

9. The Primitiopsid Ostracodes from the Ordovician of Oklahoma and the Systematics of the Family Primitiopsidae

By

Anders Martinsson

ABSTRACT.—A new genus, *Anisocyamus*, is established for the true primitiopsids among the ostracodes described by R. W. HARRIS in 1931 and 1957 from the Tulip Creek and Bromide formations of the Simpson group, Ordovician of Oklahoma. Two species, *A. bassleri* (HARRIS 1931) and *A. elegans* (HARRIS 1957) are reexamined.

In connection with this a survey is made of the non-Silurian primitiopsids described up to now. Three new subfamilies, *Anisocyaminae*, *Sulcicuneinae*, and *Polenovulinae*, are distinguished. The latter subfamily includes two new genera, *Polenovula* and *Viazoviella*, both from the Devonian of the Ural region.

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Introduction

The Silurian primitiopsids described up to now constitute two groups of genera which have a posterior velar dimorphism in common but are very different in the other details of the carapace morphology. These groups are the subfamilies *Primitiopsinae* (with the genera *Primitiopsis* JONES 1887, *Clavofabella* MARTINSSON 1955, and *Limbinaria* SWARTZ & WHITMORE 1956) and

Leiocyaminae (with the genera *Leiocyamus* MARTINSSON 1956 and *Amygdalella* MARTINSSON 1956), both established after a study of a very well-preserved material from the Mulde marl of Gotland, Sweden (MARTINSSON 1956). In connection with the continued study of the Silurian palaeocopes of Scandinavia and Great Britain a large number of primitiopsines and leiocyamines have been found, all of them on about the same level of organization as the species already described.

It was natural, therefore, to pay particular attention to the oldest known forms referred to the family in order to find some primitive or connecting features for the elucidation of the phylogenetic relationships of the genera mentioned. For the same reason the youngest forms, from the Devonian, have been briefly surveyed.

In 1931 R. W. HARRIS described a new ostracode species from the Bromide formation of the Simpson group under the name of *Primitiopsis bassleri*. The figures published and a study of the hingement (LEVINSON 1950, cf. MARTINSSON 1955, p. 19) made it rather doubtful whether the species could belong to the family *Primitiopsidae*. Miss JEAN BERDAN, U.S. National Museum, however, recognized the Bromide species as having all the essential features of a primitiopsid (letter of February 16th, 1956) and sent an excellent material which entirely confirmed her observations but which could not be conspecific with *Primitiopsis bassleri* HARRIS. The new species was described by HARRIS in 1957 as *Primitiopsis elegans*, and on the same occasion a new figure of *P. bassleri* was published.

For this study further material of *P. elegans*, collected in 1959 by Dr. V. JAANUSSON, and of *P. bassleri*, determined by Dr. R. W. HARRIS, has been accessible. For comparative purposes specimens of "*Leperditellina*" *miranda* POLENOVA and "*L.*" *crassa* POLENOVA have been supplied by the author of the species.

ACKNOWLEDGEMENTS.—My sincere thanks are due to Mrs. POLENOVA, Panfederative Oil Research Institute (VNIGRI), Leningrad, Miss BERDAN, U.S. National Museum, Washington D.C., Dr. HARRIS, Oklahoma Geological Survey, Norman, and Dr. JAANUSSON, Institute of Palaeontology, Uppsala, for the material studied.

Morphological comparison between the Silurian and the Ordovician primitiopsids

The general shape of the carapace in the two Ordovician species coincides fairly well with that of the primitiopsines. The lateral outline is, as described by HARRIS, "relatively short, ovate to subquadrate", cut off dorsally by the long, straight hingeline. In dorsal view the carapace is considerably more flattened than in the primitiopsines and more or less sharply truncated anteriorly by a bend at the velar level.

There is no well-developed dorsum. The lateral side of the valves reaches

the hingeline in a strong convexity which does not, however, protrude over the hingeline.

The valves are slightly unequal in size, the right one being slightly larger and overlapping the left one in the same way as in the Silurian primitiopsines. In the Ordovician species, however, the margin of the valve forms a pronounced covering list, while in the Silurian species the left valve is more adjusted for the contact conditions, having an extramarginal shelf which is covered by the right valve. A very narrow marginal structure is developed on both valves, without any clearly visible ornamental features. There are, however, some uncertain signs in specimens of both species that the marginal structure has been dissolved in a row of faint tubercles anteroventrally.

The most interesting feature in the contact of the valves is in this case the hingement which is comparatively well preserved in the material studied.

In 1950 LEVINSON made a comprehensive study of the hingement of palaeozoic ostracodes, most of them palaeocopes, including the species *Primitiopsis bassleri* (op. cit., p. 67). He concluded that the hingement of the right valve consists of a rounded posterior tooth and an angular, flattened anterior tooth connected by a prominent groove. The hingement of the left valve consists of a rounded posterior socket and an angular anterior socket; the anterior margin of the anterior socket is not as high as other portions of the margin of the socket. A ridge connects the dorsal margin of the two sockets. From the development of and the position of the teeth and sockets LEVINSON further drew the conclusion that the ostracode should be orientated so that the dolonal flanges point forward, which explains why the words "left" and "right" have been exchanged in the above quotation.

In the present material no teeth or real sockets have been observed. The right valve has a simple groove along the hingeline—which forms the dorsal part of the lateral outline and is not protruded over by any part of the carapace—equally broad along its entire length. There may be a slight thickening of the carapace walls under the posterior end of the groove, and the inner wall of the groove is especially high and prominent posteriorly. The left valve has a ridge corresponding to the groove, practically the dorsal margin of the valve, and the anterior and posterior hinge corners are thinned out to allow the closing of the valves. It may be a question of interpretation whether this should be regarded as a tooth-and-socket arrangement or not, but on the whole it can be concluded that there is no basic difference in the construction of the hingement in the Ordovician primitiopsids and in the Silurian primitiopsines.

The orientation, consequently, should be with the dolonal flanges at the rear end of the carapace. This is further confirmed by the adductor muscle attachment and the so-called "forward swing", the prepletion, of the carapace.

There is no lobation of the valves at all. As pointed out earlier no dorsum is formed, and there is not even an adductorial pit or any trace of a preadductorial node.

