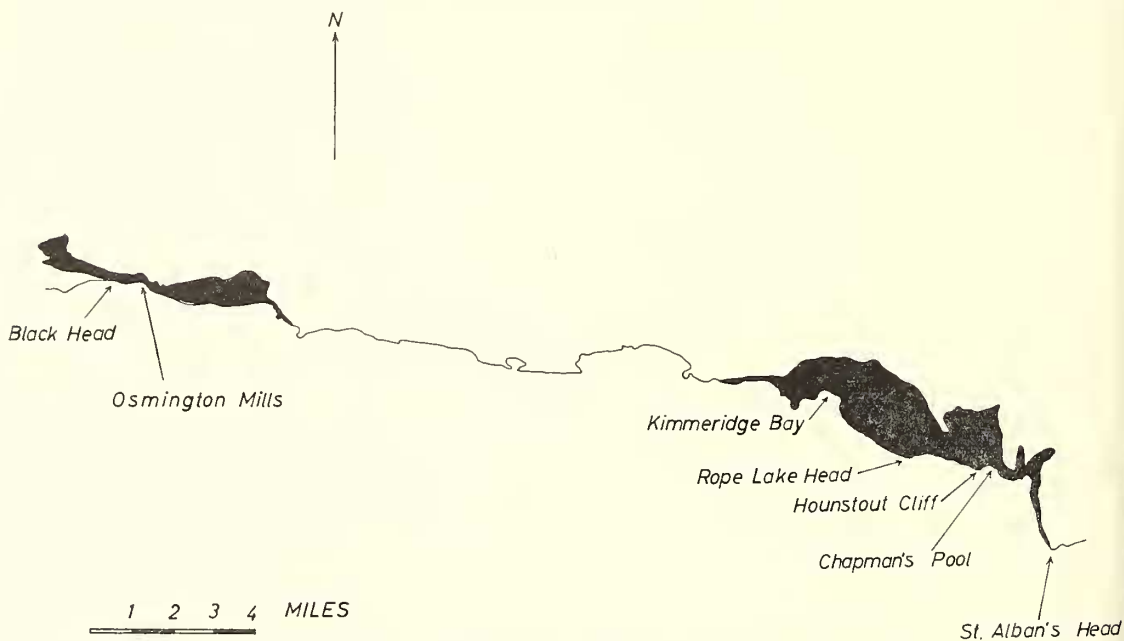


# THE OSTRACODA OF THE DORSET KIMMERIDGE CLAY

by T. I. KILENYI

ABSTRACT. Fifty-nine species of Ostracoda are recorded and figured from the Kimmeridge Clay of Dorset, the type area of the Kimmeridgian Stage. Fifteen new species and one new subspecies are described. The classification of some Jurassic ostracod genera is critically reviewed and the stratigraphical distribution of each recorded species is given.

THE best exposures of the Kimmeridge Clay in Dorset are found in two main areas (text-fig. 1). The most complete section extends from the west side of Kimmeridge Bay to Chapman's Pool, a distance of some 6 miles, exposing a thickness of almost 1,100 ft. (Arkell 1947). At the time of collecting the entire section was accessible except for a



TEXT-FIG. 1. Sketch map of the coast of south-east Dorset to show the outcrop of the Kimmeridge Clay and important localities.

50-ft. gap in the *Rhynchonella* Marls (Rotunda Zone), which was obscured by landslips. The section does not expose, however, the lower part of the Kimmeridge Clay, including the Baylei, and *Cymodoce*, *Mutabilis* Zones and the lower portion of the *Pseudomutabilis* Zone. These are accessible further to the west, between Osmington Mills and Shortlake at a locality referred to in the text as 'Black Head' section. The section here is much disturbed by landslips due to the soft nature of the shales. Arkell (1947) recorded at [Palaeontology, Vol. 12, Part 1, 1969, pp. 112-160, pl. 23-31.]

Black Head about 500 ft. of shales, extending as far up in the succession as the *Pectinatus* Zone. Only 180 ft. of this section was sampled, reaching up to and including the basal 35 ft. of the *Pseudomutabilis* Zone, the rest being obscured by landslips and mudflows.

Altogether 125 samples were collected, 106 from the Kimmeridge Bay—Chapman's Pool section and 19 from the Black Head section. In addition Dr. A. J. Lloyd was kind enough to let me have ten washed samples from the *Grandis*, *Wheatleyensis*, and *Pectinatus* Zones. Samples were collected at 10-ft. intervals, but where an obvious lithological change occurred, an additional sample was taken. In the lowest three Zones the sampling was carried out at much more frequent intervals (text-fig. 2). The stratigraphical horizon of each sample was determined by accurately measuring the vertical distance from the nearest 'stone band' or other well-marked bed (Arkell 1947). About 1,000 g. of each shale sample was washed. Some of the harder shales were extremely difficult to break down and very harsh methods had to be employed. This may be responsible for the almost complete lack of ostracods in the higher *Pseudomutabilis*, *Gigas*, and *Vimineus* Zones.

The ostracod terminology is essentially that adopted in the Treatise, Part Q. Some difficulty arises, however, in applying the hinge terminology, especially in some species of *Amphicythere* where the hinge structure seems to be transitional between the types described as paramphidont and schizodont in the Treatise (text-fig. 6).

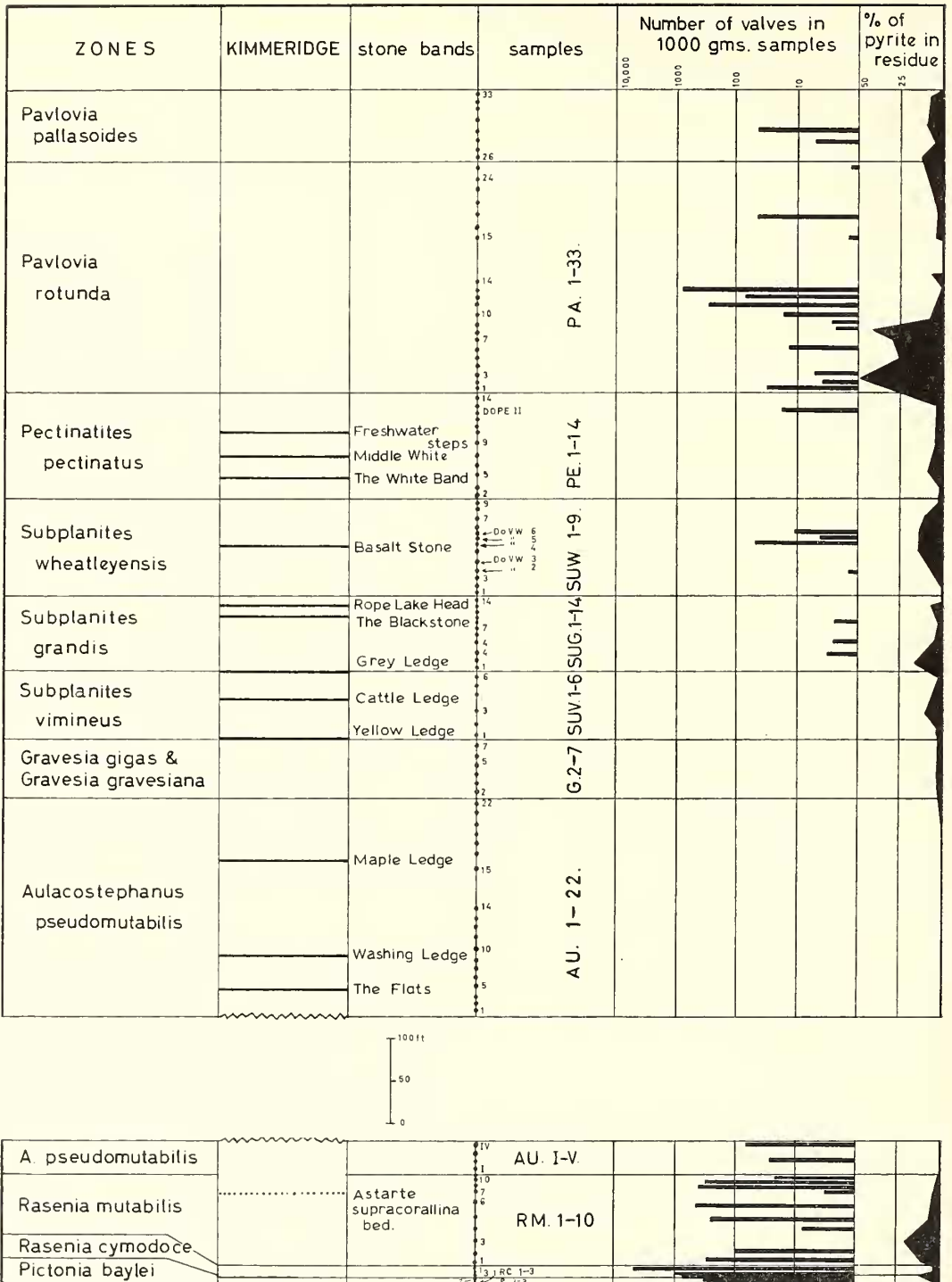
The classification adopted here is basically that of the Treatise but with some significant differences. Species of *Schuleridea* and *Nodophthalmocythere* are placed in the family Schulerideidae (Schulerideinae Mandelstam 1959, raised to family status by Bate 1963). In the writer's opinion this is justified by the distinct, fan-shaped arrangement of the radial pore canals. The Treatise included Protocytherinae Ljubimova 1955 in the family Progonocytheridae Sylvester-Bradley 1948. Bate (1963) raised Protocytherinae to family status and this practice is followed by the writer. *Mandelstamia* is retained in Loxoconchinae Sars 1925 (Neale and Kilenyi 1961; Kaye 1963).

*Acknowledgements.* The author would like to thank Dr. John W. Neale for constant advice and encouragement throughout this study; Mr. L. F. Penny for the use of facilities in the Geology Department, University of Hull; also Dr. F. W. Anderson, Dr. A. J. Lloyd, Dr. H. Malz, Mr. F. P. C. M. van Morkhoven, and Dr. R. C. Whatley, for help received.

*Abbreviations.* The sample numbers are prefixed by letters referring to the ammonite zones according to the following code: P. = *Pictonia baylei*; RC. = *Rasenia cymodoce*; RM. = *R. mutabilis*; AU. = *Aulacostephanus pseudomutabilis*; G. = *Gravesia gigas*; SUV. = *Subplanites vimineus*; SUG. = *S. grandis*; SUW. = *S. wheatleyensis*; PE. = *Pectinatites pectinatus*; PA. = *Pavlovia rotunda* and *P. pallasoides* Zones. The letters DO. preceding the codes refer to samples received from Dr. A. J. Lloyd.

In giving the dimensions of ostracod valves the following abbreviations are used throughout the text: *L*, length; *H*, height; *W*, width; *M/a*, width of anterior margin. Dimensions are given in millimetres, and are averages except in the case of numbered specimens.

*Repository.* All figured and described specimens are stored in the Geology Department, University of Hull. Specimen numbers are indicated by the prefix HU.



TEXT-FIG. 2. Zonal classification of the Kimmeridge Clay (as in Arkell 1956) and the distribution of samples throughout the section.

## SYSTEMATIC DESCRIPTIONS

Subclass OSTRACODA Latreille 1806

Order PODOCOPIDA Müller 1894

Suborder PLATYCOPIA Sars 1866

Genus CYTHERELLA Jones 1849

*Cytherella recta* Sharapova 1939

Plate 23, figs. 1-5

1939 *Cytherella ovalis* Terquem var. *recta* Sharapova, p. 34, pl. 4, figs. 45, 46 (♂).1955 *Cytherella recta* Sharapova; Ljubimova, p. 105, pl. 12, figs. 3a, b (♂).1955 *Cytherella ukraiensis* Ljubimova, p. 106, pl. 12, figs. 6a, b (♀).*Material.* 15 valves and carapaces. HU 2.J.2.1-15.*Dimensions (mm.).*

	<i>L</i>	<i>H</i>	<i>W</i>
♀ Left valve	0.68-0.70	0.35	0.13
♀ Right valve	0.69-0.70	0.43-0.44	0.14
♂ Left valve	0.68	0.36	0.12
♂ Right valve	0.69	0.38	0.12

*Occurrence.* Baylei and Cymodoce Zones, P. 1, RC. 3.

*Diagnosis.* Large, sub-rectangular carapace with equally rounded anterior and posterior ends. Right valve higher than left, overlapping it strongly ventrally and dorsally. Dorsal margin straight, ventral slightly concave in middle. Sexual dimorphism strong.

*Remarks.* In the recent literature on Mesozoic ostracods a large number of species of *Cytherella* have been described based on slight differences in the outline of the carapace. In the author's opinion a critical study would drastically reduce the number of species, but at present only a few, obvious examples are included in the synonymy.

Genus CYTHERELLOIDEA Alexander 1929

*Cytherelloidea weberi* Steghaus 1951

Plate 23, figs. 6, 7

1951 *Cytherelloidea weberi* Steghaus, p. 207, pl. 14, figs. 4-6, *non* figs. 3, 5.1955 *Cytherelloidea weberi* Steghaus; Schmidt, p. 51.1957 *Cytherelloidea weberi* Steghaus; Oertli, p. 650, pl. 1, fig. 11.1959 *Cytherelloidea weberi* Steghaus; Oertli, p. 17, pl. 2, figs. 28, 29.1960 *Cytherelloidea weberi* Steghaus, var. *reticulata* Donze, pp. 10, 11, pl. 1, figs. 3-6.1962 *Cytherelloidea weberi* Steghaus; Klinger, Malz, and Martin, p. 168, pl. 25, fig. 21.1964 *Cytherelloidea weberi* Steghaus; Glasshof, p. 52.*Material.* 1 carapace. HU 2.J.4.1-2.*Dimensions (mm.).*

	<i>L</i>	<i>H</i>
Left valve	0.65	0.34
Right valve	0.69	0.37

*Occurrence.* Mutabilis Zone, RM. 6.

*Diagnosis.* Carapace quadrangular. Each valve has peripheral ridge which runs parallel with edge of valve, equidistant from margin. Ridge may be interrupted antero-dorsally. On posterior part of both valves two rounded 'swellings' occur in vertical superposition.

Median rib branches out from upper one, descends to middle of valve, where it turns to run parallel with dorsal margin.

*Remarks.* The above diagnosis is based on the carapace found in the Dorset material. Oertli (1957, p. 650) does not mention the posterior 'swelling', while Steghaus (1951, pp. 207, 208) describes one.

*Cytherelloidea paraweberi* Oertli 1957

Plate 23, figs. 8, 9; text-fig. 5a

- 1951 *Cytherelloidea weberi* (*pars*) Steghaus, p. 207, pl. 14, figs. 3, 5, *non* figs. 4, 6.  
 1955 *Cytherelloidea weberi* Steghaus (*pars?*); Schmidt, p. 51.  
 1957 *Cytherelloidea paraweberi* Oertli, p. 651, pl. 1, figs. 12–15.  
 1959 *Cytherelloidea paraweberi* Oertli; Oertli, p. 18, pl. 2, figs. 26, 27.  
 1964 *Cytherelloidea paraweberi* Oertli; Glasshof, p. 52.  
 1966 *Cytherelloidea paraweberi* Oertli; Barker, p. 457, pl. 3, figs. 7–9; p. 485, pl. 9, figs. 1, 2.

