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Echinoids from the Pińczów Limestones (Middle Miocene; Holy Cross Mountains, Central Poland)

ABSTRACT: The assemblage of echinoids from the Middle Miocene (Badenian) red-algal (lithothamnian) detrital limestones (the Pińczów Limestones) of the Pińczów – Busko area in southern slopes of the Holy Cross Mountains, Central Poland, comprises the representatives of the ten genera, such as *Cidaris*, *Cyathocidaris*, *Plegiocidaris*, *Centrostephanus*, *Arbacina*, *Psammechinus*, *Parasalenia*, *Clypeaster*, *Echinocyamus*, and *Echinolampas*. The studied assemblage which comes from the key sections exposed at Pińczów, Skowronno, Busko, Żerniki, Szczaworyż, and Kików, bears distinct similarities to those recognized in the coeval deposits of the Korytnica Basin in the near neighborhood, as well as to those reported from other parts of the Paratethys basins and from the Mediterranean, Egypt including.

INTRODUCTION

The echinoids from the Middle Miocene (Badenian) red-algal (lithothamnian) detrital facies, called the Pińczów Limestones, developed on the southern slopes of the Holy Cross Mountains, Central Poland, have not as yet subjected to taxonomic recognition. Their validity as the facies indicators was pointed out by RADWAŃSKI (1977) who then promoted the present-author's investigation of that group of fossils.

The first report on the echinoid occurrence in the Pińczów Limestones was given by KOWALEWSKI (1930, p. 54) who noted the genus *Psammechinus* from Pińczów, and *Scutella* and *Clypeaster* from Szczaworyż. These findings were supplemented by RADWAŃSKI (1977, p. 747) who recorded from Pińczów the genera *Echinocyamus*, *Clypeaster*, and *Echinolampas*, of which the genus *Clypeaster* was demonstrated as an indicator of tropical and/or subtropical climatic conditions (see also BAŁUK & RADWAŃSKI 1977, p. 115; MAĆZYŃSKA 1987, p. 150 and 1991a, p. 553).

A review of other faunal content of the Pińczów Limestones is included in the above-referenced papers (KOWALEWSKI 1930, RADWAŃSKI 1977) and, as focussed on diverse vertebrates, it has recently been surveyed by CZYZEWSKA & RADWAŃSKI (1991).

The present paper is a result of successive studies on the Middle Miocene (Badenian) echinoids from various facies of the deposits connected with the evolution of the Fore-Carpathian Depression in Poland (see Text-fig. 1A).

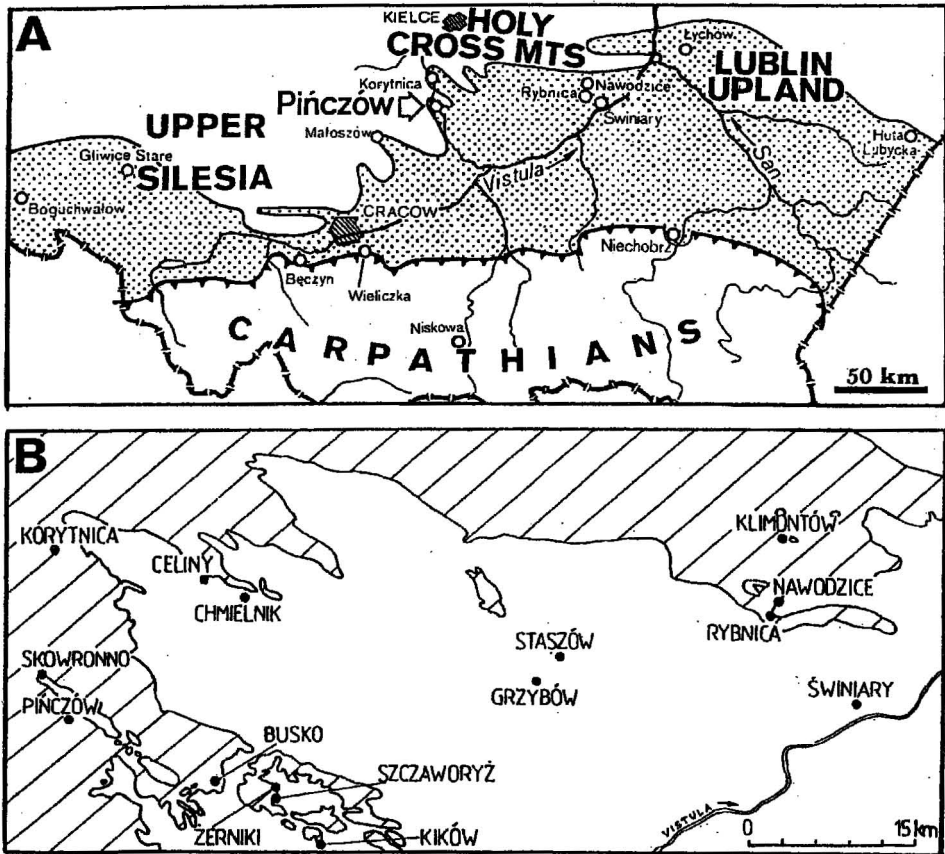


Fig. 1

A – Paleogeographic map of southern Poland, to show the extent of the Middle Miocene (Badenian) transgression in the Fore-Carpathian Depression (*stippled*), and the location of sections yielding the investigated echinoid remains; some more important fossil-bearing localities are also indicated (*adopted from: CZYZEWSKA & RADWAŃSKI 1991, Fig. 1*)

B – Geologic sketch-map of the southern slopes of the Holy Cross Mountains, Central Poland (see Text-fig. 1A), to show the extent of the Middle Miocene (Badenian) deposits (*blank*) preserved partly in erosional remnants (outliers), and their relation to the pre-Miocene substrate (*hachured*); indicated are the key sections of the Pińczów Limestones, and other echinoid-bearing localities discussed in the text (*adopted from: RADWAŃSKI 1973, Fig. 1*)

Particular studies concerned the Korytnica Basin (MĄCZYŃSKA 1977, 1987) and sandy facies (localities Świniary, Rybnica, and Nawodzice) of the southern slopes of the Holy Cross Mountains (MĄCZYŃSKA 1988), as well as the Roztocze Hills in the Lublin Upland (MĄCZYŃSKA 1979) and other sites in southern Poland, the most important of which is Niechobrz near Rzeszów at the Carpathian margin (MĄCZYŃSKA 1991a,b, 1994; *see also* ALI & MĄCZYŃSKA 1985, 1986).

