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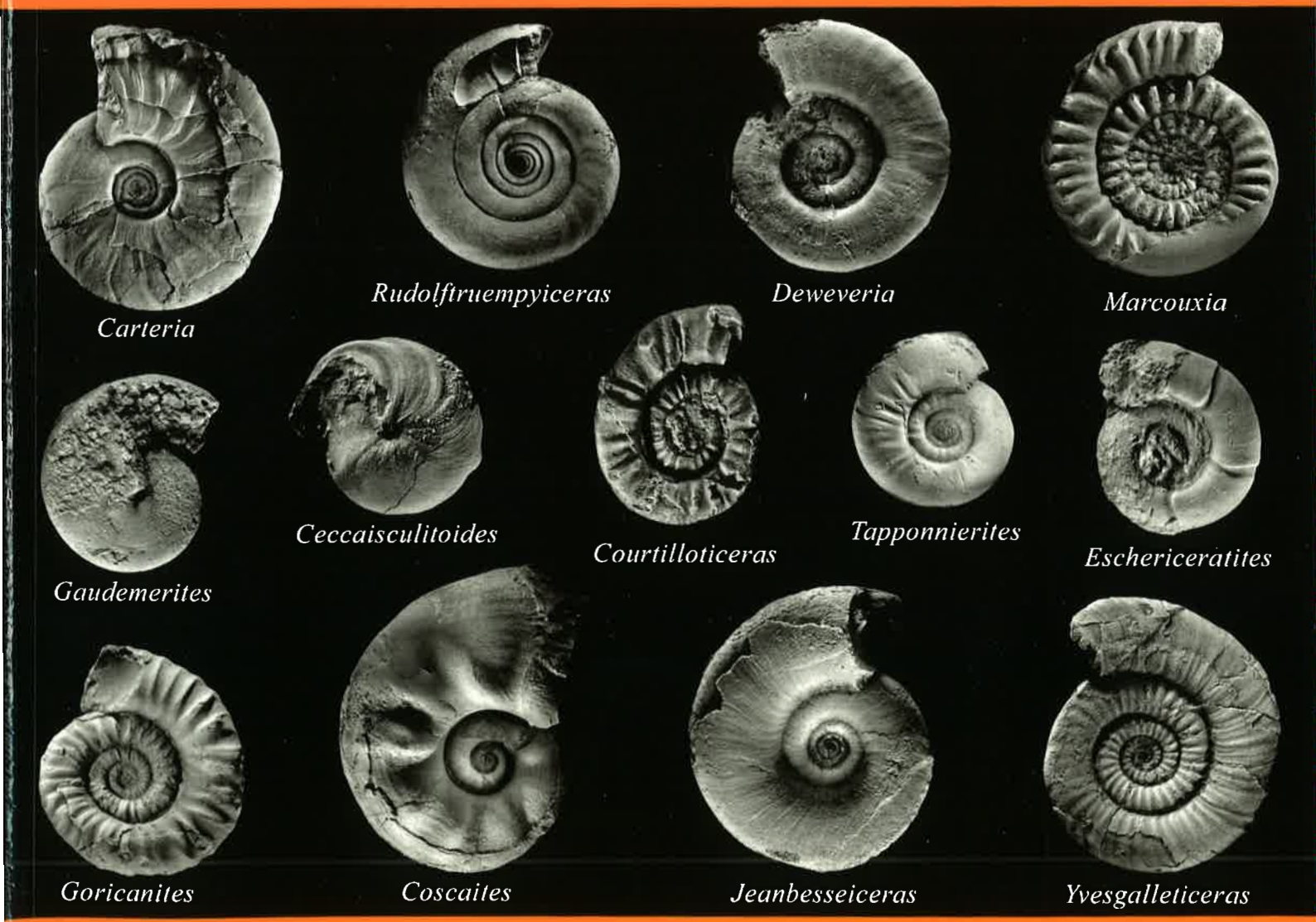


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**49**

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**In Memoriam**

**Milos Rakus  Jean Marcoux  Rudolf Trümpy**

# Contents

# SPATHIAN (LOWER TRIASSIC) AMMONOIDS FROM WESTERN USA (IDAHO, CALIFORNIA, UTAH AND NEVADA)

**Jean Guex [1], Alexandre Hungerbühler [1], James F. Jenks [2], Luis O'Dogherty [3], Viorel Atudorei [4], David G. Taylor [5], Hugo Bucher [6] and Annachiara Bartolini [7]**

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## ABSTRACT

The Early Triassic marine deposits are distributed over a large area in the Western United State and are very rich in ammonoids. The detailed bed by bed study of their stratigraphic distribution allowed us to present a new very precise biochronological framework of the Spathian stage (Middle to Late Olenekian).

Nineteen new ammonoid species belonging to the genera *Pseudosvalbardiceras* ?, *Prohungarites, Silberlingeria, Bajarunia, Hemilecanites, Arctomeekoceras, Xenoceltites, Nordophiceratoides, Sibirites, Columbites, Hellenites* and *Svalbardiceras* and eighteen new spathian ammonoid genera (*Courtilloticeras, Yvesgalleticeras, Marcouxia, Jeanbesseiceras, Tapponnierites, Gaudemerites, Deweveria, Ceccaisculitoides, Coscaites, Eschericeratites, Carteria, Goricanites, Tardicolumbites, Cowboyiceras, Nordophiceratoides, Glabercolumbites*) have been described in a recent preliminary report by Guex et al. (2005) on the basis of unpublished material collected in the western USA (Idaho, Utah, Nevada and California). In addition, one new genus (*Rudolftruempyiceras*) and four new species are also described in the present work. The precise stratigraphic description of the collected sections is given in the present Memoir and the stratigraphic distribution of 88 species belonging to 51 genera is established herein. Twenty-three new biochronological horizons are defined thanks to these new data. The Cowboy Pass section (Utah) records a very interesting terrestrial (red beds and very shallow water deposits) transition between the marine Late Smithian and the Earliest Spathian faunas. That worldwide short lived regression followed by a major transgression fits the model proposed by Guex et al. 2001 and Morard et al. 2003 for the Pliensbachian - Toarcian transition: major volcanic SO2 emissions generating a short but major cooling and glaciation associated with an important sea level fall and large scale emersions, followed by a warming inducing a transgressive episode with some anoxic deposits.

# 1. Introduction

## History

Early Triassic ammonoids of Spathian age in the western United States occur primarily in the Bear Lake area of southeastern Idaho, the Confusion Range of west-central Utah, the northern Humboldt Range of northwestern Nevada and the Union Wash area in the Inyo Range of eastern California. The particular portion of the Spathian represented by the ammonoid successions varies somewhat from area to area, but the southeastern Idaho and northwestern Nevada successions are much more complete than the other two areas.

Marine sediments of Triassic age were first discovered in the southeast Idaho, southwest Wyoming area in the late 19th century, when Dr. C.A. White (1879) described ammonoids and other fossils collected by Dr. A.C. Peale, a field geologist with the Territorial Survey, and recognized their age (*Meekoceras* beds) as Lower Triassic (Hyatt and Smith, 1905). Then, early in the 20th century Robert S. Spence, an amateur collector living in the Bear Lake area, found some unusual fossils in Paris Canyon about one mile west of Paris, Idaho and sent them to J.P. Smith for identification (Hyatt and Smith, 1905). Smith visited the locality with Spence and their joint collection was ultimately described as the youngest Lower Triassic ammonoids (*Tirolites/Columbites* beds) then known from North America (Hyatt and Smith, 1905). Two additional outcrop localities of the "*Columbites* beds" were discovered by Bernhard Kummel in the early 1940's while conducting a reconnaissance of the entire Lower Triassic sequence in the Bear Lake Valley area (Kummel, 1943). One of these localities, the three mile long Bear Lake Hot Springs ridge has provided many new ammonoid genera and species as well as a much refined biostratigraphic record (this volume). Kummel later formally divided the Thaynes Formation of the area into eight members, but he credits V.E. McKelvey, a U.S.G.S. geologist engaged in mapping the area's phosphate and vanadium reserves, with the discovery of a 460 meter thick shale and limestone sequence lying immediately above his heretofore uppermost member, and recognition that it was also Lower Triassic in age since it contained the *Prohungarites* ammonoid fauna (Kummel, 1954). This sequence, north of Paris Canyon in the vicinity of Hammond Creek was significant because at the time its ammonoids comprised the youngest Lower Triassic assemblage then known from North America and the ammonoid genus *Prohungarites* was previously known only from Timor and possibly the Himalayas (Kummel, 1954). Kummel (1969) later included this *Prohungarites* assemblage in his monographic treatment of "Late Scythian" ammonoids. Subsequent close examination of these same beds in the small canyons and gullies north of Sleight Canyon and along Hammond Creek has revealed several additional ammonoid successions, both below and above the *Prohungarites* horizon as well as a multitude of new ammonoid genera and species (this volume).

The first report of Triassic fossils from Nevada (W.M. Gabb, 1864) involved ammonoids, which had been collected in the early 1860's by silver miners in the northern Humboldt Range, northwestern Nevada and then subsequently described by W.M. Gabb of the Geological Survey of California (Silberling and Nichols, 1982). Later collections, made in the late 1860's by members of Clarence King's U.S. Geological Exploration of the Fortieth Parallel, were described by F.B. Meek (1877)

in collaboration with Alpheus Hyatt (Silberling and Nichols, 1982). J.P. Smith also visited the by then famous "Fossil Hill locality" in the southern Humboldt Range in 1902 and 1903 and collected a vast amount of ammonoids (Silberling and Nichols, 1982). Eventually, these huge collections were monographed by Smith (1914) as belonging to the Daonella dubia Zone in his memorable "Middle Triassic marine invertebrate fauna of North America" (Silberling and Wallace, 1969). Then, after several years of bed by bed collecting from the Prida Formation, Silberling and Nichols (1982) published a now classic modern monographic treatment of the areas Anisian and lower Ladinian ammonoids. Evidently, Triassic ammonoids of Spathian age in the northern Humboldt Range went undiscovered or at the least unrecognized until N.J. Silberling in the mid-1960s found the *Neopopanoceras haugi* assemblage and the slightly older *Prohungarites* assemblage at several localities (Silberling and Wallace, 1969). Prior to this discovery, the *N. haugi* fauna was generally considered to be lowermost Anisian in age, but Silberling established its exact age as uppermost Spathian because of its relative stratigraphic position with respect to the lowermost Anisian Lenotropites caurus Zone (Silberling and Wallace, 1969). Further collecting in this area has yielded several newly described ammonoids and a more refined zonation with additional ammonoid successions (this volume).

J.P. Smith (1898) first mentions the presence of marine Triassic rocks (and the Meekoceras fauna) in Union Wash, Inyo Mountains of eastern California, but he credits Mr. H.W. Turner with the discovery in 1899 of beds containing ammonoids now recognized as uppermost Spathian in age (Smith, 1904). This assemblage, now known as the *N. haugi* fauna, was long thought to be lowermost middle Triassic in age because no other ammonoid faunas existed in close stratigraphic proximity that would be useful to help determine its age (Silberling and Wallace, 1969). Then, N. J. Silberling established the true age of this assemblage with his work in Nevada's northern Humboldt Range (see above, Silberling and Wallace, 1969). Furthermore, the fauna's uppermost Spathian age was further corroborated when poorly preserved ammonoids tentatively identified as *Keyserlingites* were found in the Union Wash area stratigraphically above the Haugi Zone assemblage (Silberling and Tozer, 1968).

Lower Triassic ammonoids were first reported from the Thaynes Formation of the Confusion Range of west-central Utah by Bacon (1948), but aside from one obscure reference to *Columbites parisianus*, he lists only ammonoids of the Smithian *Meekoceras* and *Anasibirites* assemblages. Then, in a more comprehensive stratigraphic study, Hose and Repenning (1959) list two higher fossiliferous horizons, from which N.J. Silberling examined the ammonoids and identified them as of definite Spathian age. More recent collections have yielded rare earliest Spathian ammonoids as well as a larger assemblage approximately equivalent to the upper "*Columbites* beds" of SE Idaho (this volume).

The location of the sections is given in Figures 1 to 6 below.

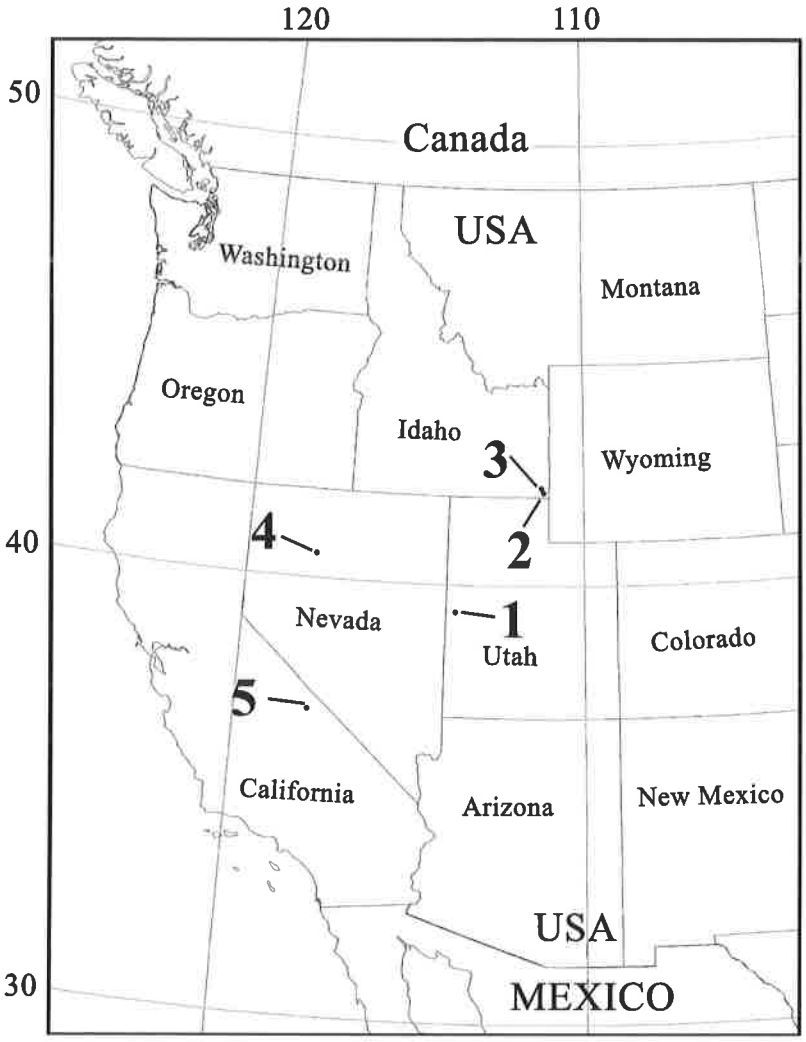



Fig.1 Map of north America showing the regional location of the studied outcrops.

1. Cowboy pass, Utah.

2. Hot Springs, Bear Lake, Idaho.

3. Hammond Creek, Bear Lake, Idaho.

4. Northern Humboldt Range, Nevada.

5. Union Wash, Inyo Range, California.

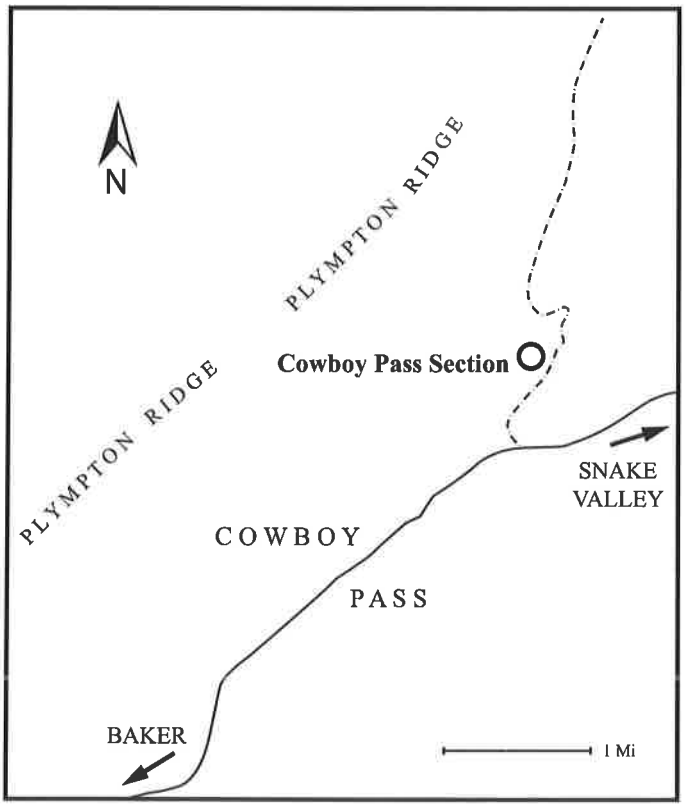



Fig.2 Map of the Cowboy Pass area (Utah), showing the location of the studied section

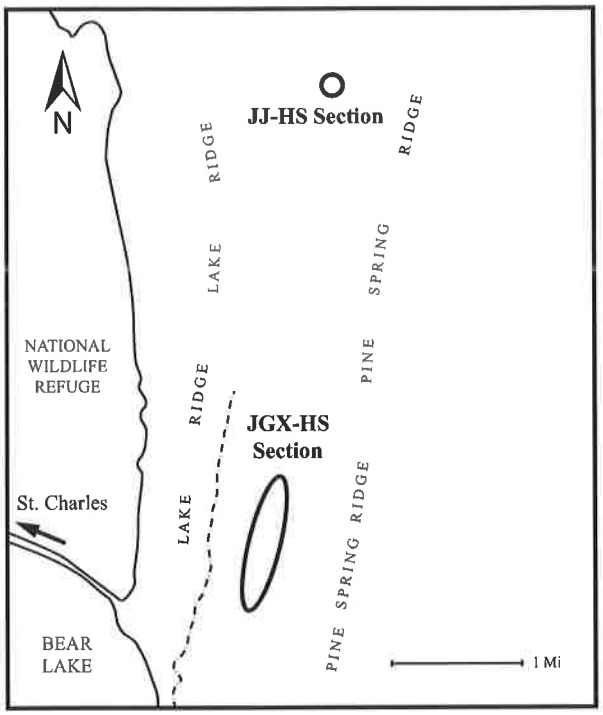



Fig.3 Map of the Hot Springs area (Bear Lake, Idaho)

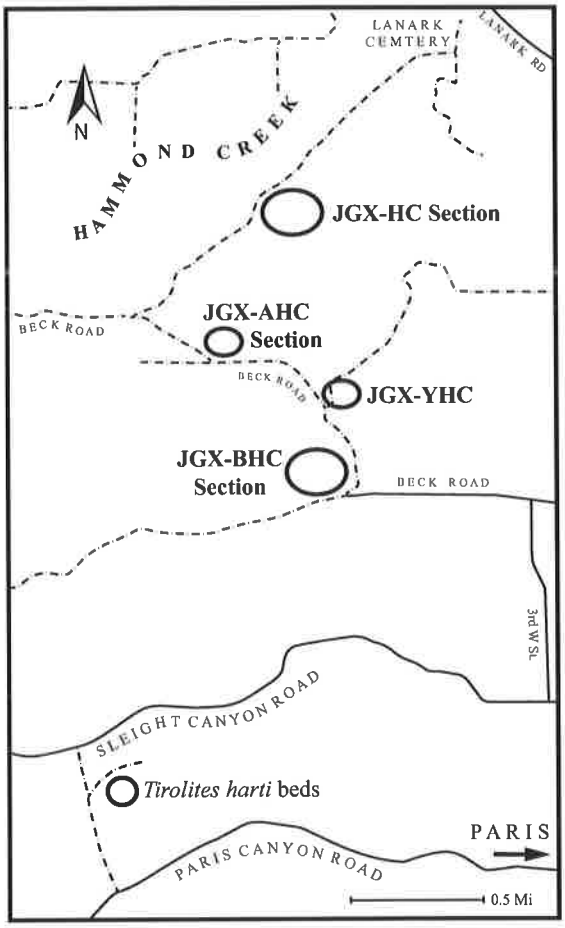



Fig.4 Map of the Paris Canyon area (Bear Lake, Idaho)

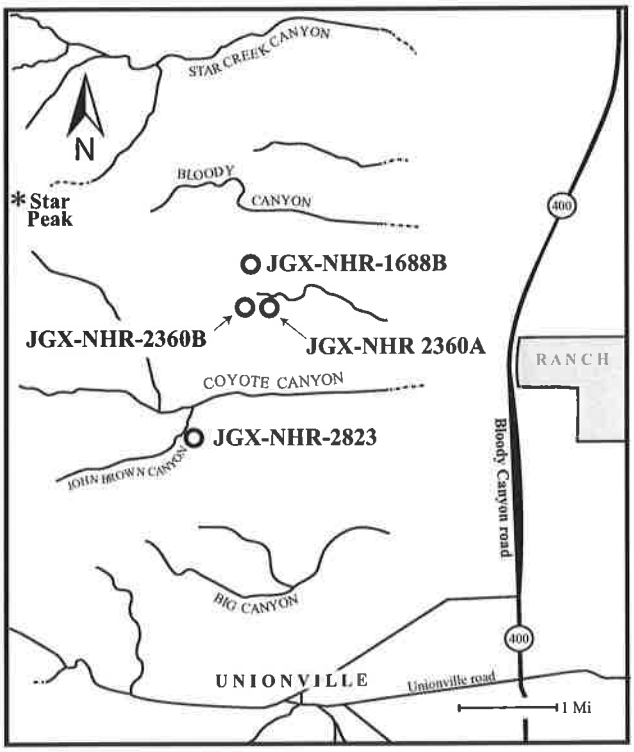



Fig.5 Map of the Coyote Canyon area (northern Humboldt range, Nevada)

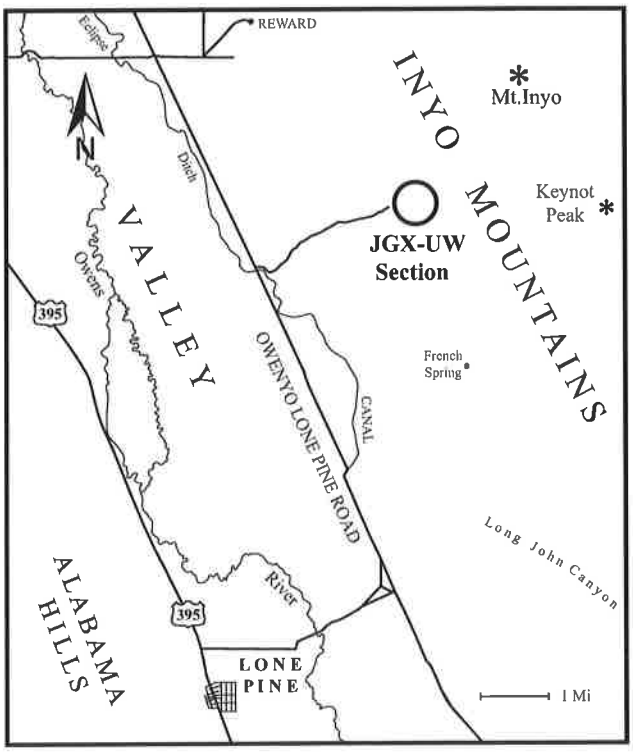



Fig.6 Map of Union Wash, California (Lone Pine area)

# 2. Stratigraphy

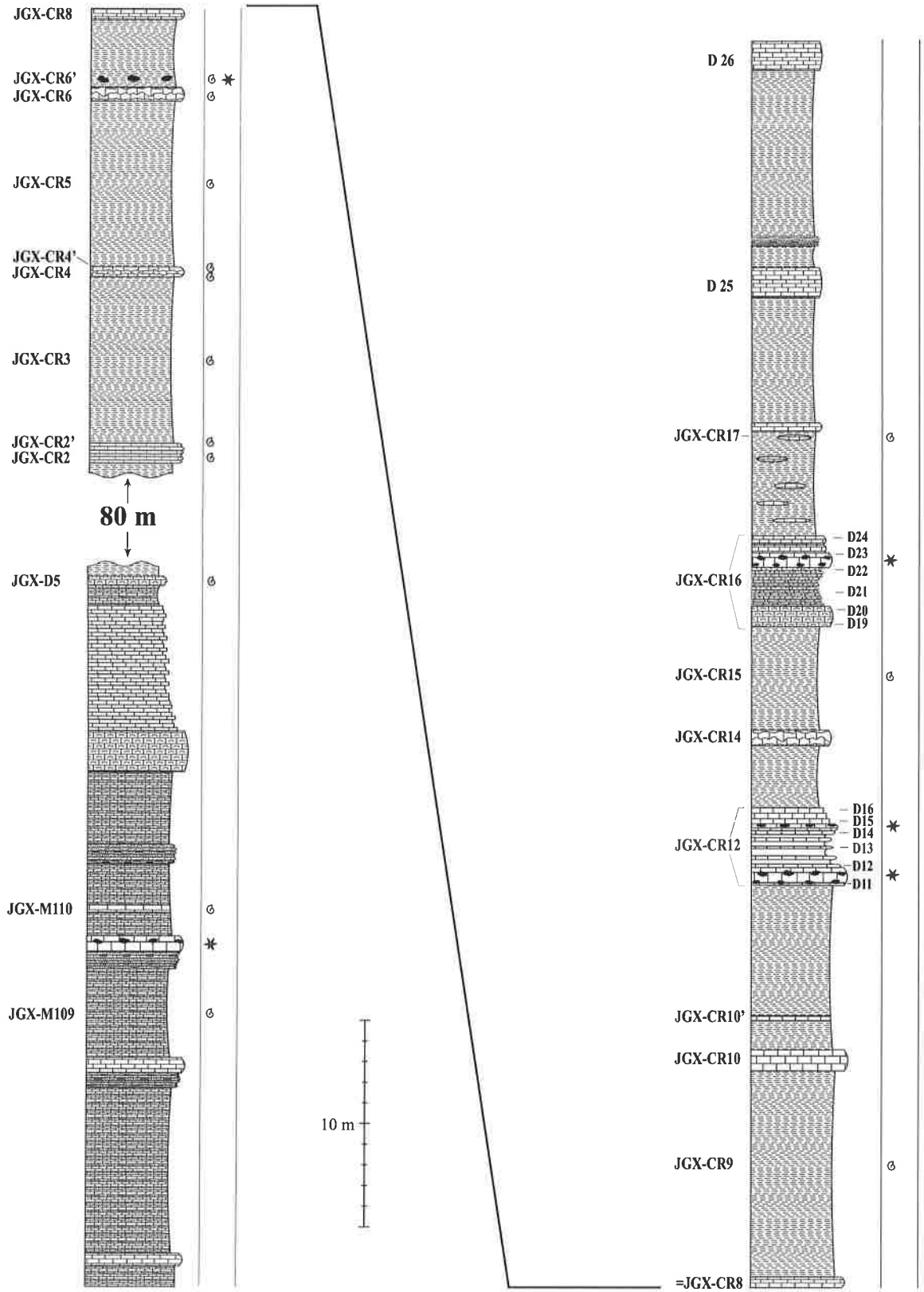



Fig.7 Cowboy pass section, Utah. The base of the section is located approximatively 100m above the late Smithian *Anasibirites* beds. Shallow water facies and emersion levels are characteristic of this Smithian-Spathian boundary interval.

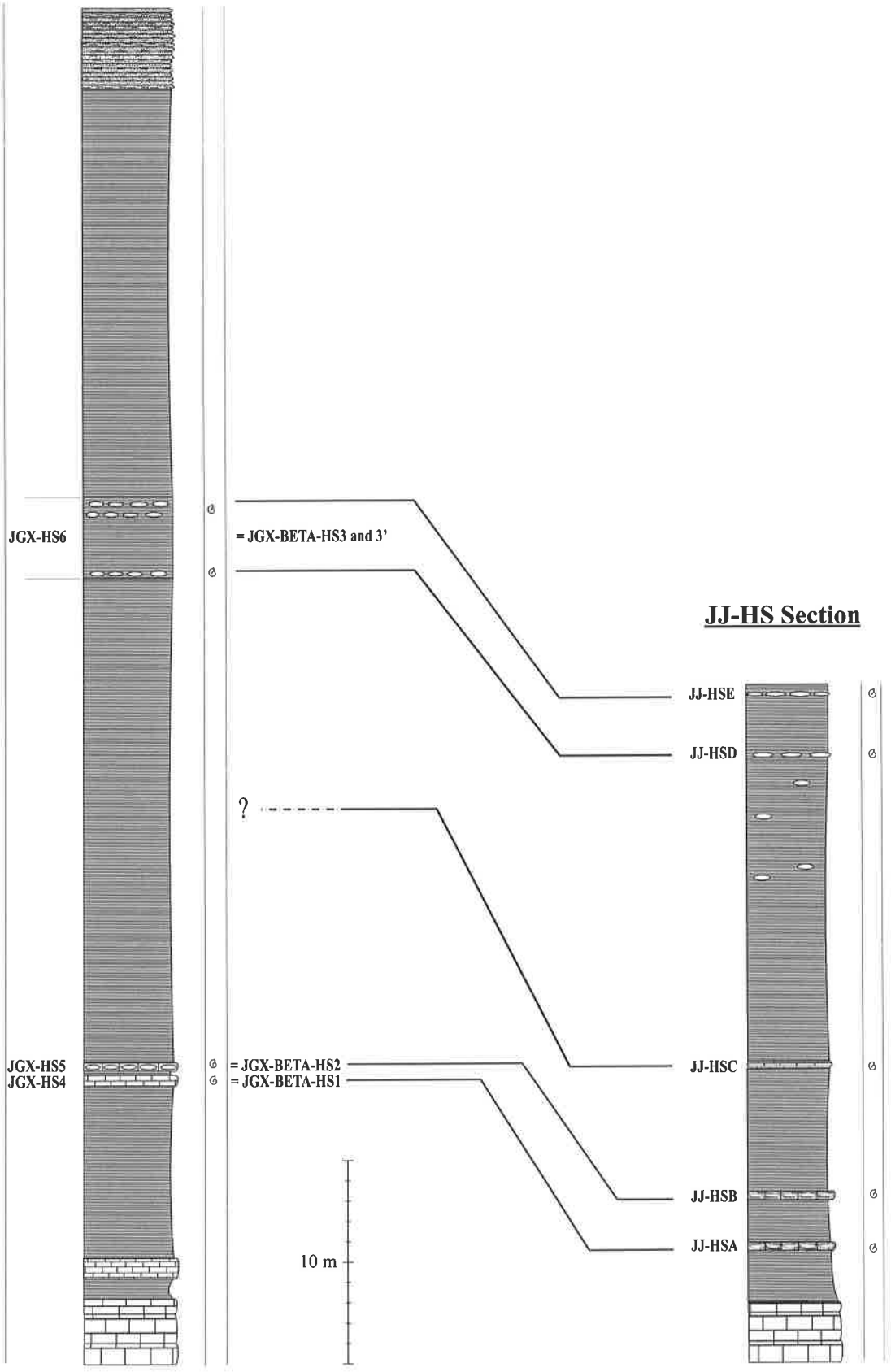



Fig.8 Hot Springs section, Bear Lake, Idaho.

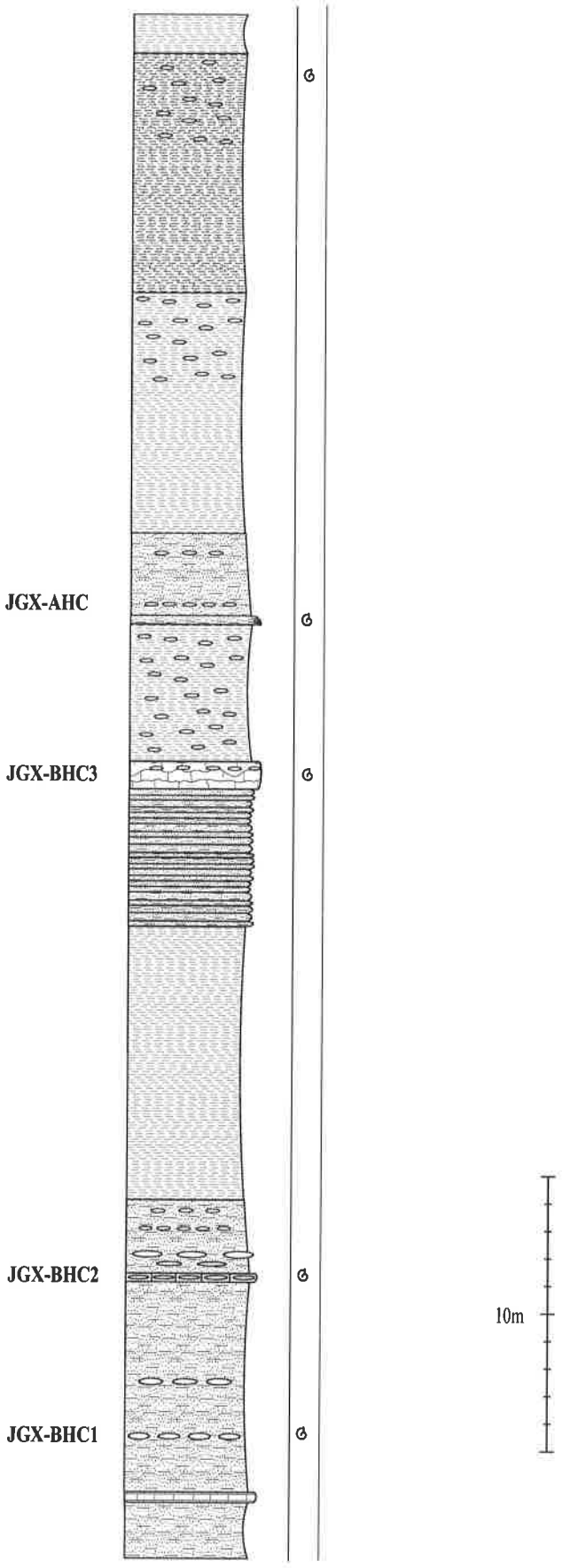



Fig.9 JGX-BETA-HC section, Hammond Creek, Bear Lake, Idaho. The presence of some specimen of the genus *Fengshanites* correlates the uppermost part of this section with the base of the JGX-HC section (Fig.-10).

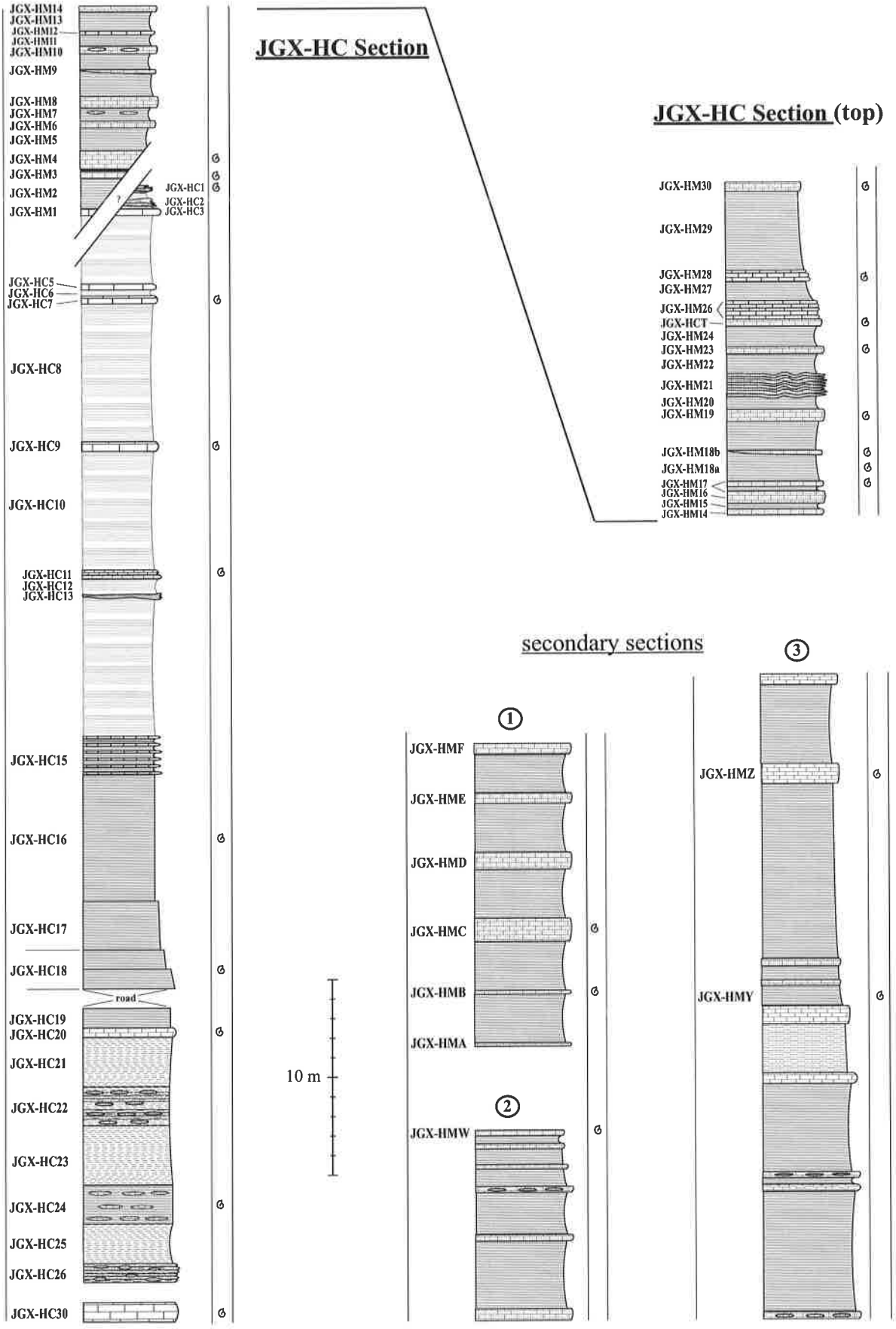



Fig.10 Hammond Creek section, Bear Lake, Idaho. Secondary sections are illustrated although they have not been used for biostratigraphy.

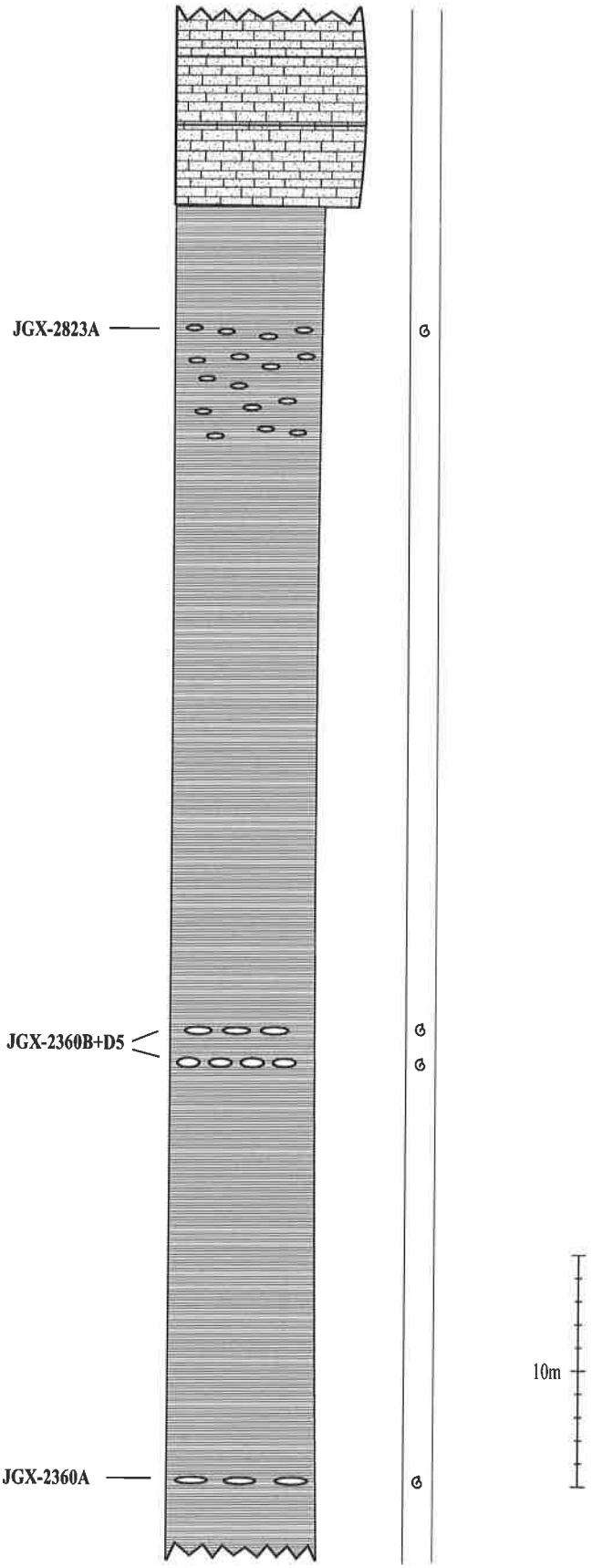



Fig.11 JGX-NHR section, northern Humboldt Range, Nevada.

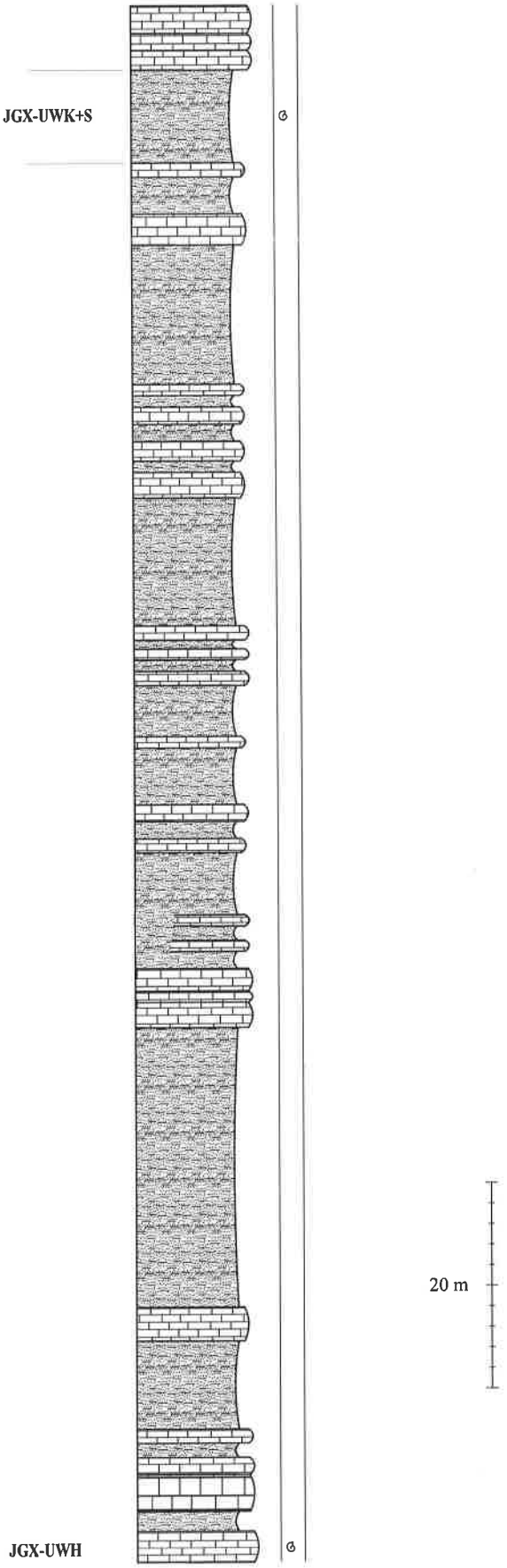



Fig.12 Union Wash section, Inyo Range, California.

# 3. Biochronology

## Faunal content of the studied intervals

### Cowboy Pass section, Utah.

Levels :
JGX-M109 : *Bajarunia confusionensis*
JGX-M110 : *Bajarunia confusionensis*
JGX-D5 : *Cowboyiceras farwestense*
JGX-CR2 : *Idahocolumbites cheneyi; Ussurites* cf. *hosei*
JGX-CR2' : *Idahocolumbites cheneyi; Jeanbesseiceras jacksoni*
JGX-CR3 : *Ussurites* cf. *hosei*
JGX-CR4 : *Pseudosageceras* sp.indet; *Idahocolumbites cheneyi; Ussurites* cf. *hosei*
JGX-CR4' : *Idahocolumbites cheneyi; Ussurites* cf. *hosei*
JGX-CR5 : *Ussurites* cf. *hosei*
JGX-CR6 : *Tirolites* aff. *smithi; Idahocolumbites cheneyi; Ussurites* cf. *hosei Jeanbesseiceras jacksoni*
JGX-CR6' : *Tirolites* aff. *smithi; Idahocolumbites cheneyi; Ussurites* cf. *hosei; Jeanbesseiceras jacksoni*
JGX-CR9 : *Tirolites* aff. *smithi*
JGX-CR15 : *Tirolites* sp.indet.
JGX-CR17 : *Tirolites carniolicus* ?

### *Tirolites* beds, Paris Canyon, Bear Lake, Idaho.

*Tirolites harti*

### JGX-HS and JJ-HS sections, Hot springs, Bear Lake, Idaho.

Levels :
JJ-HSAB (undifferentiated) : *Carteria hotspringensis*; *Rudolftruempyiceras* gen.nov. *apostolicum; Bajarunia curticostata*
JJ-HSA : *Rudolftruempyiceras* gen.nov. *apostolicum; Columbites parisianus; Yvesgalleticeras montpelierense; Nordophiceratoides catherinae*
JJ-HSB : *Rudolftruempyiceras* gen.nov. *apostolicum; Columbites parisianus*
JJ-HSC : *Arctomeekoceras popovi* sp.nov; *Columbites* aff. *dolnapaensis*
JJ-HSDE : *Albanites sheldoni; Cordillerites angulatus; Tirolites smithi; Columbites crassicostatus*; *Columbites* aff. *minimus; Columbites isabellae*; *Marcouxia astakhovi; Idahocolumbites cheneyi; Sibirites carinatus; Ussurites submansfeldi* sp.nov.; *Ussurites mansfeldi; Coscaites crassus*; *Nordophiceratoides adriani*; *Nordophiceratoides gracilis*; *Jeanbesseiceras jacksoni; Nordophiceratoides bartolinae* sp.nov.
JGX-HS4 : *Xenoceltites crenulatus; Xenoceltites spencei; Bajarunia curticostata; Columbites parisianus; Yvesgalleticeras montpelierense; Jeanbesseiceras jacksoni; Nordophiceratoides catherinae*
JGX-HS5 : *Xenoceltites crenulatus*; *Xenoceltites spencei; Bajarunia curticostata; Columbites parisianus; Jeanbesseiceras jacksoni*
JGX-HS6 : *Albanites sheldoni; Cordillerites angulatus; Tirolites smithi; Columbites crassicostatus*; *Columbites* aff. *minimus; Columbites isabellae; Idahocolumbites cheneyi; Nordophiceratoides*

*adriani; Nordophiceratoides gracilis; Xenoceltites spencei; Jeanbesseiceras jacksoni; Yvesgalleticeras raphaeli* sp.nov.; *Nordophiceratoides bartolinae* sp.nov.

**Remark :** Levels JGX-HS4, HS5 and JGX-HS6 correlate with levels JJ-HSA, JJ-HSB and JJ-HSDE respectively. Level JJ-HSC is intercalated between JJHSB and JJHSDE (= JGX-HS5 and JGX-HS6).

## JGX-BETA-HC and JGX-ALPHA-HC composite section, Hammond Creek, Bear Lake Valley, Idaho.

Levels :
JGX-BETA-HC : *Arctomeekoceras tardum; Procolumbites karataucicus; Metadagnoceras unicum; Kazakhstanites dolnapensis; Deweveria dudresnayi*
JGX-BETA-HC1 : *Arctomeekoceras tardum; Cordillerites angulatus; Procolumbites karataucicus; Neocolumbites* sp. indet.; *Metadagnoceras unicum; Kazakhstanites dolnapensis; Deweveria dudresnayi*
JGX-BETA-HC2 : *Metadagnoceras unicum; Kazakhstanites dolnapensis*
JGX-BETA-HC3 : *Procolumbites karataucicus; Kazakhstanites dolnapensis*
JGX-ALPHA-HC : *Hellenites elegans*

## JGX-HC Section, Hammond Creek, Bear Lake Valley, Idaho.

Levels :
JGX-HC30 : *Hemilecanites paradiscus; Stacheites concavus*; *Stacheites floweri; Stacheites* aff. *prionoides; Glabercolumbites glaber*; *Tardicolumbites tardicolumbus; Fengshanites americanus; Svalbardiceras sulcatum*; *Palaeophyllites* ? sp.; *Tapponnierites tenuicostatus*
JGX-HC24: *Dagnoceras* aff. *zappanese*; *Stacheites* aff. *prionoides*; *Prohungarites gutstadti; Prohungarites* sp.indet.; *Prohungarites mckelvei*
JGX-HC20: *Stacheites concavus*; *Stacheites floweri; Fengshanites americanus; Paragoceras* aff. *timorensis; Procarnites* sp.; *Sibirites* sp.indet.1; *Sibirites* sp.indet. 2; *Praesibirites ?* sp.indet.; *Svalbardiceras* aff. *spitzbergensis*; *Prohungarites gutstadti; Prohungarites mckelvei*
JGX-HC18 : *Fengshanites americanus; Subcolumbites* aff. *perrinismithi*; *Paragoceras* aff. *timorensis*; *Paragoceras* sp.indet 1; *Kiparisovites* aff. *ovalis* ; *Metadagnoceras* ? aff. *pulchrum; Metadagnoceras* ? sp.indet. 1
JGX-HC16 : *Subcolumbites* aff. *perrinismithi; Kiparisovites* aff. *ovalis*
JGX-HC11 : *Dagnoceras* ? sp.indet; *Fengshanites americanus*; *Paragoceras* aff. *timorensis*; *Paragoceras* sp.indet.2; *Paragoceras* cf. *malayanus; Prohungarites mckelvei*
JGX-HC9 : *Svalbardiceras* cf. *freboldi; Prohungarites mckelvei; Prohungarites beyrichitoides; Isculitoides* aff. *originis; Ceccaisculitoides hammondi*
JGX-HC7 : *Prohungarites mckelvei*
JGX-HC1 : *Prohungarites mckelvei; Silberlingeria bearlakensis; Eschericeratites lytoceratoides; Ceccaisculitoides hammondi*
JGX-HM3 : *Prohungarites mckelvei*
JGX-HM17 : *Silberlingeria bearlakensis; Silberlingeria sarahjanae*
JGX-HM18 : *Silberlingeria bearlakensis; Silberlingeria coronata; Silberlingeria sarahjanae; Ceccaisculitoides hammondi*
JGX-HM19 : *Silberlingeria bearlakensis*
JGX-HM23: *Silberlingeria bearlakensis*
JGX-HCT : *Silberlingeria bearlakensis; Silberlingeria coronata; Subhungarites yatesi*
JGX-HM28 : *Subhungarites yatesi*

JGX-HM30 : *Subhungarites yatesi*

## JGX-NHR section, northern Humboldt Range, Nevada.

Levels :
JGX-NHR-2360A : *Pseudosvalbardiceras ? humboldtense; Prohungarites lenticularis; Prohungarites submckelvei*
JGX-NHR-2360B+D5 : *Gaudemerites rectangularis; Ceccaisculitoides elegans; Silberlingeria rubyae; Metadagnoceras* sp.indet. 2; *Eschericeratites lytoceratoides*
JGX-NHR-2823A+B : *Hemilecanites fastigatus; Deweveria crenulata* sp.nov.; *Subhungarites yatesi; Neopopanoceras haugi; Pseudacrochordiceras inyoense*

## JGX-UW section, Union Wash, Inyo Range, California.

Levels :
JGX-UWH : *Neopopanoceras haugi; Keyserlingites pacificus; Pseudacrochordiceras inyoense; Inyoceras bittneri; Subhungarites yatesi; Goricanites noblei*
JGX-UWK+S : *Keyserlingites pacificus; Keyserlingites subrobustus; Eodanubites (Dumitricaceras) judae*; *Courtilloticeras stevensi*

The recognized biochronologic horizons are as follows:

**Horizon H1 :**
*Bajarunia confusionensis*

**Horizon H2 :**
*Cowboyiceras farwestense*

**Horizon H3 :**
*Tirolites harti*

**Horizon H4 :**
*Rudolftruempyiceras* gen.nov. *apostolicum; Columbites parisianus; Xenoceltites crenulatus*; *Nordophiceratoides catherinae; Yvesgalleticeras montpelierense; Bajarunia pilata; Carteria hotspringensis; Xenoceltites spencei; Hellenites idahoense; Jeanbesseiceras jacksoni*

**Horizon H5 :**
*Xenoceltites spencei; Hellenites idahoense; Jeanbesseiceras jacksoni; Arctomeekoceras popovi; Columbites* aff. *dolnapaensis*

**Horizon H6 :**
*Xenoceltites spencei; Hellenites idahoense; Jeanbesseiceras jacksoni; Nordophiceratoides gracilis; Sibirites carinatus; Columbites* aff. *minimus; Columbites isabellae; Marcouxia astakhovi; Tirolites smithi; Albanites sheldoni; Columbites crassicostatus; Coscaites crassus; Nordophiceratoides adriani; Ussurites submansfeldi* sp.nov.; *Ussurites mansfeldi; Idahocolumbites cheneyi; Cordillerites angulatus; Yvesgalleticeras raphaeli* sp.nov.; *Nordophiceratoides bartolinae* sp.nov.