In the female the velum forms a dolonal flange along the posterior and posteroventral part of the valve, very like that in *Clavofabella*, but reaching further forwards. The velum does not continue forwards in front of the velum. In the male it is entirely absent. There is, however, a sharp bend in both sexes, especially pronounced in the female, at the level of the expected continuation of the velum. This development of the dimorphism in the Ordovician primitiopsids from Oklahoma distinguishes them as forming the new genus *Anisocyamus* described below.

The characters described so far make comparisons with the Silurian genus *Clavofabella* attractive, especially with *C. reticristata* which seems, superficially, to show the corresponding reduction of the non-dolonal part of the velum.

At the first glance this also applies to the reticular ornamentation of the carapace walls. As pointed out by HARRIS (1931, p. 92, and 1957, p. 203), however, the right valves always prove to lack the ornamentation over the greater part of the valve. In the former paper HARRIS attributes this fact to weathering, in the latter it is said that "hundreds of right valves are worn? perfectly smooth, possibly during life of the crustacean while spinning on the right side on the muddy bottom, in fashion similar to Recent fresh-water Ostracoda observed spinning on the surface".

The primitiopsid reticulation, however, is no superficial feature. It comprises the greater part of the thickness of the valve, and it cannot be worn away. The reduction of the ornamentation of the right valve is not an individual modification but an inherited property, and as shown below the distribution of the reticulation can be used as good specific characters within the genus *Anisocyamus*. It is not improbable, of course, that the reduction or lacking development of the ornamentation has something to do with an unilateral mode of life of the animals.

Systematic description of the Ordovician material

The terminology used in the descriptions below follows that used for the Silurian species (MARTINSSON 1955, pp. 6-7).

Anisocyamus n. g.

SYNONYMY.—Since the description of *A. bassleri* (HARRIS) in 1931 the species referred here to the genus have only appeared under the generic name of *Primitiopsis*.

DERIVATION OF THE NAME.—Latinized from Greek *ἄνισος*, unequal, and *κύαμος*, bean, referring to the distribution of the ornamentation and to the shape of the carapace.

DIAGNOSIS.—Primitiopsid ostracodes lacking adductorial pit, preadductorial

node, proper dorsum and all traces of other lobal features. Valves subequal in size, reticulate or pitted; ornamentation of the right valve absent, reduced, or incompletely developed. Velum missing in the male (diagnosis of the subfamily *Anisocyaminae*, cf. below). Dolon of the female extending from the posterior hinge corner along the rear part of the valve, approaching the free margin posteroventrally, continued only as a bend along the ventral and anterior parts of the free margin.

TYPE SPECIES.—*Primitiopsis elegans* HARRIS 1957.

SPECIES.—*Primitiopsis elegans* HARRIS 1957.

Primitiopsis bassleri HARRIS 1931.

? *Primitiopsis minutiperforatus* HARRIS 1957.

OCCURRENCE.—Bromide, Tulip Creek, and (?) McLish formations of the Simpson group, Middle Ordovician (Black River) of Oklahoma. Detailed reference to all localities known is given by HARRIS 1957.

REMARKS.—Only *Anisocyamus elegans* and *A. bassleri* have been available for this revision. There may be some doubt whether *A. minutiperforatus* has the same velar morphology and fits well into the diagnosis. HARRIS's figure shows a pattern of pits along the velum on the right valve where our experience of the other two species would suggest that it would be lacking in the first place (HARRIS 1957, Pl. 6, figs. 21 a–21 b). Nothing is said in the text, however, about the distribution of the ornamentation in other species than in *A. bassleri*.

No characters are figured or described which suggest that *Primitiopsis minuta* HARRIS and *P. excavata* HARRIS should be placed in the family *Primitiopsidae* (cf. HARRIS 1957, pp. 204–206; gender emended here). The same remark applies to *Macronotella multipunctata* KAY and *M. elongata* TEICHERT which are referred by HARRIS to the genus *Primitiopsis* (op. cit., p. 204). The descriptions of the "vertical shoulder" in *P. excavata* and the truncated posterior end of *P. minuta* almost exclude the existence of a primitiopsisid velar dimorphism.

Anisocyamus elegans (HARRIS 1957)

Text-fig. 1, Pl. I, figs. 1–8, Pl. II, figs. 1–8.

1957. *Primitiopsis elegans* n. sp.—HARRIS, pp. 84, 203–204, 266, and 270; Pl. VI (6), fig. 18; Tables facing pp. 74 and 92; Chart 2 and General Ostracoda Range Chart.

HOLOTYPE.—A left dolonate valve, Harvard University, Museum of Comparative Zoology, No. 4594 (*vide* HARRIS, op.cit., p. 203).

DIAGNOSIS.—*Anisocyamus* species with finely reticulated carapace; reticulation of the right valve developed only as an irregular field in front of the adductorial spot. The reticulation density allows 10 to 12 pores to be placed along an imaginary line between this and the level of the velar bend.

DESCRIPTION.—For general characters, see the preceding chapter. The dolon of this species extends along the entire posterior and posteroventral parts of

