TRILOBITES FROM THE ORDOVICIAN
AUCHENSOUL AND STINCHAR LIMESTONES
OF THE GIRVAN DISTRICT, STRATHCLYDE

by R. P. TRIPP

ABSTRACT. Four new trilobite faunas from the Barr Group of the Girvan District are recorded; three new species are described—Remopleurides aulnechus, Raymondopsis broacklochensis, and Hemirges inghami. A new specific name, Xylabion kirkaldense, is proposed for a form from the Confinis Flags. The trilobite assemblages indicate inshore conditions of deposition; the Stinchar Limestone fauna at Minution Quarry is a good example of the shallow-water illisimid-chelurid community. The close resemblance to certain lower Eoblastoorine Formation species indicates equivalence in age, probably upper Claenian. The upper part of the Stinchar Limestone is Llandovery in terms of the British succession; it is not certain whether the lower horizons are Llanvirn or not, but there is no sign of a break in the trilobite faunas of the Barr Group, apart from that attributable to transgression.

The Auchensool Limestone yields the earliest trilobite fauna in the Barr Group. The lower/middle Stinchar Limestone faunas bridge the gap between the Confinis Flags (Tripp 1962) and the platy upper Stinchar Limestone (Tripp 1967). Brockloch Quarry exposes the youngest Stinchar Limestone. The trilobites are mainly from the following localities.


Top Stinchar Limestone, Brockloch Quarry, 0.8 kilometre north of east of Brockloch Farmhouse. Nat. Grid Ref. NX 256951 (Williams 1962, p. 13, p. 255 (b3)). Hunterian Museum Collection.

The terminology is essentially that adopted in the Treatise on Invertebrate Paleontology, Part O. Most rare taxa are illustrated, but not described. Specimens collected by the author have been purchased by the Hunterian Museum, Glasgow University, with the assistance of a Treasury Grant-in-aid. Records of the numbers of trilobite parts summarized in the Table I have been deposited with the British Library, Boston Spa, Wetherby, Yorkshire, LS23 7BQ, U.K. as Supplementary Publication No. SUP 14015 (4 pages).

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*Tramischell Quarry (1), Aldons Quarry (2), Benam Burn (3), Bougang Quarry (4).
Family REMOPLEURIIDAE Hawle and Cords, 1847
Genus REMOPLEURIDES Portlock, 1843
Remopleurides ateuchetes sp. nov.

Plate 37, figs. 1-6, 8

**Diagnosis.** Anterior tongue more than 50% maximum width of glabella, projecting. Genal and dorsal spines absent. Glabella smooth.

**Holotype.** A.13990a, b (cranium). Plate 37, figs. 1-3. Auchensoul Limestone, Auchensoul Bridge.

**Other material.** 13 cranidia, 7 free cheeks, 1 thorax (lacking first segment) with pygidium attached, 8 incomplete thoraces or single segments; Auchensoul Limestone, Auchensoul Bridge.

**Material from other horizon.** 14 cranidia, 4 free cheeks, 1 hypostome, 1 thorax (lacking first segment) with pygidium attached; Stinchar Limestone, Water of Gregg, east of Barr.

**Dimensions of holotype.**

<table>
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<td>Length of cranium (sag.)</td>
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<td>Width of cranium</td>
<td>10.0 mm</td>
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<tr>
<td>Width of glabella</td>
<td>9.3 mm</td>
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<tr>
<td>Width of anterior tongue</td>
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<tr>
<td>Distance between posterior extremities of eyes</td>
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Thorax narrows steadily backwards. Racial rings weakly convex longitudinally and transversely, no spine on eighth ring. Racial furrow deep. Pleurae approximately 30% width of ring, directed outwards anteriorly, free points curve successively more strongly backwards. Seventh pleurone slightly enlarged, extending backwards as far as eighth; posterior four pleurae reduced. Eleventh pleurone do not stretch beyond pygidium. Articulating bosses and sockets small but tall. Articulating half ring short; articulating furrow deep. Doublure extends to rachial furrow.

Pygidium more than twice as wide as long. Rachis short. First ring represented by a pair of transversely elongated lobes. Second ring weakly developed. Pleurae fused, free points hardly developed. Pleural furrows absent. Median embayment broad. Doublure convex, extending to rachis.

Glabella smooth. Occipital and thoracic rings smooth or with transverse raised lines; a row of inconspicuous tubercles at posterior margin of ring. Free cheek smooth or with faint raised lines which die out posteriorly. Doublure with terrace lines well developed.

**Remarks.** This species differs from described species in the absence of a spine on the eighth thoracic ring. The free cheek resembles that of *R. vulgaris* Tripp (1967, p. 46, pl. 1, figs. 5-19) but the venter is more oblique. The cranium has a characteristic outline, and is usually smooth.
TRIPP: ORDOVICIAN TRILOBITES

Remopleurides sp. (vulgaris species group)

Plate 37, fig. 11

1903 Remopleurides vulgaris Reed; Reed, p. 41.

Material. 3 cranidia, 40 incomplete thoraces (17 with pygidia attached); massive Stinchar Limestone, Minution Quarry.

