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Some Upper Jurassic ammonites of the genus *Ringsteadia* Salfeld, 1913, from Central Poland

ABSTRACT: A few species of ammonites of the genus *Ringsteadia* Salfeld, 1913, from the Uppermost Oxfordian (Idoceras planula zone) and Lowermost Kimmeridgian (Sutneria platynota zone) of the northern part of the Cracow-Częstochowa Jurassic Chain, Central Poland, are described. The species presented, known from Southern Germany, are of the „submediterranean" type and markedly differ from the „boreal" species from England and Normandy. This fact, as well as the other observations, enable setting forth the hypothesis on two ammonite lineages of the genus *Ringsteadia* which occurred at the turn of the Oxfordian to the Kimmeridgian, that is, (1) the „boreal" lineage in England and Normandy from which the ammonites of the genus *Pictonia* originated (cf. Morris 1968) and (2) the „submediterranean" lineage in Southern Germany, Southern France and Poland, which probably gave rise to various ammonites of the genera *Rasenia (Eurasenia, Involuticeras)* and *Pomerania (Pachypictonia)*.

INTRODUCTION

The ammonites of the genus *Ringsteadia* here described were found in the northern part of the Cracow-Częstochowa Jurassic Chain, Central Poland (Fig. 1). All of them come from the deposits of the Uppermost Oxfordian (Idoceras planula zone with ammonites of the genera *Idoceras, Perisphinctes, Lithacoceras, Glochiceras, Amoeboceras, Taramelliceras, Rasenia,* etc.) and Lowermost Kimmeridgian (Sutneria platynota zone with ammonites of the genera *Lithacoceras, Perisphinctes, ?Ataxioceras, Rasenia* and *Taramelliceras).* The stratigraphy of these deposits has been presented in previous publications (Wierzbowski 1964, 1966; Kutek & Wierzbowski 1970). The ammonites of the genus *Ringsteadia* were not collected in both younger and older deposits than those indicated above.

About 97 per cent of the specimens of *Ringsteadia,* here described,

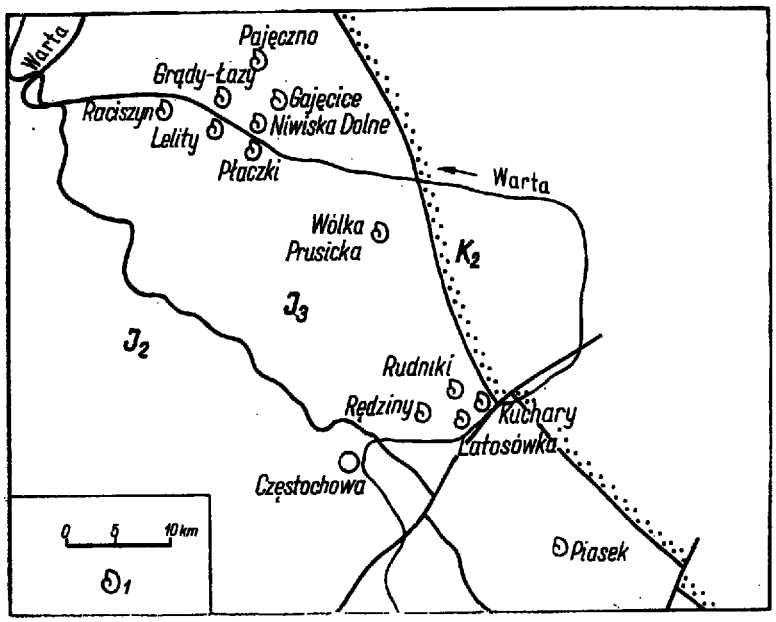


Fig. 1

Occurrence sites of the genus *Ringsteadia* in northern part of the Cracow-Częstochowa Jurassic Chain (Central Poland)

K_2 Middle Cretaceous (Albian-Cenomanian), J_3 Upper Jurassic, J_2 Middle Jurassic, 1 occurrence site

come from the deposits of the Idoceras planula zone. In the northern part of the Cracow-Częstochowa Jurassic Chain, these, considerably thick deposits contain an abundant ammonite fauna of many different genera and varying in the stratigraphic column. On the basis of this fauna, the Idoceras planula zone can be divided into three parts:

1) lower part, containing — in addition to rare ammonites of the genus *Idoceras* — the abundantly represented group of *Taramelliceras costatum (T. costatum, T. hauffianum, T. broilii, T. sarasini);*

2) middle part with numerous ammonites of the genus *Idoceras* and lacking the representatives of the group *Taramelliceras costatum* mentioned above;

3) upper part with rare representatives of the genus *Idoceras* and of the species *Rasenia (Prorasenia) quenstedti* and *Rasenia (Eurasenia)* sp.

Ringsteadiae occur in all parts of the Idoceras planula zone. Most of them, about 83 per cent of all available specimens were, however, found in the lower and middle part of the zone.

It should be emphasized that the representatives of the genus *Ringsteadia* are an only secondary component of the entire ammonite fauna

in the Uppermost Oxfordian and Lowermost Kimmeridgian of the northern part of the Cracow-Częstochowa Jurassic Chain. Thirty-five specimens, here described have been collected, mostly by the writer, over eight years.

Mostly due to the impossibility of their specific determination, resulting from the lack of comparative materials, a considerable majority of the ammonites of the genus *Ringsteadia* collected have not so far been described in print, except for three specimens whose description was previously published but without giving their specific assignment (cf. Wierzbowski 1966, pp. 187—189, Pl. 9, Figs. 1 and 2; Pl. 10, Fig. 1).

Availing himself of the British Council's scholarship and the Polish Ministry of Education's help, the writer spent two months in Great Britain, where he had ample opportunity to study specimens of *Ringsteadia* from British collections. His heartfelt thanks are extended to the management and the scientists of the Institute of Geological Sciences in London for enabling his studies and thus helping him attain the object of the scholarship. Particular thanks are due to Dr N. J. Morris from the Department of Palaeontology, British Museum (Natural History) in London for making available the typescript of his doctor's dissertation, considerable part of which is devoted to the problem of the Ringsteadiae. By courtesy of Docent A. Zeiss and Dr F. Westphal, the writer was given three plaster-of-Paris casts and photographs of ammonites of this genus from F. A. Quenstedt's collections in Tübingen, Germany. The author also feels indebted to Professor J. H. Callomon, Dr R. A. Gygi, Dr J. Kutek, Dr N. J. Morris, Docent A. Zeiss and Professor B. Ziegler for the discussion.

DESCRIPTIONS OF AMMONITES OF THE GENUS *RINGSTEADIA* SALFELD, 1913

The ammonites of the genus *Ringsteadia* Salfeld, 1913, here described are assigned to two subgenera, *Ringsteadia* Salfeld, 1913 and *Vineta* Dohm, 1925.

Fifteen, fairly well-preserved ammonites should surely be referred to the subgenus *Ringsteadia*, along with 16 others whose state of preservation is poorer, but which probably also belong to this subgenus. The ammonites of this subgenus were found in the deposits of the Uppermost Oxfordian (Idoceras planula zone) and Lowermost Kimmeridgian (Sutneria platynota zone).

A specimen described as *Ringsteadia (?Ringsteadia)* sp. probably belongs to the subgenus *Ringsteadia* but it also displays some features of the subgenus *Vineta*. It was found in the lower part of the Idoceras planula zone of the Uppermost Oxfordian.

Two ammonites for sure and one probably (with a somewhat poorer state of preservation) should be referred to the subgenus *Vineta*. Ammo-

nites of this subgenus were found in the upper part of the Uppermost Oxfordian, on the boundary between the middle and the upper part and in the upper part of the Idoceras planula zone.