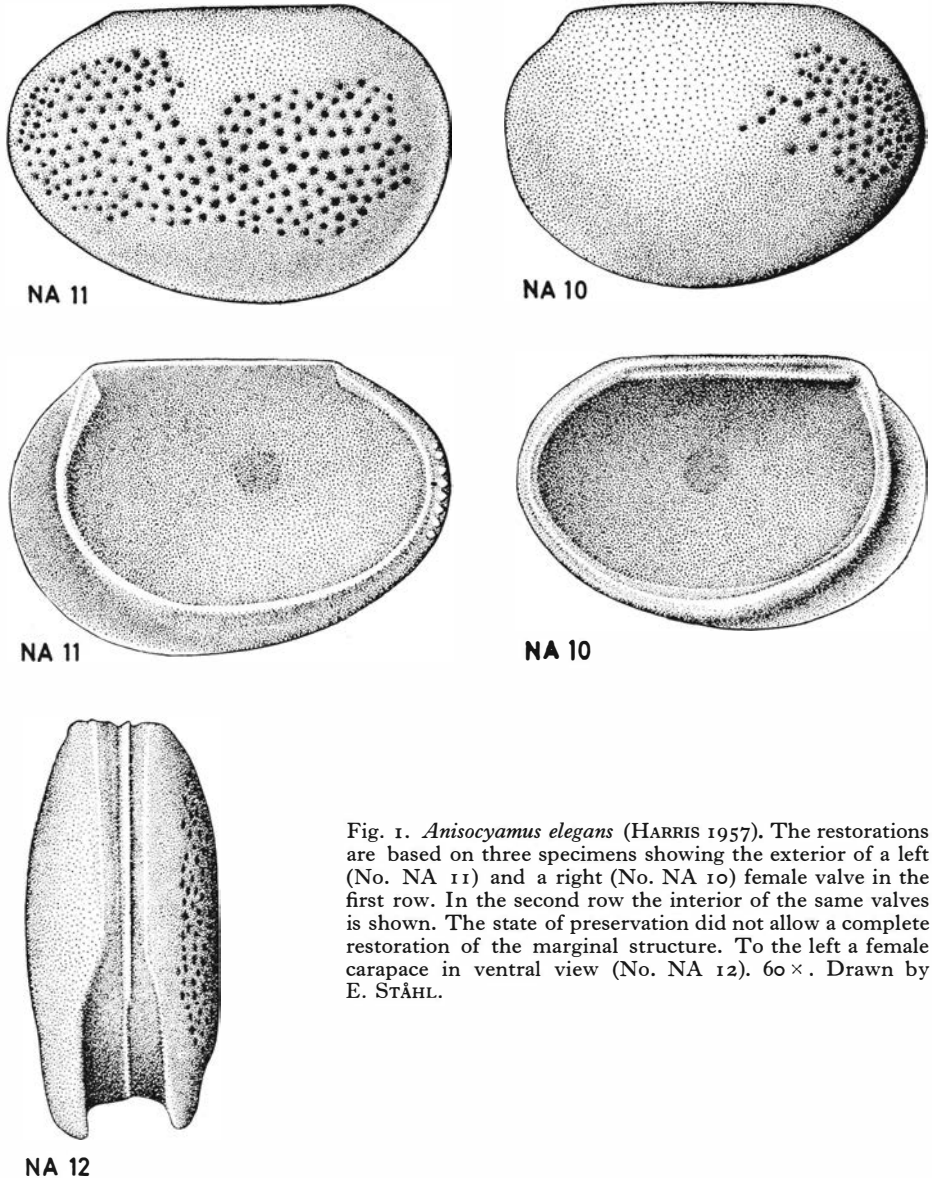


Fig. 1. *Anisocyamus elegans* (HARRIS 1957). The restorations are based on three specimens showing the exterior of a left (No. NA 11) and a right (No. NA 10) female valve in the first row. In the second row the interior of the same valves is shown. The state of preservation did not allow a complete restoration of the marginal structure. To the left a female carapace in ventral view (No. NA 12). $60\times$. Drawn by E. STÄHL.

the valve. The bend at the velar level is comparatively sharp. The left valve is densely reticulated, but the reticulation is missing in a belt along the hinge, at least in a field behind a vertical and above a horizontal line through the muscle spot, and along the ventral part of the valve. Therefore the actual number of pores along the index line adopted from HARRIS in the diagnosis is generally only about 6–8. The right valve lacks ornamentation except in the anterior part where the reticulation sometimes reaches the adductorial spot with a couple of pores or a row of pores. Especially in this valve the space

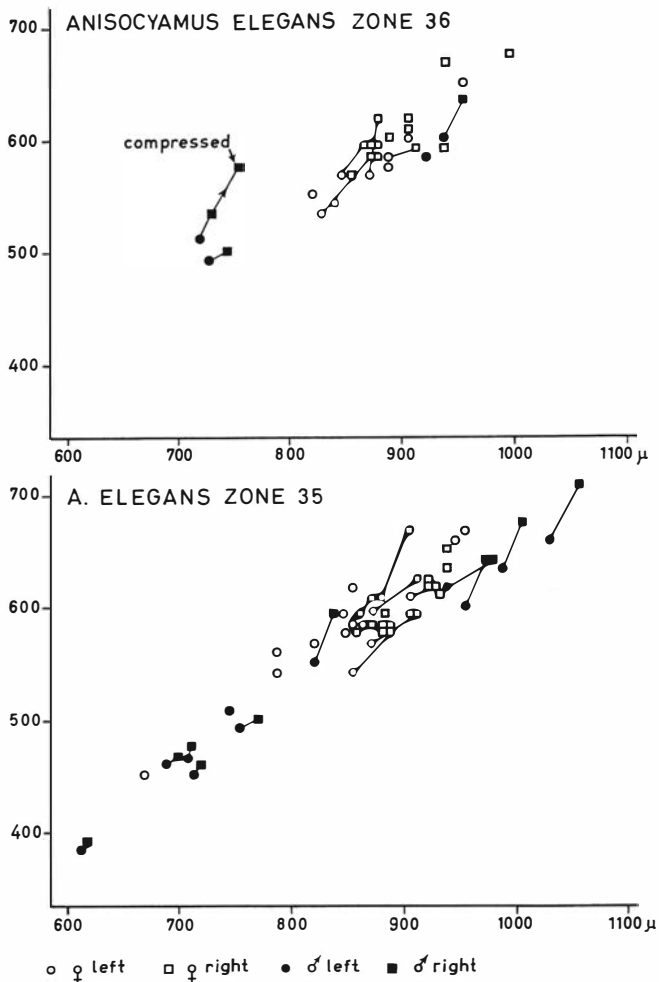


Fig. 2. Size dispersion of two samples of *Anisocyamus elegans* (HARRIS 1957). In the upper figure obviously two moult stages are represented, in the lower possibly three. The smallest female valve in the latter diagram seems to be a case of subadult dimorphism. The difference in size is mostly overemphasized due to the fact that the valves are compressed laterally so that the margins of the overlapping right valve are bent out (cf. Pl. III, figs. 7-8). For locality references, see p. 146.

between the pores is often so large that the surface is better described as porate than reticulate. In a couple of cases the ornamentation even extends to the postadductorial part of the valve. The adductorial spot and the dolon lack ornamentation on both valves. Some valves suggest that the marginal structure was dissolved anteroventrally in a row of small tubercles or spines.