Remarks. Thoraces and pygidia correspond with R. vulgaris Tripp in gross morphology; the spine on the eighth ring, which extends backwards so further than half-way across the ninth ring in R. vulgaris, is even shorter in the above material, and pygidia are similar in outline. Cranidia differ in their stronger convexity and broader outline, over 50% maximum width of glabella (compared with 40% in R. vulgaris). The occipital ring (and the margin of the glabella) are transversely strate, as is occasionally the case in R. vulgaris but not in R. vulgaris.

Remopleurides sp.

Plate 37, fig. 7

Material. 1 incomplete thorax (see explanation of plate for registered numbers); Auchensoul Limestone, Auchensoul Bridge.

Remarks. One specimen consisting of four articulating thoracic segments, probably the seventh to the eleventh, has such long pleurae (exceeding the width of the rachis), that reference to the genus Remopleurides, despite the characteristic articulating system, must be treated as questionable.

TEXT-FIG. 1. Diagrammatic section in lower/middle Stinchar Limestone at Minution Quarry, near Girvan. Prepared by Dr. J. K. Ingham.
Family Asaphidae Burmeister, 1843
Genus Isotelus Deyck, 1824
Isotelus sp.
Plate 37, fig. 15

Material. 1 cranium, 2 free cheeks, 2 hypostomes, 6 thoracic segments, 1 pygidium; Auchensoul Limestone, Auchensoul Bridge.

Remarks. This form bears a general resemblance to I. stincharensis (Begg 1950, p. 288, pl. 14, figs. 4-5; Tripp 1962, p. 6, pl. 1, figs. 20-25) from the Confinis Flags. The following are the main points of difference. The branches of the facial suture are more divergent, the hypostome is narrower anteriorly, the rachis of the pygidium is considerably shorter.

EXPLANATION OF PLATE 37

The specimens are testiferous unless otherwise stated; all were lightly coated with ammonium chloride before being photographed.

Figs. 2-3. Same, frontal and right lateral views, × 3. Auchensoul Limestone, Auchensoul Bridge.
Figs. 4. Cranidium (A.1399c), × 4. Lower Stinchar Limestone, Water of Gregg, east of Barr.
Figs. 5. Right free cheek (A.1399a), × 6. Auchensoul Limestone, Auchensoul Bridge.
Figs. 7-8. Stinchar Limestone, Water of Gregg, east of Barr.
Figs. 12. Hypostracans sp. Hypostome (IGSE 13327), × 4-5. Stinchar Limestone, Water of Gregg, east of Barr.
Figs. 15. Remopleuridae sp. Doubtful of left free cheek (A.1399b), × 2-8. Auchensoul Limestone, Auchensoul Bridge.
Figs. 16-17. Raymondaspis brooklochensis sp. nov. Top Stinchar Limestone, Brockloch Quarry.
Figs. 18. Cranidium (holotype, A.14001), dorsal and frontal views, × 4. Auchensoul Limestone, Auchensoul Bridge.
Figs. 19. Hypostome (A.14002), showing small macula at end of lateral furrow, × 10. Auchensoul Limestone, Auchensoul Bridge.
Figs. 22. Hypostome (A.1400b), × 3-7. Auchensoul Limestone, Auchensoul Bridge.
Figs. 23. Right free cheek (A.1400c), × 4. Auchensoul Limestone, Auchensoul Bridge.
Figs. 25. Illicid thorax and pygidium (A.14073a), × 2. Auchensoul Limestone, Auchensoul Bridge.
TRIPP, Ordovician trilobites
Family Scutellidae Richter and Richter, 1955
Genus Raymondaspis Přibyl, 1949
Raymondaspis brocklochensis sp. nov.
Plate 37, figs. 16–23

Diagnosis. Glabellae gently swollen, basal width about 60%, maximum width, 1S distinct. Anterior border clearly defined. Fine raised lines on glabella. Posterior margin of pygidium transverse; postrostral extension short. Pleural ribs absent.

Holotype. A.14001 (cranidia). Plate 37, figs. 16–17. Top Stinchar Limestone, Brockloch Quarry.

Other material. 6 cephalas, 8 cranidia, 23 free cheeks, 21 hypostomes; 1 incomplete thorax with pygidium attached, 25 pygida; top Stinchar Limestone, Brockloch Quarry.

Dimensions of holotype.

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<td>Width of cranidium</td>
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<td>Basal width of glabella</td>
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Description. Differs from R. reedi Tripp (1976, p. 380, pl. 3, figs. 19–28) from the basal Uppermost Mudstones in the following features: glabella much wider posteriorly, about 60%, anterior width (compared with 50%), convexity weaker. Glabella more strongly rounded in outline anteriorly. Proglabellar furrow deeper. Rachial furrow shallower. Anterior border longer (exs.). Eye smaller. Intramarginal furrow extends for full length of free cheek. Middle body of hypostome more convex. Pygidium concave abaxially, posterior margin transverse. Rachis with one ring well defined, postrostral ridge short. Faint terrace lines on pygidium, convex forwards on rachis, slanting backwards and inwards adaxially on pleural lobe.

Remarks. R. brocklochensis resembles R. reedi and R. brunleyi (Cooper 1953, p. 25, pl. 9, figs. 8–10) in the presence of 1S and absence of pygidial pleurae, but differs markedly in the greater posterior width of the glabella, and in other features mentioned above. Raymondaspis is the most abundant trilobite at Brockloch.

