Olenellid trilobites from the uppermost Lower Cambrian Evjevik Limestone at Tømten in Ringsaker, Norway

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Olenellid trilobites are recorded and illustrated for the first time from the uppermost Lower Cambrian Evjevik ['Strenuella'] Limestone at the classical locality at Tømten Farm in Ringsaker, northern Oslo Region. Two species, *Holmia kjerulfi* and *Kjerulfia lata,* are identified from decalcified bioclastic arenaceous limestones. Both species also occur in the underlying Holmia Shale at the same locality.

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The fossil macrofauna of the upper Lower Cambrian deposits at Tømten Farm in Ringsaker, northern Oslo Region, is well known through the thorough descriptions of Kiær (1917). The upper Lower Cambrian succession in the Ringsaker district comprises the Holmia Shale below and the Evjevik [= 'Strenuella'] Limestone above (Skjeseth 1963). Kiær did not recognize the 'Strenuella' Limestone at Tømten and thought that it was missing, even though he (p. 9) collected a number of loose pieces of limestone there. At Evjevika, the type locality, about 1.5 km west of Tømten, he obtained several fossils from the limestone beds. The Evjevik Limestone consists of two beds of bioclastic arenaceous limestone, each 20–25 cm thick and parted by about 1 m of shale devoid of fossils (Kiær 1917, p. 9). Fossils are extremely difficult to hammer out from the limestones, but Kiær succeeded in obtaining fairly good specimens by heating the rock. He recorded both olenellid and ellipsocephalid trilobites (and one specimen of an eodiscid) from the Holmia Shale, but only ellipsocephalids together with a few brachiopods and gastropods from the Evjevik Limestone, emphasizing its lack of olenellids (Kiær 1917, p. 96). For the geological congress in Scandinavia in 1960, the then owner of Tømten Farm, Mr. T. Ensby, kindly excavated a large part of the southwestern outcrop at the locality (where Kiær found the loose blocks), and it appeared that at least the lower bed of the Evjevik Limestone was present here as well as in several other localities in the district. The classical locality has later been visited repeatedly, but collections have been almost exclusively made from the Holmia Shale. Being aware of an olenellid fragment (Fig. 1:C) collected from the Evjevik Limestone at Tømten by G. Henningsmoen in 1961 (from a block with a 1 cm or so thick outer layer decalcified), I concentrated on the limestone on a very short visit together with Prof. G. Theokritoff to Tømten in May 1986. Loose blocks still lie scattered around as remains from the excavation in 1960. The limestone is now very strongly weathered and fossils are readily collected. One very small block yielded an incomplete but well preserved genicranium of *Kjerulfia lata* and another, even smaller, produced several incomplete and less well preserved genicrania and hypostomes of *Holmia kjerulfi,* several cranidia, thoracic tergites, one librigena and one pygidium of *Proampyx? linnarssoni,* countless valves of the brachiopod *Magnicanalis rotundata,* and three specimens of the gastropod *Latouchella* sp. Kiær (1917, p. 95) also recorded some fossils including *H. kjerulfi,* from a thin, strongly weathered limestone bed in the uppermost part of the Holmia Shale. Ahlberg (*in* Ahlberg & Bergström 1978, p. 28) recorded a fragment of a large olenellid in the Evjevik Limestone at Skyberg, about 3.5 km east of Tømten. The specimen was, as the present material, collected from a strongly weathered bioclastic limestone. He thought the fragment most probably belonged to *K. lata.* I have not seen Ahlberg's specimen, but the present find seems to confirm his assumption. Ahlberg suggested (ibid.) that the Evjevik Limestone might be a calcareous horizon of the Holmia Shale (*Holmia kjerulfi*-group Zone) and thus should be included in the same. That may well be

so and, when further collections have been made, it may appear that more trilobite species are common to the two horizons. So far, however, *Proampyx? linnarssoni,* very common in the Evjevik Limestone, has not been recorded from the Holmia Shale.

The fossils in the limestone at Tømten are, as elsewhere in the Ringsaker district, washed together in a polysorted bioclastic calcareous limestone where the larger fragments constitute a few per cent of the total. This and the fact that the fragments bear no traces of worn edges point to a short transport.