**Horizon H7 :** *Cordillerites angulatus; Idahocolumbites cheneyi; Ussurites* cf. *hosei; Jeanbesseiceras jacksoni; Pseudosageceras* sp.indet; *Tirolites* aff. *smithi*

**Horizon H8 :**
*Arctomeekoceras tardum; Cordillerites angulatus; Procolumbites karataucicus; Neocolumbites* sp.indet.; *Metadagnoceras unicum; Kazakhstanites dolnapensis; Deweveria dudresnayi*

**Horizon H9 :**
*Hellenites elegans*

**Horizon H10 :**
*Tapponnieritestenuicostatus;Hemilecantitesparadiscus;Svalbardicerassulcatum;Glabercolumbites glaber; Tardicolumbites tardicolumbus; Palaophyllites ?* sp.*; Stacheites* aff. *prionoides; Stacheites concavus; Stacheites floweri; Fengshanites americanus*

**Horizon H11 :**
*Stacheites* aff. *prionoides; Stacheites concavus; Stacheites floweri; Fengshanites americanus; Dagnoceras* aff. *zappanese; Prohungarites gutstadti; Prohungarites mckelvei*

**Horizon H12 :**
*Stacheites concavus; Stacheites floweri; Fengshanites americanus; Prohungarites gutstadti; Prohungarites mckelvei; Sibirites* sp.indet.1; *Praesibirites* ? sp.indet.; *Svalbardiceras* aff. *spitzbergensis; Paragoceras* aff. *timorensis*

**Horizon H13 :**
*Subcolumbites* aff. *perrinismithi; Kiparisovites* aff. *ovalis; Metadagnoceras* ? aff. *pulchrum; Paragoceras* aff. *timorensis; Prohungarites mckelvei; Fengshanites americanus; Stacheites floweri*

**Horizon H14 :**
*Prohungarites lenticularis; Prohungarites submckelvei; Pseudosvalbardiceras ? humboldtense; Paragoceras* aff. *timorensis; Prohungarites mckelvei; Fengshanites americanus; Stacheites floweri*

**Horizon H15:**
*Paragoceras* cf. *malayanus; Paragoceras* aff. *timorensis; Prohungarites mckelvei; Fengshanites americanus*

**Horizon H16 :**
*Prohungarites mckelvei; Isculitoides* aff. *originis; Svalbardiceras* cf. *freboldi; Prohungarites beyrichitoides*; *Ceccaisculitoides hammondi*

**Horizon H17 :**
*Prohungarites mckelvei; Eschericeratites lytoceratoides; Ceccaisculitoides hammondi; Ceccaisculitoides elegans; Silberlingeria rubyae; Gaudemerites rectangularis*

**Horizon H18 :**
*Prohungarites mckelvei; Silberlingeria bearlakensis; Eschericeratites lytoceratoides; Ceccaisculitoides hammondi*

**Horizon H19 :**
*Ceccaisculitoides hammondi; Silberlingeria bearlakensis; Silberlingeria coronata; Silberlingeria sarahjanae*

**Horizon H20 :**
*Silberlingeria bearlakensis; Silberlingeria coronata; Subhungarites yatesi;* Gymnotoceratidae ? sp.indet.; *Ceccaisculitoides hammondi*

**Horizon H21 :**
*Neopopanoceras haugi; Keyserlingites pacificus; Pseudacrochordiceras inyoense; Inyoceras bittneri; Subhungarites yatesi; Goricanites noblei*

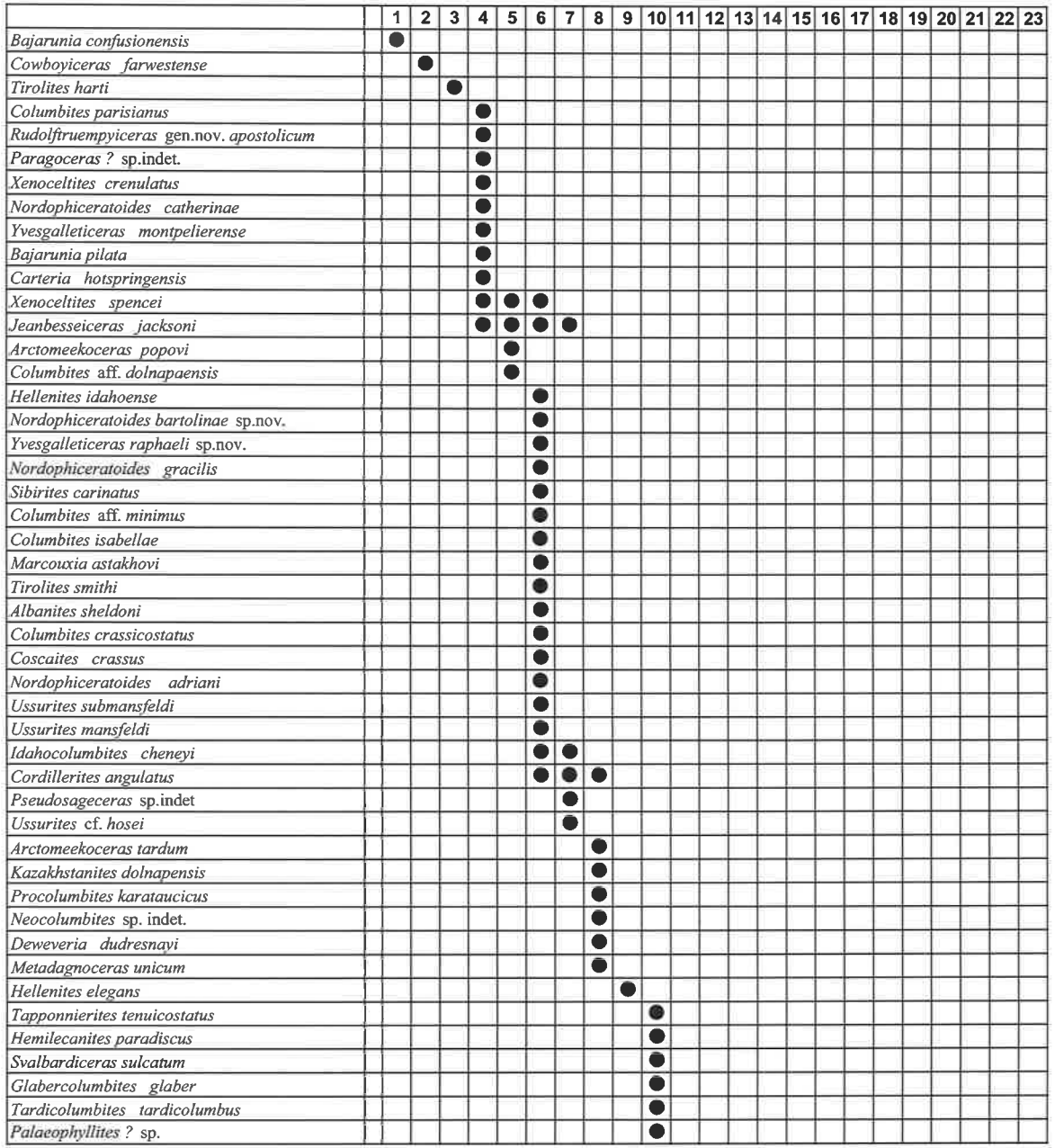
**Horizon H22 :**
*Hemilecanites fastigatus; Pseudosvalbardiceras humboldtense; Deweveria Crenulata* sp.nov.; *Subhungarites yatesi; Neopopanoceras haugi; Prohungrarites lenticularis; Pseudacrochordiceras inyoense; Keyserlingites pacificus*

**Horizon H23 :**
*Keyserlingites pacificus; Keyserlingites subrobustus; Eodanubites (Dumitricaceras) judae; Courtilloticeras stevensi*

A synthetic presentation of the above biochronological data is given in Fig.14 and the corresponding zonation is given below.

| | western USA | | |
|---|---|---|---|
| stage | zones | | biochronologic horizons recognized in this study |
| Anisian | | *Lenotropites caurus* | |
| Spathian | *Haugi* | *Subrobustus* | H 23 |
| | | *Haugi* | H 21-22 |
| | *Subcolumbites* | *Silberlingeria* | H 17-20 |
| | | *Fengshanites / Prohungarites* | H 10-16 |
| | *Columbites* | *Procolumbites* | H 8-9 |
| | | *Columbites* | H 4-7 |
| | | "*Tirolites harti* beds" | H 3 |
| | | "*Bajarunia confusionensis* beds" | H 1-2 |
| Smithian | | *Anawasatchites tardus* | |

Fig. 13 Spathian zonation of north America. The term beds is used in the sense of biohorizon.


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Bajarunia confusionensis
Cowboyiceras farwestense
Tirolites harti
Columbites parisianus
Rudolftruempyiceras gen.nov. apostolicum
Paragoceras ? sp.indet.
Xenoceltites crenulatus
Nordophiceratoides catherinae
Yvesgalleticeras montpelierense
Bajarunia pilata
Carteria hotspringensis
Xenoceltites spencei
Jeanbesseiceras jacksoni
Arctomeekoceras popovi
Columbites aff. dolnapaensis
Hellenites idahoense
Nordophiceratoides bartolinae sp.nov.
Yvesgalleticeras raphaeli sp.nov.
Nordophiceratoides gracilis
Sibirites carinatus
Columbites aff. minimus
Columbites isabellae
Marcouxia astakhovi
Tirolites smithi
Albanites sheldoni
Columbites crassicostatus
Coscaites crassus
Nordophiceratoides adriani
Ussurites submansfeldi
Ussurites mansfeldi
Idahocolumbites cheneyi
Cordillerites angulatus
Pseudosageceras sp.indet
Ussurites cf. hosei
Arctomeekoceras tardum
Kazakhstanites dolnapensis
Procolumbites karataucicus
Neocolumbites sp. indet.
Deweveria dudresnayi
Metadagnoceras unicum
Hellenites elegans
Tapponnierites tenuicostatus
Hemilecanites paradiscus
Svalbardiceras sulcatum
Glabercolumbites glaber
Tardicolumbites tardicolumbus
Palaeophyllites ? sp.

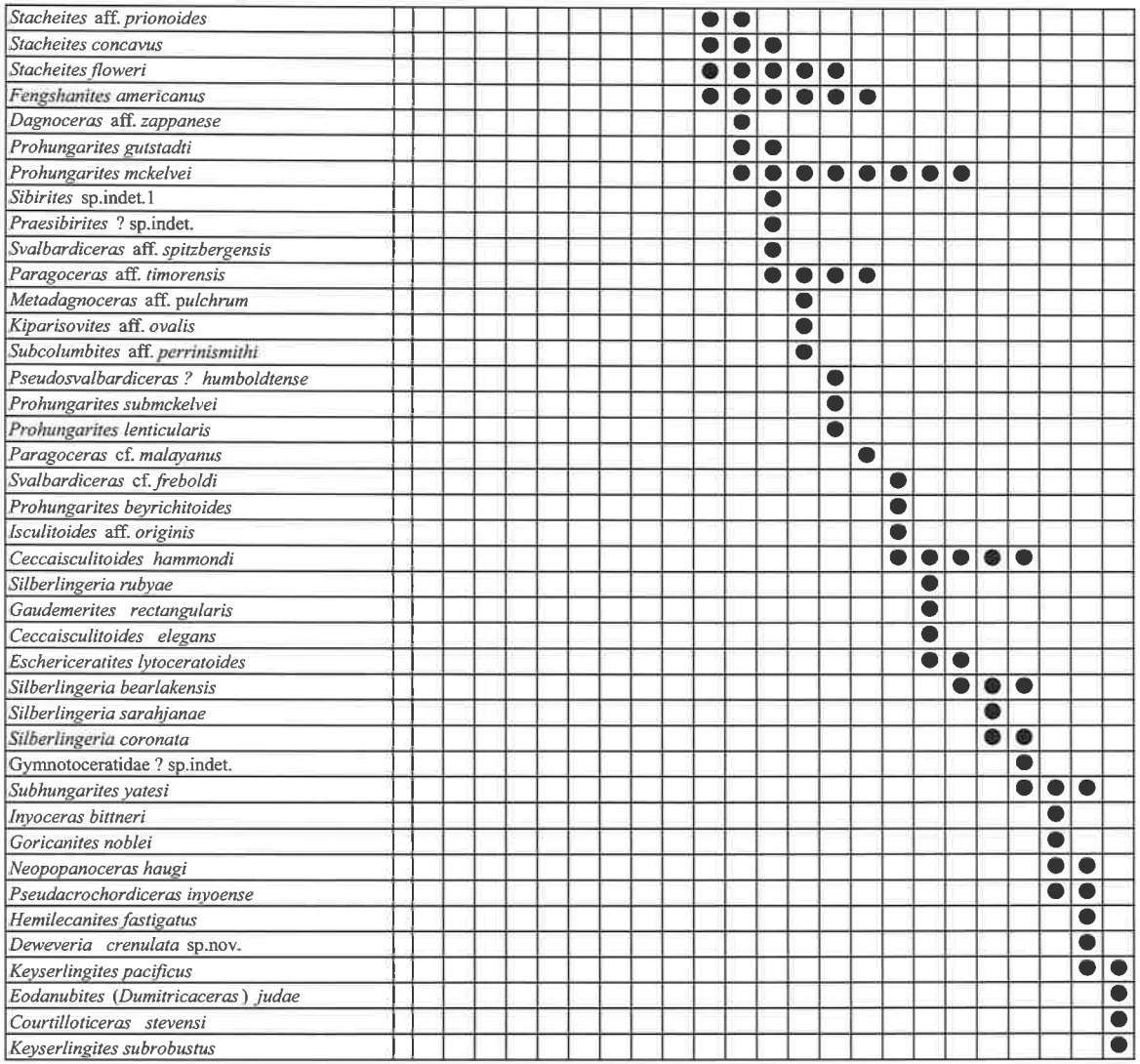



Fig. 14 Stratigraphic distribution of the Spathian ammonites from western USA (Idaho, Nevada, Utah and California)

## Discussion

**1.** Horizons H1 and H2 represent the oldest record of Spathian age in North America. The interval between the uppermost Smithien of North America (Anawasatchites tardus zone) and the Tirolites zone is still poorly documented. The two species discovered in Horizons H1 and H2 add precious biochronological data for this interval.

**2.** The *Tirolites harti* beds can be considered as a distinct biochronologic horizon, dominated by this single species, which doesn't occur in the younger *Columbites* beds.

**3.** The detailed study of the *Columbites* beds at Hot Springs allows a subdivision of this interval into 4 distinct horizons (H4-H7). It is interesting to notice the presence of *Sibirites* associated with *Columbites*. *Sibirites* is also present in the *Fengshanites* beds. This genus has therefore an important stratigraphic range in north America.

**4.** The *Procolumbites* fauna is herein described for the first time in north America. The first specimen of the genus *Metadagnoceras* appear in this horizon.

**5.** The stratigraphic distribution of *Fengshanites* et *Silberlingeria* allows the distinction of two biochronologic units.

**a. *Fengshanites* levels** (H10- H16)
The global faunal content of these levels is comparable to the *Subcolumbites* zone sensu Tozer (1971). The genera *Stacheites, Palaeophyllites, Fengshanites, Subcolumbites, Dagnoceras, Prohungarites, Procarnites* and *Paragoceras (*sensu Tozer 1994) are typical representatives of assemblages that can be found in Albania, Chios island, Iran, Afghanistan, Pakistan (Salt range), Timor, Primorye, China etc...

**b. *Silberlingeria* levels** (H17-H20)
The occurrence of *Subhungarites yatesi* in the upper part of the local *Silberlingeria* zone indicates the proximity of the Haugi zone, which is defined by the association of *Subhungarites yatesi* with *Neopopanoceras haugi*, *Inyoceras bittneri* and *Pseudoacrocordiceras inyoense* as well as *Keyserlingites pacificus*, which is found in level JGX-UWH of the Union Wash section. The occurrence of *Keyserlingites subrobustus* (level JGX-UWK+S) appx. 50m above this Haugi fauna proves that the Haugi and Subrobustus zones are consecutive, as suggested by Silberling & Tozer (1968).

# 3. Systematic descriptions

Class **CEPHALOPODA** Cuvier, 1797

Subclass **AMMONOIDEA** Agassiz, 1847

Order **CERATITIDA** Hyatt 1884

Superfamily **XENODISCACEAE**

Family **HEMILECANITIDAE** fam.nov.

Remark : Representatives of this family apparently form a distinct group having a characteristic shape and suture line.

Genus ***Hemilecantites*** Spath, 1934

Type-species : *Lecanites discus* Arthaber, 1908, p.268.

Diagnosis : Shell compressed. Whorl section ovoid with somewhat narrowly rounded or angular venter. Adult aperture with constriction and ventral rostrum. Suture line goniatitic.

Discussion : Differs from *Deweveria* by its strictly goniatitic suture line and the absence of ornamentation.

***Hemilecanites paradiscus*** Kummel
Pl. XLV, Fig.4; Pl. LX, Fig.1

*Hemilecanites paradiscus* Kummel, 1969, p. 375, Pl.29, Figs.11-12, Pl.31, Figs.15-16 (holotype), Pl. 35, Fig.12.

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| D | H | W | U |
|---|---|---|---|
| 17 | 6 | 2.5 | 5.5 |

Description : Smooth form with strongly compressed whorls (W : 42%H) and relatively evolute coiling (U : 29%D). Whorl section lenticular with maximum thickness located at mid-flank. Ventral area subogival. Flanks weakly convex. Fairly wide, shallow umbilicus with rounded shoulder. Suture line goniatitic with L1 narrower than L2 and poorly individualized umbilical lobe.

***Hemilecanites fastigatus*** Guex et al.
Pl. XLV, Figs.2-3; Pl. LX, Fig.2.

Material : 2 specimens (holotype, Nr. JGX-1011).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2823A.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1011 | 29.5 | 8 | 6.5 | 14.5 |
| JGX-1008 | 22 | 8 | 7.5 | - |

Description : *Hemilecanites* with near serpenticone coiling and subovoid whorl section. Venter slightly fastigate. Ventrolateral shoulders nearly indistinct. The suture is illustrated on Pl. LX, Fig.2.
Discussion : *H.fastigatus* differs from other *Hemilecanites* by its near serpenticone coiling.

Genus ***Deweveria*** Guex et al., 2005

Type species : ***Deweveria dudresnayi*** Guex et al., 2005, p.7.

Diagnosis : Discoidal, evolute shell with low whorl expansion rate. Whorl section varies from elliptical to ogival. Suture line varies from goniatitic to very weakly ceratitic, close to *Hemilecanites*.

Discussion : Differs from *Hemilecanites* by its more or less distinct ventral crenulation.

***Deweveria dudresnayi*** Guex et al.
Pl. XXXII, Fig.7-8 ; Pl. XXXIII, Fig.1 ; PL. LVII, Fig.1

Material : 6 specimens (holotype, Nr. JGX-527).
Locality : Level JGX-BETA-HC, JGX-BETA-HC1, JGX-YHCX, JGX-YHC ; Hammond Creek, Bear Lake Valley, Idaho.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-526 | 43 | 13 | 8 | 20 |
| JGX-527 | 43 | 13 | 9 | 18 |
| JGX-550 | 40.5 | 12 | 7 | 18 |
| JGX-1012 | 30 | 9 | 6 | 13 |
| JGX-1009 | 21.5 | 7 | 5.5 | 9 |

Description : Extremely evolute form with very compressed whorls, clearly higher than wide. Flanks sub-parallel. Venter varies from narrowly rounded to very slightly ogival. Ornamentation consists of somewhat radial, fairly dense, low intensity but distinct, bundled ribs that arise on umbilical shoulder, curve gently backwards and fade on ventral shoulder. They cross the venter in manner that imparts slight appearance of crenulation to the ogival venter. Simple suture line with two lateral lobes, which can be slightly indented and completely smooth saddles.

***Deweveria crenulata*** sp.nov.
Pl. XXXIII, Figs.2-3; Pl. LII, Fig.2

Material : 2 specimens (holotype, Nr. JGX-1012).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2823A.

| | | | | |
|---|---|---|---|---|
| JGX-1012 | 30 | 9 | 6 | 13 |
| JGX-1009 | 21.5 | 7 | 5.5 | 9 |

Description : Very evolute *Deweveria*. Whorl section compressed, subelliptical to convergent towards the outer whorl side. Venter very narrow, but not clearly ogival, ornate with a feeble crenulation generated by fine lunules restricted to the outer whorl side. Flanks are smooth or very weakly striated. The suture line is illustrated on Pl. LII, Fig.2.

Discussion : *D.crenulata* differs from *D.dudresnayi* by its slightly more involute coiling, its less compressed whorl section and by its distinctly crenulated venter. The suture line is also slightly different.

Superfamily **MEEKOCERATACEAE** Waagen, 1895

Family **ALBANITIDAE** Tozer, 1994

Genus ***Albanites*** Arthaber, 1909

Type species :*Pronorites triadicus* Arthaber, 1908, p.264.

Diagnosis : Very compressed platycone with moderately evolute coiling. Venter subtabulate to tabulate, more or less broad and marked by rounded but distinct shoulders. Flanks either smooth or with simple ribs that become stronger near ventral shoulder and cross venter with at least as much prominence as on flanks. Ceratitic suture line with six lobes. (E, L, U3, U2, U1, I). Relatively low external saddle compared with the lateral saddle.

***Albanites sheldoni*** (Kummel)
Pl. I, Figs.1-4; Pl. LII, Fig.3

*Svalbardiceras sheldoni* Kummel, 1969, p.453, Pl. 43, Fig.1 (holotype).
*Neomeekoceras scalariforme* Tozer, 1994, p.71, Pl. 37, Figs.22-26 (Fig.20= holotype).

Material : 10 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6 and JGX-BETA-HS3.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-198c | 43 | 18 | 8 | 13 |
| JGX HS6-AA | 47 | 20 | 8.5 | 13.5 |
| JHS-211c-143 | 70 | 27.5 | 12 | 24.5 |
| JGX-142 | 65 | 27 | 11 | 18.5 |
| JHS-102c-144 | 39 | 17 | 7.5 | 12 |

Description : Very compressed, moderately evolute platycone with an umbilicus of average size (U/D : apprx. 0.26-0.35). Flanks weakly convex, slightly convergent towards the outer whorl side from mid-flank. Venter weakly subtabulate to tabulate, narrow, with more or less strongly crenulated ornamentation, typical of Albanitidae. Test smooth and ornate with slightly tended, feebly-defined striae. Some specimens show extremely thin rib-like folds on umbilical third of flanks. These

Undulations are directed forwards on umbilical portion of the flanks and tend to increase in intensity on the outer whorl side.
Discussion : "Tozer (1994) assigns the species *scalariforme* to the family Meekoceratidae and refutes its attachment to the genus *Albanites* because of the presence of phylloid saddles in the suture line of the latter. However, this characteristic is not typical and the morphological affinities of the present taxon with *Albanites* and more particularly its ventral ornamentation, justify our assignment to this genus.

Genus ***Gaudemerites*** Guex et al., 2005

Type species : ***Gaudemerites rectangularis*** Guex et al., 2005, p.10.

Diagnosis : Very involute robust shell with an almost occluded umbilicus. Whorls subrectangular, high and relatively wide. Well-defined rounded ventrolateral shoulders transition to a weakly convex venter.

Discussion : This group resembles Albanitidae by its suture line, but it is characterized by a total absence of ornamentation, its parallel flanks and its practically occluded umbilicus. It could be ancestral to the Cladiscitids.

***Gaudemerites rectangularis*** Guex et al.
Pl. I, Fig.5; Pl. LX, Fig.6

Material : 1 specimen (holotype, Nr. JGX-1010)
Locality : northern Humboldt Range, Nevada. Lev. JGX-2360B.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1010 | 34 | 17 | 12 | 1.5 |

Description : Robust shell with smooth flanks, an almost occluded umbilicus and high subrectangular whorls. Sightly arched venter is well-delimited by rounded ventrolateral shoulders. The suture is illustrated on Pl. LX, Fig.6.

Discussion : Differs from common *Albanitidae* by the characters mentioned above.

Superfamily **SAGECERATACEAE** Hyatt, 1884

Family **HEDENSTROEMIIDAE** Waagen, 1895

Genus ***Pseudosageceras*** Diener, 1895a

Type species : ***Pseudosageceras*** sp.indet., Diener, 1895, p.28.

Diagnosis : Venter narrowly sulcate and bicarinate. Occluded umbilicus. Surface smooth or with weak radial ribs. Suture line with two to five adventive lobes, L is characteristically trifid.

***Pseudosageceras*** sp.indet
Pl. II, Fig.3

Material : 1 specimen.
Locality : Cowboy Pass, Confusion Range, Utah. Lev. JGX-CR4.

Description : Large sized fragment of typical *Pseudosageceras*, undeterminable at specific level. Whorl height measures 75 mm.

Genus ***Cordillerites*** Hyatt & Smith, 1905

Type species :***Cordillerites angulatus*** Hyatt & Smith, 1905, p.110.

Diagnosis : Similar to *Pseudosageceras*, but having a wider venter and only one adventive lobe, like *Clypites* Waagen.

***Cordillerites angulatus*** Hyatt & Smith
Pl. II, Figs. 1-2; Pl. LII, Fig.4

*Cordillerites angulatus* Hyatt & Smith, 1905, p.110, Pl.2, Figs.1-8; Pl.68, Figs.1-10; Pl.71, Figs.1-6; Pl.85, Figs.14-20.
*Cordillerites angulatus*, -Smith, 1932, p.96, Pl.2, Figs.1-8; Pl.42, Figs.14-20; Pl.60, Figs.14; Pl.68, Figs.1-10; Pl.71, Figs.1-6.

Material : min.6 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6, JGX-BETA-HS3 and JGX-BETA-HC1.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-139 | 26 | 15 | 5 | 1.5 |
| JGX-140 | 32 | 18 | appx.6 | 2 |
| JGX-549 | 39 | 22 | appx.7 | 2.5 |

Description : Shell extremely compressed with occluded umbilicus. Venter very narrow, tabulate or concave and bicarinate with extremely angular ventrolateral shoulders. Shell appears smooth, but is ornate with laterally, slightly flexuous growth lines, whose trajectory is more or less radial and slightly forward projected on the outer whorl side.

Superfamily **DINARITACEAE** Mojsisocics, 1882

Family **DINARITIDAE** Mojsisovics, 1882

Genus ***Cowboyiceras*** Guex et al., 2005

Type species : ***Cowboyiceras farwestense*** Guex et al., 2005, p.13.

Diagnosis : Involute form with feebly developed ornamentation. Flanks almost flat, venter rounded

and narrow.

Discussion : This group relates to the family Dinaritidae by its suture line and general shape.

***Cowboyiceras farwestense*** Guex et al.
Pl. II, Figs.4-6; Pl. LII, Fig.5

Material : 5 specimens (holotype, Nr. JGX-566).
Locality : Cowboy Pass, Confusion Range, Utah. Lev. JGX-D5.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-565 | 73 | 38 | 17 | 9 |
| JGX-566 | 80 | 41 | 21 | 16.5 |
| JGX-596 | 69 | 36 | 19 | 11 |

Description : Compressed, involute form with feebly developed ornamentation. Flanks almost flat with rounded and relatively narrow venter. Narrow umbilicus with steep wall and narrowly rounded, well-defined shoulder. Ornamentation mainly consists of growth lines, which are prorsiradiate on umbilical half of flanks and slightly flexuous on external portion. Some specimens exhibit vague rib-like undulations which follow the trajectory of the growth lines.

Genus ***Dagnoceras*** Arthaber, 1911

Type species : *Dagnoceras nopcsanum* Arthaber, 1911, p.241, Pl.11, Figs.6-7.

Diagnosis: Shell moderately involute (U : ± 25%D). Whorl section clearly ovoid with flanks converging to an arched venter. Surface smooth or with indistinct folds. (Spath 1934, p.268).

***Dagnoceras ?*** sp.indet.
Pl. III Fig.1; Pl. LII, Fig.6

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC11.

| D | H | W | U |
|---|---|---|---|
| min.32 | min.13 | min. 7 | 11 |

Description : Shell moderately involute. Although not completely preserved, the whorl section exhibits convex flanks merging with rounded dorsal shoulder. Umbilicus broad and quite deep with a rounded shoulder. Poor preservation doesn't permit description of ornamentation.

***Dagnoceras*** aff. ***zappanese*** Arthaber
Pl. III, Fig.2

*Dagnoceras zappanese* Arthaber, 1911, p.241, Pl. 21(5), Figs.8-9.

Material : 1 poorly preserved specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC24.

| D | H | W | U |
|---|---|---|---|
| 23 | 11.5 | (?) 11 | ± 5.5 |

Description : Moderately involute (U : 24%D) shell with elliptical to ovoid whorl section reaching maximum thickness near umbilical shoulder. Venter arched and flanks convex, without ventral shoulders. Umbilical shoulder rounded with shallow subvertical wall. The ammonite is smooth with the exception of blunt, radially elongated nodes, which start on the umbilical shoulder and quickly weaken on the internal part of the flanks. They are regularly spaced and consist four per half-whorl. The suture is unknown.

Discussion: The specimens of *Dagnoceras zappanese* illustrated by Arthaber (1911, Pl. 21, Fig. 8,9), possess a similar morphology and ornamentation although not as well defined. The venter is narrower with more widely rounded ventral shoulders.

Genus ***Stacheites*** Kittl, 1903

Type species : *Stacheites prionoides* Kittl, 1903, p.27

Diagnosis : Shell discoidal. Venter tabulate or with a slight furrow. Surface smooth or with ribs on the internal part of the flanks.

***Stacheites concavus*** Shevyrev
Pl. III, Fig.6; Pl. LII, Fig.7

*Stacheites concavus* Shevyrev, 1968, p.170, Pl.13, Fig.2.

Material : 5 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30 and JGX-HC20.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-421 | 35 | 19 | ± 9 | 3.5 |
| JGX-HC30-D1 | 25 | min.10 | 6 | - |
| D2 | 34 | 18 | 9 | ± 5 |
| D12a | 40 | 20 | 10 | 4 |
| D12b | ± 23 | min.11 | - | ± 2.5 |
| JGX-HC20-45 | 38 | - | - | - |

Description : Compressed, smooth and strongly involute (U : max.15%D) shell. Flanks convex and converging to very angular ventral shoulder. Maximum thickness is more or less located at one third of whorl height. Venter tabulate to slightly concave, adorned with two wrinkles, which mimic bicarination. Very narrow umbilicus with abruptly rounded shoulder and vertical wall. Suture is preserved (poorly) on only one specimen (JGX-421) and it shows the main features peculiar to *Stacheites*, namely a prominent first lateral lobe followed by a second lobe, which is clearly less profound and badly individualized. The ventral lobe notched by its saddle shows a depth intermediate to the two lateral lobes. The elements don't show distinct indentations, probably due to lack of preservation.

Discussion: The shape of the venter as well as the relative characteristics of the suture permit assignment to *Stacheites concavus* Shevyrev. It differs from *S.floweri* by the absence of rounded ventral shoulders and a by its smooth surface. *S.undatus* has strong ornamentation on the internal part of the flanks, which distinguishes it from other *Stacheites*.

***Stacheites floweri*** Kummel
Pl. III, Figs.3-5; Pl. LIII, Fig.1

*Stacheites floweri* Kummel, 1969, p.456, Pl.28, Figs.1-10 (Figs.3-4 =holotype).

Material : 12 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30, JGX-HC20.

| | D | H | W | U |
|---|---|---|---|---|
| JGX HC30-D4 | 41 | 20 | ± 10 | 5 |
| D7a | ± 37 | 19 | 10 | 5 |
| D7b | 24.5 | - | 6 | - |
| D8 | min.38 | min.19 | 9.5 | 4 |
| JGX-423 | 46 | 25 | ± 10 | ± 6 |
| JGX HC30-D10 | ± 25 | 14 | 6.5 | ± 3 |
| JGX-424 | ± 30 | 15 | - | 4 |
| JGX HC30-D13 | min.60 | - | ± 15 | - |
| JGX HC20-46 | ± 47 | - | 13 | - |
| JGX-422 | 40 | 22.5 | 10.5 | 4 |

Description : Morphologically, *Stacheites floweri* is so remarkably similar to *S.concavus* that their juvenile stages cannot be distinguished based on just their shape. The main difference is that *S.floweri* acquires during ontogenesis rounded ventral shoulders adjacent to the tabulate venter (this character can be observed from a diameter of 25 mm on) and sinuous to falciform growth lines, while *S.concavus* is smooth. The very thin and closely spaced striae of *S.floweri* seem to cross the ventral shoulder, after which they almost totally fade. These can form relatively distant rib-like undulations of greater wavelength. The suture, which is visible on two specimens, is finely denticulate and very similar to that of *S.concavus*; it only differs by a higher first lateral saddle. However, the illustration of Kummel (1969, p.455, Fig.29B) shows a clearly narrower first lateral lobe and a second, less well individualized lobe.

***Stacheites*** aff. ***prionoides*** Kittl
Pl. III, Fig.7

*Stacheites prionoides* Kittl, 1903, p.27, Pl.4, Fig.8 (= holotype).

Material : 2 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30 and JGX-HC24.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-420 | - | 16.5 | 9.5 | - |
| JGX HC24-15a | - | min.27 | 12.5 | ± 4(estimated) |

Description : Involute discoidal shell with slightly convex flanks, which converge on a tabulate, slightly sulcate venter. Ventral shoulder, somewhat blunt in appearance, is less angular than in *S.floweri* and *S.concavus*. Narrow, shallow umbilicus with vertical wall. Specimen JGX-420 has very thin sinuous striae, similar to those of *S.floweri*. The suture is unknown.

Discussion: *S.prionoides* Kittl, although defined from an incomplete specimen, possesses a similar venter (Kummel 1969, p.455-56), but has a smooth surface. This last characteristic may be due to poor preservation. The special feature of the venter makes this species easy to distinguish, especially as it doesn't have rounded ventral shoulders as does *S.floweri*.

***Stacheites carinae*** sp.nov.
Pl. L, Fig.8

Derivatio nominis : In honour of Carine Hungerbühler.
Material : 1 specimen (holotype, Nr. JGX-1688b-688).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-1688B, appx. 50m below USGS M1688 locality of N.J. Silberling.

Description : Involute, compressed shell. Flanks are parallel till mid-height after which they abruptly converge towards the outer flank, forming a tabulate and concave venter bordered by distinct shoulders. Ornamentation consists of distinct, regularly spaced ribs, strongly marked only on the outer flanks, whereas the inner flanks are almost smooth, except for fine prorsiradiate growth lines joining the ribs. These strongly fade on the ventral shoulder, and cross the venter without curvature, giving it a slightly crenulated aspect reminiscent of *Albanites*. *Stacheites*-type suture line.

Discussion : Differs from other *Stacheites* by its slightly crenulated venter and its distinct ribs marked only on the outer whorl side. Differs from *Albanites* by its concave venter and more simple suture line.

Family **Tirolitidae** Mojsisovics

Genus ***Tirolites*** Mojsisovics, 1879

Type species :*Ceratites idrianus* Hauer, 1865, p.610.

Diagnosis : Whorl section more or less quadratic. Body chamber measures almost one half a whorl in length. More or less marked tubercles or prominent spines present on the ventrolateral margin. Dinaritaceae-type suture line.

***Tirolites smithi*** Kummel
Pl. IV, Figs.1-2; Pl. LIII, Fig.2

*Tirolites illyricus* Mojsisovics, Smith, 1932, p.84, Pl. 49, Figs.12-16 (Figs.12-13 =Lectotype).
*Tirolites smithi* Kummel, 1969, p.501, Pl. 54, Figs.1-5 (Figs.2-3 = Lectotype)

Material : 2 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE and JGX-HS6.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-209c-135 | 65 | 25 | 19 | 23 |
| JHS-136 | 19 | 7.5 | 6 | 7 |

Description : Evolute *Tirolites* with subrectangular whorl section and a relatively deep umbilicus. Flanks almost flat, venter subtabulate. Steep umbilical wall and rounded shoulder. Juvenile ornamentation consists of finely marked undulating striae or very thin ribs. Adult ornamentation is practically absent and mainly comprised of growth lines with exception of parabolic nodes on ventrolateral shoulder, which are associated with megastriae.

***Tirolites*** aff. ***smithi*** Kummel
Pl. IV, Figs.6-7; PL. LIII, Fig.3

Material : 3 specimens.
Locality : Cowboy Pass, Confusion range, Utah. Lev. JGX-CR6, JGX-CR6' and JGX-CR9.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-562 | - | 18.5 | 16 | - |
| JGX-563 | - | 18.5 | 16 | - |
| JGX-564 | - | 15 | 13 | - |

Description : Relatively evolute *Tirolites* with subrectangular whorl section. Ventrolateral shoulder slightly rounded. Umbilicus shallow slightly rounded shoulder. Shell ornated with very blunt, quite dense ribs and quite distant ventrolateral parabolic nodes.

***Tirolites*** sp.indet.
Pl. IV, Fig.5

Material : 1 specimen.
Locality : Cowboy Pass, Confusion range, Utah. Lev. JGX-CR15.

Description : Fragment of *Tirolites* undeterminable at specific level, exhibiting well-defined ventrolateral tubercles, a relatively evolute coiling and subparallel flanks. The specimen is crushed and doesn't allow a more detailed description. Its interest is purely stratigraphic.

***Tirolites carniolicus*** ? Mojsisovics
Pl. IV, Fig.3-4

*Tirolites carniolicus* Mojsisovics, 1882, p.65, Pl.1, Figs.2-3.

Material : 2 specimens.
Locality : Cowboy Pass, Confusion Range, Utah. Lev. JGX-CR17.

Description : Fragment of *Tirolites* with particularly high whorls and relatively important involution rate. Flanks parallel. Maximum whorl width located at upper third of flank. Venter rounded with indistinct ventral shoulders. Umbilicus relatively deep with rounded shoulder and slightly overhanging wall. Ornamentation consists only of ventrolateral tubercles. The suture is unknown.

***Tirolites harti*** Smith
Pl. L, Figs.1-3

Material : 3 specimens.
Locality : *Tirolites* beds, Paris Canyon, Bear Lake Valley, Idaho.

Description taken from Smith, 1932. Lower Triassic ammonoids of North America. U.S. Geological Survey, Professional Paper 167, p.83.

Shell rather large, evolute, widely umbilicate. Whorls with flanks sloping outwardly upward from the umbilicus, so that the widest part is at the ventral shoulders. Venter nearly flat but very gently arched. Surface with about 10 coarse spines to a revolution, situated on the ventral shoulder.
The height of the last whorl is somewhat greater than one fourth of the diameter of the shell; the width is a little more than the height; the width of the umbilicus is somewhat less than half the diameter of the shell.

Family **COLUMBITIDAE** Spath, 1934

***Rudolftruempyiceras*** gen.nov. Guex & Bylund

Type species : *Dieneroceras demokidovi* Popov, 1961, p.36

Derivatio nominis : Dedicated to Prof. Rudolf Trümpy, the greatest geologist of the 20th century.
Diagnosis : Serpenticone shell with a subquadratic whorl section.. Shell smooth except for spiral lines and relatively wide, low intensity prorsiradiate ribs that cross venter with convexity.

Discussion : This new name stands to remplace the old genus *Boreoceras* Dagys & Ermakova (1988) which has been already used for a Nautiloid by Miller & Youngquist (1947).

***Rudolftruempyiceras apostolicum*** (Smith)
Pl. V, Figs.1-6; Pl. LIII, Fig.4

Material : min. 9 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSAB, JGX-HS4, JGX-HS5, JGX-BETA-HS1 and JGX-BETA-HS2. Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCAB

*Celtites apostolicus* Smith, 1932, p.104, Pl.48, Figs.1-10.
*Celtites ursensis* Smith, 1932, p.104, Pl. 47, Figs.11-23.
*Celtites planovolvis* Smith, 1932, p.104, Pl. 48, Figs.11-20.
*Dieneroceras apostolicus*, - Kummel, 1969, p.369, Pl.53, Figs.1-12.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-29c-48 | 38.5 | 9 | 9 | 22 |
| JHS-44c-49 | 43 | 11 | 8 | 24 |
| JHS-27c-47 | 33 | 9 | 7 | 17.5 |
| JGX-51 | 25 | 6.5 | 6.5 | 14 |
| JGX-51 | 31 | 7 | 7.5 | 17 |
| JGX-HS4-42 | 16.5 | 4 | 5.5 | 9.5 |

| | | | | |
|---|---|---|---|---|
| JGX-52 | 31 | 8.5 | 7 | 17 |
| JGX-53 | 24 | 5.5 | 5.5 | 13 |

Description: Serpenticone shell with parallel to slightly convex flanks and cadicone whorl section on young specimen, becoming quadratic to rectangular when mature. Venter slightly arched to subtabulate. Umbilical shoulder rounded. Umbilicus shallow in the early whorls. Ornamentation consists of relatively wide, low intensity prorsiradiate ribs, which arise on umbilical shoulder, become projected on ventral margin and cross venter with distinctive convexity. These are sometimes accompanied by broad, feebly pronounced constrictions. On internal whorls, these are associated with adjacent bulges, which are absent on some specimens. In addition to the more or less fine strigation on the venter, we note the presence of feather structures on flanks of certain individuals, which can be described as an irregular succession of disorganized bundles of lines that converge towards the aperture. These structures are composed of discontinuous lines, coarser than the fine strigation on the venter.
The suture is illustrated on Pl. LIII, Fig.4. The first lateral lobe tends to have a flat basis and rather coarse indentations. The umbilical lobe has a more rounded aspect.

Discussion : *Rudolftruempyiceras* gen.nov. is herein questionably assigned to the family Columbitidae.

Genus ***Columbites*** Hyatt & Smith, 1905

Type species : *Columbites parisianus* Hyatt & Smith, 1905, p.51.

Diagnosis : Internal whorls with a coronate section. Ribbing possessing a ventrolateral tuberculation. The external whorls are more or less smooth and rounded.

***Columbites parisianus*** Hyatt & Smith
Pl. VI, Figs.1-7; Pl. VII, Figs.1-4; Pl. LIII, Fig.5

*Columbites parisianus* Hyatt & Smith, 1905, p.51, Pl.1, Figs.9-14, Pl.61, Figs.1-21, Pl.72, Figs.1-24.
*Columbites spencei* Smith, 1932, p.108, Pl.77, Figs.1-21, Pl.78, Figs.1-16.
*Columbites consanquineus* Smith, 1932, p.106, Pl.46, Figs.1-13.
*Columbites ligatus* Smith, 1932, p.106, Pl.47, Figs.1-8
*Columbites ornatus* Smith, 1932, p.107, Pl.46, Figs.14-21.

Material : min.40 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-HS4, JGX-HS 5, JHSA, JHSB and JGX-BETA-HS1.

Description : Shell with serpenticone coiling, more or less strongly ribbed and with coronate internal whorls, becoming quadratic to ovoid when mature. The tendency for tuberculation on ventral shoulder is more or less strong according to the whorl section.
The oldest *Columbites* we studied, coming from lower levels of the Parisianus zone, exhibit an extremely significant variability that serves as an excellent example of Buckman's law of covariation as reformulated by Guex 1999 and Guex et al. 2003.
The extreme morphotypes of the morphological spectrum of the *parisianus* group exhibit on one hand relatively compressed spineless forms with rounded to ovoid whorl sections and moderately

strong ribs, and on the other hand, forms with sharp ribs and a cadicone to quadratic whorl section with strong ventrolateral spination. Between these extreme forms there are all sorts of intermediaries, the most typical of them having internal whorls that are cadicone to quadratic to cadicone with ventrolateral tuberculation and rounded to ovoid external whorls. On the most involute specimens, the umbilical shoulder is rounded.

The numerous, more or less robust ribs are radial (sometimes slightly arched forwards on the outer whorl section) to slightly prorsiriadiate. They are more or less strongly attenuated on the ventral shoulder, where they are bifurcated or trifurcated and projected forwards, forming a sinus. The weakening of the ribs, which is very clear on the cadicone sections, is almost nonexistent on the most compressed whorls. Occasional constrictions, more or less deep and parallel to the ribs, are present as well as a moderately closely spaced fine strigation, which is often visible on the ventral area. The suture of this species (s.l.) is illustrated on Pl. LIII, Fig.5.

### ***Columbites*** aff. ***dolnapaensis*** Kiparisova
Pl. VII, Fig.5; Pl. LIII, Fig.6

*Columbites dolnapaensis*, -Shevyrev, 1968, Pl.13, Fig.7.

Material : 1 specimen.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSC

| D | H | W | U |
|---|---|---|---|
| 29 | 8 | appx.6 | 14 |

Description : Near serpenticone shell (H/D : 0.27) with compressed whorls. Flanks parallel to slightly convex. Whorl section subelliptical to subrectangular. Venter weakly arched to subtabulate. Ventral shoulder rounded, pronounced on the body chamber. Very shallow umbilicus with rounded shoulder. Ornamentation consists of broad ribs with a rounded section (approx 9 per half whorl) arising on umbilical shoulder and projecting slightly forward before fading and disappearing on ventral shoulder. On the body chamber these ribs are much less pronounced and become nothing more than feeble undulations. The suture is illustrated on Pl. LIII, Fig.6. A relatively deep first lobe is notable.

Discussion: The specimen illustrated by Shevyrev (1968, Pl.13, Fig.7) seems to have a slightly less compressed section.

### ***Columbites crassicostatus*** Guex et al.
Pl. VII, Fig.6-8; Pl. LIII, Fig.7

Material : 4 specimens (holotype, Nr. JHS-268c-66).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE and JGX-HS6.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-268c-66 | 33 | 8 | 10.5 | 19 |
| JHS-1680c-67 | 28 | 7 | 9 | 15 |
| JGX-69 | 20 | 5 | 6 | 10 |
| JHS-207c-65 | 25 | 7 | 7 | 13.5 |

Description : Sepenticone shell with a depressed whorl section. Flanks convex and slightly divergent. Whorl section subtrapezoidal. Venter broad, feebly arched to subtabulate. Ventral shoulders pronounced. Umbilical shoulder gradually rounded. Ornamentation consists of prominent ribs with a triangular section that tend to be sharp (about 11 per half whorl). Strength of the ribs is maximum high on ventral shoulder, where they are slightly arched forward before rapidly fading on venter. On internal flank, ribs progressively weaken and disappear on umbilical shoulder. A few deep, occasional constrictions form a moderately strong chevron on venter. Rib immediately following such constriction tends to have its maximum prominence at one half height and it weakens faster than its neighbours when approaching periphery. We note the presence of coarse, rather distant strigate lines on the venter.

The suture is illustrated on Pl. LIII, Fig.7. The lateral lobe tends to be triangular.

Discussion: Differs from other *Columbites* by its very robust ribbing.

***Columbites*** aff. ***minimus*** Smith
Pl. VIII, Figs.1-11; Pl. IX, Figs.1-3; Pl. LIV, Fig.1

*Columbites minimus* Smith, 1932, p.106, Pl.47, Figs.9-10.

Material : min.15 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6 and JGX-BETA-HS3.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-256c-72 | 34 | 10 | 9.5 | 16 |
| JHS-205c-73 | 26 | 8 | 8 | 13 |
| JGX-75 | 17 | 5 | 7 | 8 |
| JGX-78 | 15 | 4 | 4.5 | 8 |
| JGX-77 | 13 | 4 | 4 | 6.5 |
| JGX-HS6-49 | 18.5 | 5.5 | 5 | 8.5 |
| JGX-HS6-67 | 15 | 4.5 | 5 | 7 |
| JGX-HS6-68 | 13 | 4 | 4 | 6.5 |
| JGX-HS6-37 | 18.5 | 5 | 55 | 9 |

Description : Evolute shell with subquadratic whorls, having tendency to become elliptical when mature. Flanks slightly convex. Maximum thickness of whorl always located on the internal part of flanks. Venter weakly arched, ventrolateral shoulder more or less strongly pronounced. Umbilical shoulder abruptly rounded. Umbilical wall inclined to vertical and shallow. Ornamentation consists of more or less sharp ribs with triangular section, radial to prorsiradiate and having their maximum prominence on internal flank or umbilical shoulder (approx 10-12 per half whorl). They greatly decrease in strength or totally disappear when approaching periphery. On the body chamber, ribs are arched backwards slightly on most internal part of flanks and they form pseudo-nodes overhanging the umbilical shoulder. Occasional constrictions, frequent on the body chamber, are more or less abruptly projected forwards on ventral margin and expand on venter where they form a sinus. Moreover, we note the presence of moderately closely spaced strigate lines visible on venter. Growth lines observable on the test are parallel to ribs and constrictions.
The suture, illustrated on Pl. LIV, Fig.1, is very close to that of *Columbites parisianus*.

Discussion: The variability of the species includes forms having slightly more compressed whorls

with nearly parallel flanks and feebly pronounced ornamentation, where only the constrictions are clearly noticeable.