Family Ilaenidae Hawle and Corda, 1847
Unassigned ilaeinid parts
Plate 37, fig. 25, text-fig. 2

Remarks. A multiplicity of taxa is represented in the Auchensoul and Stinchar Limestones, but evidence for the association of parts is lacking. Text-fig. 2 illustrates the diversity of free cheeks, rostral plates, and hypostomes.

Family Dimeropygidae Hupé, 1953
Genus Dimeropyge Ópik, 1937
Dimeropyge aff. labrosa Tripp, 1967
Plate 38, fig. 1

Material. 5 cranidia, 1 free cheek; decalcified Stinchar Limestone, Minniburn Quarry.

Remarks. Differs from D. labrosa Tripp (1967, p. 54, pl. 2, figs. 21–32) from the platy upper Stinchar Limestone, in the following features: the three aculeate tubercles on the occipital ring are absent, the adaxial and abaxial tubercles on the posterior border of the cranidium are not so greatly enlarged, the field of the free cheek is broader and more tuberculate. D. labrosa was compared with D. spinifera Whittington and Evitt (1954, p. 42, pl. 22, 23; text-figs. 9–10) from the Lincolnshire Limestone. Chatterton and Ludvigsen (1976, p. 51) have drawn attention to the close similarity between D. labrosa and D. clavata Shaw

(1968, p. 40, pl. 11, figs. 12-38) from the Chazy Group. The Minution form of *D. labrosa* is closer both to *D. clintonensis* and to *D. spinifera* than is the type form, but both differ from the North American species in the circumflex outline of the anterior margin of the cranidium, and the straight genital spine.

Family DIONIDIDAE Gülich, 1907
Genus *Dionide* Barrande, 1847

*Dionide* sp.

Plate 38, fig. 3

**Material.** 1 cranidium (internal and external moulds of upper lamella); top Stinchar Limestone, Brockloch Quarry.

**Description.** Cephalon semicircular in outline. Glabella longer than wide, moderately convex in both directions. Glabella widens abruptly to twice basal width at 25% length from back, narrowing steadily anteriorly. 1S short, running inwards and forwards at anterior extremity of neck. 2S short, transverse, placed near mid-length of glabella, terminating in a large, shallow, rounded pit. Occipital ring conforms in width and convexity with neck of glabella. Occipital furrow shallow. Cheek gently convex adaxially, more
strongly convex abaxially. A shallow furrow commences opposite IS, curving forwards and outwards, then backwards and outwards and becoming shallower; a faint, transverse furrow runs from the radial furrow to the apex of this genal furrow, tangentially. Posterior border furrow possibly represented by a short (tr.) depression almost opposite occipital furrow: posterior border otherwise obsolete. Articulating ledge adaxially at back of cephalon. Lateral border weakly developed: genal angle not preserved. Glabella and occipital ring smooth, except for a low tubercle opposite 2S, with two smaller tubercules in line behind. Cheek anterior to genal furrow bears a network of low, anastomosing raised lines, with pits between; independent caecal ridge not developed. Inner limit of lower lamella probably indicated by change of convexity on right side. Cheek posterior to genal furrow pebbled and faintly pitted, without raised lines. Lateral border smooth.

Remarks. This cephalon combines characters of *Dionide turnballi* Whittington (1952, p. 8, pl. 2, figs. 1–6, 10–11) and *Dionella incisa* Penafl and Pribil (1949, p. 6, pl. 1, fig. 1, text-fig. 4; Whittard 1958, p. 96, text-figs. 5a, b). Features of the former are the elongate, moderately convex glabella, with narrow neck, and narrow occipital ring; features of the latter are the presence of 2S terminating in a pit, and the uniform sculpture of the inner and outer parts of the cheek.

The course of the genal furrow recalls that of the posterior border furrow in a number of species, particularly that referred to *Dionide formosa* (Barrande) by Curtis (1961, p. 14, pl. 7, figs. 1–2, pl. 8, fig. 1) but in the Brockloch cephalon the furrow curves much more strongly forwards, and commences opposite IS. A cephalon referred by Butts (1941, pl. 82, fig. 26) to *D. holdenii* Raymond, has a strong genal furrow

EXPLANATION OF PLATE 38

The specimens are internal moulds unless otherwise stated.

Fig. 1. *Dimorphocythere aff. latirostris* Tripp. Broad cranidium (A.14007a), ×16. Decalcified Stinchar Limestone, Minution Quarry.

Fig. 2. *Paraharpes* sp. Testiferous brim of cephalon (A.14008), ×3. Top Stinchar Limestone, Brockloch Quarry.

Fig. 3. *Dionida* sp. Internal mould of upper lamella of cephalon (A.14009a), ×4. Top Stinchar Limestone, Brockloch Quarry.

Fig. 4. *Loxochadomnus* sp. Testiferous cranidium (A.14010), ×2.5. Stinchar Limestone, Water of Gregg, east of Barr.


Fig. 20. *Acanthocystis fushi* Tripp. Cranidium (A.14023) closely associated with a left free cheek of *Quinquecosta aff. stinchcens*, ×2. Auchensoul Limestone, Auchensoul Bridge.