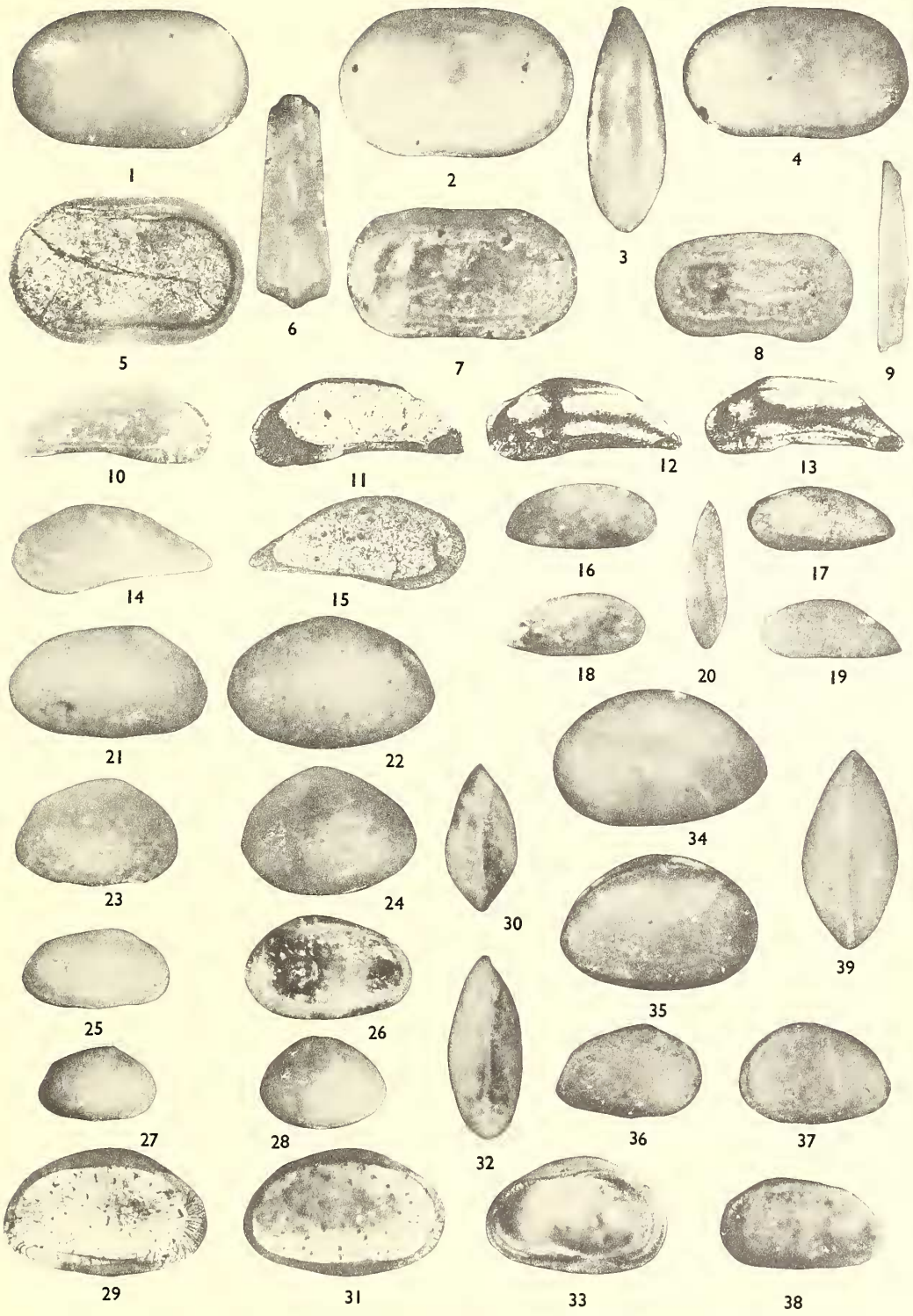
*Material.* 2 valves. HU 2.J.5.1–2.

<i>Dimensions</i> (mm.).	<i>L</i>	<i>H</i>	<i>W</i>
Right valve	0.57	0.28	0.09

EXPLANATION OF PLATE 23

All figures  $\times 50$ .

- Figs. 1–5. *Cytherella recta* Sharapova, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 1, Right valve, male, external view, HU 2.J.2.1. 2, Right valve, female, external view, HU 2.J.2.6. 3, Carapace, male, dorsal view, HU 2.J.2.9–10. 4, Left valve, male, external view, HU 2.J.2.5. 5, Right valve, female, transmitted light, HU 2.J.2.6.
- Figs. 6, 7. *Cytherelloidea weberi* Steghaus, Mutabilis Zone, RM. 6, Lower Kimmeridgian. 6, Carapace, dorsal view. 7, Carapace, left side, external view, HU 2.J.4.1.
- Figs. 8, 9. *Cytherelloidea paraweberi* Oertli, Mutabilis Zone, RM. 9, Lower Kimmeridgian. 8, Right valve, external view. 9, Right valve, dorsal view, HU 2.J.5.1.
- Figs. 10–13. *Paracypris* sp. C. Oertli, Baylei Zone, P. 1, Lower Kimmeridgian. 10, Right valve, external view, HU 2.J.6.1. 11, Right valve, internal view, transmitted light, HU 2.J.6.1. 12–13, Right valve, internal view, polarized light, HU 2.J.6.1.
- Figs. 14, 15. *Paracypris* sp. 1, Rotunda Zone, PA. 1, Upper Kimmeridgian. 14, Left valve, external view, HU 2.J.8.1. 15, Left valve, internal view, transmitted light, HU 2.J.8.1.
- Figs. 16–20. ? *Paracypris problematica* sp. nov., Rotunda Zone, PA. 21, Upper Kimmeridgian. 16, Right valve, female, external view, HU 2.J.7.2. 17, Left valve, female, external view, holotype, HU 2.J.1.1. 18, Right valve, male, external view, HU 2.J.7.3. 19, Left valve, male, external view, HU 2.J.7.4. 20, Carapace, male, dorsal view, HU 2.J.7.5–6.
- Figs. 21–33. *Schuleridea triebeli* (Steghaus), Baylei Zone, P. 2, Lower Kimmeridgian. 21, Right valve, male, external view, HU 2.J.9.1. 22, Left valve, male, external view, HU 2.J.9.2. 23, Right valve, female, external view, HU 2.J.9.7. 24, Left valve, female, external view, HU 2.J.1.32. 25, Right valve, juvenile male, external view, HU 2.J.9.13. 26, Left valve, juvenile male, external view, HU 2.J.9.12. 27, Right valve, juvenile female, external view, HU 2.J.9.15. 28, Left valve, juvenile female, external view, HU 2.J.9.16. 29, Left valve, male, with broad duplicature, transmitted light, HU 2.J.9.18. 30, Carapace, female, dorsal view, HU 2.J.9.20–21. 31, Left valve, male, with narrow duplicature, HU 2.J.9.26. 32, Carapace, male, dorsal view, HU 2.J.9.22–23. 33, Left valve, male, internal view, HU 2.J.9.17.
- Figs. 34, 35, 39. *Schuleridea* sp. 1, Wheatleyensis Zone, DO VW. 6, Middle Kimmeridgian. 34, Carapace, left side, external view, HU 2.J.1.2. 35, Carapace, right side, external view, HU 2.J.1.2. 39, Carapace, dorsal view, HU 2.J.1.2.
- Figs. 36, 38. ? *Schuleridea* sp. 1, Wheatleyensis Zone, DO VW. 4, Middle Kimmeridgian. 36, Right valve, female, external view, HU 3.J.1.5. 37, Left valve, female, external view, HU 3.J.1.4. 38, Left valve, male, external view, HU 3.J.1.7.



KILENYI, Kimmeridge Clay ostracods



*Occurrence.* Mutabilis Zone, RM. 9.

*Diagnosis.* Similar to *Cytherelloidea weberi* except for peripheral ridge, which is continuous. Median rib curved.

*Remarks.* Oertli separated *C. paraweberi* from *C. weberi* on the basis of the presence of a continuous peripheral ridge. Equally diagnostic, it seems, are the lack of posterior 'swellings' in *C. paraweberi* and different dorsal silhouette.

Suborder PODOCOPINA Sars 1866  
Superfamily CYPRIDACEA Baird 1845  
Family PARACYPRIDIDAE Sars 1923  
Genus PARACYPRIS Sars 1866  
*Paracypris* sp. C, Oertli 1957

Plate 23, figs. 10–13; text-fig. 5b

1957 *Paracypris* sp. C, Oertli, p. 653, pl. 1, fig. 24.

*Material.* 1 broken right valve. HU 2.J.6.1.

*Dimensions (mm.).* L: 0.60; H: 0.24.

*Occurrence.* Baylei Zone, P. 1.

*Paracypris* sp. 1

Plate 23, figs. 14, 15

*Material.* 2 left valves. HU 2.J.8.1–2.

*Dimensions (mm.).* L: 0.58; H: 0.26.

*Occurrence.* Base of Rotunda Zone, PA. 1.

*Description.* Left valve elongated, greatest height near anterior end. Dorsal margin strongly convex, ventral slightly concave. Posterior end terminates in sharp point.

Marginal areas relatively narrow, posterior duplicature slightly wider than anterior. Inner margin and line of concrescence seem to coincide. Radial pore canals straight, simple, numerous. Muscle scar pattern not seen.

? *Paracypris problematica* sp. nov.

Plate 23, figs. 16–20; text-fig. 5c

*Holotype.* A female left valve, HU 2.J.1.1.

*Paratypes.* 23 valves, HU 2.J.7.2–24.

*Type locality and horizon.* Hounstout Cliff, Kimmeridge, Dorset. Rotunda Zone, Upper Kimmeridgian.

*Dimensions (mm.).*

	L	H	W
♀ Left valve (holotype)	0.45	0.19	0.05
♀ Right valve	0.44	0.18	0.04
♂ Left valve	0.44	0.17	0.05
♂ Right valve	0.42	0.17	0.05

*Occurrence.* Rotunda Zone, PA. 21.

*Diagnosis.* Shape elongated, with pointed posterior end. Marginal areas extremely narrow. Seven irregularly spaced muscle scars. Strong sexual dimorphism.



*Description.* Shell minute, anterior end rounded, posterior pointed. Dorsal margin strongly convex, ventral straight. Left valve slightly larger than right, overlapping it dorsally and ventrally. Valve surface smooth.

Marginal areas narrow, line of concrescence and inner margin seem to coincide. Number and nature of radial pore canals not seen. No hinge structure observed. Muscle scar pattern consists of 7 irregularly spaced scars, 6 together in two groups of three and 1 anterior. Sexual dimorphism strong; presumed female valves much higher posteriorly.

*Remarks.* The generic position of this species is doubtful. In shape it is closest to *Paracypris*, but it differs in the narrower marginal areas and the slightly different muscle scar pattern. The genus *Pontocypris* has a similar shape and relatively narrow marginal areas, but the muscle scars are definitely different, and in the case of *Pontocypris* always constant. *Macrocypris* has a wide anterior margin with a broad inner lamella.

Superfamily CYTHERACEA Baird 1850  
Family SCHULERIDEIDAE Mandelstam 1959  
Subfamily SCHULERIDEINAE Mandelstam 1959  
Genus SCHULERIDEA Swartz and Swain 1946  
*Schuleridea triebeli* (Steghaus 1951)

Plate 23, figs. 21–33

- 1951 *Haplocytheridea triebeli* Steghaus, p. 214, pl. 15, figs. 27–29.  
1955 *Haplocytheridea triebeli* Steghaus; Schmidt, p. 58, pl. 4, fig. 4; pl. 5, fig. 2.  
1957 *Schuleridea triebeli* (Steghaus); Oertli, p. 654, pl. 1, figs. 25–29.  
1958 *Schuleridea triebeli* (Steghaus); Bizon, p. 23, pl. 5, figs. 4–6.  
1959 *Schuleridea triebeli* (Steghaus); Oertli, p. 25, pl. 3, figs. 87, 88.  
1960 *Schuleridea* cf. *triebeli* (Steghaus); Lutze, p. 433, pl. 37, fig. 9.  
1964 *Schuleridea triebeli* (Steghaus); Glasshof, pp. 40, 41.

*Material.* 585 valves and carapaces. HU 2.J.1.32, HU 2.J.9.1–584.

<i>Dimensions</i> (mm.).	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.42–0.50	0.31–0.37	0.14	0.05
♀ Right valve	0.44–0.46	0.30–0.31	0.10	0.05
♂ Left valve	0.49–0.62	0.31–0.37	0.13	0.05
♂ Right valve	0.45–0.62	0.25–0.26	0.13	0.05

*Occurrence.* Baylei, Cymodoce, and Mutabilis Zones, P. 1, 2, RC. 1–3, RM. 7, 9.

*Diagnosis.* Species of *Schuleridea* with very strong sexual dimorphism. Female carapace with ovoid outline, tapering towards posterior, males elongated. Faint depression in ocular region. Peripheral sulcus developed along anterior and posterior border. Overlap of left valve very pronounced, especially in females.

*Remarks.* This is an extremely common species in the Upper Jurassic of western Europe, ranging from the Mariae Zone (Lower Oxfordian) to the top of the Mutabilis Zone (Lower Kimmeridgian). There seems to be a considerable variation in the forms described from the various localities, especially in size and degree of sexual dimorphism. The median element of the hinge has been described as smooth or finely denticulate; the Dorset specimens seem to belong to the latter type. An unusual phenomenon was

observed in a large population of *S. triebeli* from the Lower Kimmeridgian; the width of the duplicature was reduced by half in some specimens which in all other respects conformed to the type. This is certainly not a variation as it is observed in the final instar only, in both males and females.

*Schuleridea* sp. 1

Plate 23, figs. 34–39

*Material.* 30 valves and carapaces. HU 2.J.1.2, HU 3.J.1.2–30.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Carapace	0.60–0.65	0.40–0.42	0.30
? Juvenile forms			
♀ (?) Left valve	0.45–0.48	0.30	0.12–0.14
♀ (?) Right valve	0.45	0.26	0.11–0.12
♂ (?) Left valve	0.49	0.27	0.11

*Occurrence.* The larger, closed carapaces occur in DO VW. 6, the smaller valves in DO VW. 4, Wheatleyensis Zone.

*Description.* Carapace ovoid, well rounded, without marked cardinal angles. Left valve larger than right, overlapping it along dorsal and ventral margins. Contours of both valves similar, right valve being slightly less high. Only closed carapaces found.

From slightly lower horizon similar, but smaller, forms were found, which may represent earlier instar. These specimens have rather more angular appearance, and since found as separate valves, characteristic hinge and duplicature of *Schuleridea* could be observed. These smaller valves show sexual dimorphism, a feature not definitely established in larger, closed carapaces. Smaller forms therefore included only tentatively in *Schuleridea* sp. 1.

*Remarks.* This form is close to *S. triebeli* but differs from it in the far less pronounced overlap of the left valve and the outline of the right valve; the state of preservation does not allow the establishment of a new species.

? *Schuleridea* sp. 2

Plate 24, fig. 1

*Material.* 1 right valve. HU 2.J.10.1.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Right valve	0.62	0.37	0.16	0.05

*Occurrence.* Top of Pectinatus Zone, DO PE. 11.

*Description.* In side view valve ovoid, slightly triangular, with rounded anterior, straight dorsal and ventral margins. Posterior end more angular. Greatest height at prominent anterior cardinal angle.

Surface finely punctate, and normal pore canals plainly visible. Inner margin and line of concrescence coincide. About 25–30 anterior radial pore canals occur, arranged in shape of fan. Hinge structure (owing to poor preservation) not seen clearly, but gives impression that all positive hinge elements are in right valve.

*Remarks.* The number and arrangement of the radial pore canals are typical of *Schuleridea*. The hinge structure would give the decisive identification.

## Genus NODOPHTHALMOCYTHERE Malz 1958

*Nodophthalmocythere tripartita* Malz 1958

Plate 24, figs. 2-7

1958a *Nodophthalmocythere tripartita* Malz, pp. 125, 126, pl. 1, figs. 1-8; pl. 3, figs. 25, 26.

Material. 24 valves and carapaces. HU 2.J.11.1-24.

Dimensions (mm.).

	L	H	W
♀ Left valve	0.48	0.31	0.12
♀ Right valve	0.47	0.28	0.12
♂ Left valve	0.54	0.30	0.13
♂ Right valve	0.54	0.28	0.13

Occurrence. Mutabilis Zone, RM. 6.

*Diagnosis.* Species of *Nodophthalmocythere* with upside down T-shaped median sulcus. Two bulges in front and behind sulcus, and long one underneath. Eye tubercles developed. Sexual dimorphism pronounced.

*Remarks.* This species was first described by Malz (1958a) from the Pseudomutabilis Zone of the Black Head section, and he mentioned that it occurred with *Exophthalmocythere fuhrbergensis* Steghaus. *N. tripartita* is here recorded with *E. fuhrbergensis*, from the middle of the Mutabilis Zone but no trace of it has been found in the Pseudomutabilis Zone. It is very likely, therefore, that Malz's horizon and locality corresponds with the writer's and not to the Pseudomutabilis Zone as first suggested.