The terminology employed mainly follows that of Harrington et al. (1959, *O*117–*O*126), with the exceptions and additions given by Nikolaisen & Henningsmoen (1987).

Subfamily HOLMIINAE Hupé, 1953.

Genus *Holmia* Matthew, 1890

Synonym. – *Olenellus (Cephalacanthus)* Lapworth, 1891 [partim.] *non* Lacèpéde 1802.

Type species. – *Paradoxides Kjerulfi* Linnarsson, 1871, by monotypy.

Remarks. – Matthew proposed naming the genus after G. Holm in 1888, but the taxon was formally established both by Marcou in June 1890 and by Matthew in June 1890 (cf. Walcott 1891, p. 641). The article by Marcou preceded Matthew's in the synonymy list of *Holmia* given by Walcott (1910, pp. 286–287). However, the accepted use of Matthew, 1890 as the author of the genus is followed here.

Holmia kjerulfi (Linnarsson, 1871)

Fig. 1: A–E.

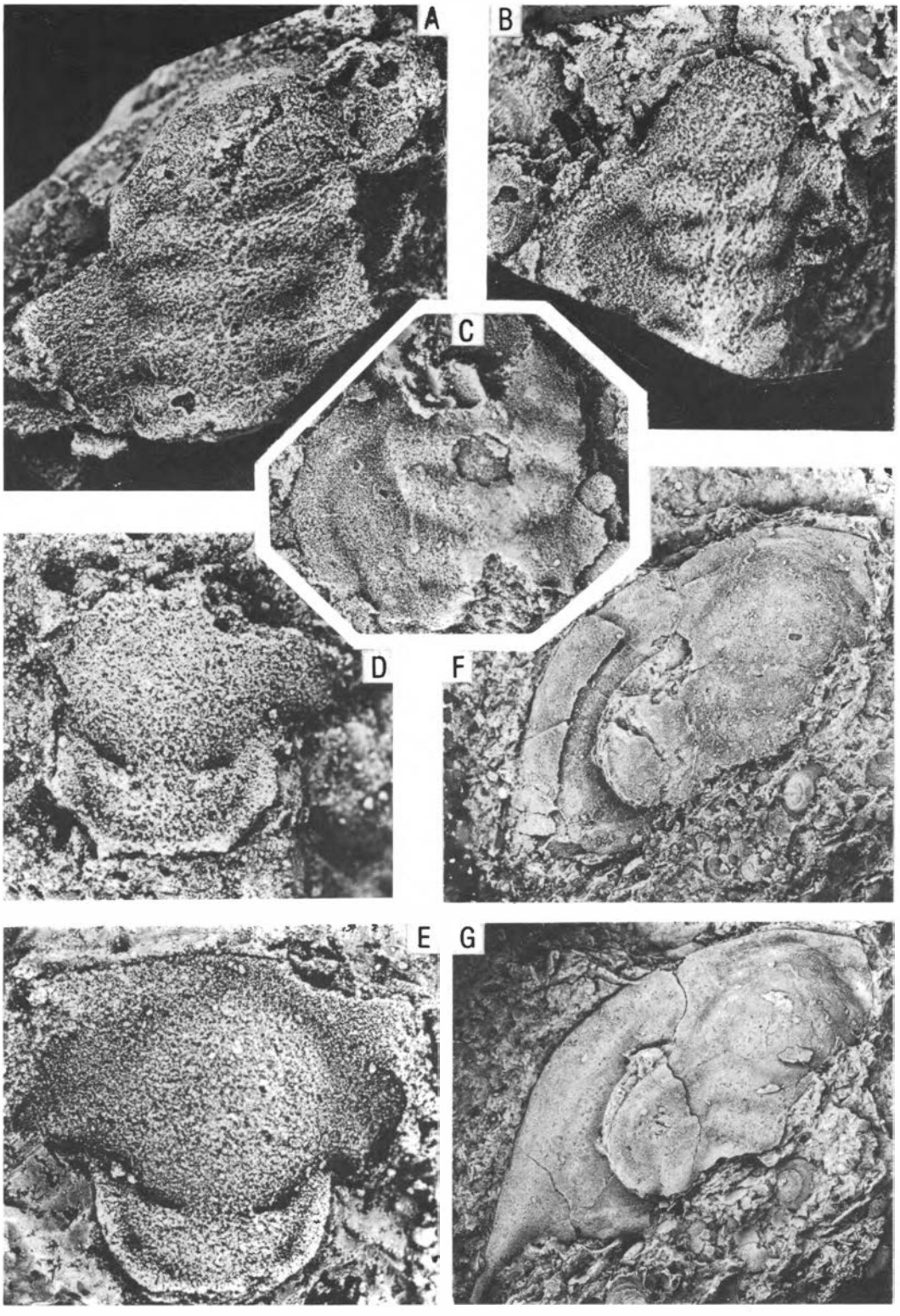
□ 1871 *Paradoxides Kjerulfi* – Linnarsson, pp. 790–792, Pl. 16, figs 1–3 (descr. and figs of fragmentary dorsal exoskeleton, genicranium and gena). □ 1917 *Holmia kjerulfi* Linnarsson – Kiær, pp. 58–70, Pls. 6–8, 14, fig. 3 (descr., ontogeny, and figs. of all parts of the exoskeleton). With synonymy list to date. □ 1973 *Holmia kjerulfi* (Linnarsson) – Bergström, pp. 287–288, Fig. 2 (remarks and figs. of genicrania). With synonymy list from 1937 to date.