The studied material was collected in the sections exposed in large quarries at Pińczów, and in temporary exposures at Skowronno, Busko, Żerniki, Szczaworyż, and Kików (*see* Text-fig. 1B; *cf. also* MĄCZYŃSKA 1991a, pp. 550–551). The complete tests were supplied by the genera *Arbacina*, *Psammechinus*, *Parasalenia*, *Clypeaster*, and *Echinocyamus*, while the others are represented by test fragments, isolated plates, spines (mostly of the Cidaridae), and loose elements of Aristotle's Lanterns.

The investigated collection is housed at the Museum of the Earth (Polish Academy of Sciences) in Warsaw, and kept under the Catalogue Numbers *MZ VIII Ee 1331 – 1370* and *1552*.

SYSTEMATIC ACCOUNT

Order *Cidaroida* CLAUS, 1880
Family *Cidaridae* GRAY, 1825
Genus *Cidaris* LESKE, 1778

Cidaris zeamais SISMONDA, 1842
(Pl. 1, Fig. 1 and Pl. 4, Fig. 1a)

1987. *Cidaris zeamais* SISMONDA; S. MĄCZYŃSKA, Pl. 1, Fig. 1.

1988. *Cidaris zeamais* SISMONDA; S. MĄCZYŃSKA, p. 60, Pl. 1, Figs 1–3.

MATERIAL: Over 50 spines, mostly fragmented from Pińczów (*Ee 1331*), and fragmented spines in the number of 15 from Szczaworyż (*Ee 1334*), 3 from Żerniki (*Ee 1335*), 2 from Skowronno (*Ee 1333*), and 1 from Busko (*Ee 1332*).

REMARKS: Spines of this species are quite common in the studied deposits. Both the complete spines and their fragments are well preserved, with distinct ornamentation featured by transverse swellings (rings) in the middle of the spine (*see* Pl. 1, Fig. 1 and Pl. 4, Fig. 1a).

OCCURRENCE: The species is widely distributed in the Middle Miocene, both in the southern slopes of the Holy Cross Mountains (MĄCZYŃSKA 1987, 1988) and at Niechobrz (MĄCZYŃSKA 1991b, 1994), as well as in Hungary (VADÁSZ 1907), the Rhone Basin, and the Aquitaine Basin in France, and Colli Torinesi in Italy (PHILIPPE 1984).

Cidaris cf. *desmoulinsi* SISMONDA, 1842
(Pl. 1, Fig. 2)

1977. *Cidaris* cf. *desmoulinsi* SISMONDA; S. MĄCZYŃSKA, p. 194, Pl. 1, Figs 7 and 13 [*cum syn.*].

MATERIAL: Two spines, partly damaged from Pińczów (*Ee* 1337).

REMARKS: The collected specimens are very similar to those reported from the Korytnica Basin (MĄCZYŃSKA 1977), and share with them all their morphological features.

OCCURRENCE: The species *Cidaris desmoulinsi* SISMONDA, 1842, is known from the Paratethys regions of Hungary (VADÁSZ 1915), and the forms designated as *conformis* were also noted from the Korytnica Basin (MĄCZYŃSKA 1977).

Genus *Cyathocidaris* LAMBERT, 1910
Cyathocidaris avenionensis (DESMOULINS, 1837)
(Pl. 1, Figs 3–4 and Pl. 6, Fig. 1c)

1984. *Cyathocidaris avenionensis* (DESMOULINS); M. PHILIPPE, p. 85, Pl. 5, Figs 1–6 [*cum syn.*].

1987. *Cyathocidaris avenionensis* (DESMOULINS); S. MĄCZYŃSKA, Pl. 1, Figs 3–7.

MATERIAL: Ten isolated interambulacral plates, 2 joined ambulacral plates, and 2 test fragments from Pińczów (*Ee* 1338); 1 ambulacral plate from Skowronno (*Ee* 1333); 1 test fragment from Szczaworyż (*Ee* 1339).

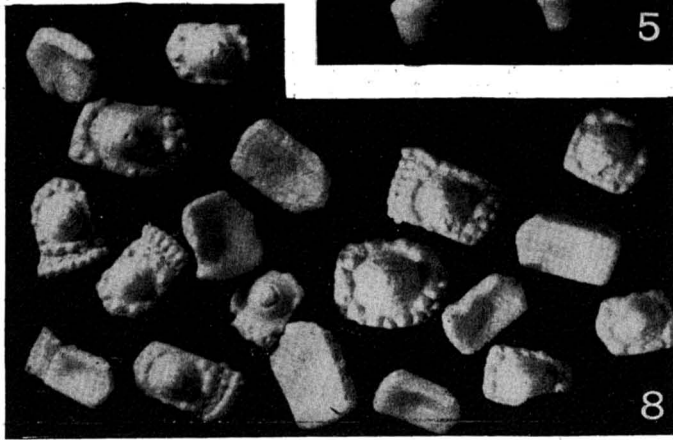
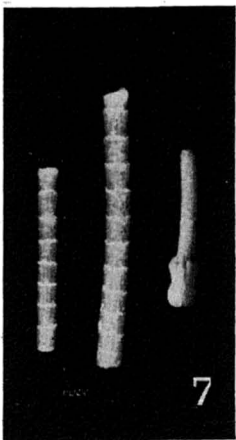
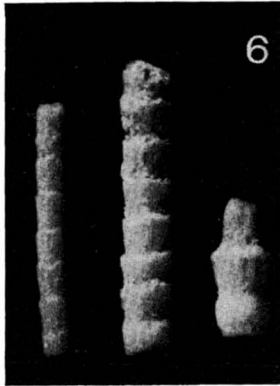
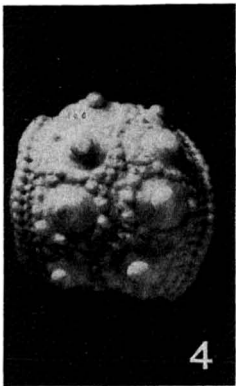
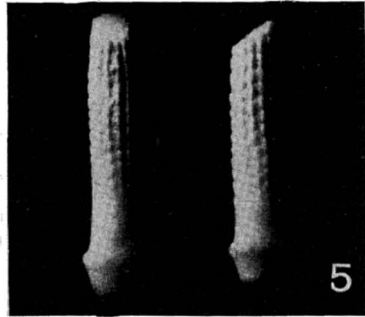
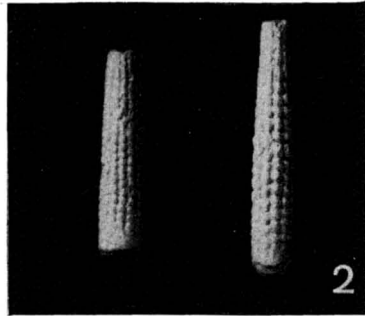
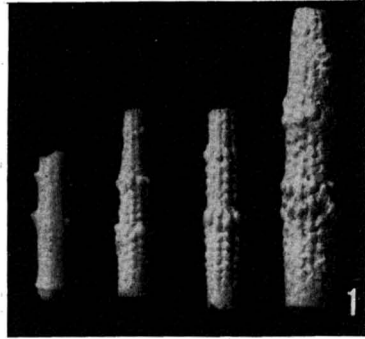
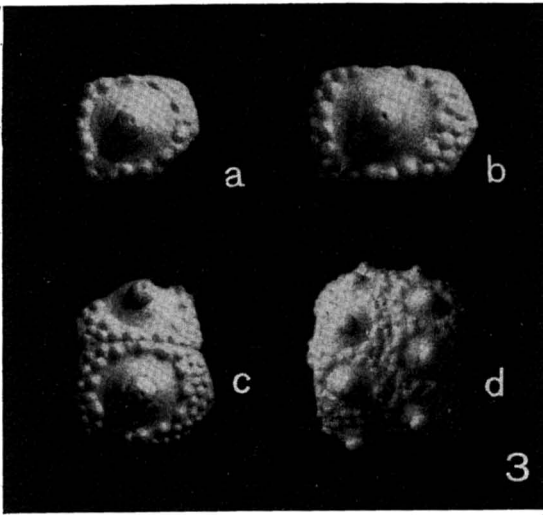
REMARKS: The collected material is well preserved, with the tubercle pattern well discernible, typical of the species which has recently been studied by PHILIPPE (1984).

