

## Diplomoceratidae Ammonites from Shiranish Formation (Upper Cretaceous) in Sinjar Anticline Northwest Iraq

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### Abstract:

Diplomoceratidae ammonites were commonly referred to ammonitic types depending on their complex suture line, distinctive coiling and ornamentation. These assemblages were collected from the lower part of Shiranish Formation, exposed at core of Sinjar anticline, northwestern of Iraq.

In the present study, six heteromorph species of the Diplomoceratidae family were identified and systematically described. These are:

- (1) *Solenoceras bearpawense* Kennedy et al., 2000
- (2) *Solenoceras elegans* Kennedy et al., 2000
- (3) *Solenoceras reesidei* Stephenson, 1941
- (4) *Exitloceras* cf. *jenneyi* (Whitfield, 1877)
- (5) *Diplomoceras cylindraceum* (Defrance, 1816)
- (6) *Lewyites oronensis* (Lewy, 1969).

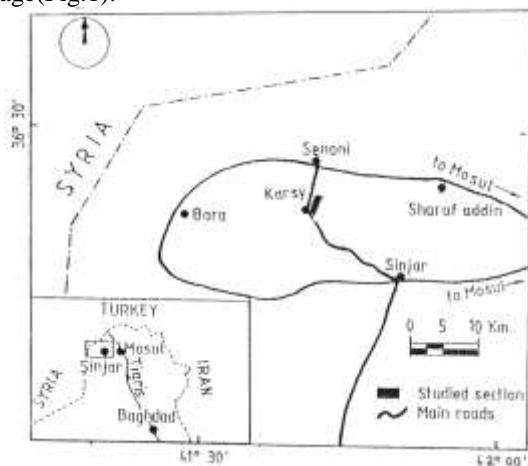
**Keywords:** ammonite, diplomiceratidae, upper cretaceous, Shiranish.

### Introduction:

Diplomoceratidae were mostly distinguished by loose coils tending to be bilateral in one plane of symmetry. The shell was ornamented by fine to coarse ribs, intercalated by numerous constrictions at different stages of growth. Some other forms have ventrolateral tubercles or spines. The morphological variability of these organisms seems to be evolved from the family Nostoceratidae. Diplomoceratidae occurs worldwide in the Upper Cretaceous from Turonian throughout Maastrichtian (1). About studied section some authors said there are an ammonite in Shiranish Formation at Sinjar area, but this is the first time such study classified and described these fauna systematically.

### Geologic Setting:

The specimens were collected from the lower part of Shiranish Formation, and appears at the core of Sinjar anticline, placed at the Foothill zone of the unstable shelf Northwest Iraq, from Nubio-Arabian platform(2). The Formation divided into three units by some authors for example (3) who said that the lower unit are abundance of ammonite fauna. The studied section is considered to be Late Campanian in age by (4) and (5), consist of marl and marly Limestone, with thickness of 58m, exposed at the northern limb of Sinjar anticline near Kersy village (Fig.1).



**Fig.1:** Location map showing the studied section.

### Systematic Paleontology:

The following abbreviations were used to indicate the repositories of specimens cited in the text:

USNM: United State Natural Museum.

USGS: United State Geological Survey.

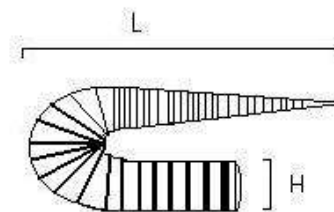
IRSNB: Institut Royal des Sciences Naturelles de Belgique.

H: Height of whorl.

L: Length of shell.

D: Diameter of shell.

R: Rib index; (It represents number of ribs measured at a distance equivalent to the whoral height located at the middle of the body chamber). All dimensions are given in millimeter (Fig.2). The systematic paleontology mostly based on (6).



