidljiva na sl. 2b).
Torton, litavac, kod Dvora na Uni, Hrvatska. Sve sl. × 5.

Foto: M. Czarnocka.

PLATE – TABLA I

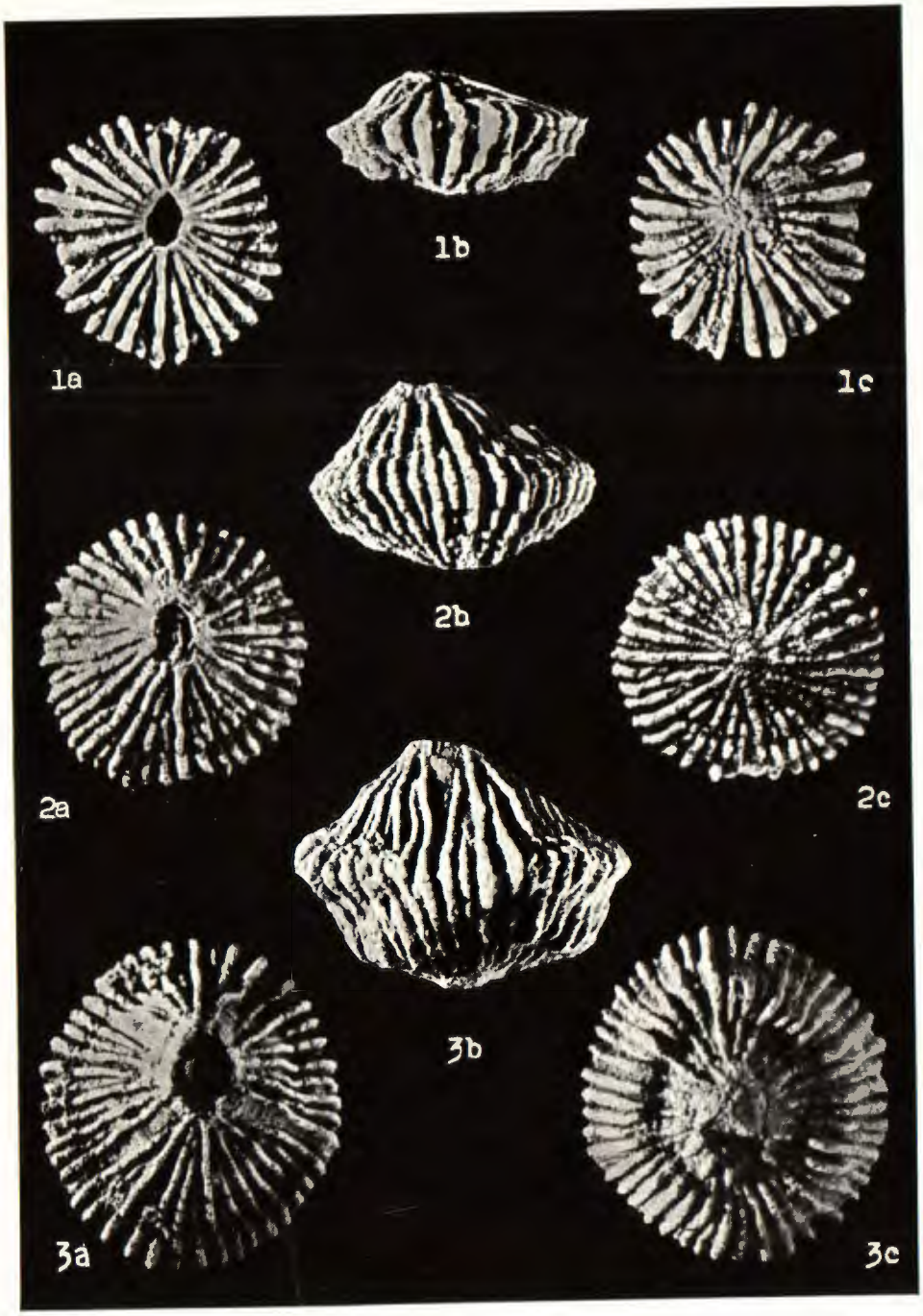


PLATE – TABLA II

Creusia miocaenica Procházka. Three other individuals, numbered 4, 5, 6 (the same as in chart I) and their opercular plates:

4a – the crown; note a pathological swelling of the left lateral compartment, influenced probably by a parasite of the intestines.
4b – the imperfect, left tergum; outer view,
4c – the same. inner view,
4d – the left scutum, outer view; note pathological changes – dwarfing and disturbances of the shape,
4e – the same, inner view,
4f – the right, rather healthy scutum; outer view,
4g – the same, inner view; note the enlarging of the articular furrow,
5a – the crown,
5b – the left scutum, outer view,
5c – the same, inner view,
6a – the crown: note the development of broad external radii,
6b – the right scutum, outer view,
6c – the same, inner view.

Figures 4a, 5a, 6a in the same orientation as in the preceding plate (upwardly with the carina).

Tortonian (Leitha-limestone facies) at Dvor-on-the-Una, Croatia.