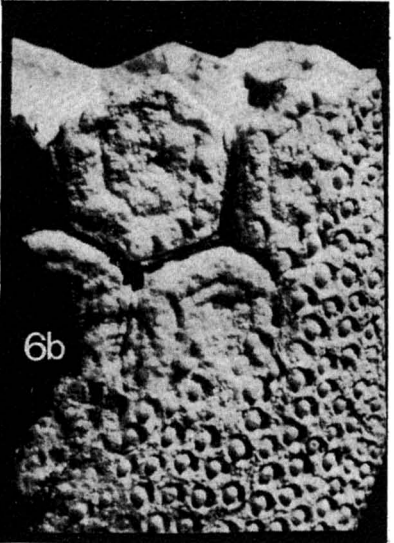
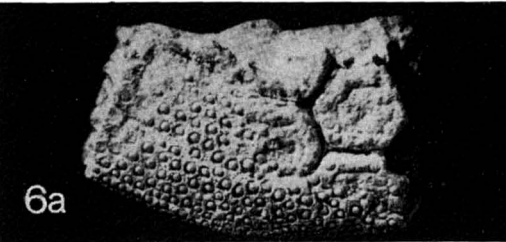
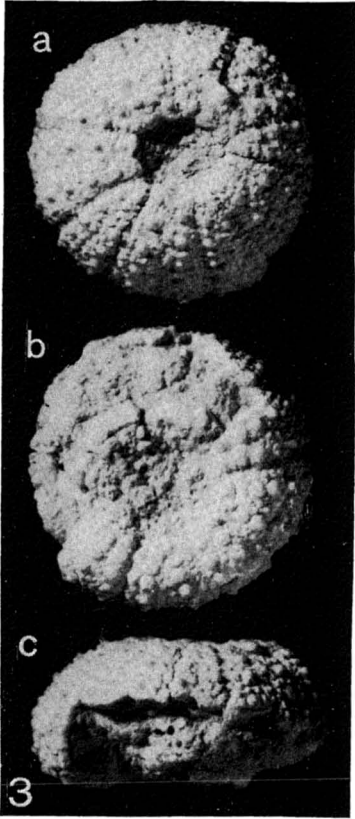
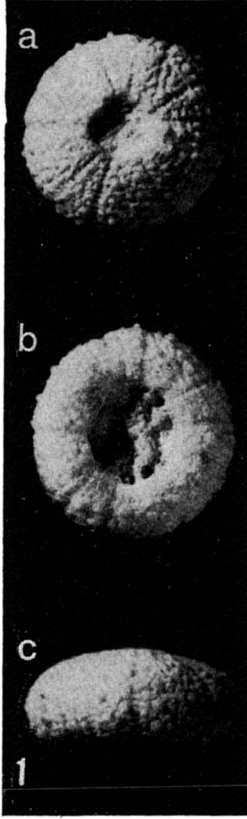
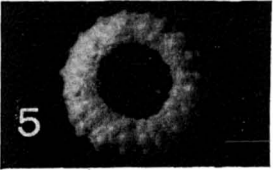
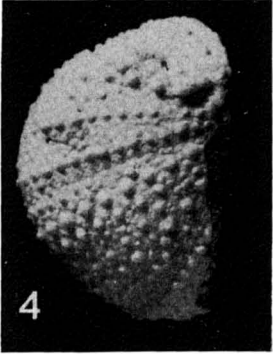
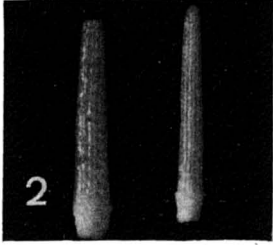
OCCURRENCE: In Poland, known from the Korytnica Basin (MĄCZYŃSKA 1987) and Niechobrz (MĄCZYŃSKA 1991a,b, 1994). It is one of the most common species in the Rhone Basin, being also recorded from Corsica, Sardinia, Switzerland, Spain (PHILIPPE 1984), and Portugal (VEIGA FERREIRA 1961).