***Columbites isabellae*** Guex et al.
Pl. IX, Figs.4-6; Pl. X, Figs.1-4; Pl. LIII, Fig.8

Material : min. 20 specimens (holotype, Nr. JHS-1679c-83).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6, JGX-BETA-HS3 and JGX-BETA-HS3'.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-169c-85 | 23 | 6.5 | 8 | 11 |
| JHS-1677c-86 | 23.5 | 7 | 8 | 10.5 |
| JHS-1679c-83 | 23.5 | 6.5 | 7.5 | 11 |
| JHS-1678c-84 | 28 | 8 | 10 | 13 |
| JGX HS6-69 | 17 | 5 | 5.5 | 8 |
| JGX HS6-70 | 15.5 | 5 | 5 | 7 |
| JGX HS6-33 | 19 | 5.5 | 6 | 9 |
| JGX HS6-26 | 15 | 5 | 5 | 7.5 |

Description : Small evolute, shell (H/D : 0.29). Flanks subparallel. Section subquadratic. Venter feebly arched. Umbilical and ventral margin broadly rounded. Ornamentation is made up of thin, closely spaced ribs (about 18 per half whorl) and frequent constrictions. The ribs are radial and arched backward slightly on flanks. They cross venter without interruption and form a feebly accentuated sinus. On mature whorls the ribs preceding a constriction tend to be more strongly projected forward and to bifurcate on ventral margin, where the apertural portion of the bifid rib acquires more accentuated relief, maximum on ventral margin, whereas the rear portion is strongly attenuated. Venter adorned with thin strigate lines. *Procolumbites karataucikus* Shevyrev (1968) has a similar ribbing, which suggests a connection between the two species.
The suture is illustrated on Pl. LIII, Fig.8. We note that the lateral lobe is rounded and doesn't have any indentation. This may, however, be explained by the small size of the specimens.

Discussion: *C.isabellae* differs from finely ribbed species described by Smith (1932) by the absence of tuberculation (even on the internal whorls), by the tendency of the ribs to be bifid and by the reduced size of the specimens.

Genus ***Idahocolumbites*** Guex et al., 2005

Type species : *Pseudoceltites cheneyi* Kummel 1969, p.438.

Diagnosis : Columbitidae with a clearly quadratic to subrectangular whorl section at adult stage. Shell exhibits radial and regularly spaced ribs, becoming slightly wider as they simultaneously fade on the ventrolateral margin without crossing the venter. Tendency for tuberculation associated with ribs is weak or nonexistent.

Discussion : This group differs from *Columbites* by the adult whorl section, which tends to become higher than wide and by the subangular ventrolateral margin. Ribs are absent on the venter.

***Idahocolumbites cheneyi*** (Kummel)
Pl.X, Figs.5-7; Pl. XI, Figs.1-6; Pl.XII, Figs.1-2

*Pseudoceltites cheneyi* Kummel, 1969, p.438, Pl.44, Figs.1-10 (Figs.8-9= holotype).
*Pseudoceltites nevadi* Kummel, 1969, p.440, Pl.34, Figs.1-5 (Figs.1=holotype)

Material : min.20 specimen.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6, JGX-BETA-HS3 and JGX-BETA-HS3'.
Cowboy Pass, Confusion Range, Utah. Lev. JGX-CR2, JGX-CR2', JGX-CR4, JGX-CR4', JGX-CR6 and JGX-CR6'

| | D | H | W | U |
|---|---|---|---|---|
| JGX-90 | 15 | 5 | 5 | 7.5 |
| JGX-91 | 25 | 8 | 7 | 11 |
| JGX-92 | min.29.5 | 9.5 | - | 13.5 |
| JGX-94 | 18 | 6.5 | 6.5 | 7 |
| JGX-96 | 14 | 5 | 5 | 5 |
| JGX-97 | 19 | 7 | 6.5 | 6.5 |
| JGX-98 | 24 | 8 | 7 | 8.5 |
| JGX-575 | 32 | 10 | min.7 | 14.5 |
| JGX-576 | 35 | 8.5 | 10 | 19 |
| JGX-577 | 19 | 6 | 5.5 | 8 |

Description : Shell serpenticone with parallel flanks and quadratic to rectangular adult whorl section. Venter tabulate to slightly arched. Ventral margin subangular, becoming more rounded when mature. Umbilical shoulder broadly rounded. Ornamentation consists of slightly prorsiradiate ribs. When approaching ventral shoulder, they become more pronounced before being more or less abruptly projected forwards. They then widen or bifurcate before losing most of their intensity on venter. On young whorls, these seem to completely disappear on venter. Occasional constrictions parallel to the ribs form a sinus on the venter.
We note some variability in the density and strength of the ribs during the ontogenesis. We observe specimens having thin, dense ribbing on internal whorls that later becomes more robust. Thus, the number of ribs varies from 10 to 20 per half whorl. However, when the outer shell is preserved, the ribs are badly individualized and appear more like bundles of growth lines. We also note the presence of very thin strigate lines on the venter.
The suture line is typical of Columbitidae.

Discussion : Certain specimens with a relatively fine ribbing resemble *Columbites isabellae*. They essentially differ by their more compressed and angular whorl section. Moreover, *Columbites isabellae* is generally of smaller size and its ribs continuously cross the venter.

Genus ***Yvesgalleticeras*** Guex et al., 2005

Type species: *Prefloriantites montpelierensis* Kummel, 1969, p.382.

Diagnosis : Columbitidae of small to medium size, serpenticone with very compressed whorls. The juvenile whorl section is subquadratic and becomes subelliptical at maturity. The venter is arched, and the suture line is typical of Columbitidae.

Discussion : Essentially differs from *Columbites* by its much more compressed whorls, its lack of tuberculation and its ribs, which cross the ventral shoulder and venter without projection.

***Yvesgalleticeras montpelierense*** (Kummel)
Pl.XII, Fig.3-7 ; Pl. LIV, Fig.2

*Preflorianites montpelierensis* Kummel, 1969, p.382, Pl.43, Figs.2-3, Pl. 44, Figs.11-13 (Fig.13 = holotype).

Material : 5 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSA, JGX-HS4, JGX-BETA-HS1.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-200c-59 | 44.5 | 12 | 9 | 21.5 |
| JHS-134c-58 | 48 | 13.5 | 9.5 | 24 |
| JHS-1690c-57 | 48 | 13 | 9.5 | 25 |
| JGX-61 | 29 | 8 | 7 | 14 |
| JGX-62 | 26 | 9 | min.4 | 12 |

Description : Serpenticone shell with strongly compressed whorls. Flanks weakly convex. Whorl section subquadratic for young whorls and becoming elliptical when mature. Venter arched, ventral shoulders indistinct. Umbilical shoulder rounded and shallow. Ornamentation consists of radial to slightly concave ribs (about 16 per half whorl) that maintain constant strength on flanks and become very weakly projected on ventral shoulder before losing most of their intensity or disappearing on venter. These are well-defined on the internal whorls and become weaker during ontogenesis. On full-grown body chamber, we observe on some specimens constrictions lined by a rib-like fold, which is mostly marked on outer flank and on the umbilical shoulders.
The suture is illustrated on Pl. LIV, Fig.2. The occurrence of an additional element on the umbilical part may be explained by the whorl-geometry, leaving only restricted space for the internal suture.

***Yvesgalleticeras raphaeli*** sp.nov.
Pl. XIII, Fig.1; Pl. LIV, Fig.8

Derivatio nominis : Dedicated to Raphael Guex.
Material : 1 specimen (holotype, Nr. JGX-26).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-HS6.

Description : Small evolute shell. Whorl section narrow and oval. Ornamentation includes strong prorsiradiate ribs, straight to slightly flexuous, bifurcating on upper quarter of flanks. Secondary ribs overlap venter and form a weak forward inflexion. The disposition of the lateral and external elements of the suture line is similar to that of *Y. montpelierense*. The lobes, however, have coarse indentations in the present species.

Discussion : Differs mainly from *Y. montpelierense* by its stronger, more distant ribs that fade on the outer flank Slightly more involute.

Genus ***Marcouxia*** Guex et al., 2005

Type species : *Tirolites astakhovi* Kummel, 1969, p.502.

Diagnosis : General shape and suture line similar to *Columbites*. Ornamantion different, having a much more pronounced ventrolateral tuberculation.

Discussion : The absence of constrictions and the tendency to form sharp marginal spines much stronger than those of *Columbites* permits us to distinguish this genus.

***Marcouxia astakhovi*** (Kummel)
Pl. XIII, Figs.2-3; Pl. LIV, Fig.3

Material : 2 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-167c-71 | 66 | 15 | 17 | 39 |
| JHS-210c-70 | 48 | 12 | 13.5 | 26 |

Description : Shell serpenticone with a quadratic to trapezoidal whorl section. Venter weakly arched and ventral margin abruptly rounded. On the last whorl of the specimen JHS-167c-71 the venter has a particular geometry in that it is arched and elevated in the median part. The umbilical shoulder is rounded. Ornamentation consists of more or less sharp radial ribs with a high triangular section (about 13 per half whorl). They arise low on the umbilical shoulder, immediately arch slightly forward and then gradually increase in prominence toward the ventral margin, where they form pronounced, slightly elongated spines. On the phragmocone, the ribs tend to terminate with the spines, whereas on the body chamber they are abruptly projected forwards onto the edge of the venter, where they rapidly fade, giving the venter an irregularly wavy appearance. The venter also bears several weak strigate lines.

The suture line of this species is illustrated on Pl. XXX, Fig.3. We note the presence of a prominent ventral lobe followed by a narrow lateral lobe with two coarse indentations. These characteristics as well as some additional indentations in the umbilical lobe allow us to distinguish the suture line of this species from that of the more common *Columbites*.

Genus ***Procolumbites*** Astachova, 1960

Type species : *Procolumbites karataucicus* Astachova, 1960, p.141.

Diagnosis : Similar to *Columbites,* but generally having stronger ribs and an absence of tuberculation. Still, some variants have a feebly developed ribbing. This group often displays many constrictions. The ribs may be very strong and they often develop a tendency to be laterally bifurcated.

***Procolumbites karataucicus*** Astachova

Pl. XIII, Figs.4-5; Pl. XIV, Figs.1-6; Pl. XV, Figs.1-8; Pl. XVI, Figs.1-2; Pl. LIV, Fig. 4

*Procolumbites karataucicus*, - Shevyrev, 1968, Pl.14, Figs.4-5.

Material : min. 50 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-BETA-HC, JGX-BETA-HC1, JGX-YHC, JGX-YHCX, JGX-BETA-HC3.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-529 | 41 | 12 | 12 | 19 |
| JGX-530 | 42 | 12 | 13 | 19.5 |
| JGX-531 | 32 | 9 | 10 | 15 |
| JGX-532 | 37 | 11.5 | 10 | 16 |
| JGX-534 | 47.5 | 17 | 16.5 | 19 |
| JGX-535 | 38 | 11 | 10 | 17 |
| JGX-536 | 32 | 11 | 11.5 | 14.5 |
| JGX-537 | 34 | 11 | 10 | 15 |
| JGX-538 | 39 | 11.5 | 10 | 19 |
| JGX-539 | 33 | 10.5 | 10.5 | 16 |
| JGX-540 | 32 | 10 | 10 | 14 |
| JGX-541 | 34 | 10 | 10 | 16 |
| JGX-542 | 27.5 | 9 | 9 | 12 |
| JGX-514 | 34 | 10.5 | 10 | 15.5 |
| JGX-515 | 32 | 9.5 | 10 | 15 |
| JGX-516 | 35 | 12 | 11.5 | 14.5 |
| JGX-517 | 33 | 10 | 10 | 16 |
| JGX-545 | 28 | 10 | 8 | 10 |
| JGX-543 | 17 | 6 | 6 | 7 |

Description : Evolute Columbitidae with more or less compressed whorls and strong ribbing. Some particularly evolute specimens display a higher than wide whorl section and ornamentation, which tends to weaken on the body chamber. Most specimens have a relatively rounded juvenile whorl section, tending to become quadratic to subrectangular at adult stage. Ornamentation generally consists of very strong ribs, more or less closely spaced, rectiradiate to slightly arched backwards, and intercalated with a variable number of constrictions. The ribs commonly cross the venter, while remaining well marked, showing only a slight decrease in intensity. Umbilical shoulder varies from rounded to more abruptly rounded. The suture is illustrated on Pl. LIV, Fig. 4.

Discussion: Specimen JGX-535 exhibits a slightly acute venter with a draft of medioventral crenulation. Shevyrev (1968) defines this form as a distinct species. ((*Pro*) *columbites ventroangustus* Pl.14, Fig.3). We consider it herein as a variant of *P.karataucicus*.

Genus ***Neocolumbites*** Zakharov, 1968

Type species : *Neocolumbites grammi* Zakharov, 1968, p.111.

Diagnosis : Smooth, evolute shell with strong growth lines and a *Columbites*-type sutural line.

Discussion : More involute than *Columbites*.

***Neocolumbites*** sp. indet.
Pl.XVI, Fig. 3

Material : 1 fragmentary specimen.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-BETA-HC1.

| D | H | W | U |
|---|---|---|---|
| min 31 | min. 10 | 9 | 13.5 |

Description : Smooth evolute form, ornated with very clearly marked growth lines, laterally rectiradiate and very slightly curved forwards on the venter. Whorl section displays quite flattened flanks and a perfectly rounded venter.

Discussion : This form is close to *Neocolumbites insignis* or *N.grammi* (Zakharov, 1968, Pl.21, Fig.6).

Genus ***Glabercolumbites*** Guex et al., 2005

Type species : *Glabercolumbites glaber* Guex et al., 2005, p.7.

Diagnosis : Smooth serpenticone sporadically showing strong prorsiradiate constrictions and a subquadratic whorl section. Flanks slightly convex and venter rounded.

Discussion : Differs from *Rudolftruempyiceras* gen.nov. by the presence of strong constrictions and more distinct growth lines.

***Glabercolumbites glaber*** Guex et al.
Pl. XVI, Fig.4

Material : 1 specimen (holotype, Nr. JGX-403).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| D | H | W | U |
|---|---|---|---|
| 32 | 8.5 | ± 9 | ± 17 |

Description : Smooth serpenticone sporadically showing strong prorsiradiate constrictions and a subquadratic whorl section. Flanks slightly convex with indistinct ventrolateral shoulders and rounded venter. Umbilical wall vertical and shoulder rounded. Although the internal whorls aren't preserved, the lack of indentations on the umbilical wall apparently indicates that this species doesn't have ventrolateral tuberculation, at least on the volution preceding the last whorl. Ornamentation consists of growth lines strongly projected forwards on ventral shoulder and venter intercalated by prorsiradiate constrictions following the same trajectory and forming very pronounced convex furrows on venter.

Discussion : Resembles *Rudolftruempyiceras* gen.nov., but differs by the presence of strong

constrictions.

***Tardicolumbites*** Guex et al. 2005

Type species : *Tardicolumbites tardicolumbus* Guex et al., 2005, p.8.

Diagnosis : Columbitidae without tuberculation, possessing a particularly thin ribbing. Suture line as for *Columbites*.

Discussion: The genus can easily be distinguished from other Columbitidae by the absence of tuberculation. Differs from *Fengshanites* by the absence of strigation and by its simpler suture line.

***Tardicolumbites tardicolumbus*** Guex et al.
Pl. XVI, Fig.5, Pl. LIV, Fig.5

Material : 1 specimen (holotype, Nr. JGX-402)
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| D | H | W | U |
|---|---|---|---|
| 24 | 8.5 | 10 | 10 |

Description : Very evolute shell with subrectangular juvenile whorl section becoming subcircular and broad at adult stage. Venter broad and weakly arched. Flanks convex. Maximum thickness of whorl is located at one half its height. Umbilical wall deep, shoulder convex, and indistinct from flanks. Umbilicus fairly deep. Ornamentation consists of numerous thin, dense, evenly spaced ribs (about 40 per whorl), which cross venter with equal intensity and moderately distinctive convexity. They are concave and obliquely cross the ventral margin without increase of curvature. The suture has a deep and relatively narrow ventral lobe which is fitted with two points, coming from the incision by a quite broad but shallow ventral saddle. The first lateral lobe has two or three indentations, whereas the second consists of only one.

Remark : The holotype, although having a nonreticulated surface, has an ornamentation that reminds one of *Subcolumbites* and *Fengshanites*. Its suture, however, is less complex.

Family **HELLENITIDAE** Kummel, 1952, p.852

Genus ***Hellenites*** Renz et Renz, 1948

Type species : *Tropiceltites praematurus* Arthaber 1911, p. 268.

Diagnosis : Shell with variable rate of coiling and rursiradiate ribs on the flanks, projected forwards on the ventral area. Exhibits a distinct ventral keel. Some forms show parabolic ventrolateral nodes.

Remark : The genera *Pallasites* and *Pseudoharpoceras* are herein regarded as synonyms of *Hellenites*.

***Hellenites idahoense*** (Smith)
Pl.XVI, Fig.8

*Pseudoharpoceras Idahoense* Smith, 1932, p.81, Pl.49, Figs.17-18 (= holotype).
*Hellenites idahoense*, - Kummel, 1969, p.516, Pl.53, Figs.13-14.

Material : 1 specimen
Locality : Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCDE equivalent.

| | D | H | W | U |
|---|---|---|---|---|
| JJ-182c-137 | 38.5 | 13 | 13 | 17 |

Description : Shell evolute with slightly broader than high whorls; and venter strongly carinate. Ribbing very strong, slightly rursiradiate laterally and projected forwards on the ventrolateral margin, where they develop minor tubercles. Some ribs are bifurcated high on ventral shoulder.

***Hellenites elegans*** Guex et al.
Pl. XVI, Fig.6-7; Pl. LIV, Fig.6

Material : 2 specimens (holotype, Nr. JGX-503).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-ALPHA-HC.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-503 | 24 | 10 | 8 | 7.5 |
| JGX-503bis | 12.5 | 5 | 5.5 | 4 |

Description : Relatively involute *Hellenites* with weak ornamentation, represented by some more or less laterally radiate striae, projected forwards on ventrolateral margin. Last whorl displays 6 or 7 lateral constrictions. Whorl section high, relatively compressed and slightly ovoid. Venter strongly carinate and smooth. Umbilical margin quite abruptly rounded, flanks slightly convex. The suture line is illustrated on Pl. VII, Fig. 8.

Discussion : Differs from other *Hellenites* by its very slender ornamentation and its constrictions.

Family **PARAGOCERATIDAE** fam.nov.

Genus ***Fengshanites*** Chao, 1950

Type species :***Fengshanites robustus*** Chao, 1950, p.4.

Diagnosis : Similar to *Subcolumbites*, but without ventral keel. Umbilical shoulder rounded or angular. Certain species possess a weak ribbing, inflated on the internal flanks.

***Fengshanites americanus*** (Kummel)
Pl. XVII, Figs.1-5

*Fenshanites robustus* Chao, 1959, p.305, Pl.8, Figs.1-2, Pl.29, Figs.21-22.
*Subcolumbites amercicanus* Kummel, 1969, p.436, Pl.30, Figs.1-14.( Figs.1-2= holotype).

Material : 14 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30, JGX-HC20, JGX-HC18a, JGX-HC18 and JGX-HC11.

Description : Material is too fragmentary for the measurement of significant biometric parameters. Shell involute. Venter broadly arched, flanks convex. Ventral shoulders absent. Maximum whorl thickness located adjacent to umbilical shoulder, which is rounded and followed by plane, deep subvertical wall. Strigate ornamentation is associated with transverse growth lines of variable intensity. These are expressed in the form of very fine ribs or striae (around 30 per half whorl) projected forwards on the umbilical wall, then subradiate to slightly prorsiradiate on the lateral area. They cross venter in a convex manner with very little curvature. At an advanced stage of maturity, these ribs become more distant and take the form of staircase-like folds, irregular on the ventral areas of the largest specimens, where they resemble bundles of striae. The ribs sometimes form rather imperceptible nodes above the umbilical margin. The suture line is unknown.

Discussion : In his description of *Fengshanites robustus*, Chao quotes: "faint transverse ribs on the internal whorls and irregular low folds on the outermost one. Both these folds and ribs run obliquely forward and form broad curves on the venter pointing anteriorly. The folds commence from the umbilical edge and form irregular nodes on it." (1959, p.305, PL. 8, Figs.1-2, Pl.29, Figs. 21-22). This species has a morphology so similar to *F. americanus,* that it is practically indistinguable without the suture line. The latter essentially differs only by an additional subdivision in the suspensive lobe. Chao's illustrations also point to a slightly less deep but still comparable umbilical wall. In conclusion, *F. robustus* and *F. americanus* are considered in the present work as two varieties of the same species.

## Genus ***Subcolumbites*** Spath, 1930

Type species :*Columbites perrinismithi* Arthaber, 1908, p.277.

Diagnosis : Shell evolute (U : 30-45 % D). Whorl section compressed and ovoid. Venter arched on the internal whorls, developing a blunt keel on the body chamber. The surface has a reticulate sculpture.

### ***Subcolumbites*** aff. ***perrinismithi*** (Arthaber)
Pl. XVII, Figs.6-8

*Columbites perrini smithi* Arthaber, 1911, p.262, Pl.23 (7), Figs.19-20.

Material : 4 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC18 and JGX-HC16c.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-442 | ± 24 | ± 6 | | 10 |
| JGX-HC18-19 | Min. 18 | Min.6 | - | ± 8 |
| JGX-20 | ± 17.5 | Min.4 | - | ± 11 |
| JGX-444 | ± 15 | 4 | - | ± 10 |

Description : Shell relatively evolute. Flanks convex. Umbilical shoulder broadly rounded with

an inclined wall. Venter not preserved. Maximum whorl thickness located at one-half height of flank on juvenile stage, migrating to edge of umbilical margin when mature. There is a significant increase in height on the last whorl. Ornamentation consists of thin, dense concave ribs (up to 20 per ¼ whorl) of constant intensity. They are slightly curved forwards on the umbilical border. The inversion of curvature occurs on the umbilical margin (or slightly above) and from then on, the ribs have a tilted aspect on the external flanks, although a very feeble curvature persists. The species also possesses thin, weak strigation creating an easily recognizable reticulate sculpture. The suture, partially preserved on a juvenile stage (specimen JGX-444), shows a siphonal lobe with several indentations.

Discussion: *S.perrinismithi* has a keel, but the venters of the specimens described herein are not preserved; thus, its presence cannot be confirmed. The specimens are therefore doubtfully assigned to this species. *(?)S.dusmani* (Arthaber) is slightly more involute and has nodes above the umbilical border (Kummel 1969, Pl.2, Fig. 3), which associated with the absence of a keel, connects it rather to the genus *Fengshanites*.

Genus ***Paragoceras*** Arthaber, 1911

Type species : *Paragoceras dukagini* Arthaber 1911, p. 265.

Diagnosis : Shell with a more or less trigonal whorl section on the outer portion of the whorl. Surface ornamented with growth lines or ribs generally well-defined on the external mold in the form of varixes.

Discussion : *Prenkites* Arthaber differs from this genus by its smooth surface. *Arnautoceltites* is considered herein as a synonym of *Paragoceras*.

***Paragoceras*** aff. ***timorensis*** Spath
Pl. XVIII, Figs.1-3

Material : 4 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC20, JGX-HC18 and JGX-HC11.

Description : The material is too fragmentary for the measurement of biometric parameters indicative of the mature stage. Nevertheless, the whorl section seems to be slightly compressed. The venter and the flanks are broadly arched, giving the section a somewhat globular aspect. Ventral shoulders absent. Specimen JGX-457bis has a more flatter lateral area. However, this could be the result of crushing. Ornamentation consists of robust broad ribs with a rounded section, progressively projected forward throughout the lateral area and crossing the venter with broad convexity, where they sometimes take the appearance of broad folds resembling a grout of honey. This resemblance is accentuated when the elements are of unequal intensity. As umbilical border is approached, the sculpture is slightly curved forwards (specimen JGX-457bis). The suture is unknown.

***Paragoceras*** sp.indet 1
Pl. XVIII, Fig.4

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC18.

| D | H | W | U |
|---|---|---|---|
| ± 16 | 7.5 | - | 1.5 |

Description : This specimen, of which only one side is preserved, has slightly convex flanks, converging on the outer portion of the whorl. The venter is not preserved. The adult aperture is preceded by a deep and wide constriction, gently projected forwards. The umbilicus is small and the umbilical margin is rounded. The suture is unknown.

Remark : The narrow umbilicus as well as the regular curvature of the constrictions brings this species close to « *Paranannites* » *aspensis* et *P.compressus* (Renz and Renz 1948, Pl.1, Figs.15-16) (=*Paragoceras*, cf.Kummel 1969 p.397-98). A more precise identification is not possible because a complete whorl section is not preserved and the suture is unknown.

***Paragoceras*** sp.indet.2
Pl. XVIII, Fig.6

Material : 1 specimen
Locality : Hammond Creek, Bear Lake Valley, Idaho.Lev. JGX-HC11.

Description : The specimen is preserved as an imprint. There is a striation and two varices preceding a preperistomal constriction.

***Paragoceras*** cf. ***malayanus*** (Renz et Renz)
Pl. XVIII, Fig.5

*Columbites malayanus* Renz et Renz, 1948, p.24, Pl.9, Figs. 4-6, 8-10. (Fig.6= holotype).

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC11.

Description : Shell globular and involute. Whorl section circular. Venter arched and broad. Flanks slightly convex. Umbilical shoulder abruptly rounded. The specimen's morphology is similar to *P.* aff. *timorensis*. However, it differs by its wider venter and appreciably different ornamentation. The ribs, similar in appearance, are subradiate on the flanks, and then very slightly projected forward on the venter where they form a sinus of extremely feeble curvature. They tend to be grouped two by two with a small depression in the middle of each pair, simulating a constriction. The suture is unknown.

Discussion: *Paragoceras malayanus* is considered by Kummel as conspecific to *P.timorensis* (1969, p.441-44). Indeed, the sutures are very close but the broader venter and the particularity of the ornamentation justify a specific distinction.

***Paragoceras*** **?** sp.indet
Pl. L, Fig. 4

Material : 1 specimen.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-BETA-HS1.

Description : Paragoceratidae of small size with circular whorl section displaying irregular folds and constrictions. The presence of this individual proves evolutionary development of Paragoceratids as early as in the *Columbites parisianus* fauna; it is probably an offshoot of this genus.

## Genus ***Isculitoides*** Spath, 1930

Type species : *Isculites originis* Arthaber, 1911, p.259.

Diagnosis : Sphaerocone with an excentric umbilicus. Venter arched, surface smooth. The body chamber measures more than one whorl in length. Suture line with L characteristically indented on both the base and sides; suspensive lobe with deep indentations, but without well-individualized auxiliary lobe.

### ***Isculitoides*** aff. ***originis*** Arthaber
Pl. XXXII, Fig.4

*Isculites originis* Arthaber, 1911, p.259, Pl.23 (7), Figs.1-10.

Material : 1 specimen
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC9.

| D | H | W | U |
|---|---|---|---|
| 19 | 7.5 | 8.5 | 3 |

Description : The specimen's morphology is similar to the most compressed varieties of *Ceccaisculitoides hammondi,* but differs by its non-excentric and wider umbilicus and by an unusual ornamentation, which consists of weak ripples that are prorsiradiate, slightly concave, quite concentrated and visible on the last whorl, forming a sinus on the venter. These create folds near the aperture, simulating shallow constrictions. Suture line unknown.

Discussion: *Isculitoides originis* (Arthaber) has a slightly wider and excentric umbilicus (U : min.20%D; Arthaber, 1911, p.259), but has growth lines of similar shape with thin regularly spaced constrictions (Arthaber 1911, Pl.23, Figs. 3a and b).
Chao (1959, p.285-286) includes in his description of (?) *Paranannites involutus* (from a *Subcolumbites* fauna) an ornamentation comparable to this specimen and consisting of "faint transverse striations projecting obliquely forward on the lateral flanks and continuous across the venter...some of these striations become weak bundles on the body chamber to form *Ptychites*-like folds." Moreover, (?) *P.involutus* has a very similar morphology considering the size of its umbilicus and the lack of a contracted body chamber. However, the section is slightly less compressed. (Chao, 1959, Pl.24, Figs. 13-15, 18, 20, 25).
In the absence of suture line, further comparison is not possible.

## Genus ***Ceccaisculitoides*** Guex et al., 2005

Type species : *Ceccaisculitoides elegans* Guex et al., 2005, p.11.

Diagnosis : Paragoceratidae characterized by a completely closed umbilicus and by the development, at the end of growth, of strong rib-like undulations arched backwards on the flanks and projected

forwards on venter, forming a prominent rostrum on the adult aperture.

Discussion : Differs from *Isculitoides* SPATH and *Nevadisculites* BUCHER by its closed umbilicus.

***Ceccaisculitoides elegans*** Guex et al.
Pl.XXXII, Fig.5; Pl. LX, Fig.7

Material : 2 specimens (holotype, Nr. JGX-1004).
Locality : northern Humboldt Range, Californie. Lev. JGX-2360B.

| D | H | W | U |
|---|---|---|---|
| 23 | 12.5 | 12 | - |

Description : Shell ovoid with a closed umbilicus. Ornamentation consists of regular striae, arched backwards on the flanks and projected forwards on the outer flank. They overlap the venter, forming a regular arch. The adult body chamber shows two or three rib-like folds having the same trajectory as the striae. The last fold immediately precedes the aperture, which shows a strong ventral projection in the form of a rostrum.

Discussion : Differs from *Isculitoides* by the characters of the genus.

***Ceccaisculitoides hammondi*** (Kummel)
Pl. XXXII, Figs.1-3

*Isculitoides hammondi* Kummel, 1969, p.419.

Material : 13 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC9, JGX-HC1, JGX-HM18a and b.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-462 | - | 6 | 13 | 1 | - |
| JGX HC1-13 | 17 | max. 9.5 | 10 | 1.5 | 9 |
| JGX-472 | 24 | max.12.5 | 16.5 | 2 | ± 8.5 |
| JGX HM18a-2 | 22 | 12 | 12.5 | 1 | 4.5 |
| 3 | 20 | 11.5 | 9 | 1 | 5 |
| 4 | 15.5 | ± 8.5 | 9 | - | - |
| 5 | 20 | ± 12 | 9 | - | - |
| 6 | 21 | ± 9 | 9 | - | - |
| 7 | 17.5 | - | 6 | - | - |
| JGX-471 | 18 | max.9 | 9 | 1.5 | ± 8.5 |
| 11b | 22 | max.10 | ± 10 | - | - |
| JGX HC>T, 1 | 16 | max.8 | 10 | 1.5 | ± 9.5 |
| 2 | 16.5 | max.9 | 11.5 | 1.5 | 9 |

Description : Shell globular, more or less compressed. Whorl section subelliptical to rounded in the most expanded forms. Venter arched. A weak ventral shoulder is visible on the compressed forms. Flanks convex, more or less inflated. Maximum thickness is always located near the umbilicus, which is very small, almost closed. On mature specimens, the body chamber is more or less contracted.

The surface is smooth except for folds lined with a depression, forming a ripple from one umbilical border to another, more or less radial on the most internal part of the flanks, then slightly bent forward on the venter, where it forms a feebly curved sinus. This ornamentation is only occasionally visible. The suture, only partially known, corresponds to the illustration of Kummel (1969, p.413, Fig.18Q).

Discussion: The present species is herein assigned to *Ceccaisculitoides* based on the nearly closed umbilicus and ornamentation. It should also be noted that Kummel (1969, p.419) in his description, states that the species is smooth. We show this to be inaccurate (see the description above).
*Ceccaisculitoides wasserbergi* (Kummel 1969, pl.29, figs.1-10) has a suture line that is very close and a similar but strictly radial ornamentation. This characteristic as well as a more expanded section serves to distinguish the latter from *Ceccaisculitoides hammondi*.
*Isculitoides originis* differs from the described species mainly by its suture and its wider umbilicus.

Family **KHVALINITIDAE** Shevyrev, 1968

Genus ***Metadagnoceras*** Tozer, 1965a

Type species :*Metadagnoceras pulchrum* Tozer, 1965, p.29.

Diagnosis : Relatively involute form with subtabulate to tabulate venter . Surface smooth to feebly ribbed, sometimes with a strigation. External saddle with deep and non-phylloid indentations. The lateral saddle is not indented.

***Metadagnoceras unicum*** Kiparisova
Pl. XIX, Figs.1-3; Pl. LIV, Fig.7

*Dagnoceras* ( ?) *unicum* Kiparisova, 1961, p.74, Pl. 13, Fig.6 (=holotype).
*Metadagnoceras* ( ?) *unicum*, - Zakharov, 1968, p.81, Pl. 13, Figs.2-5.

Material : 6 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-BETA-HC, JGX-BETA-HC1, JGX-BETA-HC2 and JGX-YHC.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-551 | 121 | 60 | appx.40 | 19 |
| JGX-552 | 37 | 16.5 | 13 | 8 |

Description : Typical *Metadagnoceras*. The largest specimen displays a deep umbilicus with a very slightly rounded, abrupt shoulder and an almost vertical wall. Umbilical shoulders well-marked. Flanks nearly parallel to slightly convex, converging on the outer whorl side and determining a rounded to subtabulate venter. The whorl section is subtrapezoidal, compressed outwards and wide in the umbilical region. The adult shell of specimen JGX-551 is apparently smooth. Specimen JGX-552, which is probably a juvenile from the same species, has flexuous, closely spaced growth lines that are projected forwards on the outer whorl side . The suture is illustrated on Pl. LIV, Fig.7.

Discussion : The geometry as well as the ornamentation of the shell is similar to that of the holotype. The illustrations of Kiparisova, 1961, p.74 display a suture line having an auxiliary lobe slightly

better individualized than on our specimens.
The present species mainly differs from *M. pulchrum* Tozer by its less inflated whorl section, having clearly convergent flanks and by the shape of the growth lines.

***Metadagnoceras*** **?** aff. ***pulchrum*** Tozer
Pl. XVIII, Fig.7

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC18.

| D | H | W | U |
|---|---|---|---|
| 37.5 | ± 16.5 | - | ± 9 |

Description : Shell relatively involute (U : ± 25%). Although badly crushed the specimen suggests the presence of strong, maybe angular ventral shoulders and a broadly rounded umbilical shoulder. The flanks are ornate with extremely fine, closely spaced and distinctly sinuous growth lines, which are of constant intensity on the visible preserved portion of flank. They are associated with very dense, thin, strigate lines creating a very finely reticulate surface. The suture is unknown.

Remark : The specimen of *Metadagnoceras pulchrum* illustrated by Tozer (1994, Pl.38, Fig.7a and b) has a comparable degree of involution as well as a surface ornamentation having the same characteristics.

***Metadagnoceras*** **?** sp.indet. 1
Pl. L, Fig.5

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC18a.

Description : The specimen is crushed, but the preserved side, displays flexuous growth lines, which form regularly spaced bundles of similar intensity. Although the entire whorl section cannot be observed, the geometry as well as the ornamentation is compatible with that of *Metadagnoceras*.

***Metadagnoceras*** sp.indet. 2
Pl. L, Fig.6

Material : 1 specimen (Nr. JGX-801).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2360B.

Description : Fragment of a small sized *Metadagnoceras* showing an elliptical whorl section. Flanks convex. Venter rounded to subtabulate, slightly arched. Ventral shoulders indistinct or feebly pronounced. The maximum thickness of the whorl is located at mid-flank. Ornamentation consists of closely spaced growth lines of equal strength on the entire whorl, creating weak, irregular folds. The growth lines are slightly prorsiradiate on the internal part of the flanks. At mid-height they are gently directed backwards and become flexuous before being strongly directed backwards on the venter, where they form a weak sinus.
Discussion : The unusual ornamentation of the specimen could be pathological.

***Metadagnoceras*** sp.indet. 3
Pl. L, Fig.7

Material : 1 specimen (Nr. JJ-1371c-809)
Locality : USGS Loc. 2834, northern Humboldt Range, Nevada. Lev. *Neopopanoceras haugi* Zone.

Description : Geometry typical of *Metadagnoceras* with convex flanks converging on the outer flank, forming a subtabulate, slightly arched venter bordered by distinct shoulders. Ornamentation consists of low, distant, regularly spaced sinuous and very fine longitudinal striae.

Discussion : Differs from other *Metadagnoceras* by the presence of sinuous undulations.

SuperFamily **MEGAPHYLLITACEAE** Mojsisovics, 1896

Family **PROCARNITIDAE** Chao, 1959

Genus ***Neopopanoceras*** Spath, 1951

Type species :*Popanoceras haugi* Hyatt & Smith, 1905, p.71.

Diagnosis : Shell globular, moderately involute with a rounded venter. Suture line comprising approximately 6 saddles on the flanks.

Discussion : Resembles *Procarnites*, but has a more globular shell and a less complex suture line.

***Neopopanoceras haugi*** (Hyatt & Smith)
Pl. XIX, Figs.4-5; Pl. LV, Fig.1

Material: 2 specimens.
Locality: Union Wash, Inyo Range, California. Lev. JGX-UWH.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1020 | 19 | 8.5 | 10 | 4.5 |
| JGX-1023 | 23 | 10 | 12 | 6.5 |

Description: Shell moderately involute (U : 23%D). whorl section rounded, depressed. Venter arched, broad. Flanks convex. Umbilical shoulder rounded. The suture is illustrated on Pl. LV, Fig.1.

SuperFamily **CERATITACEAE** Mojsisovics, 1879

Family **SIBIRITIDAE** Mojsisovics, 1896

Genus ***Sibirites*** Mojsisovics, 1886

Type species : *Sibirites pretiosus* Mojsisovics, 1886, p.61.

Diagnosis : Shell characteristically adorned with simple radial ribs somewhat swollen on the flanks, bifurcating on the external flanks and crossing the venter with a projection and a slight interruption at the midline.

***Sibirites carinatus*** Guex et al.
Pl. XX, Fig.1

Material : 1 specimen (holotype, Nr. JHS-290c-138).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-290c-138 | 20 | 6.5 | appx.6 | 9 |

Description : Evolute, small sized *Sibirites*, with a very low rate of whorl expansion. Our specimen has very sharp lateral ribbing, more or less radiate and sometimes showing a light forward inflection at one half of whorl height. The ribs almost develop a spination on the ventrolateral shoulder. They tend to bifurcate on the ventral area and then overlap the outer whorl forming a ventral chevron, which forms a type of crenulated keel. The suture is unknown.

Discussion : *Sibirites carinatus* differs from *Sibirites eichwaldi* Mojsisovics by its crenulated keel.

***Sibirites*** sp.indet.1
Pl. XX, Fig.2

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC20.

| D | H | W | U |
|---|---|---|---|
| 37 | Min.11 | - | 16.5 |

Description : The specimen, of which only one side is visible, is evolute and has almost flat flanks. The periphery is not preserved. Umbilical shoulder rounded. The surface has radial, thin and dense ribbing, often bifurcated on the last whorl. On the internal whorls, the ribs are strong, simple and spaced. The suture is unknown.

***Sibirites*** sp.indet. 2
Pl. XX, Fig.3

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC20.

| D | H | W | U | R2 |
|---|---|---|---|---|
| - | 17 | 7 | ± 13 | ± 1/5 |

Description : Shell discoidal, moderately involute. The internal whorl section is trapezoidal with a more or less tabulate venter with respect to its ventral ornamentation, but rather rounded in the intercostal spaces. The periphery of the last whorl is not completely preserved. Flanks flat. The surface has radial ribs of irregular strength (around 7 per ¼ whorl). They are more or less prominent and cross the ventral margin with high relief. One of them joins a periventral spine, whose elongated

basis diagonally crosses the ventral margin. The suture is unknown.

Discussion : Our *Sibirites* is typical and it differs from the species *S.eichwaldi* and *S.pretiosus* by its less wide umbilicus. The shell is more evolute than *Parasibirites subpretiosus* (Dagys & Ermakova, 1988, Pl.32, Figs.4-5), which moreover, doesn't possess such prominent spines.

Genus ***Praesibirites*** Dagys & Ermakova, 1988

Type species : *Praesibirites egorovi* Dagys et Ermakova, 1988, p.82.

Diagnosis : Shell very evolute, strongly ribbed with laterally convex whorls and a tabulate, smooth venter. On some specimens, the ribs tend to bifurcate on the outer portion of the whorl.

***Praesibirites*** ? sp.indet.
Pl. XX, Fig. 4

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC20.

| D | H | W | U |
|---|---|---|---|
| ± 34 | Min.7 | - | 18 |

Description : Shell very evolute (U : max. 53%D). The periphery is not preserved. Flanks convex. Umbilical shoulder widely rounded with a subvertical wall. The sculpture consists of broad, distant subradiate ribs (around 11 per half whorl), which are of remarkably constant intensity and spacing at the beginning of the last whorl, and then become subject to strong irregularities as evidenced by the presence of much weaker ribs
(up to 3) sporadically interspersed between the more prominent ones. The ribs have a symmetrical, dune-shaped section. They are still weakly present on the umbilical wall. Slightly above the umbilical margin, they form a significant prominence that continues on the flanks and then, gradually decreases on the outer portion of the whorl. Some ribs fade more abruptly.

Discussion: The properties of the ornamentation, particularly the cross-section of the ribs, their position and variation in intensity, are remarkably similar among the species *P.tuberculatus* and *P.egorovi* (Dagys and Ermakova 1988, Pl.28, Figs.2-6 et Pl.29, Figs. 1-4 respectively).

Family **OLENEKITINAE** Tozer, 1971a

Genus ***Kazakhstanites*** Shevyrev 1968

Type species :***Kazakhstanites dolnapensis*** Shevyrev, 1968, p.154.

Diagnosis : Shell moderately involute to involute. Venter arched. Ornamentation consists of more or less prominent , regularly spaced ribs. Their intensity decreases on the body chamber. Suture line ceratitic.

***Kazakhstanites dolnapensis*** Shevyrev
Pl. XX, Figs.5-8; Pl. XXI, Figs.1-2; Pl. LV, Fig.2

*Kazakhstanites dolnapensis* Shevyrev, 1968, p.154, Pl.9, Figs.2-3.

Material : 6 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-BETA-HC, JGX-BETA-HC1, JGX-BETA-HC2, JGX-BETA-HC3 and JGX-YHCX.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-524 | 43 | 17.5 | 15 | 13 |
| JGX-525 | 34 | 15 | 9 | 9 |
| JGX-554 | 35 | 16 | 8 | 7 |
| JGX-544 | 54 | 21 | - | 17.5 |
| JGX-555 | 19 | 8.5 | 6 | 5 |
| JGX-546 | 26 | 11 | 8 | 8 |

Description : Involute form with a deep umbilicus. The whorls are robust and subtrapezoidal with a rounded venter and umbilical shoulder. The slightly convex flanks are clearly convergent to the rounded venter. Ornamentation consists of very distant, more or less radial ribs, which are expressed as costiform folds in the umbilical region and then gradually disappear on the ventral shoulder. The suture is illustrated Pl. LV, Fig.2.

Discussion : Some specimens resemble Subolenekites pilaticus sensu Tozer 1994. We note that the more compressed morphotypes possess a more attenuated ribbing, which depends on the law of covariation as redefined by Guex (2003).

Our specimens display a slightly more complex suture than the one illustrated by Shevyrev, 1968, p.154.

Genus ***Svalbardiceras*** Frebold, 1930

Type species : *Lecanites spitzbergensis* Frebold, 1929, p. 299.

Diagnosis : Shell discoidal. The umbilicus measures between 20 and 30 % of the diameter. Venter tabulate to subtabulate. The phragmocone has simple ribbing comparable to that of *Olenekites altus* (Mojsisovics). Ceratitic suture line with weakly indented lobes; presence of a shallow U3.

***Svalbardiceras sulcatum*** Guex et al.
Pl. XXI, Figs.3-6; Pl. LV, Fig.3

Material : 4 specimens (holotype, Nr. JGX-528).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| | D | H | W | U | R1 | R2 |
|---|---|---|---|---|---|---|
| JGX-428 | ± 23 | 10.5 | ± 7.5 | 6 | ± 2/3 | ± 1/5 |
| JGX-429 | 25 | 10 | 7.5 | 7.5 | - | - |
| JGX-426 | 11 | 5 | 4.5 | 3 | - | - |
| JGX-HC30-13a | min.18 | 6.5 | ± 6 | 5.5 | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| JGX-HC30-13b | 17.5 | ± 6 | ± 6 | ± 6 | - | - |
| JGX-427 | ± 32 | 12.5 | min.10 | ± 11 | - | - |

Description : Shell moderately evolute. Whorl section slightly compressed, subelliptical. Venter arched to subtabulate, flanks feebly convex. The maximum thickness is located slightly above the umbilical margin. The venter has a shallow but well-defined median furrow. Umbilical shoulder broadly rounded followed by a moderately deep subvertical wall. Ornamentation consists of broad, distant, either radially or slightly projected, elongated nodes (~ 4 per half whorl). These have maximum prominence just above the umbilical margin, but they quickly fade towards the outer flank without reaching the venter. We also note the presence of thin intercalated striae. On the juvenile stage, the ornamentation is less strong, but denser. However, a gradual passage to stronger and more distant nodes is observable on the last whorl. The suture is illustrated on Pl. LV, Fig.3.

Discussion: Differs from other *Svalbardiceras* by its sulcate venter.

***Svalbardiceras*** aff. ***spitzbergensis*** (Frebold)
Pl. XXI, Fig.8; Pl. LV, Fig.4

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC20.

| D | H | W | U |
|---|---|---|---|
| ± 27 | Min.10 | Max 7(?) | 8.5 |

Description : Shell moderately involute (U : ± 30 % D). Whorl section trapezoidal. Venter tabulate, flanks weakly convex. Ventral margin angular. Umbilical shoulder more or less abruptly rounded, umbilical wall smooth and almost vertical. The surface shows distant, unevenly spaced, radial ribs, whose length occupies the entire flank. They are of moderate but constant strength throughout the flank. The suture, badly preserved, has a first lateral saddle overlapping the ventral margin followed by a broad and deep lateral lobe. The second lateral saddle is higher and wider than the first one. The properties of the more internal elements are uncertain because of poor preservation. The presence of a second lateral lobe, with a finely indented flat base, is hypothetical.

Discussion: *Svalbardiceras spitzbergensis* (Frebold)(Kummel 1969, Pl.26, Fig.3) has a very similar morphology and notably, an identical ribbing at equal diameter. The suture is also compatible (see Kummel 1969, p.451, Fig.28D), except that the first lateral saddle is higher than the second, while in the present example, it is just the opposite. However, this difference is considered of little importance since opposing trends can be observed within a single species or even a single specimen in a general way.

***Svalbardiceras*** cf. ***freboldi*** Tozer
Pl. XXI, Fig.7

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC9.

| D | H | W | U |
|---|---|---|---|
| ± 22.5 | 9.5 | 7.5 | 7.5 |

Description : Shell discoidal, moderately involute (U : ± 34%D). Whorl section trapezoidal. Venter tabulate, relatively broad. Flanks almost flat and slightly convergent. Ventral margin angular. Umbilical shoulder rounded followed by a moderately deep, subvertical wall. The surface is ornate with fine, falcoid and somewhat irregular undulations, which vanish on the ventral margin. The suture is unknown.

Discussion: Tozer's illustration of *Svalbardiceras freboldi* (1994, Pl.38, Fig.2a and b) exhibits characteristics very similar to those of the described specimen. The surface in particular, has undulations almost identical in shape and arrangement.

Genus ***Pseudosvalbardiceras*** Dagys & Ermakova, 1988

Type species :*Meekoceras sibiricum* Mojsisovics, 1886, p.85.

Diagnosis : Very involute discoidal shell with a subtabulate venter bordered by blunt shoulders. Phragmocone ornate with regularly arranged low, sigmoidal ribs. Simple growth lines present on body chamber.

***Pseudosvalbardiceras ? humboldtense*** Guex et al.
Pl. XXII, Figs.1-4

Material : 4 specimens (holotype, Nr. JGX-1002).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2360A.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1006 | 27 | 11.5 | 9 | 6 |
| JGX-1003 | 22 | 10.5 | 8 | 4.5 |
| JGX-1013 | 17.5 | 8 | 5.5 | 4 |
| JGX-1002 | 35 | 16 | 11.5 | 7 |

Description : *Pseudosvalbardiceras* with an ovoid juvenile whorl section, ornate with well-defined sigmoidal ribs, becoming subtabulate and covered with fine growth lines on adult stage.

Discussion : Differs from *Pseudosvalbardiceras sibiricum* (Mojsisovics) by the less angular tabulation of the venter at the adult stage. Our generic assignment is uncertain and provisional.

Family **KEYSERLINGITIDAE** Zacharov, 1970

Genus ***Keyserlingites*** Hyatt, 1900

Type species : *Ceratites subrobustus* Mojsisovics ,1886, p.44.

Diagnosis : Relatively evolute form with subhexagonal or coronate whorl section. Juvenile stage ornate only with tubercles located at mid-flank and on the ventrolateral margin. On adult stage, tubercles are located at mid-flank and connected to simple or bifurcated ribs. Juveniles show parabolic auricles located in the plane of symmetry.

***Keyserlingites pacificus*** (Hyatt & Smith)
Pl. XXII, Figs.5-6; Pl. XXIII, Fig.1; Pl. LI, Fig.4; Pl. LV, Fig.5

*Tirolites pacificus* Hyatt & Smith, 1905, p.159, Pl. 21, Figs.14-18 (Figs.14-15=holotype).
*Tirolites pacificus*, - Smith, 1932, p.68, Pl. 2, Figs.14-18 (Figs.14-15=holotype).

Material : 4 specimens.
Locality : Union Wash, InyoRange, California. Lev. JGX-UWH, JGX-UWK.
Material: 1 specimen. Norm Silberling's USGS Loc. 2834, northern Humboldt Range, Nevada. Lev. *Neopopanoceras haugi* Zone.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1000 | 24.5 | 8 | - | 12 |
| JGX-1039 | 28 | 9.5 | 13 | 12 |
| JGX-1022 | 24 | 9 | 10 | 10 |
| JGX-1034 | 38 | 11 | - | 13.5 |
| JJ-1370c-802 | 15 | 4 | 7.5 | 6.5 |

Description taken from Hyatt & Smith, 1905. The Triassic cephalopod genera of North America. U.S. Geological Survey Professional Paper 40, p.159.

Evolute, widely umbilicate; whorls robust, subquadrate, low, and increasing slowly in height, little embracing, and little indented by the inner volutions. Sides of the whorls narrow, and subangular; venter flattened; abdominal shoulders abrupt. The height of the whorl is one-third of the total diameter of the shell, the width is slightly greater than the height, and the indentation is only one-ninth of the height of the whorl. The width of the umbilicus is four-ninths of the total diameter of the shell. The surface is ornamented with fine radial ribs which cross the venter, and with strong spines on the abdominal shoulders.
The septa are slightly ceratitic; the ventral lobe is divided by a small siphonal notch into two narrow, slightly serrated divisions. There is a serrated lateral lobe on the abdominal shoulders, and an unserrated small second lateral on the umbilical slope. The latter is narrow, pointed, and unserrated.

Genus ***Goricanites*** Guex et al., 2005

Type species : *Goricanites noblei* Guex et al., 2005, p.13.

Diagnosis: Serpenticone with a subcircular whorl section. Ribbing strong laterally, slightly weakening on the outer flank of the phragmocone. The apical part of the ribs is underlined by a megastria, which develops in a small parabolic auricle, and is well marked in the symmetry plan of the shell. Suture line ceratitic.

Discussion: The presence of parabolic auricles in the symmetry plan places this group in the phyletic proximity of *Monacanthites* and *Keyserlingites*.