DIMENSIONS.—Length of female left valves, dolon included, 785-955 μ , height over adductorial region 535-660 μ . A female specimen with the dimensions 660 and 450 μ , respectively, is possibly a case of subadult dimorphism. For the size dispersion of the material, see Fig. 2.

REMARKS.—The holotype and the material studied here come from two different sections, U.S. Highway 77 Section and U.S. Highway 99 Section, respectively. There is possibly a somewhat denser reticulation in HARRIS's drawing than in the photographs published here, but with the present material and HARRIS's correlation tables there is no reason to doubt that the specimens from the two sections are conspecific.

TYPE LOCALITY AND STRATUM.—Oklahoma, U.S. Highway 77 Section, about 2.45 m above the base of zone 32, Tulip Creek formation of the Simpson group (*vide* HARRIS 1957, p. 203).

OCCURRENCE.—Known so far only from the Tulip Creek formation (*sensu* HARRIS) of Oklahoma.

MATERIAL STUDIED.—A sample with 23 specimens labelled "On Oklahoma State Highway 99 (road cut) in NE 1/4 SW 1/2 sec. 12 T. IN. R. 6E. Pontotoc County, Oklahoma" (prep. JEAN BERDAN, Mus. Pal. Inst. Univ. Uppsala, Nos. NA 9-NA31), from zone 36, and 40 specimens from part of a marl sample collected from zone 35 along the same highway, 3 km S of Fittstown, by V. JAANUSSON 1959 (Mus. Pal. Inst. Univ. Uppsala, Nos. NA 32-NA 71).

Anisocyamus bassleri (HARRIS 1931)

Pl. III, figs. 1-10.

SYNONYMY.—The synonymy up to 1952 is given by HARRIS (1957, 202). The species is further commented by MARTINSSON (1955, p. 19).

LECTOTYPE (designated herein).—The dolonate carapace figure by HARRIS 1931, Pl. XIV, figs. 2a-2b (Harvard University, Museum of Comparative Zoology, cf. p. 153). In this paper HARRIS also refers to material from the Tulip Creek formation (Pl. XI, figs. 2a-2d). In both plates the specimens are figured with ornamentation on both valves and no difference in the ornamentation is shown. In the current text Plate XI is referred to the Tulip Creek formation (*op. cit.*, p. 38) and Plate XIV to the Bromide formation (*op. cit.*, p. 47). As defined by HARRIS in 1957 *A. bassleri* occurs exclusively in the latter formation.

DIAGNOSIS.—*Anisocyamus* species with coarsely reticulated left valve; no reticulation at all on the left valve. The reticulation density allows 5-6 pores to be placed along an imaginary line between the adductorial spot and the level of the velar bend.

DESCRIPTION.—For general characters, see the preceding chapter. The dolon extends along the posterior and posteroventral part of the valve, but is somewhat shorter than in *A. elegans*. The bend at the velar level lies nearer the margin than in *A. elegans*, with the result that the anterior end of the carapace is fairly evenly rounded in dorsal view. The coarseness of the reticulation and its distribution are also characters distinguishing *A. bassleri* from *A. elegans*. As in *A. elegans* there are areas of the left valve which lack ornamentation, *viz.* the area above a horizontal line through the adductorial spot and a narrower belt along the free margin.

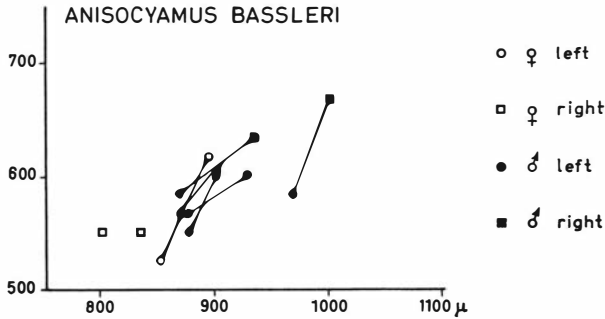


Fig. 3. Size dispersion of 8 adult specimens of *Anisocyamus bassleri* (HARRIS 1931). For locality reference, see this page.

DIMENSIONS.—Length of female left valves, dolon included, 800–900 μ ; height over adductorial region 525–620 μ . For the size dispersion of the material studied, see Fig. 3.

REMARKS.—HARRIS mentions (1931, p. 92; 1957, p. 202) that the male specimens are rarer than the females, or even “occasional”. The same has been the result of the present investigation in which at least the material of *A. elegans* from Dr. JAANUSSON’s marl samples must have been representative for the sex ratio.

TYPE LOCALITY AND STRATUM.—Oklahoma, Arbuckle Mountains, about 400 m. W U.S. Highway 77, Sec. 25, T. 2S., R 1E. Top of zone 8 (29.9 m. below the top of the Simpson group), Bromide formation.

OCCURRENCE.—Known so far only from the Bromide formation of Oklahoma.

MATERIAL STUDIED.—A sample with 8 specimens from the base of zone 26, U.S. Highway 99 Section, Oklahoma (Mus. Pal. Inst. Univ. Uppsala, Nos. NA 1–NA 8).

Systematic position of hitherto known primitiopsisid genera

The specific characters of the primitiopsids consist in rather small differences in the ornamentation and in details in the morphology of the adventral structures. The generic characters are associated with quantitative or qualitative differences in the development of the dimorphism, *e.g.* the extension of the dolon or the degree of formation of a closed pouch which seems to be high stage of development among the *Primitiopsidae*. The primitiopsisid carapace does not contain many details to base systematic characters on, but the ones mentioned have proved very reliable for the rich Silurian faunas.

It is evident, however, that the family *Primitiopsidae* consists of a number of series of genera with posterior velar dimorphism which are separated by

wide developmental gaps, though it seems certain that monophyletic relationships exist between most of them. To illustrate this a suprageneric taxonomic category is needed.

For this reason the Silurian genera were referred to two subfamilies, *Primitiopsinae* and *Leiocyaminae* (MARTINSSON 1956). The Ordovician and Devonian genera form three groups which it is convenient to rank at the same level.

The genus *Anisocyamus* has many features in common with the primitiopsine genus *Clavofabella*, but they are hardly closely related. The advanced isolateral symmetry, the lobation tendency, and the richly developed velar arrangement in *Clavofabella* contrasts with the anisolateral, totally unlobated carapace of *Anisocyamus* where a male velum is lacking.