**Fig.2:** sketch diagram showing the measured parameters.

Order Ammonoidea Zittel, 1884

Suborder Ancyloceratina Widmann, 1966

Superfamily Turrilacea Gill, 1871

Family Diplomoceratidae Spath, 1926

Subfamily Diplomoceratina Spath, 1926

Genus *Diplomoceras* Hyatt, 1900

### Type Species:

*Baculites cylindracea* Defrance, 1816, P.160, by original designation of Hyatt, 1900, P.571.

*Diplomoceras cylindraceum* (Defrance, 1816)

Pl.1, fig.a, b.

1816 *Baculites cylindracea*; Defrance

1930 *Diplomoceras* cf. *notabile* Whiteaves; Wetzel

1971 *Diplomoceras notabile* Whiteaves; Collignon

1981 *B. cf. D. notabile* Whiteaves ;Matsumoto  
 1986 *Diplomoceras cylindraceum* Defrance ;Kennedy  
 1986 *Diplomoceras lambi* Spath;Macellari  
 1989 *Diplomoceras lambi* Spath;Olivero and Zinsmeister  
 1989 *Diplomoceras maximus* Olivero and Zinsmeister  
 1992 *Diplomoceras cylindraceum*(Defrance, 1816):Henderson et al.  
 1992b *Diplomoceras cylindraceum* (Defrance, 1816); Kennedy and Henderson  
 1995 *Diplomoceras cylindraceum* (Defrance, 1816);Machlaski  
 1999 *Diplomoceras cylindraceum*(Defrance, 1816);Fatmi and Kennedy



Fig: a



Fig: b

**Types:**

Neotype, designated by Kennedy , 1987, P.183, is IRSNB 10511, from the Upper Maastrichtian Meerssen Chalk of St. Pieterberg, Maastricht, The Netherlands.

**Materials And Mesurments:**

Six specimens represented this species were collected having the following measurements

No. of specimens	L.(mm.)	H.(mm.)	R
1	110	27	8
2	100	35	8
3	102	33	9
4	-	28	7
5	-	30	7
6	-	30.5	8

**Description:**

The shell consists of at least three straight, very gradually expanding shafts, joined by tightly curved sector ornamented by sharp with narrow-spaced annular ribs, slightly weaker on the dorsum than elsewhere. They are oftenly straight on the flanks becoming gradually prorsiradiate.

**Discussion:**

Olivero and Zinsmeister recognized two species from the Antarctic Peninsula-Patagonian region; *Diplomoceras lambi* and *Diplomoceras maximus* ; separated from each other and from European *Diplomoceras cylindraceum* on the basis of rib density(7). However , *Diplomoceras cylindraceum* was also displayed rib index ranging from (8) to (20)as recorded from it's type locality by (8).

**Occurrence:**

*Diplomoceras cylindraceum* has a hamiticone shell-shaped of a very limited horizontal movement. In spit of that, it is widely distributed throughout the whole of the Maastrichtian, and appear in the Upper Campanian. Their considerable distribution in France, Spain, Italy, Poland, Austria, Ukania, Bulgaria, South Africa, South India, Australia, Antarctic Peninsula, Chile, Argentina, Brazil, U.S.A, British, Belgium, Netherlands, Denmark, Columbia(Canada), Japan, and perhaps Greenland and New Zealand.

Genus *Exiloceras* Hyatt, 1894

**Type Species:**

*Anciloceras jenneyi* Whitfield, 1877, P.42, by the subsequent designation of Diener, 1925, P.88.

*Exiloceras jenneyi* (Whitfield, 1877)

Pl.1, fig.c.

