

CONTRIBUTIONS TO THE GEOLOGY AND PALAEOLOGY
OF SOUTHEAST ASIA, CCXXIII

*Upper Jurassic and Lower Cretaceous Ammonites
from Sarawak Borneo, East Malaysia*

By

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Upper Jurassic and Lower Cretaceous Ammonites from Sarawak Borneo, East Malaysia

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[With Plate XIII]

Introduction

Some Upper Jurassic and Lower Cretaceous Ammonites were collected from the Bau Series distributed in the southern area of Kuching, Sarawak, Borneo during the geological and palaeontological reconnaissance survey in 1974. The reports of the marine Jurassic formations and faunas in Southeast Asia (SATO, 1975) and the Cretaceous System of Southeast Asia (HASHIMOTO et al., 1975) have already been published. A considerable number of Upper Jurassic and Lower Cretaceous ammonites have been reported from Southeast Asia (mainly Indonesia, New Guinea and Philippines), although their occurrences are sporadic in Borneo and especially rare in Sarawak, East Malaysia.

The Bau Series named by WILFORD in 1950 (WILFORD, 1955, p. 46) is distributed around the Bau area and the southern area of Kuching and consists of fossiliferous limestone, chert, shale, siltstone, sandstone, conglomerate, etc. The Bau Series has been stratigraphically assigned to the Jurassic and Cretaceous based on foraminifers, bivalves, coral sponges, gastropods and algae found in the limestone (SCRIVENOR, 1905; KROL, 1930; WILFORD, 1955 etc.). At the same time, it is presumed to be correlative with the Cretaceous formations distributed in the Seberoeang area of the upper Kapuas River in Indonesian Borneo (ZEYLMANS VAN EMMICHOVEN, 1939) on the basis of lithological similarity. WILFORD and KHO (1965) subdivided the Bau Series into three formations, the Kedadom Formation, the Bau Limestone Formation and the Pedawan Formation in ascending order.

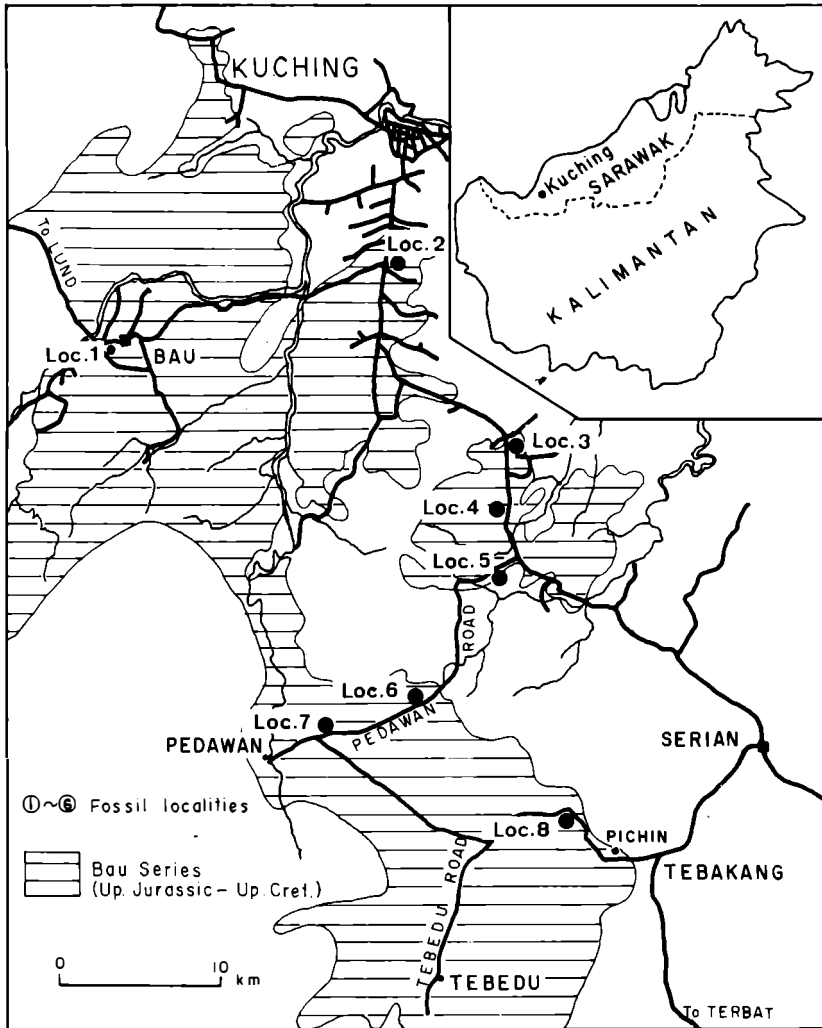
SCRIVENOR (1905) was the first who reported the occurrence of ammonite, "*Perisphinctes* sp.", from the Bau Series exposed at Tai Parit, an area adjacent to Bau (Fig. 1). In addition, some ammonite fragments have been reported from several localities (Fig. 1) in the Kedadom and the Pedawan Formations, but none of them has been described or illustrated. The following species are identified and described in this paper:

Pedawan Formation

Neocomites sp.
Limaites sp.
Phylloceras sp.
Thurmanniceras sp.

Kedadom Formation:

Berriasella sp.
Neolissoceras sp.
Proniceras? sp.



Text-fig. 1. Map showing location of ammonoid collection and distribution of the Bau Series.

Micracanthoceras sp.
Parabliceras jubar (BLANFORD)
Phanerostephanus sp.
Virgatosphinctes sp.

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Remarks on the Ammonites of the Bau Series

The occurrences of ammonites in the Bau Series have been sporadically known since SCRIVENOR (1905) reported the first "*Perisphinctes* sp." from Sarawak. Localities 1–7, found in the Pedawan Formation, and Locality 8 in the Kedadom Formation have revealed the following:

Locality 1: Tai Parit, area adjacent to Bau.

"*Perisphinctes* sp." (SCRIVENOR, 1905)

Locality 2: Kuching Airfield, about 8 miles south of Kuching (S 222)*

Two berriasellid ammonites (WILFORD, 1955)

Locality 3: Kuching-Serian Road at 17 mile point

Berriasella sp., *Thurmanniceras* sp.

Micracanthoceras sp. (SARKAR, 1973)

Limaites sp., *Phylloceras* sp., *Thurmanniceras* sp.,

Micracanthoceras sp., *Paraboliceras jubar* (BLANFORD)

Phanerostephanus sp., *Virgatosphinctes* sp. (The present paper)

Locality 4: Bukit Akut (Gunong Akud), Kuching-Serian Road at 21.5 mile point

Ammonite fragments (HASHIMOTO & TAMURA, 1969)

Locality 5: Pedawan Road 23 1/3–23–2/3 mile point

Perisphinctid ammonite (HASHIMOTO & TAMURA, 1969)

Locality 6: Kampong Pesang, Pedawan Road, 35 mile point

Ammonite fragments (HASHIMOTO & TAMURA, 1969)

Berriasella or *Micrascanthoceras* (TAMURA, 1973)

Locality 7: Junction of Pedawan and Semeru Roads

Neocomites sp. (The present paper)

Locality 8: Tebedu Road at 3 mile point NW of Kampong Pichin (S 5287)

Lithacoceras sp. or *Subplanites* sp. (WILFORD & KHO, 1965)

Berriasella sp., *Neolissoceras* sp., *Proniceras* ? sp.

(The present paper)

Such ammonoids from locality 3 as *Paraboliceras jubar* (BLANFORD), *Virgatosphinctes* sp., and *Phanerostephanus* sp. distinctly indicate the Tithonian of Upper Jurassic, although other ammonoids from the same locality may be assignable to the Tithonian, Berriasian or Valangian. Those ammonoid materials were collected from the flat outcrop (ca. 70 m × 100 m in size) of a shale bed. It is presumed that there is a boundary between the Jurassic and the Cretaceous in this area. The am-

* Locality number of WILFORD (1955) and WILFORD and KHO (1965).

monoid fauna collected from the lower part of the Kedadom Formation clearly indicates the Late Tithonian Age as well as the Early Cretaceous (WILFORD and KHO, 1965; SARKAR, 1973).