Anisocyamus is the only Ordovician primitiopsid genus known so far.

The Silurian genera are *Primitiopsis*, *Clavofabella*, *Limbinaria* (*Primitiopsinae*), *Leiocyamus*, and *Amygdalella* (*Leiocyaminae*). *Limbinaria* is described from North America, the others from Scandinavia and Great Britain. Furthermore *Schmidtellina circularis* ABUŠIK 1957 (*nomen nudum*), from the Silurian of the Siberian Platform, obviously is a primitiopsid; the author has kindly reported in a letter that she refers it tentatively to the genus *Leiocyamus*.

Devonian primitiopsids are known from North America, the Ural region, and, possibly, from Germany.

Leperditellina miranda POLENOVA 1955 and *L. crassa* POLENOVA 1955 are two species with rather different development of a perfectly closed dolonal pouch. *L. crassa*, which is fairly similar to the genus *Primitiopsis* in the general shape of the carapace, agrees well with the drawing of *Primitiopsis eifliensis* by KUMMEROW (1953, Pl. II, figs. 19a–19c). A photograph of the only known specimen, in the collections of the Geological Commission of the DDR, made by Dr. K. KRÖMMELBEIN, Frankfurt am Main, could not, however, confirm the existence of a primitiopsid pouch with certainty.

The species mentioned exhibit relatively certain relationships to the Silurian primitiopsids. This is, however, not true for the American Devonian species *Sulcicuneus* KESLING 1951 which exhibits a number of foreign features in the velar and ornamental characters. The homology of the velum in the primitiopsids and in other eurychilinae is far from clear, but internal or superimposed structures like the tubercles along the velum in *Sulcicuneus* and the obviously fused denticles forming its pouch are absolutely foreign to the other primitiopsid genera. The monotypic genus *Sulcicuneus* represents the most isolated branch of the family.

The present knowledge of the family is illustrated in the following system:

Family *Primitiopsidae* SWARTZ 1936

Subfamily *Primitiopsinae* SWARTZ 1936

Primitiopsis JONES 1887

P. planifrons JONES 1887

Clavofabella MARTINSSON 1955

C. multidentata MARTINSSON 1955

- C. incurvata* MARTINSSON 1955
C. reticristata (JONES 1888)
C. borussica (KUMMEROW 1923)
Limbinaria SWARTZ & WHITMORE 1956
L. multipunctata SWARTZ & WHITMORE 1956
L. biangulata SWARTZ & WHITMORE 1956
L. paucipunctata SWARTZ & WHITMORE 1956
 Subfamily *Leiocyaminae* MARTINSSON 1956
Leiocyamus MARTINSSON 1956
L. apicatus MARTINSSON 1956
Amygdalella MARTINSSON 1956
A. subclusa MARTINSSON 1956
 Subfamily *Anisocyaminae* n. subf.
Anisocyamus n. g.
A. elegans (HARRIS 1957)
A. bassleri (HARRIS 1931)
 ? *A. minutiperforata* (HARRIS 1957)
 Subfamily *Polenovulinae* n. subf.
Polenovula n. g.
P. crassa (POLENOVA 1955)
 ? *P. eifliensis* (KUMMEROW 1953)
Viazoviella n. g.
V. miranda (POLENOVA 1955)
 Subfamily *Sulcicuneinae* n. subf.
Sulcicuneus KESLING 1951
S. porrectinatum KESLING 1951

Among the increasing number of species which are referred to the family *Octonaria muricata* ULRICH & BASSLER 1923 and *Primitia cristata* JONES & HOLL 1865 (*Clavofabella cristata*, cf. MARTINSSON 1955, p. 23) are certain primitiopsids, but they cannot be placed within the system owing to the lack of revisions and insufficient knowledge about the velar morphology.

Diagnoses of new subfamilies and of new Devonian genera

Before the treatment of the new subdivisions of the family some remarks should be added about the family name *Primitiopsidae*.

The original spelling is *Primitiopsidae* (cf. SWARTZ 1936, p. 555). Since then the spellings *Primitiopsiidae*, *Primitiopsidae* and *Primitiopsididae* have appeared. Only the last spelling has been accompanied by a linguistic motivation (POKORNÝ 1958, p. 227, note 1).

Article 4 in the International Code of Zoological Nomenclature says that a family name is formed by adding the ending *-idae* to the stem of the name of its type genus. The generic name *Primitiopsis* is constructed from the generic name *Primitia* and the Greek substantive ὄψις, gen. ὄψεος ("sight", "appearance"), here used in the adjectivic meaning "like", "similar to". The transcribed Greek stem would, therefore, be *opse-*.

Article 3 of the same Code states that the zoological nomenclature must be based on

words which are either Latin or latinized, or considered and treated as such in case they are not of classic origin. Words of the present type adopted into Latin were declined with the genitive ending *-is* (like homoeosyllabic Latin words in *-is*) or, preferably, with the original Greek genitive ending *-eos* (WIKÉN 1951, p. 164). But in the case of the adjectivized ending *-opsis* there is a third possible genitive, *viz.* *-opsidis* (WIKÉN 1951, p. 171; cf. POKORNÝ, l.c.). Thus the three alternatives *Primitiopse-idae*, *Primitiopsid-idae*, and *Primitiops-idae* (but not *Primitiopsi-idae*) are all verified, and there is no necessity to emend SWARTZ's original spelling *Primitiopsidae*.

Subfamily *Anisocyaminae* n. subf.

DIAGNOSIS.—Primitiopsid ostracodes lacking adductorial pit, preadductorial node, proper dorsum and all traces of other lobal features. Valves subequal in size, reticulate or pitted; ornamentation of the right valve absent, reduced, or incompletely developed. Velum missing in the male.

TYPE GENUS.—*Anisocyamus* n.g., the only genus described so far.

REMARKS.—The subfamily differs from the subfamily *Primitiopsinae* by the complete absence of lobal features and of a velum in the male and younger tecnomorphs. It differs from the subfamily *Leiocyaminae* by the subequal size of the valves and by the absence of a dorsum, and from both subfamilies by the unilateral arrangement of the ornamentation. The affinities to the Silurian forms seem to be evident.