Family CYTHERIDEIDAE Sars 1925

Subfamily CYTHERIDEINAE Sars 1925

Genus GALLIAECYTHERIDEA Oertli 1957

*Galliaecytheridea dissimilis* Oertli 1957

Plate 24, figs. 8-20; text-figs. 3a, 5d

## EXPLANATION OF PLATE 24

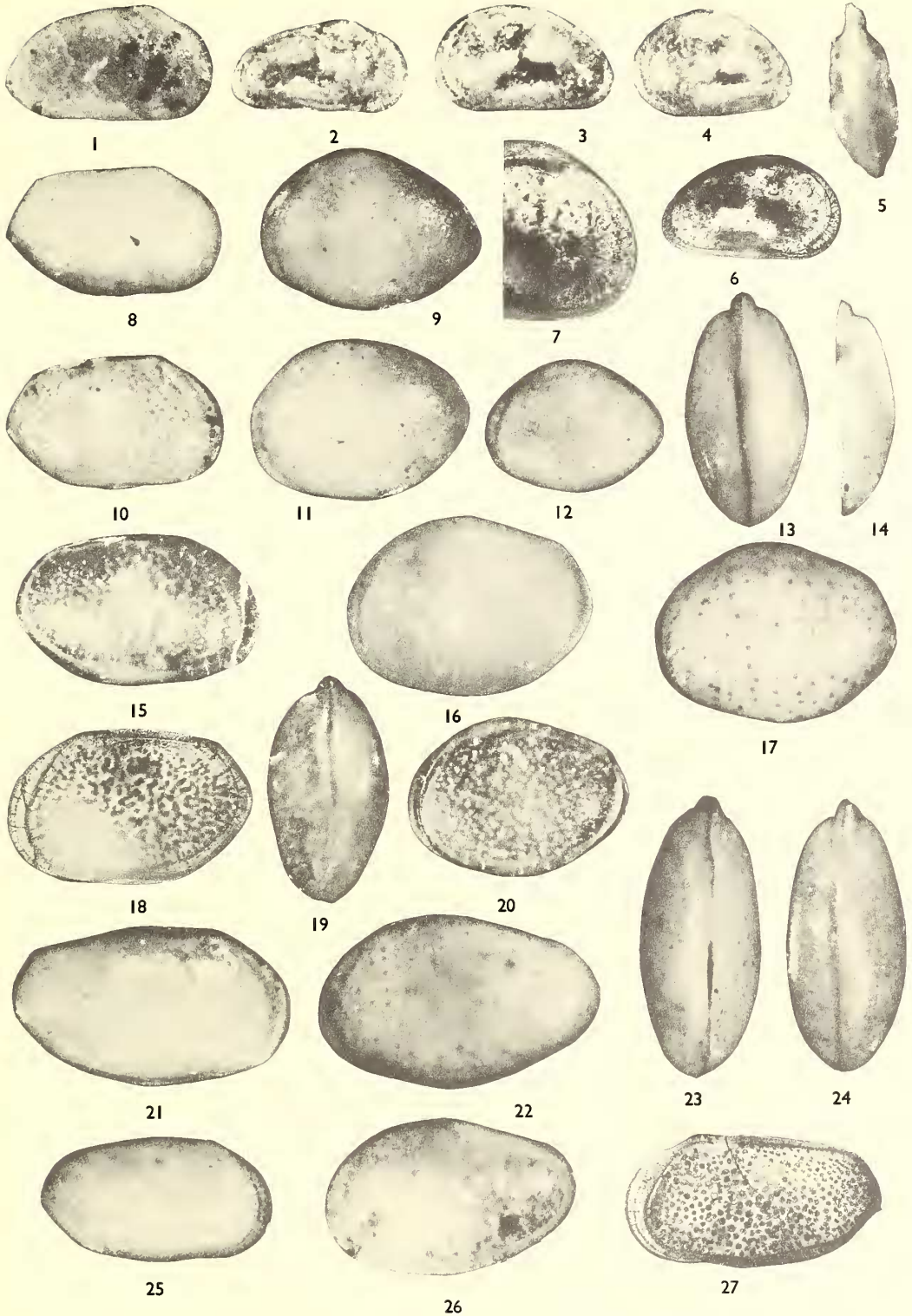
All figures  $\times 50$ , unless otherwise stated.Fig. 1. ? *Schmuleridea* sp. 2, Pectinatus Zone, DO PE. 11, Upper Kimmeridgian. Right valve, external view, HU 2.J.10.1.

Figs. 2-7. *Nodophthalmocythere tripartita* Malz, Mutabilis Zone, RM. 6, Lower Kimmeridgian. 2, Right valve, male, external view, HU 2.J.11.1. 3, Left valve, male, external view, HU 2.J.11.2. 4, Left valve, female, external view, HU 2.J.11.4. 5, Carapace, male, dorsal view, HU 2.J.11.5. 6, Left valve, male, internal view, transmitted light, HU 2.J.11.9. 7, Left valve, male, anterior margin, transmitted light, HU 2.J.11.2,  $\times 85$ .

Figs. 8-14. *Galliaecytheridea dissimilis* Oertli, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 8, Right valve, male, external view, HU 2.J.12.1. 9, Left valve, male, external view, HU 2.J.12.2. 10, Right valve, female, external view, HU 2.J.12.6. 11, Left valve, female, external view, HU 2.J.12.4. 12, Left valve, juvenile, external view, HU 2.J.12.5. 13, Carapace, female, ventral view, HU 2.J.12.10-11. 14, Right valve, female, dorsal view, HU 2.J.12.12.

Figs. 15-20. *Galliaecytheridea dissimilis* Oertli, Pseudomutabilis Zone, AU. II, Lower Kimmeridgian. 15, Right valve, ? female, external view, HU 3.J.2.2. 16, Left valve, ? female, external view, HU 2.J.1.3. 17, Left valve, ? male, external view, HU 3.J.2.4. 18, Right valve, ? female, internal view, transmitted light, HU 3.J.2.2. 19, Carapace, ? female, ventral view, HU 3.J.2.7-8. 20, Left valve, juvenile, external view, HU 3.J.2.3.

Figs. 21-27. *Galliaecytheridea wolburgi* (Steghaus), Mutabilis Zone, RM. 1, Lower Kimmeridgian. 21, Right valve, external view, HU 2.J.13.1. 22, Left valve, external view, HU 2.J.13.2. 23, Carapace, dorsal view, HU 2.J.13.8-9. 24, Carapace, ventral view, HU 2.J.13.8-9. 25, Right valve, juvenile, external view, HU 2.J.13.5. 26, Left valve, juvenile, external view, HU 2.J.13.3. 27, Right valve, juvenile, internal view, transmitted light, HU 2.J.13.5.



KILENYI, Kimmeridge Clay ostracods



1957 *Galliaecytheridea dissimilis* Oertli, p. 655, pl. 1, figs. 32-9; pl. 2, figs. 40-44.

1964 *Galliaecytheridea dissimilis* Oertli; Glasshof, pl. 4, figs. 8-11.

*Material.* 1,396 valves and carapaces. HU 2.J.12.1-1,387, HU 3.J.1-9.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.64-0.73	0.45-0.52	0.20	0.06
♀ Right valve	0.63-0.71	0.36-0.40	0.16	0.07
♂ Left valve	0.67	0.46	0.21	
♂ Right valve	0.64	0.39	0.16	

*Occurrence.* Baylei, Cymodoce, Mutabilis, and Pseudomutabilis Zones, P. 1, RM. 2, RC. 1-3, AU. II.

*Diagnosis.* Left valve much larger than right and more rounded in side view. Dorsal margin of left valve strongly convex, of right valve straight. Right valve posterior end pointed. Surface smooth or finely punctate. Radial pore canals straight, simple, and few. Sexual dimorphism occurs.

*Remarks.* The Dorset specimens are appreciably larger than the specimens described by Oertli (1957) from the Paris basin, but sexual dimorphism is less prominent.

### *Galliaecytheridea wolburgi* (Steghaus 1951)

Plate 24, figs. 21-27; text-figs. 3e, 5e

1951 *Cyprideis wolburgi* Steghaus, p. 213, pl. 14, figs. 24, 25; pl. 15, fig. 26.

1955 *Cyprideis wolburgi wolburgi* Steghaus; Schmidt, p. 58, pl. 2, figs. 25, 26.

1955 *Cyprideis wolburgi minuta* Schmidt, p. 58, pl. 2, figs. 27-30.

1957 *Galliaecytheridea wolburgi* (Steghaus); Oertli, p. 657, pl. 2, figs. 56-60; pl. 3, figs. 61-68.

1959 *Galliaecytheridea wolburgi* (Steghaus); Oertli, p. 14.

1964 *Galliaecytheridea wolburgi* (Steghaus); Glasshof, p. 39, pl. 4, figs. 1-3.

1966a *Galliaecytheridea wolburgi* (Steghaus); Barker, p. 450, pl. 2, figs. 1-8.

*Material.* 347 valves and carapaces. HU 2.J.13.1-347.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.75	0.50	0.18	0.08
Right valve	0.74	0.40	0.16	0.06

*Occurrence.* Baylei, Cymodoce, and Mutabilis Zones, P. 2, RC. 1-3, RM. 1, 2, 5, 9, 10.

*Diagnosis.* Carapace elongate, tapering posteriorly. Posterior cardinal angle about 45°. Posterior end angular. Left valve overlapping dorsally and ventrally.

*Remarks.* Sexual dimorphism was not observed in the Dorset material.

### *Galliaecytheridea punctata* sp. nov.

Plate 25, figs. 1-4; text-fig. 3c

*Holotype.* A left valve. HU 2.J.1.4.

*Paratypes.* 342 valves and carapaces. HU 3.J.3.1-342.

*Type locality and horizon.* Black Head, Dorset. Cymodoce Zone, Lower Kimmeridgian.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.63	0.42	0.14	0.06
Left valve	0.55-0.64	0.39-0.42	0.14	0.06
Right valve	0.54-0.61	0.34-0.35	0.13	0.05

*Occurrence.* Pictonia and Cymodoce Zones, P. 1, 2, RC. 1, 3.

*Diagnosis.* Species of *Galliaecytheridea* with ovoid shape, tapering strongly towards posterior. Dorsal margin straight on both valves. Surface ornamented with small pits. Radial pore canals straight, widening towards middle. Sexual dimorphism not present.

*Description.* Carapace ovoid, anterior rounded, posterior more angular, both valves taper strongly towards posterior. Left valve much larger than right, overlapping it dorsally and ventrally. Dorsal margin of both valves straight, ventral margin convex, more so in left valve. In dorsal and ventral views carapace elliptical with greatest width in middle. In side view greatest height one-third of length from anterior end. Posterior end of valve often bears 1 or 2 spines.

Inner margin and line of concrescence coincide. Radial pore canals (10–15 anteriorly) straight, widening towards middle. Surface of valve coarsely punctate with ends of normal pore canals.

Hinge robust. Right valve has dentate anterior ridge with 6 strong denticles, smooth median groove and posterior dentate ridge, slightly larger than anterior one. Denticles on anterior element increase in size towards middle, third from front being largest while most posterior one reduced to small rounded knob-like projection. In posterior element size of denticles increases posteriorly. Left valve carries corresponding structure with smooth median bar. Above bar is fairly wide accommodation groove.

Muscle scar pattern shows usual arrangement of 4 vertical scars with 2 anterior ones. Lower 2 scars in vertical row usually bigger.

*Remarks.* *G. punctata* resembles the type species *G. dissimilis* but differs from it in the structure of the hinge (terminal elements), shape of the radial pore canals, and surface ornamentation.

## EXPLANATION OF PLATE 25

All figures  $\times 50$ .

Figs. 1–4. *Galliaecytheridea punctata* sp. nov., Cymodoce Zone, RC. 3, Lower Kimmeridgian.

1, Right valve, external view, HU 3.J.3.2. 2, Left valve, external view, holotype, HU 2.J.1.4.

3, Carapace, dorsal view, HU 3.J.3.6–7. 4, Left valve, external view, HU 3.J.3.3.

Fig. 5. *Galliaecytheridea* sp. 1, Mutabilis Zone, RM. 9, Lower Kimmeridgian, HU 2.J.1.5. Left valve, external view.

Figs. 6–12. *Galliaecytheridea elongata* sp. nov., Mutabilis Zone, RM. 8, Lower Kimmeridgian.

6, Right valve, ? male, external view, HU 3.J.5.2. 7, Left valve, ? female, external view, holotype,

HU 2.J.1.6. 8, Right valve, ? female, external view, HU 3.J.5.3. 9, Left valve, ? male, external view,

HU 3.J.5.4. 10, Carapace, ? male, ventral view, HU 3.J.5.6. 11, Left valve, ? female, internal view,

transmitted light, holotype, HU 2.J.1.6. 12, Right valve, ? male, internal view, transmitted light, HU 3.J.5.2.

Figs. 13–19. *Galliaecytheridea trapezoidalis* sp. nov., Mutabilis Zone, RM. 8, Lower Kimmeridgian.

13, Right valve, female, external view, HU 3.J.7.2. 14, Left valve, female, external view, holotype,

HU 2.J.1.8. 15, Right valve, male, external view, HU 3.J.7.3. 16, Left valve, male, external view,

HU 3.J.7.4. 17, Left valve, female, internal view, holotype, HU 2.J.1.8. 18, Right valve, female,

internal view, HU 3.J.7.2. 19, Carapace, male, dorsal view, HU 3.J.7.11–12.

Figs. 20–22. *Galliaecytheridea malzi* sp. nov., Baylei Zone, P. 1, Lower Kimmeridgian. 20, Right valve,

external view, HU 3.J.6.2. 21, Left valve, external view, holotype, HU 2.J.1.7. 22, Carapace, dorsal

view, HU 3.J.6.9–10.

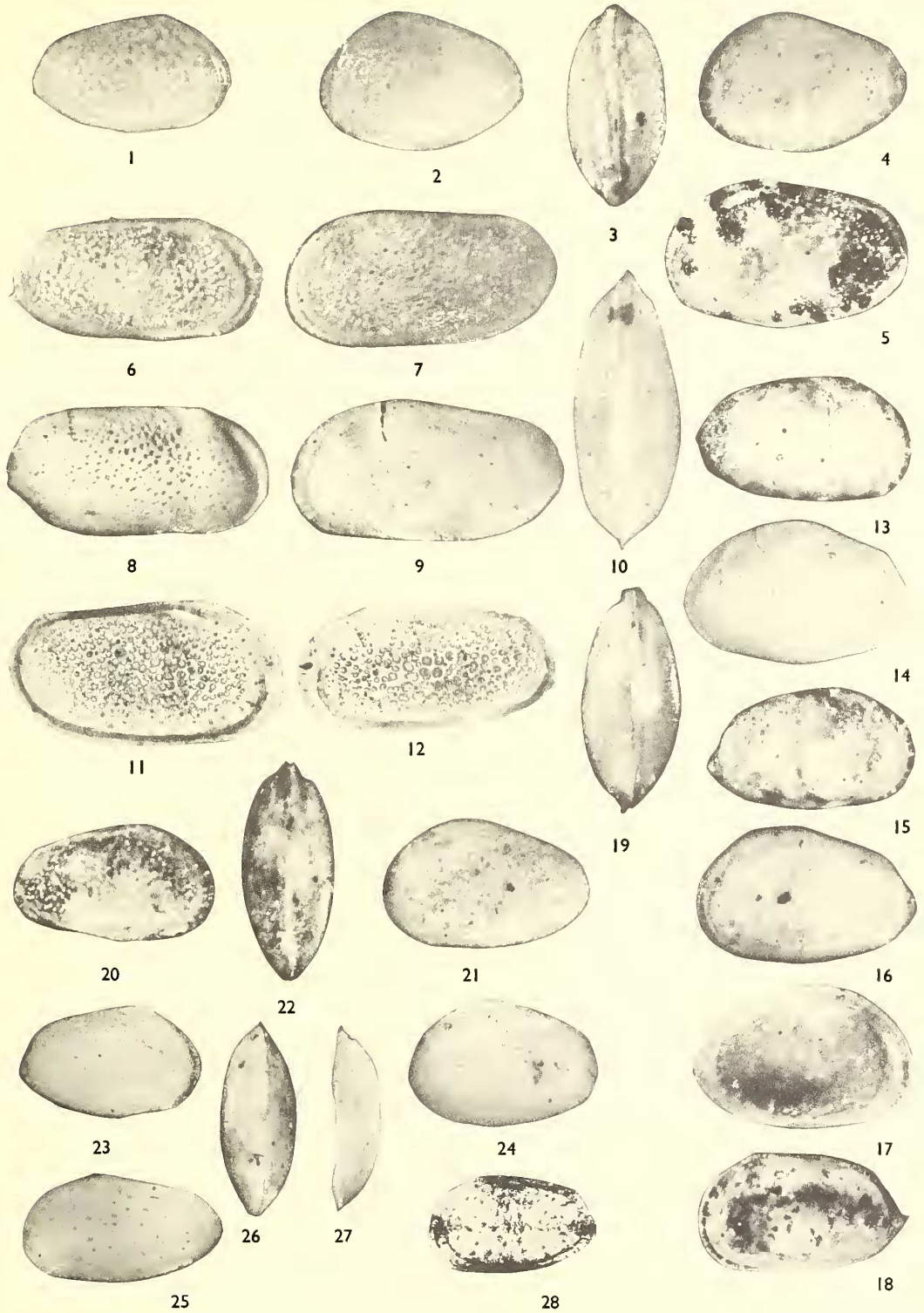
Figs. 23–28. *Galliaecytheridea confundens* sp. nov., Cymodoce Zone, RC. 2, Lower Kimmeridgian.