Genus *Plegiocidaris* POMEL, 1883
Plegiocidaris peroni (COTTEAU, 1877)
(Pl. 1, Fig. 5 and Pl. 6, Fig. 1b)

PLATE 1

- 1 – *Cidaris zeamais* SISMONDA; spines, Pińczów (*Ee* 1331), × 4
- 2 – *Cidaris* cf. *desmoulinsi* SISMONDA; spines, Pińczów (*Ee* 1337), × 4
- 3–4 – *Cyathocidaris avenionensis* (DESMOULINS): 3a–3b – isolated interambulacral plates, 3c – two joined interambulacral plates, 3d – fragment of the test, ambulacral column, all from Pińczów (*Ee* 1338); 4 – fragment of the test, ambulacral column, Szczaworyż (*Ee* 1342); all × 4
- 5 – *Plegiocidaris peroni* (COTTEAU); spines, Pińczów (*Ee* 1340), × 4
- 6–7 – *Centrostephanus calarensis* (COTTEAU): 6 – spines, Szczaworyż (*Ee* 1342), × 6; 7 – spines, Kików (*Ee* 1343), × 4
- 8 – *Cidaridae*; isolated plates of the test, Pińczów (*Ee* 1341), × 3





1984. *Plegiocidaris peroni* (COTTEAU); M. PHILIPPE, D. 86, Pl. 5, Figs 7–10 [cum syn].
 1987. *Plegiocidaris peroni* (COTTEAU); S. MACZYŃSKA, Pl. 1, Fig. 2.

MATERIAL: Two fragmented spines from Pińczów (*Ee* 1340) and 1 interambulacral plate from Skowronno (*Ee* 1333).

REMARKS: The interambulacral plate displays (see Pl. 6, Fig. 1b) features typical of the species, viz. the perforated tubercle situated centrally, and distinctly crenulated. The spines (see Pl. 1, Fig. 5) assigned herein to that species are slightly damaged at their base, but they show typical ornamentation of regular longitudinal ridges with distinct depressions.

OCCURRENCE: In Poland, known from the Korytnica Basin (MACZYŃSKA 1987). It also occurs in the Rhone Basin, Corsica, and Italy, Sardinia including (PHILIPPE 1984).

Order Diadematoida DUNCAN, 1889
Family Diadematidae GRAY, 1855
Genus *Centrostephanus* PETERS, 1855

Centrostephanus calarensis COTTEAU, 1905
 (Pl. 1, Figs 6–7)

1988. *Centrostephanus calarensis* COTTEAU; S. MACZYŃSKA, p. 60, Pl. 1, Fig. 4 [cum syn].

MATERIAL: Fragmented spines in the number of 3 from Szczaworyż (*Ee* 1342), 3 from Kików (*Ee* 1343), 2 from Żerniki (*Ee* 1344), and 1 from Pińczów (*Ee* 1345).

REMARKS: The species is represented solely by spines which are very brittle, delicately ornamented by longitudinal ridges composed of regular rings stacked one upon another; in some specimens the basal parts are preserved (see Pl. 1, Fig. 6).

OCCURRENCE: In Poland, known from the Korytnica Basin (MACZYŃSKA 1977) and Rybnica (MACZYŃSKA 1988). In other countries it occurs in Romania (VADÁSZ 1915) and Sardinia (LAMBERT 1907).

Order Temnopleuroidea MORTENSEN, 1942
Family Temnopleuroidea A. AGASSIZ, 1872
Genus *Arbacina* POMEL, 1869

PLATE 2

- 1 – *Arbacina catenata* (DESOR); Pińczów (*Ee* 1346), × 3
 2–3 – *Arbacina* sp.; 2 – spines, Żerniki (*Ee* 1349); 3a – aboral, 3b – oral, 3c – lateral views of the test; Pińczów (*Ee* 1347), × 3
 4–5 – *Psammechinus dubius* L. AGASSIZ: 4 – fragment of the test, Pińczów (*Ee* 1353), × 3; 5 – juvenile test, oral view, Pińczów (*Ee* 1352), × 10
 6 – *Echinolampas* sp.; marginal fragment of the test, Pińczów (*Ee* 1354); 6 and 6a × 2, 6b × 5

Arbacina catenata (DESOR, 1847)
(Pl. 2, Fig. 1)

1984. *Arbacina catenata* (DESOR); M. PHILIPPE, p. 87, Pl. 5, Fig. 16.

1987. *Arbacina catenata* (DESOR); S. MĄCZYŃSKA, p. 60, Pl. 2, Fig. 3.

MATERIAL: One test from Pińczów (*Ee* 1346).

REMARKS: The collected specimen, well preserved, is of a small size, but it displays the features typical of the species (see PHILIPPE 1984), viz. the test outline, pattern of ambulacral columns, situation of the peristome and periproct, structure of the tubercles, and the overall ornamentation.

OCCURRENCE: In Poland, known from the Korytnica Basin (MĄCZYŃSKA 1987). In other countries it occurs in Spain (MONTENAT & ROMAN 1970), the Rhone Basin, and Egypt (PHILIPPE 1984).

Arbacina sp.
(Pl. 2, Figs 2–3)

MATERIAL: One damaged test from Pińczów (*Ee* 1347), and spines in the number of 3 from Pińczów (*Ee* 1348), 3 from Szczaworyż (*Ee* 1351), 2 from Żerniki (*Ee* 1349), and 1 from Kików (*Ee* 1350).

REMARKS: All the collected remains belong evidently to the genus *Arbacina*, but due to a poor state of preservation they escape from recognition to the species level. The test (see Pl. 2, Fig. 3) is very close to that of *A. catenata* (DESOR, 1847) discussed above, whilst the spines (see Pl. 2, Fig. 2) to those determined as "*Arbacina* sp." from the Korytnica Basin (MĄCZYŃSKA 1977, 1987).

Order Echinoida CLAUS, 1867
Family Echinidae GRAY, 1825
Genus *Psammechinus* L. AGASSIZ & DESOR, 1846

Psammechinus dubius (L. AGASSIZ, 1840)
(Pl. 2, Figs 4–5)

1973. *Psammechinus* sp.; A. RADWAŃSKI, p. 395, Pl. 6, Figs 1–2 and Pl. 7.

1979. *Psammechinus dubius* (AGASSIZ); S. MĄCZYŃSKA, p. 31, Pl. 1, Figs 1–3 [*cum syn.*].

1984. *Psammechinus dubius* (AGASSIZ); M. PHILIPPE, p. 87, Pl. 5, Figs 17–18.

1985. *Psammechinus dubius* (AGASSIZ); S. MIHALY, p. 238, Pl. 1, Figs 3–5.

1987. *Psammechinus dubius* (L. AGASSIZ); S. MĄCZYŃSKA, p. 48, Pl. 2, Figs 6–7; Pl. 3, Figs 1–7.

1988. *Psammechinus dubius* (AGASSIZ); S. MĄCZYŃSKA, p. 61, Pl. 1, Figs 7–9; Pl. 3, Fig. 11; Pl. 4, Fig. 1.

1991a. *Psammechinus dubius* (L. AGASSIZ); S. MĄCZYŃSKA, p. 554, Pl. 2, Fig. 4.