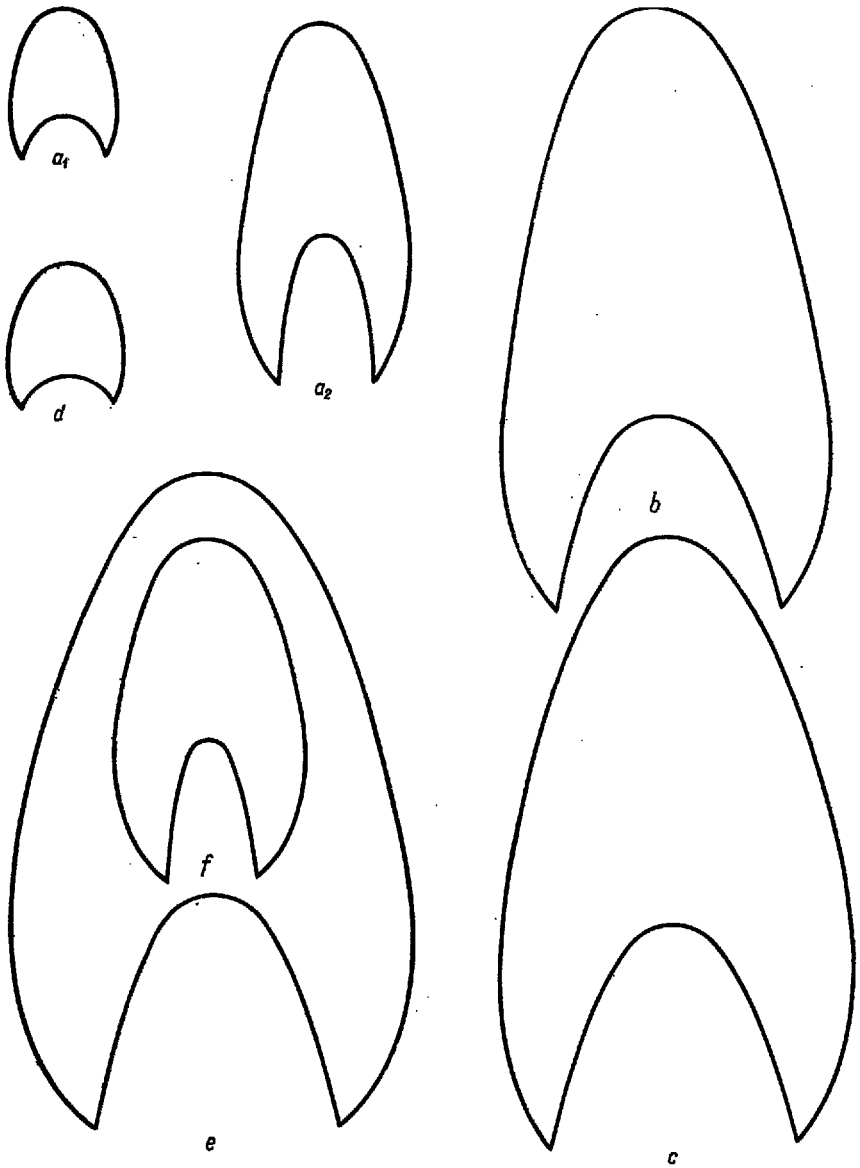


Fig. 2

Whorl sections of some ammonites of the genus *Ringsteadia*, × 1

a — *Ringsteadia (Ringsteadia) flexuoides* (Quenst.); a_1 — at D = 40 mm; a_2 — at D = 120 mm. b — *Ringsteadia (Ringsteadia) limosa* (Quenst.); at D = 190 mm. c — *Ringsteadia (Ringsteadia)* cf. *limosa* (Quenst.); at D = 200 mm. d — *Ringsteadia (Ringsteadia)* sp. indet.; at D = 45 mm. e — *Ringsteadia (Ringsteadia) tenuiplexa* (Quenst.); at D = 200 mm. f — *Ringsteadia (Ringsteadia ?)* sp.; at D = 100 mm

Measuring properties, given by Geyer (1961) and Koerner (1963), have been used by the writer in the descriptions of ammonites. Hence, measurement values of some of them published in these authors' works might here be used in comparative Charts. The following abbreviations have been introduced by the writer to these Charts: D — whorl diameter in mm, U — umbilical diameter as percentage of whorl diameter, H — whorl height as percentage of whorl diameter, P — number of primaries on a whorl, S/P — secondaries-primaries ratio (obtained by the division of the number of secondaries by 10 primaries corresponding to them).

Subgenus *Ringsteadia* Salfeld, 1913
Ringsteadia (Ringsteadia) flexuoides (Quenstedt, 1888)
(Pl. I, Figs. 1—3; Pl. II, Figs. 1 and 2)

1888. *Ammonites flexuoides* Quenst.; Quenstedt, p. 969, Pl. 107, Fig. 15.
v. 1888. *Ammonites streichensis* Opp.; Quenstedt, p. 966, Pl. 107, Fig. 6.
1963. *Ringsteadia (Ringsteadia) flexuoides* (Quenst.); Koerner, pp. 374—375 (pars), Pl. 27, Fig. 3.
v. 1966. *Ringsteadia (Ringsteadia)* sp. indet.; Wierzbowski, p. 188, Pl. 9, Fig. 1.

Description. — Maximum diameter of the five specimens amounts to about 120 mm. Body chamber is at least about a whorl in length. Shell markedly involute. Section of inner whorls oval, of outer whorls — high-oval (Fig. 2*a*). Umbilical slope rather gentle. An only specimen from the collection, described before (cf. Wierzbowski 1966, Pl. 9, Fig. 1) is strongly squashed and, consequently, has a very gently inclined umbilical slope.

Sculpture consisting of slightly prorsiradiate and, less frequently, radial primaries and secondaries. Character of ribs modifies together with the growth of specimens. Up to a diameter of about 35—45 mm, primaries are thin, sharp and split halfway whorl-side or slightly below into 2—3 secondaries. Intercalatory ribs appear among the secondaries. All secondaries are equally strongly developed as primaries. Thickness of both primaries and secondaries gradually increasing on outer whorls. Primaries, at first similar to secondaries, then becoming considerably thicker. Beyond this, the point of furcation of the ribs, located halfway the whorl-side or slightly above, becomes gradually obliterated and a marked increase is observed in the secondaries-primaries ratio (cf. Chart 1).

Remarks. — Quenstedt's and Koerner's (cf. Koerner 1963 and see synonymy and Chart 1) specimens, so far described as *Ringsteadia flexuoides*, represent only inner whorls of this species, being almost completely conformable with the inner whorls of the writer's specimens. The only difference is the presence of strongly developed but shallow constrictions which are invisible in the writer's specimens. Apart from the state of preservation, not too perfect in some of the writer's specimens, causing the impossibility of an unequivocal statement of a complete lack of such constrictions, it should be also emphasized that the number of constrictions in Quenstedt's and Koerner's specimens is fairly variable