The lower limit of the Pedawan Formation has been considered the Lower Tithonian to the Upper Kimmeridgian on the basis of ammonoids (SPATH, 1924, 1933; WILFORD and KHO, 1965) and some bivalves (TAMURA and HON, 1977). However, if the present identification of the ammonoids from locality 8 is correct, there is no evidence for the Kimmeridgian, at least for the ammonoids from the Pedawan Formation.

In addition to this evidence, YANAGIDA and LAU (1978) described some brachiopods from the Bau Limestone Formation (the middle formation of the Bau Series) in the Bau area. One indicates the Late Jurassic (Lower Malm) and the other the Early or Middle Cretaceous (Aptian-Cenomanian) age. The stratigraphical problems of the Bau Series should be addressed by further better preserved materials and detailed field work.

Description of Species

Family Phylloceratidae ZITTEL, 1884

Subfamily Phylloceratinae ZITTEL, 1884

Genus *Phylloceras* SUESS, 1865

Type-species:—*Ammonites heterophyllus* J. SOWERBY, 1820

Phylloceras sp. indet.

Pl. XIII, Figs. 5 and 6.

Material:—Two incomplete specimens (GK.G 11401–11402) are examined.

Descriptive remarks:—The shells are involute, compressed with a narrow arched venter, smooth on the surface. The fine radial striae are on test and have vague radial folds on the whorl side. The umbilicus is almost closed without an umbilical shoulder. The suture near the body chamber is preserved on specimen GK.G 11401 showing the triphyllic saddles.

The *Phylloceras* is well known from the Lower Jurassic to Lower Cretaceous in the world. The present specimens are not so well preserved but can be referred to *Phylloceras*.

Occurrence:—Locality 3. Pedawan Formation.

Family Haploceratidae ZITTEL, 1884

Genus *Neolissoceras* SPATH, 1923

Type-species:—*Ammonites grasianus* D'ORBIGNY, 1841

Neolissoceras sp. indet.

Pl. XIII, Figs. 2–4.

Material:—Three (GK.G 11403–11405) of eight specimens are examined and described.

Descriptive remarks:—The shell is quite evolute and laterally compressed, its height increasing gradually. The whorl embraces about one-third of the inner

whorl, the umbilicus occupies about 30% of the diameter (GK.G 11405) and its margin is distinct. Very weak, distant, convex ribs develop in the flank but the suture is not observable in the present specimens.

Neolissoceras is known from the Upper Jurassic (Up. Tithonian) to the Lower Cretaceous (Hauterivian) of the South Europe, Madagascar and Punjab areas (ARKELL, 1957). The specimens from Borneo are assigned to the genus *Neolissoceras* based on their whorl volution characteristics, the umbilical margin, smooth surface, etc.; they are similar to *N. grasianum* described from the Upper Tithonian of France, but the former have larger umbilicus and a more evolute whorl.

Occurrence:—Locality 8. Kedadom Formation.

Family Perisphinctidae STEINMANN, 1890

Subfamily Virgatosphinctinae SPATH, 1923

Genus *Virgatosphinctes* UHLIG, 1910

Type-species:—*Virgatosphinctes broilii* UHLIG, 1910

Virgatosphinctes sp. indet.

Pl. XIII, Fig. 7.

Material:—One incomplete specimen (GK.G 11415) is available.

Descriptive remarks:—The diameter of the present specimen is presumed to be about 10 cm. The whorl is moderately evolute. The ribs are fasciculate, and typically triplicate and virgotome. Though the present specimen is incomplete it distinctly belongs to this genus based on the characteristic ribs, and is somewhat similar to the *Virgatosphinctes krafti* group described from Spiti (UHLIG, 1910, p. 335, pl. 57, figs. la-b). The present specimen has been left unnamed because of insufficient information.

Occurrence:—Locality 3. Pedawan Formation.

Genus *Phanerostephanus* SPATH, 1950

Type-species:—*Phanerostephanus subsenex* SPATH, 1950

Phanerostephanus sp. indet.

Pl. XIII, Figs. 12–13.

Material:—Two fragmental specimens (GK.G 11416–11417) are here examined.

Descriptive remarks:—The present specimens have distinctly evolute whorls and so-called perisphinctid rib characters. The ribs are rectiradiate, approximately in the inner to middle whorls, and are distant, intercalatory and broader in the outer whorl.