MATERIAL: One, damaged juvenile specimen (*Ee* 1352) and one fragment of the adult test (*Ee* 1353), both from Pińczów.

REMARKS: The test of the juvenile specimen (*see* Pl. 2, Fig. 5), whose oral side is preserved, is almost identical with young forms of the species reported from the Korytnica Basin (*comp.* MACZYŃSKA 1987); this specimen, of a 2mm diameter, is the smallest ever found in Poland within this species. The species itself is known to occur gregariously as a rock-building component of some layers in the coeval sandy deposits exposed at Świniary (*see* RADWAŃSKI 1973, Pl. 7; MACZYŃSKA 1988, Pl. 6 and 1991a, Pl. 2, Fig. 4).

OCCURRENCE: In Poland, it is a common species, reported from the Korytnica Basin, sandy facies at Świniary and Nawodzice, and from the Lublin Upland (MACZYŃSKA 1979, 1987, 1988, 1991a). It is also widely distributed in other countries, through Hungary (MIHÁLY 1985), the Rhone Basin, Switzerland, Sicily, Spain and Portugal, as far as Egypt and Morocco (PHILIPPE 1984).

Family Parasaleniiidae MORTENSEN, 1903
Genus *Parasalenia* A. AGASSIZ, 1863

***Parasalenia fontanesi* COTTEAU, 1888**
(Pl. 3, Figs 1–3 and Pl. 6, Fig. 1d-1f)

1977. *Parasalenia fontanesi* COTTEAU; S. MACZYŃSKA, p. 195, Pl. 3, Figs 1–5 [*cum syn.*].

1994. *Parasalenia fontanesi* COTTEAU; S. MACZYŃSKA, Pl. 1, Figs 8–9.

MATERIAL: Five tests of various size from Szczaworyż (*Ee* 1355), 3 tests, also of various size, from Busko (*Ee* 1356), 1 test from Kików (*Ee* 1358), one juvenile test from Żerniki (*Ee* 1359), and 4 joined and/or isolated ambulacral plates from Skowronno (*Ee* 1333).

REMARKS: The collected material comprises remains of specimens varying in their ontogenic age from the juveniles to the adult, and possibly even gerontic forms, what is well demonstrated by the remains coming from Busko and Szczaworyż (*see* Pl. 3, Figs 1–2), and ambulacral plates from Skowronno (*see* Pl. 6, Fig. 1d-1f). An elliptical outline of the test, and all the morphological features are concordant with those presented by LAMBERT (1910) for the species.

The juvenile specimen from Żerniki, attaining 2mm in its diameter, is the smallest ever found within the species; the hitherto reported forms from the Rhone Basin were not smaller than 6–7mm (LAMBERT 1910).

OCCURRENCE: The species was first recorded in Poland from Niechobrz by GOŁĄB (1932; *see also* MACZYŃSKA 1991b, 1994); it also occurs in the Korytnica Basin (MACZYŃSKA 1977, 1987). In other countries, it is known from the Rhone Basin (LAMBERT 1910).

***Parasalenia* sp.**
(Pl. 3, Figs 4–5)

MATERIAL: Two fragmented tests (*Ee* 1357, 1366), and one isolated ambulacral plate (*Ee* 1360), all from Pińczów.

Order *Clypeasteroida* A. AGASSIZ, 1872
 Family *Clypeasteridae* L. AGASSIZ, 1835
 Genus *Clypeaster* LAMARCK, 1801

Clypeaster scillae DESMOULINS, 1837
 (Pl. 4, Figs 1a-1d and Pl. 5, Fig. 1)

1949. *Clypeaster scillae* DESMOULINS; V. KALABIS, p. 86, Pl. 1, Figs 1-2 [cum syn].
 1985. *Clypeaster scillae* DESMOULINS; A. MARCOPOULOU-DIACANTONI, p. 104, Pl. 15.
 1988. *Clypeaster scillae* DESMOULINS; J.A.S. GÓMEZ-ALBA, p. 604, Pl. 299, Fig. 3
 1991a. *Clypeaster scillae* DESMOULINS; S. MĄCZYŃSKA, p. 554, Pl. 2, Fig. 1a-1d.
 1994. *Clypeaster scillae* DESMOULINS; S. MĄCZYŃSKA, Pis 2-3.

MATERIAL: One, well preserved test (*Ee* 1552).

DIMENSIONS: Length 10.2cm, width 8.3 cm, height 3.4 cm.

DESCRIPTION: Test of larger size and pentagonal outline, with rounded margins. Petals well developed, distinctly domed, rounded; the anterior median one the longest, the two paired anterior ones longer than the posterior ones. Aboral side pronouncedly domed, but slightly depressed along its margin. Adoral side almost flat, with the peristome located in a deep infundibulum. Periproct inframarginal. Ornamentation uniform all over the test surface.

REMARKS: The collected specimen is very similar to that described from Niechobrz (MĄCZYŃSKA 1991a, 1994), but featured by its adoral side much more flattened.

OCCURRENCE: In Poland, the species is known from Niechobrz (GOŁĄB 1932; MĄCZYŃSKA 1991a, 1994). It is widely distributed in the Miocene deposits both of Europe and of northern Africa (see LAMBERT 1912; KALABIS 1949; MARCOPOULOU-DIACANTONI 1974, 1985; ALI 1983; GÓMEZ-ALBA 1988; MĄCZYŃSKA 1991a, 1994).