***Goricanites noblei*** Guex et al.
Pl. XXIII, Fig.2; Pl.LX, Fig.8

Material : 1 specimen (holotype, Nr. PIMZ 24403, Coll. Ed Noble)

Locality: Union Wash, Inyo Range, California. Haugi Zone, Lev. JGX-UWH.
Description: Small, strongly ribbed serpenticone with a subcircular whorl section. Ribs vary from radiate to slightly arched backwards. These are underlined by a parabolic megastria with development of an auricle, located in the symmetry plan. The suture is illustrated on Pl. LX, Fig.8.

Discussion: See the characters of the genus.

Family **LONGOBARDITIDAE** Spath, 1951

Subfamily **NOETLINGITINAE** Parnes, 1975

Genus ***Kiparisovites*** Astachova, 1964

Type species : *Kiparisovites carinatus* Astachova, 1964, p.154.

Diagnosis : Discoidal shell with nearly flat flanks and indistinct ventral shoulders. The internal whorls have blunt and rather prominent ribs, whereas the external whorls are smooth.

***Kiparisovites*** aff. ***ovalis*** Shevyrev
Pl. XXIV, Figs. 3-4; Pl. LVI, Fig.2

*Kiparisovites ovalis* Shevyrev, 1968, p.105, Pl.5, Figs.7-8.

Material : 2 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC16c and JGX-HC18.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-436 | min.15 | min.7 | - | 4.5 |
| JGX-435 | - | ± 6 | - | - |

Description : Only one side of each specimen is preserved. The shape of the venter is unknown. Flanks flat. The involution rate is high. The internal whorls have distant, radially elongated, umbilical nodes (± 5 per whorl) of blunt appearance, which tend to rapidly weaken on the external whorls where they form no more than wide undulations. The umbilical margin is rounded and followed by a shallow, smooth, inclined wall. The umbilical border has a polygonal outline generated by the presence of the nodes. The ornamental elements of the internal and external whorls are positioned on common radiuses. The suture, incompletely preserved, has a widened L2 (supposed) with a flat indented base, like the suspensive lobe of which only the external part is observable.

Discussion: *K.carinatus* has a more acute venter than *K.ovalis* as well as an ornamentation that may be more dense, although the two specimens illustrated by Shevyrev (1968, Pl.5, Figs.5-6) demonstrate that this property is not constant. The suture lines of the two species are so close that they cannot be discerned. This is aptly demonstrated by the incomplete suture of specimen JGX-435, which is still sufficient to confirm generic attribution. Since the shape of the venter is also unknown, no valid distinction criterion is applicable, except the style of the ribs (especially on the specimen JGX-435), which is very similar to *K.ovalis* (Figs. 7 and 8).
Compared to *Olenekites*, the more blunt nodes slightly cross the umbilical margin and fade more gradually towards the periphery.

Genus ***Prohungarites*** Spath 1934

Type species :*Prohungarites similis* Spath, 1934, p.327.

Diagnosis : Like *Kiparisovites*, but with a less distinct ribbing and more prominent ventral and umbilical shoulders.

***Prohungarites gutstadti*** Kummel
Pl. XXV, Figs.1-3; Pl. LVI, Fig.3

*Prohungarites gutstadti* Kummel, 1969, p.521, Pl. 36, Figs. 3 (holotype), 14-15.

Material : min.20 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC24 and JGX-HC20.

| | D | H | W | U | W/H*100 | U/D*100 |
|---|---|---|---|---|---|---|
| HC 24-20 | 15.5 | 6 | 5.5 | 6 | ± 91 | 29 |
| 22 | 18.5 | ± 8 | 7 | ±5 | ± 87 | 27 |
| 1b | 26.5 | 12 | 10 | 7 | | 27 |
| 3a | 26.5 | 12 | 9.5 | ±7 | ± 80 | 26 |
| 3x | 26.5 | ±11.5 | 8 | ±7 | ± 70 | 26 |
| Ib | 39 | ± 15 | 11 | 10.5 | ± 73 | 27 |
| Ie | ± 35 | 16 | 10.5 | ± 9 | ± 63 | ± 26 |
| JGX-410 | 40 | 18 | 14 | ± 10 | ± 78 | ± 25 |
| JGX-408 | ± 37 | 15 | 14 | 11 | ± 93 | ± 30 |
| JGX-409 | 54 | 25.5 | ± 20 | ± 13 | ± 78 | 24 |
| HC 20-17b | 37.5 | ± 15 | 10 | 10 | ± 66 | 26 |
| 26 | 33.5 | 14 | 11 | 10.5 | ± 78 | 31.5 |

Description : Shell discoidal, moderately involute (U : 25-30 % D). Whorl section compressed. Venter fastigate on juvenile stage, becoming progressively rounded during ontogenesis. On juvenile whorls, the ventral shoulder is more or less strongly pronounced, and rounded to subangular.
The ventral surfaces are strongly convergent. They become increasingly convex and the periphery progressively acquires its rounded form; the ventral shoulders then become very weak. Flanks almost flat, sometimes slightly convergent towards the outer flank. Umbilical shoulder abrupt. The radial or sometimes slightly prorsiradiate ornamentation is of highly variable strength and varies from low undulations (8-10 per half whorl) more or less pronounced, strong on the internal part of the flanks and fading rapidly on the outer whorl side, to pronounced, dense and moderately high ribs in specimens with a more expanded section, relatively gently diminishing near the outer whorl side and reaching the ventral margin without transgressing it (JGX-408). The suture corresponds to the illustration of Kummel (1969, p.519). The lobes are finely indented.

Discussion : The specimen closest to *P.crasseplicatus* (JGX-408), by its very pronounced ornamentation and its robust form, is distinguished by distinctly less tortuous ribs, although their arrangement and intensity are quite comparable.
Even when the transition to a rounded venter is not observable (this one may occur to a variable diameter) and even on a rather smooth variety, the species differs from *P.mckelvei* by more pronounced ventral shoulders and by a clearly less acute venter with more convergent ventral surfaces. The section is also less compressed and the umbilicus is wider. However, there are intermediate forms making these distinction criteria difficult to apply. Stratigraphically speaking, the first real *P. mckelvei*

considered in this work, corresponds to a smooth or weakly ornamented morphotype having a venter with the properties mentioned above.
Ornamentation consisting of more closely spaced undulations of regular strength on the flank, which are slightly flexuous and sometimes projected onto the venter, are considered as being of intermediate character to *P.mckelvei,* although the general shape of these specimens is still very close to *P.gutstadti* by the whorl section and the size of the umbilicus. Thus, for these specimens, the change in ornamentation occurs before the change in geometry. For these reasons, they are still assigned to *P.gutstadti.*
The study of many specimens reveals a high degree of intraspecific variability, especially regarding ornamentation. Kummel's specific description is too narrow in scope. His illustrations (1969, Pl.36, Figs.3, 14-15) do not exhibit prorsiradiate sculpture, yet this is mentioned as one of the main differences with *P.crasseplicatus* in his description (p.521). We have concluded that the only true criterion is the transition from a fastigate to a rounded venter. *Prohungarites mckelvei* has an acute venter, which is pseudofastigate (the ventral shoulder is indistinct). It could be the direct descendant of *P.gutstadti*, the fastigate venter appearing by proterogenesis in the latter. The stratigraphic distribution of the two species and the presence of intermediate forms confirm this hypothesis.

***Prohungarites*** sp.indet.
Pl. XXV, Figs.4-5

Material : 2 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC24.

| | H | W | R2 |
|---|---|---|---|
| JGX-412 | 16 | 10.5 | 1/5 |
| JGX-413 | 11.5 | ± 8 | ¼ |

Description : We note on the specimens a distinctly fastigate venter and flat, slightly convergent flanks. The curvature of the umbilical shoulder suggests a significantly lower degree of involution than *P.gutstadti.* The surface is ornate with regularly arranged, subradiate ribs. They have maximum strength on the internal flanks and progressively grow fainter when approaching the ventral margin.

***Prohungarites mckelvei*** Kummel
Pl. XXV, Figs.6-7; Pl. XXVI, Figs.1-2; Pl. LVI, Fig.4

*Prohungarites mckelvei* Kummel, 1969, p.520, Pl.35, Figs. 1-2 (holotype), 3-5, 8, 9.

Material : min. 20 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC24, JGX-HC20, JGX-HC11, JGX-HC9, JGX-HC7, JGX-HC1, JGX-HM3 et JGX-HM float >4.

Description : Compressed, involute shell (U : 15-25 %D). Whorl section ogival. The venter is acute and has a fastigate appearance; however, the ventral shoulder is weak and rounded. The most outer periphery may have a small ripple that accentuates the sharp form of the venter. The ventral surfaces form an angle clearly more acute than in *P.gutstadti.* Flanks slightly convex. Umbilical shoulder abrupt with a subvertical wall. The ornamentation consists of falcoid striae that may form bundles, creating regularly spaced, small undulations of varying intensity. However, there are smooth forms. The suture differs only very little from *P.gutstadti.*

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX HC24-5a | 37.5 | 17 | 10 | 9.5 | 25 |
| JGX HC24-5c | 39 | 16 | 7.5 | 9 | 23 |
| JGX HC20-27 | 44 | 22 | 7 | 7.5 | 17 |
| 17a | 29.5 | 14.5 | 8 | 6 | 20 |
| JGX HC11-5 | 39 | 20 | 7.5 | - | - |
| X | 25 | 11.5 | 7 | 4.5 | 18 |
| JGX HC9-13 | 41 | 20 | ± 8 | 8 | 19 |
| T | 19 | 9 | 3.5 | 3 | 15 |
| JGX-468 | 26.5 | 13 | ± 6 | ± 5 | 19 |
| JGX HC7-7 | 26 | 12.5 | 6.5 | 5 | 19 |
| 5 | 25.5 | 13 | 5 | 4.5 | 19.6 |

Discussion: We note the presence of a multitude of intermediate forms between different species of *Prohungarites* as well as transitional forms of the latter to *Silberlingeria* and *Subhungarites* (Pl. LI). They are too numerous to be described in this work.

***Prohungarites submckelvei*** Guex et al.
Pl. XXVI, Fig.4

Material : 1 specimen (holotype, Nr. JGX-1007).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2360A.

| D | H | W | U |
|---|---|---|---|
| 33 | 14 | 9 | 10 |

Description : Relatively evolute *Prohungarites* with a compressed sub-trapezoidal whorl section. The flanks are slightly convergent and the venter is weakly fastigate with feebly pronounced ventrolateral shoulders. Ornamentation consists of feebly marked ribs, subrectiradiate to slightly rursiradiate. The umbilicus has a high, steep, smooth wall and a rather abruptly rounded shoulder.

Discussion : Differs from *P.mckelvei* by its weaker involution rate.

***Prohungarites lenticularis*** Guex et al.
Pl. XXVI, Fig.3

Material : 1 specimen (holotype, Nr. JGX-1005).
Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-2360A.

| D | H | W | U |
|---|---|---|---|
| 30 | 11.5 | 7.5 | 8 |

Description : Moderately involute *Prohungarites* with a compressed and almost perfect lens-shaped whorl section. The flanks are weakly convergent until mid-flank, at which point the convergence increases such as to form an acute venter devoid of ventrolateral shoulders.

Discussion : Differs from the other *Prohungarites* by its compressed, lens-shaped whorl section and by the absence of ventrolateral shoulders.

***Prohungarites beyrichitoides*** Guex et al.
Pl. XXVI, Figs.5-6; Pl. LVI, Fig.5.

Material : 2 specimens (holotype, Nr. JGX-465).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC9.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-465 | 14 | 5.5 | 3.5 | 3.5 | 25 |
| JGX-466 | 10 | 3.5 | 3 | 3 | - |

Description : Shell discoidal, moderately involute (U : 25 %D). Whorl section compressed, somewhat ogival. Flanks flat, progressively converging towards outer flank. Venter more or less acute. Umbilicus with abruptly rounded shoulder and inclined, almost flat wall. Ornamentation essentially consists of relatively low, regularly spaced constrictions (~ 10 per whorl) in which the apical margin is most pronounced. The suture is illustrated on Pl. LVI, Fig.5.
Discussion: Some individuals of *Prohungarites mckelvei* tend to have convex ventral surfaces, creating a certain resemblance with the present species. However, the latter differs from them by its less acute venter and less involute coiling. The ornamentation is also clearly stronger. Our new species represents a proterogenetic prefiguration of Anisian Beyrichitidae.

Genus ***Silberlingeria*** Waterhouse, 1999

Type species: *Keyserlingites bearriverensis* Kummel, 1969, p.487.

Diagnosis: Juvenile stage similar to *Prohungarites,* but generally having a more robust ribbing, which can form lateral or marginal spines. The adult whorl section is more or less strongly expanded and the venter becomes rounded or tabulate in *S.coronata.* The suture line is similar to that of *Prohungarites.*

Discussion: Transitional forms between species of this genus are very numerous and diversified. The three taxa introduced herein only represent extreme morphological variants that are easily recognizable.

***Silberlingeria rubyae*** Guex et al.
Pl. XXVII, Fig.1

Material : 1 specimen (holotype, Nr. JGX-1005)
Locality: northern Humboldt Range, Nevada. Lev. JGX-NHR-2360D5.

| D | H | W | U |
|---|---|---|---|
| 54 | 23.5 | 22 | 13 |

Description: Semi-involute *Silberlingeria* with a broad subtrapezoidal whorl section, first half of flank rounded then clearly convergent towards the outer flank. Venter fastigate with well-defined ventrolateral shoulders. Ornamentation consists of fairly low intensity, radial ribbing. Ribs are strongest over first half of flank with maximum width at mid-flank after which they fade and disappear on outer flank near ventral shoulder.

Discussion: Differs from *S. bearlakensis* (Kummel) by its more trapezoidal whorl section and its

clearly fastigate venter, which persists on mature whorls. Differs from *S. bearriverensis* by its radial (not prorsiradiate) ribbing.

***Silberlingeria bearlakensis*** (Kummel)
Pl. XXVII, Figs.2-3; Pl. XXVIII, Figs.1-4; Pl. LVI, Fig.6

*Keyserlingites bearriverensis* Kummel, 1969, p.487, Pl.37 Fig.1-4.
*Keyserlingites bearlakensis* Kummel, 1969, .p.486, Pl.37 Fig.5-6, Pl.37 Fig.1-3.

Material : min. 26 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC1, JGX-HM17, JGX-HM18a and b, JGX-HM ≈18, JGX-HM19, JGX-HM23, JGX-HCT, JGX-HM float > 4, JGX-HMB, JGX-HMC.

Description : Large form, moderately evolute (U : 25- 35%). Venter fastigate on juvenile stage, becoming widely arched on later whorls. On the mature whorl, the presence of a small median ripple on the venter represents all that remains of a previously more acute venter. Flanks flat to broadly convex on the most expanded sections. Ventral shoulders absent. Umbilical shoulder is more or less gradually rounded according to the whorl section. Robust ornamentation, limited to the lateral area, consists of prominent radial to slightly prorsiradiate ribs, more or less regularly spaced and tending to form prominent spines at mid flank. The density of these elements is quite variable, but their number does not exceed 10 per half whorl. On the body chamber, the whorl section becomes more compressed and acquires a secondary ornamentation, consisting of thinner growth lines crossing the venter. Suture ceratitic: E deeply indented, L1 deep and irregularly indented, L2 small. The suspensive lobe does not show well-individualized elements. The second lateral saddle is prominent.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-473 | 68.5 | 19 | 23 | 21 | 30 |
| JGX-475 | 84.5 | 33 | 37 | 28.5 | 34 |
| JGX-476 | 72 | 30 | 28 | | |
| JGX HM18a-26 | 49.5 | 17.5 | 17 | ± 16 | 32 |
| 32 | 71 | 31 | 26 | ± 19 | 26 |
| JGX-477 | 38.5 | 15 | 15 | 11.5 | 30 |
| HM ≈ 18-1 | 91 | 42 | 31 | 24 | 26 |
| 2 | 94 | 30 | | 31.5 | 33 |
| HM 19-2 | 90 | 28 | ± 48 | | |
| 4 | 78 | 31 | 37 | 26 | 33 |
| HM float>4-1 | 99 | 44 | 35 | 29.5 | 30 |
| HM C-10 | 112.5 | 45 | 52 | 35.5 | 31 |

Discussion: The considerable variation in the amount of compression of the whorl section (which can undergo significant changes during ontogenesis) is judged as insufficient to distinguish several taxa, since the general morphology remains more or less the same. It follows that *"Keyserlingites" bearriverensis* is not considered a separate species, but probably represents an intermediate stage. The suture lines illustrated by Kummel (1969, p.484, Figs. E and F), don't show a finely indented suspensive lobe, which seems to connect his specimens to *Prohungarites*.
On specimen JGX-476, we observe a migration of the ribs towards the external flanks, indicating a transition to *Silberlingeria coronata*. The internal whorl section of this specimen is fastigate.

***Silberlingeria coronata*** Guex et al.
Pl. XXIX, Fig.1; Pl. XXX, Figs.1-3

Material : 10 specimens(holotype, Nr. JGX-482).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HM18a, JGX-HCT, JGX-HMY, JGX-HMZ, JGX-HMW and JGX-HMC.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-485 | 23 | 11 | ± 8 | 5 | 21 |
| HM 18b-10 | 49.5 | 18 | - | 17 | 34 |
| HCT-19 | 65 | 27 | - | 21 | 32 |
| JGX-482 | 140 | 63.5 | 57 | 44 | 31 |

Description : *Silberlingeria* exhibiting a subquadratic whorl section, becoming coronate at full-growth stage. Venter broadly tabulate with rounded ventrolateral shoulders. Flanks slightly convex with maximum thickness located slightly above mid-flank. Umbilical shoulder more or less abruptly rounded, becoming gradually rounded on body chamber. Umbilical wall vertical on the more expanded whorl sections. Ornamentation consists of regularly spaced, subradial to prorsiradiate ribs, which gradually arise on the internal part of the flanks, become quite strong in an elongated manner perpendicular to coiling, and then they exhibit a tendency to bifurcate forwards near the ventral margin. Moreover, we note the presence of intercalated ribs more or less strongly pronounced. Unlike the spiny main ribs, these sometimes cross the venter in a forward projected manner. The internal whorls are concave-fastigate and display a finely undulated venter. The suture line is similar to that of *Silberlingeria bearlakensis*.

Discussion: This species mainly differs from *S.rubyi* in that its sharp elongated ribs are located closer to the ventral shoulder. The involution rate is similar.

***Silberlingeria sarahjanae*** Guex et al.
Pl. XXXI, Figs.1-2; Pl. LVI, Fig.7

Material : min.16 specimens (holotype, Nr. JGX-480).
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HM17, JGX-HM18b.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX HM17-8 | 62.5 | 30 | 18.5 | 13 | 21 |
| JGX-479 | ± 82 | 35 | 14 | ± 15 | 18 |
| JGX-480 | 62 | 26.5 | 18 | 13 | 21 |

Description : Discoidal, involute form (U : 15-22%D). Whorl section more or less compressed with a concavi-fastigate venter, progressively becoming rounded during ontogenesis. Flanks feebly convex. Umbilical shoulder varies according to the whorl section. Umbilicus significantly widens near the aperture. Ornamentation consists of radial to prorsiradiate ribs or folds, which are sometimes very feeble and of variable density and regularity. Occasionally, an alternation of weak and strong elements is present. The weak elements are then limited to the external flanks, reminiscent of *Silberlingeria coronata*. When approaching the periphery the ribs become weaker and they may be projected forward. Only some thinner growth lines cross the venter, creating undulations. The ribs tend to form spines, which can occupy variable positions on the lateral area, although a radically different site isn't observed within a given specimen. The extension of the basis of spines is parallel

to the ribs. In some individuals, the thickening of the whorl section begins with a swelling on the internal flank, creating a funnel-shaped umbilicus. The suture line is illustrated on Pl. LVI, Fig.7

Discussion: The first appearance of the species corresponds to a morphotype with a pronounced ribbing. In the upper levels, the venter is broader at an equal diameter and has the tendency to form well-defined spines, although the ribbing is less dense. Certain individuals and more particularly the young tend to have a tricarinate venter and flat flanks without well-defined ornamentation, resembling *Subhungarites*. These juvenile stages differ from *Silberlingeria coronata* by their smoother surface and a less flattened venter.
The intermediate forms between *Silberlingeria* and *Prohungarites* still have less pronounced and sometimes flexuous ribs. These specimens have a more compressed whorl section and they reach a large diameter without significant widening of the whorl section. (Pl. LI, Figs.1-2).

## Genus ***Subhungarites*** Tozer 1994

Type species : *Hungarites yatesi* Hyatt & Smith, 1905, p.129.

Diagnosis : Shell very involute with smooth whorls. Venter narrow and clearly tricarinate. The three keels are sharp, becoming slightly blunt at the aperture. Suture line with approximately two auxiliary lobes.

Discussion : *Subhungarites* was previously classified in the subfamily Longobarditinae (Tozer 1994). The complete progression from *Prohungarites* to *Subhungarites* via *Silberlingeria* demonstrates the provenance of this genus to the same subfamily Noetlingitinae.

### ***Subhungarites yatesi*** Hyatt & Smith
Pl. XXXI, Fig.6

*hungarites yatesi* Hyatt & Smith, 1905, p.129, Pl.20, Figs.1-4 (holotype).
*hungarites yatesi*, - Smith, 1932, Pl. 1, Figs.1-4 (holotype).

Material : 3 specimens.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HCT, JGX-HM28 and JGX-HM30.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-489 | 39 | 22 | 10 | 5 | 13 |
| JGX HM28-1 | 49 | 26 | 9 | 4.5 | 9 |

Description : Form discoidal, smooth, strongly involute (U : 9-13 % D). Whorl section extremely compressed with flat flanks, but widens considerably at aperture. Umbilical shoulder more or less broadly rounded. Venter narrow, fitted with three salient keels of which the middle is the highest. Although surface details are poorly preserved, barely perceptible fine growth lines that are projected forward are apparent. The suture is unknown.

Discussion: Specimen JGX-481 (Pl. XXXI Fig.7) represents a primitive Subhungarites, whose venter is still fastigate rather than tricarinate. Its type of coiling as well as its ornamentation, consisting of thin sinuous to falcoid lines, are remarkably close to this species. However, the suture has fewer

elements. The sole auxiliary lobe overlaps the dorsal margin, whereas *Subhungarites yatesi* has at least two auxiliary lobes outside the umbilical furrow.

| | D | H | W | U | U/D*100 |
|---|---|---|---|---|---|
| JGX-481 | 42.5 | 23 | ± 8 | 6 | 14 |

Family **DANUBITIDAE** Spath, 1951

Genus ***Eodanubites*** Wang, 1978

Espèce type : *Eodanubites xinyuanensis* Wang, 1978, p.158.

Diagnosis : Shell relatively evolute with a wide umbilicus. Subovoid whorl section with flanks varying from flat to slightly convex. Umbilical shoulder abrupt and shallow and venter rounded. Ornamentation consists of strong, relatively distant ribs.

Discussion : Apparently, this group is linked to Acrochordiceratidae by its suture line. It differs by its much more compres sed form.

***Eodanubites (Dumitricaceras) judae*** (Guex et al.)
Pl. XLVI, Figs.1-6; Pl. LX, Fig.3

Material : 8 specimens (holotype, Nr. JGX-1040).
Locality : Union Wash, Inyo Range, California. Lev. JGX-UWK.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1040 (s) | 23 | 8.5 | 7 | 10 |
| JGX-1035 | 35 | 13 | - | 14.5 |
| JGX-1030 | 64 | 24 | - | 24.5 |
| JGX-1029 | 37 | 14.5 | - | 14.5 |
| JGX-1036 | 42 | 15 | - | 16 |
| JGX-1028 | 40 | 12 | - | 19 |

Description : Shell compressed with relatively wide umbilicus. Subovoid whorl section with flanks varying from flat to slightly convex, umbilical shoulder abruptly rounded with low wall venter rounded. Ornamentation consists of strong, fairly dense ( 20-25 per outer whorl), slightly rursiradiate ribs, arising on umbilical shoulder, becoming most prominent at mid flank and weakening at ventral shoulder with some crossing venter.

Discussion : See the characters of the genus.

Family **ACROCHORDICERATIDAE** Arthaber, 1911

Genus ***Pseudoacrochordiceras*** Tozer, 1994

Type species :*Arcochordiceras inyoense* Smith. 1914, p.40.

Diagnosis : Thick phragmocone with depressed whorls. Adorned with thick ribs, that tend to develop tubercles on the internal part of the flanks, although true nodes are absent, which distinguishes this genus from *Proacrochordiceras*. Ornamentation is similar in young and adult stages. Sutural line ceratitic with a narrow external lobe.

***Pseudacrochordiceras inyoense*** (Smith)
Pl. XXIII, Figs.3-5; Pl. XXIV, Figs.1-2; Pl. LVI, Fig.1

*Arcochordiceras inyoense* Smith. 1914, p.40.

Material : 5 specimens.
Locality : Union Wash, Inyo Range, California. Lev. JGX-UWH, ;
northern Humboldt Range, Nevada. Lev. JGX-NHR-2823AB.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1015 | - | 16 | 31 | - |
| JGX-1024 | 27 | 12 | 13 | 8.5 |
| JGX-1025 | 28 | 12.5 | 23 | 10.5 |

Description : Shell relatively evolute with broad cadicone whorl section. Flanks strongly curved towards the umbilicus, umbilical shoulder rather abruptly rounded with high wall. Venter broadly rounded. Ornamentation consists of very strong ribs with a quite irregular trajectory, occasionally bifurcated at each edge of venter. Ribs cross venter in a very slightly forward curved arc. The adult body chamber tends to become ovoid. The suture line is illustrated on Pl. LVI, Fig.1.

Discussion : Differs from the other Acrochordiceratidae by its typical cadicone whorl section.

Order **PHYLLOCERATIDA** Zittel

Superfamily **USSIRITADEAE** Hyatt

Family **PALAEOPHYLLITIDAE** Popov, 1958

Genus ***Palaeophyllites*** Welter, 1922

Type species :*P.steinmanni* Welter, 1922, p.119.

Diagnosis : Shell relatively evolute. Surface may be flared and irregular ribs may be present.

***Palaeophyllites*** **?** sp.
Pl. XXXII, Fig.6; Pl. LVI, Fig.9

Material : 1 specimen
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-407 | - | 19 | ? 16 | min.18 |

Description : Fragmentary specimen indicating an apparent slightly involute shell. The whorl section appears to be slightly compressed, subelliptical. The venter and the flanks are broadely arched, without distinct ventral shoulders. Umbilical shoulder gently rounded with low wall. Surface smooth except for low, subradial undulations and fine striae projected forwards on the umbilical shoulder. The imprint of the absent internal whorl doesn't indicate more pronounced ornamentation. The suture line possibly indicates a generic affinity to the genus *Palaeophyllites*.

Family **USSURITIDAE** Hyatt, 1900

Genus ***Ussurites*** Hyatt, 1900

Type species : *Monophyllites sichoticus* Diener, 1895, p.29.

Diagnosis : Surface adorned with growth lines exhibiting a slight projection on the venter. The internal whorls may have parabolic nodes on the ventrolateral margin. The suspensive lobe has, at most, only one individualized auxiliary lobe.

***Ussurites submansfeldi*** sp.nov.
Pl. XXXIII, Fig.7; Pl. LVII, Fig.3

Material : 1 specimen (holotype, Nr. JPC-179c-5).
Locality : Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCDE equivalent.

| D | H | W | U |
|---|---|---|---|
| 29 | 9.5 | 9.5 | 13 |

Description : Shell moderately involute (U/D : 0.45). Flanks vary from parallel to very weakly convex. Whorl section subquadratic with broad, weakly arched venter and rounded ventral shoulders. Umbilicus with rounded shoulder and inclined, relatively shallow wall. Ornamentation consists of megastriae related to the resorption of relatively distant ventrolateral nodes of apparently irregular frequency. Radial growth lines are intercalated between these structures.

Remark : The rate of increase in whorl height is less than that of *Ussurites mansfeldi*.

***Ussurites mansfeldi*** Kummel
Pl. XXXIII, Figs.4-6

*Ussurites mansfeldi* Kummel, 1969, p.530, Pl. 44, Figs.1-3, Pl.45, Figs.1 (holotype), 2-3.

Material : 6 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE. Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCDE equivalent.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-212c-2 | 40 | 18 | 14 | 11.5 |
| JHS-1692c | 46 | 22 | - | 13 |
| JHS-215c | 51 | 23.5 | - | 14 |

| | | | | |
|---|---|---|---|---|
| JHS-43c-3 | 40 | 17 | 16.5 | 12.5 |
| JPC-176c-4 | 30 | 14.5 | - | 9 |

Description : Shell relatively evolute, smooth and umbilicus with rounded shoulder and high, slightly overhanging wall. Flanks very weakly convex and venter perfectly rounded. Rate of whorl height expansion quite high. The test has radial growth lines, which are occasionally bent backwards slightly on the venter. We also note the presence of sporadic parabolic nodes, which tend to become rare on adult whorls. However, we ascertain their presence by the polygonal-appearing umbilicus. Specimens JHS-212c-2 and JHS-43c-3 show the variability of the lateral curvature of the whorls, which are more or less stocky.

***Ussurites*** cf. ***hosei*** Kummel
Pl. XXXIV, Figs.1-3

*Ussurites hosei* Kummel, 1969, p.528, Pl.33, Figs.1 (holotype), 2-6.

Material : 10 specimens.
Locality : Cowboy Pass, Confusion Range, Utah. Lev. JGX-CR2, JGX-CR3, JGX-CR4, JGX-CR4', JGX-CR5, JGX-CR6 et JGX-CR6'.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-570 | 44 | 20 | 18 | 12 |
| JGX-571 | 80 | 38 | 23 | 19.5 |
| JGX-572 | 57 | 24 | 18 | 19.5 |

Description : *Ussurites* of variable form. Some specimens exhibit parallel to slightly convergent flanks and a rounded to slightly subtabulate venter. Whorl section more or less trapezoidal. The suture is typical of the genus. The parabolic nodes on ventral shoulder are weakly marked or absent.

Genus ***Coscaites*** Guex et al., 2005

Type species : *Coscaites crassus* Guex et al., 2005, p.11.

Diagnosis : Like *Ussurites*, but developing strong ribbing.

***Coscaites crassus*** Guex et al.
Pl. XXXIV, Fig.4; Pl. XXXV, Fig.1; Pl. LVII, Fig.4

Material : 2 specimens (holotype, Nr. JHS-255c-6).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-213c-1 | 101 | 45 | - | 28.5 |
| JHS-255c-6 | 83.5 | 40 | appx.30 | 25 |

Description : Relatively evolute Ussuritidae with a quite high whorl height expansion rate. Although internal whorls are smooth, prominent ribs are developed on the upper umbilical shoulder and inner

flank area beginning at the end of the phragmocone and continuing for preserved length of the body chamber. Umbilicus with rounded shoulder-and slightly overhanging wall. Venter is circular. The shell is adorned with a fine strigation. The suture is illustrated Pl. LVII, Fig.4.

Discussion : Because of its strong ribbing, this group can't be confused with other *Ussuritidae*.

Family **NORDOPHICERATIDAE** Popov, 1961a

Genus ***Nordophiceratoides*** Guex et al., 2005

Type species :***Nordophiceratoides catherinae*** Guex et al., 2005, p.12.

Diagnosis : Shell with more or less narrow whorls, flanks vary from flattened to convex, ornate with striae or sigmoidal ribs. Some specimens have parabolic nodes on the ventrolateral margin. The suture line is phylloid, close to that of Ussuritudae.

Discussion : *Nordophiceratoides* differs from *Nordophiceras* Popov by its phylloid suture line, its clearly wider geometry and its more robust ornamentation. Its suture line and parabolic nodes make it closer to Ussuritidae.

***Nordophiceratoides catherinae*** Guex et al.
Pl. XXXV, Figs.2-5; Pl. LVII, Fig.5

Material : 4 specimens (holotype, Nr. JHS-279c-7).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSA, JGX-HS4.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-279c-7 | 82 | 34 | 21 | 25 |
| JHS-1019c-9 | 80 | 30 | 19 | 26 |
| JHS-194c-8 | 76 | 32 | 19 | 22 |
| JGX-10 | 20.5 | 9 | 6.5 | 6 |

Description : Shell discoidal, slightly involute. Flanks slightly convex. Subelliptical whorl section. Venter varies from weakly arched to subtabulate. Umbilical shoulder broadly rounded. Ornamentation consists of sigmoidal growth lines curved forwards on the umbilical shoulder and weakly projected forwards on the outer flank. Some megastriae are associated with ventrolateral tubercles. On the internal whorls, these nodes are less dense and regularly arranged, giving umbilicus a rather polygonal appearance. On adult shell, their density increases considerably, giving venter a somewhat tabulate appearance.
The suture is illustrated on Pl. LVII, Fig.5. We note a prominent first lateral lobe having phylloid-type indentations. However, these indentations are restricted to the basal part of the lobe.

Discussion : Differs from *Nordophiceras* by the characters of the genus.

*Nordophiceratoides adriani* Guex et al.
Pl. XXXVI, Figs. 3-4, Pl. XXXVII, Figs.1-3; Pl. LVII, Fig.6

Material : 9 specimens (holotype, Nr. JGX 18).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6 and JGX-BETA-HS3.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-218c-14 | 44 | 19 | - | 12 |
| JHS-220c-15 | 53.5 | 24.5 | 13 | 15 |
| JHS-138c-16 | 37.5 | 18.5 | 10 | 10 |
| JHS-1681c-17 | 38 | 19 | 10 | 10.5 |
| JHS-1682c | 37.5 | 16.5 | 10 | 10 |
| JHS-1683c | 44.5 | 19.5 | - | 13.5 |
| JGX-18 | 28 | 13 | 8 | 8 |
| JGXHS6-60 | 33.5 | 15.5 | - | 9.5 |
| JGX-BETA-HS3-1c | 21 | 9 | 6.5 | 7 |

Description : Shell discoidal, feebly involute. Flanks convex, slightly convergent on the outer flank. Whorl section elliptical to ovoid. Venter arched, moderately broad with a rounded ventrolateral shoulder. Umbilical shoulder broadly rounded, relatively high. Ornamentation consists of strong radial, slightly sinuous, relatively broad ribs with a rounded section (about 12 per half-whorl). They are prominent on the internal part of the flanks and rapidly fade just past mid-flank. Megastriae present intercalated between the ribs, and associated with ventrolateral tubercles (about 4 per half-whorl) positioned symmetrically on each side of venter. Occasionally, these nodes are immediately followed by weak constrictions. When the nodes are present on the internal whorls, they give the umbilicus a more or less accentuated polygonal appearance depending on the strength of the nodes.
The suture is illustrated on Pl. LVII, Fig.6. We note the presence of three relatively narrow lobes and of an auxiliary lobe, possessing irregular or indistinct divisions. The first lateral lobe is of equal depth as the ventral lobe. The first two lateral saddles have a general phylloid aspect.

Discussion: The present species has a less compressed whorl section than the other *Nordophiceratoides*.

*Nordophiceratoides gracilis* Guex et al.
Pl. XXXVII, Figs.4-5

Material : 5 specimens (holotype, Nr. JPC-110c-12).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6 and JGX-BETA-HS3.
Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCDE equivalent.

| | D | H | W | U |
|---|---|---|---|---|
| JPC-110c-12 | 49 | 24 | 11 | 12 |
| JHS-201c-13 | 44 | 20 | 9.5 | 11 |
| JHS 1684c | 28 | 13 | 8 | 8 |
| JHS 1685c | 29.5 | 14 | 7 | 7 |
| JHS 168c | 37 | 18 | 8.5 | 9 |

Description : Shell discoidal, moderately involute. Flanks subparallel in young becoming weakly convex at maturity. Whorl section strongly compressed, subelliptical. Maximum whorl width located

on internal part of flank. Venter narrow, weakly arched and ventral shoulders rounded. Umbilical shoulder more or less abruptly rounded and wall moderately high.

Discussion: This species represents a more slender variant than *N. adriani*. It exhibits a higher rate of involution and has a more compressed whorl section. The ornamentation is similar, but weaker. The suture line is identical.

***Nordophiceratoides bartolinae*** sp.nov.
Pl. XXXVI, Figs.1-2; Pl. LII, Fig. 1

Derivatio nominis : Dedicated to Annachiara Bartolini.
Material : 2 specimens (holotype. Nr. JGX-25).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSDE, JGX-HS6.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-1676c-24 | 83 | 36 | 18 | 24 |
| JGX-25 | 62 | 25 | min 11 | 17 |

Description : Shell discoidal, compressed with regularly spaced, rectiradiate to slightly rursiradiate ribs with their maximum strength in the umbilical part of the flanks. They abruptly fade at mid flank and simultaneously widen and rapidly fade on the outer flank. Whorl section subtrapezoidal and compressed. Flanks flat to weakly convex, converging on the outer whorl side. Venter slightly rounded. Sporadic constrictions present, associated with weak parabolical nodes and megastriae. A fine strigation can be observed on the outer shell. The phylloid suture line is typical of the genus.

Discussion : Differs from other *Nordophiceratoides* mainly by its relatively strong, regularly spaced ribs.

## INCERTAE SEDIS

The phylogenetic relationships and origins of many genera are actually unclear, and thus, we classify them here in the group «incertae sedis». This solution seems to us, by far, preferable to the one which consists, for example, of joining together all evolute forms in a polyphyletic taxon such as the «Xenoceltitidae» of the current literature. This family has obviously no meaning in regard to evolution and we reject it.

Genus ***Inyoceras*** Tozer, 1994

Type species : *Xenodiscus bittneri* Hyatt & Smith, 1905, p.123.

Diagnosis : Form with a rounded to ovoid whorl section. Ribbing strong and distant on the internal whorls, dense and quite irregular on the adult stage.

Discussion : Differs from *Kashmirites* Diener and *Xenoceltites* Spath by its more dense ribbing.

***Inyoceras bittneri*** (Hyatt & Smith)
Pl. XLVII, Figs.4-6; Pl. LX, Fig.5

*Xenodiscus bittneri* Hyatt & Smith, 1905, p.123, Pl.20, Figs.5-15 (Figs.5-7= holotype), Pl.21, Figs.1-13.

*Xenodiscus bittneri*, Smith, 1932, p.56, Pl.1, Figs.5-15 (Figs.5-7= holotype), Pl.2, Figs.1-13.

Material : 3 specimens.
Locality : Union Wash, Inyo Range, California. Lev. JGX-UWH.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1018 | 18.5 | 5.5 | 5 | 9 |
| JGX-1019 | 31.5 | 10 | 7 | 14 |
| JGX-1021 | 19.5 | 6.5 | 4.5 | 8.5 |

Description : Serpenticone shell with ovoid to slightly compressed whorls. Ornamentation consists of strong ribs projected forwards on the outer flank and forming a proverse sinus on the venter. The density of the ribs is variable. More or less regular constrictions present followed by a slight thickening. The suture line is illustrated on Pl. LX, Fig.5.

## Genus ***Eschericeratites*** Guex et al., 2005

Type species: *Eschericeratites lytoceratoides* Guex et al., 2005, p.6.

Diagnosis : Small serpenticone shell with wide, rounded whorls ornated with sporadical constrictions. The type of coiling sharply evokes that of some Lytoceratids of the Jurassic, even if there obviously is no phyletic connection. *Inyoceras*-type suture line.

Discussion : The specimens we collected are similar to the very early juvenile stage of *Inyoceras bittneri* and we consider them as being ancestral to the this genus. The two groups can easily be distinguished in their later growth stage by the fact that *Eschericeratites* has wider whorls than *Inyoceras* and by the fact that it doesn't develop the strong full-grown ribbing characteristic of the latter.

### ***Eschericeratites lytoceratoides*** Guex et al.
Pl. XLVIII, Figs.1-2; Pl. LII, Fig.3

Material : 2 specimens (holotype, Nr. JGX-710).
Locality : northern Humboldt Range, Nevada. Lev. JGX-2360B. Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC1.

Description : Species of small size, serpenticone with rounded and wide whorls adorned with slightly prorsiradiate constrictions becoming thinner on the flanks and crossing the venter without projection. Lytoceras-type of coiling.

Discussion : see the definition of the genus.

## Genus ***Tapponnierites*** Guex et al., 2005

Type species: *Tapponnierites tenuicostatus* Guex et al., 2005, p.3.

Diagnosis: Evolute shell with subelliptical whorl section ornated with very thin, straight and slightly prorsiradiate ribs, which are weakly curved forwards on the ventral shoulder. Ceratitic suture.

Discussion: Differs from *Bajarunia* by its wider whorls and its rounded (and not subogival) venter.

***Tapponnierites tenuicostatus*** Guex et al.
Pl. XLVIII, Figs.3-5; Pl. LVI, Fig.8

Material : 3 specimens (holotype, Nr. JGX-419).
Locality: Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HC30.

| | D | H | W | U | R1 | R2 |
|---|---|---|---|---|---|---|
| JGX-419 | 23.5 | 8 | 6 | 9.5 | ± ½ | 1/5 |
| JGX-417 | ± 73 | 23 | ± 14 | ± 32 | Max.1/3 | ± 1/5 |
| JGX-418 | 22 | 7 | 5 | 10 | ± 1/3 | ± 1/5 |

Description: Evolute form with subelliptical whorl section. Venter arched, flanks flat. Ventrolateral margin rounded. Umbilical shoulder rounded, with a shallow, subvertical and slightly convex wall. Ornamentation consists of very thin ribs, which are more or less regularly spaced. The straight, slightly prorsiradiate ribs extend the entire length of the lateral area. On the umbilical wall, they are slightly curved forwards and they rapidly weaken on the ventral margin. On juvenile stage, they are curved forwards on the venter, forming a sinus which overlaps the ventral area. The Ceratitic suture consists of two wide and finely denticulated lateral lobes and an auxiliary lobe occupying the entire umbilical wall. L1 rounded, large and deep, L2 short and narrow. Siphonal lobe is deeply lanced.

Discussion: see characters of the genus.

Genus ***Bajarunia*** Dagys, 1983

Type species : *Ceratites eoumphalus* Keyserling, 1845, p.171.

Diagnosis : Shell with a variable rate of whorl height expansion, compressed and more or less strongly adorned . The representatives of this genus exhibit growth lines that can form more or less sigmoidal and pronounced rib-like undulations. The venter is subogival to ogival in juveniles and becomes rounded at subsequent stages of development.

***Bajarunia pilata*** (Hyatt & Smith)
Pl. XXXVIII, Figs.1-6; Pl. XXXIX, Figs.1-4; Pl. LVIII, Fig.1

*Meekoceras pilatum* Hyatt & Smith, 1905, p.144, Pl. 63, Figs. 3-9; Smith, 1932, p.59, Pl. 63, Figs. 7-13.
*Meekoceras curticostatum* Smith, 1932, p.56, Pl.48, Figs.21-30.
*Nordophiceras pilatum* (Hyatt & Smith), Kummel, 1969, p. 470, Pl. 50, Figs. 1,2.

Material : min. 11 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSAB, JGX-HS4, JGX-HS5, JGX-BETA-HS1 and JGX-BETA-HS2. Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCAB

| | D | H | W | U |
|---|---|---|---|---|
| JHS-22c-31 | 76 | 35 | 17 | 16 |
| JPC-86c-32 | 74 | 30 | 16 | 23 |
| JGX-35 | 61 | 25.5 | 13 | 18 |
| JGX-36 | 52 | 22 | 9 | 14 |
| JGX HS4-18 | 47 | 23 | 10 | 10.5 |
| JGX HS4-4a | 60 | 23 | - | 18 |
| JGX HS4-2 | 46 | 19.5 | 9 | 11 |
| JGX HS4-54 | 53 | 22.5 | 10 | 14 |
| JGX HS4-55 | 36 | 16 | 8 | 9.5 |
| JGX-33 | 56.5 | 24.5 | 12 | 13 |
| JGX-37 | 56.5 | 24 | 12 | 15.5 |
| JGX HS4-3 | 46 | 19.5 | 9.5 | 12 |
| JGX-38 | 43 | 18 | 8.5 | 11 |
| JGX-40 | 53 | 21 | 11 | 18 |
| JGX-41 | 49.5 | 21 | 10 | 13.5 |
| JGX-42 | 47 | 23 | 10 | 10.5 |
| JGX-34 | 32.5 | 13.5 | 7 | 9 |

Description : Shell compressed, involute. Flanks convex. Whorl section elliptical. Venter narrowly arched, almost ogival on the internal mold of the young, tending to widen when mature. The ventral margin is rounded or has very feeble shoulders. Umbilicus shallow, shoulder more or less abruptly rounded, accentuated when the outer shell is preserved. Umbilical wall usually quite steep. Ornamentation consists of sigmoidal or falcoid growth lines, forming rib-like undulations of variable strength, but generally not very pronounced. These are positioned more or less evenly and generally have their maximum prominence on the internal portion of the flanks. The growth lines cross the venter in a convex manner. On the umbilical wall, they are curved forwards. We also note the presence of fine strigation, moderately closely spaced on the venter. Certain particularly compressed specimens are almost smooth.

The suture line is illustrated on Pl. LVIII, Fig.1. We note the presence of two lateral lobes relatively shallow and narrow compared to the adjacent saddles. The umbilical portion of the suture is comprised of a finely indented line. Some specimens, however, have an individualized umbilical lobe.

Discussion : Differs from the other known *Bajarunia* by its typical, stronger ornamentation.

***Bajarunia confusionensis*** Guex et al.
Pl. XXXIX, Figs.5-7; Pl. LVIII, Fig.2

Material : min.4 specimens (holotype, Nr. JGX-592).
Locality : Cowboy Pass, Confusion Range, Utah. Lev. JGX-M109 and JGX-M110.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-590 | 50 | 17 | - | 19 |
| JGX-591 | 47 | 17 | 7.5 | 19 |
| JGX-592 | 43 | 17 | 8 | 15 |

Description : *Bajarunia* with a relatively wide umbilicus. Whorl section subogival with venter which tends to become sharp, but that is sometimes narrowly rounded. Shallow umbilicus with

somewhat abruptly rounded shoulder. The holotype has very weak undulations. The general state of preservation does not permit further description. The suture line is illustrated on Pl. LVIII, Fig.2.

Discussion : Our specimens differ from usual *Bajarunia* by the more acute ogival character of its venter.

Genus ***Arctomeekoceras*** Popov, 1962

Type species :*Meekoceras rotundatum* Mojsisovics 1886, p.83, Pl. X, Fig. 16.

Diagnosis : Discoidal shell with a small umbilicus (approx. 10% of the diameter), adorned with striae or weak flexuous ribs, which are projected forward on the umbilical region of the flanks. Suture line with two weakly indented lateral lobes, without individualized auxiliary lobes.

***Arctomeekoceras popovi*** Guex et al.
Pl. XL, Figs.1-2; Pl. LVIII, Fig.3

Material : 3 specimens (holotype, Nr. JHS-1674c-43).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSC.

| | D | H | W | U |
|---|---|---|---|---|
| JHS-1673c-44 | 54 | 28 | 12.5 | 6.5 |
| JHS-1674c-43 | 59 | 32 | 14 | 8.5 |

Description : Shell discoidal, strongly involute. Flanks slightly convex. Whorl section elliptical. Venter arched without ventrolateral shoulders. Umbilical shoulder abruptly rounded with an inclined, relatively high wall. Ornamentation consists of weakly striated rib-like undulations, strongly projected forward on the umbilical region of the flank and slightly curved on the outer flank. The growth lines are dense and prorsiradiate on the flanks. Sometimes, we observe very weak constrictions on the body chamber.

The suture is illustrated on Pl. LVIII, Fig.3. It resembles that of *Bajarunia pilata,* but has a first and a second lateral saddle of equal height.

Discussion : *A. popovi* differs from *A. rotundatum* by its growth lines, which are more strongly projected forwards on the umbilical region and by its suture line, which exhibits slightly deeper lobes and a narrower first lateral saddle.

***Arctomeekoceras tardum*** Guex et al.
Pl. XL, Figs.3-6; Pl. LVIII, Fig.4

Material : 3 specimens (holotype, Nr. JGX-521).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-BETA-HC, JGX-BETA-HC1 and JGX-YHCX.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-521 | 44 | 22 | 12 | 6.5 |

| | | | | |
|---|---|---|---|---|
| JGX-522 | 33 | 16.5 | 9 | 5.5 |
| JGX-528 | - | 21.5 | 10 | 6.5 |
| JGX-547 | | 19 | 10 | 6.5 |

Description : Very involute form with a relatively deep umbilicus. Umbilicus with abruptly rounded shoulders and high, steep wall. The flanks vary from subparallel to slightly convergent. Venter is very narrow and rounded. The ventrolateral shoulders are very weakly defined.
The shell is ornated with rectiradiate to slightly prorsiradiate growth lines that are projected forward on the ventral shoulder. Many of the growth lines form bundled, parallel rib-like undulations.

Discussion : The undulations are more rectiradiate than in *A. popovi*. The suture line has a slightly more prominent second lateral lobe and coarser indentations.

Genus ***Carteria*** Guex et al., 2005

Type species : *Carteria hotspringensis* Guex et al., 2005, p.15.

Diagnosis : Shell with sub-serpenticone internal geometry, becoming relatively involute at the adult stage. The juvenile shape is smooth and its internal mold displays subrectiradiate constrictions on the flanks, which are projected forwards on the outer whorl side. The adult ornamentation is weakly developed.

Discussion : This group is a near homeomorph of the Smithian *Arctoceras*. It differs by its suture line and by its sub-serpenticone juvenile whorls.

***Carteria hotspringensis*** Guex et al.
Pl. XLI, Fig.1; Pl. LIX, Fig.1

Material : 1 specimen (holotype, Nr. JHS-127c-39).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JHSB

| D | H | W | U |
|---|---|---|---|
| 69 | 31 | 16 | 19 |

Description : Shell with sub-serpenticone internal geometry, becoming relatively involute at the adult stage. The juvenile shape is smooth and its internal mold exhibits subrectiradiate constrictions on the flanks, which are projected forwards on the outer whorl side. Adult ornamentation consists of relatively distant rib-like undulations comprised of prominent growth lines that are strongly projected forwards on the umbilical portion of the flanks. They are subrectiradiate laterally and weakly projected forwards on the outer whorl side. The adult whorl section is subelliptical. The suture line is illustrated on Pl. LIX, Fig.1.

Discussion : see characters of the genus.

Genus ***Xenoceltites*** Spath, 1930

Type species : *Xenoceltites subevolutus* Spath 1930, p.12.

Diagnosis : Whorls thin, ovoid in section. Variocostate, phragmocone with constrictions as well as ribs. Peripherical projection of growth lines pronounced, resulting in a more or less crenulated venter.

Discussion : This Genus crosses the Smithian-Spathian boundary and is probably the ancestor of *Jeanbesseiceras*, *Tapponnierites*, *Bajarunia*, *Eschericeratites* and *Inyoceras*.

***Xenoceltites crenulatus*** Guex et al.
Pl. XLI, Figs.2-3; Pl. LIX, Fig.2

Material : 2 specimens (holotype, Nr. JGX-163).
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-HS4, JGX-HS5.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-163 | 18 | 7.5 | 5.5 | 5 |
| JGX-150 | 29 | 10 | 7.5 | 9.5 |

Description : Form of small size exhibiting rib-like undulations clearly prominent on the ventral half of the whorl and crossing the venter with a strong forward projection. Coiling is evolute to moderately involute. The whorls are higher than broad. Flanks feebly convex, venter clearly rounded. Umbilical shoulder rounded relatively abruptly. The suture is illustrated on Pl. XXXV, fig.2.