OCCURRENCE.—Simpson group, Ordovician of Oklahoma.

Subfamily *Sulcicuneinae* n. subf.

DIAGNOSIS.—Primitiopsid ostracodes with sulcoid adductorial pit, preadductorial node, and granulose ornamentation of the valves. Velum developed in both sexes; the dolon of the female with radiate internal structures, forming an almost closed pouch. Tuberculate ornamentation on the edge of the velum.

TYPE GENUS.—*Sulcicuneus* KESLING 1951, the only genus described so far.

REMARKS.—The morphology of the dolon is an absolutely distinctive character as against all other primitiopsids. The ornamentation of the sides of the valves and of the velum, furthermore, are entirely foreign to the other subfamilies which are unornamented or form series of typically reticulate or pitted forms.

OCCURRENCE.—Traverse group, Devonian of Michigan.

Subfamily *Polenovulinae* n. subf.

DIAGNOSIS.—Valves almost equal in size, without any other lobal features than a sulcoid depression. No distinct velum in the male or in front of the dolon in the female. Dolon forming a perfectly closed pouch the walls of which merge with the carapace walls without any marked exterior morphological or ornamental limit.

TYPE GENUS.—*Polenovula* n. g.

GENERA.—*Polenovula* n. g. and *Viazoviella* n. g.

REMARKS.—These ostracodes follow up the developmental trends of the Silurian primitiopsids. The dolonal pouch and the domicilium form, as far as the exterior is concerned, a morphologically natural unit. Unfortunately no detailed study of the velar morphology has been made, especially as no isolated valves have been available. It is probable that the velum is marked by the bend along the ventral part of the valve in *Viazoviella* and is completely fused with the margin in *Polenovula* in the same way as is indicated by *Primitiopsis planifrons* and *Clavofabella reticristata* among the primitiopsines. The surface of all known forms is perfectly smooth. The only trace of a lobation is the faint sulcoid depression in *Viazoviella*.

The affinities to the Silurian *Primitiopsinae* seem to be evident at least in *Polenovula*. There is, however, a considerable evolutionary gap between the ornamented primitiopsines, with their faint traces of a lobation and with generally well-developed non-dolonal parts of the velum, and the smooth polenovulines which almost completely lack these features.

The species included were referred by POLENOVA (1955) to the genus *Leperditellina* NECKAJA (*nomen nudum*), with the undescribed species *L. diffusa* from the Upper Ludlovian of Ösel (Saaremaa), Estonia, as the type species. To judge from POLENOVA's generic diagnosis (op. cit., p. 197) this is a reticulate primitiopsine.

Genus *Polenovula* n. g.

DERIVATION OF THE NAME.—Named in honour of the author of the type species, Mrs. E. N. POLENOVA, Leningrad. The name is the feminine diminutive of an adjective with the stem *Polenov-*.

DIAGNOSIS.—Polenovuline ostracodes with very tumid, smooth carapace, without any lobal features but with an antero-central muscle spot. Dolon forming a closed pouch, covering only the posterior part of the carapace, not drawn forwards posteroventrally.

TYPE SPECIES.—*Leperditellina* (?) *crassa* POLENOVA 1955 (for description and figures, see POLENOVA 1955). Possibly one more species, *Primitiopsis eifliensis* KUMMEROW 1953, belongs to this genus.

OCCURRENCE.—Vjazovian beds, Middle Devonian (Givetian) of south-western Ural and, possibly, Middle Devonian (Givetian) of western Germany (Rheinisches Schiefergebirge).

REMARKS.—It is possible, as far as can be observed from the three specimens (1♀, 1♂, and one small tecnomorph) of *P. crassa* examined, that the continuation of the dolon lies immediately on the free margin of the valve where a thin and low ridge is formed. No marginal structure of the usual primitiopsid type can be observed on these specimens which are all closed carapaces. Nothing is said about admarginal structures in the larger German species, ? *P. eifliensis*.

Genus *Viazoviella* n. g.

DERIVATION OF THE NAME.—Feminine diminutive of an adjective *Viazovius*, referring to the Vjazovian beds (Вязовские слои), named after the railway station Vjazovaja, southern Ural.

DIAGNOSIS.—Polenovuline ostracodes with somewhat flattened, smooth carapace, with a faint sulcoid depression in the adductorial region. Dolon forming a closed pouch extending along the posterior and posteroventral parts of the carapace, continued forwards by a sharp bend along the ventral part of each valve near the free margin.

TYPE SPECIES.—*Leperditellina miranda* POLENOVA 1955, the only species known so far (for description and figures, see POLENOVA 1955).

OCCURRENCE. — Vjazovian beds, Middle Devonian (Givetian) of south-western Ural.

REMARKS.—It has not been possible to obtain an exact view of the termination of the pouch forwards (material examined: 2 ♀♀, 2 ♂♂, and one small tecnomorph). In one female specimen the dolon is broken so that the subdolonal field can be observed. A normal marginal structure is evidently present.

Institute of Palaeontology, University of Uppsala, November 6th, 1959.

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ADDENDUM. — During the printing of this paper Dr. H. B. WHITTINGTON, Cambridge, Mass., has kindly placed at the author's disposal information about the type material of the Simpson ostracodes in the Museum of Comparative Zoology at Harvard University and has sent the type specimens deposited there to the author for examination.

The lectotype of *Anisocyamus bassleri* is not, as stated on p. 146 (*vide* AMSDEN, T. W., 1957: Catalog of Middle and Upper Ordovician Fossils. *Okl. Geol. Survey*, Circ. 43, p. 23) registered in the collections of this museum.

It is further evident that not only *Primitiopsis minutiperforata* HARRIS 1957 but also *P. minuta* HARRIS 1957 are primitiopsids. It is impossible to clarify the relationships of these species to the *Anisocyamus* species revised here on the base of these two specimens. In the former species the anterior end of the dolon is bent towards the free margin and is not continued forwards by a velar bend clearly set off from the free margin. The holotype of *P. minuta* has very inconsiderably developed dolonal flanges, but the specimen seems to exhibit the same tendency to asymmetric distribution of the ornamentation as known from *Anisocyamus bassleri* and *A. elegans*.

