BAJOCIAN SONNINIIIDAE AND OTHER AMMONITES FROM WESTERN SCOTLAND

by NICOL MORTON

ABSTRACT. The sequence of Bajocian ammonites in the Bearnerraig Sandstone of Skye is summarized in terms of a modified scheme of zones or subzones: Discites, Ovalis, Lauriculata, Sauzei (with subzone Sauzei and a new upper subzone Hebrides), and Humphriesianum (with subzones Cycloides, Humphriesianum, and Blagdoni). The first three are used informally to replace Severby, but Sauzei and Humphriesianum, with subzones as above, can be regarded as part of a formal Lower Bajocian zonal scheme. Upper Bajocian zones cannot yet be distinguished in Skye. Part of the family Sonniniiidae is modified and discussed, and the species of Euhoplites (with subgenera Euhoplites and Fistulobiceras), Shirshiniina, Witchelliina, Pelodites, Sonninia (with subgenera Sonninia and Papilliceras), and Doroverobus which are present in western Scotland are described, together with some other ammonites. There is clear dimorphism in some of the faunas, for example Witchelli (M) and Pelodites (m), but Pelodites (m) also occurs with Sonninia (M = 7m), and pairing of dimorphs is obscure and so not attempted. Some species in Scotland are slightly dwarfed in comparison with other parts of Europe.

Bajocian ammonites occur in western Scotland mainly in the Bearnerraig Sandstone in the Trotternish peninsula of the Isle of Skye, although they have also been recorded in Mull (Lee and Bailey 1925). The fauna is dominated by species of stephanoceratids (Morton 1971a) and sonniniids (Morton 1972, 1973), and the purpose of this paper is to describe the Sonniniiidae and some other Bajocian ammonites.

The specimens described are mainly in the collections of the Hunterian Museum, University of Glasgow (HM), but some are from the collections of the Institute of Geological Sciences, Edinburgh (GSE), Dr. J. H. Callomon, London (Call.) and the Department of Geology, Birkbeck College, London (BkC).

STRATIGRAPHY

The lithostratigraphy is based on Morton (1965, 1969) (see also Lee 1920 and Anderson and Dunham 1966). The sequence of faunas and their zonal or subzonal position (see Table I) are:

1. Bearnerraig Burn section; 17 m above base of Shaly Sandstones: Euhoplites (E.) dominius (Buckman), E. (E.) margarita (Buckman)—top of Concavum Zone (Aalenian) or base of Discites Zone (Hypereoceras sp. occurs 1–2 m higher).

2. Bearnerraig Burn section; 26 m, 27 m, and 29 m below top of Shaly Sandstones (44 m above base): Euhoplites (E.) sp. (?) cf. modestum (Buckman) and (?) cf. costatum (Buckman)—Discites Zone.

3. Bearnerraig Burn section and foot of high cliff 400 m south of Bearnerraig; top 2–3 m of Shaly Sandstones: Euhoplites (Fistulobiceras) fistulaticeras (Waagen), E. (E.) sp. (?) cf. advenum (Waagen), Shirshiniina trirugata (Buckman)—Ovalis Zone.

4. Bearnerraig Burn section; 18 m below top of Massive Sandstones: Witchelli aff. rubra (Buckman), W. aff. lauriculata (Sowerby), W. aff. romanoides (Dousiillé), Pelodites zurcheri (Dousiillé), P. macer (Buckman), P. minimus (Fosterman), Sonninia (S.) corrugata (Sowerby), E. (E.) sp. nov.—Lauriculata Zone (also loose Sonninia (Papilliceras) arenata (Quenstedt) from Saussae Zone).

5. Rudha Sughar, Bearnerraig; loose blocks from top 10–12 m of Massive Sandstones: Sonninia (S.)

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cf. sowerbyi (Sowerby), S. (S.) cf. propinquus (Bayle), S. (S.) corrugata (Sowerby), S. (Papilliceras) arenata (Quenstedt), S. (P.) mesacantha (Wangen), Pelecodites macer (Buckman), Strigoceras bestsim (Brasil, Emileia (E.) sp.—Sauzei Zone and Subzone. A single specimen of Wissella aff. rubra (Buckman) suggests that some Laeviuscula Zone may also be present.

6. Torvaig, near Portree; basal bed of Upper Sandstones: Stephanoceras (St.) nodosum (Quenstedt), St. (St.) aff. nodosum and aff. macrum (Quenstedt), ?Chondroceras evolvenscens (Waagen), Lissoceras oolithicum (d'Orbigny), Dorsetensia pinguis (Roemer), D. hambrovi (Hiltermann), D. hebridica Morton, 'Sonnia' aff. furticarinata (Quenstedt)—Hebridae Subzone, Sauzei Zone. Formerly placed (Morton 1971a, 1972) in the lower part of the Humphriesianum Zone, the basal part of the Upper Sandstones containing this fauna is now excluded from the Humphriesianum Zone and placed in the Sauzei Zone as a new subzone. It can be correlated with the Pinguis-Schichten of northern Germany (see Huf 1968; Westermann 1967, p. 123).

7. Rigg shore; lower part of Upper Sandstones:
   (a) Near waterfall and southwards along shore: Oppelia (O.) ?subradiata (Sowerby), Stephanoceras (St.) mutabile (Quenstedt), St. (St.) nodosum (Quenstedt), St. (St.) sp., St. (Normanni) ?obligy (Buckman), St. (N.) ?densus (Buckman), Chondroceras evolvenscens (Waagen), Dorsetensia Iostracca Buckman, D. romani (Oppel), 'Sonnia' aff. furticarinata (Quenstedt), Poecilomorphus cycloides (d'Orbigny)—Cycloides Subzone, Humphriesianum Zone.
   (b) North of waterfall, stratigraphically higher than (a): Stephanoceras (St.) nodosum (Quenstedt), St. (St.) aff. triplex Weisert, St. (Normanni) ?obligy (Buckman), St. (N.) ?densus (Buckman)—Humphriesianum Subzone, Humphriesianum Zone.

8. Rudha Sgathar, Bearreraig; loose blocks from basal 30 m of Upper Sandstones: Oppelia (O.) ?subradiata (Sowerby), Stephanoceras (St.) mutabile (Quenstedt), St. (St.) aff. nodosum and aff. macrum (Quenstedt), St. (St.) aff. triplex (Sowerby), St. (St.) aff. nodosum and aff. macrum (Quenstedt), St. (St.) aff. triplex Weisert, St. (St.) pyritosum (Quenstedt), St. (Normanni) ?obligy (Buckman), Dorsetensia Iostracca Buckman, D. romani (Oppel), D. pinguis (Roemer), 'Sonnia' aff. furticarinata (Quenstedt)—Hebridae Subzone, Sauzei Zone and Cycloides and Humphriesianum Subzones, Humphriesianum Zone.

9. Pipe-line cutting at Bearreraig; 30 m above base of Upper Sandstones: Stephanoceras (St.) pyritosum (Quenstedt), St. (St.) aff. triplex Weisert, St. (Normanni) sp.—Humphriesianum Zone and Subzone.

10. Pipe-line cutting at Bearreraig; 4 m above fauna 9, 3 m above base of Upper Sandstones: Teloceras (T.) blagdeni (Sowerby)—Blagdeni Subzone, Humphriesianum Zone.

Apparent ranges of species occurring in the Upper Sandstones (excluding fauna 8) are:

<table>
<thead>
<tr>
<th>Species</th>
<th>Hebridae</th>
<th>Cycloides</th>
<th>Humphriesianum</th>
<th>Blagdeni</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oppelia (O.) ?subradiata</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lissoceras oolithicum</td>
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<tr>
<td>Stephanoceras (St.) nodosum</td>
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<tr>
<td>St. (St.) aff. nodosum and aff. macrum</td>
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<tr>
<td>St. (St.) mutabile</td>
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<tr>
<td>St. (St.) aff. triplex</td>
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<tr>
<td>St. (St.) pyritosum</td>
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<td></td>
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<tr>
<td>St. (N.) ?obligy</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>St. (N.) ?densus</td>
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<td></td>
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<tr>
<td>Teloceras (T.) blagdeni</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Chondroceras evolvenscens</td>
<td>?</td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Dorsetensia Iostracca</td>
<td></td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>D. romani</td>
<td></td>
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<td></td>
<td>×</td>
</tr>
<tr>
<td>D. pinguis</td>
<td></td>
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<td></td>
<td>×</td>
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<tr>
<td>D. hambrovi</td>
<td></td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>'Sonnia' aff. furticarinata</td>
<td></td>
<td></td>
<td></td>
<td>×</td>
</tr>
<tr>
<td>Poecilomorphus cycloides</td>
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<td></td>
<td>×</td>
</tr>
</tbody>
</table>
11. Beurreraig; loose block presumably from upper part of Upper Sandstones, found by Dr. J. K. Wright; Garantiana (G.) 'buculata' (Quenstedt) (i.e. Morton 1971a, p. 287) - Subfurcatum or lower part of Garantiana Zone. (HMS 26429 - pl. 16, figs. 9-10.)

12. Prince Charles's Cave; Garantiana Clay; Garantiana (G.) 'buculata' (Quenstedt) (Morton 1971a, p. 287) or Pseudogarrantiana dichotoma (Bentz) (Pavis 1973, p. 110) - Subfurcatum or lower part of Garantiana Zone.

**TABLE 1.** Divisions of the Bajocian Stage recognized in western Scotland

<table>
<thead>
<tr>
<th>SUBSTAGES</th>
<th>ZONES OR SUBZONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Bajocian</td>
<td>Garantiana or Subfurcatum</td>
</tr>
<tr>
<td></td>
<td>Humphriesianum</td>
</tr>
<tr>
<td></td>
<td>Humphriesianum</td>
</tr>
<tr>
<td></td>
<td>Cycloides</td>
</tr>
<tr>
<td>Lower Bajocian</td>
<td>Sauzei</td>
</tr>
<tr>
<td></td>
<td>Hebridica</td>
</tr>
<tr>
<td></td>
<td>Sauzei</td>
</tr>
<tr>
<td></td>
<td>Laeviuscula</td>
</tr>
<tr>
<td></td>
<td>Ovalis</td>
</tr>
<tr>
<td></td>
<td>Discites</td>
</tr>
</tbody>
</table>

**DIMENSIONS**

Below is a full list of the dimensions given, though not all are appropriate for every species described (all lengths are in mm):

- **D** Diameter of specimen.
- **Wh** Whorl height \[ H = \frac{W_h}{100} \] D.
- **Wb** Whorl breadth \[ B = \frac{W_b}{100} \] D.
- **W** A measure of whorl shape \[ W = \frac{W_b}{100} \] Wh.
- **Ud** Diameter of umbilicus \[ U = \frac{U_d}{D} \] D.
- **Vw** Width of venter, in round brackets where the edges of the venter are not distinct \[ V = \frac{V_w}{D} \] Wh.
- **Vb** = \[ V_b = \frac{V_w}{D} \] Wh.
- **Rd** Average distance between ribs where Wh was measured \[ R = \frac{R_d}{100} \] D, using prefixes 'R' and 'r' where appropriate to indicate primary or secondary ribs respectively.
- **Rn** Number of ribs per whorl or part of whorl as specified, counting from the point where Wh was measured towards the apex.
- **Td** Average distance between tubercules where Wh was measured \[ T = \frac{T_d}{100} \] D. A 'd' for Td, Tn, and Tc indicates that the tubercles decline within the distance normally measured.
- **Tn** Number of tubercles per whorl or part of whorl as specified, counted as for Rn.
- **Tc** Number of tubercles in the part of the whorl between where Wh was measured and 5 cm adapically along the whorl sides (only on larger specimens).
- **C** Length of body chamber, measured as the angle subtended about the protoconch by the umbilical end of the aperture and the tips of the saddles of the last septum, in square brackets if the body chamber is incomplete.
A measure of sutural complexity, based on the amount of indentation of the sides of the lateral lobe compared with the length of the lobe. The amount of indentation is derived by subtracting from the maximum width (SLo) of the lobe the minimum distance (SLi) between the sides of the adapertural part of the lobe (before subdivision). Both are measured in a direction at right angles to the tangent to the venter where the suture crosses the venter. The length of the lobe (SLi) is the orthogonal distance from a line joining the tips of the neighbouring saddles to the tip of the lobe. This may not be at right angles to SLo and SLi. Thus

\[ S = \frac{(SLo - SLi) \times 100}{SLi} \]

This is a measure of the complexity of the suture rather than the size of the lobe, and gives high values of S for complex deeply indented lobes.

'A' or 'P' before the measurements for the diameter indicate that the measurements were made at the aperture or at the end of the phragmocone respectively, while 'c' before any measurement indicates that it is approximate.