Chart 1

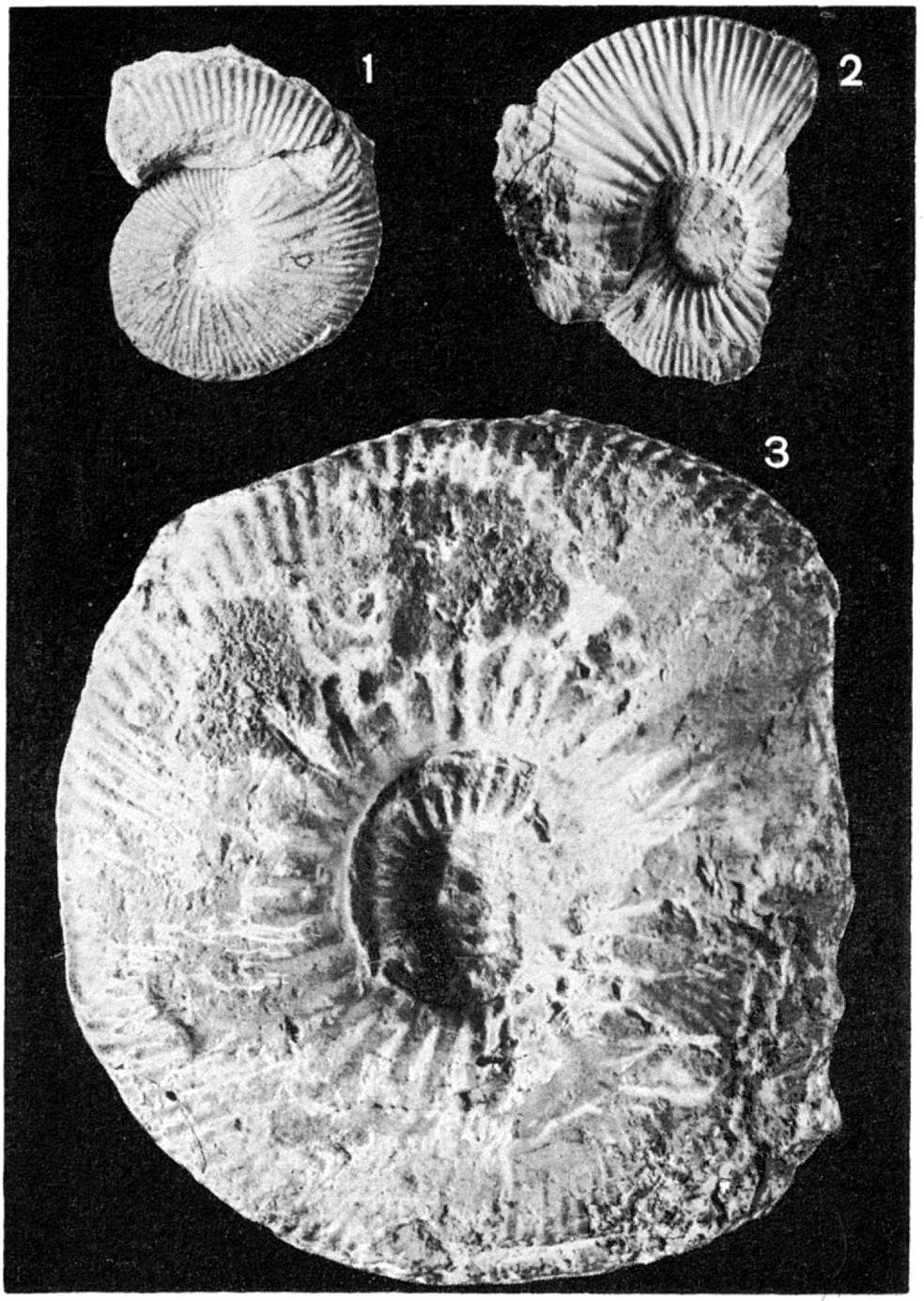
Dimensions and stratigraphical position of *Ringsteadia flexuoides* (Quenstedt)

Specimens*	D	U	H	P at D								S/P at D					
				30	40	50	60	70	80	90	100	110–120	35–40	45–50	55–60	60–80	80–100	100–120
1	45 50 57	25 25 26	46 46 45		33	34	34						2.9	3.2	3.3			
2	40	25	43		29								2.9					
3	56	29	43		32		35						2.6		2.9			
Author's collection:																		
4	30 40	25 24	45 47	30	31								2.9					
5	50 65 122	30 30 29	42 44 40			35	35					?30		3.0				?3.8
6	70 98	23 25	45 43					32	31	30–31						3.1	3.5	
7	100 120	27 30	44 39								30	29					3.5	3.7
8	50	27	45			34								2.9				

* Specimens (place of illustration, locality and stratigraphical position):
1 — Quenstedt (1888, pl. 107, fig. 6), Laufen, Idoceras planula zone;
2 — Quenstedt (1888, pl. 107, fig. 15), Laufen, Idoceras planula zone;
3 — Koerner (1963, pl. 27, fig. 3), „Sauerbrunnen", Idoceras planula zone — lower part;
Author's collection:
4 — pl. I, fig. 1; Niwiska Dolne, Idoceras planula zone — boundary of the lower and middle part;
5 — pl. II, fig. 1–2; Niwiska Dolne, Idoceras planula zone — boundary of the lower and middle part;
6 — Wierzbowski (1966, pl. 9, fig. 1), Wólka Prusicka, Idoceras planula zone — middle part;
7 — pl. I, fig. 3; Piasek, Idoceras planula zone — middle part;
8 — pl. I, fig. 2; Latosówka, Idoceras planula zone — upper part.

so the problem of a diagnostic importance of the constriction itself cannot be unequivocally solved by the writer.

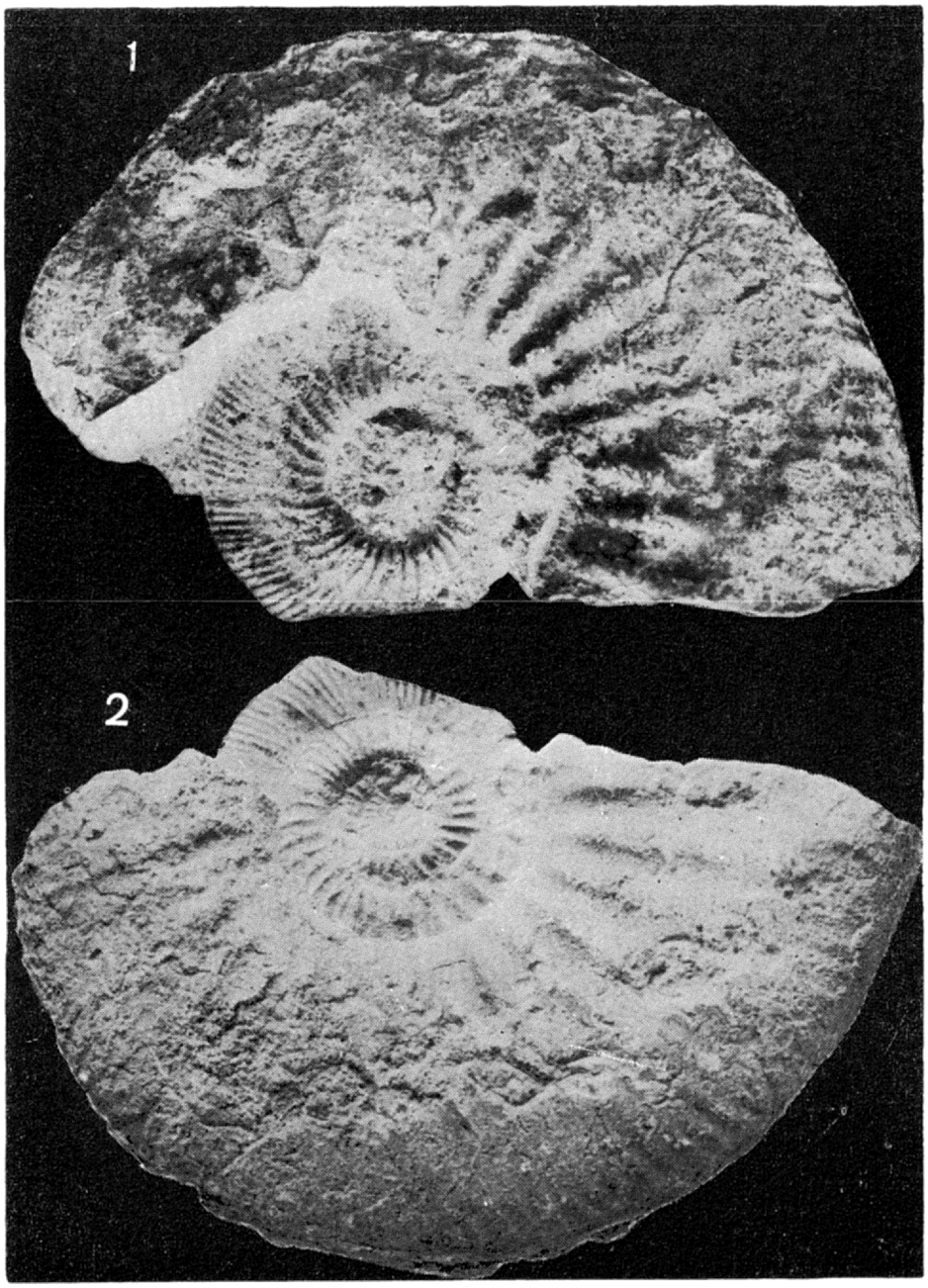
The specimens of *Ringsteadia salfeldi* Dorn (cf. Dorn 1925, Pl. 22, Figs. 1—3 and 1930, Pl. 29, Fig. 6) have been included by Koerner (1963) in the synonymy of the species under study. *Ringsteadia salfeldi* differs from *R. flexuoides* in primaries, more strongly developed on inner whorls and, perhaps, in being less involute. On outer whorls, *R. salfeldi* is much more evolute and has less ribs. Here, it should be also mentioned that all



1 — *Ringsteadia (Ringsteadia) flexuoides* (Quenst.), × 1. Idoceras planula zone — boundary of the lower and middle part; Niwiska Dolne.