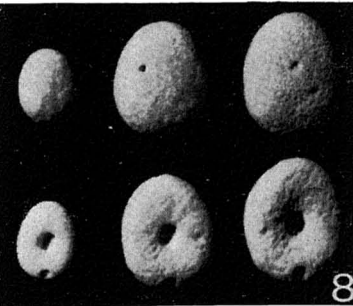
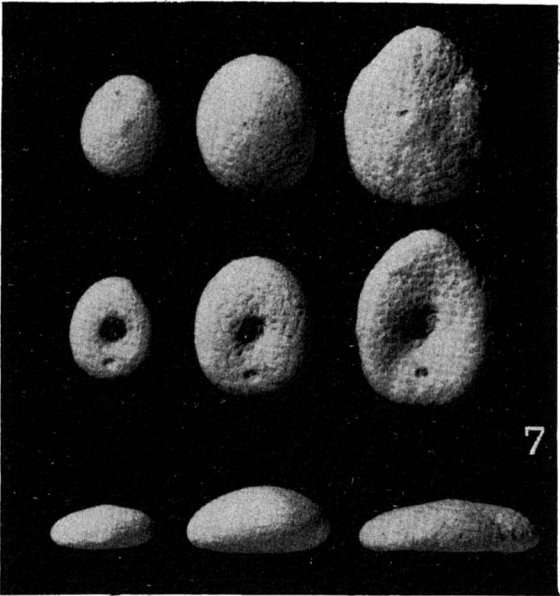
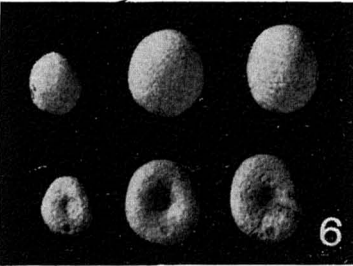
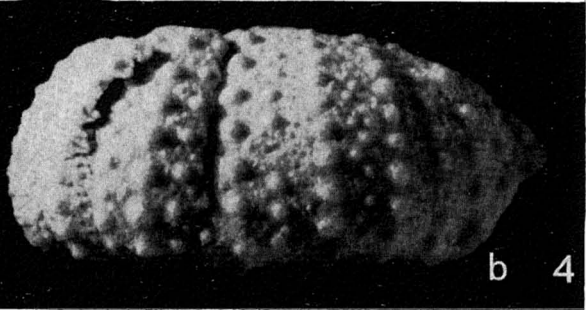
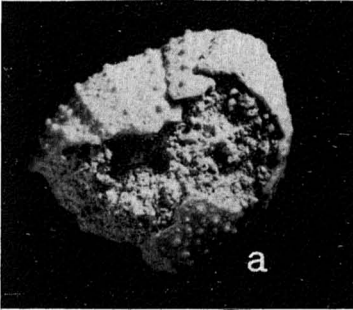
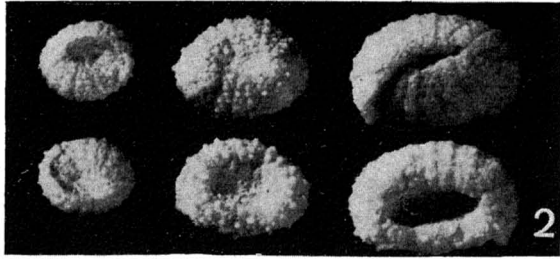
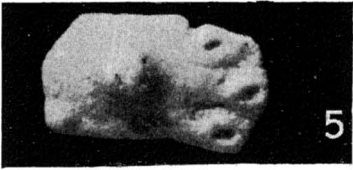
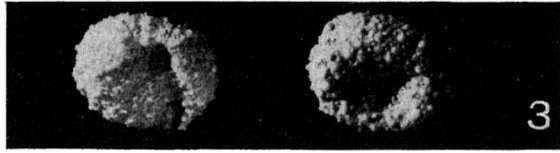
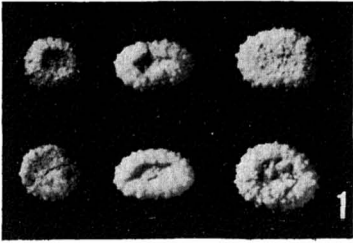
Family *Fibularidae* GRAY, 1855
 Genus *Echinocyamus* VAN PHELSUM, 1774

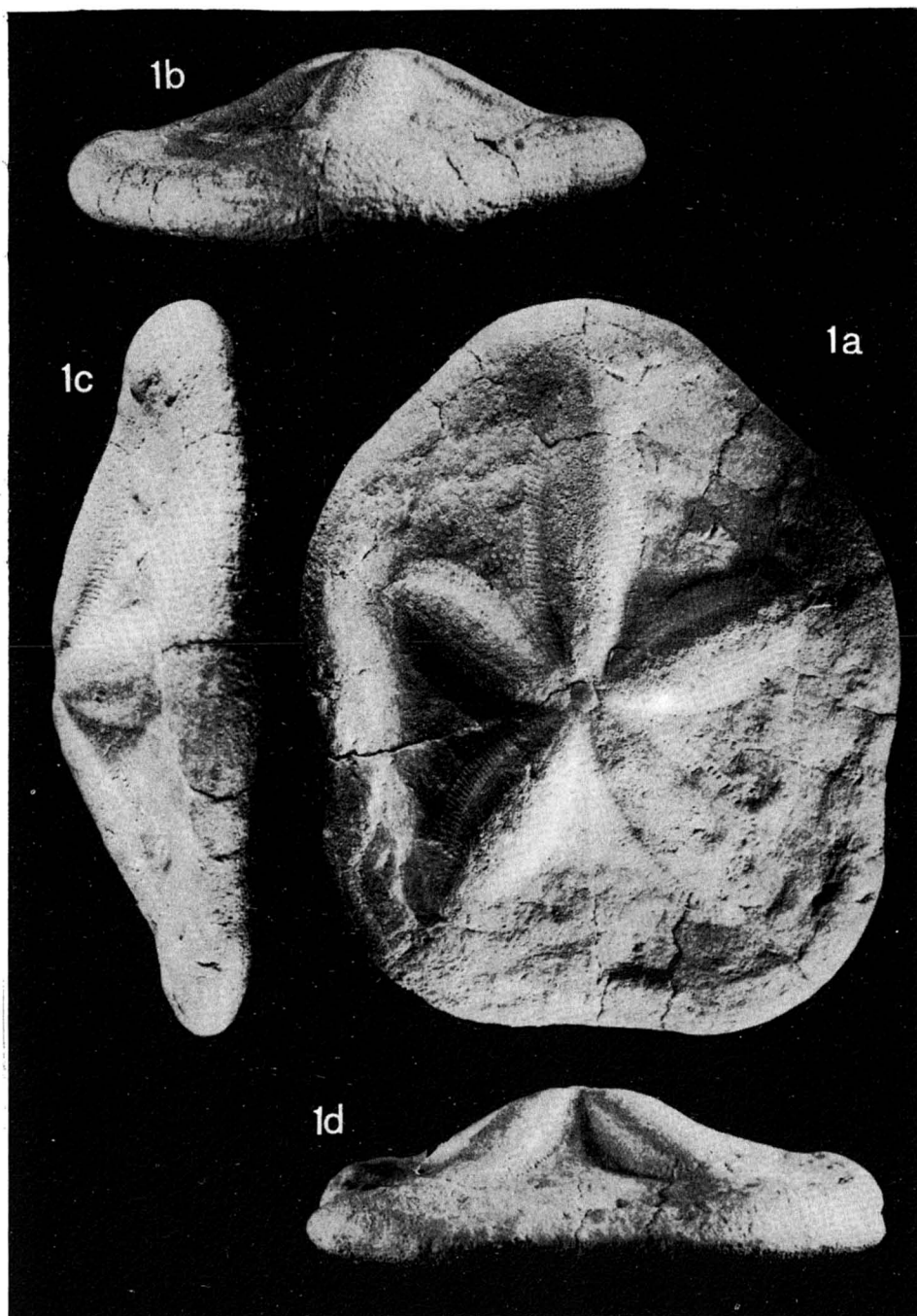
Echinocyamus pusillus (O.F. MÜLLER, 1776)
 (Pl. 3, Figs 6-7)

1977. *Echinocyamus pusillus* (O.F. MÜLLER); S. MĄCZYŃSKA, p. 196, Pl. 5, Figs 1-4.