Original data for species represented by two or more specimens are not published here, but are deposited with the British Library, Boston Spa, Yorkshire, as Supplementary Publication No. SUP 14005 (twenty pages). For these species mean and standard deviation (in round brackets) have been calculated for those dimensions which show little or no variation with growth. Dimensional relationships which are growth variant are expressed by means of regression equations, with the mean square deviation about the regression in square brackets. These are intended partly for comparison of species, but mainly to provide population data for eventual comparison with populations from other areas. The number of observations (cf. number of specimens) is indicated, since most specimens have been measured at least two or three stages of growth.

Most of the specimens have not been significantly affected by post-burial distortion, but dimensions affected by distortion are indicated by an asterisk.

**SYSTEMATIC DESCRIPTIONS**

**Superfamily HILDOCERATACEAE Hyatt, 1867**

**Family Sisticaeidae Buckman, 1892**

The generic classification used is modified from Arkell (1957). The basis for the recognition of the genera is as follows (see also Table 2).

*Euhoplloceras*. Distinguished from *Soninna* (s.s.) by having broader more quadrate whorls, distinct subtabulate (or even bisulcate) venter (V = 9.3 and 8.4, not measurable in *Soninna*), and low keel. *Fissilobicerca* is included here because of similarities in whorl shape, distinct flattened venter, and low keel, but recognized as subgenus because it is smoother, more involute (U = 26.8 cf. 40.0), and has a more complex suture (S = 67.6 cf. 60.0).

*Shirahimia*. Distinguished from *Euhoplloceras* by trigonal rather than subquadrate whorl shape, with fastigate venter not distinct from whorl sides (V not measurable); from *Soninna* by different whorl shape (with maximum whorl breadth lower in whorl cross-section), low keel, and simpler suture; from *Witchelania* in lacking a tabulate venter; and from large specimens of *Dorsetenia* by broader whorls.

*Witchelania*. Distinguished from *Euhoplloceras* in being more involute (U = 29.8 cf. 40.0 for *Euhoplloceras* excluding *Fissilobicerca*) and more compressed, by broader more distinctly tabulate venter (V = 12.5 cf. 8.7) and simpler suture (S = 35.0); from *Soninna* in having tabulate venter and simpler suture; from *Dorsetenia* see Morton (1975, p. 505).
TABLE 2. Mean and standard deviation of selected characters of sonniniid genera based on specimens from Skye. N indicates the number of measurements available rather than number of specimens—for most specimens sets of measurements at more than one diameter are available.

<table>
<thead>
<tr>
<th>Genus</th>
<th>N</th>
<th>H</th>
<th>U</th>
<th>V</th>
<th>N</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linchoploceras</td>
<td>6</td>
<td>36.0</td>
<td>2.6</td>
<td>40.6</td>
<td>5.4</td>
<td>9.3</td>
</tr>
<tr>
<td>Euloploceras</td>
<td>12</td>
<td>43.4</td>
<td>6.0</td>
<td>26.8</td>
<td>5.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Witchellia</td>
<td>135</td>
<td>43.4</td>
<td>3.3</td>
<td>29.8</td>
<td>4.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Pelekoideos</td>
<td>137</td>
<td>39.5</td>
<td>2.9</td>
<td>34.3</td>
<td>3.2</td>
<td>12.9</td>
</tr>
<tr>
<td>Somninia</td>
<td>138</td>
<td>41.4</td>
<td>3.1</td>
<td>32.5</td>
<td>3.4</td>
<td>10.5</td>
</tr>
<tr>
<td>Dorsetensia</td>
<td>100</td>
<td>43.7</td>
<td>3.9</td>
<td>28.2</td>
<td>5.3</td>
<td>11.5</td>
</tr>
<tr>
<td>‘S.’ aff. furticarinata</td>
<td>12</td>
<td>46.2</td>
<td>2.6</td>
<td>24.3</td>
<td>4.2</td>
<td>10.6</td>
</tr>
</tbody>
</table>

* Excluding *D. liostraco* which has an acutely fastigate venter.
† Venter of *Sonninia* acutely fastigate, not distinct from whorl sides.
1 Number of measurements, not number of specimens.

**Pelekoideos.** As defined at present includes the great majority of known sonniniid microconchs from the old Soverbyi Zone, but may disappear if constituent species can be paired with macroconch synonyms, e.g. *Witchellia* (Westermann 1969a, pp. 115–116), or *Sonninia* (Westermann and Riccardi 1972, pl. 10, fig. 3). Reasons for retention are discussed below. Distincted from most by small size and simpler sutures (*S. = 35.5*); from *Witchellia* and *Dorsetensia* by being more evolute (*U. = 43.5* cf. 29.8 and 28.2) and having squarer whorl cross-section.

**Sonninia.** Characterized by being more compressed with acutely fastigate venter not distinct from whorl sides, high keel, and complex suture (*S. = 64.1* cf. 39.4 in *Dorsetensia* which may be otherwise similar except in details of radial line and style of ornamentation). *Papilloceras* is recognized as subgenus distinguished by the development of mid-lateral tubercles (or papillae) on body chamber (cf. Arkell 1957, p. L268, who stated merely that tubercles persist on to body chamber in some). Some species of *Sonninia* (*Sonninia*), including the type of *S.* (*S.* propinquum (Bayle), may have developed tubercles on the body chamber if they were more complete and fully grown, and the subgenera may not be as distinct as apparent at present (see also Westermann and Riccardi 1972, pp. 47, 73–77, and Imlay 1973, p. 5).

‘Sonninia.’ The precise systematic position of ‘Sonninia’ aff. furticarinata (Quenstedt) is not clear (see p. 80).

**Dorsetensia.** See Morton (1972, p. 505).


Dimorphism is very marked in some sonniniid faunas from Skye, for example in the concurrence of *Witchellia* as macroconch and *Pelekoideos* as microconch, but in other faunas, for example *Euloploceras*, it is not at all clear and there is a distinct
‘shortage’ of microconchs (see also Westermann 1966, 1969a). It is possible that the microconchs have been ‘lumped’ into the one genus *Pelekodites*, but if my earlier interpretation (Morton 1972) of *Dorsetenisia* is correct then there may also be unrecognized dimorphism within some sonninid genera as currently defined. Westermann and Ricardi (1972) describe and figure male and female of some species. In some cases the association seems highly likely, though hardly proved conclusively, and ‘marriage’ into one species may be appropriate. However, in most cases the association is somewhat tenuous and does not provide a sound basis for revision of sonninid taxonomy into bisexual biospecies (and this is not considered desirable by some authors—see discussions in Westermann 1969b). This should be based on more than one local fauna. Therefore no attempt is made to deal with sonninid dimorphism other than as separate taxonomic categories, as has Imlay (1973).

**Genus Euhoploceras** Buckman, 1913

**Subgenus Euhoploceras (Euhoploceras)** Buckman, 1913

*Type species.* *Sominia acanthodes* Buckman, 1889, original designation by Buckman (1913, p. 4).

*Includes.* *Sherborneites* and *Stiphromorphites* Buckman, 1923.

*Discussion.* The many species of *Euhoploceras*, mainly from Bradford Abbas (Dorset), described by Buckman were referred by Westermann (1966) to a single species *adica* (Waagen) on the basis of semi-quantitative work on Buckman’s plates. There are undoubtedly too many specific names, but Westermann’s ‘sample’ can hardly be said to be adequate to establish the continuity or otherwise of the variation in such a morphologically diverse group. Furthermore, the 0·18 m of the Discites Zone at Bradford Abbas is equivalent to some 35-40 m of strata at Bearreraig, so that it is simply not true to say (cf. Westermann 1966, p. 291) that the Bradford Abbas ‘discites bed’ is not condensed. Also the assumption that Buckman’s specimens all came from one zone or subzone is not justified (see Barker and Torrens 1971, p. 55). Until a revision of the Dorset sonninids, the specimens from Skye will be compared with Buckman’s ‘species’ rather than lumped into Westermann’s enlarged species *adica*.

Similar conclusions were arrived at by Imlay (1973, pp. 4-6).

**Euhoploceras (Euhoploceras) marginata** (Buckman)

Plate 6, figs. 2-3

1892 Sominia marginata S. Buckman, pp. 321–322, pl. 62; pl. 63, fig. 2; pl. 65, figs. 1–2.

1894 Sominia marginata S. Buckman, pp. 387, 407, pl. 94, fig. 6.

1937 Sominia marginata Buckman, Gillet, p. 53.

**EXPLANATION OF PLATE 6**

Fig. 1. Euhoploceras (Fishtlobiceras) fistilobatum (Waagen); HMS 26390/1; Ovalis Zone; top 2-3 m of Shaly Sandstones, foot of high cliff 300 m north of Holm, Trotternish, Skye, × 0·63.

Figs. 2, 3. Euhoploceras (Euhoploceras) marginata (Buckman); HMS 26398; top of Concavum Zone or base of Discites Zone; 17 m above base of Shaly Sandstones, lowest exposure in Bearreraig Burn, Trotternish, Skye, × 1.

Fig. 4. *Sherborneia exigua* Buckman; HMS 15342/1; Ovalis Zone; horizon and locality as fig. 1, × 0·44.
Material. One medium-sized specimen, HMS 26398.

Dimensions.

|   | D  | Wb | H  | Wb | B  | W  | Ud | U  | Vw | V  | Vb | Rd | R  | Ra | C  |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| c.| 55-0 | 10-8 | 36 | 18-0 | 33 | 91 | 23-9 | 43 | (6-5) | (12) | (36) | 3-2 | 6 | 24/1wh [200] |

Description. Evolute, thick whorls; large spines, broad distant ribs, and striae replaced at D c. 40 mm by close, not quite regular ribs, slightly curved and rursiradiate, but strongly projected ventrally; whorl section subquadrate, with umbilical edge smooth, rounded, becoming steep; venter broad, tabulate, with prominent keel; last suture only partly visible; aperture broken.

Discussion. The specimen is similar to several species which show change in ornamentation from spines or tubercles to ribs, but *ptyla* has more strongly curved ribs, *spinocostata* has the ribs more confined to the whorl sides, *crassa* has more distant ribs which do not show ventral projection, *euromphalica* shows earlier decline of the tubercles, *regularis* has a relatively narrower venter, and *submarginata* has slightly less well-developed ribs and narrower venter. It is most similar (though smaller) to some specimens of *marginata* figured by Buckman and to some described by him as intermediate between *marginata* and *dominans*.

Buckman (1892, p. 322) recorded *S. marginata* from the ‘Concaum-zone’ of Bradford Abbas and other localities in Dorset, but this was later changed to Discites Zone (see also Barker and Torrens 1971, pp. 54–55).

Locality. Top of Concaum Zone or base of Discites Zone; approximately 17 m above base of Shaly Sandstones; lowest exposure in Bearella Burn, Trotternish, Isle of Skye.

**Euhoploceras (Euhoploceras) 'dominans' (Buckman)**

Plate 7, figs. 1–2

1892 Somnina dominans S. Buckman, pp. 322–324, pl. 66; pl. 67, figs. 1–2, 73–4; pl. 69.
1894 *Somnina dominans* S. Buckman, pp. 435–437, pl. 94, figs. 1–2; pl. 95, fig. 1; pl. 97, fig. 4.
1923 *Somnina dominans* Buckman, Fallot and Blanchet, pp. 100–101.
1957 *Somnina dominans* Buckman, Gillet, p. 53.
1973 *Somnina (Euhoploceras) dominana* Buckman, Imlay, pp. 63–64, pls. 11–12.

Material. One large fragment, HMS 15337.

Dimensions.

|   | D  | Wb | H  | Wb | B  | W  | Ud | U  | Vw | V  | Vb | Rd | R  | Ra | C  |
|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| P | 150 | 43-0 | 36 | 37-1 | 25 | 68 | c. 62-0 | 41 | 150 | 10 | 40 | 12-1 | 8 | 13/1wh [c. 150] |

**EXPLANATION OF PLATE 7**

Figs. 1, 2. *Euhoploceras (Euhoploceras) 'dominans'* (Buckman); HMS 15337; top of Concaum Zone or base of Discites Zone; 17 m above base of Shaly Sandstones, lowest exposure in Bearella Burn, Trotternish, Skye, × 0.72.
Figs. 3, 4. *Euhoploceras (Euhoploceras)* sp. (cf. *modesta* Buckman); HMS 26403; Discites Zone; 29 m below top of Shaly Sandstones, Bearella Burn, Trotternish, Skye, × 0.35.
Figs. 5, 6. *Euhoploceras (Euhoploceras)* sp. (cf. *costium* Buckman); HMS 26402; Discites Zone; 26 m below top of Shaly Sandstones, Bearella Burn, Trotternish, Skye, × 0.33.
Description. Evolute, mainly body chamber; regular moderately widely spaced straight ribs approximately rectiradiate with slight ventral projection, confined to whorl sides; umbilical edge smooth and rounded; venter broad, smooth, tabulate (almost bisulcate), with keel; last suture partly visible.