Fig. 21. *Plumosella* sp. Testiferous left free cheek (A.14024), ×3.5. Top Stinchar Limestone, Brockloch Quarry.

TRIPP, Ordovician trilobites
Family CHEIRURIDAE Saltier, 1864

Genus CEREAURINELLA Cooper, 1953

Ceraurinella aff. magnilocata Tripp, 1967

Plate 39, figs. 5-11

Material. 2 cranidia from the massive Sunchar Limestone, Minunton Quarry. 2 cephalas, 137 cranidia, 35 free cheeks, 49 hypostomes, 77 thoracic segments, 25 pygidia; decalcified Sunchar Limestone, Minunton Quarry.

Remarks. Some specimens are indistinguishable from C. magnilocata Tripp (1967, p. 61, pl. 3, figs. 14-28) from the platy upper Sunchar Limestone, but most show the following differences: the convexity of the glabella is stronger, 1L is shorter compared with 2L and 3L, the eye is larger compared with the width of the cheek, the middle body of the hypostome is more convex, the great spine of the pygidium is set at a steeper angle to the slope of the rachis, and the spine curves upwards near the tip, the anterior flange of the pygidium slopes downwards.

New Specific Name. Lane (1971, p. 24) considered the holotype of Burtoninus dispersus Tripp (1962, p. 18, pl. 2, fig. 22a, b) from the Confinis Flags, to be attributable to Ceraurinella, and generically distinct from the remainder of the material referred to that species. I am in agreement with that conclusion and hereby propose the specific name kirklandiensis for the other specimens referred to B. dispersus. I select as holotype the pygidium HM A.5312 from the Confinis Flags, Kirkdomine (Tripp 1962, pl. 2, fig. 31). The species is attributable to the genus Xylobloc Lane (1971, p. 40). The weak definition of the anterior border of the cranidium, and the short, outwardly directed spine on the anterior flange of the pygidium distinguish X. kirklandiensis from other species. C. magnilocata and C. aff. magnilocata differ from C. dispersus in their stronger glabellar furrows and larger eye.

In describing C. kirklandiensis Chatterton and Ludvigsen (1976, p. 52, pl. 8) compared their species most closely with C. magnilocata, and the resemblance to the affiliated form from Minunton is even closer. The Scottish populations can be distinguished from the Canadian by the larger 1L of the cranidium and larger anterior flange of the pygidium.

The resemblance of C. magnilocata to C. chandra Whitington and Evitt, and to A. type Whitington and Evitt has been discussed by Lane (1971, p. 19). Again, the Minunton form stands closer to these two species than does the type material of C. magnilocata, particularly in the steeper slope of the great spine.

The degree of resemblance between the species discussed above is sufficiently great to indicate close relationship and therefore equivalence to the lower Esbastaettine in age (see p. 359).

Genus SPHAEROCORYphe Angelin, 1854

Sphaerocoryphe sp.

Plate 38, figs. 12-14

Material. 1 cephalon, 44 cranidia (mainly swollen anterior glabellar lobes), 7 hypostomes, 2 pygidia; top Sunchar Limestone, Brockloch Quarry.


Remarks. The above material resembles S. pennhis Lane (1971, p. 62, pl. 14, figs. 1-18) from the Balaclachie Group, in its short neck, but differs in its larger 1L, absence of lateral cranidial spines, and stouter genital spine.
Family ENCIRNUIDAE Angelin, 1854
Genus ENCIRNUROIDES Reed, 1931
Encirnuroides stinchacarensis (Reed, 1928)
Plate 39, figs. 1-17

1906 Encirnurus punctatus (Brünich), var. arenacea, Suter; Reed, p. 120, pl. 16, fig. 8.
1928 Encirnurus stinchacarensis Reed, p. 64.
1931 Encirnurus stinchacarensis Reed; Reed p. 19.

Holotype (by monotypy). BM In.23157 (testiferous pygidium, massive Stinchacare Limestone, Minution Quarry). Reed 1906, pl. 16, fig. 8. This paper, Plate 39, figs. 16-17.

Other material. 3 pygidia from the massive Stinchacare Limestone, Minution Quarry. 1 cephalon, 9 eranidia, 4 free cheeks, 1 hypostome, 7 thoracic segments, 21 pygidia; decalcified Stinchacare Limestone, Minution Quarry.

Description. Holotype pygidium triangular in outline, strongly vaulted, approximately as wide as long; 21 rachial rings and 9 pleurae, ninth pair not reaching posterior margin. Rachis almost 30% maximum width of pygidium, narrowing slowly and steadily to an ill-defined apex at 20% length from back, strongly convex longitudinally and transversely. Ring furrows continuous, increasingly shallow medially on successive rings. Rachial furrow deep and narrow anteriorly, becoming shallow posteriorly. Pleural lobe curves strongly downwards near midwidth. Pleural ribs prominent; first four ribs end in blunt free tips, posterior ribs merge with lateral border. Anterior pleural gently convex forwards, posterior pleural straight. First four rib furrows deep and narrow throughout, fifth furrow shallow abaxially, subsequent furrows die out near margin. Lateral border of moderate and uniform width, extending horizontally inwards anteriorly, sloping slightly upwards posteriorly; inner margin almost straight. Articulating half-ring and facet short (imag.). Articulating furrow shallow. Surface granulate; pairs of irregularly spaced, small tubercles or large granules on rachis. Pygidia from the decalcified limestone are identical with specimens from the massive limestone, and associated parts are attributed to E. stinchacarensis accordingly.