Explanation of the plates

The specimens were whitened with ammonium chloride before photographing, except those photographed in transmitted light. A slight retouch has been undertaken. All figures magnified 50 ×. Photographs by ANDERS MARTINSSON. Retouch by ERIC STÅHL.

The numbers in the series NA refer to the Museum of the Palaeontological Institute, University of Uppsala. For locality references, see pp. 146 and 147.

The letter symbols to the right of the museum numbers mean:

- ll = left valve, lateral view
- rl = right valve, lateral view
- v = ventral view
- d = dorsal view
- i = internal view
- t = transmitted light

Plate I

Anisocyamus elegans (HARRIS 1957)

Figs. 1–8. Morphology and ornamentation of two right and two left female valves. The left row shows the specimens in incident light, the right row the same specimens in transmitted light.

Plate II

Anisocyamus elegans (HARRIS 1957)

Figs. 1–4. Internal view of the female valves in Plate I, to show the extension of the dolon and the contact conditions of the valves, including the hingement. The muscle spot is very distinct in the left valves, and remains of the marginal structure can be traced at the anterior margin of the specimen in Fig. 1.

Fig. 5. Adult male carapace.

Fig. 6. Tecnomorph in the penultimate moult stage.

Fig. 7. Female carapace in ventral view, showing the extension of the dolon and the marginal structure.

Fig. 8. Tecnomorph in ventral view.

Plate III

Anisocyamus bassleri (HARRIS 1931)

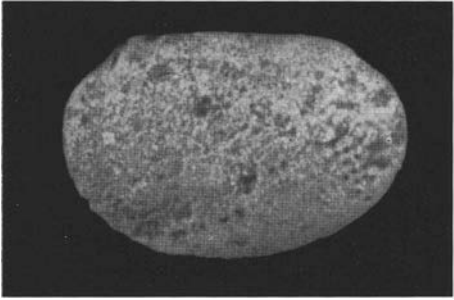
Figs. 1–2. Female carapace.

Figs. 3–4. Male carapace.

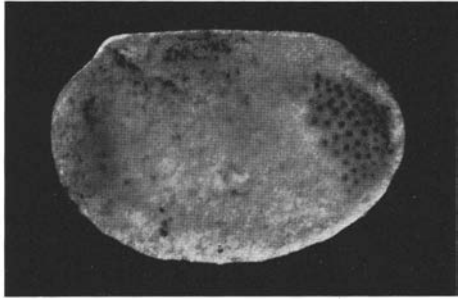
Figs. 5–6. Female carapace.

Figs. 7–8. Male carapace, compressed.

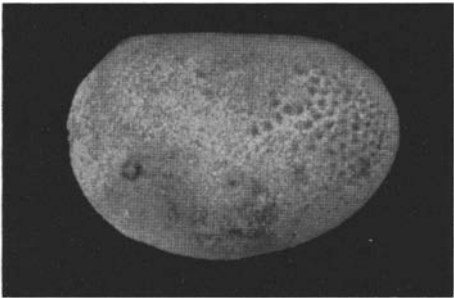
Figs. 9–10. Two right valves in transmitted light showing the complete absence of ornamental structures.



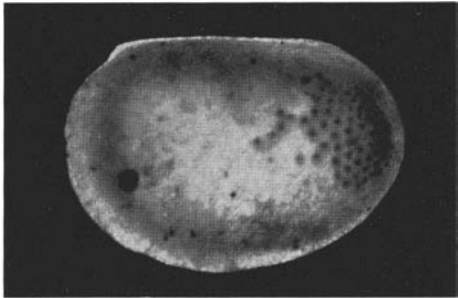
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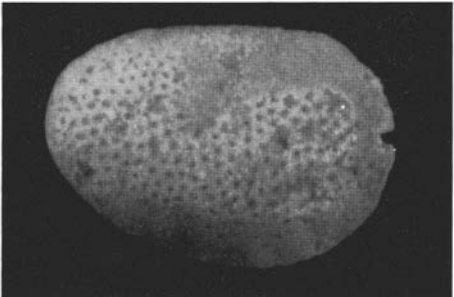
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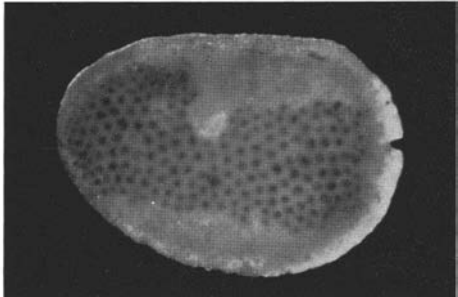
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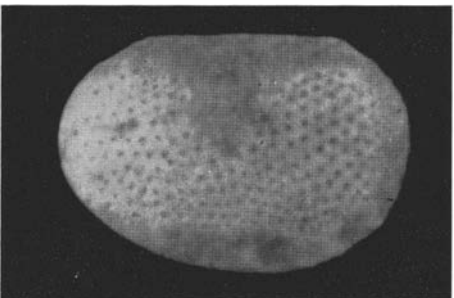
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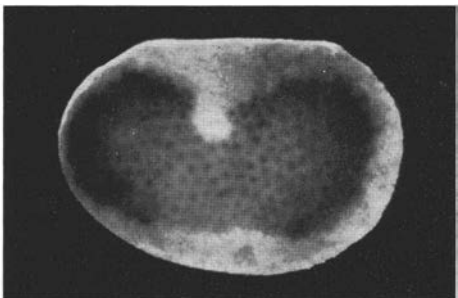
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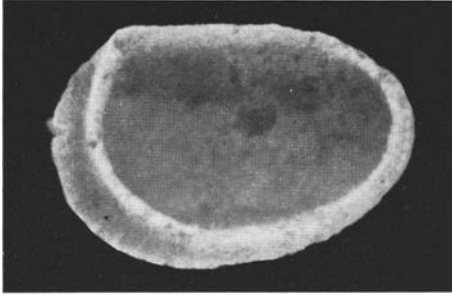
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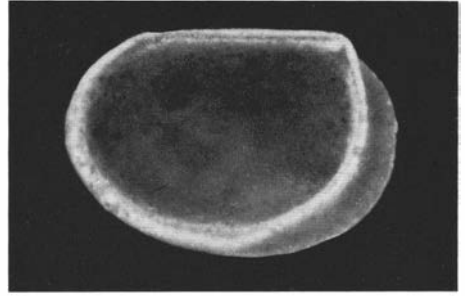
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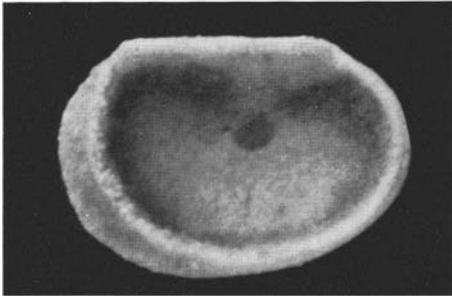
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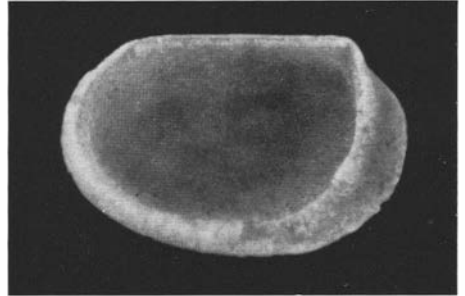
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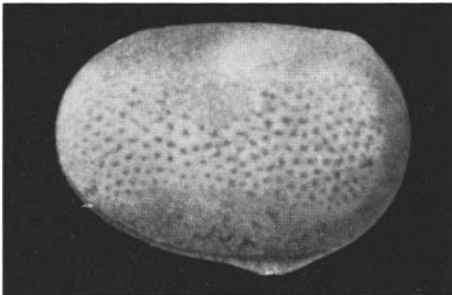
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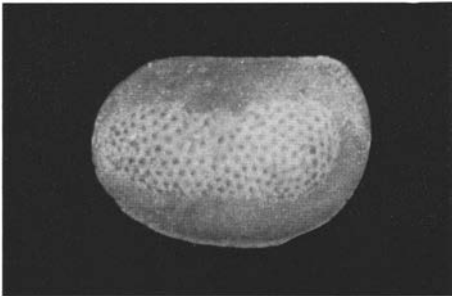
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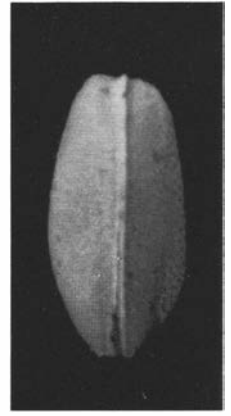
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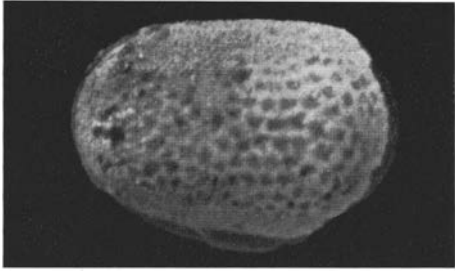
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6 NA 14 ll