Discussion. The ribbing on this specimen is more regular and relatively more widely spaced (R = 8 cf. 6) than in marginata described above. Of other similarly ribbed species dominata has more closely spaced ribs and crassa has broader whorl cross-section. The specimen is most similar to dominata, which Buckman (1892, pp. 323-324) recorded from the Concavum-zone of Bradford Abbas and other localities in Dorset. This may be either Concavum Zone or Discites Zone (Barker and Torrens 1971, pp. 54-55) (see also Imlay 1973, p. 5, etc.).

Locality. Top of Concavum Zone or base of Discites Zone; approximately 17 m above base of Shaly Sandstones; lowest exposure in Bearrernig Burn, Trotternish, Isle of Skye.

Euhoploceras (Euhoploceras) spp.

Plate 7, figs. 3-6

Material. Four very large fragments, HMS 15336, HMS 26401, HMS 26402, HMS 26403.

Measurements.

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<th>Wh</th>
<th>H</th>
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Description. Mostly body chamber; evolute with more or less subquadrate whorls; HMS 26402 has broad irregularly developed straight ribs, slightly rursiradiate, lading on to umbilical shoulder and upper part of whorl sides; HMS 15336 has very broad more distant blunt ribs than HMS 26402 (R = 14 cf. 10); there are a few broad undulations on HMS 26401 and HMS 26403, which is also striate; venters broad,
tabulate or subtabulate and almost bisulcate in HMS 26402, with a broad low keel; HMS 26401 shows complex suture with long lateral lobe.

Discussion. HMS 15336 is similar to typical adicrum (Waagen), while HMS 26402 resembles costatum (Buckman) and related species. HMS 26401 and HMS 26403 have more quadrate whorl section than parvicecostatum and medum (Buckman), more prominent keel than contusum, simplex, and substriatum (Buckman), but are most similar to modesta (Buckman). The specimens are not well enough preserved for definite identification. According to Westermann (1966, p. 289), Euhoplaceras (E.) adicra (Waagen) and the related species referred to above are mainly from the Discites Zone. The exact range of most species has not been established (see also Imlay 1973).

Localities. (a) Discites Zone; Shaly Sandstones—(i) HMS 26402 from 26 m below the top, (ii) HMS 26401 from 27 m below the top, (iii) HMS 26403 from 29 m below the top—all in the Bearraign Burn section below the main waterfall. (b) Ovulus Zone; top 2-3 m of the Shaly Sandstones; foot of high cliff 300 m north of Holm. Both localities are in Trotternish, Isle of Skye.

Subgenus EUHOPLOCERAS (FISILIBICERAS) Buckman, 1919

Type species. Ammonites fissilobatus Waagen, 1867, original designation by Buckman (1919, p. 15).

Discussion. Fissilobiceras was regarded as a subgenus of Sonninia by Westermann and Ricardi (1972, p. 59) who commented on the differences between it and Shirbutania (cf. Arkell 1957) and noted the possibility of derivation from the hammatoceratid Eudemoceras (Euququetliceris) amplexus (Buckman).

Euhoplaceras (Fissilobiceras) fissilobatus (Waagen)

Plate 6, fig. 1; Plate 8, figs. 1-3

1867 Ammonites fissilobatus Waagen, p. 599, pl. 27, fig. 1a, b.
1886 Ammonites fissilobatus Quenstedt; pp. 501-502, pl. 63, fig. 1.
1920 Fissilobiceras fissilobatum Waagen sp., Buckman, pl. 151a, n.
1935 Sonninia fissilobata Waagen, Dorn, pp. 56-57, pl. 13, fig. 1; pl. 15, fig. 4; pl. 5, figs. 8-9.
1958 Sonninia fissilobata (Waagen), Oechsle, pp. 96-98, pl. 11, figs. 11-12; pl. 12, figs. 7-8; pl. 19, fig. 4.
1972 Sonninia (Fissilobiceras) fissilobata (Waagen), Westermann and Ricardi, p. 59, text-fig. 22.

Material. Eight large specimens and two fragments, HMS 15343/1-4, HMS 26397, HMS 26399/1-3, HMS 26400/1-2.

Dimensions. For the full list of dimensions see deposited data.

Mean and standard deviation for characters which show little variation with growth are (twelve observations): H = 43.4 (6.0); U = 26.8 (5.6); V = 8.4 (1.2); Vb = 36.9 (3.9); C = 217.5 (two specimens only); S = 67.6 (10.1). Maximum measured diameter is c. 370 mm in HMS 26600/1, c. 225 mm in HMS 15343/1.

Description. Moderately involute becoming more evolute (see text-fig. 1); innermost whorls ribbed, but ribs become irregular and fade by D approx. 40 mm, or earlier; intermediate and outer whorls smooth or striate; radial line very slightly curved but strongly projected; whorl cross-section elongate sub-oval, maximum thickness just below mid-whorl; umbilical edge rounded, steep but not vertical; venter broad, obtusely fastigate with blunt low keel; sutures complex with long deeply divided
lateral lobe and umbilical lobes slightly retracted (text-fig. 2A, B); aperture curved with large ventral projection; body chamber, just under two-thirds of a whorl, shows eccentric coiling with widening umbilicus (see text-fig. 1). Specimen HMS 26397 has the bivalved aptychus preserved inside the body chamber (Morton 1973 and Pl. 8, figs. 2–3).

Discussion. The specimens are smoother, more involute, and have a more distinctly fastigate venter, and a more complex suture than the great majority of species of *Euhoplloceras*. They are similar to *nuda* Buckman, but the maximum whorl thickness in this species is lower on the whorl sides giving a more triangular whorl cross-section, while *stephani* Buckman also has a different whorl shape and a simpler suture line. They are similar to *ovalis* Quenstedt but the cross-sections of this species figured by Quenstedt (1886) and Oechsle (1958) show a more rounded venter even on the inner whorls, and a less complex suture with shorter lateral lobe. The whorl cross-section of the Skye specimens, especially the shape of the venter, and the complex suture, especially the long lateral lobe, are most like *fissilobatus* Waagen, although most
would be larger if complete. At first sight the Skye specimens seem more evolute, but this is because the figured specimens mostly lack a body chamber. The specimen of *fissilobatum* figured by Buckman (1920, pl. 131A) has the trace of the umbilical seam for a further two-thirds of a whorl and this shows that the umbilicus widens in the same way as in the Skye specimens. A minor difference is that the ribbing on the inner whorls of the Skye specimens fades at a slightly earlier stage than on figured specimens of *fissilobatum* from Germany.

In Germany the species *fissilobatum* is recorded from the Sowerbyi Zone by Waagen (1867), the Sowerbyi–Bank by Oechsle (1958, p. 124), and the Brauner Jura by Quenstedt (1886, p. 501). Dorn (1935, p. 120) records it as from 'mittleres Gamma', which Westermann (1967, table 6) shows as being in the Sowerbyi Zone, above the Discites Subzone and below the Sauzei Zone. Buckman (1920) records the species from the lower part of the Sandford Lane fossil bed, the 'Sauvarya hemera', of Dorset.
Localities. Ovalis Zone; top 2-3 m of Shaly Sandstones: (a) most specimens are from the foot of the high cliff 300 m north of Holm; (b) HMS 26400/1-3 are from the foot of the main waterfall in the Bearrarig Burn; both localities in Trotternish, Isle of Skye.

**Genus Shirburrinia** Buckman, 1910

*Type species.* Shirburrinia trigonalis Buckman, 1910, subsequent designation by Arkell (1954, p. 561).

**Discussion.** Shirburrinia has been discussed recently by Westermann and Riccardi (1972, p. 59) who classified it as a subgenus of Sonninia, disagreeing with the relationship between Shirburrinia and Fissilobiceras suggested by Arkell (1957, pp. L268, 270).

**Shirburrinia trigonalis** Buckman

Plate 6, fig. 4

1910 Shirburrinia trigonalis Buckman, p. 92, pl. 10, figs. 2-3.
1924 Shirburrinia trigonalis Buckman, pl. 517A, in.

**Material.** One large specimen, HMS 15342/1.

**Dimensions.**

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**Description.** Increasingly evolve in final whorl; maximum breadth low on whorl sides; inner whorls with broad irregular ribbing; intermediate whorls smooth; outer whorl has very broad low undulations on lower half of whorl sides; whorl section subtrigonal, umbilical edge rounded becoming vertical into deep umbilicus; venter

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**EXPLANATION OF PLATE 8**

Figs. 1-3. *Eutheleceras* (Fissilobiceras) _fissilatium_ (Waagen); HMS 26397; Ovalis Zone; top 2-3 m of Shaly Sandstones, foot of high cliff 300 m north of Holm, Trotternish, Skye. 1, side view, × 0.50. 2, 3, apyrtach and ventral view, stereopair (separation 65 mm), × 1.
fastigate, not distinct from whorl sides, with low blunt keel; suture (text-fig. 2c) less complex than typical of large soninids; body chamber over half a whorl in length.

Discussion. This specimen is more evolute, has a different whorl shape and a simpler suture than the specimens of *fossilobatum* (Waagen) with which it occurs. The subtrigonal whorl shape and relatively simple suture are characteristic of *Shirbauria*. Of four species described, *stephani* (Buckman, 1882) and *fasiagata* Buckman, 1924 are more involute and have sharper venter; *pseudotrigonalis* Maubeuge, 1951 is more involute but otherwise similar. The specimen is most similar to *trigonalis* Buckman, 1910, although this is slightly more involute and larger (D = 328 mm cf. c266 mm). *Sh. trigonalis* is listed by Buckman (1924, pl. 517; 1930, p. 36) as coming from the *Shirbauria* hemera of Sandford Lane, Dorset.

Locality. Ovalis Zone; top 2–3 m of the Shaly Sandstones; foot of high cliff 300 m north of Holm, Trotternish, Skye.

Genus WITCHELLIA Buckman, 1889

Type species. *Ammonites laeviuscula* J. de C. Sowerby, original designation by Buckman (1889, p. 82).


-*Witchellia aff. rubra* (Buckman)

Plate 9, figs. 1–34

aff. 1926 *Rubruleites ruber* S. Buckman, pl. 642.

aff. 1939 *Sorninia stephani ruber* (Buckman), Hiltermann, p. 180, pl. 12, fig. 10; pl. 13, figs. 8–9.

Material. Fifty-four specimens, HMS 15344/1–2, HMS 15346/1–3, HMS 26401/1–45, HMS 26403/1–3, HMS 26406, GSE 2968.

Dimensions. For the full list of dimensions see deposited data.

Mean and standard deviation for characters which show little variation with growth are (140 observations): *H* = 43.4 (3.4); *U* = 29.8 (4.5); *V* = 12.6 (3.6); *Vb* = 46.2 (4.8); *R* = 6.6 (1.5), but ribs fade on some specimens; *Rn* = 21.2; *Wh* = 37; *C* = 208.4 (9.6); *S* = 350 (6.5). Maximum measured diameter is 62.0 mm in HMS 15346/1. Regression equations (see also text-fig. 3) are:

\[ \text{Wh} = 0.30 \times D - 1.18 \ [0.44] \]
\[ \text{Wb} = 0.19 \times D - 2.22 \ [0.28] \]
\[ Ud = 0.18 \times D + 2.22 \ [0.68] \]

EXPLANATION OF PLATE 9

All figures natural size.

Figs. 1–34, *Witchellia aff. rubra* (Buckman): Laeviuscula Zone; approximately 18 m below top of Massive Sandstones, ledge behind main waterfall in Boarrerig Burn, Trotternish, Skye. 1, 2, HMS 15346/1; 3, 4, HMS 26404/2; 5, 6, HMS 26404/3; 7, 8, HMS 26404/6; 9, 10, HMS 26404/7; 11, 12, HMS 15344/1; 13, 14, HMS 26404/9; 15, 16, HMS 26404/8; 17, 18, HMS 26404/4; 19, 20, HMS 26404/18; 21, 22, GSE 2968; 23, 24, HMS 26404/21; 25, 26, HMS 26404/22; 27, 28, HMS 26404/23; 29, 30, HMS 26404/24; 31, 32, HMS 26404/37; 33, 34, HMS 26404/38.
MORTON, Scottish Bajocian ammonites
Description. Involute compressed (see text-fig. 3); protoconch bulbous and very broad; first whorls broader than high, smooth then developing broad faint undulations, with rounded venter lacking keel; the broad undulations develop gradually into distinct primary ribs which branch near umbilical shoulder into more prominent secondary ribs; a keel and flattened venter developed (by D 3·5 mm on HMS 26404/27: on outer whorls whorl height greater than breadth, venter more defined, tabulate or even bisulcate with prominent keel; ribbing more pronounced and closer, curved and projected ventrally (sometimes more strongly developed on outer half of whorl sides),
then fainter, many specimens passing from costate to striate, others strongly ribbed at the same diameter; umbilical edge rounded but sharper on outer whorls of larger specimens, with umbilical face vertical in some; aperture curved; body chambers approximately five-eighths of a whorl; few specimens show evidence of maturity; sutures not complex, lateral lobe broad open showing trid structure (text-fig. 5a, b).