23, Right valve, female, external view, HU 3.J.8.7. 24, Left valve, female, external view, holotype,

HU 2.J.1.9. 25, Left valve, male, external view, HU 3.J.8.8. 26, Carapace, female, dorsal view,

HU 3.J.8.10–11. 27, Right valve, female, dorsal view, HU 3.J.8.7. 28, Right valve, female, internal

view, transmitted polarized light, HU 3.J.8.7.







*Galliaecytheridea elongata* sp. nov.

Plate 25, figs. 6–12; text-fig. 3i

*Holotype*. A female (?) left valve. HU 2.J.1.6.*Paratypes*. 26 valves and carapaces. HU 3.J.5.1–26.*Type locality and horizon*. Black Head, Dorset. Mutabilis Zone, Lower Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.82	0.43	0.16	0.06
Left valve	0.72–0.82	0.37–0.43	0.11–0.16	
Right valve	0.68–0.79	0.34–0.40	0.10–0.14	

*Occurrence*. Mutabilis Zone, RM. 8.*Diagnosis*. Species of *Galliaecytheridea* with very elongated carapace, dorsal and ventral margins running parallel. Posterior end often bears postero-ventral spine. Left valve overlaps right dorsally and ventrally. Surface finely punctate.*Description*. Carapace very elongated. Left valve larger than right, overlapping it ventrally and dorsally. Carapace elliptical in dorsal view; greatest width at middle. Straight dorsal and ventral margins run parallel. Anterior cardinal angle rounded, posterior prominently angular. Anterior end rounded, posterior ends in blunt angle at mid-height. Postero-ventral spine often present.

Surface smooth or finely punctate, with very numerous normal pore canals, covering surface of valve densely. Slight depression developed in eye region.

Anterior duplicature broad, with strongly developed selvage running at moderate distance from outer margin. Inner margin and line of concrescence coincide. Radial pore canals few, only about 7 or 8, straight, simple. Selvage lip narrow, more prominent on right valve. Often 1 or 2 septae on inner side of duplicature.

Hinge follows usual hemimerodont structure found in *Galliaecytheridea* but very thin. Denticles on anterior and posterior elements of right valve small, rounded, situated on spindle-like, slightly curved ridge. 5 or 6 denticles and corresponding loculi in left valve. Median element of right valve is wide smooth groove, occupying nearly whole width of hinge margin. Bar on left valve slender and straight, accommodation groove above it narrow.

Shell structure characterized by dense system of pits, round or sometimes more angular. Sexual dimorphism doubtful. Some valves relatively higher than others and may be considered females.

*Galliaecytheridea malzi* sp. nov.

Plate 25, figs. 20–22; text-figs. 3h, 5f

*Holotype*. A left valve. HU 2.J.1.7.*Paratypes*. 85 valves and carapaces. HU 3.J.6.22–86.*Type locality and horizon*. Black Head, Dorset. Baylei Zone, Lower Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.63	0.39	0.14	0.05
Left valve	0.61–0.64	0.38–0.42	0.14	0.05
Right valve	0.63	0.39	0.14	0.05

*Occurrence*. Baylei Zone, P. 1.

*Diagnosis.* Carapace tapering posteriorly. Posterior end rounded. Surface finely punctate. Dorsal margin straight, ventral margin slightly convex. Radial pore canals few and thick. Left valve higher than right. Teeth on right valve's hinge very small. Sexual dimorphism not apparent.

*Description.* Carapace ovoid. In dorsal and ventral view carapace elliptical, greatest width around middle. Left valve larger than right, overlap being most prominent ventrally. Dorsal margin straight, ventral margin slightly convex, both margins converging towards posterior end. Posterior cardinal angle marked, anterior rounded. In side view greatest height one-third of length from anterior.

Surface smooth or finely punctate. Normal pore canals clearly visible on surface. Eye depression not developed.

Marginal areas narrow, especially hinge margin. Inner margin and line of concrescence coincide. Radial pore canals straight, simple, relatively broad, about 6–8 anteriorly, 2–3 posteriorly.

Hinge rather delicate, denticles weakly developed on terminal ridges of right valve as 4 or 5 rounded projections. Median groove on same valve smooth, shallow, rather narrow. Median element on left valve smooth, narrow bar. Accommodation groove present but hardly noticeable.

Muscle scar pattern shows oblique row of 4 scars, with 2 more in front. Upper anterior scar larger than others, pear-shaped, pointing downwards.

*Remarks.* This species closely resembles *G. punctata* in many features but is more elongated and its hinge is weakly developed (in contrast to the robust hinge of the latter). Sexual dimorphism was not observed.

*Galliaecytheridea trapezoidalis* sp. nov.

Plate 25, figs. 13–19; text-figs. 3f, 5g

*Holotype.* A female left valve. HU 2.J.1.8.

*Paratypes.* 30 valves and carapaces. HU 3.J.7.1–30.

*Type locality and horizon.* Black Head, Dorset. Upper part of Mutabilis Zone, Lower Kimmeridgian.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve (holotype)	0.70	0.44	0.13	0.05
♀ Right valve	0.68	0.38	0.12	0.06
♂ Left valve	0.66–0.73	0.37–0.44	0.12	
♂ Right valve	0.69	0.36	0.11	

*Occurrence.* Mutabilis Zone RM. 6, 8, 10.

*Diagnosis.* Species of *Galliaecytheridea* with trapezoidal outline. Straight margin between posterior cardinal angle and posterior end. Hinge strongly developed, with prominent teeth in right valve. Sexual dimorphism occurs.

*Description.* Carapace trapezoidal in side view, spindle-shaped in dorsal view. Left valve larger than right, overlapping it ventrally and dorsally. Left valve dorsal margin slightly concave, posterior cardinal angle marked, postero-dorsal margin straight or very slightly concave. Posterior end angular, but rounded at extreme end. Ventral margin convex. Right valve dorsal margin straight, posterior extremity angular, carrying

upward-pointing spine. Sexual dimorphism fairly strong, female carapace being higher and more rounded ventrally. Shell heavy, thick.

Surface of valve smooth. Normal pore canals fairly numerous. Slight depression around ocular region. Marginal areas fairly narrow, except at strongly developed hinge margin. Inner margin and line of concrescence coincide. About 10–12 simple, straight radial pore canals occur on anterior margin.

Hinge in right valve consists of 2 terminal dentate ridges, both spindle-shaped, curved, with 6 strong denticles on each. Anterior element larger than posterior. Median element wide smooth groove, widest in anterior quarter of its length. In left valve median bar narrow at posterior end, widening anteriorly. Same applies to accommodation groove.

Muscle scars follow usual pattern in *Galliaecytheridea*, but 2 anterior scars much bigger than scars of vertical row.

*Galliaecytheridea confundens* sp. nov.

Plate 25, figs. 23–28; text-fig. 3d

*Holotype*. A female left valve. HU 2.J.1.9.

*Paratypes*. 33 valves and carapaces. HU 3.J.8.2–34.

*Type locality and horizon*. Black Head, Dorset. Cymodoce Zone, Lower Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.58	0.37	0.13	0.04
♀ Left valve	0.54–0.58	0.33–0.38	0.13	0.04
♀ Right valve	0.54	0.33	0.12	0.04
♂ Left valve	0.58–0.61	0.31–0.34	0.11	0.04
♂ Right valve	0.52–0.57	0.28–0.31	0.10	0.04

*Occurrence*. From Baylei to Pseudomutabilis Zones, P. 2, RC. 2, 3, RM. 2, AU. II.

*Diagnosis*. Short, rather tumid form. Dorsal margin straight, ventral slightly curved. Posterior end rounded, postero-dorsal margin straight. Surface of valve smooth. Hinge robust, teeth on right valve elevated. Sexual dimorphism pronounced.

*Description*. Carapace ovoid (♀) or elongated (♂). Left valve larger, overlapping right dorsally and ventrally. Anterior end rounded, posterior more or less angular. Dorsal margin straight, ventral slightly convex. Postero-dorsal part of margin straight also, and spine often occurs postero-ventrally.

Surface smooth, ends of normal pore canals very conspicuous. Marginal areas narrow, selvage hardly visible. About 12 radial pore canals, straight, equally spaced.

Hinge robust, strongly developed. Right valve terminal elements are prominent ridges with 5 equally spaced denticles on each. Denticles strong, high. Median groove widens towards middle, where it is exceptionally wide. Terminal elements on left valve equally strongly developed, and median bar bent towards centre of valve. Accommodation groove widest near anterior end.

Sexual dimorphism prominent, males being longer and less high than females.

*Remarks*. Specimens of this species vary considerably and it is not easy to delimit them from similar forms. *G. punctata* is similar in shape but differs markedly in the hinge structure (the median element is straight and narrow in *G. punctata*) and there is also a

great difference in the shape of the radial pore canals. *G. malzi* differs in hinge structure, having a much more delicately built hinge.

*Galliaecytheridea* cf. *mandelstami* (Ljubimova 1955)

Plate 26, figs. 1–9; text-fig. 3g

1955 *Palaeocytheridea mandelstami* Ljubimova, p. 42, pl. 4, figs. 4a, b.

*Material.* 75 valves and carapaces. HU 3.J.9.2–75, HU 2.J.1.10.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.71–0.75	0.43–0.46	0.17–0.19	0.06
Right valve	0.70–0.72	0.38–0.40	0.16–0.18	0.06

*Occurrence.* Middle of Mutabilis Zone, RM. 6.

*Diagnosis.* Carapace high with marked posterior cardinal angle, ending in blunt point. Surface finely punctate. Marginal areas broad. Sexual dimorphism doubtful.

*Description.* Carapace ovoid in side view, elliptical in dorsal view, greatest height and width in middle. Left valve only slightly larger than right, two valves similar in shape. Dorsal margin straight on both valves, ventral margin straight or slightly concave. Marked posterior cardinal angle, postero-dorsal margin straight. Posterior ends in blunt point.

Surface punctate, densely covered with system of small pits, size of which varies, largest concentrated on middle of valve.

Duplicature wide, inner margin and line of concrescence coincide. Radial pore canals straight, simple, few, only 6–8 anteriorly.

EXPLANATION OF PLATE 26

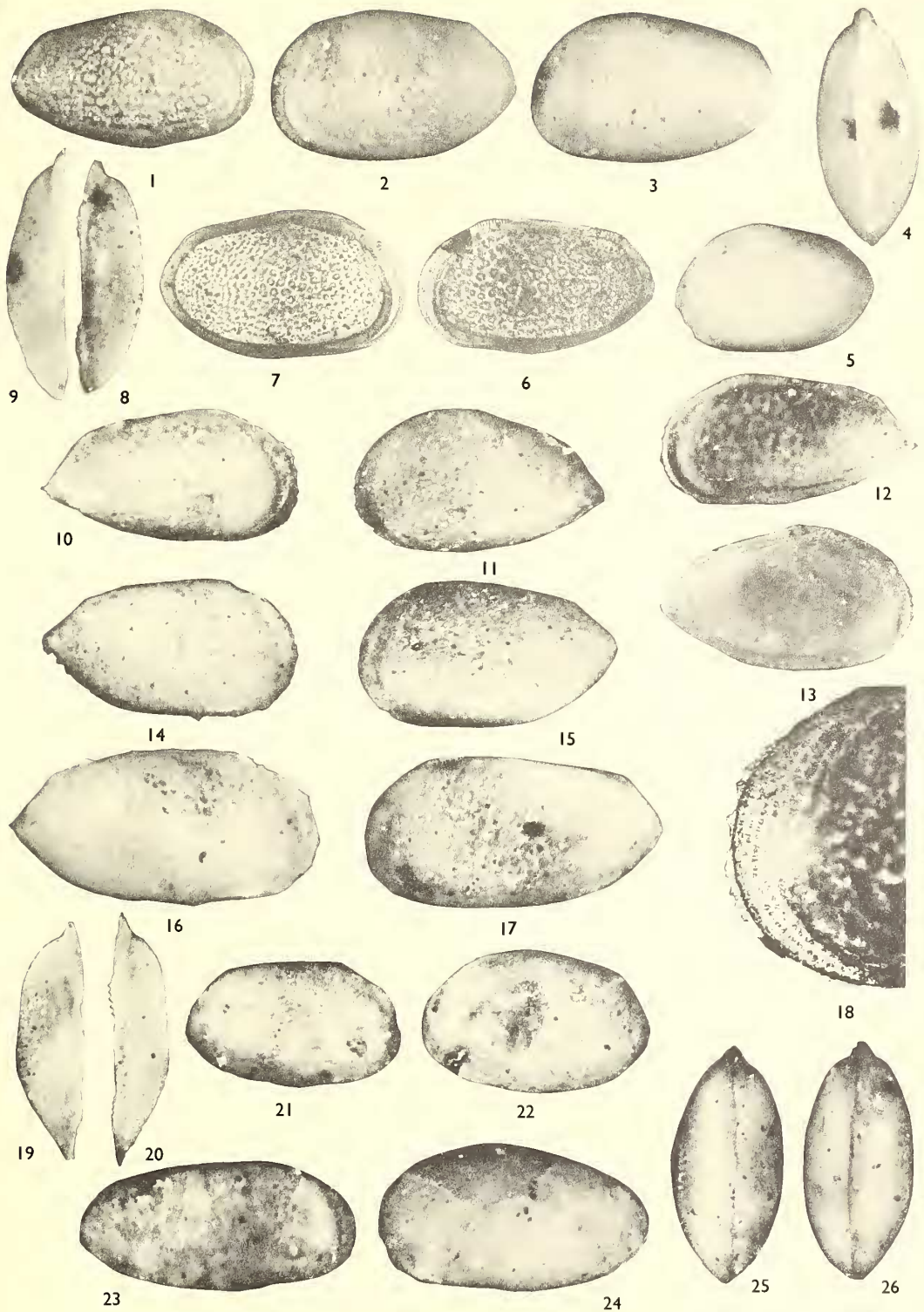
All figures  $\times 50$ , unless otherwise stated.

Figs. 1–9. *Galliaecytheridea* cf. *mandelstami* (Ljubimova), Mutabilis Zone, RM. 6, Lower Kimmeridgian. 1, Right valve, ? female, external view, HU 3.J.9.2. 2, Left valve, ? female, external view, HU 2.J.1.10. 3, Left valve, ? male, external view, HU 3.J.9.6. 4, Carapace, ? female, ventral view, HU 3.J.9.8–9. 5, Left valve, juvenile, external view, HU 3.J.9.3. 6, Right valve, ? female, internal view, transmitted light, HU 3.J.9.2. 7, Left valve, ? female, internal view, transmitted light, HU 2.J.1.10. 8, Right valve, ? female, dorsal view, HU 3.J.9.4. 9, Left valve, ? female, dorsal view, HU 3.J.9.5.

Figs. 10–13, 16, 17. *Galliaecytheridea spinosa* sp. nov., Rotunda Zone, PA. 11, Upper Kimmeridgian. 10, Right valve, female, external view, HU 3.J.10.3. 11, Left valve, female, external view, holotype, HU 2.J.1.11. 12, Right valve, female, internal view, HU 3.J.10.3. 13, Left valve, female, internal view, holotype, HU 2.J.1.11. 16, Right valve, male, external view, HU 3.J.10.5. 17, Left valve, male, external view, HU 3.J.10.4.

Figs. 14, 15, 18–20. *Galliaecytheridea spinosa* sp. nov., Rotunda Zone, PA. 21, Upper Kimmeridgian. 14, Right valve, female, external view, HU 3.J.10.10. 15, Left valve, female, external view, HU 3.J.10.11. 18, Right valve, female, anterior margin in transmitted light, HU 3.J.10.22,  $\times 125$ . 19, Left valve, female, dorsal view, HU 3.J.10.15. 20, Right valve, female, dorsal view, HU 3.J.10.15.