Discussion : *Xenoceltites crenulatus* differs from *X. spencei* (Hyatt & Smith) by its strong ribbing, which crosses the venter without interruption.

***Xenoceltites spencei*** (Hyatt & Smith)
Pl. XLI, Figs.4-5; PL. XLII, Figs.1-4; Pl. XLIII, Figs.1-3; Pl. LIX, Fig.3

*Ophiceras spencei* Hyatt & Smith 1905, p.119, Pl.62 Figs.1-10 (Fig.5-6 = lectotype).
*Ophiceras spencei* Smith, 1932, p.50, Pl.62, Figs.1-10. (Fig.5-6 = lectotype)
*Xenoceltites spencei*, - Kummel, 1969, p.376, Pl.48, Figs.5-9, Pl.52, Figs.1-7.

Material : min. 20 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-HS4, JGX-HS5, JGX-HS6, JGX-BETA-HS1 and JGX-BETA-HS2.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-158 | 20 | 7 | 6 | 7 |
| JGX-159 | 17 | 7 | 4.5 | 6 |
| JGX-157 | 16 | 7 | 5 | 5 |
| JGX-156 | 16 | 6.5 | 5 | 5.5 |
| JGX-153 | 19 | 6 | 6 | 6 |
| JGX-155bis | 15 | 6 | 5 | 4.5 |
| JGX-164 | 21 | 8 | 6.5 | 7 |
| JGX-160 | 23 | 8 | 6 | 9 |
| JGX-152bis | 30 | 11 | 8 | 11 |

Description : Evolute shell of small to medium size, without significant ribbing, but adorned with fairly dense, regularly arranged constrictions. Whorl section is slightly higher than wide. Flanks convex. Umbilical shoulder varies from rounded to abruptly rounded. Venter is rounded.

Discussion : *X.spencei* differs from *X.crenulatus* by its weaker ribbing.

Genus ***Jeanbesseiceras*** Guex et al.

Type species : *Prionolobus jacksoni* Hyatt & Smith, 1905, p.151.
(= *Ophiceras jacksoni* Smith, 1932, p.49, Pl.62, Figs.11-13(holotype))

Diagnosis : Shell, which varies from evolute to moderately involute, is a relatively smooth homeomorph of *Psiloceras*. Growth lines are usually well-defined. Venter rounded, adorned with weak crenulated ribbing, well-defined only on the internal mold. Flanks parallel and flat.

Discussion : Differs from *Xenoceltites* by its slightly more involute coiling and larger whorls. Differs from *Bajarunia* by its rounded venter. Differs from *Rudolftruempyiceras* gen.nov. by its clearly more involute coiling.

***Jeanbesseiceras jacksoni*** (Hyatt & Smith)
Pl. XLIII, Figs.4-5; Pl. XLIV, Figs.1-6; Pl. XLV, Fig.1; Pl. LIX, Fig.4

*Prionolobus jacksoni* Hyatt & Smith 1905, p.151, Pl.62, Figs.11-13 (holotype), 14 -21.
*Ophiceras jacksoni* Smith, 1932, p.49, Pl.62, Figs.11-13 (holotype), 14 -21.
*Nordophiceras jacksoni* Kummel, 1969, p.468, Pl. 47, Figs.1-2, 4-5, Pl.48, Figs.1-4.

Material : min. 20 specimens.
Locality : Hot Springs, Bear Lake Valley, Idaho. Lev. JGX-HS4, JGX-HS5, JGX-HS6, JGX-BETA-HS1. Paris Canyon, Bear Lake Valley, Idaho. Lev. JPCAB. Cowboy Pass, Confusion Range, Utah. Lev. JGX-CR2, JGX-CR6, JGX-CR6'.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-162 | 33 | 12 | 8 | 12 |
| JGX-154 | 16.5 | 6 | 5 | 7 |
| JGX-148bis | 45 | 16 | 11.5 | 17.5 |
| JHS-92c-152 | 38 | 15 | 10 | 12 |
| JHS-1689c-161 | 50 | 17 | 12 | 20 |
| JHS-199c-146 | 40 | 14 | 10 | 13.5 |
| JHS-1688c-154bis | 43 | 13 | 11 | 18.5 |
| JGX-149 | 45.5 | 15 | 10 | 17.5 |
| JHS-199c-146 | 40 | 13.5 | 10 | 13 |
| JPC-7c-145 | 69 | 25 | 17 | 25 |

Description : Shell is a near homeomorph of smooth or striated *Psiloceras* from the Hettangien. Coiling is quite variable; some specimens exhibit a whorl covering that reaches 50%, but the umbilicus is still relatively wide. At the opposite extreme, the most evolute forms have a whorl covering reaching 10 to 20 %. Ornamentation consists of growth lines that are clearly distinct, radial to prorsiradiate and slightly projected forwards on the outer flank. The venter exhibits a weak

crenulated ribbing that can, however, be very prominent on younger whorls. This phenomenon is clearly visible on the internal mold, but barely appears on the outer shell. The umbilical shoulder is either very gently rounded on some specimens or relatively abrupt and almost flat on others. Umbilical wall inclined at an angle of apprx. 45 degrees. The flanks are subparallel and the venter is rounded. The suture line is illustrated on Pl. LIX, Fig.4.

Discussion: Some specimens from Lev. JGX-HS6 and JHSDE tend to have a subrectangular whorl section. Differs from *Bajarunia* and from *Rudolftruempyiceras* gen.nov. by the characters mentioned in the discussion of the genus (see above). Differs from *Xenoceltites* by the absence of constrictions.

Genus ***Courtilloticeras*** Guex et al., 2005

Type species :***Courtilloticeras stevensi*** Guex et al., 2005, p.15.

Diagnosis : Shell evolute and constricted, subrectangular whorl section. Strong ribbing with development of ventrolateral tuberculation.

Discussion : This group is very unique and cannot be confused with any other genus of the Lower Triassic.

***Courtilloticeras stevensi*** Guex et al.
Pl. XLVII, Figs.1-3; Pl. LX, Fig.4.

Material : 3 specimens (holotype, JGX-1032).
Locality : Union Wash, Inyo Range, California. Lev. JGX-UWK.

| | D | H | W | U |
|---|---|---|---|---|
| JGX-1032 | 29 | 8 | - | 15 |

Description : Shell evolute, compressed with a subrectangular whorl section. Flanks flat, venter slightly arched. Ornamentation consists of strong ribs with variable disposition, developing strong ventrolateral tuberculation. The ribs are sometimes of variable strength, they often bifurcate on the venter and sometimes are intercalated with simple ribs. The suture line is illustrated on Pl. LX, Fig.4.

**Gymnotoceratidae ?** sp.indet.
Pl. XLIX, Fig.1

Material : 1 specimen.
Locality : Hammond Creek, Bear Lake Valley, Idaho. Lev. JGX-HCT.

| D | H | W | U | U/D*100 |
|---|---|---|---|---|
| ± 160 | 88 | ± 44 | 11.5 | 7 |

Description : We have found a lenticular ammonoid of large size, very involute and discoidal in level JGX-HCT.. The suture line seems to be ceratitic laterally with an ammonitic ventral lobe. This form shows greater affinity with the Anisian *Gymnotoceras* than with *Prohungarites* sensu lato, with which it is associated.

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## Acknowledgements

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## Repository

Jim Jenks collection is deposited at the Natural History Museum of New Mexico.
Jean Guex collection is deposited at PIMUZ (Paläontologisches Institut und Museum der Universität Zurich).

# PLATES I - LX

Photographs by Stefan Ansermet, Geological Museum of Lausanne

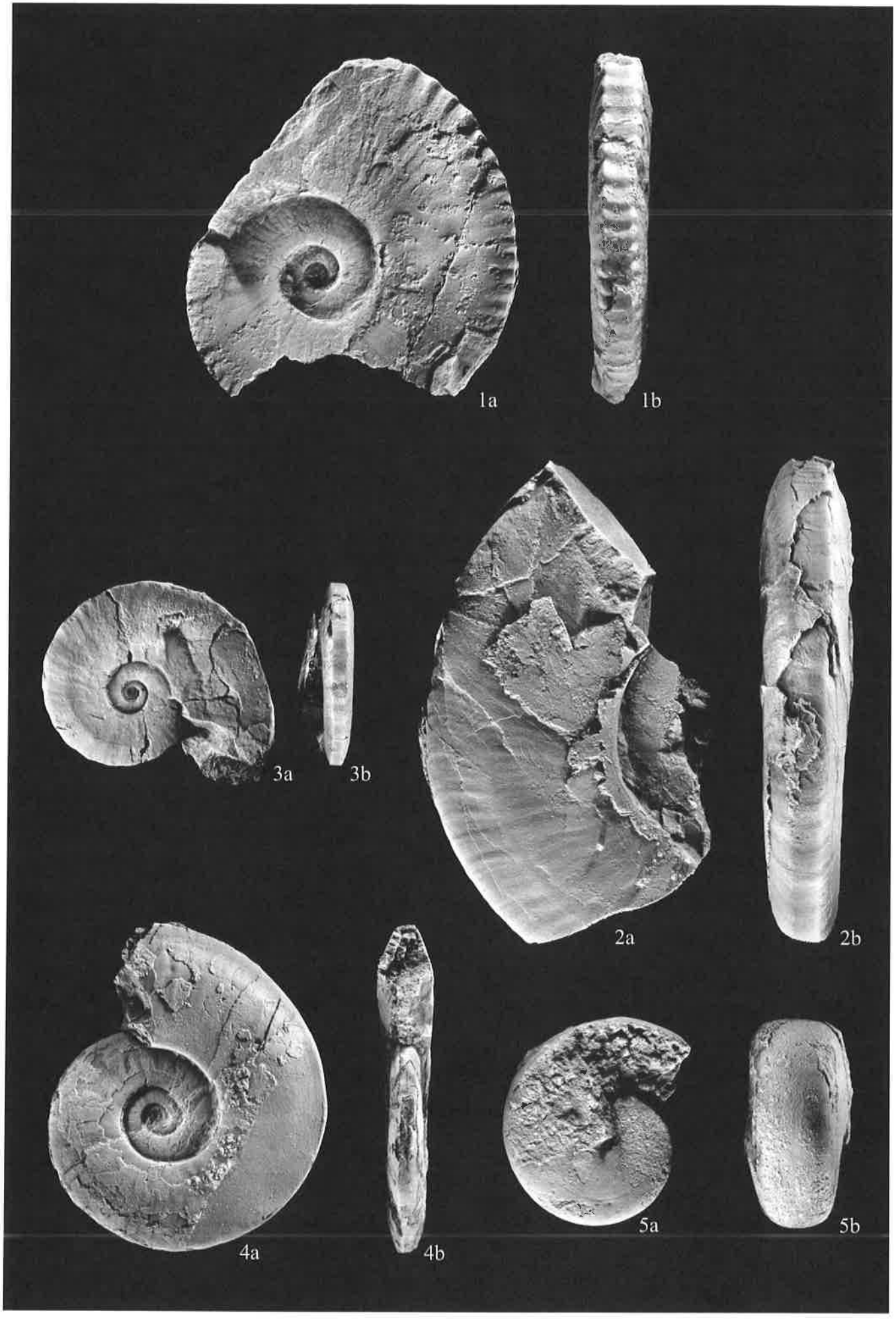
## Plate I

Figs. 1-4. *Albanites sheldoni* (Kummel). Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-142. Lev. JGX-HS6. Diameter : 65 mm.
2. Nr. JGX-142bis. Lev. JGX-HS6. Height : 36 mm.
3. Nr. JHS-102c-144. Jenks Coll. Lev. JHSDE. Diameter : 39 mm.
4. Nr. JHS-211c-143. Jenks Coll. Lev. JHSDE. Diameter : 70 mm.

Fig. 5. *Gaudemerites. rectangularis* Guex et al., holotype. Nr. JGX-1010. Locality : Lev. JGX-NHR-2360B, northern Humboldt Range, Nevada. Diameter : 34 mm.

**Plate I**



## Plate II

Figs. 1-2. *Cordillerites angulatus* Hyatt & Smith

1. Nr. JGX-549. Locality : Lev. JGX-BETA-HC1, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 39 mm.

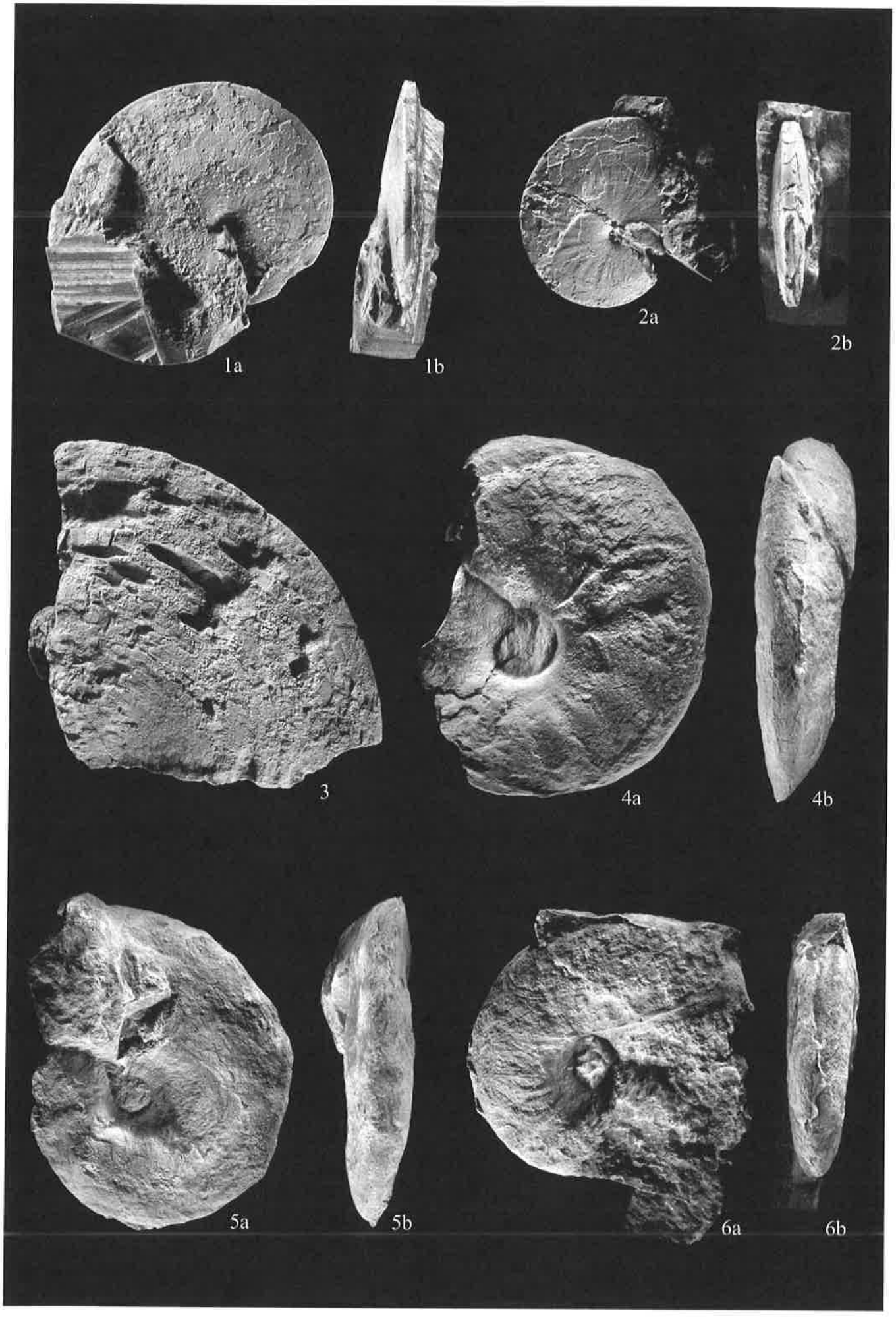
2. Nr. JGX-139. Locality : Lev. JGX-HS6, Hot Springs, Bear Lake Valley, Idaho. Diameter : 26 mm.

Fig. 3. *Pseudosageceras* sp.indet. Nr. JGX-569. Locality : Lev. JGX-CR4, Cowboy Pass, Confusion Range, Utah. Height : 75 mm.

Figs. 4-6. *Cowboyiceras farwestense* Guex et al.. Locality: Cowboy Pass, Confusion Range, Utah.

4. holotype. Nr. JGX-566. Lev. JGX-CR-D5. Diameter : 80 mm.
5. Nr. JGX-565. Lev. JGX-CR-D5. Diameter : 73 mm.
6. Nr. JGX-596. Lev. JGX-CR-D5. Diameter : 69 mm.

**Plate II**



## Plate III

Fig. 1. *Dagnoceras ?* sp.indet. Nr. JGX-460. Locality : Lev. JGX-HC11, Hammond Creek, Bear Lake Valley, Idaho. Diameter : min.32 mm.

Fig. 2. *Dagnoceras* aff. *zappanese* Arthaber. Nr. JGX-400. Locality : Lev. JGX-HC24, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 23 mm.

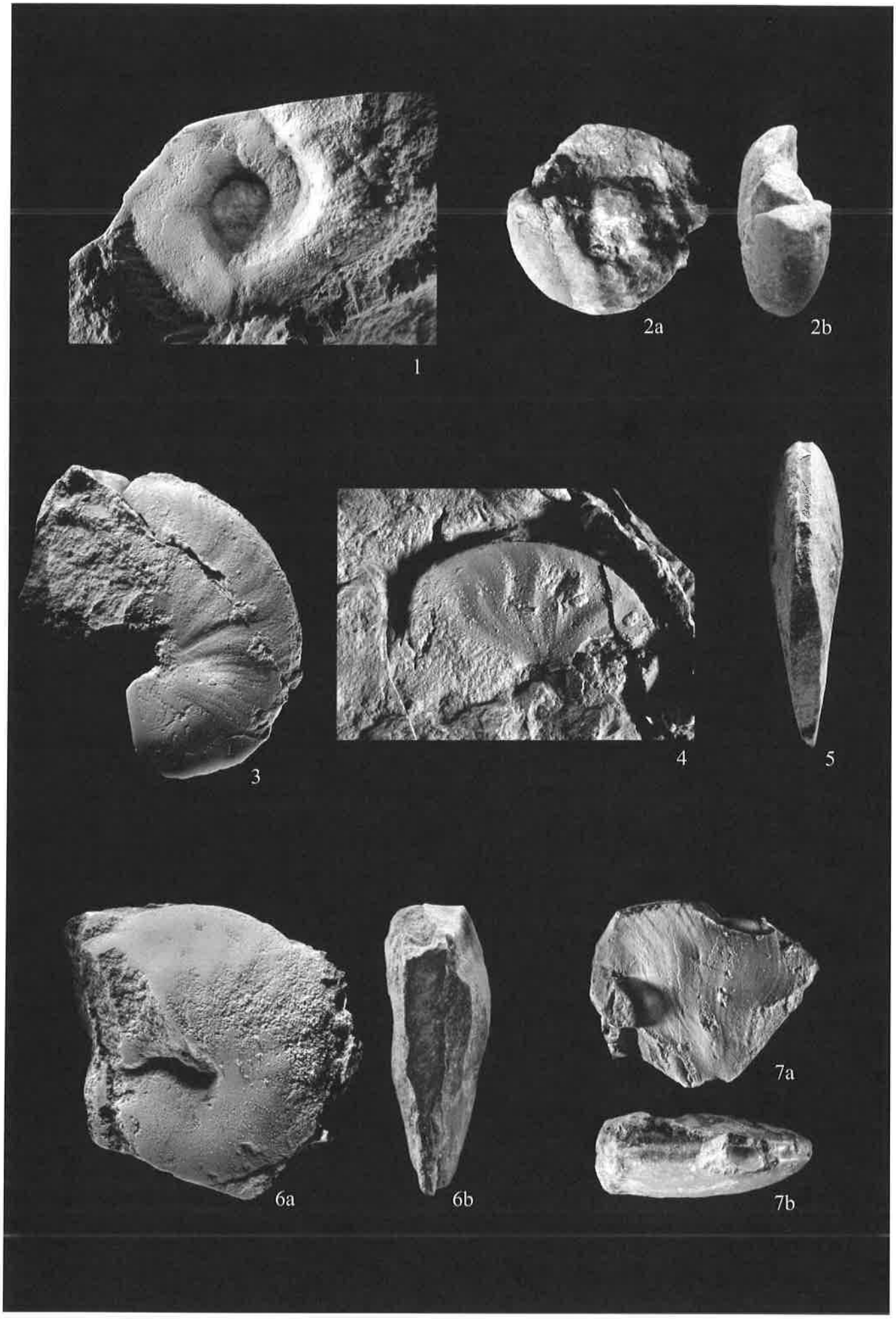
Figs. 3-5. *Stacheites floweri* Kummel. Locality : Hammond Creek, Bear Lake Valley, Idaho.

3. Nr. JGX-423. Lev. JGX-HC30. Diameter : 46 mm.
4. Nr. JGX-424. Lev. JGX-HC30. Height : 15 mm.
5. Nr. JGX-422. Lev. JGX-HC20. Diameter : 40 mm.

Fig. 6. *Stacheites concavus* Shevyrev. Nr. JGX-421. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 35 mm.

Fig. 7. *Stacheites* aff. *prionoides* Kittl. Nr. JGX-420. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Height : 16 mm.

**Plate III**



## Plate IV

Figs. 1-2. *Tirolites smithi* Kummel. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JHS-209c-135. Jenks Coll. Lev. JHSDE, Diameter : 65 mm.
2. Nr. JGX-136. Lev. JGX-HS6. Diameter : 19 mm.

Figs. 3-4. *Tirolites carniolicus ?* Mojsisovics. Locality : Cowboy Pass, Confusion Range, Utah.

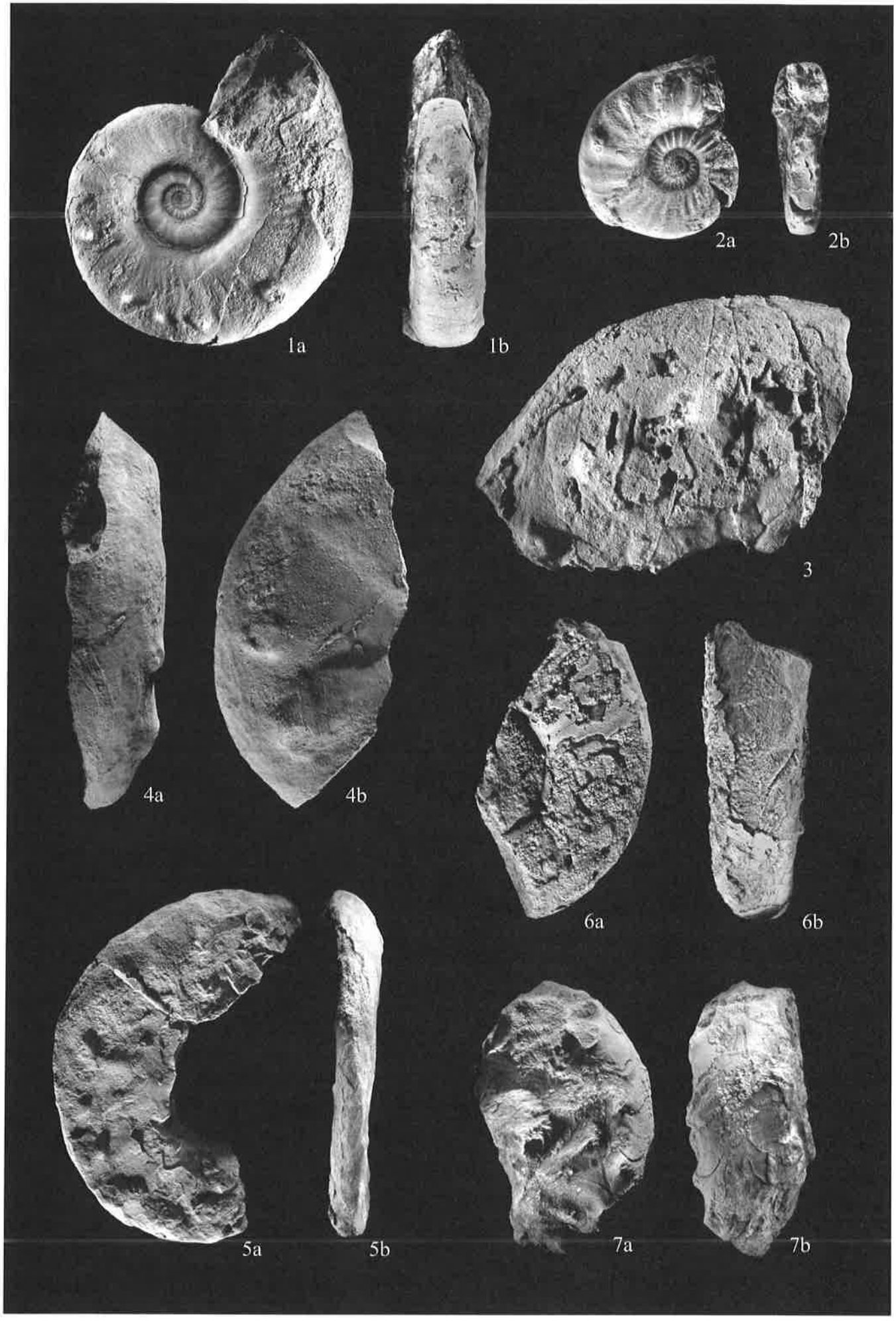
3. Nr. JGX-560. Lev. JGX-CR17. Height : 55 mm.
4. Nr. JGX-821. Lev. JGX-CR17. Height : 75 mm.

Fig. 5. *Tirolites* sp.indet.. Nr. JGX-561. Locality : Lev. JGX-CR15, Cowboy Pass, Confusion Range, Utah. Diameter : 100 mm.

Figs. 6-7. *Tirolites* aff. *smithi* Kummel. Locality : Cowboy Pass, Confusion Range, Utah.

6. Nr. JGX-564, Lev. JGX-CR9. Height : 15 mm.
7. Nr. JGX-562. Lev. JGX-CR6. Height : 18 mm.

**Plate IV**

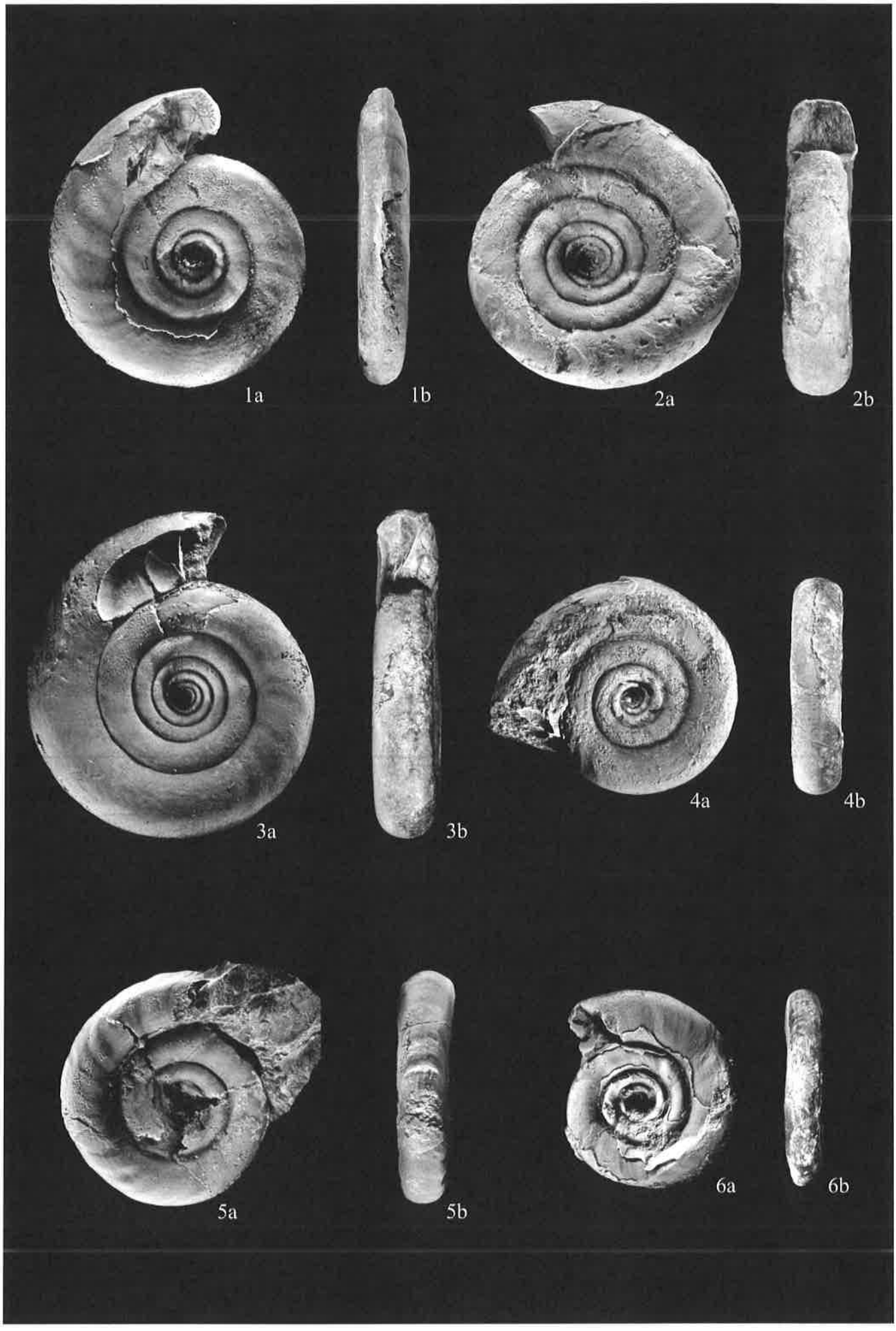


## Plate V

Figs. 1-6. *Rudolftruempyiceras* gen.nov. *apostolicum* (Smith). Locality : Figs. 1,4,5 and 6, Hot Springs, Bear Lake Valley, Idaho. Figs. 2 and 3, Paris Canyon, Bear Lake Valley, Idaho.

1. Nr. JHS-27c-47. Jenks Coll. Lev. JHSAB. Diameter : 33 mm.
2. Nr. JPC-29c-48. Jenks Coll. Lev. JPCAB. Diameter : 38 mm.
3. Nr. JPC-44c-49. Jenks Coll. Lev. JPCAB. Diameter : 43 mm.
4. Nr. JGX-52. Lev. JGX-BETA-HS2. Diameter : 31 mm.
5. Nr. JGX-50. Lev. JGX-HS4. Diameter : 31 mm.
6. Nr. JGX-51. Lev. JGX-HS5. Diameter : 25 mm.

**Plate V**

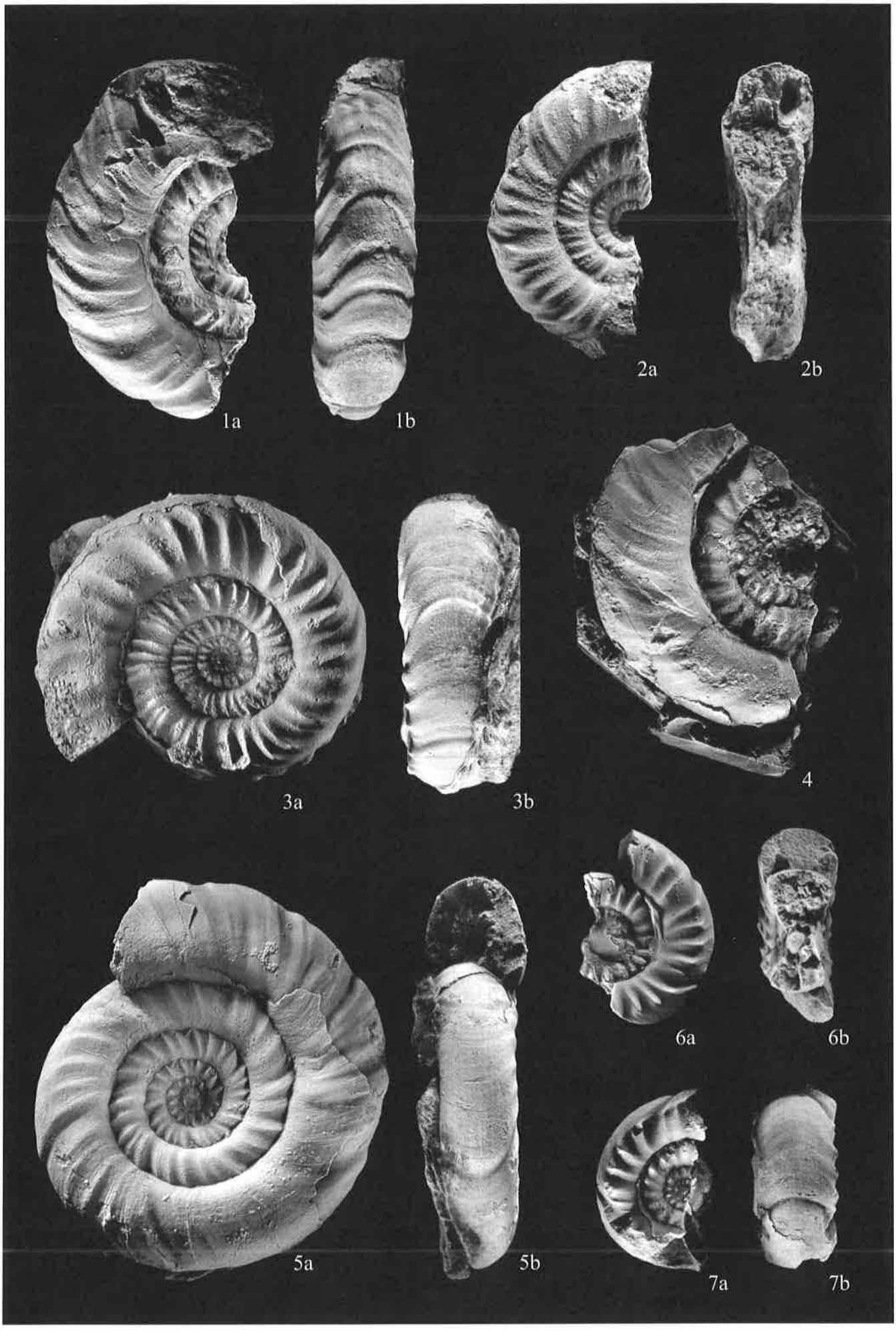


## Plate VI

Figs. 1-7. *Columbites parisianus* Hyatt & Smith. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-101. Lev. JGX-HS5. Height : 14 mm.
2. Nr. JGX-99. Lev. JGX-HS5. Diameter : 39 mm.
3. Nr. JGX-105. Lev. JGX-BETA-HS1. Diameter :43 mm.
4. Nr. JGX-100. Lev. JGX-HS5. Height : 13 mm.
5. Nr. JGX-104. Lev. JGX-BETA-HS1. Diameter : 50 mm.
6. Nr. JGX-102. Lev. JGX-HS5. Diameter : 25 mm.
7. Nr. JGX-103. Lev. JGX-HS5, Diameter : 23 mm.

**Plate VI**



## Plate VII

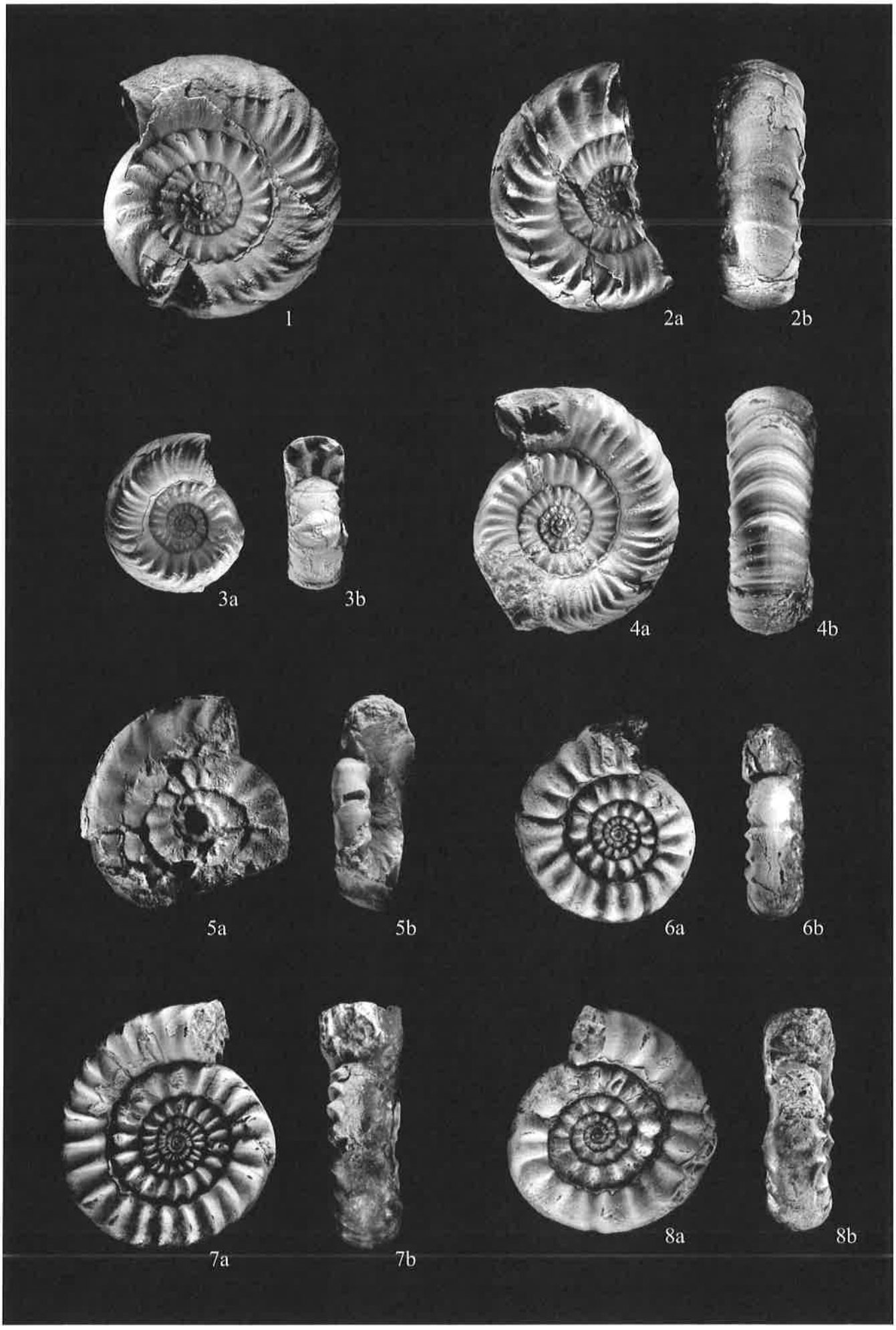
Figs. 1-4. *Columbites parisianus* Hyatt & Smith. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-107. Lev. JGX-BETA-HS1. Diameter : 32 mm.
2. Nr. JGX-106. Lev. JGX-BETA-HS1. Diameter : 32 mm.
3. Nr. JGX-108. Lev. JGX-BETA-HS1. Diameter : 20 mm.
4. Nr. JGX-109. Lev. JGX-BETA-HS1. Diameter : 31 mm.

Fig. 5. *Columbites* aff. *dolnapaensis* Kiparisova. Nr. JHS-1675c-63. Coll. Jenks . Locality : Lev. JHSC, Hot Springs, Bear Lake Valley, Idaho. Diameter : 23 mm.

Figs. 6-8. *Columbites crassicostatus* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

6. Nr. JHS-207c-65. Jenks Coll. Lev. JHSDE. Diameter : 25 mm.
7. holotype. Nr. JHS-268c-66. Jenks Coll. Lev. JHSDE. Diameter : 33 mm.
8. Nr. JHS-1680c-67. Jenks Coll. Lev. JHSDE. Diameter : 28 mm.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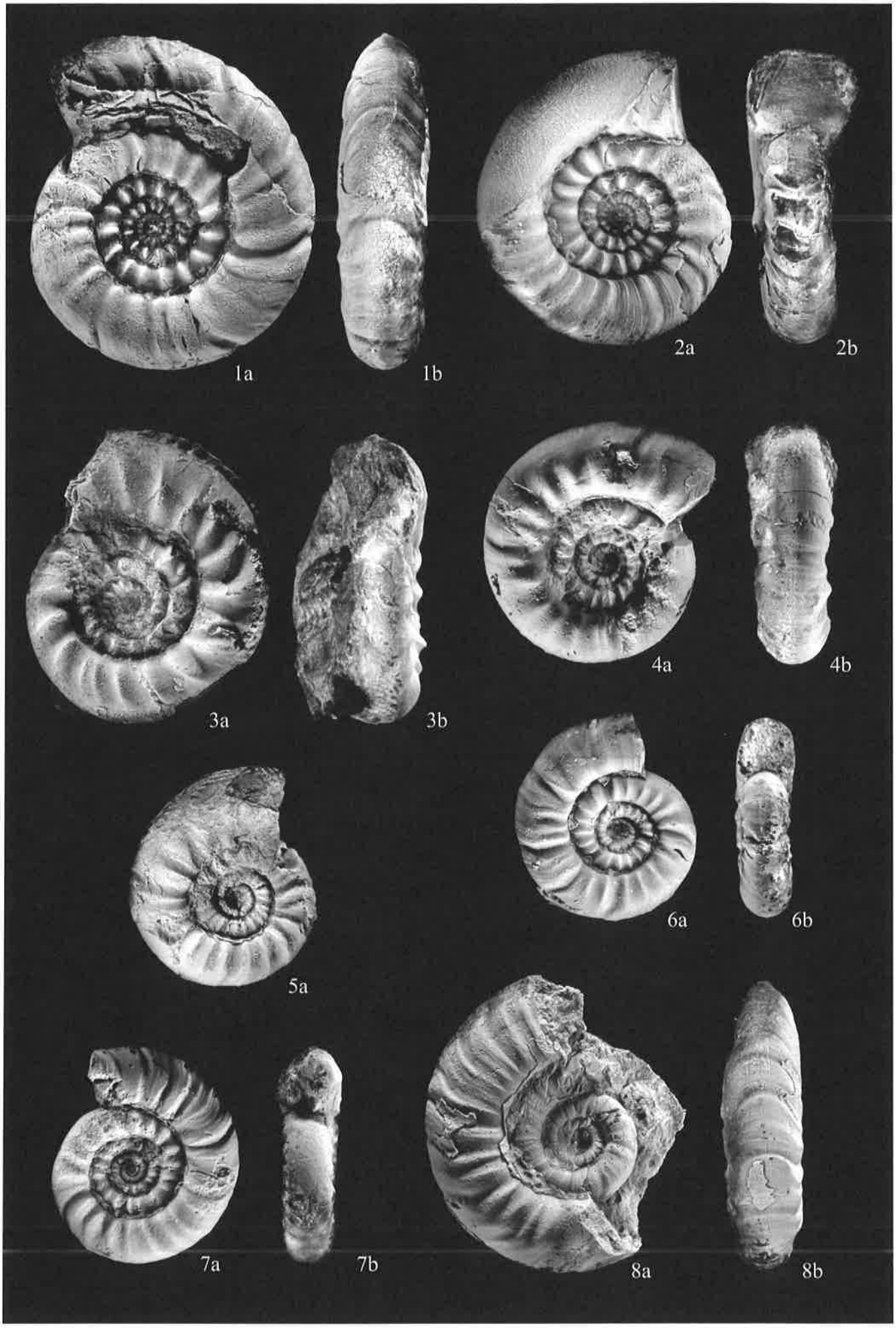
## Plate VIII

Figs. 1-11. *Columbites* aff. *minimus* Smith. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JHS-256c-72. Jenks Coll. Lev. JHSDE. Diameter : 37 mm.
2. Nr. JHS-205c-73. Jenks Coll. Lev. JHSDE. Diameter : 31 mm.
3. Nr. JGX-74. Lev. JGX-HS6, Diameter : 19 mm.
4. Nr. JGX-75. Lev. JGX-HS6. Diameter : 17 mm.
5. Nr. JGX-76. Lev. JGX-HS6. Diameter : 15 mm.
6. Nr. JGX-77. Lev. JGX-HS6. Diameter : 13 mm.
7. Nr. JGX-78. Lev. JGX-HS6. Diameter : 14 mm.
8. Nr. JGX-79. Lev. JGX-HS6. Diameter : 20 mm.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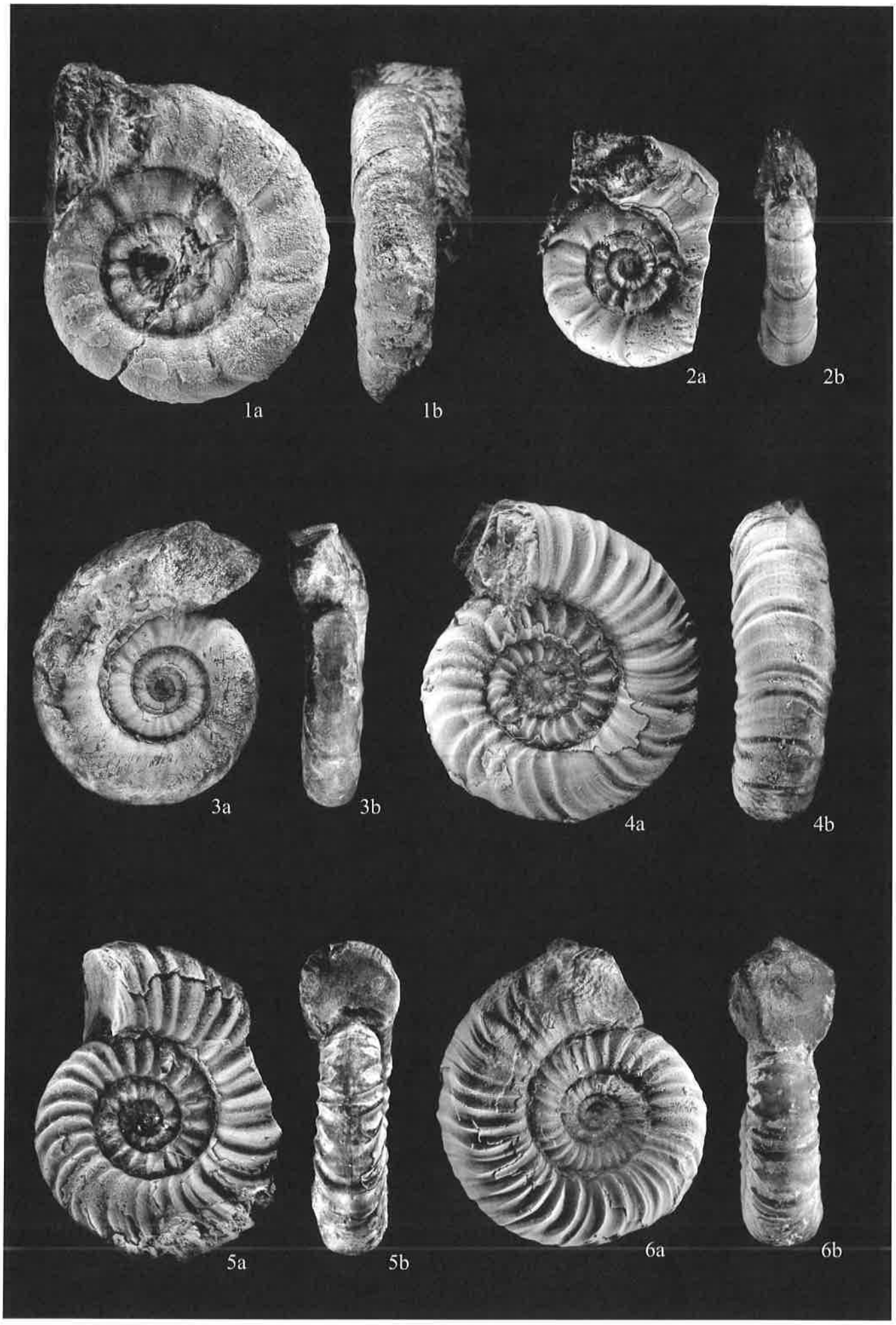
## Plate IX

Figs. 1-3. *Columbites* aff. *minimus* Smith. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-80. Lev. JGX-HS6. Diameter : 22 mm.
2. Nr. JGX-82. Lev. JGX-HS6. Diameter : 15 mm.
3. Nr. JGX-81. Ni.v. JGX-HS6. Diameter : 19 mm.

Figs. 4-6. *Columbites isabellae* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

4. holotype. Nr. JHS-1679c-83. Jenks Coll. Lev. JHSDE. Diameter : 23 mm.
5. Nr. JHS-1678c-84. Jenks Coll. Lev. JHSDE. Diameter : 27 mm.
6. Nr. JHS-169c-85. Jenks Coll. Lev. JHSDE. Diameter : 23 mm.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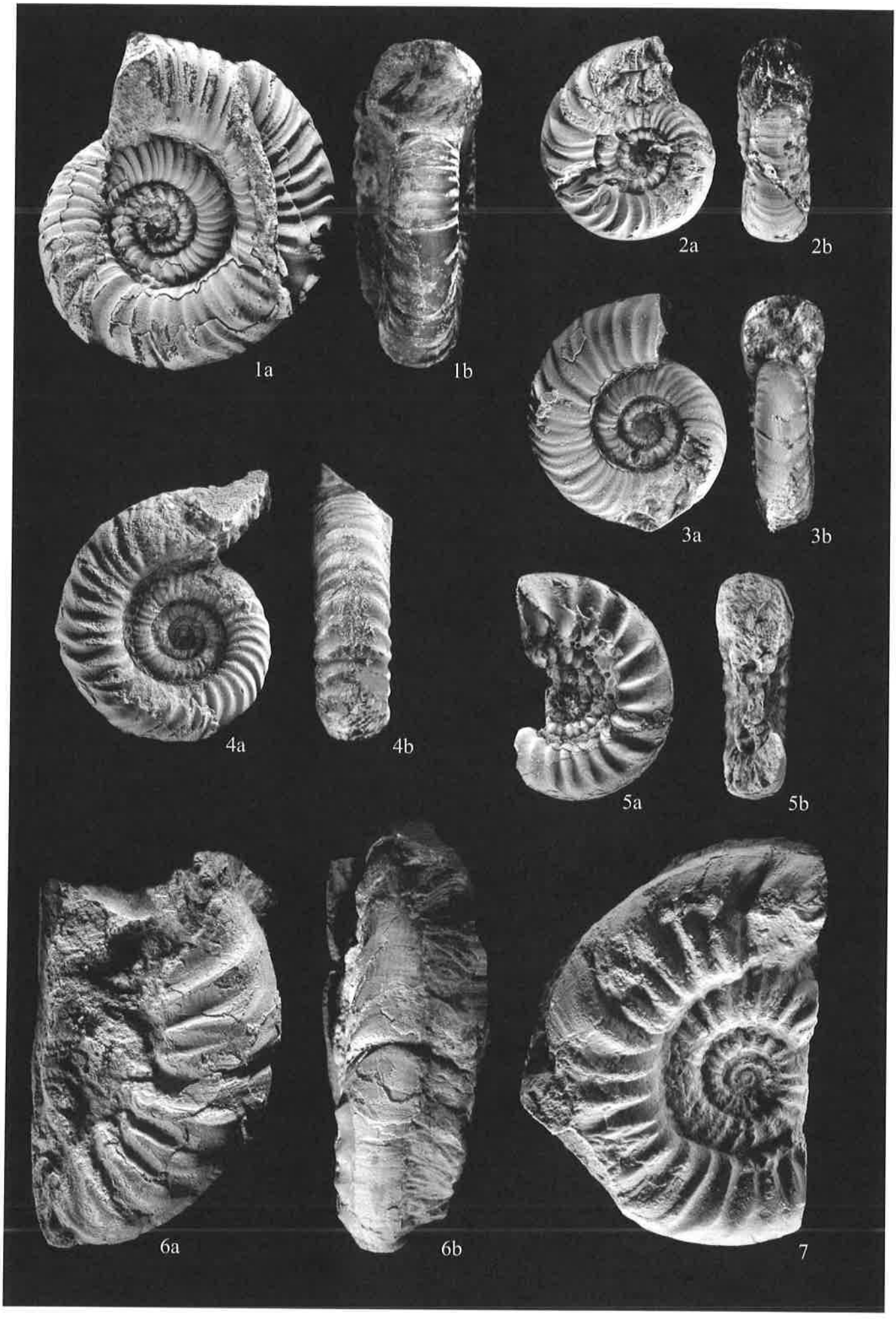
## Plate X

Figs. 1-4. *Columbites isabellae* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JHS-1677c-86. Jenks Coll. Lev. JHSDE. Diameter : 23 mm.
2. Nr. JGX-87. Lev. JGX-HS6. Diameter : 13 mm.
3. Nr. JGX-89. Lev. JGX-HS6. Diameter : 15 mm.
4. Nr. JGX-88. Lev. JGX-HS6. Diameter : 17 mm.