2 — *Ringsteadia (Ringsteadia) flexuoides* (Quenst.), × 1. Idoceras planula zone — upper part; Latosówka.

3 — *Ringsteadia (Ringsteadia) flexuoides* (Quenst.), × 1. Idoceras planula zone — middle part; Piasek.



1, 2 — *Ringsteadia (Ringsteadia) flexuoides* (Quenst.), × 1; both figures present the same specimen; Idoceras planula zone — boundary of the lower and middle part; Niwiska Dolne.

specimens of *R. salfeldi* come from much older deposits than the specimens of *R. flexuoides* (in Central Poland many specimens of *R. salfeldi* were found in lowermost part of Epipeltoceras bimammatum zone — after personal communication of dr. J. Kutek). It seems, therefore, that *R. salfeldi* should be excluded from the synonymy of *R. flexuoides* and kept as a separate species.

A specimen, previously described as *R. salfeldi* (cf. Enay 1962) has been assigned by Enay (1966) to the species *R. flexuoides*. Differing from all known specimens of *R. flexuoides* mostly in a smaller number of primaries, this specimen probably belongs to *R. salfeldi*.

Ringsteadia caliginosa (Schneid) is similar, particularly in its outer whorls, to *R. flexuoides* but differs from it in a smaller number of primaries.

Stratigraphic range. — *Ringsteadia flexuoides* occurs in the entire Idoceras planula zone, passing downwards probably to the uppermost parts of the Epipeltoceras bimammatum zone (cf. Koerner 1963).

Ringsteadia (Ringsteadia) limosa (Quenstedt, 1888)
(Pl. III)

v. 1888. *Ammonites limosus* Quenst.; Quenstedt, p. 1,068, Pl. 124, Fig. 3.
1940. *Ringsteadia limosa* (Quenst.); Dietrich, p. 35.

Description. — Maximum diameter about 200 mm. Body chamber at least 3/4 of a whorl in length. Shell markedly involute. Section of inner whorls difficult to trace, probably oval; of outer ones — high-oval, tapering towards the venture (Fig. 2b). On inner whorls, umbilical slope rather gentle, on outer — quite gentle. Sculpture composed of thick primaries, splitting halfway the whorl-side into 2—3 secondaries. Intercalatory ribs appear among secondaries. On outer whorls, secondaries are clearly less strongly developed than primaries.

Remarks. — The holotype of *Ringsteadia limosa* (Quenstedt 1888, Pl. 124, Fig. 3) is somewhat less involute than the writer's specimen (cf. Chart 2). This difference probably results from the ontogenetic variability of the species *R. limosa* and does not deviate from that of other species of the genus *Ringsteadia* (cf. ontogenetic variability of *R. flexuoides* in Chart 1).

Ringsteadia flexuoides particularly strongly differs from *R. limosa* in sculpture on outer whorls.

Stratigraphic range. — *Ringsteadia limosa* occurs in the upper part of the Epipeltoceras bimammatum zone and in the lower part of the Idoceras planula zone (cf. Dietrich 1940).

Chart 2

Dimensions and stratigraphical position of *Ringsteadia limosa* (Quenstedt)

Specimens*	D	U	H	P at D				S/P at D	
				110–130	130–150	150–170	170–190	110–150	150–190
1	110 140	32 33	40 40	30	30			2.8	
Author's collection:									
2	150 170 190	26 27 28	42 42 42		30	29	28	3.0	3.2

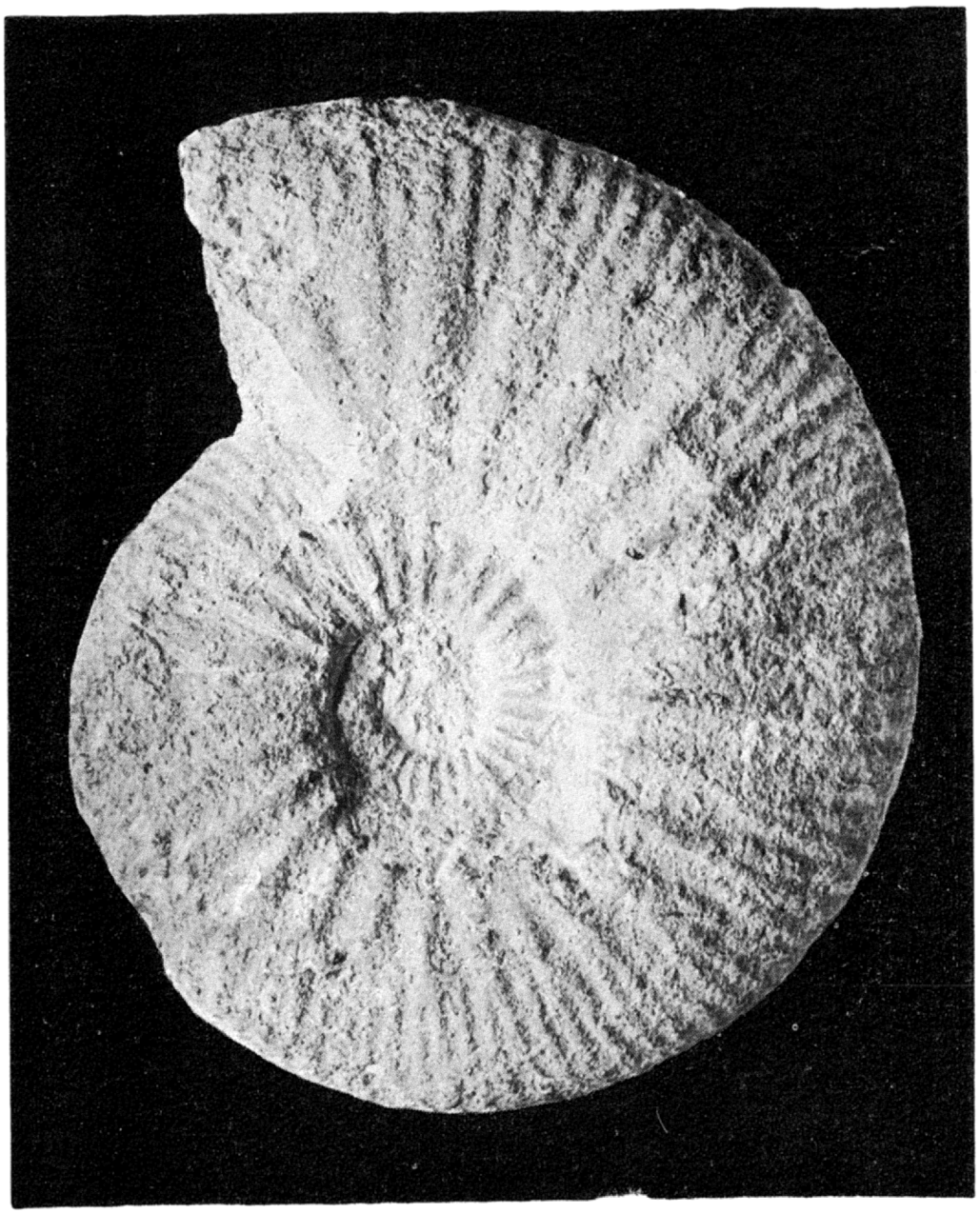
* Specimens (place of illustration, locality and stratigraphical position):
1 — Quenstedt (1888, pl. 124, fig. 3), Laufen, Idoceras planula zone;
Author's collection:
2 — pl. III; Raciszyn, Idoceras planula zone — lower part.