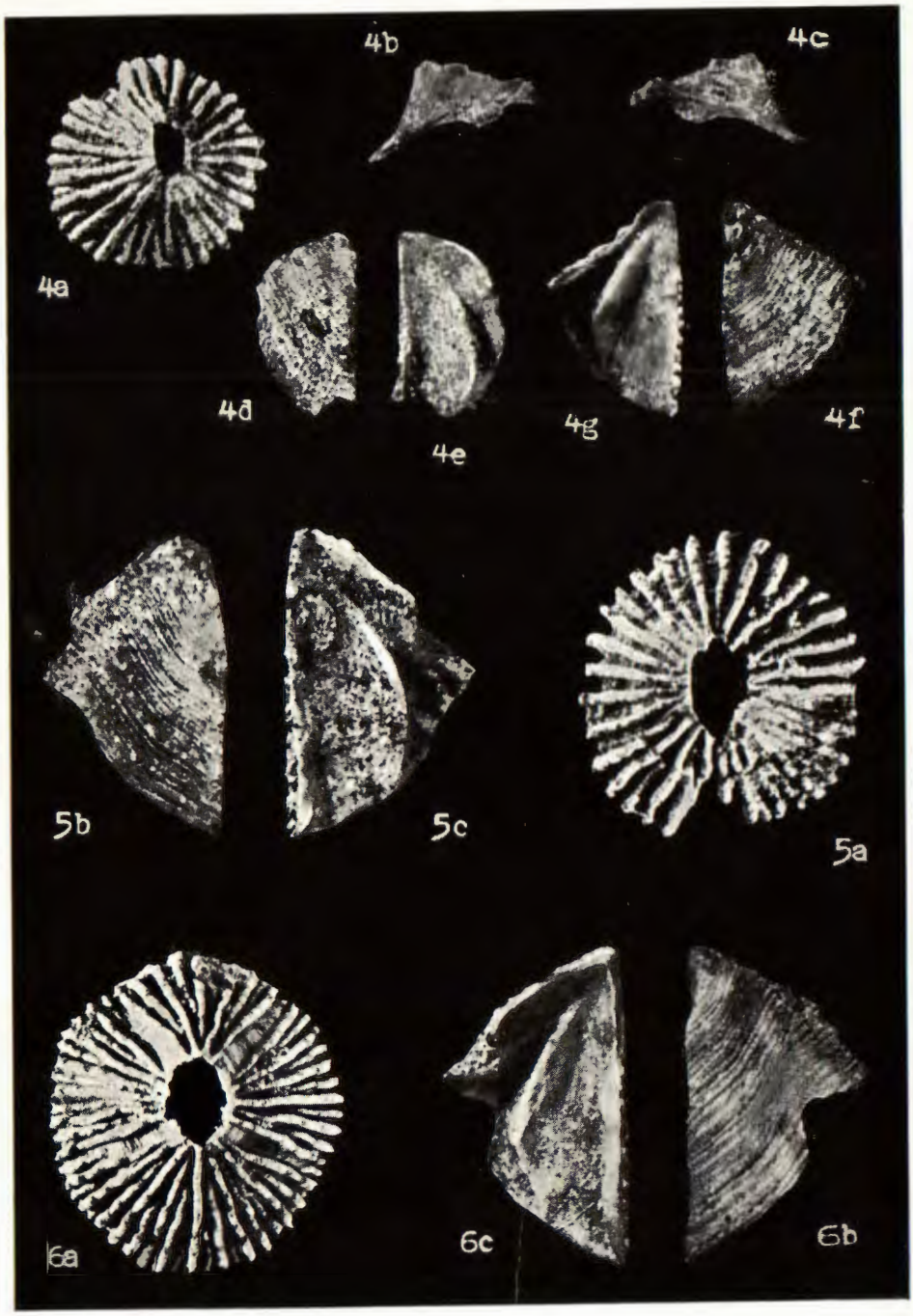
All the crowns × 5, taken by M. Czarnocka; all the opercular plates × 15, taken by L. Łuszczewska, M. Sc.

Creusia miocaenica Procházka. Tri druga individua, označena 4, 5, 6 (jednako kao u tabeli I) i njihove operkularne pločice:

4a – kruna; upozoruje se na patološki nabubrilu lijevu stranu vjerojatno zbog nekog parasita u utrobi,
4b – nepotpuni, lijevi tergum; izvana
4c – isti; iznutra,
4d – lijevi scutum, izvana; upozoruje se na patološke promjene – krŽljavost i poremetnje u obliku,
4e – isti; iznutra,
4f – desni, prilično zdravi scutum; izvana,
4g – isti, iznutra; upozoruje se na proširenje artikulatne brazde,
5a – kruna,
5b – lijevi scutum, izvana,
5c – isti; iznutra,
6a – kruna (razvijeni su široki radiji),
6b – desni scutum, izvana,
6c – isti; iznutra.

Sl. 4a, 5a, 6a jednako orijentirano kao na prošloj tabli (s carinom prema gore).

Torton, litavac kod Dvora na Uni, Hrvatska. Sve krune × 5, foto M. Czarnocka; sve operkularne pločice × 15, foto L. Łuszczewska, M. Sc.


4b
4c
4a
4d
4e
4g
4f
5b
5c
5a
6a
6c
6b