Cephalon elliptical in outline, sagittal length slightly less than 50%, width at base of genal spines, which are small. Glabella longer than wide, width across 1L about 70%, width across frontal lobe, strongly convex longitudinally and transversely. Frontal lobe 45%, length of glabella, broadly rounded in outline anteriorly. Longitudinal median furrow broad, extending backwards from preglabellar furrow for 20% length of glabella. Lateral lobes represented by gently swellings on steep lateral slope of glabella, 2L slightly longer than 3L, 3L shortest (exsag.), ridge-like and connected to neck of glabella. 1S, 2S, and 3S short and broad, successively shallower. Occipital ring short, of uniform length, wider (tr.) than base of glabella. Occipital furrow well defined, transverse. Preglabellar furrow uniformly deep and broad, undercutting glabella. Rachial furrow deep and narrow, straight; deep fossula at anterior extremity; stout apodemes adaxially at junctions with 2S, 1S, and occipital furrow. Anterior border of cranidium short (imag.), lengthening slightly abaxially. Fixed cheek convex, sloping steeply towards sides. Palpebral lobe small, elevated, midlength opposite 2S, anterior extremities 175%, anterior width of glabella apart. Eye ridge absent. Posterior border short, approximately equal in length (exsag.) to occipital ring, not widening abaxially, curving forwards abaxially. Genal spine short and slender, directed outwards, and only slightly backwards, forwardly placed. Anterior branch of facial suture runs obliquely inwards and downwards to fossula, and then curves forwards and inwards, defining anterior border of cranidium. Posterior branch of facial suture curves outwards and backwards cutting border opposite 1S.

Eye lobe small, elevated, separated from cheek by deep, broad furrow. Lens surface convex, expanded, occupying more than 50% height of lobe. Check slopes steeply outwards. Field flattened, considerably wider than border. Precranial lobe short (exsag.), distinctly marked off from anterior border. Lateral border narrow, continuous with anterior border in outline and convexity, not markedly incurved posteriorly. Lateral border furrow deep and broad, U-shaped in cross section.

Hypostome subtriangular, anterior outline strongly rounded. Middle body oval, 75% length of hypostome, very strongly convex. Rhynchos processes anteriorly but not overhanging border, ill-defined posteriorly. Anterior border strongly developed. Anterior wing large, placed anteriorly to midlength of hypostome, rounded wing process near extremity. Lateral border narrow, depressed. Posterior tongue moderately long, flattened, pointed. Doubtful unknown.
Cephalon irregularly tuberculate, lateral lobes sparsely tuberculate; about 90 tubercles on glabella, tubercle size index (Temple and Tripp in press), i.e. width of largest glabella tubercules as % of width of frontal lobe) 7%. An irregular row of about eleven small tubercles on anterior border of cranidium. Cheeks tuberculate, field of cheeks closely pitted between tubercles. External surface of middle body of hypostome granulate.

Attribute coding (Temple and Tripp in press). Pygidium: 1-0; 2-21; 3-1; 4-0; 5-0; 6-9; 7-0; 8-6; 9-1. Cranidium: 10-1; 11-1; 12-15-1100; 16-1; 17-0; 18-0; 19-0; 20-0; 21-0; 22-0; 23-4; 24-0; 25-0; 26-0; 27-90; 28-11; 29-0; 30-2; 31-0; 32-2; 33-7; 34-0.

Development. A meraspir cranidium (A.14078) 1.2 mm in sagittal length has a narrow cranidium, IS and 2S connected across the glabella, and a small torular tubercle (Evitt and Tripp 1977, p. 114) situated adaxially on the fixed cheek opposite 2S. A small free cheek 1.9 mm in lateral length has eye lobe larger compared with the adult. Small pygidia lack full number of segments ring, furrows are deeper, and first four pairs of pleurae end in out-turned free points.

Remarks. E. stincharensis. E. autocyphon Tripp (1962, p. 22, pl. 3, figs. 18-25) from the Confinis Flags, and E. polyleura Tripp (1967, p. 70, pl. 5, figs. 1-8) from the platy upper Stinchar Limestone, constitute a species group unified by the following features: glabella widens steadily forwards, glabellar furrows short, genal spine short, anterior border of free cheek not set at an angle to lateral border, 9 pairs of pleurae in pygidium, posterior pleurae fused abaxially, large paired granules on raxis of pygidium.

Genus Quinquecosta Tripp, 1965

Quinquecosta aff. stincharensis Tripp, 1967

Plate 38, figs. 22-23

Material. 4 free cheeks, 1 thoracic segment, 1 pygidium; Auchensoul Limestone, Auchensoul Bridge. 2 cranidia, 1 cranidium with 12 thoracic segments attached, 9 free cheeks, 2 hypostomes, 6 pygidia; Stinchar Limestone, Water of Gregg, east of Barr.

