

JURASSIC — EARLY CRETACEOUS AMMONITES FROM THE SOUTHERN COASTAL PLAIN, ISRAEL*

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ABSTRACT

Fourteen ammonites belonging to the families Phylloceratidae, Haploceratidae, Perisphinctidae and Berriasellidae, occurring in subsurface formations of late Jurassic to early Hauterivian age in the Negba — Heletz region (Israel) are described and figured.

INTRODUCTION

The present paper deals with ammonites from subsurface strata of late Jurassic to early Cretaceous age in the Southern Coastal Plain of Israel.

The material examined originates from oil — well cores as follows:

Well	Core No.	Depth	Box No.	No. spec.	GSI** No.	OD*** No.	Unit****	Age
Negba 1	28	6085'–6103'	unknown	2	M-3769/a, b	OCL 502	L. Cr. I	Malm
Heletz 2	29	6270'–6284'	unknown	1	M-3770	OCL 485	L. Cr. I	Malm
Heletz 3	29	1636m–1642m	3 top	3	M-3771/a, b, c	—	L. Cr. Ia	Valang. to L.?Hauteriv.
			3 bottom	1	M-3772/a	—	"	"
			5 bottom	5	M-3773/a, b, c, d, e	—	"	"
			unknown	1	M-3774	OCL 467	"	"
			unknown	1	M-3714/b	OCL 467	"	"

Sample No. M-3714/a from Heletz 3, core 29 contained a belemnite determined provisionally by A. Parnes, GSI, as *Hibolites* (?) sp. This specimen has been submitted to Prof. M. Avnimelech, Department of Geology, Hebrew University Jerusalem, for detailed study.

The specimens designated M-3769/a, b; M-3770; M-3771/b; M-3774 and M-3714/a, b were examined provisionally by A. Parnes in April — May 1956. Some of his results were published in Grader and Reiss (1958).

The ammonites studied were found imbedded in hard gray shales in Negba and in slightly sandy, dark gray shales in Heletz. The accompanying fauna is composed of lamellibranchs and gastropods as yet undetermined. Most of the ammonite specimens are fragmentary and some of them distorted, making specific determination often impossible.

* Manuscript submitted: November, 1961

** Nos. refer to GSI Paleontology Division collections, Jerusalem

*** Nos. refer to GSI Oil Division files

**** For core position and stratigraphy see Grader and Reiss, 1958

SYSTEMATIC DESCRIPTIONS

Fam. PHYLLOCERATIDAE Zittel, 1884

Subfam. PHYLLOCERATINAE Zittel, 1884

Gen. *Phylloceras* Suess, 1865

Phylloceras sp. ex gr. *Ph. tethys* (d'Orb.)

(pl. I fig. 1)

1840–41. *Ammonites tethys* d'Orbigny, *Paléontologie Française*, Vol. 1, Céphalopodes, G. Masson, Paris., p. 174, pl. 53, fig. 7–9.

1840–41. *Ammonites semistriatus* d'Orbigny, *Ibidem*, p. 136, pl. 41, fig. 3–4.

1883. *Phylloceras tethys* (d'Orbigny), Uhlig, in Douville, M. H., 1916, Les terrains Secondaires dans le Massif du Moghara à l'Est de l'isthme de Suez, *Mém. Acad. Sci.*, Paris, Vol. 5, Mém. 3, p. 98.

Material: One incomplete specimen. No. M-3772/a.

Locality: Heletz 3, core 29, 1636m–1642m, box 3, bottom.

Description: Test very thin, compressed, involute, apparently very narrow umbilicus; ornamentation composed of fine, slightly sinuous, prorsiradiate ribs, the inner half of which is not observable, their outer half being accentuated; suture phylloid with diphyllic, spatulate saddles and probably assymetric trifold lobes; no flares or constrictions recognized.