The present specimens are undoubtedly included in the perisphinctid group. It is impossible to compare the present specimens with SCRIVENOR's from locality 1. On the basis of the characters mentioned above and their stratigraphical horizon, they are referable to one of the species among *Sublithacoceras*, *Wheatleyites* or *Phanerostephanus* of the Tithonian. These genera have the same characters of whorl volution, ribs in the inner to middle whorl. So far as the outer whorl is concerned, the present specimens may be assigned to the genus *Phanerostephanus*.

SPATH (1950) established the genus *Phanerostephanus* and described four species. Of these, *Ph. hudsoni* (pl. 8, figs. 1a-b and 2a-b) from Iraq somewhat resembles the present species in characters of ribs and whorl volution, but the latter does not have the clear bullae at the umbilical side of the outer whorl which the former has. Further discussion is reserved until more and better materials become available.

Occurrence:—Locality 3. Pedawan Formation.

Family Olcostephanidae HAUG, 1910

Subfamily Spiticeratinae SPATH, 1924

Genus *Proniceras* BURCKHARDT, 1919

Type-species:—*Ammonites pronus* OPPEL in ZITTEL, 1868

Proniceras? sp. indet.

Pl. XIII, Fig. 8.

Material:—A fragmental whorl (GK.G 11418) is examined.

Descriptive remarks:—The present specimen has prorsiradiate, simple, dense, and fine ribs. The tubercle develops on the fourth rib from the previous tubercle near the umbilical margin, and looks like a pendant in shape.

Almost all spiticeratid ammonoids have the characteristic umbilical tubercles, bundled ribs and constrictions, but the present specimen has no boundled ribs as in *Proniceras pronum*, the type-species from Stramberg, but the latter has rounded, broader strong ribs. The specimen at present is tentatively placed in *Proniceras*.

Occurrence:—Locality 8. Kedadom Formation.

Family Berriasellidae SPATH, 1922

Subfamily Berriasellinae UHLIG, 1905

Genus *Berriasella* UHLIG, 1905

Type-species:—*Ammonites privasensis* PICTET, 1867

Berriasella sp. indet.

Pl. XIII, Fig. 1.

Material:—A rubber cast (GK.G 11419b) is described.

Descriptive remarks:—The present specimen is laterally and secondarily compressed. The shell is moderately evolute. The whorl is gradually embracing one-third of the inner whorl. The umbilicus occupies about 35% of diameter. The ribs are fine, distinctly sharp, prorsiradiate to rectiradiate, simple or bicipitating at the middle height on the flank. The ventral part and suture are not preserved.

WILFORD and KHO (1965) reported a species referable either to *Lithacoceras* or *Subplanites* from the same locality in the Kedadom Formation, but I could not examine it. The present specimen seems to possess some generic characters of *Subplanites*, but it can also be referred to *Berriasella* based on its rib characteristics. The former two genera have a tendency toward development of triplicating or virgatotome ribs.

The present species is very similar to *Berriasella privasenesis*, the type-species of the genus, having rectiradiate, sharp, simple or bicipitating ribs. The former

seems similar to *Berriasella jacobi* of MAZENOT (1939, p. 54, pl. 4, figs. 1–5) and that of LE HEGARAT and REMANE (1968, p. 25, pl. 5, figs. 1–2). This is the marker species of the uppermost zone of the Tithonian in Europe. It would be desirable to postpone specific identification of the present specimen until the specimen reported by WILFORD and KHO (1965) becomes available for reexamination.

Occurrence:—Locality 8. Kedadom Formation.

Genus *Micracanthoceras* SPATH, 1925

Type-species:—*Ammonites micracanthus* OPPEL in ZITTEL, 1868
Micracanthoceras sp. indet.

Pl. XIII, Fig. 9–11.

Material:—Three fragments are available. One (GK.G 11420) includes the umbilical part and the others (GK.G 11421–11422) are a part of the whorl.

Descriptive remarks:—The shell is evolute, laterally compressed. The whorl slowly increases in height and has rectiradiate, biplicating ribs. The tubercle is situated at the midpoint of the height of the whorl, which mainly develops at the biplicating point in the inner whorl. The outer whorl abruptly increases in height and has simple, distant ribs degenerating to form the tuberculate.