Ringsteadia (Ringsteadia) cf. *limosa* (Quenstedt, 1888)
(Pl. IV, Fig. 3; Pl. V, Fig. 1)

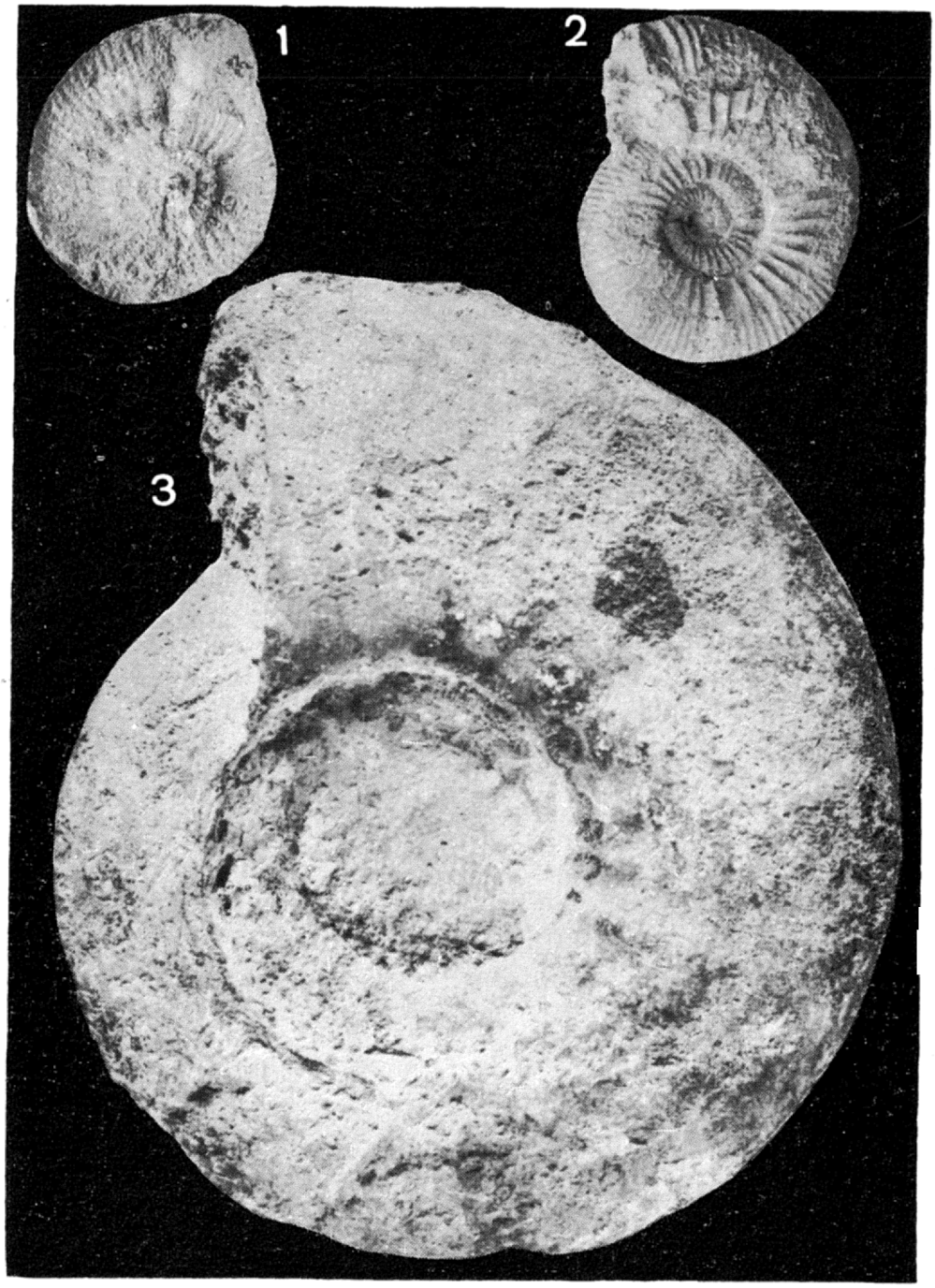
Description. — A damaged specimen, probably about 250 mm in maximum diameter. Body chamber at least 3/4 of a whorl in length. Shell moderately involute (at D = 160 mm, U = 32, H = 40; at D = 200 mm, U = 30, H = 40). Section of outer whorls high-oval, tapering towards the venture. Venture side of whorl narrow (Fig. 2c). Due to a poor state of preservation, section of inner whorls difficult to determine, probably oval. On outer whorls, umbilical slope quite gentle, on inner — probably steeper.

Sculpture strongly obliterated, traceable only on outer whorls. At a diameter of 200 mm there are about 25 primaries which completely disappear at 1/3 of the height of whorl. Very slightly outlined secondaries visible in one place only, near the venture. At a diameter of more than 200 mm, a new type of sculpture appears, composed of wide, swollen ribs clearly tending to disappear towards the venture.

Remarks. — The holotype of *Ringsteadia limosa* (Quenstedt 1888, Pl. 124, Fig. 3) displays a similar section of the whorl and similar dimensions to the writer's specimen of *R.* cf. *limosa* (cf. Chart 2). The sculpture of the holotype is, however, considerably more conspicuous and composed of thick primaries and less distinct secondaries. The differences in ribbing of the two specimens may be perhaps explained by a strongly corroded surface of whorls in the writer's specimen, in which ribs have consequently been preserved only in the places where they were most strongly developed, that is, in the umbilical region. A different type of ribbing,



Ringsteadia (Ringsteadia) limosa (Quenst.), × 0.7. Idoceras planula zone — lower part; Raciszyn



1 — *Ringsteadia (Ringsteadia)* sp. indet., × 1. Idoceras planula zone — boundary of the lower and middle part; Niwiska Dolne.

2 — *Ringsteadia (Ringsteadia)* sp. indet., × 1. Idoceras planula zone — lower part; Raciszyn.

3 — *Ringsteadia (Ringsteadia)* cf. *limosa* (Quenst.), × 0.75. Idoceras planula zone — lower part; Grądy-Łazy.

visible in the writer's specimen only at the end of the last whorl, does not occur in the holotype of *R. limosa* as a result of its smaller diameter.

Occurrence. — The specimen of *Ringsteadia* cf. *limosa* was found in the deposits of the lower part of the Idoceras planula zone (locality Grądy-Łazy).

Ringsteadia (Ringsteadia) sp. indet.
(Pl. IV, Figs. 1 and 2)

Description. — Seven specimens 47 mm in maximum diameter, probably representing inner whorls of some larger individuals. Body chamber about one whorl in length. Shell moderately involute. Whorl section oval (Fig. 2*d*). Umbilical slope rather gentle. Sculpture composed of fairly thick

Chart 8

Dimensions and stratigraphical position of *Ringsteadia* sp. indet.