Remarks. The above material agrees closely with topotypes from Auchensoul Quarry (Tripp 1967, p. 74, pl. 5, figs. 21-30) except that the eye is smaller, the field of the free cheek is larger and bears a greater number of pits, and the pygidial pleurae are longer. The thorax provides the first evidence that there were at least twelve segments present in Quinquecosta, none of which are spined or museopneural. Q. stincharensis is the only species to range (under open nomenclature) from the Auchensoul Limestone to the basal Superstes

EXPLANATION OF PLATE 39

The specimens are internal moulds from the decalcified Stinchar Limestone, unless otherwise stated; all are from Minnutation Quarry.


Fig. 25. Amphilichas sp. Hypostome (A.14042a), ×2-2.
TRIPP, Ordovician trilobites
Family Lichidae Hawle and Corda, 1847
Genus Amphileichas Raymond, 1905
*Amphileichas* spp.

Plate 39, fig. 25

Remarks. A pygidium from the Auchensoul Limestone (A.14079) closely resembles that figured from the Confins Flags, Minniont (Tripp 1962, p. 31, fig. 26) but the rachis is shorter. An exceptionally large hypostome from the decalcified Stinchar Limestone, Minniont Quarry, is illustrated.

Genus Hemiarges Gürich, 1901

*Hemiarges inghami* sp. nov.

Plate 40, figs. 1-17; text-fig. 3

1967 *Hemiarges* sp. Tripp, p. 51, pl. 6, fig. 26.


Holotype. A.14063a, b (craniidium). Plate 40, figs. 1-3. Decalcified Stinchar Limestone, Minniont Quarry.

Other material. 105 crania, 4 free cheeks, 35 hypostomes, 1 thoracic segment, 23 pygidia. Decalcified Stinchar Limestone, Minniont Quarry.

Material from other horizon. 1 craniidium from the platy upper Stinchar Limestone, Aldons Quarry.

EXPLANATION OF PLATE 49

The specimens are internal moulds from the decalcified Stinchar Limestone, unless otherwise stated; all are from Minniont Quarry, except fig. 26.


Figs. 25. Unassigned metaprotaspias (or degree zero meraspias) (A.14062), × 18.

Fig. 26. Dasycladacea algae, *Vermiporella* sp. (BM V.59776). Thin section, × 30. Top Stinchar Limestone, Brockloch Quarry.
Dimensions of holotype.

Length of cranium (sag.) 3.3 mm
Width of glabella (maximum) 2.4 mm
Width of central lobe (minimum) 0.8 mm
Length of bullar lobe (max.) 1.5 mm

Description. Cranidium moderately convex longitudinally, weakly so transversely. Central lobe weakly expanded anteriorly, extending half-way across bullar lobe, narrowing slightly backwards, not marked off from posterior lobe. Bullar lobe equal to, or slightly wider than, central lobe opposite eye, with strong independent convexity. Basal lobe slightly depressed, indistinctly demarcated on all sides. Posterior lateral swelling subelliptical, steeply inclined, confluent with basal lobe, strongly marked off from occipital ring. Occipital ring slopes forwards, tapering to a point abaxially, moderately arched transversely. Lateral tubidural furrow deep and narrow, curving outwards for a short distance posterior to bullar lobe before dying out on external surface. Occipital furrow broad and shallow mesially, deep and narrow behind postero lateral swelling. Premarginal furrow deep and well defined, continuous with rachial furrow, which curves inwards towards back of bullar lobe and dies out on external surface.

Anterior border long (sag.), expanding abaxially. Palpebral lobe slopes steeply upwards (Plate 40, fig. 4); posterior extremity posterior to bullar lobe. Palpebral furrow distinct. Eye ridge low, running backwards and slightly outwards from anterolateral angle of glabella to palpebral lobe. Fixed cheek convex, sloping steeply outwards and backwards. Posterior border short, narrowing steadily abaxially, sloping forwards, set low compared with occipital ring and fixed cheek. Posterior border furrow deep, widening strongly abaxially. Anterior branch of facial suture runs forwards and cuts anterior border at a steep angle; posterior branch curves outwards and backwards, crossing posterior border abaxially to midwidth.

Eye lobe elevated, rounded, moderately large; lens surface occupies upper half of lobe. Free cheek falcate, gently sigmoidal in outline. Field subtriangular in shape, convex. Lateral and posterior borders moderately wide, weakly convex, merging to form backwardly curving bivalve spine, which narrows steadily. Border furrows broad and shallow, faintly continued as a single furrow on spine. Doubliure wide, strongly convex abaxially, bearing faint terrace lines parallel to margin.

Cephalon tuberculate, with large paired tubercles consistently arranged. A pair of short spines at back of occipital ring, directed straight backwards. Five pairs of large tubercles: three pairs on central lobe along side bullar lobe; one pair towards back of bullar lobe; one pair adaxially on fixed cheek, alongside bullar lobe. Tubercles of intermediate size placed posteriorly on central lobe, anteriorly on bullar lobe, alongside palpebral lobe, and on field of free cheek. Positions of smaller tubercles is indicated on text-fig. 3. Well-preserved external moulds (Plate 40, fig. 8) show a pillar in the centre of the tubercle, possibly indicating presence of an open pore, presumably setiferous.