Remarks: It seems reasonable to attribute the specimen to the group of *Phylloceras tethys* (d'Orb.), because of the accentuated, slightly sinuous ribs on the outer half of the whorl as well as of the resemblance of the recognizable parts of the suture (L₁, S₁, ?L₁). This species ranges from Valanginian to Aptian according to Pervinquière (1907), but is recorded from the Berriasian to the Hauterivian by Basse (in Piveteau, 1952). *Phylloceras semistriatum* (sic!) is recorded from the Barremian of Djebel Moghara by Douvillé (1917).

Fam. HAPLOCERATIDAE Zittel, 1884

Gen. *Neolissoceras* Spath, 1923

Neolissoceras grasianum (d'Orb.)

(pl. I figs. 2–8)

1840–41. *Ammonites grasianus* d'Orbigny, *Paléontologie Française*, Vol. 1, Céphalopodes, G. Masson, Paris. p. 141, pl. 44

1923. *Neolissoceras grasianum* (d'Orb.), Spath, Arkell et al. in Moore, 1957, p. L273.

Material: One well preserved specimen, No. M-3773/a.

Locality: Heletz 3, core 29, 1636m–1642m, box 3, bottom.

Description and remarks: The flat vertical sides, the distinct umbilical margin, and the shape of the frilled suture — consisting of a trifold L₁, a very slightly assymetric bipartite S₁, a very assymetric S₂ and three auxilliary lobes — allow the determination of this specimen as *Neolissoceras grasianum* (d'Orb.). This species is known from Tithonian to Hauterivian strata.

Fam.? PERISPINCTIDAE Steinmann, 1890

Gen. aff.? *Virgatosphinctes* Uhlig, 1910, sp.

(pl. I fig. 11)

Material: One fragment. No. M-3769/b. (OCL 502).

Locality: Negba 1, core 28, 6085'–6103'.

Description: Compressed (?) form, involution not observed, apparently not involute; ribs weak, originating from the umbilicus, probably from very weak umbilical tubercles; virgatotome, splitting to about seven secondary ribs; bundled, obliterated on the sides of the whorl; passing over the venter; prorsiradiate; constriction pronounced, more or less parallel to the ribbing and not cutting it obliquely, passing over the venter.

Remarks: The specimen seems to belong to a genus of the superfamily Perisphinctacea which are characterized among other features by sharply branched ribbing and evolute forms. Although such forms occur also in the Stephanoceratacea, the specimen examined apparently does not belong to the latter because of the presence of constrictions which are missing or at most are very rare in the Stephanoceratacea. The Perisphinctacea include nine families (Arkell, in Moore, 1957), eight of them having combinations of features differing from those in our specimen. Only the family Perisphinctidae has all the features mentioned above in our specimen. The latter shows features found in the subfamily Virgatosphinctinae. Alternatively it is possible to attribute the specimen to the perisphinctid subfamily Virgatitinae, because of the relatively high and compressed whorl section. This was stated also by A. Parnes in emendation of an unpublished report on sample No. OCL 502. The form of the constriction in our specimen seems to be different of that of the Virgatitinae. The range of the Virgatitinae is Upper Jurassic (Lower Volgian, Lower Portlandian and possibly Portlandian, (in Arkell, op. cit.)). On the other hand, the accompanying microfauna of small foraminifera (and ostracodes), regarded previously as indicating a Tithonian or Tithonian — Berriasian age (Grader and Reiss, 1958) has been determined lately in several oil wells by Dr. W. Maync and Dr. H. J. Oertli-mainly on the basis of ostracodes — as *Oxfordian*.

Subfam. NEOCOMITINAE Spath, 1924

Gen. aff. *Neocomites* Uhlig, 1905, sp.

(pl. II figs. 1–9)

Material: One fairly well preserved, almost complete specimen. No. M-3771/b.

Locality: Heletz 3, core 29, 1636m–1642m, box 3, top.