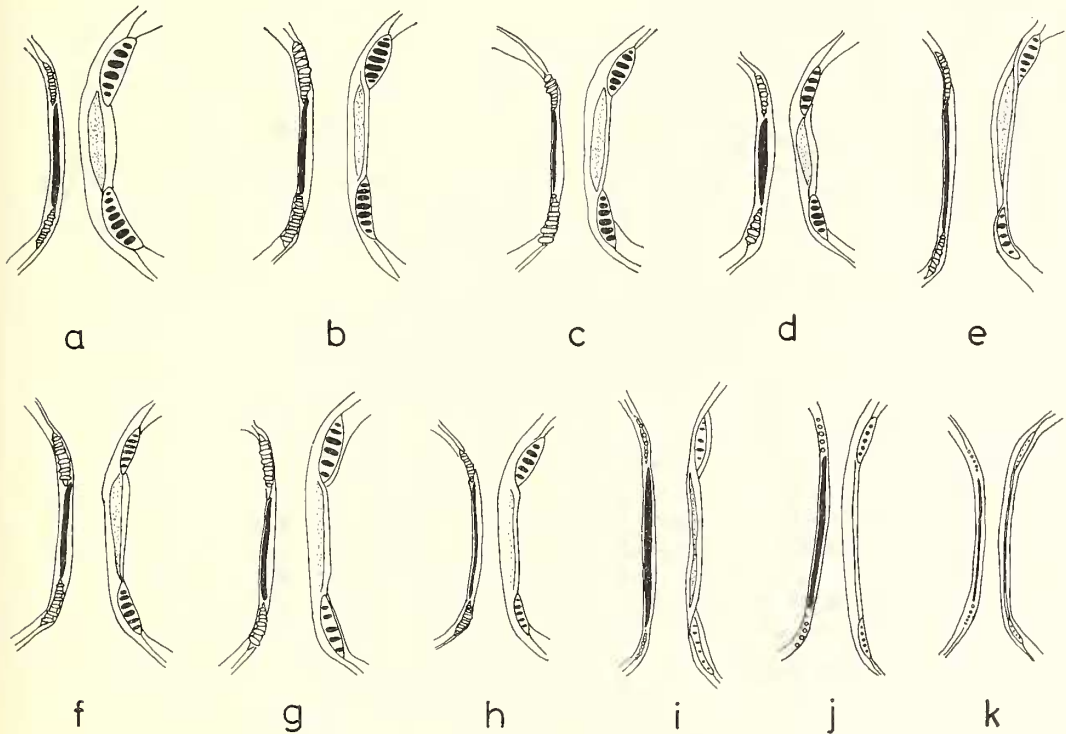
Figs. 21–26. ? *Galliaecytheridea polita* sp. nov., Pallasoides Zone, PA. 30, Upper Kimmeridgian. 21, Right valve, female, external view, HU 3.J.11.2. 22, Left valve, female, external view, holotype, HU 2.J.1.12. 23, Right valve, male, external view, HU 3.J.11.4. 24, Left valve, male, external view, HU 3.J.11.5. 25, Carapace, female, dorsal view, HU 3.J.11.7–8. 26, Carapace, female, ventral view, HU 3.J.11.7–8.



KILENYI, Kimmeridge Clay ostracods



Hinge in right valve consists of 2 terminal dentate ridges, connected with smooth groove. Very long, curved anterior element, spindle-shaped, highly elevated, with 6 denticles. Width of middle 4 denticles greater than that of ridge itself. Posterior element similar, but only 5 denticles. Median groove slightly curved. Special feature in left hinge is wide edge between terminal sockets and inside of valve. Median bar in this valve smooth, curving slightly inwards. Accommodation groove narrow.



TEXT-FIG. 3. Hinge structures in various species of *Galliaecytheridea* Oertli. Hinges are oriented with the anterior end upwards.  $\times 60$ . a, *G. dissimilis* Oertli. b, ? *G. polita* sp. nov. c, *G. punctata* sp. nov. d, *G. confundens* sp. nov. e, *G. wolburgi* Steghaus. f, *G. trapezoidalis* sp. nov. g, *G. cf. mandelstami* (Ljubimova). h, *G. malzi* sp. nov. i, *G. selongata* sp. nov. j, *G. postrotunda* Oertli. k, *G. fragilis* sp. nov.

Muscle scars form usual pattern of *Galliaecytheridea*, but 2 anterior scars set well apart from row of 4.

Sexual dimorphism doubtful; slightly more elongated specimens considered to be males.

*Remarks.* The specimens seem to agree well with Ljubimova's figures, but are slightly smaller and more elongated. In many respects this species is reminiscent of the Upper Kimmeridgian *G. spinosa* but the latter has a more angular appearance, and the posterior end always bears a few spines. Its sexual dimorphism is also very pronounced, in contrast to *G. cf. mandelstami*.



*Galliaecytheridea spinosa* sp. nov.

Plate 26, figs. 10–20

*Holotype*. A female left valve. HU 2.J.1.11.*Paratypes*. 387 valves and carapaces. HU 3.J.10.2–388.*Type locality and horizon*. Hounstout Cliff, Kimmeridge, Dorset. Rotunda Zone, Upper Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.79	0.45	0.20	0.07
♀ Left valve	0.74–0.81	0.43–0.48	0.18–0.21	
♀ Right valve	0.71–0.77	0.38–0.42	0.17–0.19	
♂ Left valve	0.89–0.95	0.44–0.46	0.20	
♂ Right valve	0.85–0.91	0.42–0.46	0.19	

*Occurrence*. Rotunda and Pallasoides Zones, PA. 8, 10–13, 19, 21, 25.*Diagnosis*. Species of *Galliaecytheridea* with extremely pointed posterior end. 2 or 3 little spines usually on posterior extremity. Sexual dimorphism very strong, males much longer than females. Surface of valve pitted.*Description*. Carapace ovoid (♀) or elliptical (♂). In side view greatest height one-third length from anterior end. Left valve larger than right, overlapping it dorsally and ventrally. In dorsal view greatest width one-third distance from posterior end.

Anterior margin rounded; dorsal, postero-dorsal, and postero-ventral margins straight. Ventral part of valve gently rounded. Posterior end on both valves sharply pointed, carrying 2–5 spines which point downwards. Often denticulation on anterior flange.

Surface ornamented with pits of varying sizes, largest occurring in central parts of valve.

Duplicature wide, with inner margin and line of conrescence coinciding. Selvage prominent, running some distance away from outer margin. Selvage lip wide, long. Radial pore canals straight, thin, about 10–15 anteriorly, 2–6 posteriorly.

Hinge well developed, with 6 denticles on terminal elements of right valve. Median element straight in both valves. Accommodation groove much wider on female valves.

Sexual dimorphism striking. Males 10–15% longer than females.

*Remarks*. See *Galliaecytheridea* cf. *mandelstami* (Ljubimova 1955).? *Galliaecytheridea polita* sp. nov.

Plate 26, figs. 21–26; text-fig. 3b

*Holotype*. A female left valve. HU 2.J.1.12.*Paratypes*. 58 valves and carapaces. HU 3.J.11.2–59.*Type locality and horizon*. Hounstout Cliff, Kimmeridge, Dorset. Pallasoides Zone, Upper Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>
Holotype	0.70	0.44	0.18
♀ Left valve	0.68–0.71	0.42–0.44	0.18
♀ Right valve	0.67–0.69	0.38–0.39	0.16
♂ Left valve	0.78	0.45	0.19
♂ Right valve	0.77	0.40	0.17

*Occurrence*. Pallasoides Zone, PA. 29, 29/A, 30.

*Diagnosis.* Carapace elongated. Left valve only slightly larger than right. Dorsal and ventral margins straight and parallel. Posterior end rounded. Sexual dimorphism pronounced.

*Description.* Carapace elongated, ovoid (♀) or elliptical (♂). Left valve only slightly larger than right, overlapping it along ventral and dorsal margins. Dorsal margin straight on both valves, ventral margin almost straight, with small convexity in middle. Postero-dorsal margin straight in females but slightly convex in males. Posterior end of valves is rounded angle, left valve ending more pointedly than right. In side view greatest height of valves falls in middle. Sexual dimorphism very pronounced, males 10–12% longer than females.

Surface of valve completely smooth. Faint depression around ocular region.

Hinge differs from usual arrangement in *Galliaecytheridea* in number and size of denticles on right valve terminal elements. 7 denticles, decreasing in size towards median element, which is smooth groove.

Duplicature and structure of valve not observed owing to infilling matrix in valves.

*Remarks.* ? *G. polita* differs from all the other species of the genus in lacking the peripheral furrow along the anterior margin on the outside of the valve and it possibly belongs to *Paraschuleridea* Swartz and Swain 1946. This genus was described from the Upper Jurassic of the Western Interior of the United States. It lacks the peripheral furrow of the anterior margin, as does ? *G. polita*, but the well-developed accommodation groove on the left valve is perhaps more typical of *Galliaecytheridae*.

### *Galliaecytheridea postrotunda* Oertli 1957

Plate 27, figs. 5–14; text-figs. 3j, 5h

1957 *Galliaecytheridea postrotunda* Oertli, pp. 656–7, pl. 2, figs. 45–55.

1959 *Galliaecytheridea postrotunda* Oertli; Oertli, p. 25, pl. 3, fig. 89.

1964 *Galliaecytheridea postrotunda* Oertli; Glasshof, p. 38, pl. 4, figs. 4–7.

1966a *Galliaecytheridea postrotunda* Oertli; Barker, p. 450, pl. 3, figs. 1–6.

*Material.* 19 valves and carapaces. HU 2.J.14.1–19.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.83	0.41	0.18
Right valve	0.82	0.39	0.18

*Occurrence.* Baylei Zone, P. 1.

*Diagnosis.* Carapace an elongate oval. Dorsal margin straight or slightly convex. Posterior cardinal angle marked. Surface finely punctate. Hinge relatively narrow. Sexual dimorphism occurs.

*Remarks.* There are some differences between Oertli's original description and the specimens from Dorset. The anterior margin is dentate on Oertli's specimens, whilst the present material shows no traces of this. Sexual dimorphism is very doubtful in the Dorset specimens, whereas according to Oertli it is very pronounced.

*Galliaecytheridea fragilis* sp. nov.

Plate 27, figs. 17–24; text-figs. 3k, 5i

*Holotype*. A left valve. HU 2.J.1.14.*Paratypes*. 36 valves and carapaces. HU 3.J.14.2–37.*Type locality and horizon*. Black Head, Dorset. Cymodoce Zone, Lower Kimmeridgian.

<i>Dimensions (mm.)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.64	0.35	0.11	0.06
Right valve	0.60	0.33	0.11	0.06

*Occurrence*. Baylei and Cymodoce Zones, P. 1, RC. 2, 3.

*Diagnosis*. Carapace elongated, fragile, tapering towards posterior. Both ends rounded. Left valve slightly larger than right, overlap restricted to dorsal region and part of anterior margin. Hinge weakly developed, teeth minute, rounded. No sexual dimorphism.

*Description*. Carapace elongated, with pronounced taper towards posterior. Left valve slightly larger than right, overlapping it along dorsal and anterior margins. In dorsal and ventral view carapace elliptical, greatest width around middle. Right valve shows slight sulcus in middle. Two valves differ in shape, dorsal margin straight on left valve, slightly arched on right. Both valves highest at anterior cardinal angle. Posterior end rounded with several weakly developed spines postero-dorsally.

## EXPLANATION OF PLATE 27

All figures  $\times 50$ , unless otherwise stated.

- Figs. 1–4. *Galliaecytheridea* sp. 2, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 1, Right valve, ? juvenile, external view, HU 3.J.12.2. 2, Left valve, ? juvenile, external view, HU 3.J.12.3. 3, Right valve, ? juvenile, external view, HU 3.J.12.4. 4, Left valve, external view, HU 2.J.1.13.
- Figs. 5–14. *Galliaecytheridea postrotunda* Oertli, Baylei Zone, P. 1, Lower Kimmeridgian. 5, Right valve, ? female, external view, HU 2.J.14.1. 6, Left valve, ? female, external view, HU 2.J.14.2. 7, Right valve, ? male, external view, HU 2.J.14.3,  $\times 40$ . 8, Left valve, ? male, external view, HU 2.J.14.4,  $\times 40$ . 9, Carapace, ? female, dorsal view, HU 2.J.14.9–10. 10, Carapace, ? female, ventral view, HU 2.J.14.9–10. 11, Left valve, ? female, internal view, transmitted light, HU 2.J.14.2. 12, Right valve, ? female, internal view, transmitted light, HU 2.J.14.1. 13, Left valve, ? female, internal view, transmitted polarized light, HU 2.J.14.2. 14, Right valve, ? female, internal view, transmitted polarized light, HU 2.J.14.1.
- Figs. 15, 16. *Galliaecytheridea* sp. 3, Rotunda Zone, PA. 11, Upper Kimmeridgian. 15, Right valve, external view, HU 2.J.15.1. 16, Left valve, external view, HU 2.J.15.2.
- Figs. 17–24. *Galliaecytheridea fragilis* sp. nov., Cymodoce Zone, RC. 3, Lower Kimmeridgian. 17, Right valve, external view, HU 3.J.14.2. 18, Left valve, external view, holotype, HU 2.J.1.14. 19, Right valve, external view, HU 3.J.14.3. 20, Left valve, external view, HU 3.J.14.4. 21, Right valve, juvenile, external view, HU 3.J.14.9. 22, Left valve, juvenile, external view, HU 3.J.14.10. 23, Carapace, dorsal view, HU 3.J.14.7–8. 24, Carapace, ventral view, HU 3.J.14.7–8.
- Figs. 25, 26. ? *Pyrocytheridea* sp., Rotunda Zone, PA. 11, Upper Kimmeridgian. 25, Right valve, external view, HU 2.J.16.1. 26, Left valve, external view, HU 2.J.16.2.
- Figs. 27–29. *Protocythere sigmoidea* Steghaus, Rotunda Zone, PA. 21, Upper Kimmeridgian. 27, Left valve, male, external view, HU 2.J.17.4. 28, Right valve, female, external view, HU 2.J.17.1. 29, Left valve, female, external view, HU 2.J.17.2.
- Figs. 30–32. *Protocythere rodewaldensis* (Klingler), Baylei Zone, P. 1, Lower Kimmeridgian. 30, Right valve, external view, HU 2.J.18.1. 31, Left valve, external view, HU 2.J.18.2. 32, Left valve, internal view, transmitted light, HU 2.J.18.2.





Surface of valve smooth, slight depression around ocular region. Normal pore canals small but clearly visible.

Duplicature rather narrow. Selvage weakly developed, selvage lip scarcely noticeable. Inner margin and line of concrescence coincide. 10 to 12 thin straight radial pore canals on anterior margin.

Muscle scars as in other species of *Galliaecytheridea*, but upper anterior scars much larger than others.

Hinge structure is 'weak' type of hinge found in some species of *Galliaecytheridea*, e.g. denticles on right valve terminal elements small, rounded, also corresponding loculi on other valve. Median element of left valve is bar which runs separate from inner edge of hinge margin; no accommodation groove present. Median groove on right valve is smooth and narrow.

*Galliaecytheridea* sp. 1

Plate 25, fig. 5

*Material.* 27 valves. HU 3.J.4.2-27, HU 2.J.1.5.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.75	0.45	0.22

*Occurrence.* Upper part of the Mutabilis Zone, RM. 9, 10.

*Description.* Carapace ovoid, both ends rounded. Left valve only slightly larger than right, overlapping it ventrally. Dorsal margin straight on both valves, both cardinal angles rounded. Ventral margin only very slightly convex in both valves.

Surface smooth, ends of numerous normal pore canals plainly visible. Marginal areas broad, with inner margin and line of concrescence coinciding. Radial pore canals straight, simple, about 10 on anterior and 5 on posterior margin. Selvage follows outer margin closely. Hinge shows usual hemimerodont arrangement of *Galliaecytheridea*.

*Remarks.* This form is close to *G. punctata* in shape, but has a more rounded outline, especially the posterior end, and the surface is smooth not punctate. There is also a considerable difference in the hinge.

*Galliaecytheridea* sp. 2

Plate 27, figs. 1-4

*Material.* 25 valves. HU 3.J.12.2-25, HU 2.J.1.13.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.59	0.34	0.14

*Occurrence.* Cymodoce Zone, RC. 3.

*Description.* Carapace elongate, tapering posteriorly. Left valve larger than right and very different in shape, having convex ventral margin and greatest height at anterior quarter of valve. Right valve much more elliptical in shape, tapering far less towards posterior, more rounded.

Surface of valve smooth; end of wide normal pore canals conspicuous. About 12 radial pore canals on anterior.

*Remarks.* Only one adult specimen has been found, the rest being immature valves. It is certainly different from other species of *Galliaecytheridea*, mainly in the outline of the right valve.

*Galliaecytheridea* sp. 3

Plate 27, figs. 15, 16

*Material.* 60 valves and carapaces. HU 2.J.15.1–60.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.65–0.79	0.37–0.40	0.20
Right valve	0.64–0.73	0.35–0.37	0.18

*Occurrence.* Pectinatus and Rotunda Zones, PA. 1, 3, 6, 10–13, DO PE. 11.