Specimens*	D	U	H	P at D						S/P at D		
				20	25	30	35	40	45	20–25	30–35	40–45
1	35 45	35 35	42 40				31	32	32	2.8	3.0	3.0
2	40	31	44					30				3.2
3	20	31	43	28						2.8		
4	35 45	34 33	40 40					32	34			2.9
5	25 30	32 31	42 43		30	30					3.0	
6	35	37	43				30	30			3.0	
7	20 35	35 31	42 43	29	27	27	28			2.6	?2.7	

* Specimens (place od illustration, locality and stratigraphical position):
1 — pl. IV, fig. 2; Raciszyn, Idoceras planula zone — lower part;
2 — Raciszyn, Idoceras planula zone — lower part;
3 — Raciszyn, Idoceras planula zone — lower part;
4 — Rędziny, Idoceras planula zone — lower part;
5 — Piaczki, Idoceras planula zone — lower part;
6 — pl. IV, fig. 1; Niwiska Dolne, Idoceras planula zone — boundary of the lower and middle part;
7 — Niwiska Dolne, Idoceras planula zone — boundary of the lower and middle part.

primaries, split about halfway the whorl-side into 2—3 slightly less strongly developed secondaries. Intercalatory ribs appear among the secondaries. All ribs slightly prorsiradiate, primaries being frequently more inclined than secondaries. One to three constrictions clearly visible on the whorl.

Remarks. — Specimens, representing inner whorls of *Ringsteadia salfeldi* Dorn (cf. Dorn 1925, Pl. 22, Figs. 1—3), are very similar to those of *Ringsteadia* sp. indet. The difference consists in a probably somewhat higher point of furcation of the primaries on the whorl-side and maybe also in an umbilical slope, steeper in *R. salfeldi* than in *Ringsteadia* sp. indet. Also noteworthy is that all specimens of *R. salfeldi,* known so far, come from older deposits than the specimens of *Ringsteadia* sp. indet. (cf. Chart 3).

It may be supposed that there is also a considerable similarity between inner whorls of *Ringsteadia limosa* and the writer's specimens of *Ringsteadia* sp. indet. An accurate tracing of inner whorls on the specimen, which is the holotype of *Ringsteadia limosa* (Quenstedt 1888, Pl. 124, Fig. 3) and which was available to the writer, was impossible. It may be, however, shown that the degree of involuteness, section of whorl and character of primaries on inner whorls as well are similar to those in *Ringsteadia* sp. indet. Furthermore, the stratigraphic range of both forms is also similar.

Ringsteadia flexuoides is more involute and on inner whorls has thinner and sharper ribs than those of *Ringsteadia* sp. indet.

Occurrence. — *Ringsteadia* sp. indet. occurs in the lower part of the Idoceras planula zone. It is probable that it passes downwards to higher parts of the Epipeltoceras bimammatum zone and upwards — to the middle part of the Idoceras planula zone.

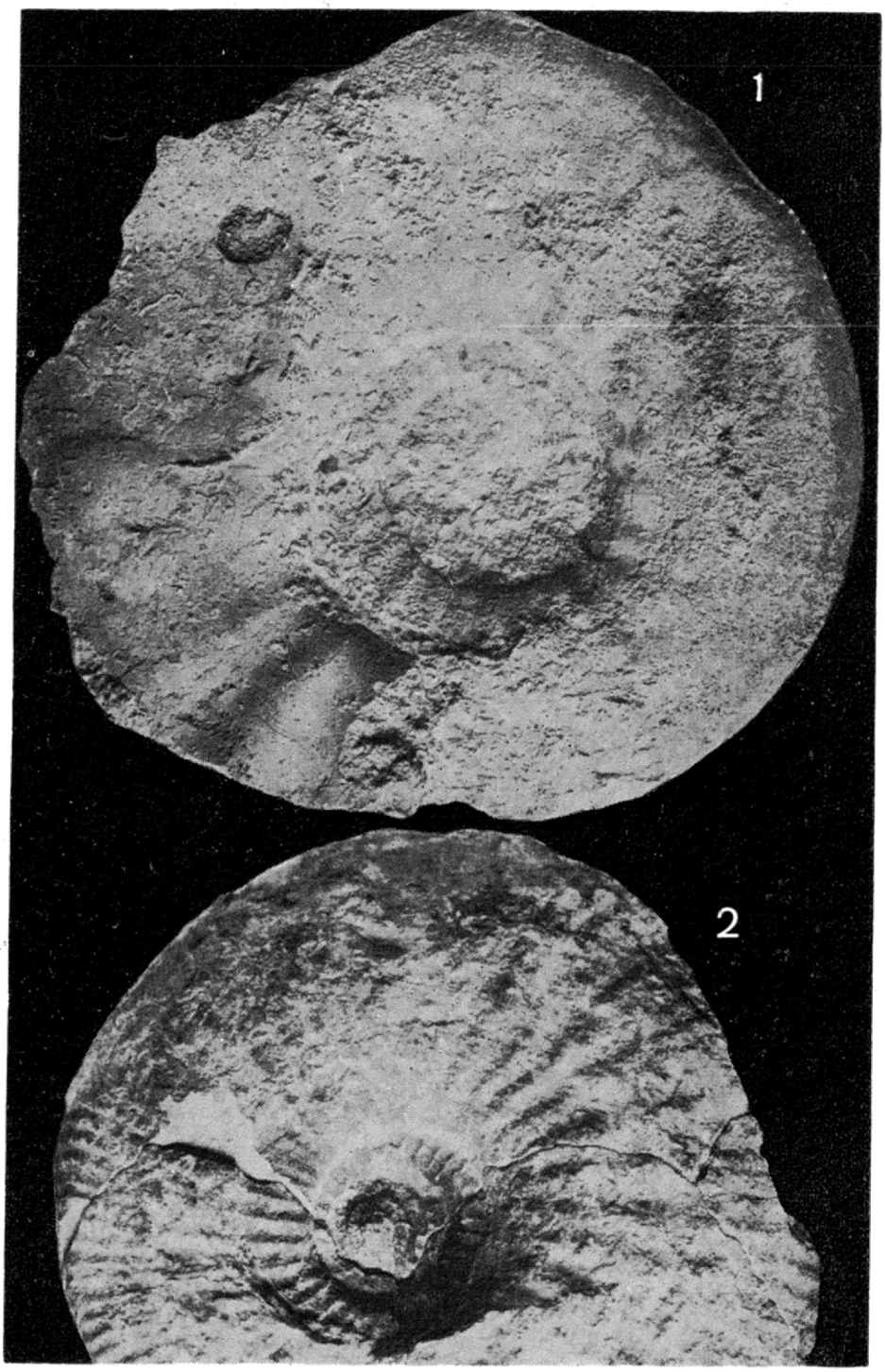
Ringsteadia (Ringsteadia) tenuiplexa (Quenstedt, 1888)
(Pl. VI)

Synonymy: vide Geyer 1961, p. 126.

Also:

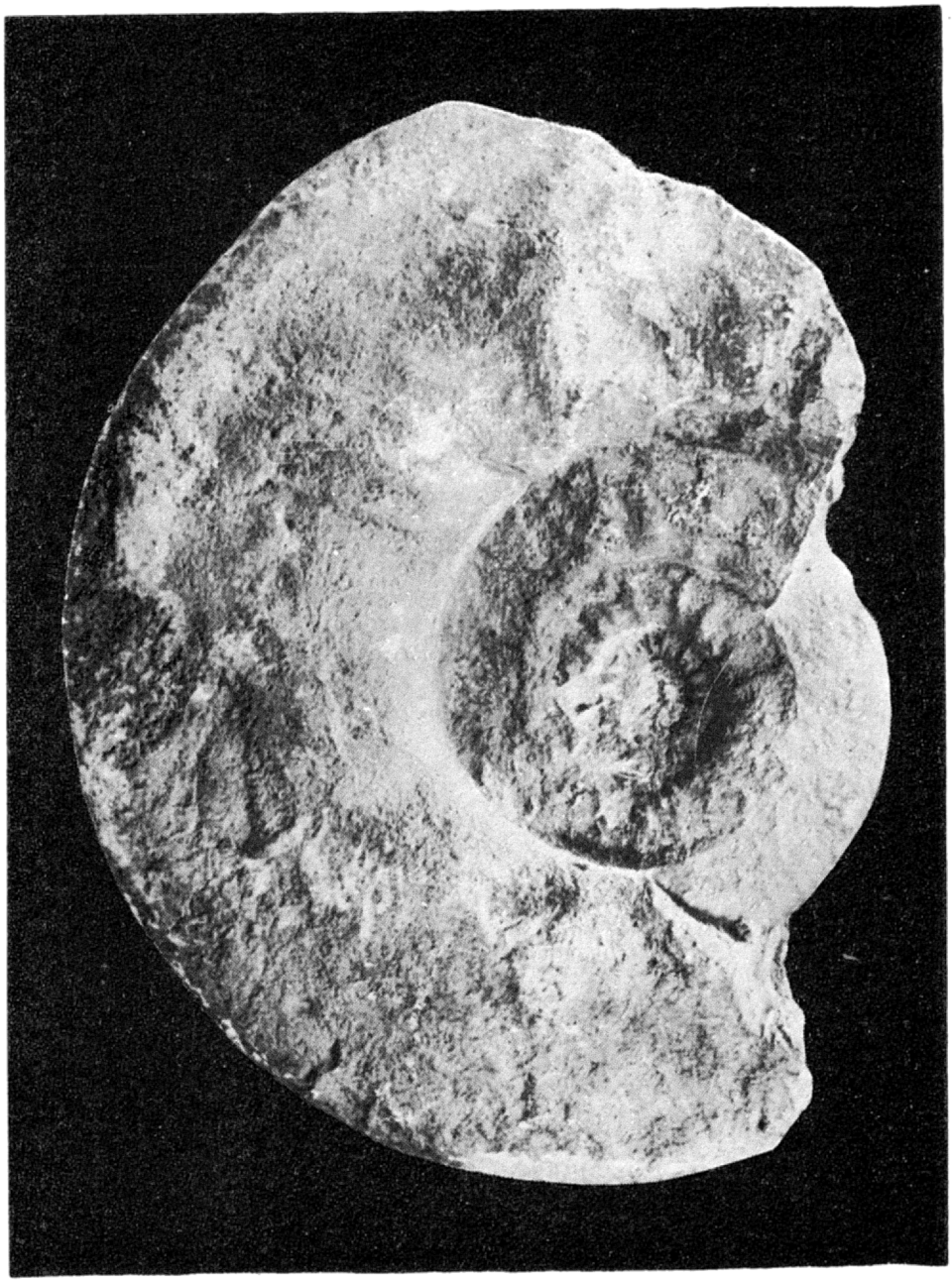
1962. *Ringsteadia marstonensis* Salf.; Wilczyński, pp. 64—66, Pl. 1 and ?Pl. 2

Description. — Maximum diameter about 360 mm. Body chamber at least 2/3 of a whorl in length. Shell moderately involute on the inner whorls and near involute/evolute on the outer whorls. Section of whorls high-oval, tapering towards venture (Fig. 2e). Umbilical slope rather gentle. Sculpture of inner whorls composed of thick primaries split about halfway the whorl-side into 3—4 slightly developed secondaries. Intercalatory ribs appear among secondaries. Sculpture of outer whorls composed of wide, swollen ribs, starting near umbilical slope and completely disappearing halfway the whorl-side.



1 — *Ringsteadia (Ringsteadia)* cf. *limosa* (Quenst.), × 0.55. The specimen presented in pl. IV, fig. 3 while the end-part of the last whorl was not taken off.

2 — *Ringsteadia (Ringsteadia ?)* sp., × 1. Idoceras planula zone — lower part; Lelity.



Ringsteadia (Ringsteadia) tenuiplexa (Quenst.), × 0.4. Sutneria platynota zone; Kuchary

Remarks. — The synonymy of the species *Ringsteadia tenuiplexa* has been presented according to Geyer's (1961) views. In the present paper, it also contains *Ringsteadia marstonensis*, described by Wilczyński

Chart 4

Dimensions and stratigraphical position of *Ringsteadia tenuiplexa* (Quenstedt)

Specimens*	D	U	H	P at D					
				150	230	250	300	350	400
1	430	36	35				18		14
2	350	37	35			20		16	
3	295 345	34 37	36 34		23		19	16	
4	295	34	37						
Author's collection:									
5	200 285 343	33 33 36	40 37 34	25	?20			?15	

* Specimens (place of illustration, locality and stratigraphical position):
1 — Quenstedt (1888, pl. 111, fig. 3), Nusplingen, White Jura γ — probably Sutneria platynota zone;
2 — Dohm (1925, pl. 2, fig. 5), Czarnogłowy (Zarnglaff), *Ringsteadia* and *Pomerania* Beds;
3 — Wilczyński (1962, pl. 1), Czarnogłowy, *Ringsteadia* and *Pomerania* Beds;
4 — Wilczyński (1962, pl. 2), Czarnogłowy, *Ringsteadia* and *Pomerania* Beds;
Author's collection:
5 — pl. VI; Kuchary, Sutneria platynota zone.

(1962). All specimens included in the synonymy (cf. Chart 4) of *R. tenuiplexa* do not display any significant differences as compared with the writer's specimen.

Stratigraphic range. — *Ringsteadia tenuiplexa* occurs in the Sutneria platynota zone (cf. Geyer 1961). Probably, it passes downwards to the upper part of the Idoceras planula zone.

Ringsteadia (Ringsteadia?) sp.
(Pl. V, Fig. 2)

? v. 1888. *Ammonites involutus* Quenst.; Quenstedt, p. 964, Pl. 107, Fig. 2.

Description. — One damaged specimen 110 mm in diameter and representing only a phragmocone was available. Judging by a growth line of not preserved outer whorl, maximum diameter probably reached about

140—150 mm. Shell strongly involute (at D = 81 mm, U = 22 and H = = 46; at D = 110 mm, U = 21 and H = 45). Section of whorl high-oval (Fig. 2*f*). Umbilical slope fairly steep.

Sculpture consisting of about 34 (on a whorl), initially fairly thin and sharp primaries, which, at about 2/3 of the lateral height of whorl split into 2—3 similarly developed secondaries. Intercalatory ribs appear among secondaries. At D = 80 mm, the secondaries-primaries ratio amounts to about 2.5. Both primaries and secondaries are prorsiradiate. At the end of the last whorl preserved, primaries become thicker and, beyond this, tend to be obliterated halfway the whorl-side.

Remarks. — The ammonite of the genus *Ringsteadia*, described by Quenstedt (1888, Pl. 107, Fig. 2) as *Ammonites involutus*, is very similar to the writer's specimen. Quenstedt's specimen has an only slightly greater number of primaries on a whorl (about 37) and is somewhat more involute. It should be mentioned that the two specimens probably belong to the same species but, in view of their state of preservation, cannot be considered as specimens of a type series.

The specimens under study should probably be assigned to the subgenus *Ringsteadia*, but their considerable involuteness, their relatively steep umbilical slope and the tendency to the disappearance of their ribbing towards outer whorls seem to be indicative of the subgenus *Vineta*. A poorly preserved *Ringsteadia*, described by Enay (1966, Pl. 40, Fig. 1) as *Ringsteadia (Vineta)* cf. *weinlandi* (Fischer) is closely related to the specimens referred to above. It is worth mentioning that Enay's specimen clearly differs from the specimens of *R. (Vineta) weinlandi* (Fischer) and should not be assigned to this species.

Ringsteadia flexuoides is less involute than *Ringsteadia (Ringsteadia?)* sp. and has a different type of sculpture, including a different secondaries-primaries ratio.

Occurrence. — The specimen of *Ringsteadia (Ringsteadia?)* sp. from the writer's collection was found in the deposits of the lower part of the Idoceras planula zone (locality Lelity).

Ringsteadia (Vineta) sp.

The writer has at his disposal two specimens, which display all features of this subgenus. Both come from the boundary of the middle and upper part of the Idoceras planula zone (localities Gajęcice Stare and Rudniki). One of them, a fragment of the whorl with the umbilical slope preserved, has previously been described by the writer (cf. Wierzbowski 1966, p. 188, Pl. 9, Fig. 2). The other, about 45 mm in diameter, is strongly deformed and, therefore, its specific interpretation is difficult. In its ribbing and section of whorls it is very similar to *Ringsteadia (Vineta) weinlandi* (Fischer).