Hypostome 70%; as long as wide. Central body broadly rounded in front, though narrower and more strongly rounded on some specimens than on others, 65% length of hypostome, weakly convex. Posterior lobe small. Lateral and posterior furrows deep and broad on internal surface, shallow on external. Lateral margin curves outwards and backwards at front, forming obtusely pointed posterior wing, converging posteriorly. Posterior border broad, slightly tumid mesially; posterior margin straight. Doubliure of posterior margin extends as far as posterior furrow, convex except for an elliptical median boss which is separated by a narrow furrow from anterior margin of doubliure. Surface smooth.

Thoracic segment with pleura curving strongly backwards. Pleural furrow sharp, mesial for most of its length, becoming shallow beyond midwidth. Doubliure broad, with faint, closely spaced terrace lines. Surface coarsely granulate.

Pygidium much wider than long. Rachis 40%; maximum width, strongly arched transversely, narrowing strongly at 65%; pygidial length from front; postrachial ridge narrow, strongly developed, reaching to border. One ring well defined by a strong ring furrow; second ring marked off abaxially only. Rachial furrow deep and narrow. Pleural lobe weakly convex. First pleura short: posterior band swollen, extended into free point; pleural furrow dies out near margin. Second pleura larger than first, expanding abaxially. Anterior band moderately swollen, separated by border furrow from independently convex lateral border. Posterior band swollen, extended into long free point which reaches well beyond third pleura. Second pleural furrow dies out abruptly where it joins border furrow. Third pleura swollen, unfurrowed, circumscribed by second interpleural furrow and border furrow. Border well defined. Terminal free points tiny, placed close together behind postrostral ridge. A slightly larger free point at anterior extremity of third pleura separated by
narrow, rounded notch from second free point. Dorsal: broad, convex; terrace lines faint. A tubercle on posterior bands of first and second pleurae, second adaxially placed; pairs of small tubercles on rachis and third pleurae (text-fig. 2).

Development. Smallest craniids (Plate 40, fig. 12) 1–0 mm in sagittal length differ from full-grown specimens in that bulbous lobe is shorter and does not extend so far forwards. Eye ridge more strongly developed, and separated by broad depressed area from anterior border. Longitudinal furrow extends beyond bulbous lobe. Large paired tubercles arranged as in adult.

Remarks. The pair of occipital spines distinguishes H. inghami from all other species. The closest comparison is with H. turnerii Chatterton and Ludvigsen (1976, p. 85, pl. 19, figs. 1–41) from the lower Esbastaquim Formation. Both species have a lateral border to the free cheek bearing a few larger tubercles; the pygidium is remarkably similar except that in H. inghami the adaxial pair of free points on the third pleurae are smaller than the abaxial pair. The well-defined border distinguishes the pygidium from that of other Barr Group species—H. insculptus Tripp (1967, p. 80, pl. 6, figs. 20–25) from the platy upper Stinchar Limestone, and H. sp. (Tripp 1962, p. 32, pl. 4, figs. 29–32) from the Conflissis Flags. The single cranium from the upper Stinchar Limestone, Aldons, quoted in the synonymy possesses the diagnostic pair of occipital spines and large paired tubercles, but those on the central glabellar lobe are less regularly arranged.

Family ODONTOPLEURIDAE Burmeister, 1843
Genus CERATOCEPHALA Warder, 1838
Ceratocephala relativa Tripp, 1967
Plate 40, figs. 18–24; text-fig. 4

1967 Ceratocephala relativa Tripp, p. 81, pl. 6, figs. 27–34.

Material. 1 dorsal shield, 19 craniids, 10 free cheeks, 1 hypostome, 1 thoracic segment, 2 pygidia; decalcified Stinchar Limestone, Minution Quarry.

Remarks. The articulated dorsal shield (Plate 40, fig. 22; text-fig. 3) resembles C. luciniata Whittington and
Evitt (1954, text-figs. 1, 13-14) from the Edinburg Limestone in general construction, but differs as follows: fourth to fifth pleural spines are the longest, whereas in C. luciniata the length increases on successive segments. In C. relative spines curve slightly backwards near tips, in C. relative spines of ninth segment are convergent, not divergent, and run parallel to first pygidial spines. Surface is granulate and does not bear small spines as in C. luciniata.

Unassigned metaprotaspis (or degree zero meraspis)

Plate 40, fig. 25; text-fig. 5

Material. 1 metaprotaspis (or degree zero meraspis) 0·7 mm in sagittal length; decalcified Stinchar Limestone, Minution Quarry.

Description. Dorsal shield as long as wide, gently convex; width of rachis 20%, maximum width; cranidium occupies 55% length. Glabella parallel sided; moderately arched transversely. Preglabellar and rachial furrows well defined, continuous. Faint transverse glabellar furrows at 30° and 60° length from occipital furrow. Occipital ring short, well defined. Occipital furrow deep. Fixed cheek large, gently convex, joining in a narrow band anterior to glabella without forming a distinct anterior border. Palpebral lobe and eye ridge not preserved. Facial suture apparently indents anterolateral margins, suggesting presence of a narrow free cheek. Posterior border of cranidium short (exs.), widening slightly abaxially. Posterior border furrow firmly impressed, transverse, subcontinuous with occipital furrow. Anterior outline of pygidium subtransverse. Rachis of pygidium narrows backwards to a point 40%, length of pygidium from posterior margin; two segments and a small, rounded terminal piece, which is strongly marked off. Rachial furrows almost straight, broad anteriorly, narrowing backwards. Pleural lobes gently convex; two very faint furrows are directed outwards and slightly backwards across lobe. Border absent.