Discussion. The specimens show continuous variation between extremes such as HMS 15346/1 (smooth) and HMS 15344/1 (ribbed). A size-frequency distribution (diameter at end of phragmocone) suggests (text-fig. 4) that there may be three or four groups, with thirteen specimens having diameter 6–11 mm at the end of the phragmocone (Pl. 9, figs. 31–34), seven specimens between 12 mm and 15 mm (Pl. 9, figs. 23–30), nine specimens between 17 mm and 22 mm (Pl. 9, figs. 7–8, 13–14, 17–20), and eleven specimens above 25 mm (Pl. 9, figs. 1–6, 9–12). Of the measured specimens five from loose blocks (e.g. Pl. 9, figs. 21–22) and two lacking body chamber (e.g. Pl. 9, figs. 15–16) are excluded from the above figures. In the absence of evidence of maturity it must be assumed that the majority of the specimens were juveniles, and it is possible that the different size groups represent successive generations. Some of the larger specimens may be adults, but the maximum size reached in the Skye population (62 mm in HMS 15346/1) is less than that of comparable Witchella specimens (especially rubra) from Dorset (107 mm in Buckman 1926, pl. 642), and Germany (111 mm in Hiltmann 1939, pl. 12, fig. 10) but may be comparable with some of the specimens from northern Germany figured by Hiltmann (1939). Similar variation was described in Witchella from Alaska by Westermann (1969, pp. 116–126) who also concluded that only one species was represented, and suggested (pp. 108–116) that many north-west European species were variants of one species. The Skye population is more homogeneous, and accuracy in taxonomic labelling would be better served by using the best fit specific name. Of described species (Buckman’s unless otherwise stated): actinophora, falcata, glaucia, platymorpha, suteri (Branco), and crassifalcata Dorn are all too strongly ribbed and/or too evolute; spinifera and laeviuscula (Sowerby) have similar outer whorls but spinose inner whorls (the latter
according to Westermann 1969a, text-fig. 35, p. 111); *gelatina* is too evolute and has too thick whorls; *helvetica* Maubeuge is not easily recognizable; *sayui* Haug is similar to the smaller specimens. The best fit, showing ribbing on the inner whorls, fading on the outer whorl, is *rubra*. The holotype of *rubra* (GSM 47839) is larger than any of the Skye specimens (D = 106.4 mm cf. maximum of 62.0 mm), and has higher whorls (H = 47), narrower umbilicus (U = 21), and narrower venter (V = 9) than the

TEXT-FIG. 5. Suture lines (all × 3-4) of *x, Witheilio* aff. *rubra* (Buckman), HMS 15346/2 at Wh 16.1 mm; b, *Witheilio* aff. *rubra* (Buckman), HMS 26406/8 at Wh 13.9 mm; c, *Witheilio* aff. *romanoides* (Douville), HMS 26408 at Wh 13.6 mm; d, *Pelecodites zurcheri* (Douville), HMS 26409 at Wh 6.0 mm; e, *Pelecodites zurcheri* (Douville), HMS 26410/1 at Wh 7.9 mm; f, *Pelecodites macer* (Buckman), HMS 15340/14 at Wh 7.6 mm; g, *Pelecodites macer* (Buckman), HMS 26412/14 at Wh 8.1 mm; h, *Pelecodites minor* (Hilczerman), HMS 26413/2 at Wh 3.2 mm; i, *Sominia* (*Sominia*) corngata (Sowerby), HMS 15345/1 at Wh 13.0 mm; j, *Sominia* (*Sominia*) corngata (Sowerby), HMS 15345/2 at Wh 8.2 mm.
means of the Skye population, but these values are within the ranges of variation. The ribbing and suture (S = 34) are similar. It differs mainly in having a slightly lower, less sharp keel, and less distinct edges to the venter. The holotype is therefore towards one end of the range of variation of the Skye population, but the differences may not be significant. No topotype population data are available so an open (aff.) determination is used here. If Westermann is correct *rubra* would be a junior synonym of *Witchellia laeviuscula* (Sowerby), but the European species of *Witchellia* come from more than one horizon and from several localities, so cannot be regarded as a single population.

According to Buckman (1926) the holotype of *rubra* comes from Frogden Quarry, Dorset—*rubra* hemera. This would be equivalent to the Laeviuscula Zone in modern terminology. In Germany (Hiltermann 1939) the species comes from bed 20 at Bethel and beds 15–22 at Hellern, both in the 'Sowerbyi Zone' according to Huf (1968, pp. 14–15).

**Locality.** Laeviuscula Zone; approximately 18 m below the top of the Massive Sandstones (cf. Morton 1965, p. 198); ledge behind main waterfall in Bearrauga Burn, Trotternish, Skye. A few specimens (HMS 26405/1.3 and GSE 2968) were found in loose blocks of the Massive Sandstones on the shore just south of Bearrauga, and one specimen (HMS 26406) is from a loose block of the Massive Sandstones at Rudha Sughar, Bearrauga.

**Witchellia aff. laeviuscula** (J. de C. Sowerby)

*Plate 10, figs. 1-2*

1824 *Ammonites laeviusculus* J. de C. Sowerby, p. 73, pl. 451, figs. 1-2.
1908 *Ammonites laeviusculus* J. de C. Sowerby, Buckman and Secretary, pl. 6, figs. 1-2.
1927 *Witchellia laeviuscula* Sow., Buckman, pl. 745.
1935 *Witchellia laeviuscula* Sow., Dorn, pp. 106–107, pl. 6, fig. 3; pl. 14, fig. 2; pl. 15, fig. 3.
1937 *Witchellia laeviuscula* Sow., Gillet, pp. 61–63, pl. 1, fig. 8; pl. 2, fig. 6; pl. 3, fig. 1.
1969 *Witchellia laeviuscula* (Sowerby), Westermann, p. 111, text-fig. 35.

**Material.** One specimen, HMS 26407.

**Dimensions.**

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**Description.** Moderately involute, compressed; inner whorls as broad as high, with broad not very strong primary ribs and occasional tubercles; outer whorls higher than broad; venter smooth, subtabulate, distinct from whorl sides with prominent keel; body chamber with very close faint ribs, slightly stronger on outer part of whorl sides, fasciculate to very broad folds on inner part of whorl sides; radial line slightly flexed, strongly projected ventrally; end of phragmocone broken; aperture largely obscured, body chamber just over half a whorl in length.

**Discussion.** This specimen is distinguished from other *Witchellia* because at comparable size broad folds are developed as well as the fasciculate fine ribbing. In this and tuberculate inner whorls, it is comparable with the lectotype of *laeviuscula* (Westermann 1969a), but the ornamentation is much stronger on the Skye specimen, *falcata* Buckman (1926, pl. 688) lacks the finer ribbing and is more evolute.
Locality. Laeviuscula Zone; approximately 18 m below the top of the Massive Sandstone; ledge behind main waterfall in the Bearreraig Burn, Trotternish, Skye.

*Witchellia* aff. *romanoides* (Douville)

Plate 10, figs. 3-4

aff. 1885 *Ludwigia romanoides* Douville, pp. 28-30, pl. 3, figs. 3-4.


aff. 1893 *Witchellia romanoides* (Douville), Haug, p. 389.

*non* 1935 *Witchellia romanoides* Douville, Dorn, pp. 118-119, pl. 20, fig. 3; pl. 9, fig. 20.

Material. One specimen, HMS 26408.

Dimensions.

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Description. Moderately involute, compressed; inner whorls strongly ribbed, with faint primary ribs branching near umbilical edge and some prominent tubercles; on outer whorls tubercles disappear and ribbing becomes fainter and closer, body chamber striate with faint irregular ribbing; radial line flexed, strongly projected ventrally; venter smooth, broad, tabulate to slightly bisulcate, with prominent hollow keel; umbilical edge sharply rounded, becoming vertical. Suture (text-fig. 5c) simple with lateral lobe broad and open; last sutures approximated; aperture not preserved but body chamber at least five-eighths of a whorl.

Discussion. This specimen is distinguished from other *Witchellia* because it is more involute and has tuberculare inner whorls although the style of ribbing is similar. It is similar only to *romanoides* (Douville), but differs in having a slightly broader more distinct venter.

Locality. Laeviuscula Zone; approximately 18 m below the top of the Massive Sandstone; ledge behind main waterfall in the Bearreraig Burn, Trotternish, Skye.

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*EXPLANATION OF PLATE 10*

All figures natural size.

Figs. 1, 2. *Witchellia* aff. *laeviuscula* (J. de C. Sowerby); HMS 26407.

Figs. 3, 4. *Witchellia* aff. *romanoides* (Douville); HMS 26408.

Figs. 5, 6, 11, 12, 17-22, 25-30. *Pelecodites macer* (Buckman); 5, 6, HMS 15350/2; 11, 12, HMS 15350/4; 17, 18, HMS 15350/4/15, 19, 20, HMS 15350/4/15, 21, 22, HMS 15350/4/3/25, 26, HMS 26412/13; 27, 28, HMS 26412/14; 29, 30, HMS 26412/17.

Figs. 7-10, 13-16. *Pelecodites zurcheri* (Douville); 7, 8, HMS 26410/1; 9, 10, HMS 26409/1; 13, 14, HMS 26410/3; 15, 16, HMS 26410/2.

Figs. 23, 24, 31-34. *Pelecodites minutus* (Hittermann); 23, 24, HMS 26413/3; 31, 32, HMS 26413/2; 33, 34, HMS 26413/1.

Figs. 1-20, 23, 31-34. Laeviuscula Zone; approximately 18 m below top of Massive Sandstones, ledge behind main waterfall in Bearreraig Burn.

Figs. 21, 22, 25-30. Saueri Zone and Subzone; loose blocks from upper part of Massive Sandstones, Rudha Sugbar, Bearreraig, Both localities in Trotternish, Skye.
Genus Pelekodites Buckman, 1923

Type species. Pelekodites pelekius Buckman, original designation by Buckman (1923, pl. 399).


Pelekodites zurcheri (Douvillé)

Plate 10, figs. 7-10, 13-16

1885 *Sommitia zurcheri* H. Douvillé, pp. 22-24, pl. 1, figs. 5-7.
71889 *Pocellicostites* macer S. Buckman, pl. 22, figs. 25-26 only.
1895 *Pocellicostites* moisyi Brasil, pp. 36-37, pl. 3, figs. 6-7.
71923 Pelekodites pelekius S. Buckman, pl. 399.
71928 Maceratites costulatus S. Buckman, p. 11.
1937 *Sommitia zurcheri* Douvillé, Gillet, p. 48.
1968 *Sommitia (Pocellicostites) boweri* Buckman, Huff, pp. 36-44, pl. 1, figs. 6-7; pl. 2, figs. 1-5 (pars).

Material. Thirteen specimens, HMS 26409/1-5, HMS 26410/1-10.

Dimensions. For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (forty-two observations): 

- $H = 38.5 \pm 1.8$ (104).
- $U = 36.5 \pm 1.9$ (104).
- $V = 12.1 \pm 1.7$ (104).
- $V_b = 42.0 \pm 5.5$ (104).
- $R = 83 \pm 1.4$ (104).
- $R_n = 16.5 \pm 2.1$ (104).
- $C = 299 \pm 9.6$ (104).
- $S = 53.6 \pm 3.1$ (104).

Maximum measured diameter is 31.1 mm in HMS 26409:3; lappets present on HMS 26409/1 at D 26.0 mm, on HMS 26410/1 at D 33.7 mm, and on HMS 26410/2 at D 30.7 mm. Regression equations are:

- $Wh = 0.33 D + 1.07 [0.12]$
- $Wb = 0.16 D + 2.59 [0.17]$
- $Ud = 0.38 D - 0.32 [0.17]$

Description. Moderately evolute, compressed; innermost whorls broader than high, smooth, with broad rounded venter lacking keel; during growth whorl height becomes greater than breadth, a keel develops, and a distinct smooth venter becomes tabulate; broad undulations on whorl sides develop into very short faint primary ribs (which disappear in later whorls) branching near umbilical edge into secondary ribs (still present in the body chamber) slightly stronger on outer part of whorl sides; development of ribbing at variable diameter; radial line flexed, strongly projected ventrally; umbilicus large and shallow with rounded edge; sutures simple with broad open lateral lobe (text-fig. 5d, e); several specimens mature (crowding of the last sutures, increase in relative umbilical diameter) with body chamber usually about seven-twelfths of a whorl and lappets up to 8.5 mm in length.