Ringsteadia (Ringsteadia? et *Vineta?)* spp: mix.

Seventeen, mostly small and poorly preserved ammonites displaying diagnostic features of *Ringsteadia*. No quite sure subgeneric and specific interpretation of these characters is possible. All specimens come from the Idoceras planula zone. Fourteen of them were found in the lower and middle (localities: Raciszyn, Lelity, Niwiska Dolne, Wólka Prusicka) and three in the upper part of this zone (localities Pajęczno and Latosówka).

Most ammonites, found in the lower and middle part of the zone, probably belong to the subgenus *Ringsteadia*, the rest may be assigned either also to it, or, much less likely, to *Vineta*. Some of the former may represent *Ringsteadia* sp. indet. here described, some others display, however, a similarity to the species *Ringsteadia flexuoides*.

Of the ammonites, found in the upper part of the Idoceras planula zone, two specimens probably belong to the subgenus *Ringsteadia* and one to *Vineta*.

GENERAL REMARKS

Ammonites of the genus *Ringsteadia* have so far been most thoroughly studied in two West-European areas, that is, in England, Normandy (cf. Salfeld 1917, Arkell 1956, Morris 1968), and in Southern Germany (cf. Dorn 1925, 1930; Schneid 1939—1940; Dietrich 1940; Arkell 1956; Geyer 1961). In each of the two areas, these ammonites display their own characteristic features which in both cases may be best examined against the background of the whole of the ammonite fauna occurring in these areas at the turn of the Oxfordian to the Kimmeridgian.

On the boundary of these two stages, in England and Normandy, a predominant importance was acquired by the boreal fauna (cf. Geyer 1961). In the Uppermost Oxfordian, there occur numerous ammonites of the genus *Ringsteadia* which are „boreal" species representing the most characteristic element of the Ringsteadia pseudocordata zone. In the Kimmeridgian, their place is taken by the ammonites of the genus *Pictonia*, on the basis of which the Pictonia baylei zone has been distinguished. It is noteworthy that the genus *Pictonia* evolved from the genus *Ringsteadia* (cf. Morris 1968) and in this connection, despite Arkell's (1956) opinion, a sedimentary continuity should be assumed between the Oxfordian and the Kimmeridgian in England and Normandy.

At the same time in Southern Germany, the submediterranean fauna was of predominant importance (cf. Geyer 1961). On the basis of this fauna, the ammonite zones of Epipeltoceras bimammatum sensu lato, Idoceras planula and Sutneria platynota have been established. The boundary

between the latter two zones is usually correlated with that between the Oxfordian and the Kimmeridgian in England and Normandy (cf. Ziegler 1964, Zeiss 1966). Ammonites of the genus *Ringsteadia* occur in Southern Germany in all zones mentioned above, in which they are, however, rare and belong, to a considerable extent, to species unknown in England and Normandy. These species deserve to be called „submediterranean" ones. Some of the individuals of the South German Ringsteadiae, in particular those coming from the Epipeltoceras bimammatum zone and lower parts of the Idoceras planula zone, are, however, similar to the English species (cf. Dietrich 1940, Arkell 1956). It is also worth mentioning that the true ammonites of the genus *Pictonia* are lacking in Southern Germany. The German ammonites, assigned to this genus by Geyer (1961) clearly deviate from the „boreal" representatives of this genus found in England and Normandy (cf. Mesezhnikov 1969).

Ammonites of the genus *Ringsteadia* from Central Poland, here described, have been found in the Uppermost Oxfordian (Idoceras planula zone) and the Lowermost Kimmeridgian (Sutneria platynota zone). They belong to the „submediterranean" species and were found together with other ammonite fauna of the submediterranean type. It should be however stressed that one specimen of *Ringsteadia*, assigned in the present paper to the species *R. limosa* (Pl. III) and coming from the lower part of the Idoceras planula zone, is fairly similar on its outer whorls to some „boreal" specimens of *Ringsteadia*, described by Morris (1968) as *Ringsteadia evoluta* Salfeld.

As a side-note to these considerations, it should be emphasized that ammonites of the genus *Ringsteadia*, described by Dohm (1925) and Wilczyński (1962) from Czarnogłowy (Zarnglaff), West Pomerania, strongly correspond to the „submediterranean" species known from the Lowermost Kimmeridgian (Sutneria platynota zone) and maybe also from the Uppermost Oxfordian (upper part of the Idoceras planula zone) from Southern Germany and Central Poland. Other ammonites, found at Czarnogłowy together with *Ringsteadia*, including representatives of the genus *Pomerania*, also corresponds to „submediterranean" species and their stratigraphic range is similar to the former one (cf. Geyer 1961, Kutek 1968). In view of the lack of „typically boreal" species, which would enable the correlation with England and Normandy, the Ringsteadia pseudocordata zone at Czarnogłowy, in contrary to previous opinions (cf. Arkell 1956), cannot be distinguished there.

These considerations enable bringing forward the hypothesis on two, independent lineages of ammonites of the genus *Ringsteadia*, that is, a „boreal" and a „submediterranean" ones.

The „boreal" lineage shows the evolution of boreal ammonites of the genus *Ringsteadia* in the Uppermost Oxfordian (Ringsteadia pseudocordata zone) in England and Normandy, which gave rise in this area,

in the Lowermost Kimmeridgian (Pictonia baylei zone), to the ammonites of the genus *Pictonia* (cf. Morris 1968).

The „submediterranean" lineage shows the evolution of „submediterranean" ammonites of the genus *Ringsteadia* in the Upper Oxfordian (Epipeltoceras bimammatum sensu lato and Idoceras planula zones) and Lowermost Kimmeridgian (Sutneria platynota zone) in Southern Germany, Southern France and Poland. In this area, the lineage in question is inadequately studied but it probably gave rise — in the Uppermost Oxfordian and the Lower Kimmeridgian — to various ammonites of the genera *Rasenia (Eurasenia, Involuticeras)* and *Pomerania (Pachypictonia).*

In comparing with each other the ammonite lineages of the genus *Ringsteadia* under study, it should be emphasized that the similarity between individual species of the genus *Ringsteadia* is stronger in the lower than in the upper parts of both lineages. The time of the appearance of these ammonites in the two lineages seems to be isochronous, but the upper boundary of the range of the genus *Ringsteadia* in them is quite different.

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AMONITY RODZAJU *RINGSTEADIA* SALFELD, 1913 Z UTWORÓW GÓRNOJURAJSKICH PÓŁNOCNEJ CZĘŚCI JURY KRAKOWSKO-CZĘSTOCHOWSKIEJ

(Streszczenie)

Opisano kilka gatunków amonitów z rodzaju *Ringsteadia* Salfeld, 1913, pochodzących z osadów najwyższego oksfordu (poziom Idoceras planula) i najniższego kimerydu (poziom Sutneria platynota) północnej części Jury Krakowsko-Często-

chowskiej (vide fig. 1). Przedstawione gatunki (fig. 2, tab. I—4 oraz pl. I—VII) znane są z południowych Niemiec i należą do typu „submedyterańskiego". Różnią się one wyraźnie od gatunków „borealnych" z obszaru normandzko-angielskiego. Fakt ten oraz inne obserwacje pozwalają na postawienie tezy o dwóch liniach rozwojowych amonitów z rodzaju *Ringsteadia* na przełomie oksfordu i kimerydu: linii „borealnej" na obszarze normandzko-angielskim, dającej początek amonitom z rodzaju *Pictonia* (por. Morris 1968), oraz linii „submedyterańskiej" na obszarze południowych Niemiec, południowej Francji i Polski, dającej zapewne początek amonitom z rodzaju *Rasenia (Eurasenia, Involuticeras)* i *Pomerania (Pachypictonia)*.

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