1877 *Anciloceras jenneyi* Whitfield

1880 *Anciloceras jenneyi* Whitfield; Whitfield

1888 *Anciloceras jenneyi* Witfield; Stanton

1893 *Anciloceras jenneyi* Whitfield; Boyle

1894 *Exiloceras (Anciloceras) jenneyi* Whitfield; Hyatt

1910 *Exiloceras jenneyi* (Whitfield); Grabae and Shiver

1925 *Turritiles (Exiloceras) jenneyi* Whitfield; Diener

1938 *Exiloceras jenneyi* (Witfield); Roman

1957 *Exiloceras jenneyi* (Witfield); Wright

1965 *Exiloceras jenneyi* (Witfield); Scott and Cobban

1966 *Exiloceras jenneyi* (Witfield); Gill and Cobban

1969 *Exiloceras jenneyi* (Witfield); Scott

1970 *Exiloceras jenneyi* (Witfield); Cobban

1973 *Exiloceras jenneyi* (Witfield); Gill and Cobban

1975 *Exiloceras jenneyi* (Witfield); Hirsch

1975 *Exiloceras jenneyi* (Witfield); Scott and Cobban

1976 *Exiloceras jenneyi* (Witfield); Kennedy and Cobban

1986a *Exiloceras jenneyi* (Witfield); Scott and Cobban

1986b *Exiloceras jenneyi* (Witfield); Scott and Cobban

1988 *Exiloceras jenneyi* (Witfield); Bryant and Martin

1992 *Exiloceras jenneyi* (Witfield); Kennedy

1996 *Exiloceras jenneyi* (Witfield); Wright

1997 *Exiloceras jenneyi* (Witfield); Kennedy and Cobban

1997 *Exiloceras jenneyi* (Witfield, 1877); Larson et al.

2000 *Exiloceras jenneyi* (Witfield, 1877); Kennedy et al.



Fig: c

**Types:**

The holotype and paratype USNM number 12295, came from "Limestone referred to the Fort Pierre Group of the Upper Missouri Cretaceous, on the East Fork of Beaver Creek, three miles west of Camp Jenney, Black Hills.

**Material And Measurements:**

One specimens was collected belonging to this species, have the following measurements:

No. of Specimens	D.(mm.)	H.(mm.)	R
1	70	26	8

**Description:**

Serpenticones planispiral shell with a maximum diameter 70 mm., narrowly spaced ribs are weak on dorsum becoming strengthening progressively, occur rectispiral to feebly rurspiral in nature, with occasional tubercles on their ventrolateral side, rib index (8).

**Discussion:**

The lack of this species in the studied section make it difficult to compare it with other similar representative assemblages. This species into two or more subspecies on the basis of ratio of whorl width to whorl height (9).

**Occurrence:**

It is widely distributed through the stratigraphic successions of the Upper Campanian of the U.S.A.

Subfamily Polyptychoceratina Matsumoto, 1938

Genus *Solenoceras* Conrad, 1860

**Type Species:**

*Hamites annulifer* Morton, 1842:109, 1842, P.213, Pl.11, Fig.4, by the subsequent designation of Conrad, 1860:284.

*Solenoceras bearpawense* Kennedy et al., 2000 Pl.1, fig.d.

1972 *Solenoceras* n.sp. Gill et al.

1997 *Solenoceras* sp. Larson et al.

2000 *Solenoceras bearpawense* Kennedy et al.



Fig: d

**Types:**

The holotype is represent the specimens number USNM 482510 from a limestone concretion in the *Didymoceras* Zone of the Bearpaw Shale at USGS of the Mesozoic locality, Montana. Paratypes are USNM 482511-482520, from Montana and Pierre Shale localities.

**Material And Measurements:**

Twenty-four specimens were collected from the same horizons, illustrated the following measurements:

No. of specimens	L.(mm.)	H.(mm.)	R
1	24	5.5	5
2	25	4	5
3	-	4.5	5
4	30	4.5	5
5	-	3.5	5
6	28	4.5	4
7	-	5	6
8	-	3.5	5
9	-	5	5
10	-	4.5	5
11	30	3.5	5
12	30	4.5	5
13	30	4.5	5
14	-	4.5	7
15	-	5	5
16	30	4.5	5
17	23	4.5	6
18	-	4	6
19	-	4	6
20	-	4	6
21	-	5.5	6
22	28	4.5	8
23	-	4.5	7
24	28	4.5	5

**Description:**

The shell consists of two tightly appressed parallel shafts, with an average length about 27 mm. for 11 specimens, connected by strongly curved, narrowly sectors. The body chambers include the curved sector and the adult shaft, with maximum whorl height of 4.4mm. Three to four weakly constrictions are intercalated the rurspiral ribs occurred in smaller younger shaft, with rib index (5). Ornamentation is poorly preserved and often disappears on the curved sector.