*Description.* Carapace elongated, tapering posteriorly. Left valve overlaps right along entire margin. Valves nearly identical in shape. Dorsal margin straight on both valves, ventral margin slightly convex. Anterior end broadly rounded, posterior pointed downwards with single strong spine also pointing downwards. Posterior cardinal angle prominent, postero-dorsal margin straight. Poor preservation of material prevented

## EXPLANATION OF PLATE 28

All figures  $\times 50$ .

- Figs. 1–4. *Protocythere nealei* sp. nov., Pallasoides Zone, PA. 21, Lower Kimmeridgian. 1, Right valve, external view, HU 3.J.15.2. 2, Left valve, external view, holotype, HU 2.J.1.15. 3, Left valve, dorsal view, holotype, HU 2.J.1.15. 4, Right valve, dorsal view, HU 3.J.15.2.
- Figs. 5–7. *Cytheropteron* sp., Wheatleyensis Zone, DO VW. 2, Middle Kimmeridgian. 5, Left valve, female, external view, HU 2.J.20.1. 6, Left valve, male, external view, HU 2.J.20.2. 7, Left valve, female, dorsal view, HU 2.J.20.1.
- Figs. 8–11. *Cytheropteron aquitanum* Donze, Wheatleyensis Zone, DO VW. 7, Middle Kimmeridgian. 8, Carapace, right side, external view; 9, Carapace, left side; 10, Carapace, anterior view; 11, Carapace, dorsal view, HU 2.J.1.16.
- Figs. 12, 13. *Exophthalmocythere fuhrbergensis* Steghaus, Mutabilis Zone, RM. 6, Lower Kimmeridgian. 12, Left valve, external view, HU 2.J.19.2. 13, Left valve, external view, HU 2.J.19.3.
- Figs. 14–17. *Eocytheropteron decoratum* Schmidt, Baylei Zone, P. 1, Lower Kimmeridgian. 14, Right valve, external view, HU 2.J.21.1. 15, Left valve, external view, HU 2.J.21.2. 16, Right valve, dorsal view, HU 2.J.21.1. 17, Left valve, dorsal view, HU 2.J.21.2.
- Figs. 18–24. *Procytheropteron* sp. 1, Baylei Zone, P. 1, Lower Kimmeridgian. 18, Left valve, male, external view; 19, Left valve, male, internal view, HU 2.J.1.18. 20, Left valve, female, internal view, transmitted light, HU 2.J.1.17. 21, Right valve, female, HU 3.J.16.7. 22, Left valve, female, external view, HU 2.J.1.17. 23, Right valve, female, external view, HU 3.J.16.6. 24, Left valve, female, external view, HU 3.J.16.8.
- Fig. 25. *Orthonotacythere interrupta* Triebel, Mutabilis Zone, RM. 2, Lower Kimmeridgian. Right valve, external view, HU 2.J.22.1.
- Figs. 26–9. *Orthonotacythere interrupta* Triebel, Mutabilis Zone, RM. 7, Lower Kimmeridgian. 26, Right valve, external view, HU 2.J.22.3. 27, Left valve, internal view, transmitted light, HU 2.J.22.4. 28, Left valve, external view, HU 2.J.22.6. 29, Left valve, external view, HU 2.J.22.4.
- Figs. 30, 31. *Orthonotacythere* sp., Rotunda Zone, PA. 6, Upper Kimmeridgian. 30, Right valve, external view, HU 3.J.30.1. 31, Left valve, external view, HU 3.J.30.1.
- Figs. 32–9. *Orthonotacythere pustulata* sp. nov., Rotunda Zone, PA. 21, Upper Kimmeridgian. 32, Right valve, external view, HU 3.J.18.6. 33, Left valve, external view, holotype, 2.J.1.19. 34, Right valve, external view, HU 3.J.18.3. 35, Left valve, external view, HU 3.J.18.4. 36, Right valve, external view, HU 3.J.18.2. 37, Left valve, external view, HU 3.J.18.4. 38, Right valve, juvenile, external view, HU 3.J.18.5. 39, Left valve, juvenile, external view, HU 3.J.18.7.
- Figs. 40–43. ? *Acrocythere inornata* sp. nov., Rotunda Zone, PA. 13, Upper Kimmeridgian. 40, Right valve, external view, HU 3.J.19.2. 41, Left valve, external view, holotype, HU 2.J.1.20. 42, Right valve, juvenile, external view, HU 3.J.19.3. 43, Left valve, juvenile, external view, HU 3.J.19.4.



KILENYI, Kimmeridge Clay ostracods





observation of internal structures of valve; one left valve, however, showed typical hinge of *Galliaecytheridea*.

Subfamily EUCYTHERINAE Puri 1954  
Genus PYROCYTHERIDEA Ljubimova 1955  
? *Pyrocytheridea* sp.

Plate 27, figs. 25, 26

*Material.* 7 valves, HU 2.J.16.1-7.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.53	0.28	0.10
Right valve	0.51	0.26	0.10

*Occurrence.* Rotunda Zone, PA. 11.

*Description.* Carapace elongated, tapering strongly towards posterior end. Both valves end in slightly blunted point. In dorsal view, carapace elliptical, greatest width at middle. Valves seem to be equal in size, shape nearly identical, right valve slightly more angular at anterior cardinal angle and at posterior end. Greatest height of valves at anterior cardinal angle. Dorsal margin straight. Surface of valve smooth.

Details of interior structure of valves not discernible owing to bad state of preservation, although duplicature seems to be very narrow.

*Remarks.* Species of *Pyrocytheridea* have a similar shape, and they occur at about the same horizon in the Upper Jurassic of the Ural region of the U.S.S.R. Unfortunately the typical hinge structure of *Pyrocytheridea* could not be seen and therefore the identification is queried.

Subfamily LOXOCONCHINAE Sars 1925  
Genus MANDELSTAMIA (MANDELSTAMIA) Ljubimova 1955  
*Mandelstamia (Mandelstamia) rectilinea* Malz 1958

Plate 29, figs. 1-6; text-figs. 4a, b

1958 *Mandelstamia rectilinea* Malz, p. 38, pl. 11, figs. 58-63.

1961 *Mandelstamia rectilinea* Malz; Neale and Kilenyi, pp. 440-2, pl. 71, figs. 1-4, 6.

1964 *Mandelstamia rectilinea* Malz; Glasshof, p. 48.

*Material.* 52 valves and carapaces. HU 2.J.1.21, HU 3.J.20.2-52.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.66-0.73	0.38-0.40	0.16	0.06
Right valve	0.67-0.72	0.39-0.40	0.16	0.06

*Occurrence.* Mutabilis Zone, RM. 5, 6.

*Diagnosis.* Species of *Mandelstamia* (*M.*) with oblong shape. Valves about equal in size. Posterior end sometimes higher than anterior. Dorsal margin straight, ventral concave. Valve surface ornamented by pits, larger on anterior part of valve.

*Mandelstamia (M.) triebeli* Kilenyi 1961

Plate 29, figs. 9, 10; text-figs. 4c, d, 5k

1961 *Mandelstamia triebeli* Kilenyi; Neale and Kilenyi, pp. 442-3, pl. 71, figs. 5, 9, 10, 14, 15.

*Material.* 513 valves and carapaces. HU 2.J.1.22, HU 3.J.21.2-513.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.55-0.61	0.30-0.35	0.15-0.17	0.05
Right valve	0.57-0.64	0.32-0.36	0.15-0.17	0.05

*Occurrence.* Mutabilis and Pseudomutabilis Zones, RM. 1, 2, 5, 6, 9, AU. II, IV.

*Diagnosis.* Species of *Mandelstamia* (*M.*) in which valves are equal in size, carapace tapering towards posterior end. Anterior end rounded, posterior cardinal angle more or less prominent; dorsal margin straight, ventral convex. Marginal areas broad.

*Mandelstamia* (*M.*) *angulata* Kilenyi 1961

Plate 29, figs. 11-16

1961 *Mandelstamia angulata* Kilenyi; Neale and Kilenyi, pp. 443-4, pl. 71, figs. 11, 12, 16-18.

*Material.* 56 valves and carapaces. HU 2.J.1.23, HU 3.J.22.2-56.

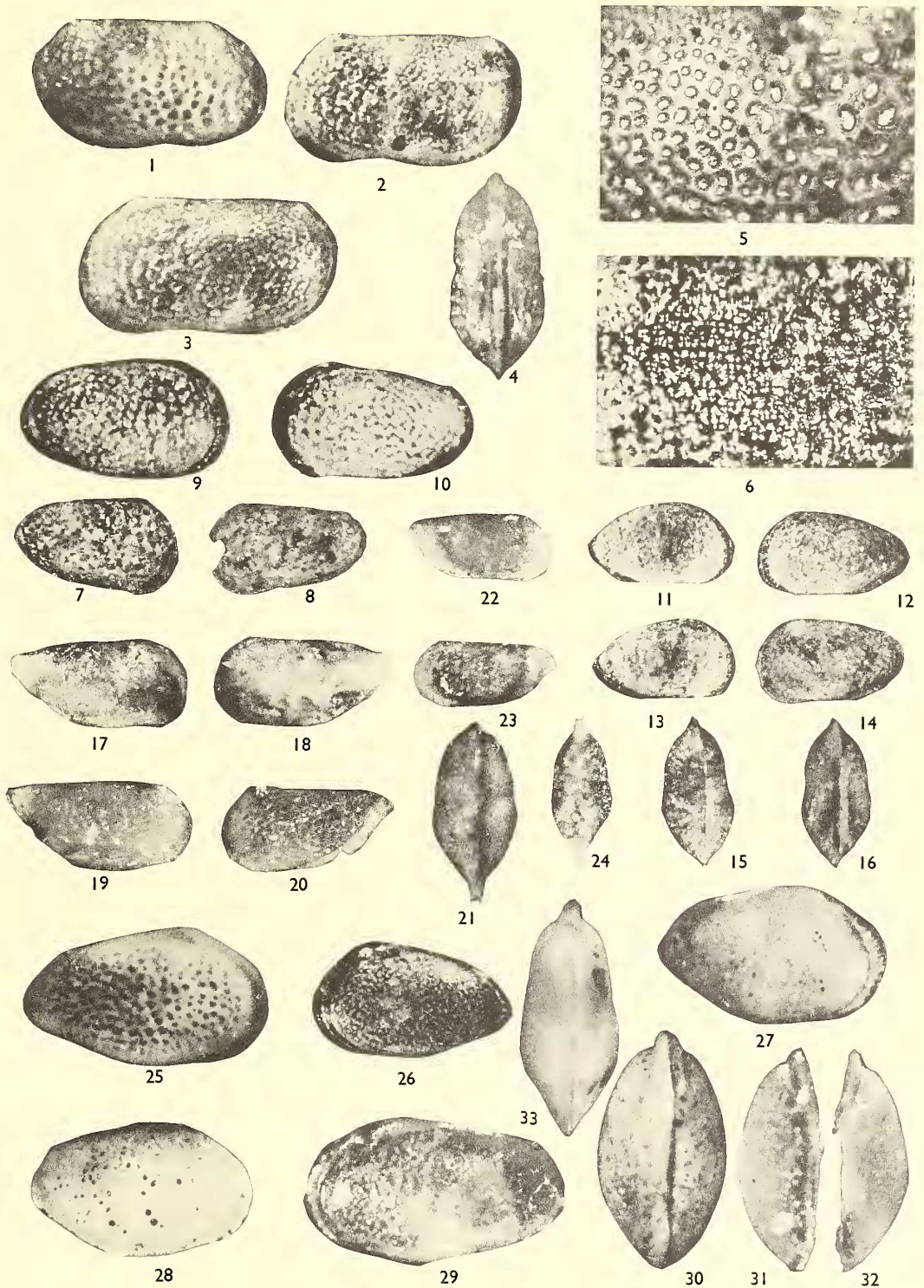
<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>M/a</i>
Left valve	0.42-0.45	0.25-0.27	0.03
Right valve	0.42-0.44	0.22-0.23	0.03

*Occurrence.* Baylei and Cymodoce Zones, P. 1, RC. 3.

EXPLANATION OF PLATE 29

All figures  $\times 50$ , unless otherwise stated.

- Figs. 1-6. *Mandelstamia* (*M.*) *rectilinea* Malz, Mutabilis Zone, RM. 6, Lower Kimmeridgian. 1, Right valve, external view, HU 3.J.20.2. 2, Left valve, external view, HU 3.J.20.3. 3, Left valve, external view, HU 2.J.1.21. 4, Carapace, dorsal view, HU 3.J.20.7; 5, Left valve, central part in transmitted light,  $\times 150$ ; 6, Left valve, central part in polarized light,  $\times 150$ .
- Figs. 7, 8. *Mandelstamia* (*Xeromandelstamia*) sp. 1. Kilenyi, Rotunda Zone, PA. 1, Upper Kimmeridgian. 7, Right valve, external view, HU 3.J.30.1. 8, Left valve, external view, HU 3.J.30.2.
- Figs. 9, 10. *Mandelstamia* (*M.*) *triebeli* Kilenyi, Mutabilis Zone, RM. 6, Lower Kimmeridgian. 9, Right valve, external view, HU 3.J.21.2. 10, Left valve, external view, HU 2.J.1.22.
- Figs. 11-16. *Mandelstamia* (*M.*) *angulata* Kilenyi, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 11, Right valve, ? male, external view, HU 3.J.22.2. 12, Left valve, ? female, external view, HU 2.J.1.23. 13, Right valve, male, HU 3.J.22.7. 14, Left valve, male, external view, HU 3.J.22.8. 15, Carapace, female, dorsal view, HU 3.J.22.10-11. 16, Carapace, female, ventral view, HU 3.J.22.10-11.
- Figs. 17, 18, 21. *Monoceratina* sp. 2, Rotunda Zone, PA. 9, Upper Kimmeridgian. 17, Right valve, external view, HU 2.J.26.1. 18, Left valve, external view, HU 2.J.26.2. 21, Carapace, dorsal view, HU 2.J.26.1-2.
- Figs. 19, 20. *Monoceratina* sp. 2, Rotunda Zone, PA. 21, Upper Kimmeridgian. 19, Right valve, external view, HU 2.J.26.1. 20, Left valve, external view, HU 2.J.26.2.
- Figs. 22-24. *Monoceratina* sp. 1, Rotunda Zone, PA. 3, Upper Kimmeridgian. 22, Right valve, external view, HU 2.J.25.1. 23, Left valve, external view, HU 2.J.25.2. 24, Carapace, dorsal view, HU 2.J.25.1-2.
- Figs. 25, 26. *Amplicythere confundens* Oertli, Cymodoce Zone, RC. 2, Lower Kimmeridgian. 25, Right valve, external view, HU 2.J.27.1. 26, Left valve, juvenile, HU 2.J.27.4.
- Figs. 27-32. *Amplicythere pennyi* sp. nov., Baylei Zone, P. 1, Lower Kimmeridgian. 27, Right valve, female, external view, holotype, HU 2.J.1.26. 28, Right valve, female, external view, HU 3.J.24.6. 29, Left valve, male, external view, HU 3.J.24.3. 30, Carapace, female, dorsal view, HU 3.J.24.10-11. 31, Left valve, female, dorsal view, HU 3.J.24.8. 32, Right valve, female, dorsal view, HU 3.J.24.12.
- Fig. 33. *Mandelstamia* (*Xeromandelstamia*) *maculata* Kilenyi, Grandis Zone, SUG. 5, Middle Kimmeridgian. Carapace, female, dorsal view, HU 2.J.1.24.



KILENYI, Kimmeridge Clay ostracods



*Diagnosis.* Small species of *Mandelstamia* (*M.*) with pointed posterior end. Dorsal margin of right valve convex, that of left valve straight. Left valve slightly rounded posteriorly, right valve pointed. Sexual dimorphism doubtful.