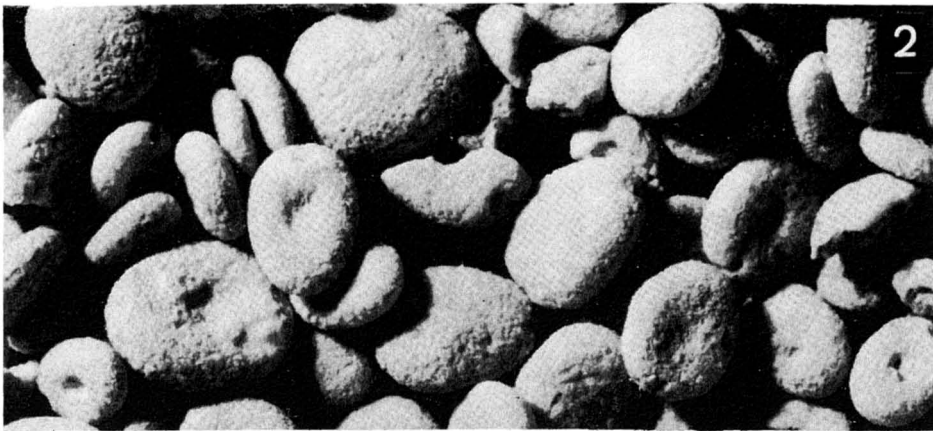
PLATE 3

- 1-3 — *Parasalenia fontannesi* COTTEAU; tests of various size (aboral and oral views); 1 — from Busko (*Ee* 1356), 2 — from Szczaworyż (*Ee* 1355), 3 — from Kików (*Ee* 1358); all $\times 4$
 4-5 — *Parasalenia* sp. from Pińczów: 4 — fragment of the test (*Ee* 1357), 4a $\times 4$, 4b $\times 8$;
 5 — isolated ambulacral plate (*Ee* 1360), $\times 6$
 6-7 — *Echinocyamus pusillus* (O.F. MÜLLER); tests of various size (aboral, oral, and lateral views):
 6 — from Busko (*Ee* 1361), $\times 3$; 7 — from Pińczów (*Ee* 1360), $\times 4$
 8 — *Echinocyamus linearis* CAFEDER; tests of various age (aboral and oral views); Pińczów (*Ee* 1362), $\times 3$



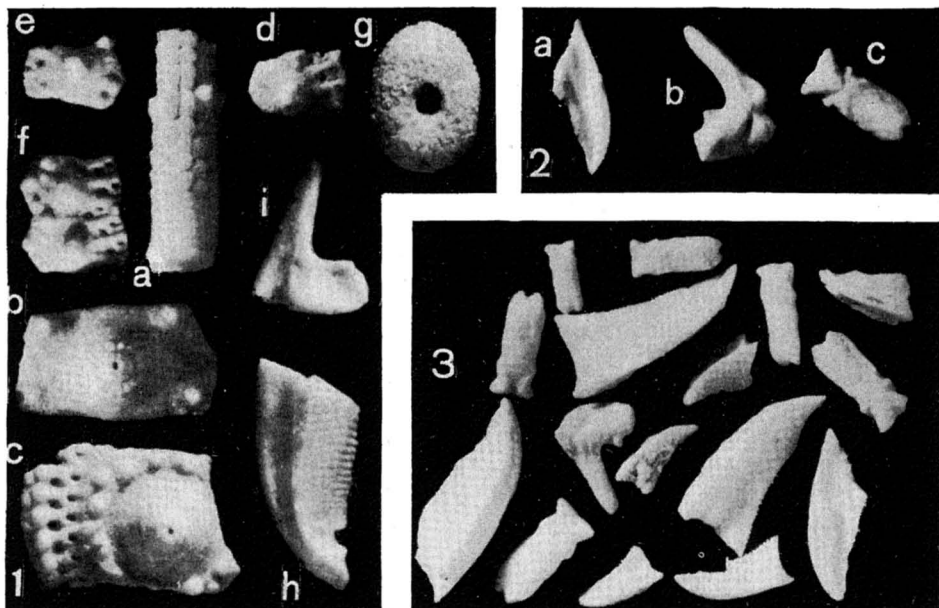


1a-1d — *Clypeaster scillae* DESMOULINS; 1a — aboral side, 1b — anterior view, 1c — lateral view, 1d — posterior view (for bottom view see Pl. 5, Fig. 1); Pińczów (Ee 1552), nat. size



1 — *Clypeaster scillae* DESMOULINS; adoral side of the specimen presented in Pl. 4, Figs 1a-1d

2 — Selected tests of diverse species of *Echinocyamus*; Pińczów (*Ee 1363*), $\times 4$



1987. *Echinocyamus pusillus* (O.F. MÜLLER); S. MACZYŃSKA, Pl. 4, Figs 1–4.

1988. *Echinocyamus pusillus* (O.F. MÜLLER); S. MACZYŃSKA, p. 61, Pl. 3, Figs 8–9 [cum syn.].

MATERIAL: Over 20 tests from Pińczów (*Ee 1360*), and 3 tests from Busko (*Ee 1361*).

REMARKS: The species is relatively rare in the Pińczów Limestones, similarly as in the Korytnica Clays (see MACZYŃSKA 1977). The collected material (see Pl. 3, Figs 6–7) is quite consistent with that of the Korytnica Basin (see MACZYŃSKA 1977).

OCCURRENCE: In Poland, besides the Korytnica Basin and the Pińczów Limestones, it is known from Niechobrz (GOŁĄB 1932; see also MACZYŃSKA 1991b, 1994). This extant species is widely distributed since the Miocene (see MORTENSEN 1948).