Description and remarks: The specimen shows the features of the genus *Neocomites* as described by Arkell et al. (Moore, 1957). The ornamentation consists of ribs which do not cross the venter on later whorls, the sides of the whorl become smooth on their midst; suture-lines resembling the general pattern of *Neocomites* (compare *N. neocomiensis* d'Orb. 1840–1841, p. 202 and Roman 1938, p. 340), although in details they resemble more that of *Kilianella* (Roman, loc. cit.); mid-side tubercle rudiments seem to exist as in *Kilianella*. It appears, however, that in spite of the differences the specimen is closely allied to *Neocomites*, whose range is Berriasian-Valanginian, ?Lower Hauterivian. The range of *Kilianella* is the same. Dr. Parnes studied provisionally the specimen before preparation, but did not determine it.

Gen. *Leopoldia* Mayer-Eymar, 1887

Leopoldia sp.

(pl. I fig. 18)

1958. *Leopoldia* cf. *leupoldina* (d'Orb.), Parnes in Grader and Reiss, p. 8.

Material: One fairly preserved fragment; part of body chamber and part of two or three sutures. No. M-3774.

Locality: Heletz 3, core 29, 1636m-1642m, box unknown.

Description: Laterally compressed, high form; ornamentation restricted to the ventrolateral region and consisting of shallow ribs ending as oblique, blunt clavi; middle of whorl sides smooth; venter most probably smooth, tabulate; the suture is not clera, detected from S1 to the outer half of S2, seems "grignoté" (compare: Basse in Piveteau 1952, p. 646) and resembles that of *Leopoldia leopoldi* (d'Orb.) (d'Orbigny 1840-1841; Roman 1938).

Remarks: It seems most probable that the specimen belongs to the genus *Leopoldia* and hence, indicates an ?Upper Valanginian to Lower Hauterivian age according to Arkell (Moore, 1957). The genus is recorded by Basse (Piveteau, 1952) exclusively from the Hauterivian. The specimen was determined by A. Parnes (in Grader and Reiss, 1958) as *Leupoldia* cf. *leupoldina* (lapsus calami). It is believed that the observed features are insufficient to carry out a definite specific determination.

Gen. *Saynella* Kilian, 1910

?*Saynella* sp.

(pl. I figs. 14-17)

1958. *Saynella* sp. Parnes in Grader and Reiss, p. 8.

Material: One fairly well preserved specimen. No. M-3714/b.

Locality: Heletz 3, core 29, 1636m-1642m, box unknown.

Description: Oxycone; acute periphery; narrow umbilicus; very delicate (seen only under the microscope) rursi — to recti-radiate striae in outer half of part of the whorl; a (spiral) groove on both sides of the last quarter of the outermost whorl exists, but it may be the result of deformation, its' posterior part continuing towards the periphery; dimensions; Diameter — 20mm, height (of last whorl) — 10mm, umbilicus diameter — 5mm.

Remarks: The specimen seems to belong to the genus *Saynella* Kilian, 1910, but as the above mentioned features are not sufficiently diagnostic and an exact determination requires sutural elements — which are missing here — the determination of the specimen is not certain. The genus *Saynella* is known from the Lower Hauterivian.

Subfam. ?NEOCOMITINAE Spath, 1924

Gen. ? sp. 1

(pl. I figs. 12-13)

Material: One incomplete specimen distorted by lateral compression. No. M-3770, (OCL 485).

Locality: Heletz 2, core 29, 6270'-6284'.

Description: Compressed form; grooved venter; ribs sinuous to almost falcoid,

prorsiradiate, one, or probably sometimes two intercalated ribs, the latter not reaching the umbilicus; probably slight bifurcation of major ribs near the venter; ribs ending at the venter by very blunt ventrolateral tubercles (or bullae); very weak umbilical tubercles.