Figs. 5-7. *Idahocolumbites cheneyi* (Kummel). Locality : Hot Springs, Bear Lake Valley, Idaho.

5. Nr. JGX-90. Lev. JGX-HS6. Diameter : 15 mm.
6. Nr. JGX-93. Lev. JGX-HS6. Diameter : 29 mm.
7. Nr. JGX-92. Lev. JGX-HS6. Diameter : 29 mm.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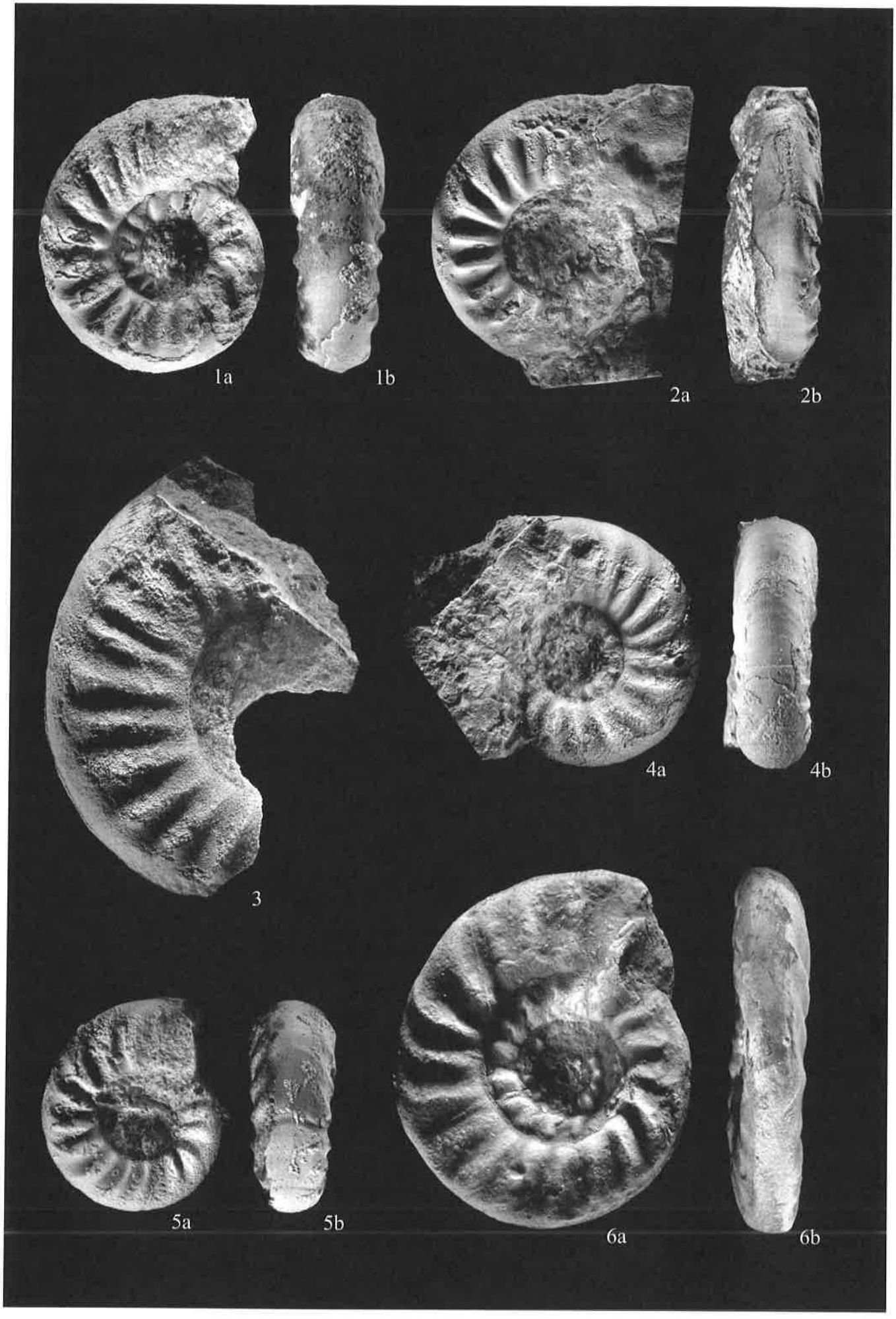
## Plate XI

Figs. 1-6. *Idahocolumbites cheneyi* (Kummel). Locality : Figs.1-5, Hot Springs, Bear Lake Valley, Idaho ; Fig. 6, Cowboy Pass, Confusion Range, Utah.

1. Nr. JGX-94. Lev. JGX-BETA-HS3'. Diameter : 18 mm.
2. Nr. JGX-98. Lev. JGX-BETA-HS3'. Diameter : 24 mm.
3. Nr. JGX-95. Lev. JGX-BETA-HS3'. Height : 9 mm.
4. Nr. JGX-97. Lev. JGX-BETA-HS3'. Diameter : 19 mm.
5. Nr. JGX-96. Lev. JGX-BETA-HS3'. Diameter : 14 mm.
6. Nr. JGX-575. Lev. JGX-CR2. Diameter : 32 mm.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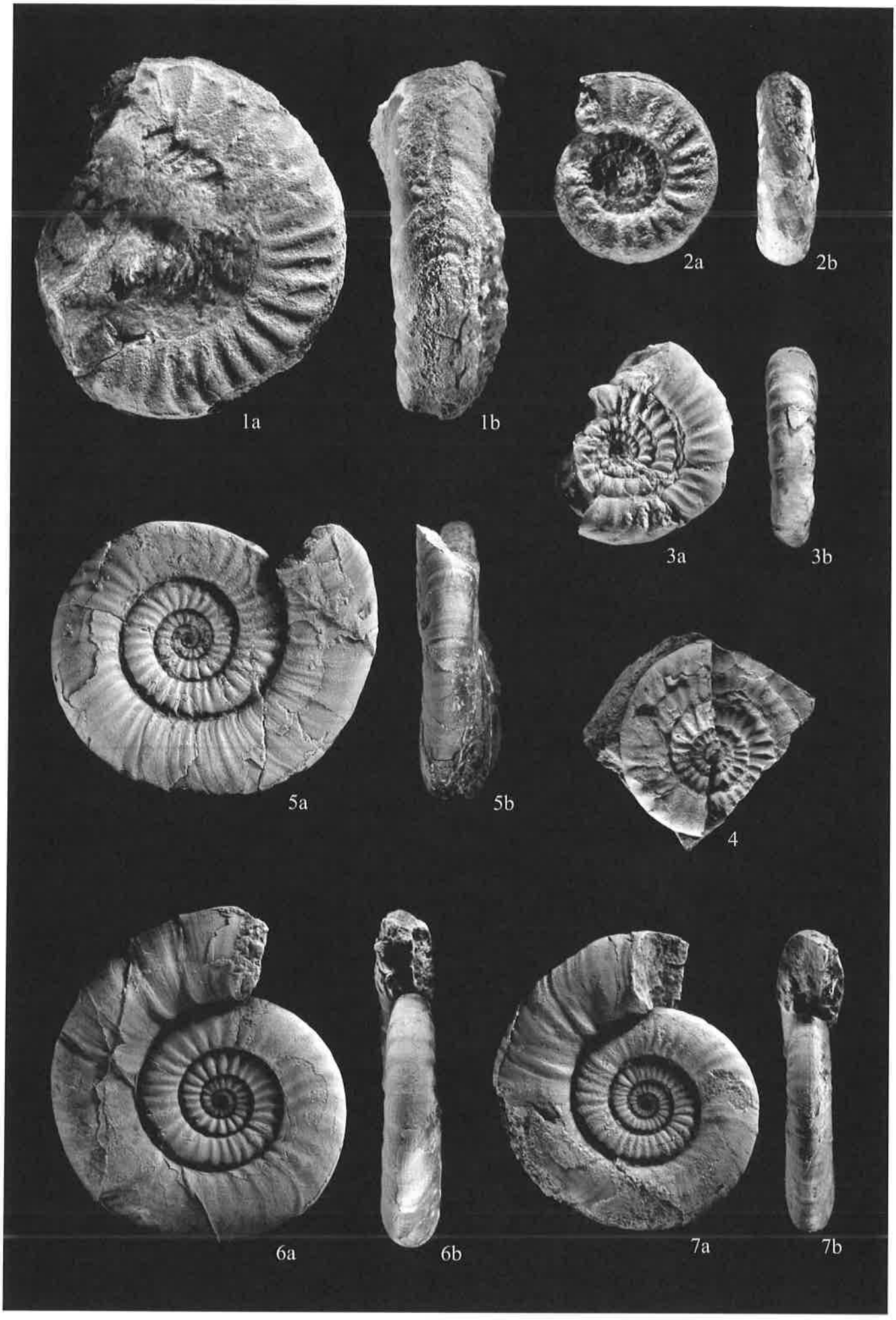
## Plate XII

Figs. 1-2. *Idahocolumbites cheneyi* (Kummel). Locality : Cowboy Pass, Confusion Range, Utah.

1. Nr. JGX-576. Lev. JGX-CR6'. Diameter : 35 mm.
2. Nr. JGX-577. Lev. JGX-CR2'. Diameter : 19 mm.

Figs. 3-7. *Yvesgalleticeras montpelierense* (Kummel). Locality : Hot Springs, Bear Lake Valley, Idaho.

3. Nr. JGX-61. Lev. JGX-HS4. Diameter : 29 mm.
4. Nr. JGX-62. Lev. JGX-HS4. Diameter : 26 mm.
5. Nr. JHS-1690c-57. Jenks Coll. Lev. JHSA. Diameter : 48 mm.
6. Nr. JHS-134c-58. Jenks Coll. Lev. JHSA. Diameter : 48 mm.
7. Nr. JHS-200c-59. Jenks Coll.Lev. JHSA. Diameter : 44 mm.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## Plate XIII

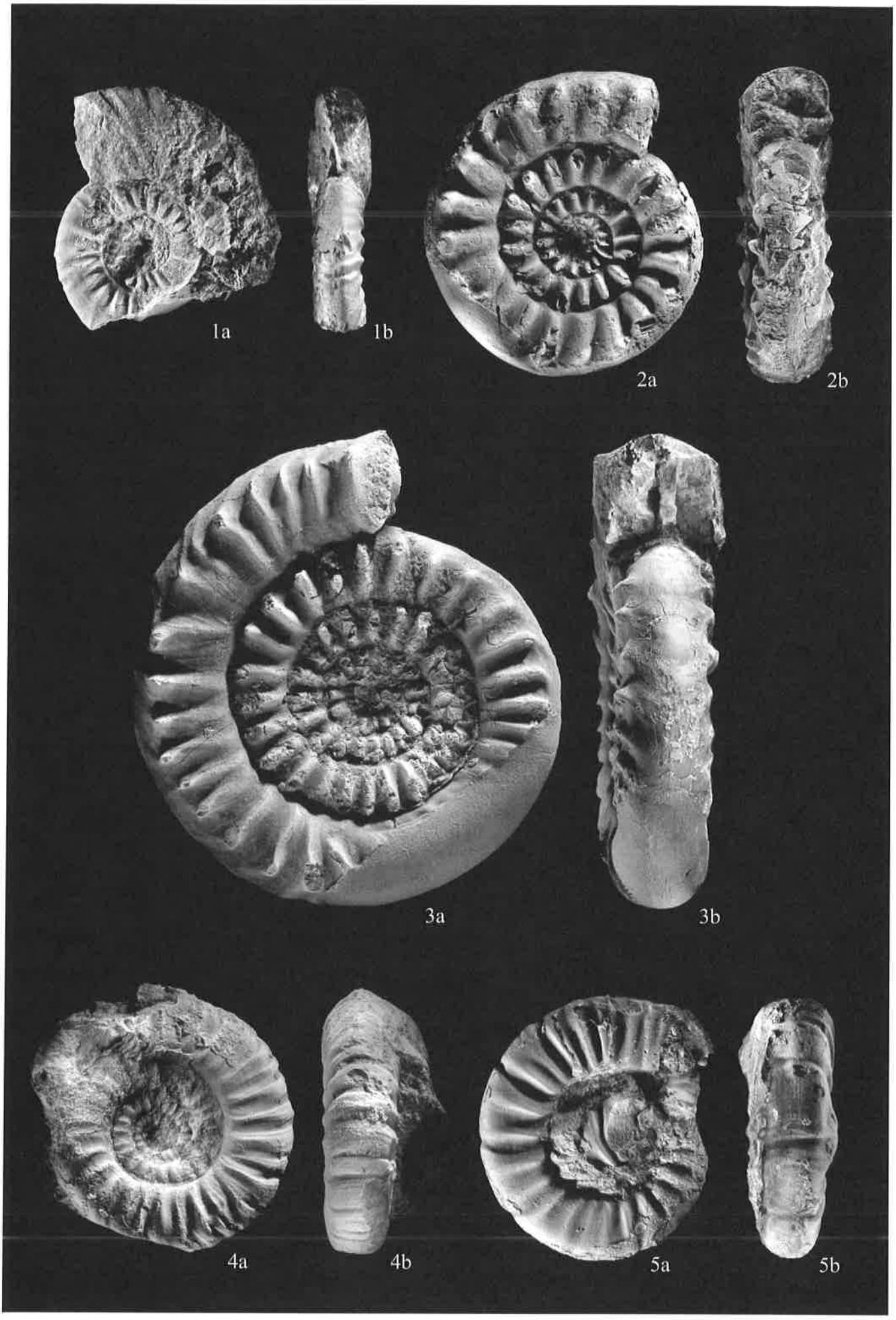
Fig. 1. *Yvesgalleticeras raphaeli* sp.nov., holotype. Nr. JGX-26. Locality : Lev. JGX-HS6, Hot Springs, Bear Lake Valley, Idaho. Diameter : 33 mm.

Figs. 2-3. *Marcouxia astakhovi* (Kummel). Locality : Lev. JHSDE, Hot Springs, Bear Lake Valley, Idaho.

2. Nr. JHS-210c-70. Jenks Coll. Diameter : 48 mm.
3. Nr. JHS-167c-71. Jenks Coll. Diameter : 66 mm.

Figs. 4-5. *Procolumbites karataucicus* Astachova. Locality : Hammond Creek, Bear Lake Valley, Idaho.

4. Nr. JGX-529. Lev. JGX-BETA-HC. Diameter : 41 mm.
5. Nr. JGX-530. Lev. JGX-BETA-HC. Diameter : 42 mm.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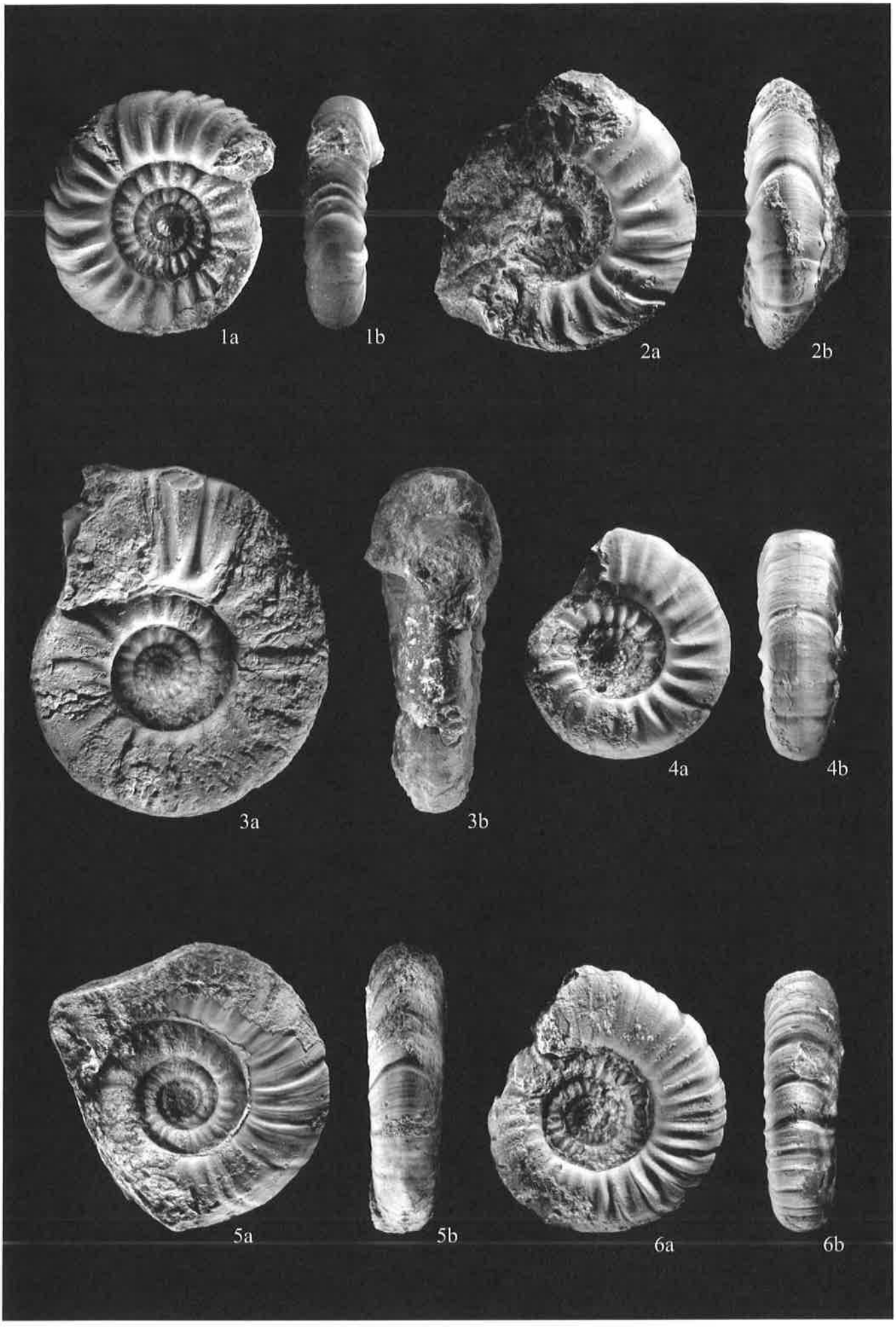
## Plate XIV

Figs. 1-6. *Procolumbites karataucicus* Astachova. Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-531. Lev. JGX-BETA-HC. Diameter : 32 mm.
2. Nr. JGX-532. Lev. JGX-BETA-HC. Diameter : 37 mm.
3. Nr. JGX-534. Lev. JGX-GAMMA-HC. Diameter : 47 mm.
4. Nr. JGX-536. Lev. JGX-GAMMA-HCX. Diameter : 32 mm.
5. Nr. JGX-535. Lev. JGX-GAMMA -HC. Diameter : 38 mm.
6. Nr. JGX-537. Lev. JGX-GAMMA -HCX. Diameter : 34 mm.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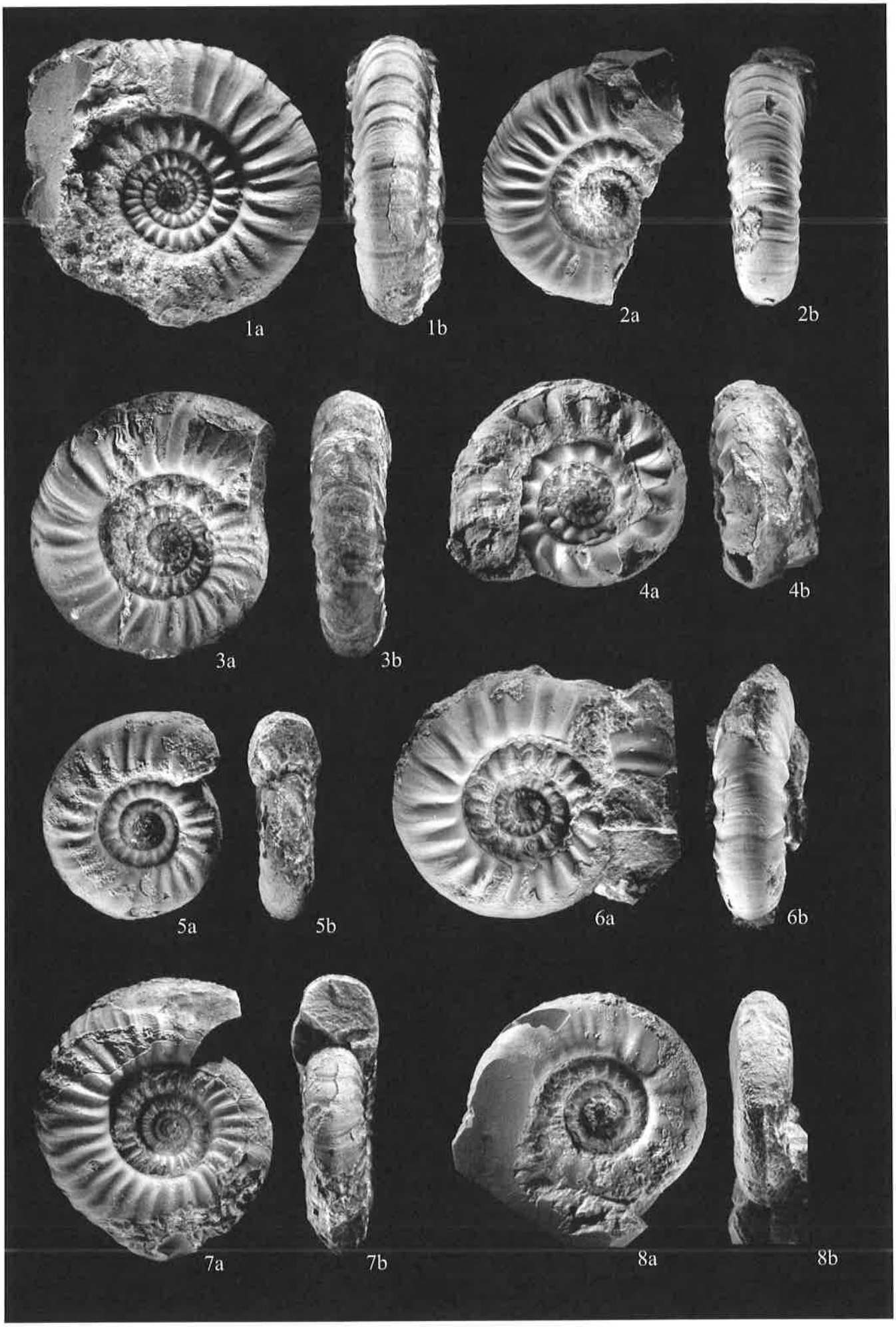
## Plate XV

Figs. 1-8. *Procolumbites karataucicus* Astachova. Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-538. Lev. JGX-GAMMA-HCX. Diameter : 39 mm.
2. Nr. JGX-539. Lev. JGX-GAMMA-HCX. Diameter : 33 mm.
3. Nr. JGX-541. Lev. JGX-GAMMA-HCX. Diameter : 34 mm.
4. Nr. JGX-517. Lev. JGX-BETA-HC1. Diameter : 33 mm.
5. Nr. JGX-542. Lev. JGX-BETA-HC1. Diameter : 27 mm.
6. Nr. JGX-514. Lev. JGX-GAMMA-HCX. Diameter : 34 mm.
7. Nr. JGX-516. Lev. JGX-BETA-HC1. Diameter : 35 mm.
8. Nr. JGX-515. Lev. JGX-BETA-HC1. Diameter : 32 mm.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## Plate XVI

Figs. 1-2. *Procolumbites karataucicus* Astachova. Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-545. Lev. JGX-BETA-HC. Diameter : 28 mm.
2. Nr. JGX-543. Lev. JGX-BETA-HC1. Diameter : 17 mm.

Fig. 3. *Neocolumbites* sp. indet.. Nr. JGX-518. Locality : Lev. JGX-BETA-HC1, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 31 mm.

Fig. 4. *Glabercolumbites glaber* Guex et al., holotype. Nr. JGX-403. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 32 mm.

Fig. 5. *Tardicolumbites tardicolumbus* Guex et al., holotype. Nr. JGX-402. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 24 mm.

Figs.6-7. *Hellenites elegans* Guex et al. Locality : Hammond Creek, Bear Lake Valley, Idaho.

6. Nr. JGX-503bis. Lev. JGX-ALPHA-HC. Diameter : 12 mm.
7. holotype. Nr. JGX-503. Lev. JGX-ALPHA-HC2, Diameter : 24 mm.

Fig.8. *Hellenites idahoense* (Smith). Nr. JPC-182c-137. Jenks Coll. Locality : Lev. JPCDE equiv., Paris Canyon, Bear Lake Valley, Idaho. Probably from a *Columbites parisianus* fauna. Diameter : 38 mm.


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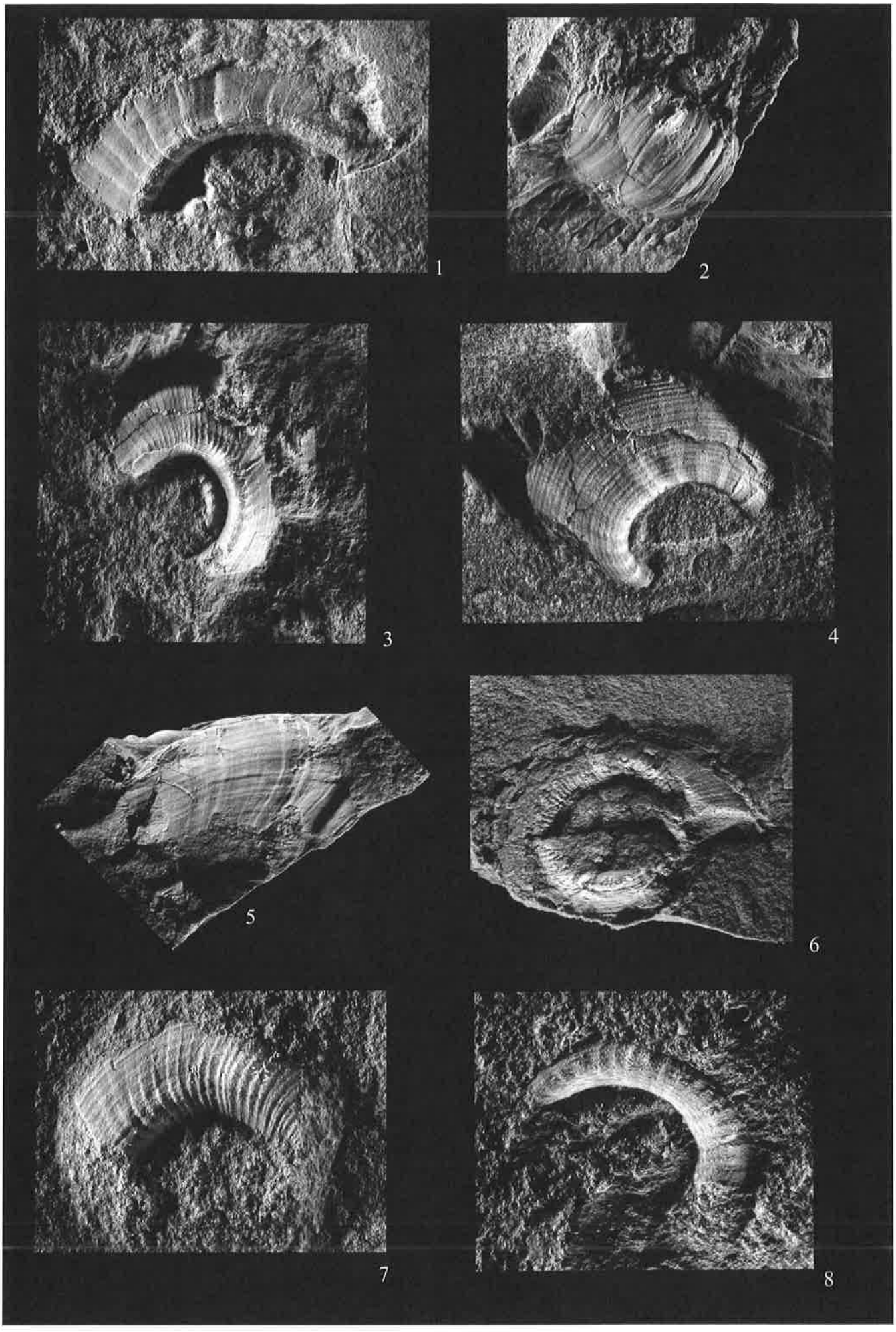
## Plate XVII

Figs. 1-5. *Fengshanites americanus* (Kummel). Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-447. Lev. JGX-HC18. max. Dimension : 45 mm.
2. Nr. JGX-448. Lev. JGX-HC18. max. Dimension : 27 mm.
3. Nr. JGX-450. Lev. JGX-HC18. Diameter : min. 20 mm.
4. Nr. JGX-451. Lev. JGX-HC18. Diameter : min. 26 mm.
5. Nr. JGX-449. Lev. JGX-HC18. max. Dimension : 30 mm.

Figs. 6-8. *Subcolumbites* aff. *perrinismithi* (Arthaber). Locality : Hammond Creek, Bear Lake Valley, Idaho.

6. Nr. JGX-442. Lev. JGX-HC18. Diameter : appx. 24 mm.
7. Nr. JGX-443. Lev. JGX-HC18. Height : 8 mm.
8. Nr. JGX-444. Lev. JGX-HC16. Diameter : 16 mm.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## Plate XVIII

Figs. 1-3. *Paragoceras* aff. *timorensis* Spath. Locality : Hammond Creek, Bear Lake Valley, Idaho.

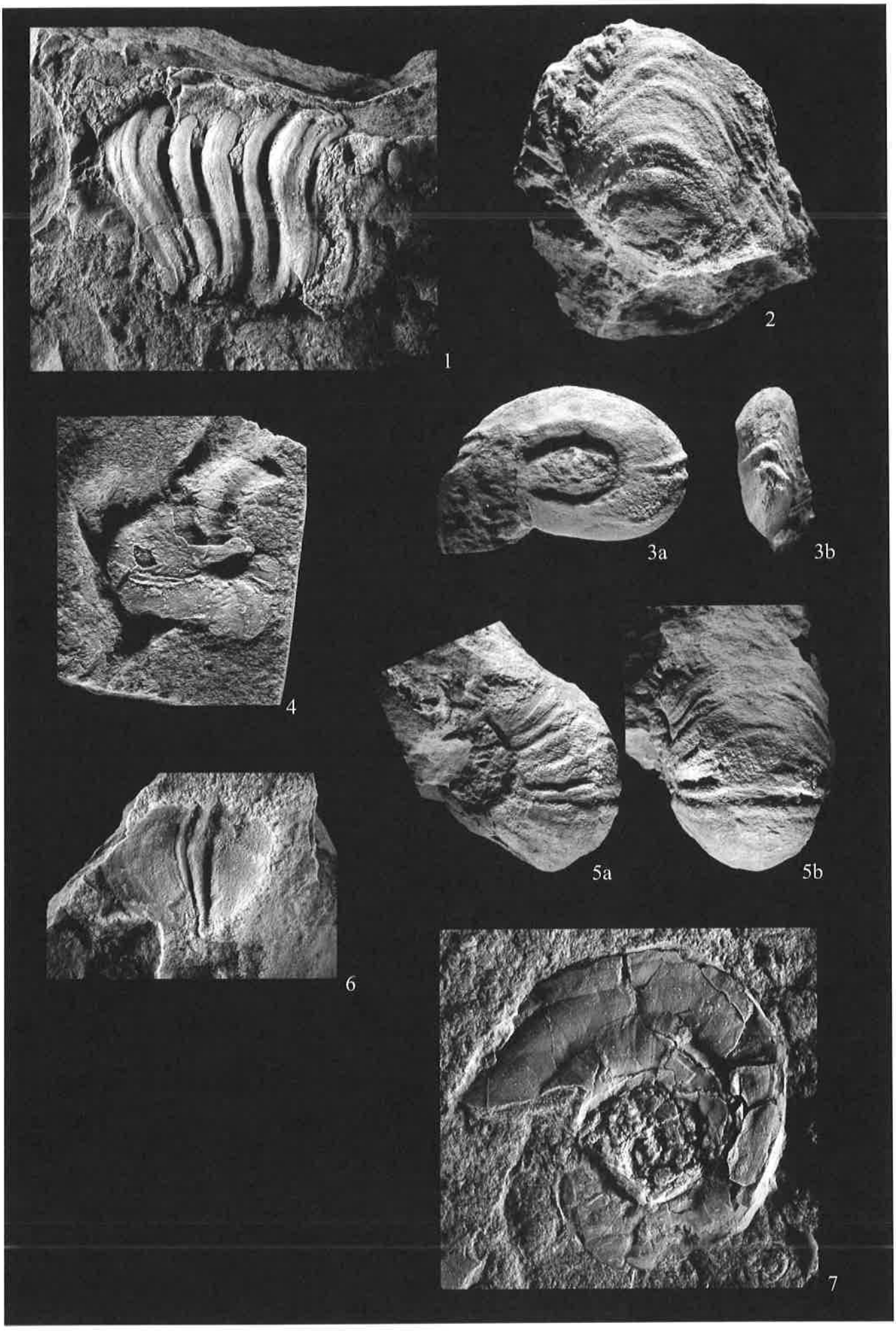
1. Nr. JGX-453bis. Lev. JGX-HC18. max. Dimension : 22 mm.
2. Nr. JGX-457bis. Lev. JGX-HC11. Width : 21 mm.
3. Nr. JGX-457. Lev. JGX-HC11. Diameter : 22 mm.

Fig. 4. *Paragoceras* sp.indet 1. Nr. JGX-453. Locality : Lev. JGX-HC18, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 16 mm.

Fig. 5. *Paragoceras* cf. *malayanus* (Renz & Renz). Nr. JGX-456. Locality : Lev. JGX-HC11, Hammond Creek, Bear Lake Valley, Idaho. Width : 15 mm.

Fig. 6. *Paragoceras* sp.indet.2. Nr. JGX-454. Locality : Lev. JGX-HC11, Hammond Creek, Bear Lake Valley, Idaho. max. Dimension : 18 mm.

Fig. 7. *Metadagnoceras ?* aff. *pulchrum* Tozer. Nr. JGX-439. Locality : Lev. JGX-HC18, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 37 mm.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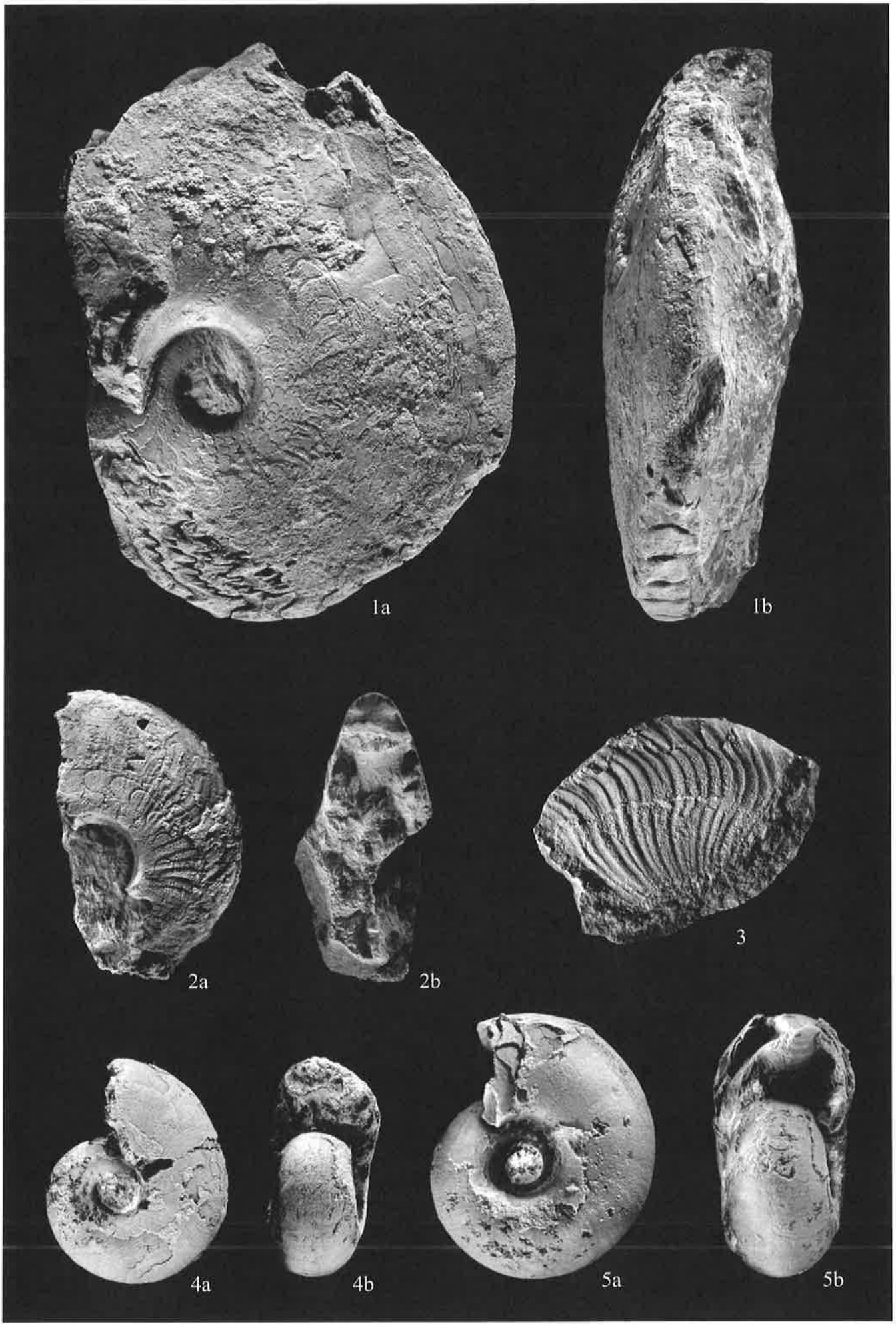
## Plate XIX

Figs. 1-3. *Metadagnoceras unicum* Kiparisova. Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-551. Lev. JGX-BETA-HC1. Diameter : 121 mm.
2. Nr. JGX-552. Lev. JGX-BETA-HC1. Diameter : 37 mm.
3. Nr. JGX-553. Lev. JGX-BETA-HC2. Height : 22 mm.

Figs. 4-5. *Neopopanoceras haugi* (Hyatt & Smith). Locality : Union Wash, Inyo Range, California.

4. Nr. JGX-1020. Lev. JGX-UWH Diameter : 19 mm.
5. Nr. JGX-1023. Lev. JGX-UWH. Diameter : 23 mm.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## Plate XX

Fig. 1. *Sibirites carinatus* Guex et al., holotype. Nr. JHS-290c-138. Jenks Coll. Locality : Lev. JHSDE, Hot Springs, Bear Lake Valley, Idaho. Diameter : 20 mm.

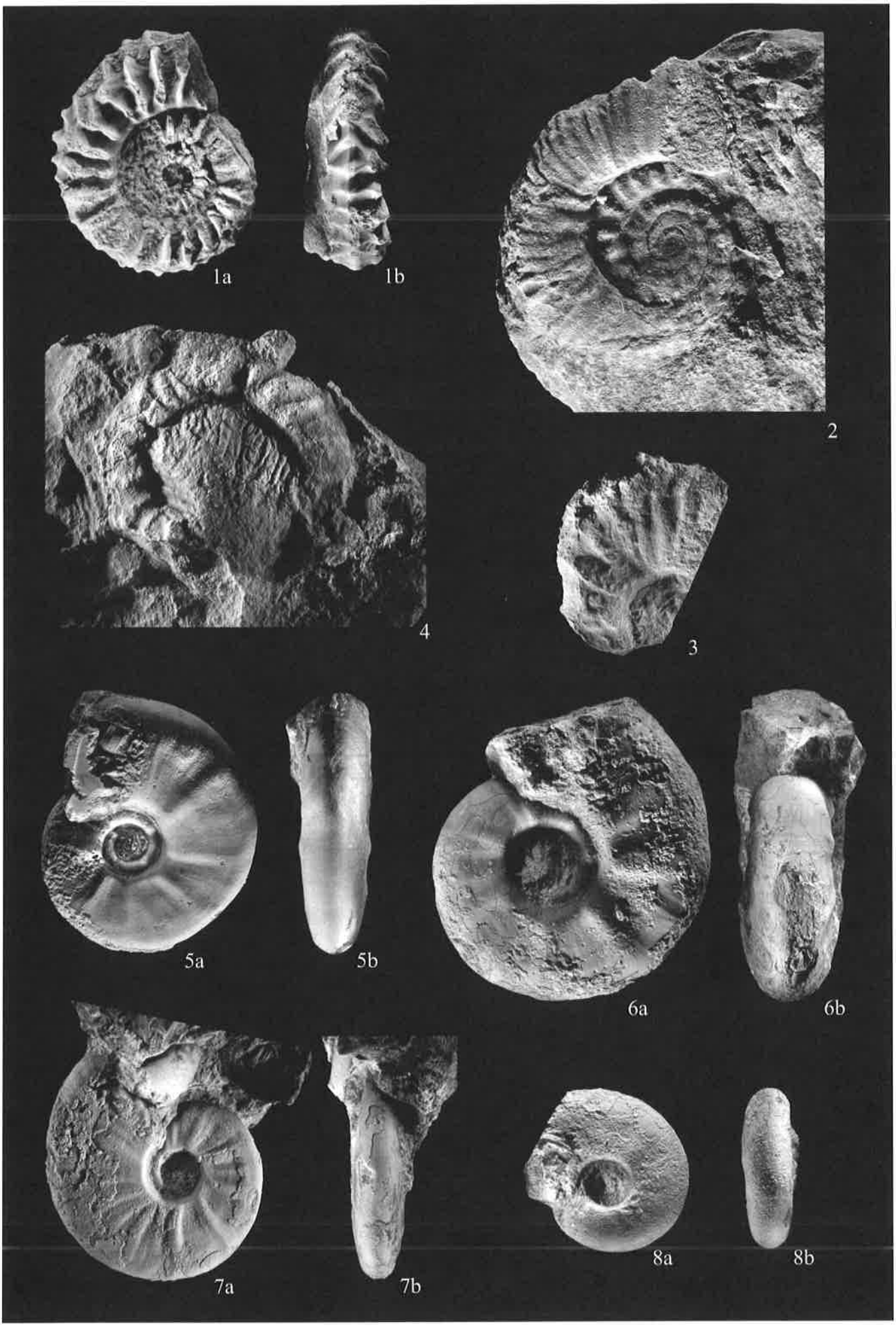
Fig. 2. *Sibirites* sp.indet.1. Nr. JGX-438. Locality : Lev. JGX-HC20, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 37 mm.

Fig. 3. *Sibirites* sp.indet.2. Nr. JGX-434. Locality : Lev. JGX-HC20, Hammond Creek, Bear Lake Valley, Idaho. Height : 17 mm.

Fig. 4. *Praesibirites ?* sp.indet. Nr. JGX-431. Locality : Lev. JGX-HC20, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 34 mm.

Figs. 5-8. *Kazakhstanites dolnapensis* Shevyrev. Locality : Hammond Creek, Bear Lake Valley, Idaho.

5. Nr. JGX-525. Lev. JGX-GAMMA-HCX. Diameter : 34 mm.
6. Nr. JGX-524. Lev. JGX-BETA-HC1. Diameter : 43 mm.
7. Nr. JGX-554. Lev. JGX-BETA-HC. Diameter : 35 mm.
8. Nr. JGX-555. Lev. JGX-BETA-HC1. Diameter : 19 mm.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## Plate XXI

Figs. 1-2. *Kazakhstanites dolnapensis* Shevyrev. Locality : Hammond Creek, Bear Lake Valley, Idaho.

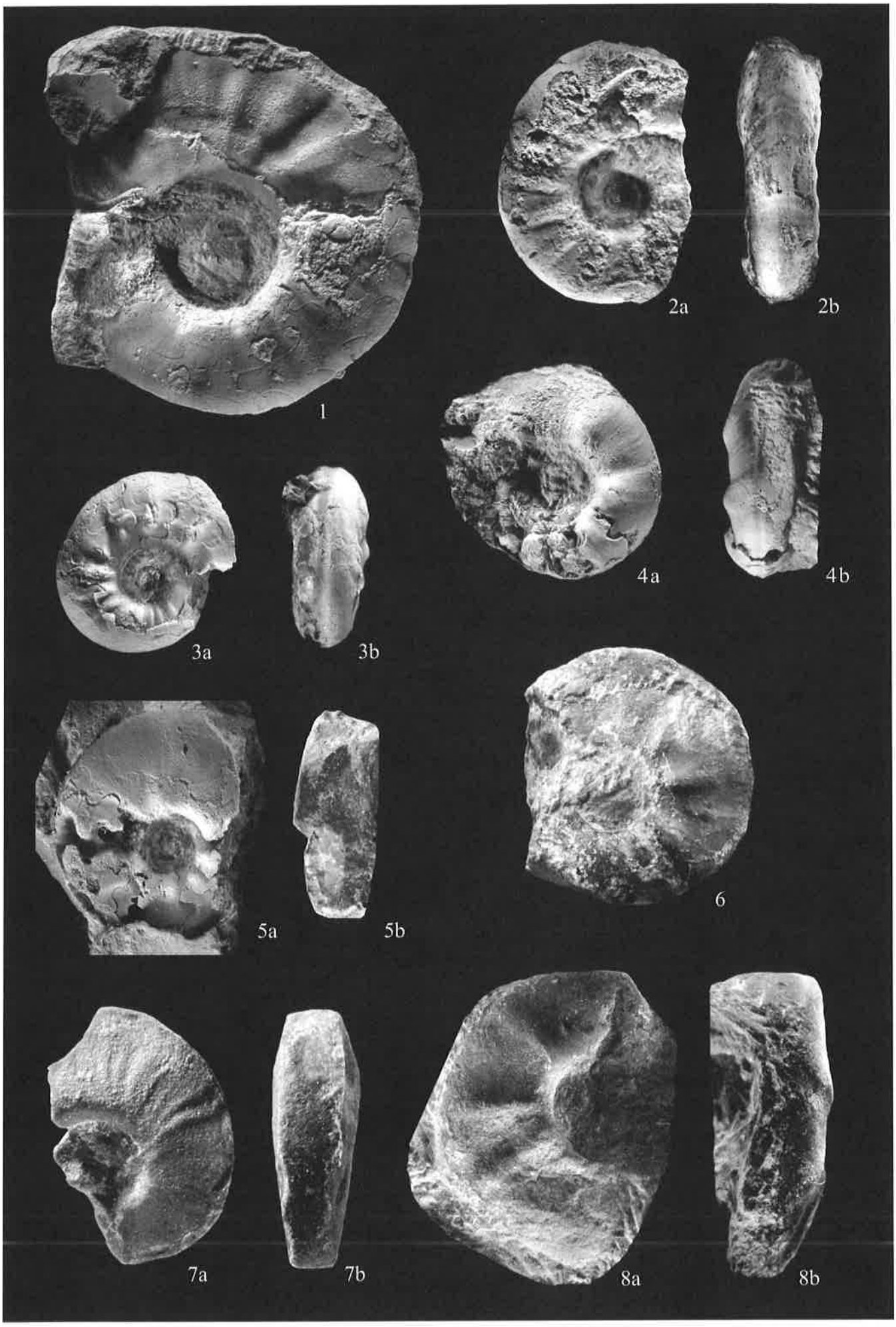
1. Nr. JGX-544. Lev. JGX-BETA-HC. Diameter : 54 mm
2. Nr. JGX-546. Lev. JGX-BETA-HC. Diameter : 26 mm.

Figs. 3-6. *Svalbardiceras sulcatum* Guex et al.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

3. Nr. JGX-426. Lev. JGX-HC30. Diameter : 11 mm.
4. Nr. JGX-427. Lev. JGX-HC30. Diameter : appx. 32 mm.
5. holotype. Nr. JGX-428. Lev. JGX-HC30. Diameter : appx. 23 mm.
6. Nr. JGX-429. Lev. JGX-HC30. Diameter : 25 mm.

Fig. 7. *Svalbardiceras* cf. *freboldi* Tozer. Nr. JGX-464 . Locality : Lev. JGX-HC9, Hammond Creek, Bear Lake Valley, Idaho. Diameter : appx. 22 mm.