Echinocyamus linearis CAPEDER, 1906
(Pl. 3, Fig. 8 and Pl. 6, Fig. 1g)

1977. *Echinocyamus linearis* CAPEDER; S. MACZYŃSKA, p. 197, Pl. 7, Figs 1–6 [cum syn.].

MATERIAL: Over 80 tests of various size from Pińczów (*Ee 1362*), and 1 test from Skowronno (*Ee 1333*).

REMARKS: The species, common in the Pińczów Limestones, is herein represented by specimens concordant with these of the type series studied by CAPEDER (1906), and with those from the Korytnica Basin, although the latter display their pentagonal outline more distinctly (see MACZYŃSKA 1977).

OCCURRENCE: In Poland, the species is known from the Korytnica Basin (MACZYŃSKA 1977). The type series comes from Sardinia (CAPEDER 1906).

Order Cassiduloidea CLAUS, 1880
Family Echinolampidae GRAY, 1851
Genus *Echinolampas* GRAY, 1825

Echinolampas sp.
(Pl. 2, Fig. 6)

PLATE 6

- 1a-1i — Echinoid remains from Skowronno (*Ee 1333*), × 4: 1a — Spine of *Cidaris zeamais* SISMONDA, 1b — interambulacral plate of *Plegiocidaris peroni* (COTTEAU), 1c — ambulacral plate of *Cyathocidaris avenionensis* (DESMOULINS), 1d-1f — ambulacral plates of *Parasalenia fontannesii* COTTEAU, 1g — test (oral view) of *Echinocyamus linearis* CAPEDER, 1h — demipyramid, 1i — epiphyse
- 2a-2c — Loose elements of the Aristotle's Lantern: 2a — demipyramid, 2b — epiphyse, 2c — rotula; Busko (*Ee 1364*), × 3
- 3 — Loose elements of the Aristotle's Lantern; Pińczów (*Ee 1365*), × 3
- 4 — Isolated spines of the Cidaridae (numerous *Cidaris zeamais* SISMONDA); Pińczów (*Ee 1336*), × 4

1987. *Echinolampas* sp.; S. MAĆZYŃSKA, Pl. 4, Fig. 5; Pl. 5, Fig. 1.

1994. *Echinolampas* sp. S. MAĆZYŃSKA, Pl. 1, fig. 10.

MATERIAL: One, small marginal fragment of the test, and 3 very small fragments of the test plates, all from Pińczów (*Ee 1354*).

REMARKS: The marginal fragment of the test, composed of a part of the interambulacral column, displays ornamental features (*see* Pl. 2, Fig. 6) typical of the genus, whose occurrence in the Pińczów Limestones has been first recorded by RADWAŃSKI (1977).

OCCURRENCE: In Poland, the genus is also known from the Korytnica Basin (MAĆZYŃSKA 1987) and Niechobrz (GOŁĄB 1932; MAĆZYŃSKA 1991b, 1994).

GENERAL REMARKS

Within the collected material of the echinoid remains from the Pińczów Limestones the regular echinoids dominate. The most widespread is the species *Parasalenia fontannesii* COTTEAU, 1888, whose occurrence is noted in all six sections studied, and which is represented by more or less complete tests. The tests are also noted for the genera *Arbacina* and *Psammechinus*, whereas the other remains are very fragmentary. Of the isolated elements, the most important are the spines and loose test-plates, primarily these of the family Cidaridae (*see* Pl. 1, Fig. 8 and Pl. 6, Fig. 4). Loose elements of the Aristotle's Lanterns are demonstrated by the rotules, epiphyses, and demipyramids which are quite common at Pińczów (*see* Pl. 6, Fig. 3), and rather rare at Busko (*see* Pl. 6, Fig. 2). Of the irregular echinoids, common are only the tests of two species of the genus *Echinocyamus* (as seen in Pl. 5, Fig. 2), while the genus *Echinolampas* has been recognized on a very scanty material, and *Clypeaster* by one complete test.

The taxonomic content of the studied assemblage from the Pińczów Limestones is very similar to that from the coeval deposits of the Korytnica Basin (*see* MAĆZYŃSKA 1977, 1987). At the genus level, the studied assemblage reminds also that one from the Rhone Basin, described by LAMBERT (1910, 1912) and by PHILIPPE (1984). Paleoecological conclusions on the latter assemblage (precisely, from the Burdigalian facies of the "*Marnes bleues*") were recognized by PHILIPPE (1984, p. 90) after an analysis of life requirements of some present-day species belonging to the genera present in the Miocene, and living today in the Mediterranean and/or in the Atlantic. The environmental conditions under which that French assemblage had lived, were thus postulated by PHILIPPE (1984) as characterized by water temperature little higher than in the present-day Mediterranean, by normal salinity, and depths not greater than 50 meters. It is thought that most likely similar conditions prevailed in the depositional area of the Pińczów Limestones, and thus they were very close or identical to those featuring the life conditions in the coeval Korytnica Basin (*see* BAŁUK & RADWAŃSKI 1977, 1979; MAĆZYŃSKA 1977, 1987, 1991a; ALI & MAĆZYŃSKA 1985, 1986).

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JEŻOWCE Z WAPIENI PIŃCZOWSKICH

(Streszczenie)

Praca przedstawia charakterystykę szczątków jeżowców zebranych w obrębie różnych stanowisk wapieni pińczowskich odsłaniających się na obszarze okolic Pińczowa, Buska i Kikowa (patrz fig. 1). Wśród szczątków tych (patrz pl. 1–6) występują zarówno całe pancerze osobników należących do rodzajów *Arbacina*, *Psammochinus*, *Parasalenia*, *Clypeaster*, *Echinocyamus*, jak również drobne fragmenty (np. rodzaj *Echinolampas*) oraz izolowane kolce (głównie rodzina *Cidaridae*) i elementy latarni *Arystotelesa*. Ogólnie w obrębie zebranego zespołu stwierdzono występowanie przedstawicieli 13 gatunków należących do 10 rodzajów z 6 rzędów.

Rozpoznany zespół jeżowców z wapieni pińczowskich jest taksonomicznie bardzo zbliżony do występującego w Basenie Korytnicy (por. MĄCZYŃSKA 1977, 1987). Większość jego przedstawicieli reprezentuje rodzaje o szerokim rozprzestrzenieniu geograficznym, przystosowane do życia w płytkich strefach mórz o normalnym zasoleniu i wodach cieplejszych niż w dzisiejszej strefie śródziemnomorskiej (patrz MĄCZYŃSKA 1991a,b, 1994; ALI & MĄCZYŃSKA 1985, 1986).