Remarks: The assemblage of features of the specimen is that of the family Berriasellidae. There are however, not enough features observable to determine the genus or even the subfamily. The specimen belongs either to the Berriasellinae or more probably to the Neocomitinae. A. Parnes (in Grader and Reiss, 1958) determined the specimen as *Blanfordiceras* sp.. This view is not shared here because of the presence of intercalated ribs and the fact that the bifurcations are doubtful and that if they exist, they are very weak.

Gen.? sp. 2

(pl. I fig. 21)

Material: One badly preserved fragment. No. M-3773/b.

Locality: Heletz 3, core 29, 1636m-1642m, box 5, bottom.

Description: Flat to almost grooved venter; prorsiradiate, sinusoidal ribs, terminated by ventrolateral oblique bullae; most probably very weak lateral tubercles; probably very faded ribs across the venter.

Remarks: The features mentioned above place the specimen within the Berriasellidae and probably among the Neocomitinae, particularly because of the flat unornamented venter.

Gen.? sp. 3

(pl. I fig. 19)

Material: One badly preserved fragment. No. M-3773/c.

Locality: Heletz 3, core 29, 1636m-1642m, box 5, bottom.

Description: Venter flat; slightly curved ribs, bifurcating (?near the umbilicus) from very obsolete tubercles, terminated by slightly oblique ventrolateral clavate bullae; ?constrictions oblique to the ribs and cutting them.

Remarks: The specimen belongs to the Berriasellidae, most probably to the Neocomitinae, and hence a Tithonian to Hauterivian age can be assumed.

Fam. ?BERRIASELLIDAE Spath, 1922

Gen.? sp. 4

(pl. I fig. 20)

Material: One fragmentary specimen. No. M-3771/c.

Locality: Heletz 3, core 29, 1636m-1642m, box 3, top.

Description: Flat venter; ventrolateral clavate bullae, sometimes duplicated; intercalated ribs.

Remarks: The observable features are insufficient for any closer determination.

Fam. ?

Gen.? sp. 5

(pl. I figs. 24–27)

Material: One fragment, slightly distorted; part of obliterated suture. No. M–3773/d.

Locality: Heletz 3, core 29, 1636m–1642m, box 5, bottom.

Description: Compressed form; carinated; ?S2 larger and deeper than S1.

Gen.? sp. 6

(pl. I figs. 22–23)

Material: One badly preserved, deformed fragment. No. M–3773/e.

Locality: Heletz 3, core 29, 1636m–1642m, box 5, bottom.

Description: ? Flat venter; ribs prorsiradiate, ? sinusoidal, terminated by oblique clavate bullae; some of the ribs are simple, others bifurcating at the middle of the side from very blunt tubercles.

Gen.? sp. 7

(pl. II figs. 10–12)

Material: One pyritic nucleus of a ? young specimen. No. 3771/a.

Locality: Heletz 3, core 29, 1636m–1642m, box 3, top.

Description: Diameter — 4.5mm; oval section; rounded venter; smooth.

Gen.? sp. 8

(pl. I figs. 9–10)

Material: One very incomplete fragment, right half of a part of a whorl. No. M–3769/a. (OCL 502).

Locality: Negba 1, core 28, 6085'–6103'.

Description: Very depressed to coronate; probably slightly distorted being depressed a little dorsoventrally; advolute or almost evolute; ornamentation consisting of sharp, prorsiradiate ribs; primary ribs splitting from very blunt lateral (or probably ?umbilical) tubercles, into two or three secondary ribs which cross uninterruptedly the venter, most probably alternating.

Remarks: The specimen is too fragmentary to facilitate determination. Its visible characters may point to several groups (Berriasellidae, Himalayitinae, Perisphinctidae, Aspidoceratidae). The lateral tubercles and coronate form exclude the specimen's attribution to the Berriasellian, as suggested by Parnes (in Grader and Reiss, 1958). The accompanying microfauna indicates (following studies by Dr. W. Maync and Dr. H. J. Oertli) an Oxfordian age.