Fig. 8. *Svalbardiceras* aff. *spitzbergensis* (Frebold). Nr. JGX-441. Locality : Lev. JGX-HC20, Hammond Creek, Bear Lake Valley, Idaho. Diameter : appx. 27 mm.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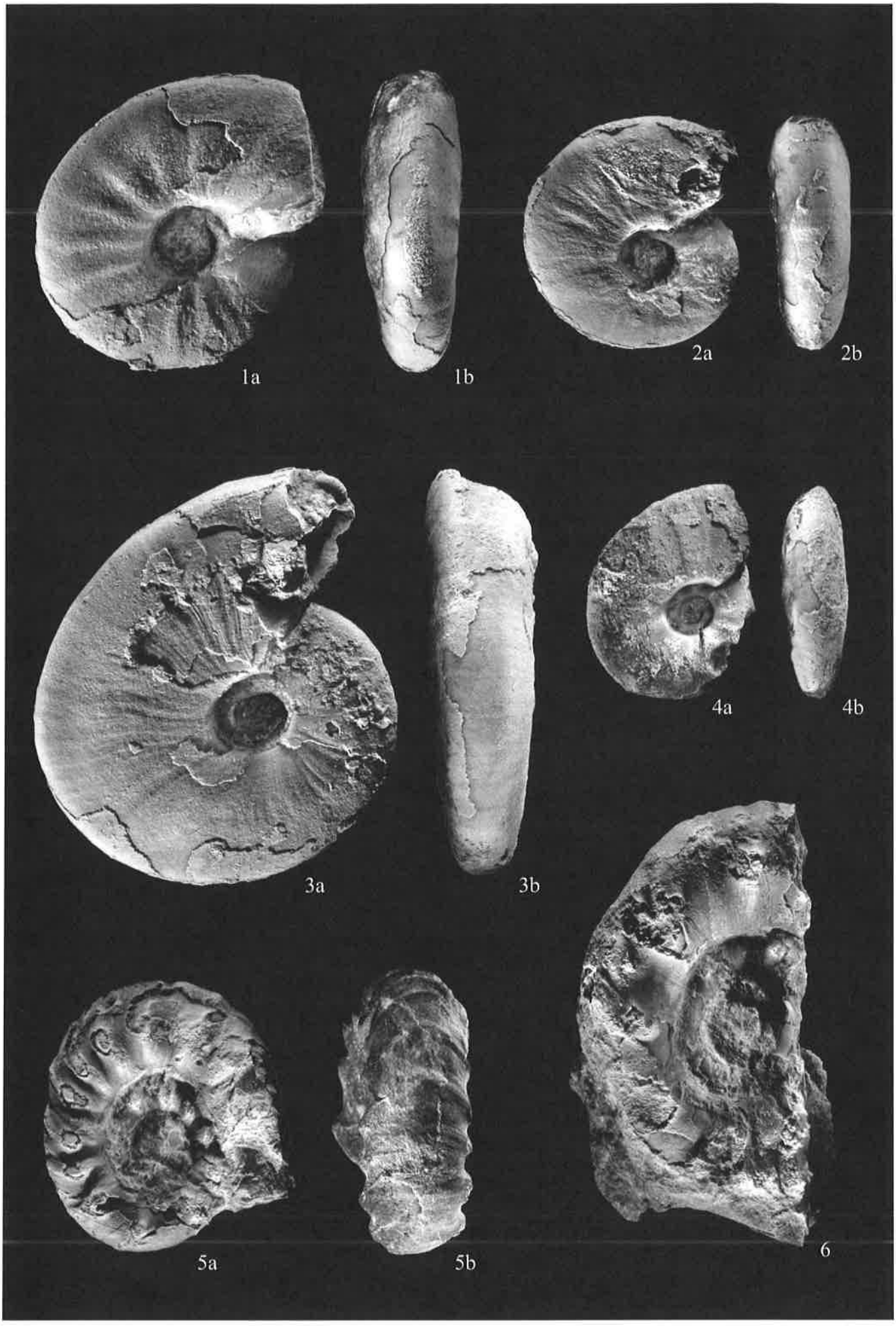
## Plate XXII

Figs. 1-4. *Pseudosvalbardiceras* ? *humboldtense* Guex et al.. Locality : northern Humboldt Range, Nevada.

1. Nr. JGX-1006. Lev. JGX-NHR-2823A. Diameter : 27 mm.
2. Nr. JGX-1003. Lev. JGX-NHR-2823A. Diameter : 22 mm.
3. holotype. Nr.JGX-1002. Lev. JGX-NHR-2823A. Diameter : 35 mm.
4. Nr. JGX-1013. Lev. JGX-NHR-2823A. Diameter : 17 mm.

Figs. 5-6. *Keyserlingites pacificus* (Hyatt & Smith). Locality : Union Wash, Inyo Range, California.

5. Nr. JGX-1022. Lev. JGX UWH. Diameter : 24 mm.
6. Nr. JGX-1034. Lev. JGX UWK. Diameter : 38 mm.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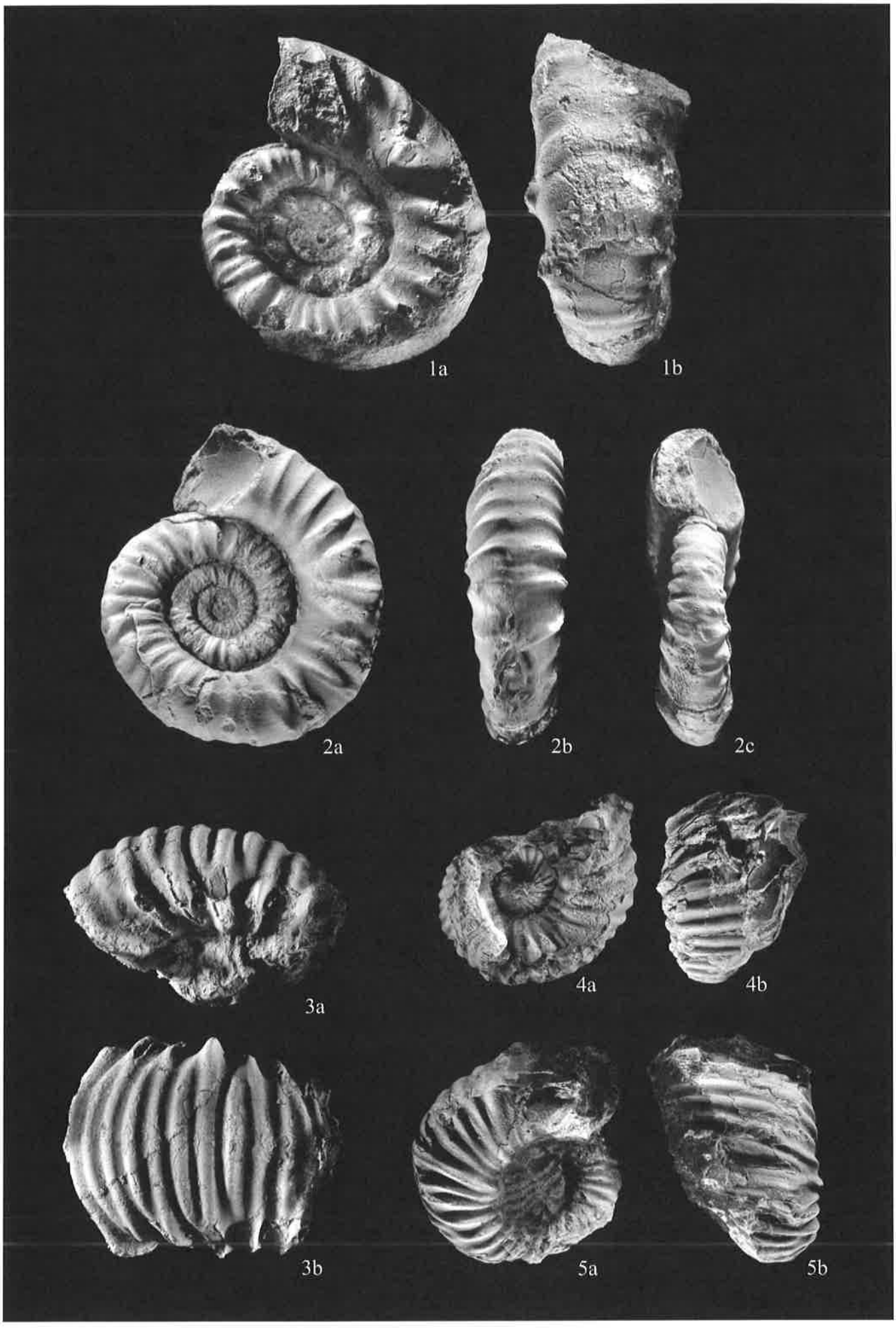
## Plate XXIII

Fig. 1. *Keyserlingites pacificus* (Hyatt & Smith). Nr. JGX-1039 Locality : Lev. JGX-UWK, Union Wash, Inyo Range, California. Diameter : 28 mm.

Fig. 2. *Goricanites noblei* Guex et al., holotype. Nr. PIMZ 24403. Coll. Noble. Locality : Lev. JGX-UWH, Union Wash, Inyo Range, California. Diameter : 32 mm.

Figs. 3-5. *Pseudacrochordiceras inyoense* (Smith). Locality : Union Wash, Inyo Range, California.

3. Nr. JGX-1015. Lev. JGX-UWH. Width : 31 mm.
4. Nr. JGX-1024. Lev. JGX-UWH. Diameter : 27 mm.
5. Nr. JGX-1025. Lev. JGX-UWH. Diameter : 28 mm.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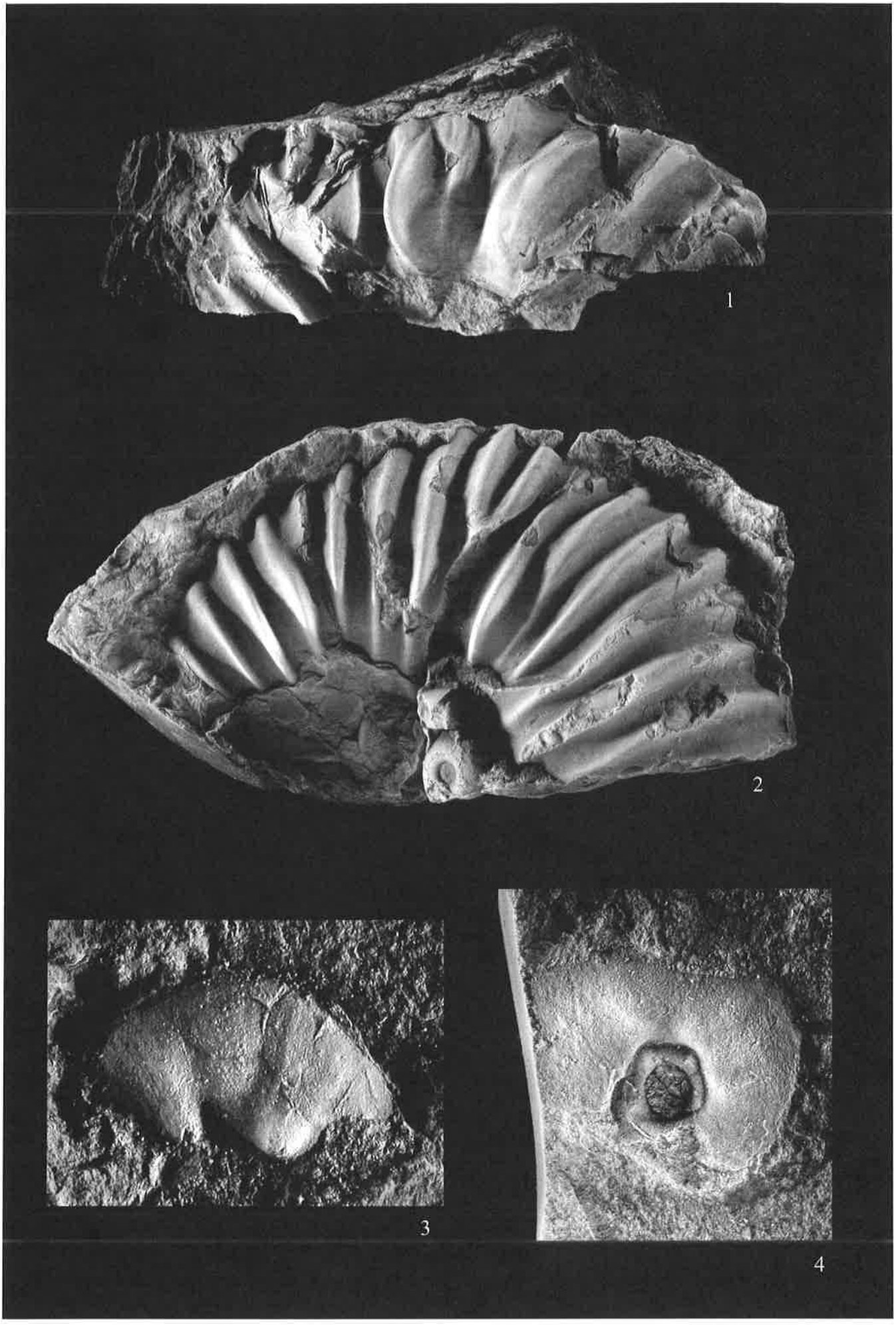
## Plate XXIV

Figs. 1-2. *Pseudacrochordiceras inyoense* (Smith). Locality : Union Wash, Inyo Range, California.

1. Nr. JGX-1017. Lev. JGX-UWH. Dimension max : 76 mm.
2. Nr. JGX-1027. Lev. JGX-UWH. Height : 39 mm.

Figs. 3-4. *Kiparisovites* aff. *ovalis* Shevyrev. Locality : Hammond Creek, Bear Lake Valley, Idaho.

3. Nr. JGX-435, Lev. JGX HC18. Height : appx. 6 mm.
4. Nr. JGX-436, Lev. JGX HC16. Diameter : min. 15 mm.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## Plate XXV

Figs. 1-3. *Prohungarites gutstadti* Kummel. Locality : Hammond Creek, Bear Lake Valley, Idaho.

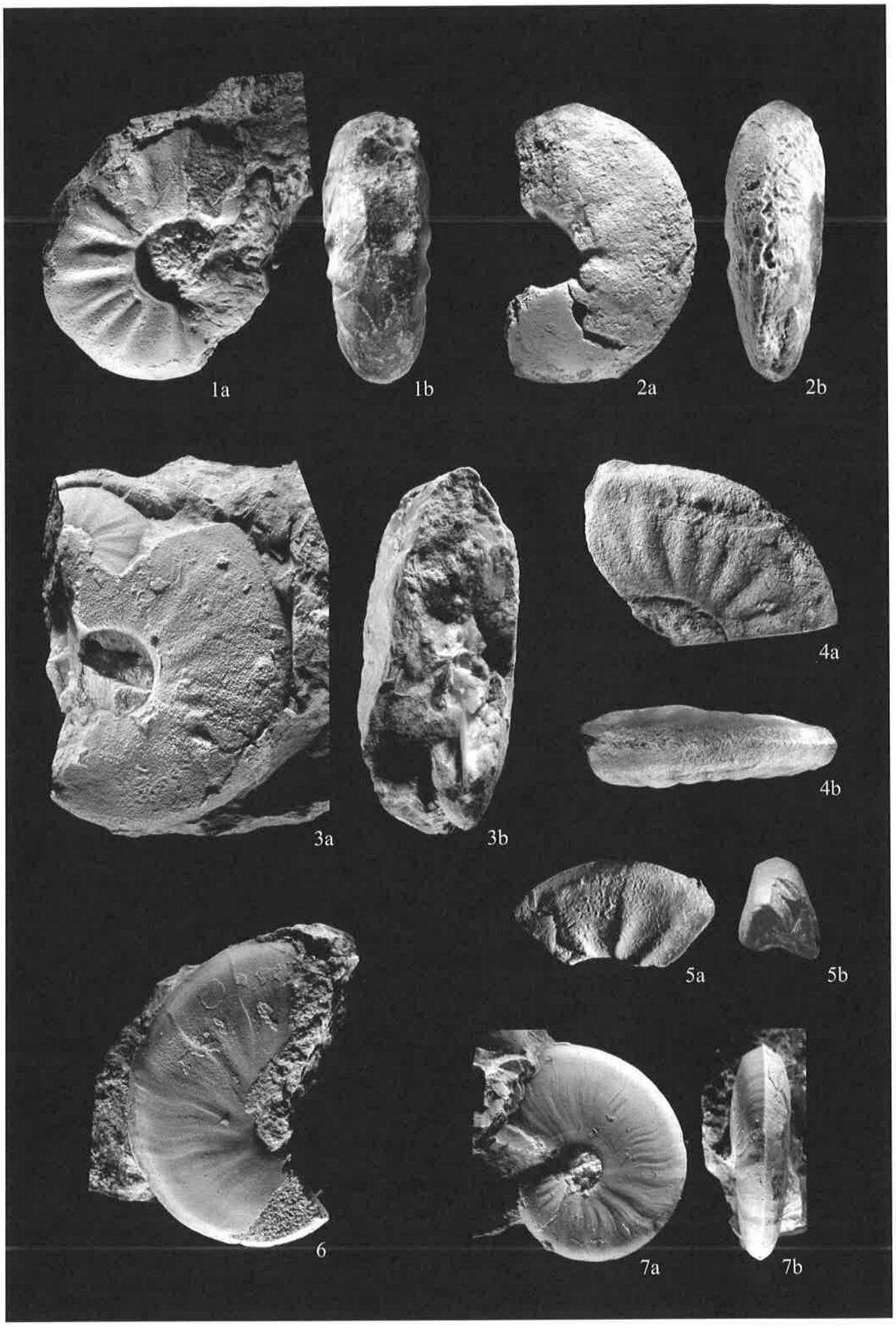
1. Nr. JGX-408. Lev. JGX-HC24. Diameter : 38 mm.
2. Nr. JGX-410. Lev. JGX-HC24. Diameter : 40 mm.
3. Nr. JGX-409. Lev. JGX-HC24. Diameter : 54 mm.

Figs. 4-5. *Prohungarites* sp.indet.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

4. Nr. JGX-412. Lev. JGX-HC24. Height : 19 mm.
5. Nr. JGX-413. Lev. JGX-HC24. Height : 11.5 mm.

Figs. 6-7. *Prohungarites mckelvei* Kummel. Locality : Hammond Creek, Bear Lake Valley, Idaho.

6. Nr. JGX-468. Lev. JGX-HC9. Diameter : 27 mm.
7. Nr. JGX-469. Lev. JGX-HC9. Diameter : 18 mm.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## Plate XXVI

Figs. 1-2. *Prohungarites mckelvei* Kummel. Locality : Hammond Creek, Bear Lake Valley, Idaho.

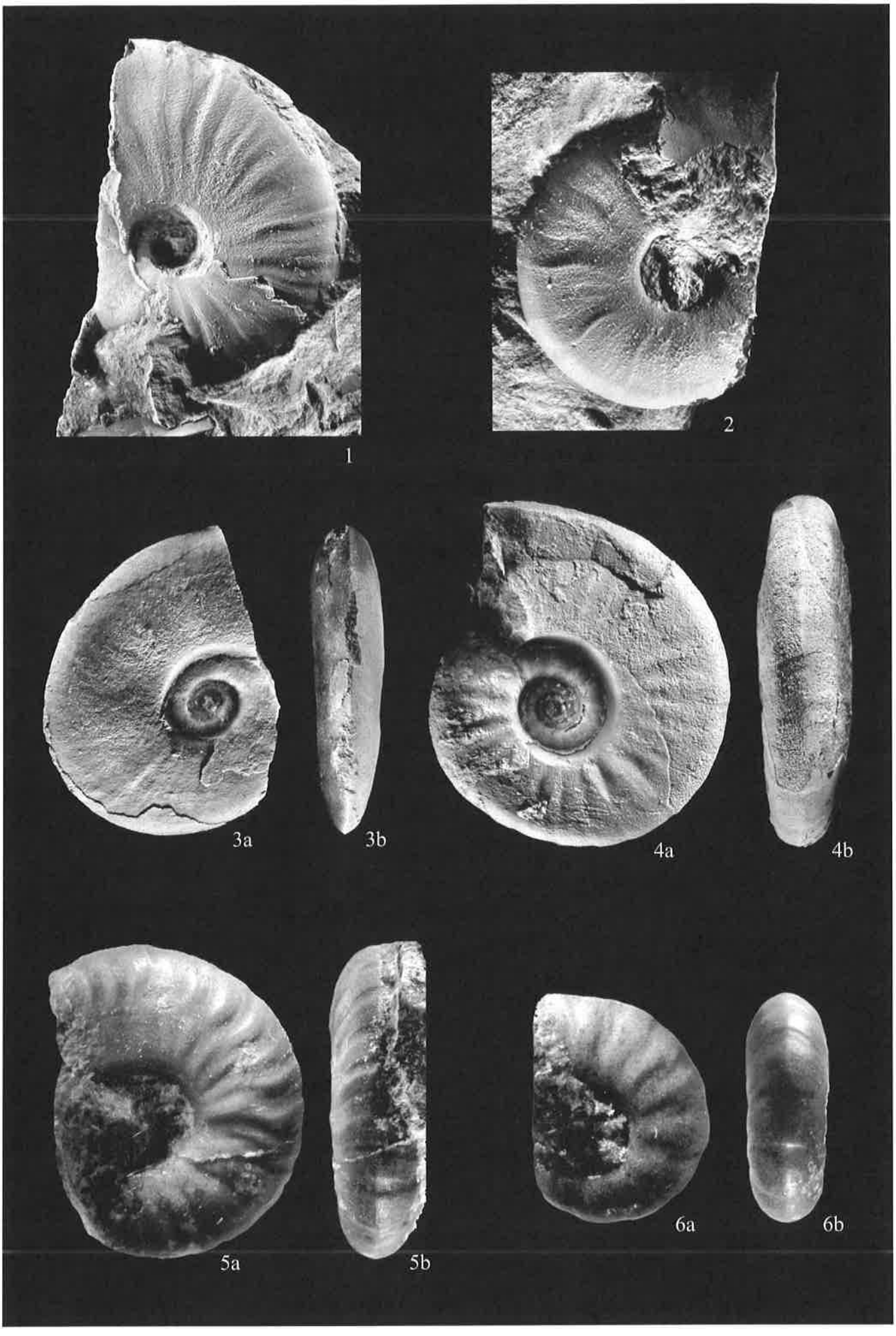
1. Nr. JGX-467. Lev. JGX-HC9. Diameter : 28 mm.
2. Nr. JGX-470. Lev. JGX-HC9. Diameter : 12 mm.

Fig. 3. *Prohungarites lenticularis* Guex et al., holotype. Nr. JGX-1005. Locality : Lev. JGX-NHR-2823A, northern Humboldt Range, Nevada. Diameter : 30 mm.

Fig. 4. *Prohungarites submckelvei* Guex et al., holotype. Nr. JGX-1007. Locality : Lev. JGX-NHR-2360A, northern Humboldt Range, Nevada. Diameter : 33 mm.

Figs. 5-6. *Prohungarites beyrichitoides* Guex et al.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

5. holotype. Nr. JGX-465. Lev. JGX-HC9. Diameter : 14 mm.
6. Nr. JGX-466. Lev. JGX-HC9. Diameter : 10 mm.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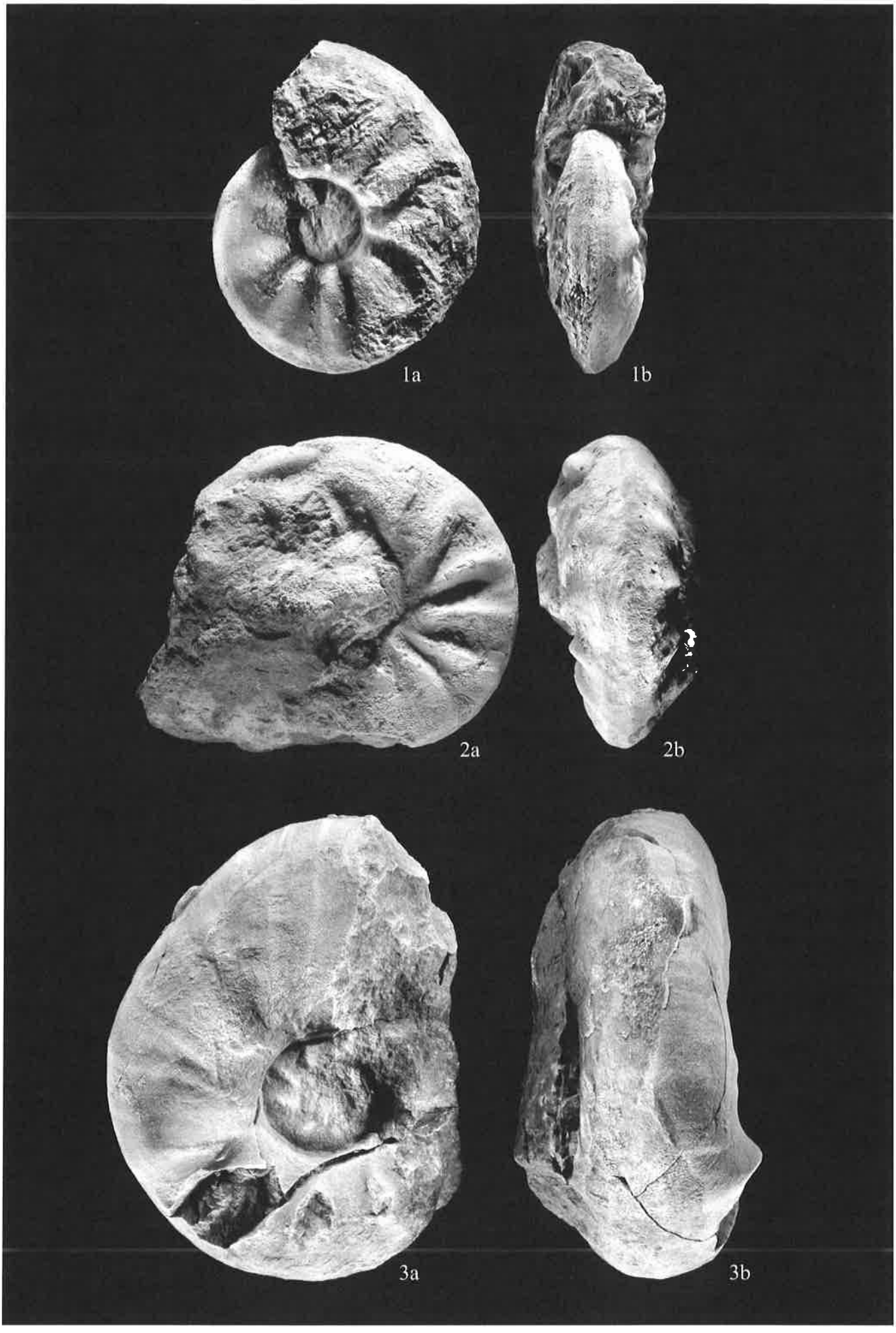
## Plate XXVII

Fig. 1. *Silberlingeria rubyae* Guex et al., holotype. Nr. JGX-1001. Locality : Lev. JGX-NHR-2360D5, northern Humboldt Range, Nevada. Diameter : 54 mm.

Figs. 2-3. *Silberlingeria bearlakensis* (Kummel). Locality : Hammond Creek, Bear Lake Valley, Idaho.

2. Nr. JGX-473. Lev. JGX-HM18a. Diameter : 68 mm.
3. Nr. JGX-474. Lev. JGX-HM-float. Diameter : 99 mm.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## Plate XXVIII

Figs. 1-4. *Silberlingeria bearlakensis* (Kummel). Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-476. Lev. JGX-HM18a. Diameter : 76 mm.
2. Nr. JGX-477. Lev. JGX-HM18b. Diameter : 38 mm.
3. Nr. JGX-478. Lev. JGX-HC1. Diameter : 68 mm.
4. Nr. JGX-475. Lev. JGX-HM18a. Diameter : 84 mm.


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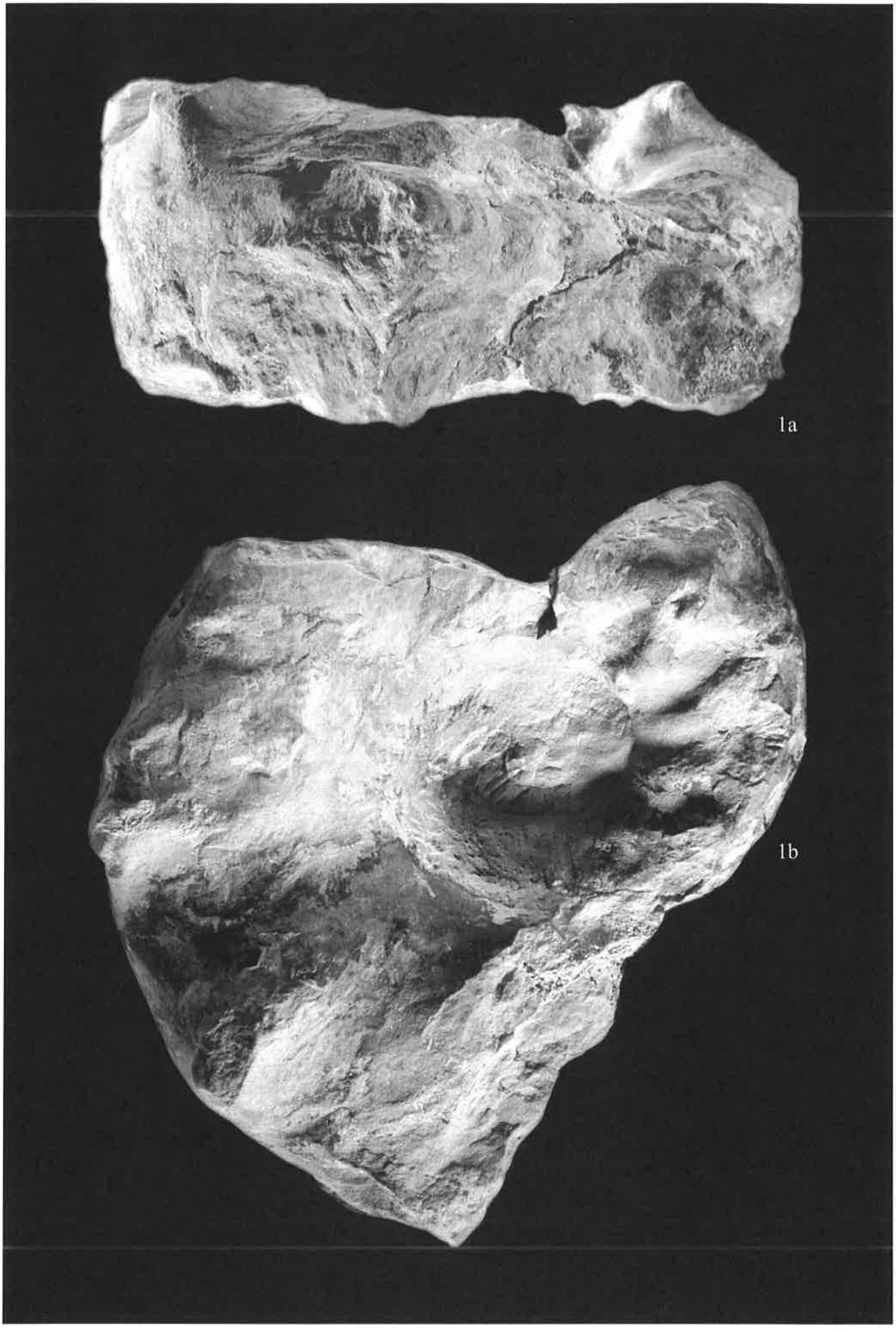
## Plate XXIX

Fig. 1. *Silberlingeria coronata* Guex et al., holotype. Nr. JGX-482. Locality : Lev. JGX-HCT, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 140 mm.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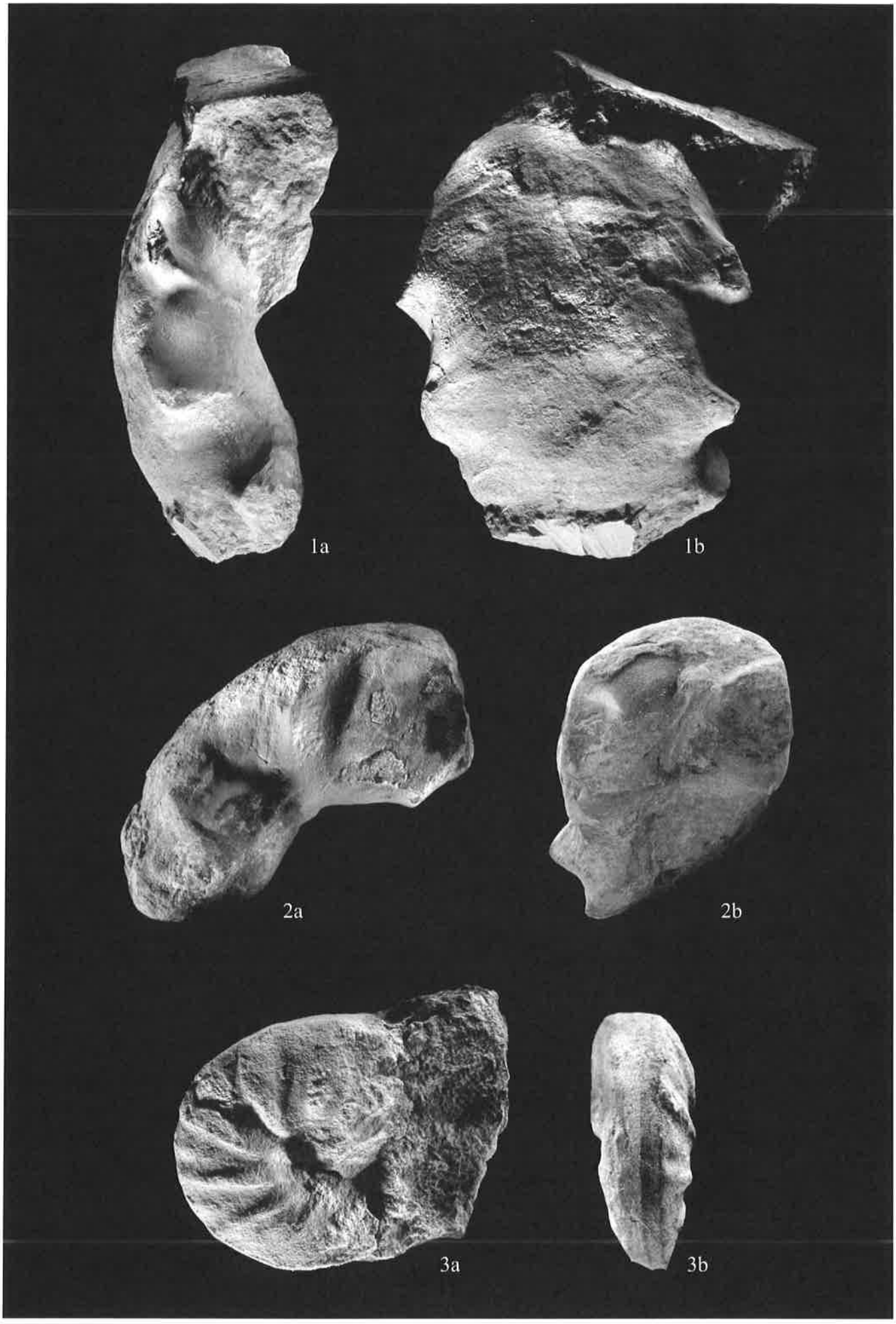
## Plate XXX

Figs. 1-3. *Silberlingeria coronata* Guex et al.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX- 484. Lev. JGX-HMW. max. Dimension : 92 mm.
2. Nr. JGX-483. Lev. JGX-HCT. Height : 36 mm.
3. Nr. JGX- 485. Lev. JGX-HMW. Diameter : 23 mm.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## Plate XXXI

Figs. 1-2. *Silberlingeria sarahjanae* Guex et al.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

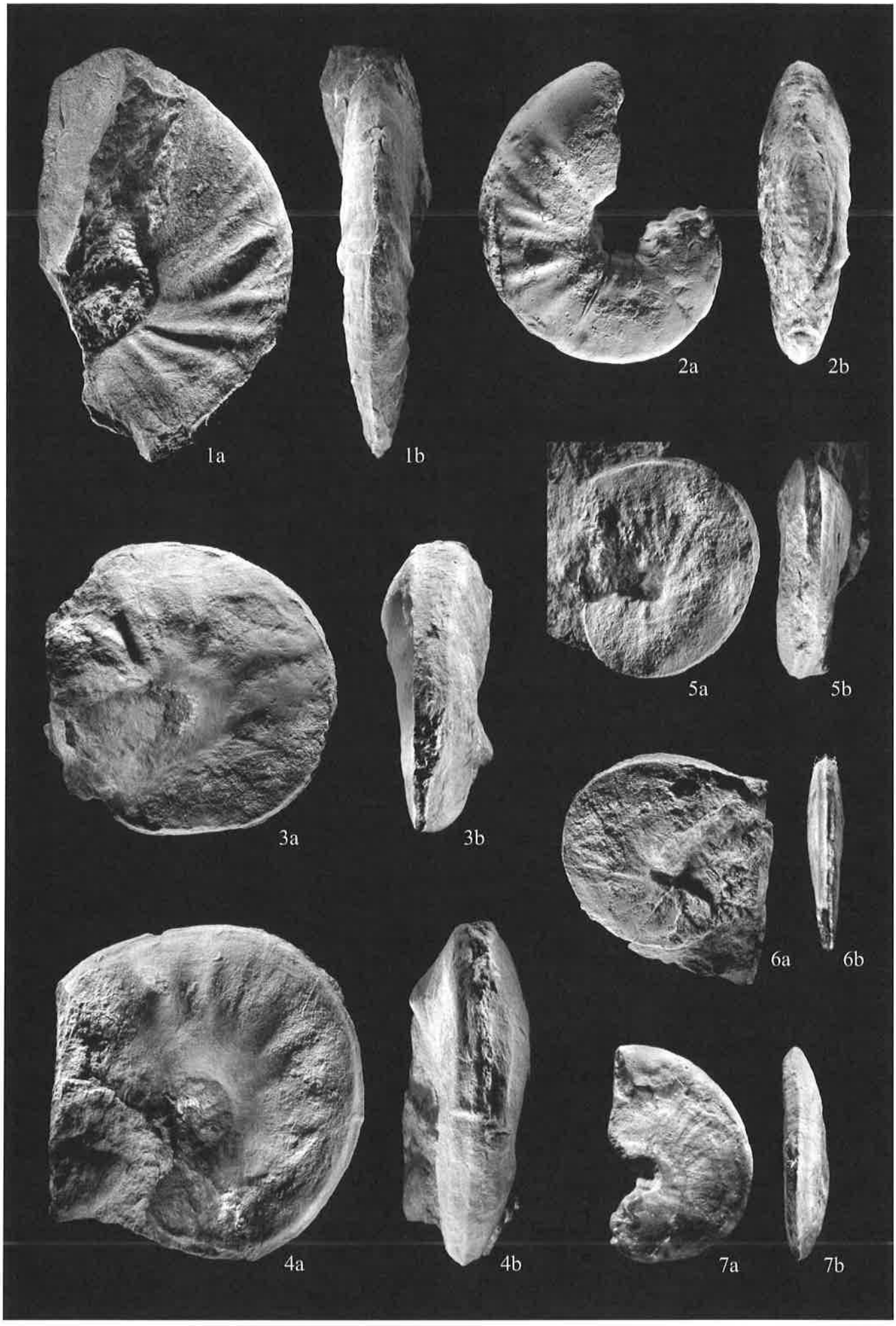
1. Nr. JGX-479. Lev. JGX-HM17. Height : appx. 82 mm.
2. holotype. Nr. JGX-480. Lev. JGX-HM18b. Diameter : 62 mm.

Figs. 3-5. Intermediate forms between *Silberlingeria sarahjanae* and *Subhungarites*. Locality : Hammond Creek, Bear Lake Valley, Idaho.

3. Nr. JGX-487. Lev. JGX-HCT. Diameter : 58 mm.
4. Nr. JGX-486. Lev. JGX-HCT. Diameter : 69 mm.
5. Nr. JGX-488. Lev. JGX-HMC. Diameter : 44 mm.

Fig. 6. *Subhungarites yatesi* (Hyatt & Smith). Nr. JGX-489. Locality : Lev. JGX HCT, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 39 mm.

Fig. 7. Intermediate form between *Prohungarites mckelvei* and *Subhungarites yatesi*. Nr. JGX-481. Locality : Lev. JGX-HM18a, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 42 mm.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## Plate XXXII

Figs. 1-3. *Ceccaisculitoides hammondi* (Kummel). Locality : Hammond Creek, Bear Lake Valley, Idaho.

1. Nr. JGX-462. Lev. JGX-HC9. Width : 13 mm.
2. Nr. JGX-472. Lev. JGX-HM18b. Diameter : 24 mm.
3. Nr. JGX-471. Lev. JGX-HM18b. Diameter : 18 mm.

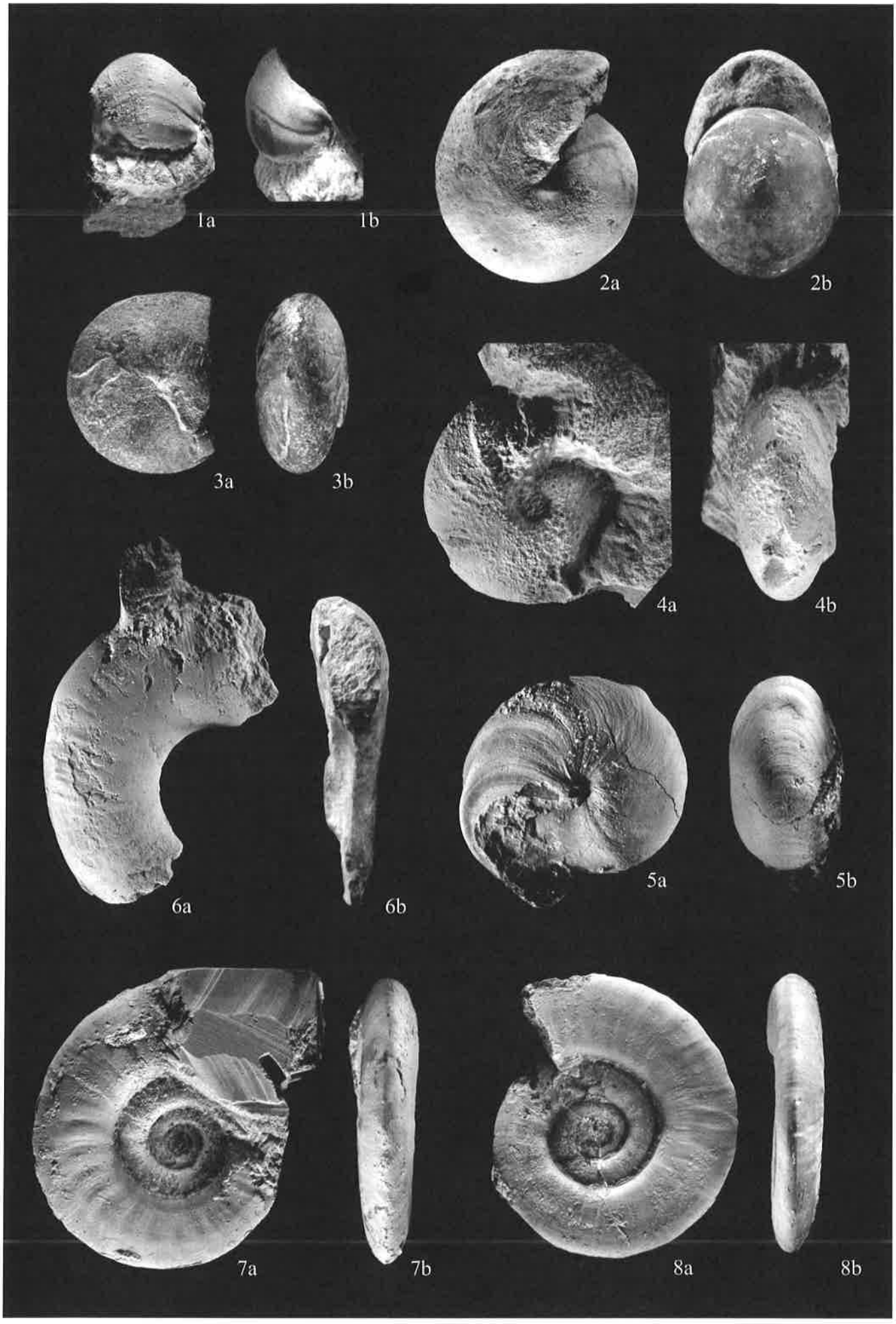
Fig. 4. *Isculitoides* aff. *originis* (Arthaber). Nr. JGX-461. Locality : Lev. JGX-HC9, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 19 mm.

Fig. 5. *Ceccaisculites elegans* Guex et al., holotype. Nr. JGX-1004. Locality : Lev. JGX-NHR-2360B, northern Humboldt Range, Nevada., Diameter : 23 mm.

Fig. 6. *Palaeophyllites* ? sp.. Nr. JGX-407. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Height : 19 mm.

Figs. 7-8. *Deweveria dudresnayi* Guex et al.. Locality : Hammond Creek, Bear Lake Valley, Idaho.

7. holotype. Nr. JGX-527. Lev. JGX-BETA-HC1. Diameter : 43 mm.
8. Nr. JGX-526. Lev. JGX-BETA-HC. Diameter : 43 mm.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## Plate XXXIII

Fig. 1. *Deweveria dudresnayi* Guex et al.. Nr. JGX-550. Locality : Lev. JGX-GAMMA-HCX, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 40 mm.

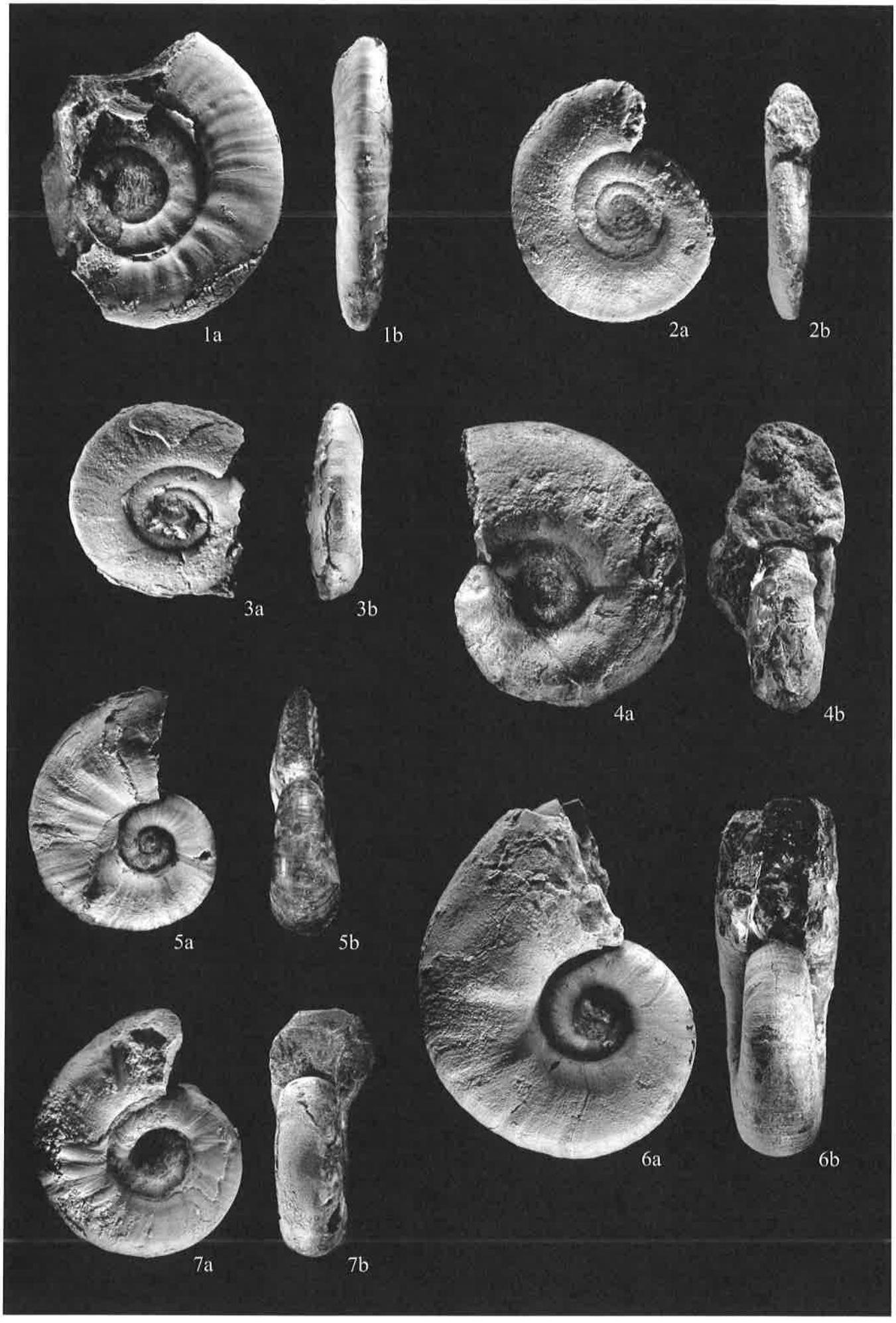
Figs. 2-3. *Deweveria crenulata* sp.nov.. Locality : northern Humboldt Range, Nevada.

2. holotype. Nr. JGX-1012. Lev. JGX-NHR-2823A. Diameter : 30 mm.
3. Nr. JGX-1009. Lev. JGX-NHR-2823A. Diameter : 21 mm.

Figs. 4-6. *Ussurites mansfeldi* Kummel. Locality : Figs. 4 and 6, Hot Springs, Bear Lake Valley, Idaho. Fig. 5, Paris Canyon, Bear Lake Valley, Idaho.

4. Nr. JHS-43c-3. Jenks Coll. Lev. JHSDE. Diameter : 40 mm.
5. Nr. JPC-176c-4. Jenks Coll. Lev. JPCDE equiv.. Diameter : 30 mm.
6. Nr. JHS-212c-2. Jenks Coll. Lev. JHSDE. Diameter : 40 mm.

Fig. 7. *Ussurites submansfeldi* sp.nov., holotype. Nr. JPC-179c-5. Jenks Coll. Locality : Lev. JPCDE equiv., Paris Canyon, Bear Lake Valley, Idaho. Diameter : 29 mm.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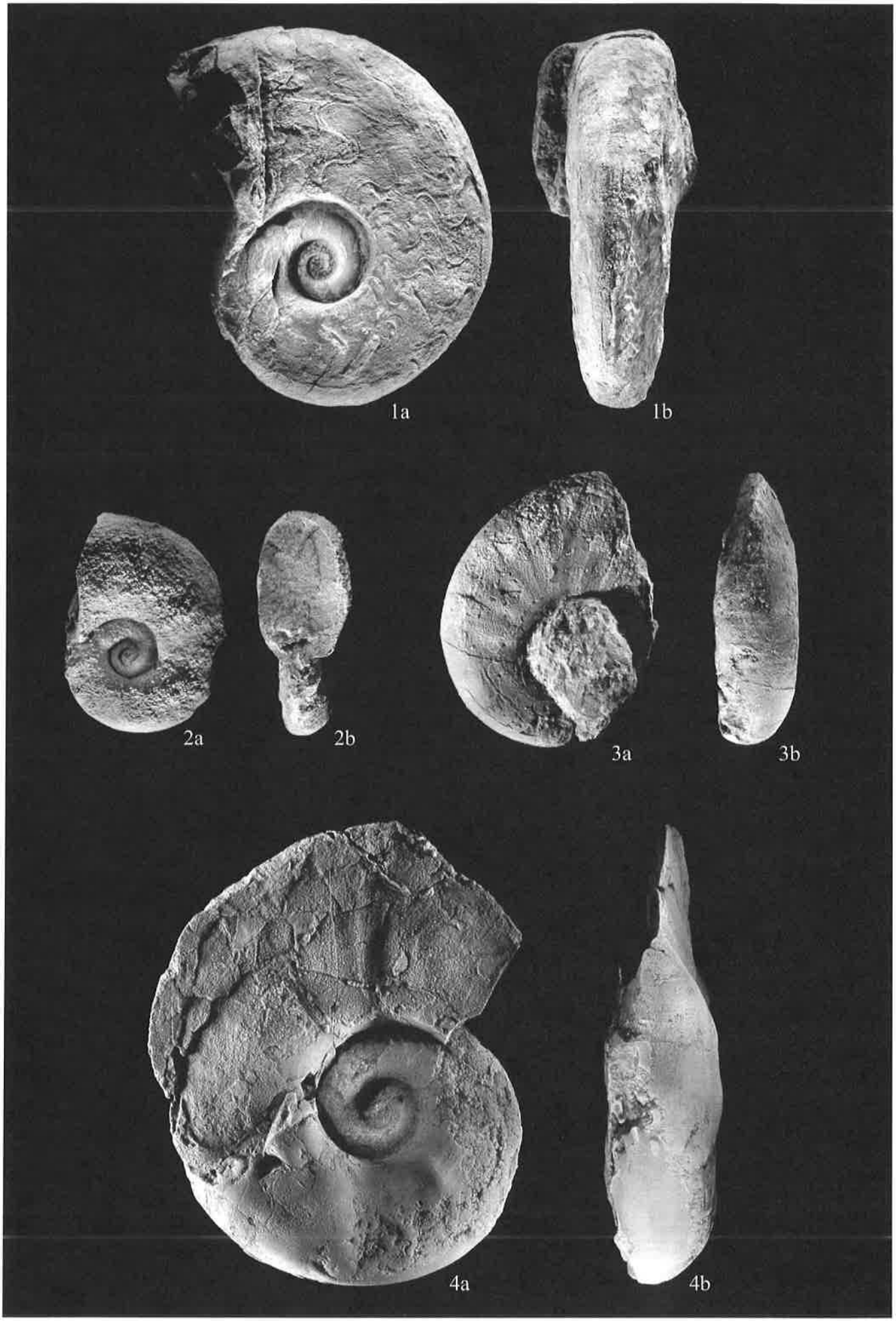
## Plate XXXIV

Figs. 1-3. *Ussurites* cf. *hosei* Kummel. Locality : Cowboy Pass, Confusion Range, Utah.