Remarks. The closest comparison is with the asaphid degree zero meraspis figured by Hughes (in press, pl. 1, fig. 10) from the Lower Llandoilo. Our specimen is smaller, with pygidium less developed, but is possibly attributable to the family Asaphidae.

TEXT-FIG. 5. Unassigned metaprotaspis (or degree zero meraspis). Reconstruction (Plate 40, fig. 26), × 55. Decalcified Stinchar Limestone, Minution Quarry.

REMARKS AND CONCLUSIONS

The Auchensoul and Stinchar Limestones are sparingly fossiliferous in the main, but yield mixed shelly faunas locally. Except for Remopleurides, nearly all the trilobites consist of isolated parts, frequently broken. Most of the specimens appear to have been transported a limited distance from the original habitat; the occasional occurrence of delicate articulated exoskeletons indicates temporarily quiet, undisturbed conditions.

The decalcified lower/middle Stinchar Limestone at Minution Quarry provides the shallowest-water fauna, the best example of the illaenid-cheirurid community (Fortey 1975, p. 340) in the Girvan District; Ceratirina is the most common genus,
illaenids are represented by a diversity of forms although not numerically dominant. *Dimeropyge* is rare, and raphiophorids and other deeper-water elements are absent. Diversity is low. The frequency of a problematical spherical alga (Plate 40, fig. 20) and gastropods support the suggestion of shallow-water conditions. The trilobites are most closely related to those of the platy upper Stinchar Limestone, but that fauna includes deeper water genera and is more diverse; algae are absent, and gastropods rare, as the following comparison shows (specimens are lodged in the Hunterian Museum):

<table>
<thead>
<tr>
<th>DECALCIFIED STINCHAR LIMESTONE</th>
<th>UPPER STINCHAR LIMESTONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINUITION QUARRY</td>
<td>AUCHENSOUL QUARRY</td>
</tr>
<tr>
<td>Algae</td>
<td>very common</td>
</tr>
<tr>
<td>Ostracodes</td>
<td>absent</td>
</tr>
<tr>
<td>Bryozoa</td>
<td>very common</td>
</tr>
<tr>
<td>Gastropods</td>
<td>33</td>
</tr>
<tr>
<td>Trilobite cranidia</td>
<td>156</td>
</tr>
<tr>
<td>Brachiopods</td>
<td>95</td>
</tr>
<tr>
<td>Pelmatozoan cup plates</td>
<td>52</td>
</tr>
<tr>
<td>Bivalves</td>
<td>20</td>
</tr>
<tr>
<td>Conodonts</td>
<td>6</td>
</tr>
<tr>
<td>Machaerids</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
</tbody>
</table>

The remaining lower/middle Stinchar Limestone assemblages indicate slightly deeper conditions of deposition compared with the Minuition, but shallower than the platy upper Stinchar Limestone. The top Stinchar Limestone of Brockloch Quarry is exceptional in the poverty of the trilobite fauna compared with the wealth of brachiopods. No species of trilobite present is certainly known to occur at any other locality. The occurrence of a dasycladacean alga (Plate 40, fig. 26) indicates warm, shallow conditions. The Stinchar Limestone is succeeded by the Superstes Mudstones, the basal part of which has yielded the offshore nielid community of Fortey.

A study of the conodonts led Bergström (1971, p. 114) to conclude that the boundary between the Llanvirn and the Llandeiloo falls within the Stinchar Limestone. Williams et al. (1972, text-fig. 9) placed the base of the Barr Group within the Llandeiloo Series. There is no indication of a break in the Stinchar Limestone trilobite faunas.

No trilobite species occurring in the Barr Group is known outside the Girvan District. The closest similarity is to certain species of upper Chazyan age from North America, in particular the lower Esbataotin Formation of the southern Mackenzie Mountains, Canada (see pp. 346, 350, 357).

Chatterton and Ludvigsen (1976) recognized four biofacies, dominated by different trilobite genera, in the lower Esbataotin. The Barr Group faunas do not compare closely with any of these, though the Minuition illaenid-cheirurid community would fit best in the *Catyptaulax-Ceraurinella* biofacies. The platy upper Stinchar Limestone fauna might correspond to the deeper *Dimeropyge* biofacies (*Dimeropyge* is the most abundant trilobite at Auchensoy Quarry) though diversity is less than at some *Catyptaulax-Ceraurinella* localities. Chatterton and Ludvigsen (1976, p. 16)
table a list showing 74% of genera common to the lower Esbataottine Formation and to the Girvan District (possibly all Stinchar Limestone occurrences). The reciprocal figure, the proportion of genera common to the Stinchar Limestone and the lower Esbataottine Formation, is less than 40%, a reflection of the exclusive character of the Barr Group faunas.

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