Type specimen. – As lectotype should be selected either the fragmentary dorsal exoskeleton or the incomplete genicranium figured by Linnarsson (1871, Pl. 16, figs 1–2) from the Holmia Shale at Tømten Farm, Ringsaker, northern Oslo Region.

Material from the Evjevik Limestone. – Five fragmentary and fairly small genicrania (PMO 113.651-2, 113.655-7), one incomplete genal spine (PMO 113.658), three fairly complete hypostomes (PMO 113.659-61) and one very fragmentary anterior part of a rostri-hypostomal plate (PMO 113.662), all except two genicrania from a single loose block collected at Tømten Farm.

Remarks. – All the genicrania in the material are from fairly small holaspid individuals. They conform very well with equal-sized material from the underlying Holmia Shale as figured by Kiær (1917) as well as additional material in the Paleontologisk Museum's collections. All show a quite narrow glabella across S1 in relation to the width of the palpebral area of the genae, the dominant palpebral lobes, a fairly small frontal lobe and wide L3. The epipalpebral furrow, though only very faintly discernible, is also close to the ocular suture. Unfortunately there are no specimens with the extraocular genae preserved, but one small fragment of a genal spine shows an acute inner spine angle (PMO 113.658). The hypostomes are obviously from larger individuals

Fig. 1. Specimens for photography were firstly indurated in pioloform dissolved in alchohol, then painted with a dilute opaque and covered with a thin layer of ammonium chloride. The specimens are deposited at the Paleontologisk Museum in Oslo and the catalogue numbers are prefixed PMO.
A–E. *Holmia kjerulfi* (Linnarsson, 1871). All specimens from loose blocks of the Evjevik Limestone at Tømten Farm, Ringsaker. C collected by G. Henningsmoen in 1961, A–B, D–E from a single block collected by F. Nikolaisen 1986. All × 10. A. Fragmentary glabella and part of left interocular part of gena. PMO 113.655. B. Dorsal view of almost complete glabella and parts of genae and palpebral lobes. PMO 113.656. C. Dorsal view of fragmentary glabella with well preserved left interocular part of gena and palpebral lobe. PMO 113.651. D. Ventral view of incomplete hypostome showing postero-lateral marginal spines. PMO 113.660. E. Ventral view of almost complete hypostome showing weak delimitation to the rostral plate. PMO 113.659.
F–G. *Kjerulfia lata* Kiær, 1917. Loose block of the Evjevik Limestone at Tømten Farm, Ringsaker. Collected by F. Nikolaisen 1986. × 1.5. Dorsal view of incomplete but fairly well preserved genicranium. F. Internal mould with parts of the dorsal surface preserved. PMO 113.649. G. Latex cast of the external mould of the same specimen. PMO 113.650.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than the genicrania above. The two best preserved specimens are fairly complete, although broken off from the rostral plate. Both are rather convex (ventral view) and only very slightly distorted. The largest hypostome (Fig. 1:E) has quite even postero-lateral and lateral margins (possibly worn off by transportation but more likely during collection) and a very gentle delimitation to what is left of the rostral plate (as in the fragmentary rostri-hypostomal plate present), unlike the condition seen in the hypostome illustrated by Kiær (1917, Pl. 17, fig. 4). The latter may have an exaggerated delimitation due to subsequent compression in the shale. The somewhat smaller and less complete hypostome (Fig. 1:D) lacks the anterior part, but shows very well the two pairs of small marginal spines as in that figured by Kiær (1917, Pl. 7, fig. 6).