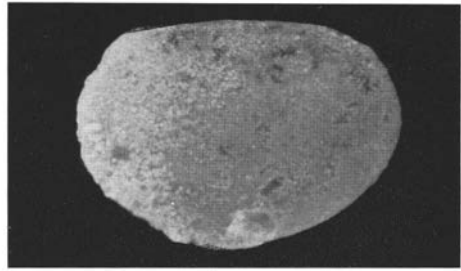


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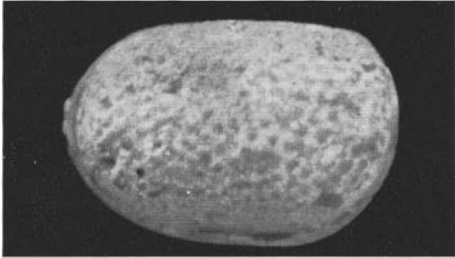


1

NA 3 ll 2

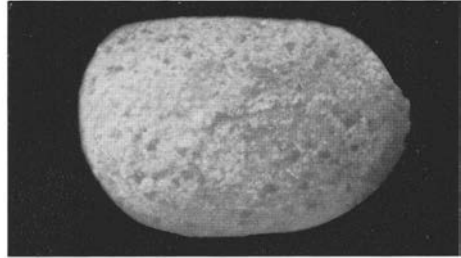


NA 3 rl

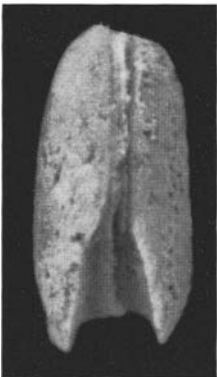


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NA 4 ll 4

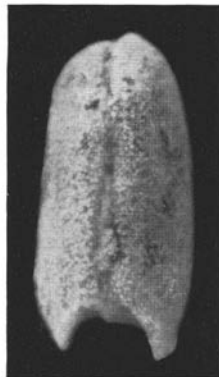


NA 4 rl



5

NA 3 v



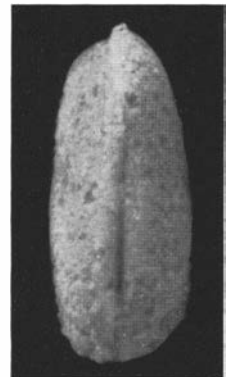
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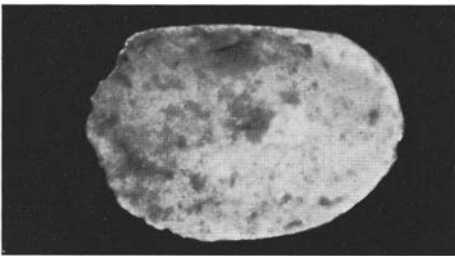
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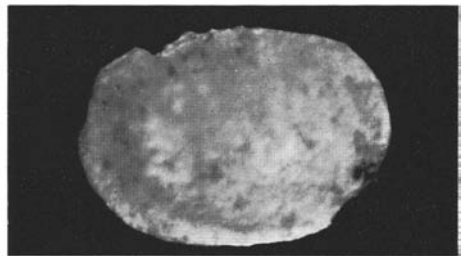
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NA 4 d



9

NA 2 rl t



NA 1 rl t