GENERAL REMARKS

The range of the ammonite from Heletz 2, core 29, indicates a Tithonian — Hauterivian age. The combined ranges of the ammonites from Heletz 3, core 29, indicate a Valanginian — Lower Hauterivian age for this core. These ammonites are also tethyan forms, some of them known from regions adjacent to Israel.

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RANGE CHART OF AMMONITES

occurring in the Heletz region

	<i>Tithon.</i>	<i>Berrias.</i>	<i>Valang.</i>	<i>Hauteriv.</i>	<i>Barrem.</i>
Heletz 2, core 29					
? NEOCOMITINAE, Gen. ? sp. 1					
Heletz 3, core 29					
box unknown					
<i>Leopoldia</i> sp.					
<i>Saynella</i> (?) sp.					
box 3, top					
Gen aff. <i>Neocomites</i> sp.					
box 3, bottom					
<i>Phylloceras</i> ex gr. <i>P. tethys</i> (d'Orb.)					
box 5, bottom					
<i>Neolissoceras grasianum</i> (d'Orb.)					

EXPLANATION OF PLATE I

- Fig. 1. *Phylloceras* sp. ex gr. *Ph. tethys* (d'Orb.)
M-3772/a; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; right side; (2x).
- 2-8. *Neolissoceras grasianum* (d'Orb.)
M-3773/a; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; 2. right side of inner whorl (app. 4x); 3. Venter (app. 4x); 4. ditto., coated by NH_4Cl (app. 4x); 5. right side of complete specimen (2x); 6. outer whorl, apertural view (2x); 7. ditto., venter (2x); 8. ditto., right side, coated by NH_4Cl (4x).
- 9-10. Gen. ? sp. 8 M-3769/a; Negba 1, core 28; Malm. 9. right side (1,5x); 10. venter, only half preserved (1,5x).
11. Gen. aff. ?*Virgatosphinctes* sp.
M-3769/b; Negba 1, core 28; Malm. left (1,5x).
- 12-13. ?*Neocomitinae*. Gen. ? sp. 1
M-3770; Heletz 2, core 29; Tithon. — Hauterive; compressed; 12. right side (2x); 13. left side, note bullate venter at left lower corner (2x);
- 14-17. ?*Saynella* sp.
M-3714/b; Heletz 3, core 29; Upp. Valang. — L. Hauterive; 14. fragment of outermost whorl, apertural view (2x); 15. ditto., left (2x); 16. ditto. right (2x); 17. impression of right side (2x).
18. *Leopoldia* sp.
M-3774; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; left side (1x).
19. ?*Neocomitinae*. Gen. ? sp. 3
M-3773/c; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; venter and right side (2x).
20. ?*Berriasellidae*. Gen. ? sp. 4
M-3771/c; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; venter and right side (2x).
21. ?*Neocomitinae*. Gen. ? sp. 2
M-3773/b; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; venter and right side (4x).
- 22-23. Fam. ?. Gen. ? sp. 6
M-3773/e; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; distorted; 22. right and venter (2x). 23. left (2x); both figures inverted.
- 24-27. Fam. ?. Gen. ? sp. 5
M-3773/d; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; 24. left side, ?body chamber; note obliterated suture bordering the lower part (2x); 25. ditto., right side (2x); 26. venter (2x); 27. apertural view (2x).

EXPLANATION OF PLATE II

- Fig. 1-8. Gen. aff. *Neocomites* sp.
M-3771/b; Heletz 3, core 29; Upp. Valang. — L. Hauteriv.; (1x); 1-5. successive stages of preparation; 1. before preparation; note left side of inner whorl with flexuous ribs on figs. 2-3.; prints of umbilical tubercles on figs. 4-5.; 6-8. removed parts; 9. venter, plasteline cast.
- 10-12. Fam. ?. Gen. ? sp. 7
M-3771/a; Heletz 3, core 29; Upp. Valang. — L. Hauteriv. (4x); 10. apertural view; 11. left side; 12. right side.