Genus *Kjerulfia* Kiær, 1917

Type species. – *Kjerulfia lata* Kiær, 1917 by original designation.

Remarks. – The systematic position of *Kjerulfia* was discussed by Repina (1979), Bergström et al. (1986) and Nikolaisen & Henningsmoen (1987). An assignment to the Holmiinae now seems to be agreed upon and is followed here.

Kjerulfia lata Kiær, 1917

Fig. 1:F–G

□ 1917 *Kjerulfia lata* nov. gen. & sp. [partim.] – Kiær, pp. 73–81, Pl. 9, figs 1–3, 5, ?*non* fig. 4, Pl. 10, figs 1–2, Pl. 11, figs 1–3, Pl. 12, figs 1, 3–5, *non* fig. 2, Pl. 13, figs 1–3, Pl. 14, figs 1–2 [Pl. 12, fig. 2; ?Pl. 9, fig. 4 = ?*Schmidtiellus*] (descr. and figs of all parts of the exoskeleton). □ 1987 *Kjerulfia lata* Kiær, 1917 – Nikolaisen & Henningsmoen [in press], Figs 1, 5A–C (descr., remarks and figs. of genicranium and glabellae). With synonymy list to date.

Type specimen. – Lectotype (Nikolaisen & Henningsmoen, in press), the incomplete genicranium (PMO 61376) figured by Kiær 1917, Pl. 10, fig. 1, from the Holmia Shale at Tømten Farm, Ringsaker.

Material from the Evjevik Limestone. – One incomplete genicranium (PMO 113.649) and counterpiece (PMO 113.650).

Remarks. – When erecting the taxon, Kiær (1917, p. 79) pointed out that his material included both long-eyed and short-eyed forms (here not including the specimen in Pl. 12, fig. 1 which is thought as belonging probably to *Schmidtiellus*). The present genicranium concurs very well with Kiær's long-eyed forms. It has an obtuse inner spine angle, a plow-formed frontal lobe, an epipalpebral furrow that is closer to palpebral area of gena than to ocular suture, a wide and very low (cf. Fig. 1:G) lateral border, and short genal spines. Noteworthy is a very shallow furrow originating from the antero-lateral margin of the frontal lobe and extending for some distance obliquely inwards forwards on the frontal lobe (not to be confused with the anterior branch of the furrows originating from the epipalpebral furrow as in the present and many other olenellids). It seems to be present in several holmiid forms, e.g. *Holmia inusitata* Ahlberg & Bergström (*in* Ahlberg et al. 1986, Fig. 3:A), *H. zimmermanni* (Schwarzbach, 1939, pp. 771–772, Pl. 50, figs 1–2; see Ahlberg et al. 1986, Fig. 4:A–B), *H.* cf. *mobergi* (sensu Ahlberg et al. 1986, Fig. 6), but also in the external mould from Finnmark figured as *H.* cf. *mobergi* by Ahlberg et al. (1986, Fig. 8:B) which was assigned to *K. lata* by Nikolaisen & Henningsmoen (1987, in press, Fig. 5:B). However, the furrows are hardly discernible on specimens from the Holmia Shale at Tømten. The two branches forming the continuation of the epipalpebral furrow onto the frontal glabellar lobe are well pronounced (Fig. 1:G). It is present in several olenellids, but is at best only very faint in material from the Holmia Shale.

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