Subgenus MANDELSTAMIA (XEROMANDELSTAMIA) Beutler and Gründel 1963

*Mandelstamia* (*Xeromandelstamia*) *maculata* Kilenyi 1961

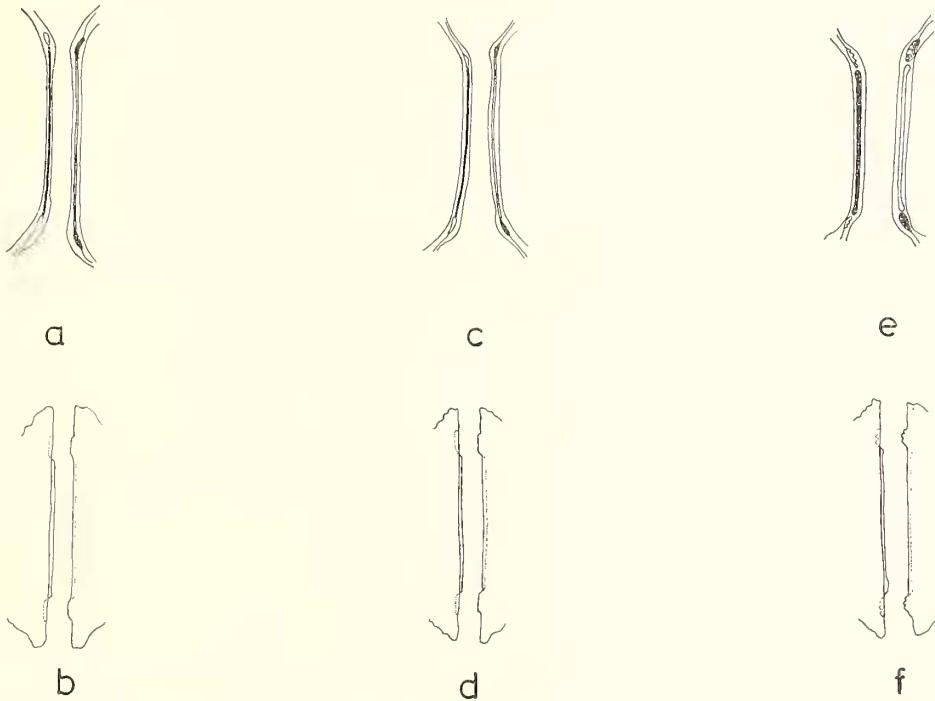
Plate 29, fig. 33; text-figs. 4e, f

1961 *Mandelstamia maculata* Kilenyi; Neale and Kilenyi, pp. 444–6, pl. 71, figs. 19–25.

*Material.* 89 valves and carapaces. HU 2.J.1.24, HU 3.J.23.2–89.

<i>Dimensions</i> (mm.).	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.72	0.40–0.41	0.17	0.08
♀ Right valve	0.72	0.42	0.17	0.07
♂ Right valve	0.86	0.45	0.18	0.07

*Occurrence.* Grandis Zone, SUG. 3, 5, 8.



TEXT-FIG. 4. Hinge structures in species of *Mandelstamia* Ljubimova. Hinges are oriented with the anterior end upwards.  $\times 60$ . a, *M. rectilinea* Malz. b, same, dorsal view. c, *M. triebeli* Kilenyi. d, same, dorsal view. e, *M. (X.) maculata* Kilenyi. f, same, dorsal view.

*Diagnosis.* Carapace elongated, tapering posteriorly. Anterior end rounded, posterior more angular. Ventral margin of right valve strongly concave, that of left valve straight,

ventral side of valves overhanging ventral margins to form sort of ala. Surface covered with equally dispersed pits. Hinge of right valve has following structure: anterior element is minute, oval-shaped ridge with 4 small rounded projections, middle 2 of which are larger than others. Median element wide, smooth groove, ending on both sides in rounded pit slightly deeper than groove itself. Posterior element like anterior, but smaller. Left valve terminal elements are oval-shaped sockets with 3 or 4 faint loculi in them. Median element lies in middle of contact margin and consists of smooth bar, both ends thickened, slightly projecting. Marginal areas relatively broad with few straight, simple pore canals. Sexual dimorphism very pronounced.

*Mandelstamia* (*X.*) sp. 1, Kilenyi 1961

Plate 29, figs. 7, 8

1961 *Mandelstamia* sp. 1, Kilenyi; Neale and Kilenyi, p. 446, pl. 71, figs. 7, 8, 13.

*Material.* 23 valves. HU 3.J.30.1–23.

<i>Dimensions</i> (mm.).	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.50	0.32	0.16	0.04
Right valve	0.48	0.28	0.15	0.04

*Occurrence.* Pectinatus and Rotunda Zones, DO PE 11, PA. 1, 3.

*Diagnosis.* Shape like *M. maculata* but with the hinge more advanced towards the hemimerodont type, the terminal teeth being more markedly dentate. The median ridge on the left valve is straight and has no terminal widening. Radial pore canals few.

EXPLANATION OF PLATE 30

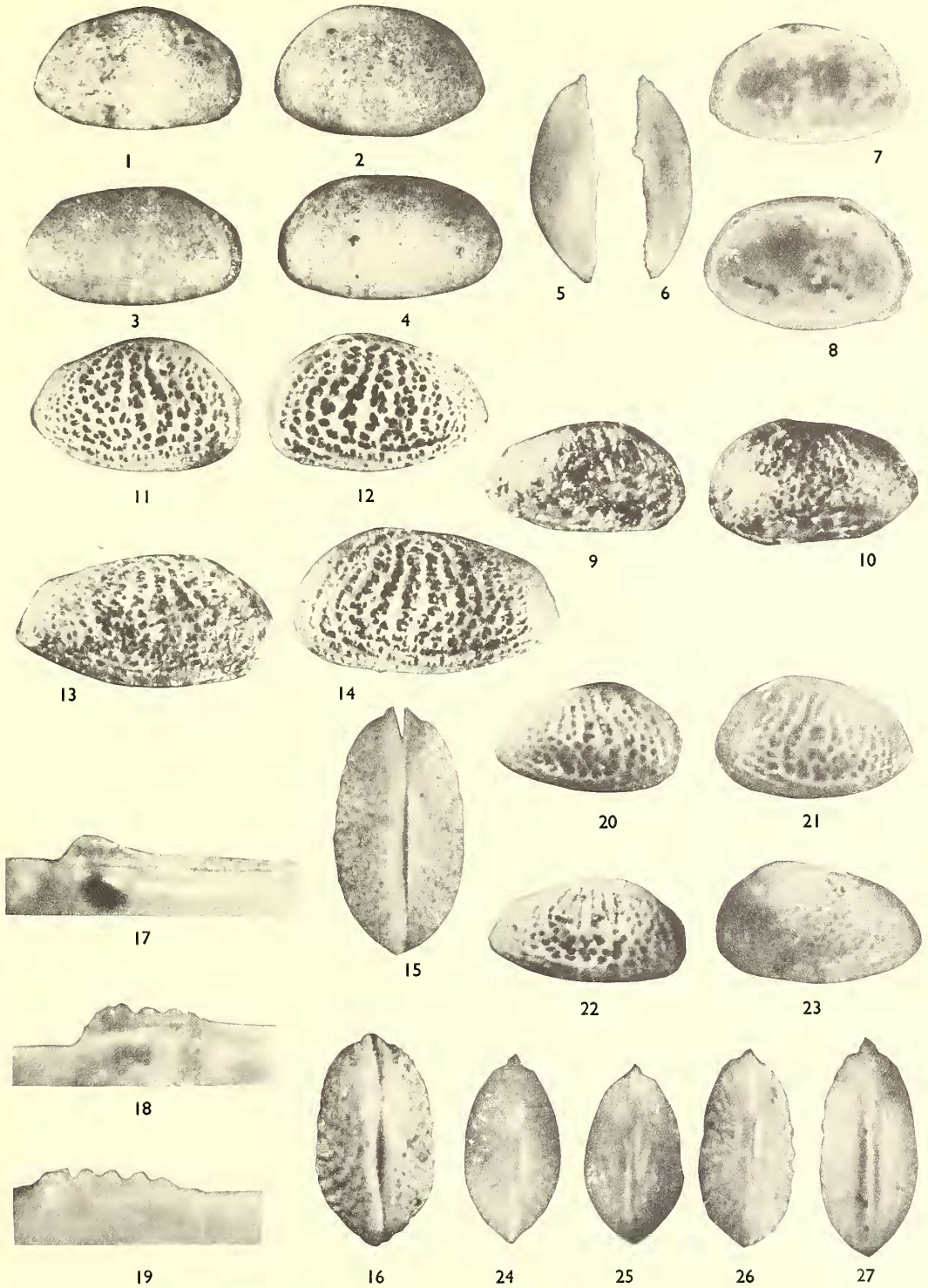
All figures  $\times 50$ , unless otherwise stated.

Figs. 1–8. *Amphicythere sphaerulata* sp. nov., Cymodoce Zone, RC. 1, Lower Kimmeridgian. 1, Right valve, female, external view, HU 3.J.26.2. 2, Left valve, female, external view, holotype, HU 2.J.1.28. 3, Right valve, male, external view, HU 3.J.26.3. 4, Left valve, male, external view, HU 3.J.26.4. 5, Left valve, male, dorsal view, HU 3.J.26.4. 6, Right valve, male, dorsal view, HU 3.J.26.3. 7, Left valve, female, internal view, holotype, HU 2.J.1.28. 8, Right valve, female, internal view, HU 3.J.26.2.

Figs. 9, 10. *Macrodentina* (*M.*) sp. 1, Mutabilis Zone, RM. 9, Lower Kimmeridgian. 9, Right valve, female, external view, HU 2.J.30.1. 10, Left valve, female, external view, HU 2.J.30.2.

Figs. 11–19. *Macrodentina* (*M.*) *cicatricosa* Malz, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 11, Right valve, female, external view, HU 2.J.29.1. 12, Left valve, female, external view, HU 2.J.29.2. 13, Right valve, male, external view, HU 2.J.29.5. 14, Left valve, male, external view, HU 2.J.29.6. 15, Carapace, male, dorsal view, HU 2.J.29.20–1. 16, Carapace, female, dorsal view, HU 2.J.29.16–17. 17, Left valve, female, hinge median element,  $\times 175$ ; 18, Right valve, female, hinge anterior element,  $\times 175$ ; 19, Right valve, hinge posterior element,  $\times 175$ .

Figs. 20–27. *Macrodentina* (*Polydentina*) *proclivis striata* subsp. nov., Pseudomutabilis Zone, AU. IV, Lower Kimmeridgian. 20, Right valve, female, external view, HU 2.J.30.1. 21, Left valve, female, external view, holotype, HU 2.J.1.36. 22, Right valve, male, external view, HU 2.J.30.2. 23, Left valve, male, external view, HU 2.J.30.3. 24, Carapace, female, dorsal view, HU 2.J.30.8–9. 25, Carapace, female, ventral view, HU 2.J.30.8–9. 26, Carapace, male, dorsal view, HU 2.J.30.6–7. 27, Carapace, male, ventral view, HU 2.J.30.6–7.







Subfamily Uncertain  
Genus DICRORYGMA Poag 1962  
Subgenus DICRORYGMA (ORTHORYGMA) Christensen 1965  
*Dicrorygma (Orthorygma) kimmeridgensis* (Kilenyi 1965)

Plate 31, figs. 22-31

1957 *Cytherideitarum* ? sp. 1, Oertli, p. 661, pl. 3, figs. 86-91.

1965 *Oertliana kimmeridgensis* Kilenyi, pp. 573-4, pl. 79, figs. 1-12; text-fig. 1.

*Material.* 101 valves and carapaces. HU 2.J.31.1, HU 3.J.29.1-100.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.36-0.38	0.20-0.21	0.08	0.03
♀ Right valve	0.35-0.37	0.18-0.20	0.07	0.03
♂ Left valve	0.43-0.45	0.21-0.23	0.08	0.04
♂ Right valve	0.43-0.45	0.20-0.22	0.07	0.03

*Occurrence.* Mutabilis Zone, RM. 9.

*Diagnosis.* Carapace elliptical, anterior end rounded, posterior slightly pointed. Valves subequal, left slightly larger. Surface of valves slightly punctate. Radial pore canals relatively thick in middle, narrowing suddenly near both ends. Sexual dimorphism strong.

*Remarks.* *D. (O.) kimmeridgensis* is distinguished from *D. (O.) maior* Christensen 1965 by its almost straight ventral margin, lacking the marked antero-ventral concavity of the dorsal margin in the latter species.

*Dicrorygma (Orthorygma) sp. 1* (Kilenyi 1965)

Plate 31, figs. 32, 33

1965 *Oertliana sp. 1*, Kilenyi, pp. 574-5, pl. 79, figs. 13-16.

*Material.* 39 valves. HU 2.J.34.1-39.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>
Left valve	0.45	0.24
Right valve	0.44	0.23

*Occurrence.* Rotunda Zone, PA. 1, 6, 11, 13.

*Diagnosis.* Elongate, almost oblong-shaped carapace. Valves equal in size. Surface very finely punctate, almost smooth. No eye depression.

Indet. gen. A. sp. 1

Plate 31, figs. 20, 21

*Material.* 2 valves (1 destroyed). HU 2.J.1.25 (left valve).

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>
Left valve	0.54	0.30
Right valve	0.54	0.30

*Occurrence.* Cymodoce Zone, RC. 3.

*Description.* Carapace ovoid, valves similar in shape. Anterior broadly rounded, posterior blunt. Surface of valves covered by rather irregular system of thick ribs, knobs, and

bulges. Semicircular dorsal rib starts from posterior cardinal angle, first rising slightly above dorsal margin, then turning back and ending on lateral part of valve at about its mid-point. Second dorsal rib starts from just below first and runs across valve, apparently ending on antero-ventral side without reaching margin. Third rib ventral, roughly following ventral margin. Between these ribs, bulges and knobs occur apparently without definite pattern.

Inner margin and line of concrescence coincide. Only few radial pore canals, 7 at most, straight, simple, widest at their middle. Selvage only weakly developed.

Hinge lophodont, with very small drop-shaped terminal teeth and wide, smooth median groove in right valve.

Muscle scars arranged in oblique row of 4 scars with 1 additional scar level with top one of row.

*Remarks.* Indet. gen. A. sp. 1. resembles species of *Wolburgia* Anderson 1966 in shape and surface ornamentation. There are, however, differences in the hinge and duplicature. *Wolburgia* has denticulate terminal hinge elements and a narrow vestibule is present, whereas in Indet. gen. A. sp. 1, the hinge teeth are definitely smooth and the inner margin and line of concrescence coincide. Since only 3 species of *Wolburgia* have been

EXPLANATION OF PLATE 31

All figures  $\times 50$ , unless otherwise stated.

Figs. 1–5. *Macrodeutina (Polydeutina) parvapunclata* sp. nov., Mutabilis Zone, RM. 5, Lower Kimmeridgian. 1, Right valve, external view, HU 3.J.28.3. 2, Left valve, external view, holotype, HU 2.J.1.30. 3, Left valve, dorsal view, HU 3.J.28.4. 4, Left valve, external view, HU 3.J.28.4. 5, Left valve, internal view, HU 3.J.28.4.

Figs. 6–11, 17, 18. *Macrodeutina (Polydeutina) proclivis proclivis* Malz, Pseudomutabilis Zone, AU. II, Lower Kimmeridgian. 6, Left valve, male, external view, HU 2.J.32.1. 7, Left valve, female, external view, HU 3.J.27.2. 8, Right valve, female, external view, HU 2.J.1.29. 9, Right valve, male, external view, HU 3.J.27.3. 10, Left valve, male, external view, HU 3.J.27.4. 11, Carapace, male, dorsal view, HU 3.J.27.6–7. 17, Left valve, female, internal view, HU 2.J.1.29. 18, Right valve, female, internal view, HU 3.J.27.2.