The present specimens apparently belong to the genera *Micracanthoceras*, *Protacanthoceras* or *Djurjureras* but can also be assigned to *Micracanthoceras* on the basis of their whorl volution and rib characteristics. The specimen from Stramberg, *Himalayites* (*Micracanthoceras*) *micracanthus* (OPPEL, 1868, p. 283, pl. 17, figs. 1a and 2; MAZENOT, 1939, p. 233, pl. 37, figs. 12a–b) is very similar to the present specimens having the rectiradiate, distant ribs in the outer whorl, but it seems advisable to delay specific identification until better materials are available.

Occurrence:—Locality 3. Pedawan Formation.

Genus *Paraboliceras* UHLIG, 1910

Type-species:—*Ammonites jubar* BLANFORD, 1865
Paraboliceras jubar (BLANFORD)

Pl. XIII, Figs. 15–23.

1865. *Ammonites jubar* BLANFORD; *Palaeontology of Niti*, p. 82, Pl. 20, Figs. 2a–b, non Pl. 21, Figs. 1a–c.

1904. *Ammonites jubar*; CRICK, *Geol. Mag.* n.s., 1, p. 116.

1910. *Perisphinctes* (*Paraboliceras*) *jubar*; UHLIG, *Paleont. Indica*, [15], 4, (1–2), p. 298, Pl. 44, Figs. 1a–b.

1938. *Paraboliceras jubar*; ROMAN, *Les ammonites jurassiques et cretacees*, p. 327, Pl. 33, Figs 313, 313a.

1957. *Paraboliceras jubar*; ARKELL, *Treatise Invert. Palaeont.*, Pt. L, p. L351, Figs. 7a–b.

Material:—A considerable number of fragments were collected, nine of which (GK.G 11406–11414) are here described.

Description:—Shell evolute, laterally compressed, discoidal; whorl gradually embracing one-fifth or one-sixth of the inner whorl and increasing slowly in height; umbilicus of moderate width, about two-fifths of the whorl diameter; ribs ap-

proximated, irregular, sinuous, some being biplicate and parabolic ventrolateral shoulder, so-called, parabolic nodes which developed regularly; venter concave with shallow groove; suture ammonitic.

Remarks:—The genus *Parabolicseras* (the type-species* was designated by ROMAN, 1938) was grouped into the family Berriasellidae, but ARKELL (1957, L323) has transferred it together with *Kossmatia* and *Parabolicseratoides* to the family Ataxioceratidae because of the occurrence of the Kimmeridgian of New Zealand (FLEMING and KEAR, 1960; STEVENS, 1965, 1967, 1968). Recent research in the Himalayan region of Nepal (BORDET et al., 1964; HELMSTAEDT, 1969) and ENAY (1973), however, insisted that these genera ought to be kept in the Upper Tithonian. I support the latter opinion, including these genera in the Berriasellinae.

UHLIG (1903–1910) described a number of species of *Parabolicseras* from Spiti in the Himalayan region and emphasized the significance of the parabolic ribs and nodes in detail. The present specimens coincide with one of them, *Parabolicseras jubar*, in some characteristics of the ribs and nodes. This species has irregular and wider intercostal, biplicating ribs, and nodes which develop at regular intervals on the end of parabolic ribs, but the other species of *Parabolicseras* have more regular and finer ribs, and shorter node intervals on the ventral shoulder.

Parabolicseras haugi (OPPEL) reported by UHLIG (1903–1910) is closely allied with the present species in the above characteristics but the former can be distinguished by its higher whorl and greater number of biplicating and intercalatory ribs. *Parabolicseras* cf. *polysphinctum* (UHLIG) has been listed by SCHLÜTER (1928) from the Tithonian of New Guinea, but so far as the holotype described from Spiti is concerned this species can be distinguished from the present species by its greater number of parabolic nodes and higher position of biplicating ribs.

Occurrence:—Locality 3. Pedawan Formation.

Subfamily Neocomitinae SPATH, 1924

Genus *Thurmanniceras* COSSMANN, 1901

Type-species:—*Ammonites thurmanni* PICTET et CAMPICHE 1858–1860

Thurmanniceras sp. indet.