Discussion. The specimens are adult microconchs and differ from *macer* (see below) in having regularly ribbed shorter body chamber (see text-fig. 6). From specimens of *Witchellia* of similar size they differ in being more evolute, having a squarer whorl section, slightly different style of ribbing, and lappets.

The Skye specimens differ from *macer* Buckman in being more costate, from *aurifer* Buckman in having more regular ribbing, from *spattians* Buckman in being smaller, having more distinct ribbing, a less complex suture, and a shorter body chamber, from *hanschenbodens* Maubeuge in having more curved ribbing. They are similar in style of ribbing to several described species, including *zurcheri* Douvillé, 1885, moisyi Brasil, 1895, pelekis Buckman, 1923, and costulatus Buckman, 1928, which probably belong to the one species. The oldest name, *zurcheri*, is used here. Several specimens of
TEXT-FIG. 6. Length of body chamber plotted against diameter for complete specimens only of *Pelekodites macer* (Buckman) (crosses) and *Pelekodites zurcheri* (Douville) (circles) from Skye.

*Somnita (Peciolomorphus) boweri* Huf (1968) non Buckman are very similar and almost certainly conspecific.

The specimens described by Buckman and Huf come from the Sowerbyi Zone, as does the lectotype of *zurcheri* (Douville 1885, pl. 1, fig. 6, designated by Buckman 1923), while Gillet (1937, p. 48) records the species from the Laeviuscula Zone in Lorraine.

*Locality.* Laeviuscula Zone: approximately 18 m below the top of the Massive Sandstone; ledge behind the main waterfall in the Bearraraig Burn, Trotternish, Skye.

*Pelekodites macer* (Buckman)

Plate 10, figs. 5-6, 11-12, 17-22, 23-30

1889 *Peciolomorphus macer* S. Buckman, pp. 116-117, pl. 22, figs. 23-24 only.
1895 *Peciolomorphus macer* Buckman, Brasil, p. 36.
1928 *Macerates macer* S. Buckman, pp. 11-12.

*Material.* Forty-two specimens, HMS 15350/1-8, 14-16, 20, HMS 15351/1-9, HMS 26411/1-2, HMS 26412/1-9.

*Dimensions.* For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (eighty-six observations): H = 40.2 (3.1); U = 33.0 (2.8); V = 13.2 (2.5); Vb = 38.9 (11.4); R = 6.8 (1.2); Rn = 22.7 (3.5) (R and Rn are based on only a few measurements, most specimens show decline of the ribbing); C = 24.5 (4.8); S = 27.4 (7.9). Maximum measured diameter is 28.0 mm in HMS 15350/3 and HMS 26412/12; lappets present on HMS 15350/2 at D 26.5 mm, HMS 26412/17 at 23.7 mm:

Wh = 0.39 D = 0.24 [0.23]
Wb = 0.19 D = 2.99 [0.16]
Ud = 0.35 D = 0.25 [0.19]
**Description.** Moderately evolute, compressed; protoconch large and bulbous; innermost whorls broader than high, smooth, with broad rounded venter lacking keel; faint broad undulations develop into variable primary ribs and a keel develops; outer whorls higher than broad with primary ribs branching just above umbilical edge into secondary ribs, but ribbing irregular, sometimes fasciculate and fainter on middle of whorl sides; on outer whorls venter with keel, tabulate or slightly bisulcate; radial line flexed laterally, strongly projected ventrally; umbilicus large and shallow, with umbilical edge rounded not usually steep; sutures simple with broad open lateral lobe (text-fig. 5r, G); in some specimens crowding of sutures, relative widening of umbilicus and spatulate lappets up to 8-8 mm long (Pl. 9, figs. 29-30); body chamber about two-thirds of a whorl; HMS 26412/12 pathological, with keel and venter displaced to one side for at least the outer whorl which is visible.

**Discussion.** The specimens differ from zurcheri in having less regular ribbing and longer body chambers (see text-fig. 6), and from other specimens of similar size from the same localities in being more evolute, having more quadrature whorl section, a different style of ribbing, and lappets. Of described species of *Pelekoelites*, Buckman’s species *pelekus, nanomorphum, spattians, aurifer, and costulatus* are more strongly and more regularly ribbed, but *macer* is very similar. According to Buckman (1928, p. 12) the holotype of *macer* comes from the ‘marl with green grains’, Frogden Quarry, Dorset (Sonninia, *Witchella* hemera), that is from the Laeviuscula Zone. The similar specimens described by Huf (1968) as *Sonninia (Poeicelomorphus) boweri boweri* (Buckman) or *S. (P.) boweri buckmani* (Haug) are from the Sowerbyi and Sauzei Zones.

**Localities.** (a) HMS 15350/1-8, 14-16, 20, HMS 26411/1-2 are from the Laeviuscula Zone; approximately 18 m below the top of the Massive Sandstone; ledge behind main waterfall in the Beareraig Burn; (b) HMS 15351/1-9, HMS 26412/1-19 are from the Sauzei Zone and Subzone, loose blocks from the uppermost part of the Massive Sandstone; Rudha Sughar. Both localities are at Beareraig, Trotternish, Skye.

*Pelekoelites minimus* (Hiltermann)

**Plate 10, figs. 23-24, 31-34.**

1939 *Sonninia deltafalcata minimina* Hiltermann, pp. 174-175, pl. 12, figs. 4, 6.

1968 *Sonninia (Poeicelomorphus) boweri boweri minimina* (Hiltermann), Huf, pp. 50-53, pl. 4, figs. 4-6.

**Material.** Three specimens, HMS 26413/1-3.

**Dimensions.** For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (ten observations): H = 37-5 (5-3); U = 35-5 (4-6); V = 15-0 (4-3); Vb = 45-0 (7-3); C = 235; S = 18 (on HMS 26412/2 only). Diameters at apertures are 12-5 mm, 13-6 mm, and 17-3 mm; lappets present on HMS 26413/2 at D 13-6 mm and on HMS 26413/3 at 17-3 mm.

**Regression equations are:**

\[ W_h = 0.33 D - 0.41 \]  \[ W_b = 0.15 D - 2.13 \]  \[ L_d = 0.41 D - 0.50 \]

**Description.** Small, evolute; protoconch large bulbous, and smooth; first whorls smooth, broader than high, with broad smooth venter lacking keel; by second whorl broad blunt undulations on whorl sides; by D 4-0 mm a faint keel bordered by two
shallow sulci appears, and whorls become higher than broad; on outer whorls and body chamber faint irregular fasciculate ribbing strongly curved backwards on upper part of whorl curving forwards on to venter; umbilical edge rounded not steep; there is slight increase in relative size of umbilicus in HMS 26413/1 and 2 while HMS 26413/2 and 3 have lappets, up to 3·7 mm in length; sutures simple (text-fig. 5th); in HMS 26413/2 the last two sutures are closer; body chamber about two-thirds of a whorl.

Discussion. The specimens are adult microconchs, reaching maturity at a much smaller size than others from the same bed—the end of the phragmocone being at diameter 8·6 mm in HMS 26413/2 and approximately 10 mm in HMS 26413/3. They are similar to specimens from Bethel, northern Germany, figured by Hiltermann (1939) and Huf (1968). This species (minima) is now transferred to Pelekodites. According to Huf (1968, p. 53) P. minima occurs in the Sowerbyil Zone of northern Germany.

Locality. Laveinsula Zone; approximately 18 m below the top of the Massive Sandstone; ledge behind main waterfall in the Beareraig Burn, Trotternish, Skye.

Genus Sonninia Bayle, 1879

Subgenus Sonninia (Sonninia) Bayle, 1879

Type species. Wiaenegia propinquata Bayle, 1878, original designation by Bayle in Douville’s presentation of the Atlas (see Bull. Soc. géol. Fr. sér. 3, vol. 7, p. 52).

Includes. Sonninia Buckman, 1925 (not Sonnites as given by Arkell 1957, p. L267).

Sonninia (Sonninia) cf. sowerbyi (J. Sowerby)

Plate 11, figs. 3, 10

cf. 1818 Ammonites Sowerbyi Miller (MS.), J. Sowerby, p. 235, pl. 213.

cf. 1908 Ammonites Sowerbyi J. Sowerby, Buckman and Secretary, text-fig. with explanation of pl. 3.

Material. One medium-sized specimen, HMS 26414.

Dimensions.

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Description. Evolute, compressed; inner whorls with moderately strong distant ribbing and large tubercles, approximately six per whorl; on intermediate whorls ribbing stronger and tubercles larger and closer (approximately fourteen per whorl); last part of phragmocone missing; on body chamber more distant, less regularly developed tubercles remain with more pronounced curved ribbing branching at tubercles, and strongly projected ventrally; on intermediate and outer whorls whorl breadth (between tubercles) less than height; umbilicus large, shallow with rounded indistinct edge; venter acutely fastigate, also not distinct, with high prominent keel; body chamber incomplete at 180° (with trace of umbilical seam for a further 45°).
Discussion. This specimen differs from others from the same locality and from most described species in having the tubercles typical of the inner whorls still present on the body chamber along with well-developing ribbing. The type and distribution of tubercles on the body chamber are not comparable with those found on specimens of Somninia (Papilliceras), especially in being less regular. The end of the phragmocone and of the body chamber are missing on the specimen so that it is impossible to establish whether it was mature. It cannot be matched exactly with any complete figured species. The inner whorls are very similar to the holotype of sowerbyi which lacks the outer whorls, so it is impossible to be certain of the exact nature of this species. Westermann and Riccardi (1972, p. 47) suggest that it may be the inner whorls of a Somninia (Papilliceras). In the past Somninia sowerbyi has been recorded from most parts of the Lower Bajocian, but it seems likely that the holotype and really typical S. sowerbyi as distinct from Euhoploceras spp. come from the Sauzei Zone.

Locality. Sauzei Zone and Subzone; loose block from the upper part of the Massive Sandstones; Rudha Sughar, Bearerraig, Trotternish, Skye.

Somninia (Somninia) cf. propinquans (Bayle)

Plate 12, figs. 5, 8; Plate 14, figs. 1-6

cf. 1878 Waagenia propinquans Bayle, pl. 84, figs. 1-6(?)
cf. 1922 Somninia propinquans Bayle sp., Buckman, pl. 298.

Material. Eleven medium-sized to small specimens, HMS 15339, HMS 26415, HMS 26416, GSE 2972-2974, GSE 2975-2978, GSE 3020, GSE 3060.

Dimensions. For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (twenty observations): $H = 41.6$ (2.9); $U = 34.9$ (3.2); $Rn = 27.7$ (1.9); $T = 25.6$ (5.9); $S = 74.6$ (7.6). Maximum measured diameter is 73.1 mm in GSE 3060. Regression equations are:

\[
\begin{align*}
\text{Wh} & = 0.39 D + 1.08 [0-99] \\
\text{Wb} & = 0.18 D + 4.11 [0-70] \\
\text{Ud} & = 0.34 D - 0.06 [1-37]
\end{align*}
\]

Description. Moderately evolute and compressed; innermost whorls smooth or ribbed, but by D 10 mm large distant blunt tubercles dominant; on intermediate whorls tubercles larger, sharper, and more regular, with more or less irregular strong

EXPLANATION OF PLATE II

All figures natural size.

Figs. 1, 2. Somninia (Papilliceras) arenata (Quenstedt); HMS 15341/1.
Figs. 3, 10. Somninia (Somninia) cf. sowerbyi (Sowerby); HMS 26414.
Figs. 4-9. Somninia (Somninia) corrugata (Sowerby); 4, 5, HMS 15345/3; 6, 7, HMS 26417/16; 8, 9, HMS 26417/20.

All specimens (except figs. 4, 5) from Sauzei Zone and Subzone; loose blocks from upper part of Massive Sandstones, Rudha Sughar, Bearerraig, Trotternish, Skye.
Figs. 4, 5. Laeviascula Zone; approximately 18 m below top of Massive Sandstones; ledge behind main waterfall in Bearerraig Burn, Trotternish, Skye.
MORTON, Scottish Bajocian ammonites
ribboning; on outer whorls tubercles more distant or less regular and outermost whorls only ribbed; last tubercle at varying diameter, up to 53 mm on GSE 3060; on outer whorls ribbing more regular, branching just below mid-whorl with secondary ribbing on upper part of whorl more prominent, but strength varies; ribs slightly curved on whorl sides, strongly projected ventrally; umbilical edge rounded—fastigate with prominent high keel; sutures complex, with long deeply divided lateral lobe (text-fig. 5ί); body chamber mostly not preserved.