**Discussion:**

The species is closely resemble *Solenoceras bembense* Haas, 1943(P.11, Figs.4,14) from Angola. The holotype of the later species, is composed from two smaller parallel shafts, ornamented by numerous strong ribs with rib index equal to five. These features is more likely similar to those occurred in the above studied species (*Solenoceras bearpawense*). On the other hand, the species *Solenoceras mexicanum* Anderson (1958) from California is slightly different in having weak ornamente and with no obvious intercalation constrictions.

**Occurrence:**

This species has a stratigraphic successions passing through the Upper Campanian, it is found in U.S.A. and New Mexico.

*Solenoceras elegans* Kennedy et al., 2000

Pl.1, fig.e.

1970 *Solenoceras* n. sp. Gill et al.

2000 *Solenoceras elegans* Kennedy et al.

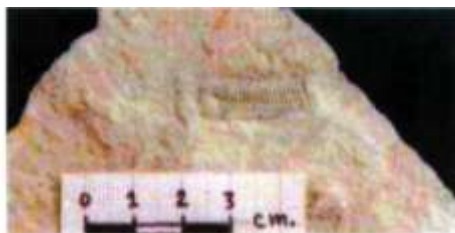


Fig: e

#### Types:

The holotype is represented by the specimens numbered USNM 482530, from the Rock River Formation at Mesozoic locality, Wyoming(fig.2, loc.27). Paratypes are USNM 482531-482538, 482826, from the same locality, from USGS .

#### Material And Measurements:

Fourteen specimens were collected from the same mentioned locality, illustrated the following measurable parameters:

No. of Specimens	L.(mm.)	H.(mm.)	R
1	25	4	5
2	22	4.5	5
3	25	4.5	6
4	35	5	6
5	25	4	5
6	30	5.5	5
7	30	4.5	5
8	30	5.5	6
9	20	3.5	5
10	28	4.5	5
11	27	4	6
12	27	5	6
13	25	4	5
14	35	4.5	5

#### Description:

The species composed of two appressed, slightly curved shafts connected by narrow curved sector with an average shell length of about 27mm. for 14 specimens. The small end of the younger shaft is mostly adapical with an average whorl height of 4.5mm.. The shell is ornamented by numerous ribs(R=5) with some constrictions at the adapertural and adapical ends.

#### Discussion:

*Solenoceras elegans* is most resembles to *Solenoceras bearpawense*, particularly in having a longer body chamber and ornamented by moderately ribs, but it is differ in lacking of the constrictions occur on the smaller shaft.

#### Occurrence:

This species is mostly occur throughout the stratigraphic successions of the Upper Campanian from U.S.A.

*Solenoceras reesidei* Stephenson, 1941

Pl.1, fig.f.

1941 *Solenoceras reesidei* Stephenson

1969 *Solenoceras* cf. *S.reesidei* Stephenson; Lewy

1992 *Solenoceras reesidei* Stephenson; Cobban, Kennedy and Scott

1994 *Solenoceras reesidei* Stephenson; Cobban and Kennedy

2000 *Solenoceras reesidei* Stephenson; Kennedy and Lunn



Fig: f

#### Types:

Holotype is represented by the specimens numbered USNM 7723, the paratypes USNM 77235-77239.They were collected from the Upper Campanian, Navarro county, Texas.