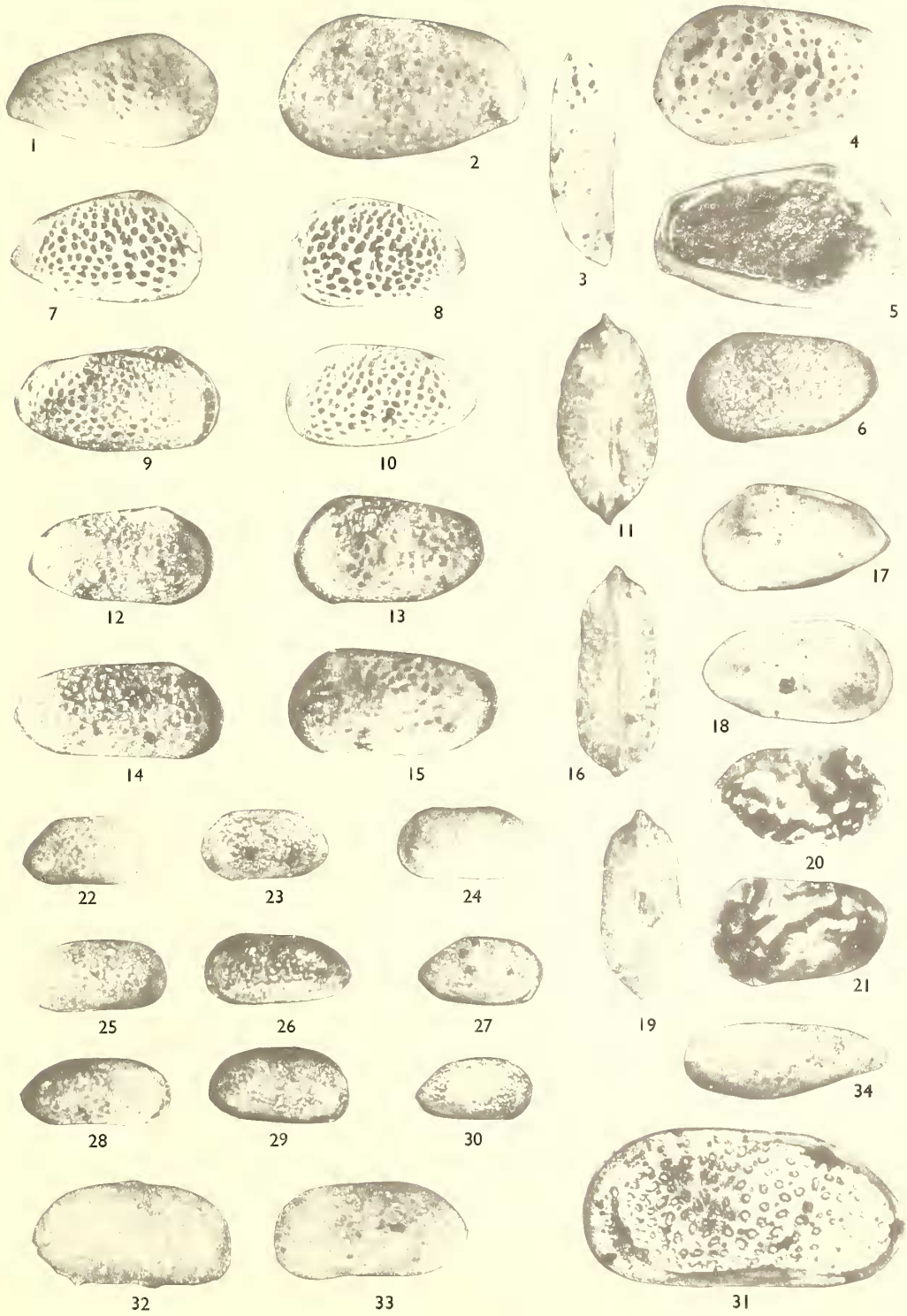
Figs. 12–16, 19. *Macrodeutina (M.) maculata* Malz, Mutabilis Zone, RM. 9, Lower Kimmeridgian. 12, Right valve, female, external view, HU 2.J.31.1. 13, Left valve, female, external view, HU 2.J.31.2. 14, Right valve, male, external view, HU 2.J.31.4. 15, Left valve, male, external view, HU 2.J.31.5. 16, Carapace, male, dorsal view, HU 2.J.31.8–9. 19, Carapace, female, dorsal view, HU 2.J.31.6–7.

Figs. 20, 21. Indet. gen. A. sp. 1, Cymodoce Zone, RC. 3, Lower Kimmeridgian. 20, Right valve, external view, (destroyed). 21, Left valve, external view, HU 2.J.1.25.

Figs. 22–31. *Dicrorygma (Orthorygma) kimmeridgeusis* (Kilenyi), Mutabilis Zone, RM. 9, Lower Kimmeridgian. 22, Right valve, female, external view, HU 3.J.29.17. 23, Left valve, female, external view, HU 2.J.31.1. 24, Left valve, male, external view, HU 3.J.29.7. 25, Right valve, male, external view, HU 3.J.29.6. 26, Left valve, male, external view, HU 3.J.29.2. 27, Right valve, female, external view, HU 3.J.29.22. 28, Right valve, male, external view, HU 3.J.29.17. 29, Right valve, ? male, external view, HU 3.J.29.23. 30, Right valve, female, external view, HU 3.J.29.3. 31, Right valve, male, internal view, transmitted light, HU 3.J.29.15,  $\times 125$ .

Figs. 32, 33. *Dicrorygma (Orthorygma)* sp. 1 (Kilenyi), Rotunda Zone, PA. 13, Upper Kimmeridgian. 32, Right valve, ? male, external view, HU 2.J.34.1. 33, Left valve, ? male, external view, HU 2.J.34.3.

Fig. 34. Indet. gen. B. sp. 1, Rotunda Zone, PA. 11, Upper Kimmeridgian. Left (?) valve, external view, HU 2.J.35.1.



KILENYI, Kimmeridge Clay ostracods



described, all from the Purbeck–Wealden beds, the assignment of this form to *Wolburgia* would be premature.

Family PROTOCYTHERIDAE Ljubimova 1955  
 Subfamily PROTOCYTHERINAE Ljubimova 1955  
 Genus PROTOCYTHERE Triebel 1938  
*Protocythere sigmoidea* Steghaus 1951

Plate 27, figs. 27–29

- 1951 *Protocythere sigmoidea* Steghaus, p. 219, pl. 15, figs. 42–45.  
 1955 *Protocythere sigmoidea* Steghaus; Klingler, pl. 11, figs. 11a–d.  
 1955 *Protocythere sigmoidea* Steghaus; Schmidt, p. 59.  
 1957 *Protocythere sigmoidea* Steghaus; Oertli, p. 661, pl. 3, figs. 92–94.  
 1959 *Protocythere sigmoidea* Steghaus; Oertli, p. 31, pl. 4, fig. 126.  
 1964 *Protocythere sigmoidea* Steghaus; Glasshof, p. 45.

*Material.* 12 valves and carapaces. HU 2.J.17.1–12.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.62	0.36	0.20	0.08
♀ Right valve	0.63	0.34	0.19	0.08
♂ Left valve	0.70	0.36	0.22	0.08
♂ Right valve	not found			

*Occurrence.* Rotunda Zone, PA. 19, 21.

*Diagnosis.* Species of *Protocythere* in which median rib joins dorsal rib at posterior end, and ventral rib at anterior end. Result is sigmoidal surface ornament. Surface is smooth. Duplicature broad. Sexual dimorphism strong.

*Remarks.* According to Steghaus (1951), Schmidt (1955), and Oertli (1957) the median element of the left valve hinge is denticulate. In the rather poorly preserved specimens from Dorset the bar appears to be smooth.

*Protocythere rodewaldensis* (Klingler 1955)

Plate 27, figs. 30–32; text-fig. 5j

- 1955 *Pleurocythere ? rodewaldensis* Klingler, p. 198, pl. 10, figs. 10a–c; pl. 11, fig. 10d.  
 1955 *Protocythere ? n. sp.* Schmidt, p. 59, pl. 2, fig. 33.  
 1957 *Protocythere rodewaldensis* (Klingler); Oertli, p. 662, pl. 3, figs. 95–97.  
 1959 *Protocythere rodewaldensis* (Klingler); Oertli, p. 31, pl. 4, fig. 127.  
 1964 *Protocythere rodewaldensis* (Klingler); Glasshof, p. 46.

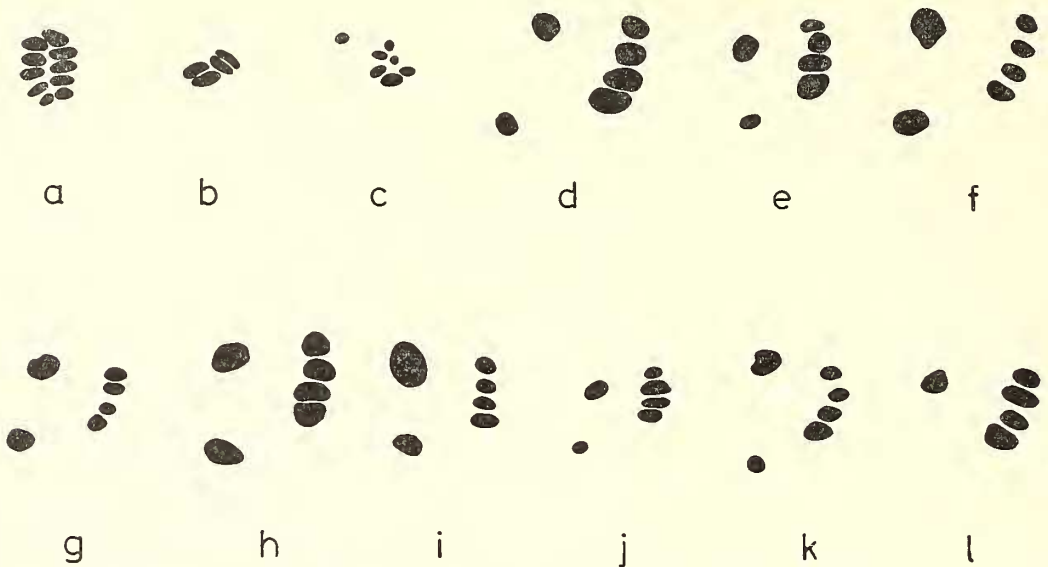
*Material.* 4 valves. HU 2.J.18.1–4.

<i>Dimensions (mm.). (females?)</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.52	0.32	0.17	0.08
Right valve	0.55	0.29	0.13	0.08

*Occurrence.* Baylei Zone, P. 1.

*Diagnosis.* Surface ornamentation of 3 main ribs. Median rib starts from posterior cardinal angle and joins ventral rib antero-ventrally. Additional fine rib runs parallel with anterior margin. Eye tubercle well developed. Surface of valve reticulate.

*Remarks.* The sexual dimorphism mentioned by Klingler (1955), was not observed in the Dorset material and it is very likely that only female valves were represented.



TEXT-FIG. 5. Muscle scar patterns (right valves),  $\times 250$ . *a*, *Cytherelloidea paraweberi* Oertli. *b*, *Paracypris* sp. C. Oertli. *c*, ? *Paracypris problematica* sp. nov. *d*, *Galliaecytheridea dissimilis* Oertli. *e*, *G. wolburgi* (Steghaus). *f*, *G. malzi* sp. nov. *g*, *G. trapezoidalis* sp. nov. *h*, *G. postrotunda* Oertli. *i*, *G. fragilis* sp. nov. *j*, *Protocythere rodewaldensis* (Klingler). *k*, *Mandelstania triebeli* Kilenyi. *l*, *Amplicythere sphaerulata* sp. nov.

*Protocythere nealei* sp. nov.

Plate 28, figs. 1-4

*Holotype.* A female left valve. HU 2.J.1.15.

*Paratypes.* 8 valves. HU 3.J.15.2-9.

*Type locality and horizon.* Hounstout Cliff, Kimmeridge, Dorset. Pallasoides Zone, Upper Kimmeridgian.

*Dimensions (mm.).*

	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Holotype	0.58	0.34	0.15	0.06
Right valve	0.60	0.30	0.15	0.06

*Occurrence.* Pallasoides Zone, PA. 21.

*Diagnosis.* Species of *Protocythere* with following surface ornamentation: dorsal and median ribs joined together at posterior end. Median rib branches out from dorsal rib near posterior cardinal angle where a characteristic knob-like structure is found which projects above dorsal margin of valve when viewed from side. Valve surface reticulate. Hinge hemimerodont, delicate. Sexual dimorphism doubtful.

*Description.* Carapace triangular, highest at anterior cardinal angle. Left valve slightly larger than right, but as only separate valves found, degree of overlap not observed. In dorsal view valves alike, roughly triangular in shape. Greatest width about one-fifth distance from posterior end.

Valves similar in shape, but left valve higher at anterior cardinal angle, and its anterior end less rounded. Dorsal margin straight on both valves. Cardinal angles more marked on right valve, as edge of terminal sockets in left valve form two half-circles, giving more rounded appearance to cardinal angles. Postero-dorsal margin very short, concave, more conspicuous on left valve. Posterior end more or less a rounded right-angle. Ventral margin straight on both valves. Sexual dimorphism doubtful; some valves somewhat longer and less high than others and probably males.

Surface ornamented by system of 3 quasi-horizontal ribs between which surface is reticulate; 'secondary' ribs may occur. Three main ribs form main ornamentation. Upper one starts from posterior part of valve, just in front of posterior cardinal angle. Here knob-like protuberance occurs, usually more strongly developed on left valve, protruding above dorsal margin in side view. Rib itself runs parallel with dorsal margin for about half its length and then for short distance leaves dorsal margin, forming semi-circular depression, rejoining dorsal margin at anterior cardinal angle. Rib continues round anterior margin, joining ventral rib. This runs parallel with dorsal rib, becoming very prominent towards its posterior end, where it ends abruptly. On left valve these 2 ribs seem to join at their posterior ends. Median rib branches out from dorsal one at posterior cardinal angle, where protuberance occurs, and from this point forms a straight line to exact centre of valve, where it turns upwards and joins dorsal rib near anterior. Faint 'secondary' rib (crest) branches out from median rib near centre of valve and joins anterior part of ventral rib. Exact structure of rib system best observed in transmitted light. In side view all 3 ribs are highest at their posterior end and slope gradually towards anterior, ventral rib being highest of 3.

Duplicature broad. Line of concrescence coincides with inner margin; radial pore canals straight, thin, few.

Hinge delicate; consists of 2 terminal dentate ridges connected with long, straight, apparently smooth groove (right valve). Five denticles on terminal elements. Complementary arrangement of left valve has 2 elongate, loculate sockets and straight smooth bar.

*Remarks.* *P. nealei* resembles *P. rodewaldensis* (Klingler 1955) but is easily distinguishable from it by its more angular appearance and the ornamentation of the valves.

Family CYTHERURIDAE Müller 1894  
Genus CYTHEROPTERON Sars 1865  
*Cytheropteron aquitanum* Donze 1960

Plate 28, figs. 8-11

1960 *Cytheropteron aquitanum* Donze, p. 21, pl. 4, figs. 48-51.

*Material.* 1 carapace. HU 2.J.1.16.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>
Left valve	0.59	0.35	0.19
Right valve	0.57	0.33	0.15

*Occurrence.* Wheatleyensis Zone, DO VW. 7.

*Diagnosis.* Species of *Cytheropteron* with inflated ventral border and strongly developed alae.



*Cytheropteron* sp.

Plate 28, figs. 5-7

*Material.* 2 valves. HU 2.J.20.1-2.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>
♀ Left valve	0.45	0.28
♂ Left valve	0.48	0.26

*Occurrence.* Wheatleyensis Zone, DO VW. 2, 4.

*Description.* Species of *Cytheropteron* with flat wing-like alae. Four ribs on surface of valve, none of them very marked. First connects anterior cardinal angle with posterior part of ala. Second and third arch to dorsal margin from anterior and posterior parts. Fourth runs vertically in middle of valve. Longer, vertically more compressed valves are considered males.

Genus EOCYTHEROPTERON Alexander 1933  
*Eocytheropteron decoratum* (Schmidt 1954)

Plate 28, figs. 14-17

1954 *Cytheropteron* (*C.*) *decoratum* Schmidt, p. 82, pl. 5, figs. 1, 2; pl. 6, figs. 16-18.1955 *Cytheropteron* (*C.*) *decoratum* Schmidt; Schmidt, p. 59.1957 *Eocytheropteron* ? *decoratum* (Schmidt); Oertli, p. 663, pl. 4, figs. 109-112.*Material.* 8 valves. HU 2.J.21.1-8.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
Left valve	0.46	0.28	0.14	0.03
Right valve	0.41	0.25	0.15	0.03

*Occurrence.* Baylei Zone, P. 1.

*Diagnosis.* Carapace bud-shaped, posterior end pointed. Surface ornamented with fine vertical ribs radiating from centre of dorsal margin, ventral part of valve bearing few longitudinal ribs. Hinge on the right valve consists of 2 terminal dentate ridges with 6 denticles each connected with smooth median bar. Accommodation groove present on left valve.

*Remarks.* There seems to be some difference between Schmidt's and Oertli's figures, the Dorset specimens being closer to the latter. The sexual dimorphism mentioned by Schmidt is not apparent in the Kimmeridge material.

Genus PROCYTHEROPTERON Ljubimova 1955  
*Procytheropteron* sp. 1

Plate 28, figs. 18-24

*Material.* 25 valves. HU 3.J.16.1-18, HU 3.J.17.1-5, HU 2.J.1.17-18.

<i>Dimensions (mm.).</i>	<i>L</i>	<i>H</i>	<i>W</i>	<i>M/a</i>
♀ Left valve	0.42	0.24	0.11	0.05
♀ Right valve	0.40	0.23	0.11	0.05
♂ Left valve	0.48	0.22		

*Occurrence.* Baylei Zone, P. 1, 2.