Discussion. These specimens differ from _sowerbyi_ in that all show disappearance of the tubercles on the phragmocone, and in being slightly less compressed. Most lack body chamber so that it is not possible to predict the ornamentation of the adult whorls. It is possible that they are the inner whorls of _S. (Papilliceras) mesaconitha_ (Buckman) described below, but this does not seem likely because of the better-developed ribbing than typical of the inner whorls of _mesaconitha_. They are closely comparable with _propinquans_ (especially text-figs. 2-4), although Bayle's specimens show more pronounced ribbing. The problem of the lectotype of _propinquans_ is discussed by Huf (1968, p. 26) and Westermann and Riccardi (1972, p. 47), with lectotype designation (of Bayle 1878, p. 84, figs. 3-4) attributed to Roman (1938). However, there is an earlier lectotype designation (of Bayle 1878, pl. 84, fig. 1) by Gillet (1937, pp. 30, 32). _Soninia propinquans_ is recorded from Dorset by Buckman (1922), from France by Mouterde et al. (1971, p. 11) and from the Basses Alpes by Pavia and Sturani (1968, p. 311), and in other areas from the Sauzei Zone (see also Gillet 1937, p. 29).

Locality. Sauzei Zone and Subzone; loose blocks from the upper part of the Massive Sandstones (identified from the matrix); Rudha Sughair, Bearreraig (except GSE 3060 from south of Bearreraig), Trotternish, Skye.

_Sonnina (Soninia) corrugata_ (Sowerby)

Plate 11, figs. 4-9; Plate 12, figs. 6-7; Plate 13, figs. 4-7

1824 _Ammonites corrugatus_ J. de C. Sowerby, p. 74, pl. 451, fig. 3.

1855 _Lucicythere corrugata_ Sowerby sp., Dousset, p. 22-28, pl. 2, figs. 1-5; pl. 3, figs. 1-2 (≡ _Witchellia sayui_ Haug, 1893, p. 308).

1893 _Soninia corrugata_ (Sow.), Haug, p. 231, pl. 8, figs. 1-2.

1908 _Ammonites corrugatus_ J. de C. Sowerby, Buckman and Secretary, pl. 4, fig. 4a, b.

1923 _Soninia corrugata_ J. de C. Sowerby sp., Buckman, pl. 412.

1926 _Soninia corrugata_ J. de C. Sowerby sp., Buckman, pl. 412a.

1935 _Witchellia corrugata_ Sow., Dorn, pp. 107-108, pl. 5, fig. 4; pl. 9, fig. 2; text-fig. pl. 9, fig. 6.

1937 _Soninia corrugata_ Sowerby, Gillet, pp. 34-35, fig. 16.

EXPLANATION OF PLATE 12

All figures natural size.

Figs. 1, 2. _Soninia (Papilliceras) arenata_ (Quenstedt); GSE 3912.
Figs. 3-8. _Soninia (Soninia) corrugata_ (Sowerby); 3, 4, HMS 26417/1; 6, 7, HMS 26417/8.
Figs. 3, 8. _Soninia (Soninia) corrugata_ (Bayle); GSE 3060.

All specimens from Sauzei Zone and Subzone; loose blocks from upper part of Massive Sandstones, Rudha Sughair, Bearreraig, Trotternish, Skye, figs. 3, 8 from south of Bearreraig.
1939 *Sonninia corrugata* (Sow.) emend. Dorn, Hiltermann, pp. 163–164, pl. 11, fig. 7; text-figs. 38–39.

1958 *Sonninia corrugata* (Sow.), Oechsle, pp. 117–118.

**Material.** Thirty-two small specimens, HMS 15340/1–3, HMS 15345/1–5, HMS 26417/1-24, plus small nuclei.

**Dimensions.** For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (thirty observations): $H = 42.7 (2.2)$; $U = 32.4 (2.2)$; $R = 5.9 (1.5)$; $Rn = 24.4 (3.8) wH (2.7)$; $C = 230$ (one specimen only); $S = 62.8 (4.6)$. Maximum measured diameter is 36.9 mm in HMS 15345/1. Regression equations are:

- Wh $= 0.46 D - 0.54 [0.24]$
- Wh $= 0.28 D - 1.22 [0.30]$
- Ud $= 0.27 D - 1.11 [0.17]$

**Description.** Moderately evolute, not very compressed, small; protoconch large and bulbous; innermost whorls smooth, broader than high, with broad rounded venter and keel by $D = 20$ mm; on intermediate and outer whorls keel more prominent; by $D = 10$ mm whorl height greater than breadth; faint broad folds (at $D = 3.5$ mm) becoming more definite (by $D = 7.3$ mm) developing into close ribbing at varying diameters (generally greater than 10 mm); ribbing fasciculate from broad blunt folds on lowermost part of whorl sides, usually three ribs developed, sometimes with an extra rib intercalated; ribs slightly curved on whorl sides but projected ventrally, fading on to obtusely fastigate venter without distinct edges; umbilicus moderately broad, edge rounded, vertical, and overhanging in some; suture complex, with long deeply divided lateral lobe and slightly retracted umbilical lobe (text-fig. 5i, k); some have last sutures closer together; body chambers incomplete (except HMS 26417/16 with $C = 230^\circ$) or not preserved.

**Discussion.** The specimens are smaller than some others from the same localities. Some are nuclei, others are presumably juveniles, but a few may be adults as suggested by crowding of the last few sutures. They differ from *Witchellia* and *Pelekodites* in whorl shape (less quadrate), fastigate rather than tabulate venter, different style of ribbing, and a much more complex suture line (this last is notable in view of the similarities in size). They differ from inner whorls of *Sonninia* (*Sonninia*) and *Sonninia* (*Papilliceras*) in having body chamber present and well-developed fasciculate ribbing but no tubercles, but shape of venter and complexity of suture are similar. The specimens do not resemble the inner whorls of any of the species of *Sonninia* (either subgenus), but must belong to a distinct small species, possibly of microconchs. They differ from most described species of *Sonninia* in size, and from figured specimens of comparable size in lacking tubercles and having fasciculate ribbing. In these features, and in the shape of the venter, they are similar to *Ammonites corrugatus* Sowerby (1824). The holotype of *corrugata* is wholly septate, while Buckman’s specimen (pl. 412 only) has only the beginning of the body chamber preserved, so that the type material cannot be established as microconch. According to Buckman (1923) *S. corrugata* (Sowerby) comes from the *sauezi* hemera (i.e. Sauzei Zone) of Dundry, Somerset.

**Localities.** (i) HMS 15345/1-5 from Laeviuscula Zone; 18 m below the top of the Massive Sandstones; ledge behind main waterfall in the Beareraig Burn. (ii) Other specimens from Sauzei Zone and Subzone; upper part of Massive Sandstones; Rudha Sgarih, Beareraig. Both localities are in Trotternish, Skye.
MORTON: BAJOCIAN AMMONITES FROM SCOTLAND

Subgenus SONNINIA (PAPILLICERAS) Buckman, 1920

Type species. Papilliceras papillatum Buckman, 1920, original designation by Buckman (1920, pl. 150).

Includes. Preppapillites Buckman, 1927.

SONNINIA (PAPILLICERAS) ARENATA (QUENSTEDT)

Plate 11, figs. 1-2; Plate 12, figs. 1-2

1886 Ammonites arenatus Quenstedt, pp. 482-484, pl. 60, fig. 10.
1927 Preppapillites arenatus Quenstedt, sp., Buckman, pl. 709.
1935 Sonninia arenata Quenstedt, Dorn, pp. 38-39, pl. 7, fig. 1; text-fig. pl. 3, figs. 3-4.
1951 Papilliceras arenastum Quenstedt sp., Maubeuge, pp. 49-50, pl. 3, fig. 2.
1958 Sonninia patella arenata (Quenstedt), Oechsle, p. 102, pl. 12, fig. 10.
1964 Sonninia (Papilliceras) cf. S. arenata (Quenstedt), Imlay, p. B34, pl. 6, figs. 1-3.
1973 Sonninia (Papilliceras) cf. S. (P.) arenata (Quenstedt), Imlay, p. 68, pl. 26, fig. 11.

Material. Seventeen specimens, HMS 15341/1-3, 6-8, HMS 26394, HMS 26396, HMS 26418/1-3, BkC F329, GSE 2911-2912, GSE 7102, Call. J460.

Dimensions. For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (sixty-three observations): H = 41.1 (3.4); U = 32.0 (3.8); Tn = 34.9; Wh = 31.6; Tw = 34.4 (44.1) (on outer whorls only); C = 236.4 (19.1); S = 61.7 (7.9). Maximum measured diameter is 186.4 mm on HMS 26394. H and U vary slightly with growth (see text-fig. 7).

<table>
<thead>
<tr>
<th>Aperture</th>
<th>Body chamber</th>
<th>Phragmocone</th>
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<tr>
<td>H</td>
<td>35.0</td>
<td>42.5</td>
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<tr>
<td>U</td>
<td>37.3</td>
<td>31.4</td>
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Regression equations (see also text-fig. 7):  
\[ Wh = 0.34D + 5.22 \quad [5.65] \]
\[ Wh = 0.14D + 6.14 \quad [4.04] \]
\[ Ud = 0.38D + 4.26 \quad [13.30] \]

Description. Evolute and compressed, becoming more so with growth; inner whorls as broad as high, with broad rounded venter developing a distinct keel by D 3.5 mm, and with distant blunt tubercles; by D 8.5 mm whorl height exceeds breadth (text-fig. 7) and specimens become suboxyconic when fully grown with whorl sides sub-parallel; inner whorls with broad blunt ribbing which remains on intermediate whorls where striae may also be developed; ribbing fainter on outer whorls, penultimate whorl of most almost smooth but faintly ribbed on others; at about same stage in growth a faint longitudinal ridge appears on middle of whorl sides and develops on outer whorl into progressively more distinct small tubercles (papillae); on some specimens modern secondary ribbing develops on upper part of whorl sides; umbilical edge rounded, steep but never vertical; venter not distinct from whorl sides, fastigate with a very high keel, hollow on body chamber but floored on phragmocone; suture extremely complex with long, deeply divided lobes, especially lateral lobe, and very slightly retracted umbilical lobe (text-fig. 8a, b); several specimens with last two or three sutures closer together, complete body chamber and pronounced relative widening of the umbilicus; aperture curved with pronounced ventral projection; three specimens with aptychus preserved inside body chamber (Morton 1973).

Discussion. The specimens are adult macroconchs and the development of the
TEXT-FIG. 7. Umbilical diameter, whorl height, whorl breadth, and whorl shape plotted against diameter for specimens of *Sominia (Papillliceris) arenata* (Quenstedt) from Skye.

EXPLANATION OF PLATE 13

All figures natural size.

Figs. 1, 2. *Sominia (Papillliceris) mesavula* (Waagen); HMS 26419.

Fig. 3. *Sominia (Papillliceris) mesavula* (Waagen) with appyclus; HMS 26395.

Figs. 4-7. *Sominia (Sominia) corrugata* (Sowerby); 4, 5. HMS 26417/5; 6, 7. HMS 15345/2.

All specimens (except figs. 6, 7) from Sauzei Zone and Subzone; loose blocks from upper part of Massive Sandstones, Rudha Saghar, Bearreraig, Trotternish, Skye.

Figs. 6, 7, from Laeviuscula Zone; approximately 18 m below top of Massive Sandstones, ledge behind main waterfall in Bearreraig Burn, Trotternish, Skye.
tubercles on the body chamber is characteristic of *Papilliceras*, though most of the species figured by Buckman (1909–1930) are more strongly ornamented, especially on the inner whorls. They are almost identical in ornamentation, etc., with the holotype of *arenata*, although this specimen is much larger (D = 285 mm according to Dorn 1935, p. 38, cf. 186 mm in HMS 26394). The specimens figured by Buckman (1927) and Imlay (1964), and GSE 2911 have much larger tubercles on the body chamber, and may not belong in this species (see also discussion of mesacantha below). *S. (P.) arenata* was recorded by Quenstedt (1886, p. 482) from Brauer Jura y and by Dorn (1935, p. 120) from “unteres Gamma”, which lies in the Sowerbyi-Zone according to Westermann (1967, p. 50). Oechsle (1958, p. 102) states that the type specimen comes from the Blaukalk (i.e. Sauzei Zone) and not the ‘sowerbyi-Zone’. Buckman’s specimen comes from the ‘*Shirburnia* hemera’, while Mouterde et al. (1971, p. 11) record the species from the Laeviuscula Zone. In Skye the species was found in loose blocks from the upper part of the Massive Sandstones, thought to be in the Sauzei Zone.

*Localities*. Sauzei Zone and Subzone; loose blocks from the upper part of the Massive Sandstones; Rudha Sughar, Bearreraig, Trotternish, Skye. One specimen (Call. 3460) was found at the waterfall in the Bearreraig Burn.