#### Material And Measurements:

Four specimens were collected to this species, having the following measurements:

No. of Specimens	L.(mm)	H.(mm)	R
1	30	5	5
2	27	4.5	5
3	28	5	5
4	30	5	6

#### Description:

The shell is commonly composed of two parallel appressed shafts, with an average length of about 28.5mm. for 4 specimens. The smaller younger shaft is longer than the larger adult shaft of an average whorl height of 4.9mm.of 4 specimens. These shafts are mostly ornamented by densely type of prorsiradiate ribs (R=5), with some obvious constrictions, becoming coarser towards the adapertural end. These ribs are oftenly combined by tubercles, particularly at the ventro-lateral side of the shell, The ornamentation of this species is also remarkable distinguished at the shell curved sector.

#### Discussion:

*Solenoceras reesidei* is more likely resemble to *Solenoceras bearpawense* in most of it's shell features except that the studied species (*Solenoceras reesidei*) has densely coarser ribs and tubercles at it's shafts and the curved sector.

#### Occurrence:

It is a widely distributed throughout stratigraphic succession of the Upper Campanian of USA, Italy, Palestine and Iraq.

Genus *Lewyites* Matsumoto and Miyauchi, 1984.

#### Type Species:

*Idoiohamites? oronensis* Lewy, 1969

*Lewyites oronensis*(Lewy, 1969)

Pl.1, fig.g.

1969 *Idoiohamites? oronensis* Lewy

1974 *Exteloceras oronensis* (Lewy); Cobban

1984 *Lewyites oronensis* (Lewy); Matsumoto and Miyauchi



1993 *Lewyites oronensis*(Lewy, 1969);Kennedy  
2000 *Lewyites oronensis*(Lewy, 1969);Kennedy and Lunn



**Fig: g**

#### **Types:**

Holotype is represented by sample number 3002a from the upper part of the Mishash Formation, Upper Campanian Southern Palestine.

#### **Material And Measurements:**

Five uncompleted specimens were collected from Shiranish Formation, which make it difficult to carry out the shell length measurements, while the other measurable parameters are as follows:

No. of specimens	H.(mm)	R
1	21	7
2	15	6
3	17	7
4	15	6
5	17	8

#### **Description:**

The shell consists of untightly and curved shafts; the apical and of the small younger shaft is narrow and curved upwards, with an average whorl height of 17mm. of 5 specimens. The shell is ornamented by numerous rectiradiate type of ribs becoming rursiradiate at its flanks with an average rib index 6.8. particularly by tubercles, these type of ribs were a combination present at the ventro-lateral side of the shell intercalate by non-tuberculate ones.

#### **Discussion:**

The specimens of this species make it difficult to compare with other, but see Kennedy and Cobban (1993) and Kennedy and Christensen (1997) for discussion of different from other species referred to *Lewyites*.

#### **Occurrence:**

This species record from Upper Campanian in Palestine and Iraq(11).

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## امونايت الدبلوموسيراتيدي من تكوين شرانش (الكريتاسي المتأخر) في طية سنجار المحدبة شمال غرب العراق

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### الملخص:

الشكل المعروفة بأنواعها ذات الالتفاف الصدفي غير المستوي وهذه الأنواع هي:

- (1) *Solenoceras bearpawense* Kennedy et al., 2000
- (2) *Solenoceras elegans* Kennedy et al., 2000
- (3) *Solenoceras reesidei* Stephenson, 1941
- (4) *Exiteloceras* cf. *jenneyi* (Whitfield, 187
- (5) *Diplomoceras cylindraceum* (Defrance, 1816)
- (6) *Lewyites oronensis* (Lewy, 1969).

تتميز عائلة الدبلوموسيراتيدي بأنواعها ذات الدروز الامونيتية المعقدة، بالإضافة إلى زخرفتها والتفافها المتميزين، جمعت العينات المدروسة حالياً من التتابعات الطباقية السفلى لتكوين شرانش التي تتكشف في لب طية سنجار المحدبة شمال غرب العراق. واعتماداً على المظاهر والتراكيب المورفولوجية المميزة للعينات تم تشخيص ستة أنواع تابعة لنموذج متعدد