Pl. XIII, Figs. 14a–b.

Material:—The specimen consists of a shell part (GK.G 11423).

Descriptive remarks:—The shell is laterally compressed and moderately involute with a narrow, flat venter. The ribs are rounded, gently flexuous, irregular in width, simple or branched near the middle of the whorl sides, and end with tubercles on ventral and umbilical shoulders. The suture is not preserved on this specimen.

This is easily assignable to the genus *Thurmanniceras* by the characteristics of its whorl volution, ribs and the ventral part. SARKAR (1973) reported *Thurmanniceras* sp. from the same locality without giving any illustration, therefore a comparison is not possible. The present specimen is very similar to the holotype of *Thurmanniceras thurmanni* described from the Cretaceous of France, but specific

* DACQUÉ, E. (1934) had designated "the genotype" as *Parabolicseras griesbachi* (UHLIG).

identification is better delayed until SARKAR's specimen can be examined and better ones are available.

Occurrence:—Locality 3. Pedawan Formation.

Genus *Neocomites* UHLIG, 1905

Type-species:—*Ammonites neocomiensis* D'ORBIGNY, 1841

Neocomites sp. indet.

Pl. XIII, Figs. 24a–b and 25.

Material:—Two specimens (GK.G 11424–11425) are examined.

Descriptive remarks:—The genus *Neocomites* was established by UHLIG (1905) as a subgenus of *Hoplites*. The specimens from Sarawak have laterally compressed and very involute shells with flexuous, prorsiradiate ribs. The ribs are branching sheaves from the umbilical edge with constrictions on the flank. The venter is rounded with a shallow groove.

The present specimens were collected from a shale bed near the outcrop of the *Orbitolina lenticularis* bed at locality 7 (HASHIMOTO et al., 1975, p. 284), and they are recognizable as belonging to the genus *Neocomites* by the noticeable characteristics remaining on the whorl volution and the side with ribs. The constrictions are not common in *Neocomites* but are common in *Kilianella* of the same subfamily. *Neocomites neocomiensis* (D'ORBIGNY), the type-species, has been reported from Kalimantan, Indonesian BORNEO (ZEIJLAMANS VAN EMMICHOVEN, 1939). The type specimen figured by ROMAN (1938) and ARKELL (1957) is certainly similar to the Sarawak specimen in many respects.

Occurrence:—Locality 7. Pedawan Formation.

Genus *Limaites* LISSON, 1924

Type-species:—*Hoplites leopoldinus* var. *peruanum* LISSON, 1907

Limaites sp. indet.

Pl. XIII, Fig. 26.

Material:—One rubber cast (GK.G 11426b) is here examined.

Descriptive remarks:—The shell is laterally compressed and moderately involute. The ribs are approximate, rursiradiate and very fine and become stronger toward the ventral margin. The ventral part is not preserved in the present specimen.

Limaites is only known from the Berriasian to Upper Valangian of Peru. The original paper by LISSON (1907) is not available but the type specimens are illustrated by ARKELL (1957). In comparison with those figures and on the basis of generic diagnosis, the present specimen may be referred to this genus. The unfavorable condition of preservation and an insufficiency of materials make exact identification difficult. Better materials are necessary.

Occurrence:—Locality 3. Pedawan Formation.

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Explanation of Plate XIII

- Fig. 1. *Berriasella* sp. indetp. 70
GK.G 11419b. Locality 8. Kedadom Formation
- Figs. 2-4. *Neolissoceras* sp. indet.p. 68
Fig. 2.: GK.G 11403, Fig. 3: GK.G 11404,
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- Figs. 5-6. *Phylloceras* sp. indet.p. 68
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Locality 3. Pedawan Formation
- Fig. 7. *Virgatospinctes* sp. indet.p. 69
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- Figs. 9-11. *Micracanthoceras* sp. indet.p. 71
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- Figs. 12-13. *Phanerostephanus* sp. indetp. 69
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Fig. 19: GK.G 11410, Fig. 20: GK.G 11411
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- Figs. 24-25. *Neocomites* sp. indet.p. 73
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- Fig. 26. *Limaites* sp. indet.p. 73
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(Figures natural size unless otherwise indicated)