*Sonninia (Papilliceras) mesacantha* (Waagen)

Plate 13, figs. 1–3; Plate 14, figs. 7–9; Plate 15, fig. 1

1867 *Ammonites mesacantha* Waagen, pp. 594–595, pl. 28, fig. 1a, b.
1925 *Papilliceras mesacantha* Waagen sp., Buckman, pls. 557a, b.
1925 *Papilliceras micracanthicum* Buckman, pl. 611.
1935 *Sonninia mesacantha* Waagen, Dorn, pp. 43–44, pl. 8, figs. 1, 4; text-fig. pl. 4, fig. 1.
1937 *Sonninia mesacantha* Waagen, Gillet, pp. 16–18, fig. 8.
1938 *Sonninia mesacantha* (Waagen), Oechsle, pp. 83–84, pl. 10, fig. 3.

*Material*. Seven specimens, HMS 26395, HMS 26419, HMS 26420/1–3, GSE 2913, GSE 2971.

*Dimensions*. For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (twenty observations): *H* = 41:1 (2:7); *U* = 32:1 (2:9); *Tn* = 31:3 (5:2); *Wh* = 16:4 (4:7); *C* = 240 and 280, *S* = 62:0 and 63:0 (both *C* and *S* measurable only on two specimens). Maximum measured diameter is 165:0 mm on HMS 26419. Regression equations are:

\[
\begin{align*}
Wb &= 0.34 \times D + 5.52 \\
Wh &= 0.14 \times D + 2.29 \\
Ud &= 0.36 \times D - 3.64
\end{align*}
\]

*Description*. Evolute compressed, but less than *arenata*; inner whorls broader than high with broad rounded venter and high distinct keel by D 8:5 mm; by D 19 mm whorl height exceeds breadth and with growth whorl section becomes more compressed, venter narrower and more acute, and keel more prominent; innermost whorls almost smooth but by D about 8 mm broad, blunt undulations present developing into distinct ribbing and very large tubercles; on middle whorls large tubercles but ribbing less pronounced; on outer whorls tubercles disappear more or less abruptly at varying diameters and generally penultimate whorl (well before end of phragmocone on larger specimens) smooth or striate, sometimes with very faint
ribbing; a faint longitudinal ridge (approximately at mid-whorl) develops into distinct small tubercles; outer whorls with whorl sides slightly convex, umbilical edge sharply rounded with umbilical face steep but not vertical; venter fastigate, with very high keel hollow on body chamber but floored on phragmocone; suture highly complex (text-fig. 8c), with long, deeply divided lateral lobe and one other prominent lobe, slightly retracted; body chamber preserved on several specimens, complete on two with part of aperture preserved, and relative widening of umbilicus but no crowding of sutures. One specimen has the aptychus preserved inside the body chamber (see Morton 1973, and Pl. 13, fig. 3).

Discussion. The specimens are mostly adult macroconchs and differ from arenata in the presence of prominent tubercles on the inner whorls. The development of the tubercles on the body chamber is very similar in the two species and is characteristic of Papilliceras. Of the species referred to Papilliceras: papillata and acanthoidea have
stronger ornamentation and lack the almost smooth stage, as does *pseudoarenata* (Mauboue); *arenata* (both Quenstedt's and Buckman's) does not have the tuberculate inner whorls. They are very similar to *mesacantha* and *micracanthica*, although these are almost twice the size. All show tuberculate inner whorls followed by smooth intermediate whorls and then papillate outer whorls. The variation in the Skye specimens, especially in the diameter at which the tubercles on the inner whorls fade, suggests that all belong to the same species, although the holotype of *mesacantha* shows a very short smooth stage between the tuberculate inner whorls and the papillate outer whorls. No data illustrating variation in populations of *mesacantha* are available so that it seems best to group all the specimens discussed above in one species.

Westermann and Riccardi (1972, p. 75) comment on a specimen from Skye which they consider as intermediate between *mesacantha* and *arenata* and suggest that both should be in one species. Similar arguments have been used by Westermann for other sonnids, and if individual specimens are considered in isolation, or if all European specimens regardless of locality and precise stratigraphical horizon are lumped together then there may be some justification for this view. However, the fact that in the Skye fauna at least there are two distinct types (one with smooth inner whorls, the other with tuberculate inner whorls to varying diameters) suggests that the taxonomic situation is more complex than Westermann's suggestion indicates.

The stratigraphical position of Dorn's specimen (Pl. 8, fig. 1) is doubtful, but Buckman (1925) records his *mesacantha* from the 'Sauzei hemera' and *micracanthica* from the 'propepingans hemera', both of which would now be regarded as equivalent to the Sauzei Zone. This is the same as given by Waagen (1867, p. 595), confirmed by Oechsle (1958, p. 84), Pavia and Sturani (1968, p. 811), Westermann and Riccardi (1972, pp. 74-75), and most other authors (but cf. Gillet 1937, p. 16).

*Locality.* Sauzei Zone and Subzone; loose blocks from the upper part of the Massive Sandstones, Rudha Sughar, Beareraig, Trotternish, Skye.

'Sominia' aff. *furcicarinata* (Quenstedt)

Plate 15, fig. 2; Plate 16, figs. 1-2; Plate 17, figs. 3-4

aff. 1858 Ammonites *furcicarinatus* Quenstedt, p. 120, pl. 14, fig. 6.

aff. 1886 Ammonites *furcicarinatus* Quenstedt, pp. 553-559, pl. 68, figs. 5-8.

aff. 1893 *Sominia furcicarinata* (Quenst.), Haug. pp. 286-287, pl. 8, figs. 3-4.

aff. 1935 *Sominia furcicarinata* Quenstedt, Dorn, pp. 49-50, pl. 20, figs. 1-2; pl. 4, figs. 8-10.

aff. 1958 *Sominia furcicarinata* (Quenstedt), Oechsle, pp. 98-100, pl. 11, figs. 3; pl. 20, fig. 2.

EXPLANATION OF PLATE 14

All figures natural size.

Figs. 1-6. *Sominia* (Sominia) cf. *propepingans* (Bayle); 1, 2, GSE 2973; 3, 4, GSE 2972.

Figs. 7-9. *Sominia* (Papilliceras) *mesacantha* (Waagen); 7, 8, HMS 26420; 9, HMS 26420-1, ventral view of Plate 12, fig. 1.

All specimens from Sauzei Zone and Subzone; loose blocks from upper part of Massive Sandstones, Rudha Sughar, Beareraig, Trotternish, Skye.
MORTON, Scottish Bajocian ammonites
Material. Three large specimens and five fragments, HMS 15338, HMS 26421/1-2, HMS 26422/1-2, HMS 26423/1-2, HMS 26424.

Dimensions. For the full list of dimensions see deposited data. Mean and standard deviation for characters which show little variation with growth are (twelve observations): H = 44.2 (2.6); U = 24.3 (4.2); V = 10.6 (1.5); Vb = 19.1 (2.9); S = 58.0 and 67.0 (two specimens only). Maximum measured diameter is c316.0 mm in HMS 15338. Regression equations are:

\[
\begin{align*}
Wb &= -0.48 \times D - 2.66 [14.98] \\
Wb &= -0.48 \times D + 9.36 [14.06] \\
Ud &= 0.08 \times D + 7.84 [2.34]
\end{align*}
\]

Description. Large, moderately involute, compressed; by D 4 mm whorl broader than high, distant large blunt tubercles present, and venter broad and carinate-bisulcate; on later whorls height greater than breadth, tubercles develop into broad blunt distant ribs (which sometimes branch low on the whorl sides); on intermediate whorls ribbing gradually fades (by D c60 mm on HMS 15338, by D c85 mm on HMS 26421/1); outer whorls smooth or striate; at about same stage whorls sides almost parallel and venter less well defined, subbulbulate and eventually fastigiate; high prominent keel throughout; umbilical shoulder sharply rounded, umbilical face approximately vertical; suture complex, with long deeply divided lateral lobe (Pl. 15, fig. 2); body chambers incomplete.

Discussion. The specimens are larger and smoother than most species of Sonninia and seem to be similar only to *furticarinata* (Quenstedt). They are very close to Quenstedt's species in proportions and in ornamentation—with ribbed inner whorls and striate outer whorls, but differ in the bisulcate rather than rounded venter on the inner whorls.

The precise systematic position of these specimens is uncertain. They differ from typical *Sonninia* in ornamentation and the bisulcate becoming obtusely fastigiate venter, though they do have a similar complex suture line. The suture is much more complex than that typical of *Dorsetensia*, though the whorl shape and ornamentation of the inner whorls (especially the carinate-bisulcate venter) suggest that they may be related to *Dorsetensia pinguis, hannoverana*, and *hebrida* (Morion 1972) with which they occur in part (see also Table 2).

According to Quenstedt (1886, pp. 553-559), Dorn (1935, p. 120), Oechsle (1958, p. 124), and others, *Sonninia furticarinata* comes from the lower part of Dogger 8 in southern Germany, that is, the lower part of the Humphriesianum Zone.

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**Explanation of Plate 15**

All figures natural size unless otherwise stated.

Fig. 1. *Sonninia* (Psammites) mesacantha (Würgen); HMS 26420/1; Sauzei Zone and Subzone; loose block from upper part of Massive Sandstones, Rudha Sughar, Bearreraig, Trotternish, Skye.

Fig. 2. *Sonninia* aff. *furticarinata* (Quenstedt); HMS 26423/2; fragment of phragmocone showing suture; *hebrida* Subzone, Sauzei Zone; loose block from lower 30 m of Upper Sandstones, Rudha Sughar, Bearreraig, Trotternish, Skye. × 0.75.

Figs. 3, 4. *Emileia* (*Emileia*) sp.; Cali 3468; 8Sauzei Zone; loose block from Massive Sandstones, Bearreraig, Trotternish, Skye.
Localties. (i) Hebridica Subzone, Sauzei Zone; basal bed of the Upper Sandstones; foot of cliff east of Torvaig, near Portree (HMS 15358, HMS 26421/1-2). (ii) Sauzei Zone (Hebridica Subzone) or Humphriesianum Zone; loose blocks from the lower 30 m of the Upper Sandstones; Rudha Sughar, Beareraig (HMS 26422/1-2. HMS 26423/1-2). (iii) Cyclidies Subzone, Humphriesianum Zone; lower part of the Upper Sandstones; shore south of Rigg waterfall (HMS 26424). All localities are in Trotternish, Skye.

Genus DORSETENIA Buckman, 1892

Type species. Ammonites eduardianus d’Orbigny, 1844, original designation by Buckman (1892, p. 302).

Discussion. The genus Dorsetenia has been discussed earlier by me (Morton 1972) and by Westermann and Riccardi (1972, pp. 96-105) and Inlay (1973, p. 7) (see also Table 2). The only further comments are that poorly preserved specimens of D. pinguis (Roemer) (HMS 26425/1-4) occur in loose blocks from the lower part of the Upper Sandstones at Beareraig (Pl. 16, fig. 7), and that the maximum size of Skye Dorsetenia is less than that of the same species in other areas. Buckman (in Lee and Bailey 1925, pp. 105-106) identified four species of Dorsetenia from Port nam Marbh, Isle of Mull. These specimens (GSE 2835-2836, 2876-2877) are small and not very well preserved, so that the specific identifications must be treated with reserve, but they are enough to confirm the occurrence of the genus in Mull.

Superfamily STEPHANOCERATACEAE Neumayr, 1875
Family STEPHANOCERATIDAE Neumayr, 1875
Subfamily STEPHANOCERATINAE Neumayr, 1875
Genus EMILEIA Buckman, 1898

Using the same taxonomic procedure for the stephanoceratids as before (Morton 1971a, following Westermann 1964), macroconch and microconch subgenera E. (Emileia) and E. (Otoites) respectively are recognized.

EXPLANATION OF PLATE 16

All figures natural size unless otherwise stated.
Figs. 1, 2. 'Semieiala' aff. justicicrinita (Quenstedt); HMS 26421/1; Hebridica Subzone, Sauzei Zone; basal bed of Upper Sandstones, Torvaig, Trotternish. Skye. 1. × 0.9; 2. × 1.
Figs. 3, 4. Strigoceras brevistamin Brasil; HMS 26428; Sauzei Zone and Subzone; loose block from upper part of Massive Sandstones, Rudha Sughar, Beareraig, Trotternish, Skye.
Figs. 5, 6. Emileia (Otoites) sp. nov.; HMS 26424; Laeviavulca Zone; approximately 18 m below top of Massive Sandstones, ledge behind main waterfall in Beareraig Burn, Trotternish, Skye.
Fig. 7. Dorsetenia pinguis (Roemer); HMS 26425/2; Hebridica Subzone, Sauzei Zone; loose block from lower part of Upper Sandstones, Rudha Sughar, Beareraig, Trotternish, Skye.
Fig. 8. Proetolomorphus cyclidies (d’Orbigny); HMS 26427; Cyclidies Subzone, Humphriesianum Zone; lower part of Upper Sandstones, shore just north of Rigg waterfall, Trotternish, Skye.
Figs. 9, 10. Garanitiana (Garanitiana) plicata (Quenstedt) Morton, 1971. - Pseudogaranitana dichotoma (Bentz) testes. Pavin, 1973; Sublauritican or Garanitana Zone; loose block probably from upper part of Upper Sandstones, Beareraig, Trotternish, Skye.
Macroconch subgenus EMILEIA (EMILEIA) Buckman, 1898

Type species. Ammonites brochii J. Sowerby, 1818, original designation by Buckman 1898.

Emileia (Emileia) sp.

Plate 15, figs. 3-4


Dimensions.

<table>
<thead>
<tr>
<th>D</th>
<th>Wh</th>
<th>H</th>
<th>Wb</th>
<th>B</th>
<th>W</th>
<th>Ud</th>
<th>U</th>
<th>Rd</th>
<th>R</th>
<th>Rn</th>
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<td>3</td>
<td>6</td>
<td>8</td>
<td>30</td>
<td>[c 240]</td>
</tr>
</tbody>
</table>

Description. Involute, cadicone; venter very broad, rounded not distinct from whorl sides; umbilical edge rounded, overhanging, umbilicus deep; fairly strong primary ribs branch into close faint secondary ribs which are uninterrupted across venter; just under three-quarters of a whorl of body chamber present; aperture not preserved.

Discussion. The specimen is not sufficiently well preserved for definite identification, but the width of the whorls and the strength of the ribbing suggests that it is an Emileia rather than an Otoites, and it is similar to subcandida Buckman. Emileia occurs mainly in the Sowerbyi and Sauzei Zones (e.g. see Westernman 1964, p. 52).

Locality. Sauzei Zone and Subzone; loose block from the Massive Sandstones (judging from the matrix); Bearreraig, Trotternish, Skye.

Microconch subgenus EMILEIA (OTOITES) Mascke, 1907

Type species. Ammonites sauczei d’Orbigny, 1846, original designation by Mascke (1907, p. 23).

Emileia (Otoites) sp. nov.

Plate 16, figs. 5-6

Material. One small specimen, HMS 26426.

Dimensions.

<table>
<thead>
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<th>H</th>
<th>Wb</th>
<th>B</th>
<th>W</th>
<th>Ud</th>
<th>U</th>
<th>Td</th>
<th>T</th>
<th>Tn</th>
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<td>28</td>
<td>14</td>
<td>12</td>
<td>29</td>
<td>[170]</td>
<td></td>
</tr>
</tbody>
</table>

Description. Involute, cadicone; very broad rounded venter separated from lower part of whorl sides by sharply rounded should immediately, emerging from the umbilicus; from this umbilicus there are more rounded sharply slightly curved, each terminating in a tubercle; from each tubercle two rectiradiate almost straight secondary ribs branch almost immediately, uninterrupted across venter; suture moderately complex, with second lateral saddle almost as large as first lateral saddle, and umbilical lobe retracted; last four septa approximated; just under half a whorl of body chamber preserved; aperture broken, part of peristome, including lappets, displaced.

Discussion. The specimen seems to be an adult microconch. The style of the ornamentation and the relative size of the umbilicus are typical of Otoites. The specimen is much smaller and the ornamentation is closer and finer than the species of Otoites.
figured by Buckman, Westermann (1954), and other authors, although the closest would be *delicatus* Buckman 1913. It may belong to a new miniature species.

**Locality.** Laeviuscula Zone; approximately 18 m below the top of the Massive Sandstones; ledge behind main waterfall in Bearehraig Burn, Trotternish, Skye.

**Superfamily HAPLOCERATAEAE** Zittel, 1884  
**Family HAPLOCERATIDAE** Zittel, 1884  
**Genus POECILOMORPHUS** Buckman, 1889

*Type species.* *Ammonites cycloides* d’Orbigny, 1845, original designation by Buckman (1889, p. 115).

**Discussion.** According to Sturani (1971, p. 99) *Poecilomorphus*, with microconch subgenus *Micropoecilomorphus*, evolved from *Toxamblytes* (Buckman 1924) (mis-spelt *Toxalamites* by Sturani) and should therefore be placed in the superfamily Haplocerataceae, family Haploceratidae (cf. Arkell 1957). *Poecilomorphus* was also discussed by Huf (1968), although none of the species described by him belong in this genus but rather to *Pelekodites* or *Dorsetensia* (see also Morton 1972), and by Imlay (1973, pp. 7–8, 75).

*Poecilomorphus cycloides* (d’Orbigny)

*Plate 16, fig. 8*

1844 *Ammonites cadomensis* (non Defrance) d’Orbigny, pl. 121, figs. 1–6.  
1845 *Ammonites cycloides* d’Orbigny, p. 370.  
1889 *Poecilomorphus cycloides* (d’Orbigny), Buckman, pp. 117–121, pl. 22.  
1971 *Poecilomorphus cycloides* (d’Orbigny), Sturani, pp. 100–110, pl. 8, figs. 1–21; pl. 9, figs. 12–16.

*Material.* One specimen, HMS 26427.

**Dimensions.**

<table>
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<th>H</th>
<th>Wb</th>
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<td>60*</td>
<td>9.6*</td>
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<td>18*</td>
<td>56*</td>
<td>30*</td>
<td>11*</td>
<td>13.5*</td>
</tr>
</tbody>
</table>

**Description.** Involute; subquadracte whors (but distorted during compaction); large blunt ribs, strongly rursiradiate but curving forwards on to venter, confined to upper part of venter sides, fading just below mid-whorl; venter broad, carinate-bisulcate.

**Discussion.** In spite of the crushing the specimen can be seen to fall within the range of variation of *P. cycloides* as described by Sturani, near typical *cycloides* of Buckman (1927, pp. 9–11). According to Sturani and others, *P. cycloides* is typical of the lower part of the Humphriesianum Zone (Cycloides Subzone).

**Locality.** Cycloides Subzone, Humphriesianum Zone; lower part of the Upper Sandstones; shore just north of Rigg waterfall, Trotternish, Skye.

**Superfamily OPPELIACEAE** Bonarelli, 1894  
**Family STRIGOCERATIDAE** Buckman, 1924  
**Genus STRIGOCERAS** Quenstedt, 1886

*Type species.* *Ammonites truellei* d’Orbigny, 1845, original designation by Quenstedt (1886, pp. 565–566).
Strigoceras hessicum Brasil

Plate 16, figs. 3-4

1895 Stigoceras hessicum Brasil, pp. 43-44, pl. 4, figs. 6-7.
1971 Stigoceras hessicum Brasil, Sturani, pp. 118-119, pl. 4, figs. 16-19.

Material. One small specimen, HMS 26428.

Dimensions.

<table>
<thead>
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<th>Wb</th>
<th>B</th>
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<th>Ud</th>
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<td>12.6</td>
<td>7.1</td>
<td>56</td>
<td>3.8</td>
<td>30</td>
<td>54</td>
<td>1.6</td>
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</tbody>
</table>

Description. Involute, oxyconic, maximum thickness below mid-whorl; venter acutely fastigate with low keel; smooth or very faint close ribbing; body chamber partly preserved.

Discussion. The specimen is smaller than, but otherwise similar to, Stigoceras hessicum Brasil, from the Humphriesianum Zone.

Locality. Sauzei Zone and Subzone; loose block from the uppermost part of the Massive Sandstone, Ruhda Sughar, Bearraiga, Trotternish, Skye.

Superfamily PERISPHINCTACEAE Steinmann, 1890
Family PERISPHINCTIDAE Steinmann, 1890
Subfamily ZIGZAGICERATINAE Buckman, 1920
Genus PROCERITES Siemiradzki, 1898

Procrites sp.

Plate 17, figs. 1-2


Dimensions.

<table>
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<th>H</th>
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<td>24-2*</td>
<td>20*</td>
<td>49*</td>
<td>c. 35-5*</td>
<td>29*</td>
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</table>

Description. Poorly preserved internal mould of body chamber and part of phragmocone and one inner whorl; broad blunt primary ribs branch near mid-whorl into closer and fainter secondary ribs; ribbing straight, approximately rectiradiate, uninterrupted over venter. On one inside wall of body chamber are several serpulids.

Discussion. The ornamentation is typical of Procrites, but the preservation is too poor to allow more precise identification. The presence of the serpulids suggests that the empty shell may have drifted.

All figures natural size.

Figs. 1, 2. Procrites sp.; Call. J467; Upper Bajocian; loose block possibly from White Sandstone (Great Estuarine Series), Ruhda Sughar, Bearraiga, Trotternish, Skye.

Figs. 3, 4. "Sominia" aff. farcimoranta (Quenstedt); HMS 26421/1; inner whorls of Plate 16, figs. 1, 2; Hebridica Subzone; Sauzei Zone; basal bed of Upper Sandstones, Torvaig, Trotternish, Skye.
MORTON, Scottish Bajocian ammonites
Locality. The specimen was found by Dr. J. H. Callomon at Rudha Sughr, Beareraign. The matrix, a medium grey calcareous sandstone with a few dark grey carbonaceous streaks, indicates that it is certainly not derived from the Upper Sandstones, and probably not from the Massive Sandstones. More likely is derivation from the White Sandstone in the Great Estuarine Series, because Procerites, though mainly Lower-Middle Bathonian (Arkell 1957, p. L315), does range down into Upper Bajocian but not to Sauzezi Zone.

DISCUSSION AND SUMMARY

A modified scheme of Lower Bajocian zones or subzones is used in Skye: Discites, Ovalis, Laeviusculus, Sauzezi (with subzones Sauzezi and Hebridica), and Humphriesian (with subzones Cycloides, Humphriesian (with subzones Cycloides, Humphriesian, and Blagdeni). The first three are used informally at present to replace Sowerbi, but Sauzezi and Humphriesian, with these subzones, can be regarded as part of a formal scheme. Revisions of earlier biostratigraphy include: (a) redefinition of the base of the Humphriesian Zone to exclude the newly defined Hebridica Subzone means that the base of the Humphriesian Zone in Trotternish lies a short distance above the base rather than coinciding with the base of the Upper Sandstones; (b) discovery of Garantiana in a loose block of the Upper Sandstones means that the base of the Upper Bajocian must lie an unknown distance below the top of the Upper Sandstones.

A modified generic classification of part of the family Sonninidae is used and discussed: Euophloceras (with subgenera Euiophloceras and Fissilobiceras), Shirburnia, Witchellia, Pelekodites, Somnina (with subgenera Somnina and Papilliceras), and Dorsitensia. The species represented are described and discussed, as are species of some non-sonnini genera including Emileia (with subgenera Emileia and Otoites), Poeclomorphus, Strigoceras, and Procerites. The specimen of Procerites is possibly from the lower part of the Great Estuarine Series.

There is clearly dimorphism in at least some of the sonniniid faunas from Skye, with proven microconchs and macroconchs in the Laeviusculus Zone and Sauzezi Subzone. Possible dimorphism in the Hebridica and Cycloides Subzones has been discussed earlier (Morton 1972). No attempt is made here to deal taxonomically with sonniniid dimorphism other than as separate taxonomic categories; the approach to the problem used by Westermann and Ricardi (1972) could not be used on the Skye faunas because there is no clear indication of which microconch and macroconch 'species' belong together. Even macroconch: microconch subgenera such as used for Skye stephanoceratids (Morton 1971) could not be used, because for example Pelekodites (m) occurs with Witchellia (M) in the Laeviusculus Zone and with Somnina (M + ?m) in the Sauzezi Zone. Analysis of the Skye sonniniids in terms of possible dimorphism is summarized in Table 3.

Bajocian Sonninidae have been extensively monographed in Europe, and one result of this is an excess of available names. Hiltermann (1939, pp. 136-137) listed over 200, and a rough estimate obtained by adding names he missed and new ones since then, even allowing for non-European species and species transferred to other families, would suggest that there must be some 250 specific names available in the family. There are undoubtedly too many names at present and extensive 'lumping' has been taking place, notably by Westermann (e.g. 1966). Westermann's 'lumping' has been discussed in various places in this paper (e.g. discussion of Euophloceras,
TABLE 3. Possible dimorphism of sonninids from Skye. The numbers in square brackets refer to the sequence of faunas, the numbers in the round brackets refer to the number of specimens of each species.

<table>
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<td>?S. (S.) cf. sowerbyi (1)</td>
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<td>DISCITES ZONE [1, 2]</td>
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</table>

Witchellia aff. rubra, Sonninia (Papilliceris) arenata and mesacantha and has had to be rejected. It is clear that taxonomic revision of European Sonniniidae will have to be based on populations which are carefully controlled stratigraphically and geographically, rather than on a study of individual specimens.

In the discussions of several species (e.g. Euthoplaceras (F.) fiscibatum) it was noted that the specimens from Skye were smaller than figured specimens from other localities with which they were being compared. It seems that the Skye sonninids are slightly dwarfed, with ontogenetic changes tending to appear earlier (i.e. at a smaller diameter).

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MORTON: BACIOCIAN AMMONITES FROM SCOTLAND


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