1. Nr. JGX-571. Lev. JGX-CR3. Diameter : 80 mm.
2. Nr. JGX-570. Lev. JGX-CR6'. Diameter : 44 mm.
3. Nr. JGX-572. Lev. JGX-CR4'. Diameter : 57 mm.

Fig. 4. *Coscaites crassus* Guex et al., Nr. JHS-213c-1. Jenks Coll. Locality : Lev. JHSDE, Hot Springs, Bear Lake Valley, Idaho. Diameter : 101 mm.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## Plate XXXV

Fig. 1. *Coscaites crassus* Guex et al., holotype. Nr. JHS-255c-6. Jenks Coll. Locality : Lev. JHSDE, Hot Springs, Bear Lake Valley, Idaho. Diameter : 83 mm.

Figs. 2-5. *Nordophiceratoides catherinae* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

2. holotype. Nr. JHS-279c-7. Jenks Coll. Lev. JHSA. Diameter : 82 mm.
3. Nr. JHS-1019c-9. Jenks Coll. Lev. JHSA. Diameter : 76 mm.
4. Nr. JHS-194c-8. Jenks Coll. Lev. JHSA. Diameter : 80 mm.
5. Nr. JGX-10, Lev. JGX-HS4. Diameter : 20 mm.


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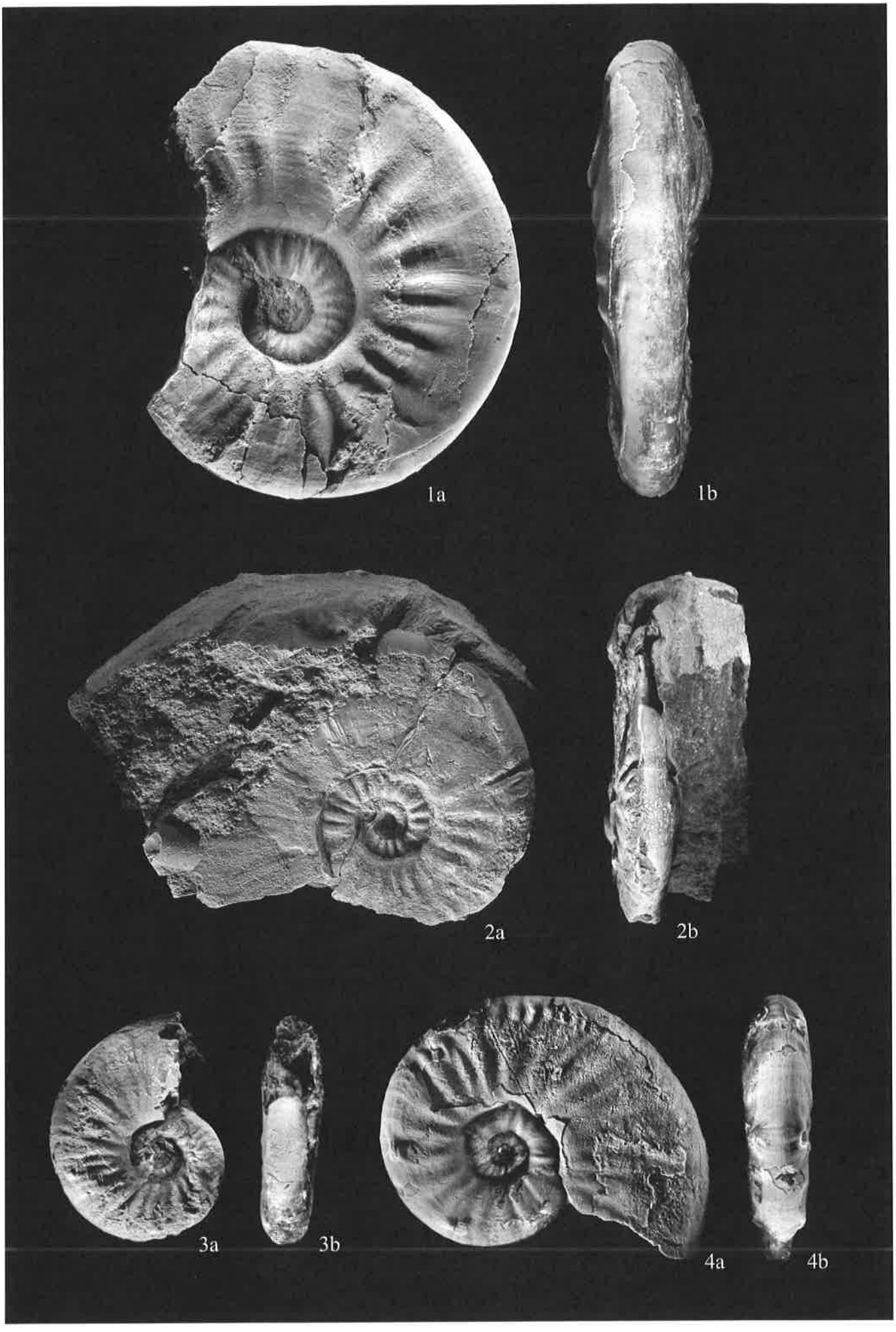
## Plate XXXVI

Figs. 1-2. *Nordophiceratoides bartolinae* sp.nov.. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JHS-1676c-24. Jenks Coll. Lev. JHSDE. Diameter : 83 mm.
2. holotype. Nr. JGX-25. Lev. JGX-HS6. Diameter : 62 mm.

Figs. 3-4. *Nordophiceratoides adriani* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

3. holotype. Nr. JGX-18. Lev. JGX-HS6. Diameter : 28 mm.
4. Nr. JHS-176c-14. Jenks Coll. Lev. JHSDE. Diameter : 44 mm.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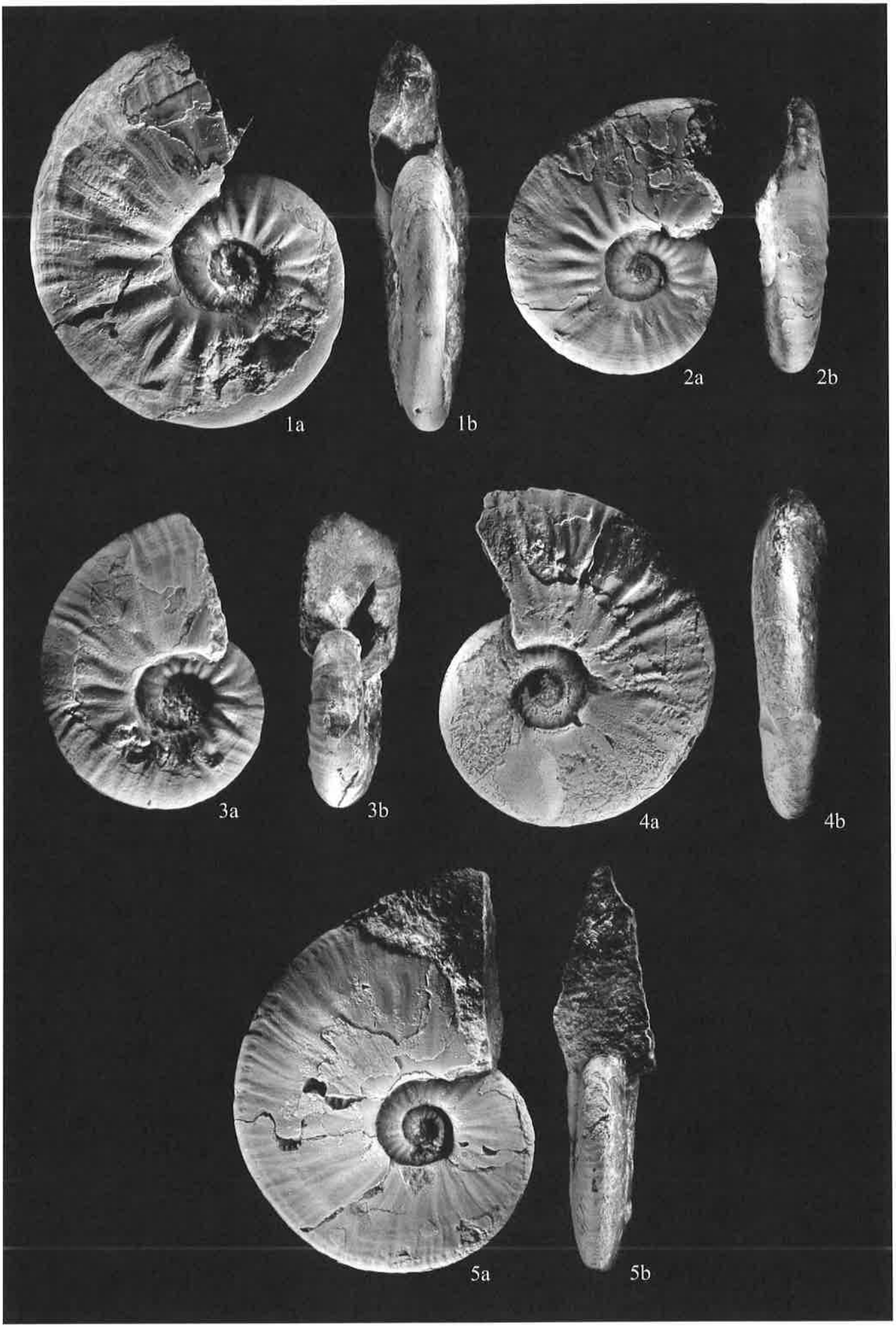
## Plate XXXVII

Figs. 1-3. *Nordophiceratoides adriani* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JHS-220c-15. Jenks Coll. Lev. JHSDE. Diameter : 53 mm.
2. Nr. JHS-138c-16. Jenks Coll. Lev. JHSDE. Diameter : 37 mm.
3. Nr. JHS-1681c-17. Jenks Coll. Lev. JHSDE. Diameter : 38 mm.

Figs. 4-5. *Nordophiceratoides gracilis* Guex et al.. Locality : Fig. 4, Hot Springs, Bear Lake Valley, Idaho. Fig. 5, Paris Canyon, Bear Lake Valley, Idaho.

4. Nr. JHS-210c-13. Jenks Coll. Lev. JHSDE. Diameter : 44 mm.
5. holotype. Nr. JPC-110c-12. Jenks Coll. Lev. JPCDE equiv.. Diameter : 49 mm.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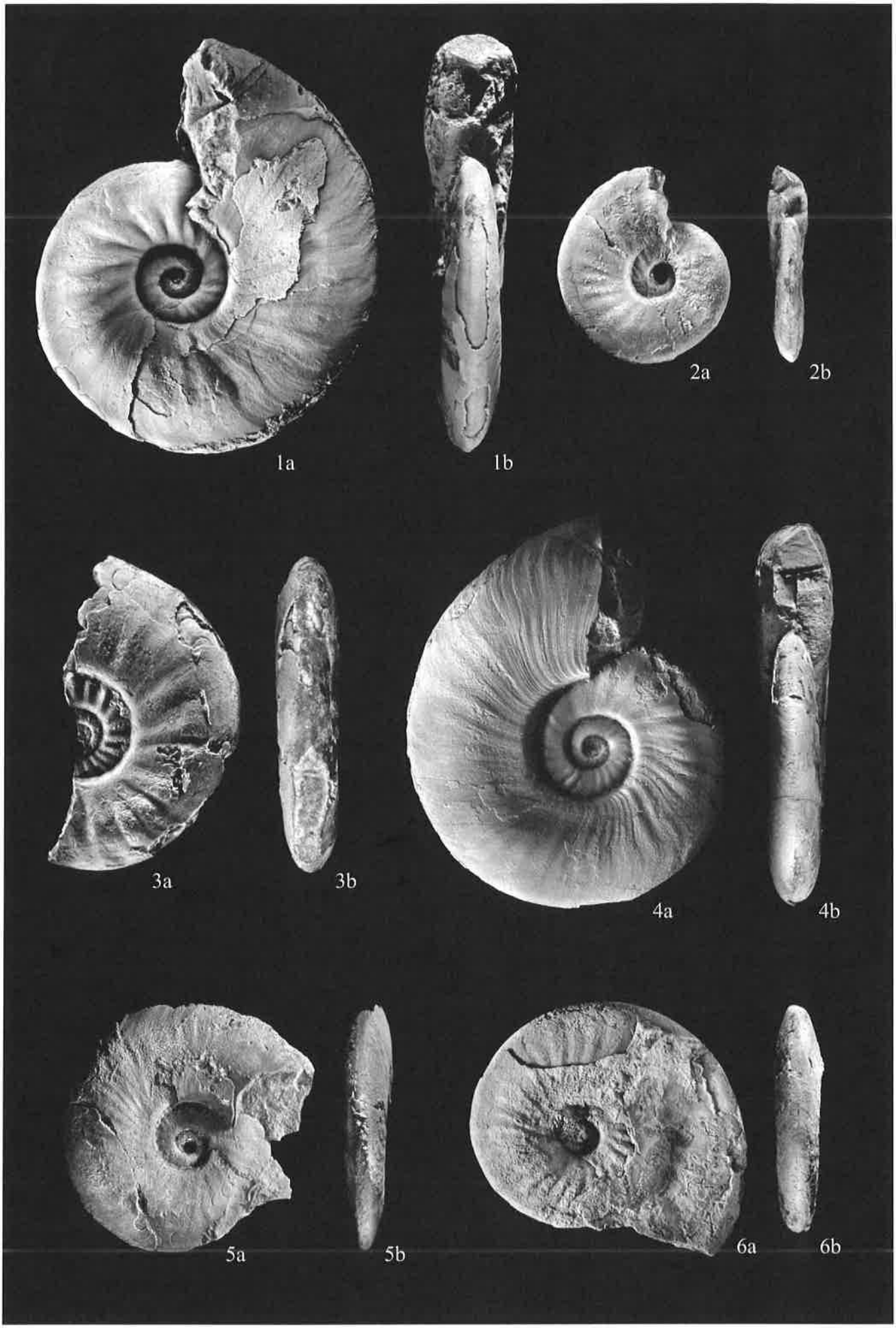
## Plate XXXVIII

Figs. 1-6. *Bajarunia pilata* (Hyatt & Smith). Locality : Figs. 1, 2,3,5, &6, Hot Springs, Bear Lake Valley, Idaho. Fig. 4, Paris Canyon, Bear Lake Valley, Idaho.

1. Nr. JHS-22c-31. Jenks Coll. Lev. JHSAB. Diameter : 76 mm.
2. Nr. JGX-34. Lev. JGX-HS4. Diameter : 32 mm.
3. Nr. JGX-40. Lev. JGX-HS4. Diameter : 53 mm.
4. Nr. JPC-86c-32. Jenks Coll. Lev. JPCAB. Diameter : 74 mm.
5. Nr. JGX-41. Lev. JGX-HS4. Diameter : 49 mm.
6. Nr. JGX-33. Lev. JGX-BETA-HS1. Diameter : 56 mm.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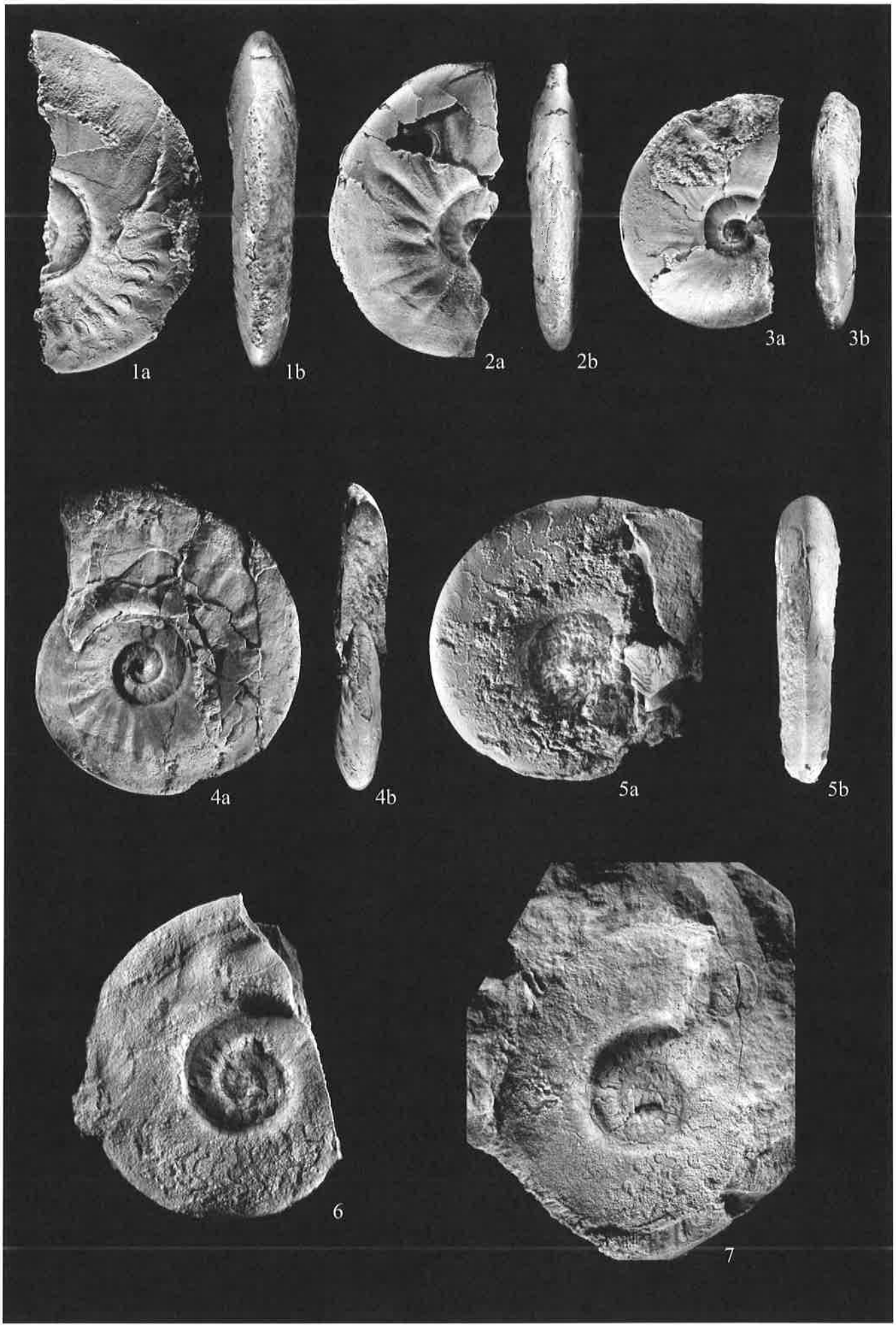
## Plate XXXIX

Figs. 1-4. *Bajarunia pilata* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-35. Lev. JGX-HS4. Diameter : 61 mm.
2. Nr. JGX-36. Lev. JGX-HS4. Diameter : 52 mm.
3. Nr. JGX-38. Lev. JGX-BETA-HC1. Diameter : 43 mm.
4. Nr. JGX-37. Lev. JGX BETA-HC 1. Diameter : 56 mm.

Figs. 5-7. *Bajarunia confusionensis* Guex et al.. Locality : Cowboy Pass, Confusion range, Utah.

5. holotype. Nr. JGX-592. Lev. JGX-M110. Diameter : 43 mm.
6. Nr. JGX-591. Lev. JGX-M109. Diameter : 47 mm.
7. Nr. JGX-590. Lev. JGX-M109. Diameter : 50 mm.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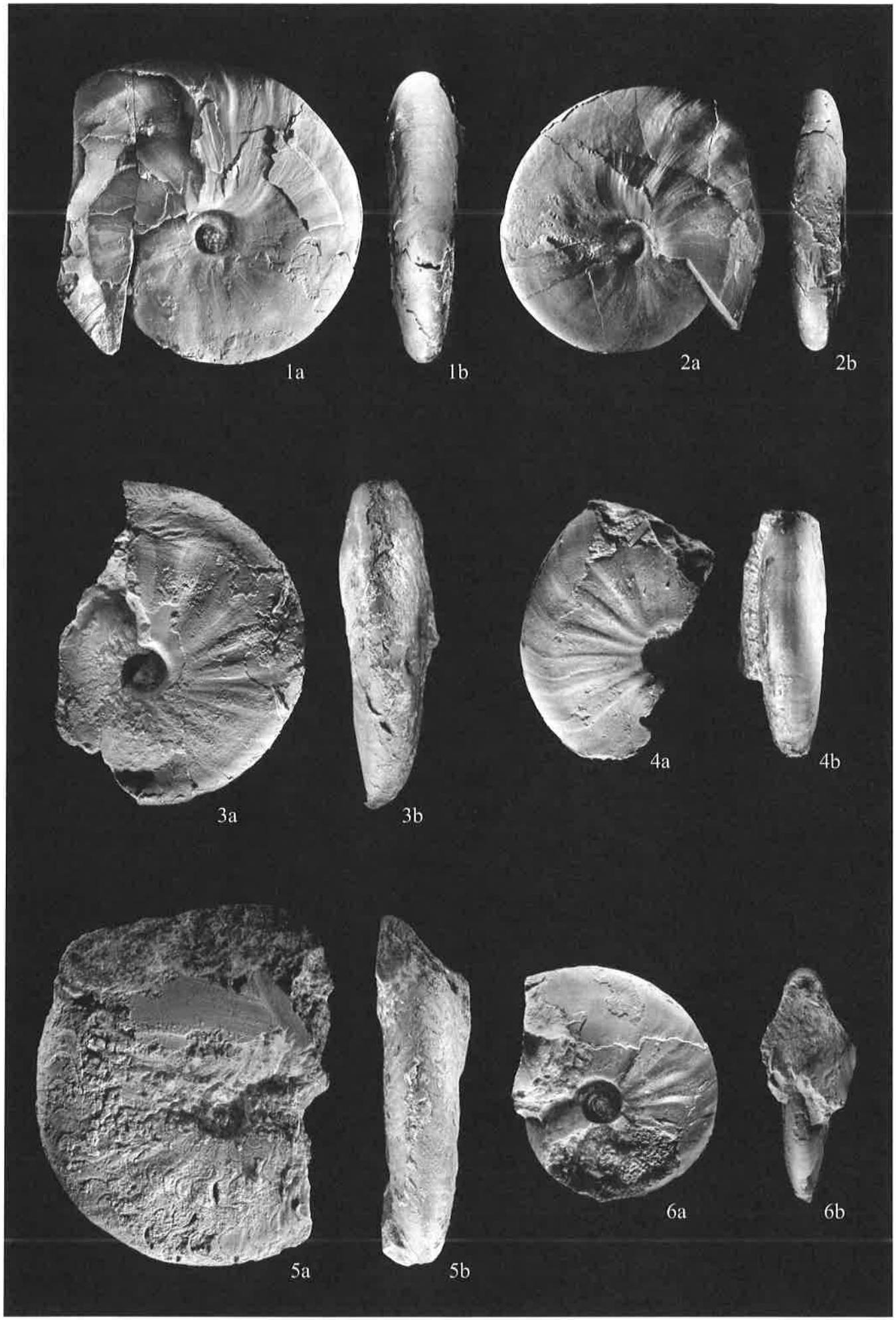
## Plate XL

Figs. 1-2. *Arctomeekoceras popovi* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

1. holotype. Nr. JHS-1674c-43. Jenks Coll. Lev. JHSC. Diameter : 59 mm.
2. Nr. JHS-1673c-44. Jenks Coll. Lev. JHSC. Diameter : 54 mm.

Figs. 3-6. *Arctomeekoceras tardum* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

3. holotype. Nr. JGX-521. Lev. JGX-BETA-HC1. Diameter : 44 mm.
4. Nr. JGX-547. Lev. JGX-GAMMA-HCX. Height : 19 mm.
5. Nr. JGX-528. Lev. JGX-BETA-HC1. Height : 21 mm.
6. Nr. JGX-522. Lev. JGX-BETA-HC Diameter : 33 mm.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## Plate XLI

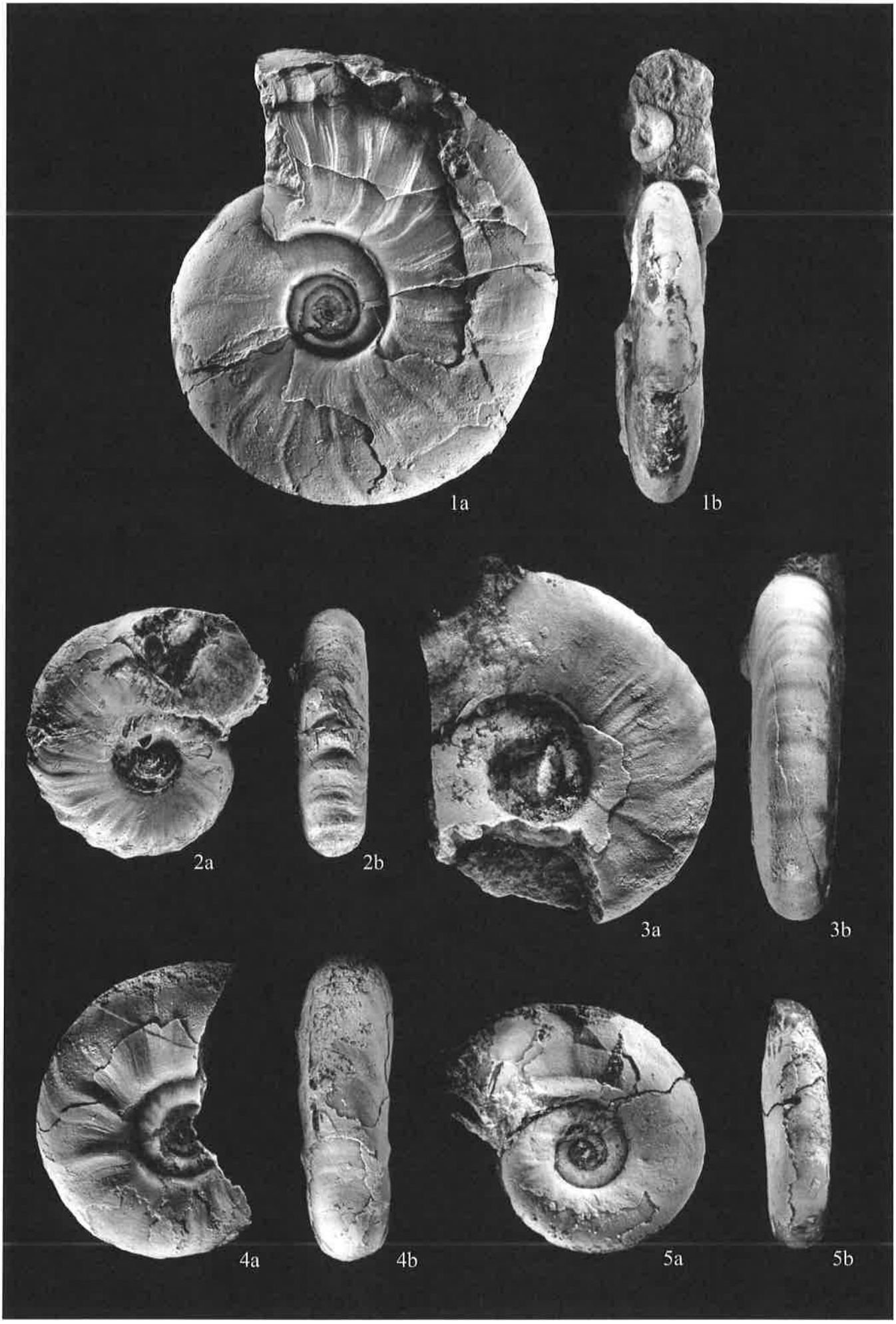
Fig. 1. *Carteria hotspringensis* Guex et al., holotype. Nr. JHS-127c-39. Jenks Coll. Lev. JHSB. Locality : Hot Springs, Bear Lake Valley, Idaho. Diameter : 69 mm.

Figs. 2-3. *Xenoceltites crenulatus* Guex et al.. Locality : Hot Springs, Bear Lake Valley, Idaho.

2. holotype. Nr. JGX-163. Lev. JGX-HS5. Diameter : 18 mm.
3. Nr. JGX-150. Lev. JGX-HS4. Diameter : 29 mm.

Figs. 4-5. *Xenoceltites spencei* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

4. Nr. JGX-158. Lev. JGX-BETA-HS1. Diameter : 20 mm.
5. Nr. JGX-159. Lev. JGX-HS4. Diameter : 17 mm.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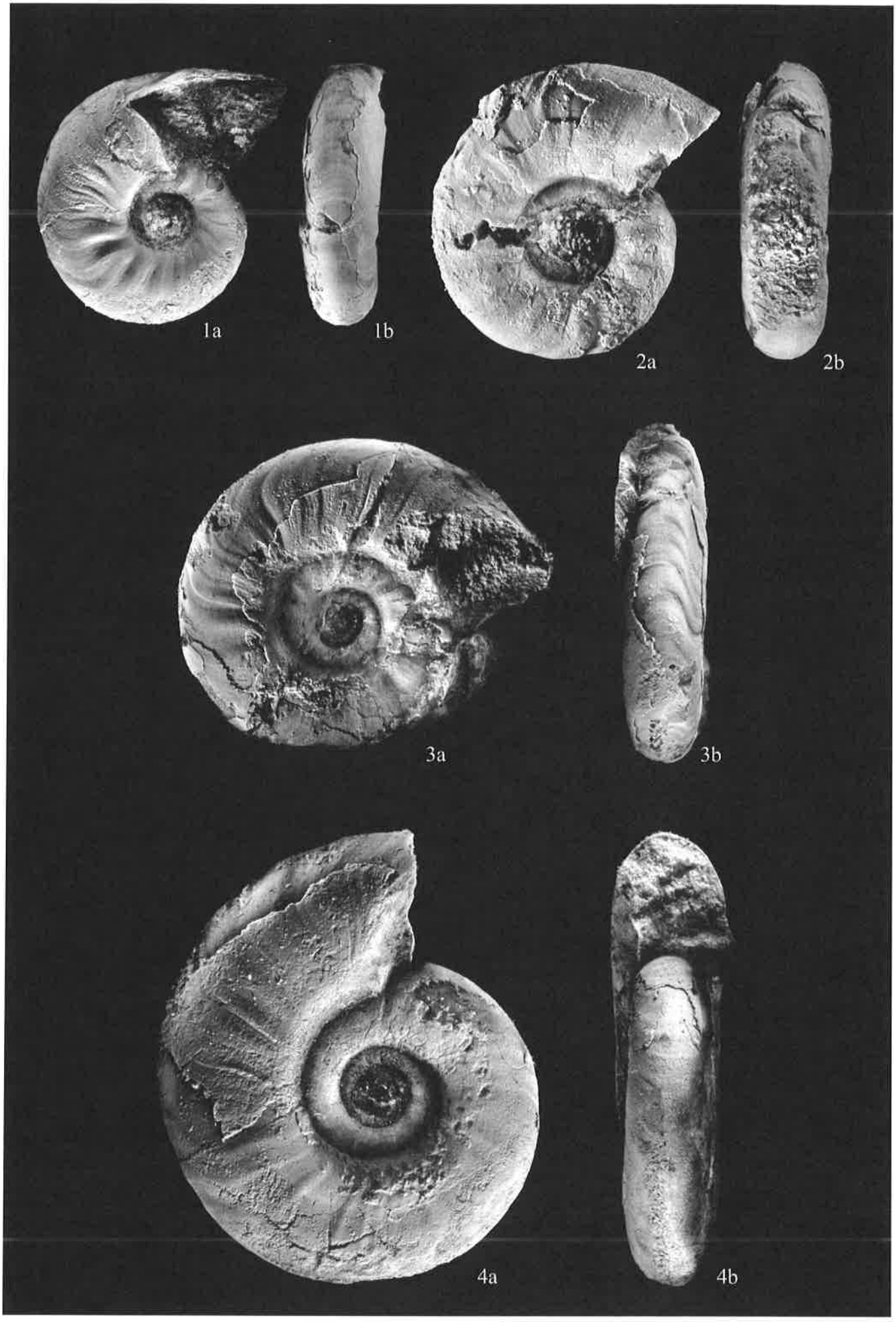
## Plate XLII

Figs. 1-4. *Xenoceltites spencei* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-157. Lev. JGX-BETA-HS1. Diameter : 16 mm.
2. Nr. JGX-164. Lev. JGX-HS6. Diameter : 21 mm.
3. Nr. JGX-160. Lev. JGX-HS5. Diameter : 23 mm.
4. Nr. JGX-152bis. Lev. JGX-HS5. Diameter : 30 mm.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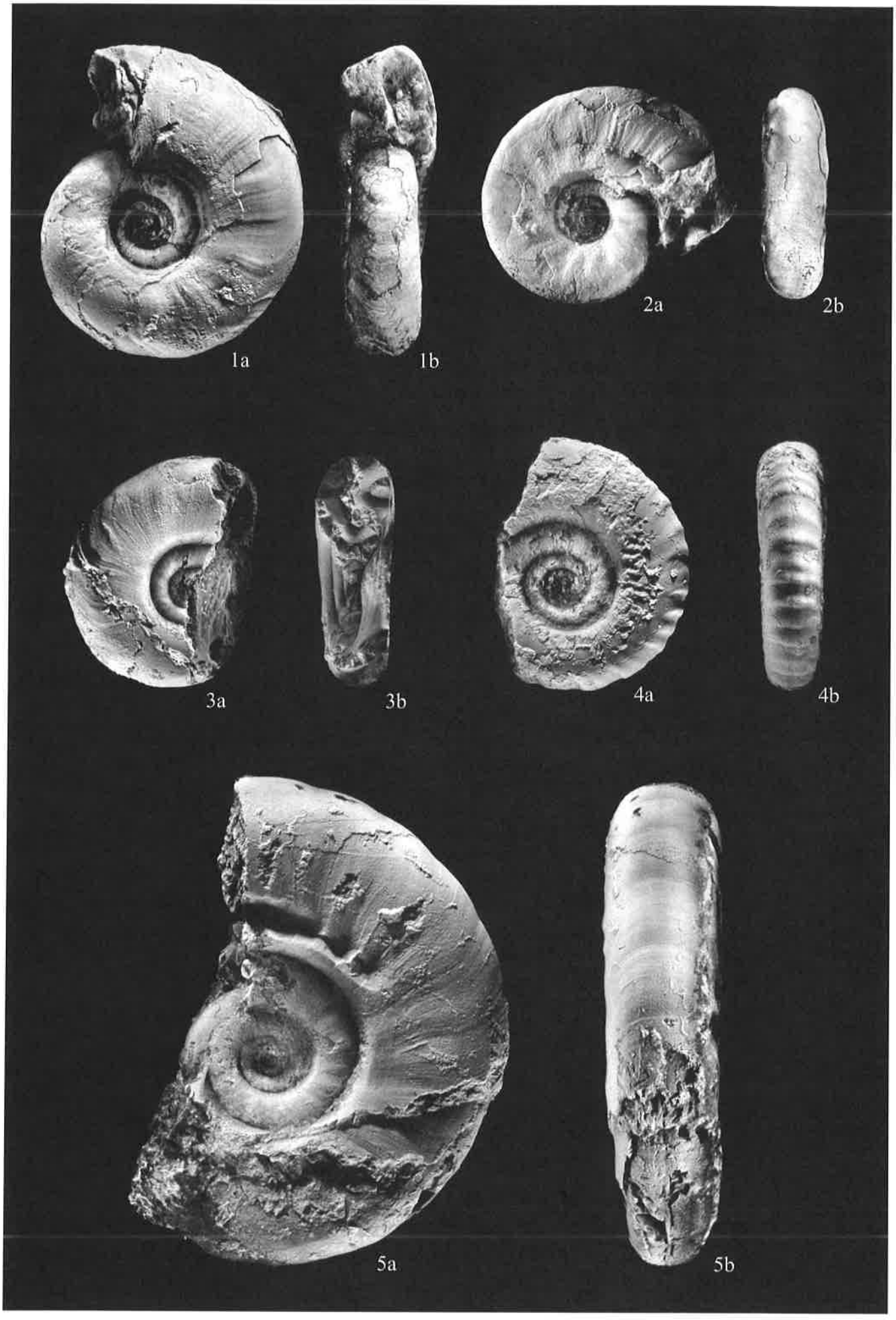
## Plate XLIII

Figs. 1-3. *Xenoceltites spencei* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-153. Lev. JGX-HS5. Diameter : 20 mm.
2. Nr. JGX-156. Lev. JGX-HS5. Diameter : 16 mm
3. Nr. JGX-155bis. Lev. JGX-BETA-HS1. Diameter : 15 mm.

Figs. 4-5. *Jeanbesseiceras jacksoni* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

4. Nr. JGX-154. Lev. JGX-HS6. Diameter : 16 mm.
5. Nr. JGX-162. Lev. JGX-HS6. Diameter : 33 mm.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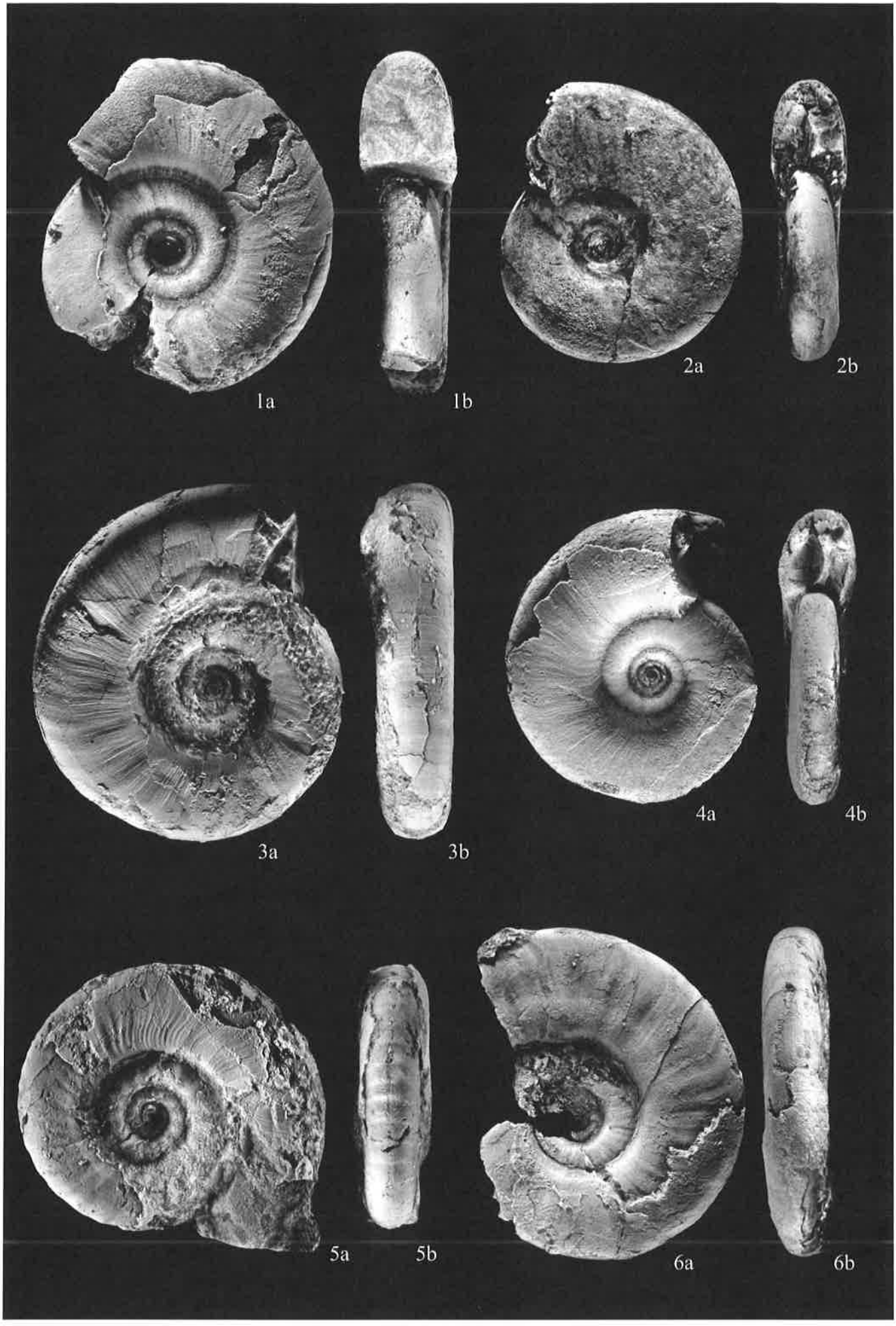
## Plate XLIV

Figs. 1-6. *Jeanbesseiceras jacksoni* (Hyatt & Smith). Locality : Hot Springs, Bear Lake Valley, Idaho.

1. Nr. JGX-148bis. Lev. JGX-BETA-HS1. Diameter : 45 mm.
2. Nr. JHS-92c-152. Jenks Coll. Lev. JHSAB. Diameter : 38 mm.
3. Nr. JHS-1689c-161. Jenks Coll. Lev. JHSDE. Diameter : 50 mm.
4. Nr. JGX-146. Lev. JHSAB. Diameter : 40 mm.
5. Nr. JHS-1688c-154bis. Jenks Coll. Lev. JHSDE. Diameter : 43 mm.
6. Nr. JGX-149. Lev. JGX-HS5. Diameter : 45 mm.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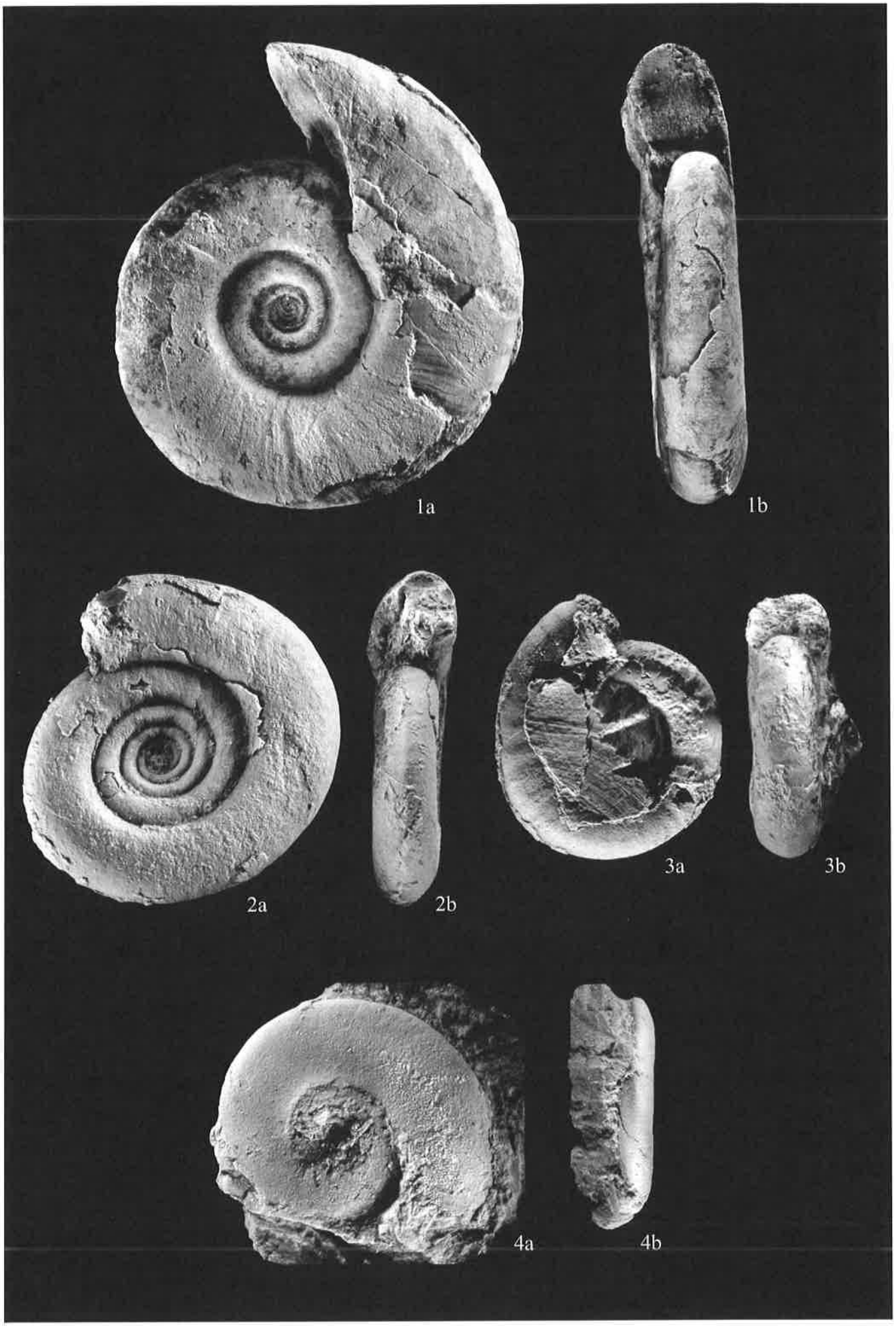
## Plate XLV

Fig. 1. *Jeanbesseiceras jacksoni* (Hyatt & Smith). Nr. JPC-7c-145. Jenks Coll. Locality : Lev. JPCAB, Paris Canyon, Bear Lake Valley, Idaho. Diameter : 69 mm.

Figs. 2-3. *Hemilecanites fastigatus* Guex et al.. Locality : northern Humboldt Range, Nevada.

2. holotype. Nr. JGX-1011. Lev. JGX-NHR-2823A. Diameter : 29 mm.
3. Nr. JGX-1008. Lev. JGX-NHR-2823A. Diameter : 22 mm.

Fig. 4. *Hemilecanites paradiscus* Kummel. Nr. JGX-404. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho. Diameter : 17 mm.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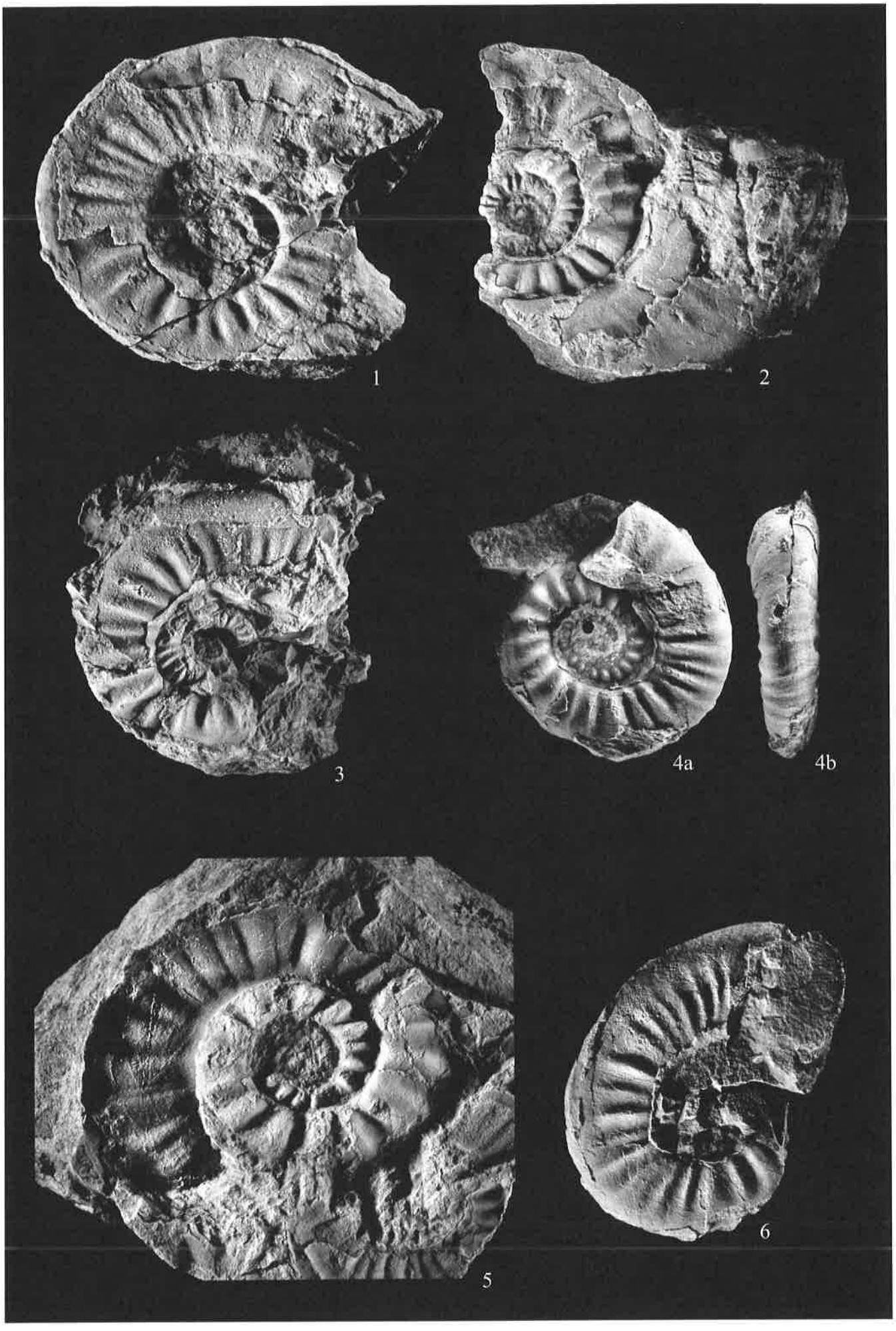
## Plate XLVI

Figs. 1-6. *Eodanubites* (*Dumitricaceras*) *judae* (Guex et al.). Locality : Union Wash, Inyo Range, California.

1. Nr. JGX-1030. Lev. JGX-UWK. Diameter : 64 mm.
2. Nr. JGX-1028. Lev. JGX-UWK. Diameter : 37 mm.
3. Nr. JGX-1029. Lev. JGX-UWK. Diameter : 37 mm.
4. Nr. JGX-1040. Lev. JGX-UWK. Diameter : 23 mm.
5. Nr. JGX-1026. Lev. JGX-UWK. Diameter : 40 mm.
6. Nr. JGX-1036. Lev. JGX-UWK. Diameter : 42 mm.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4a
4b
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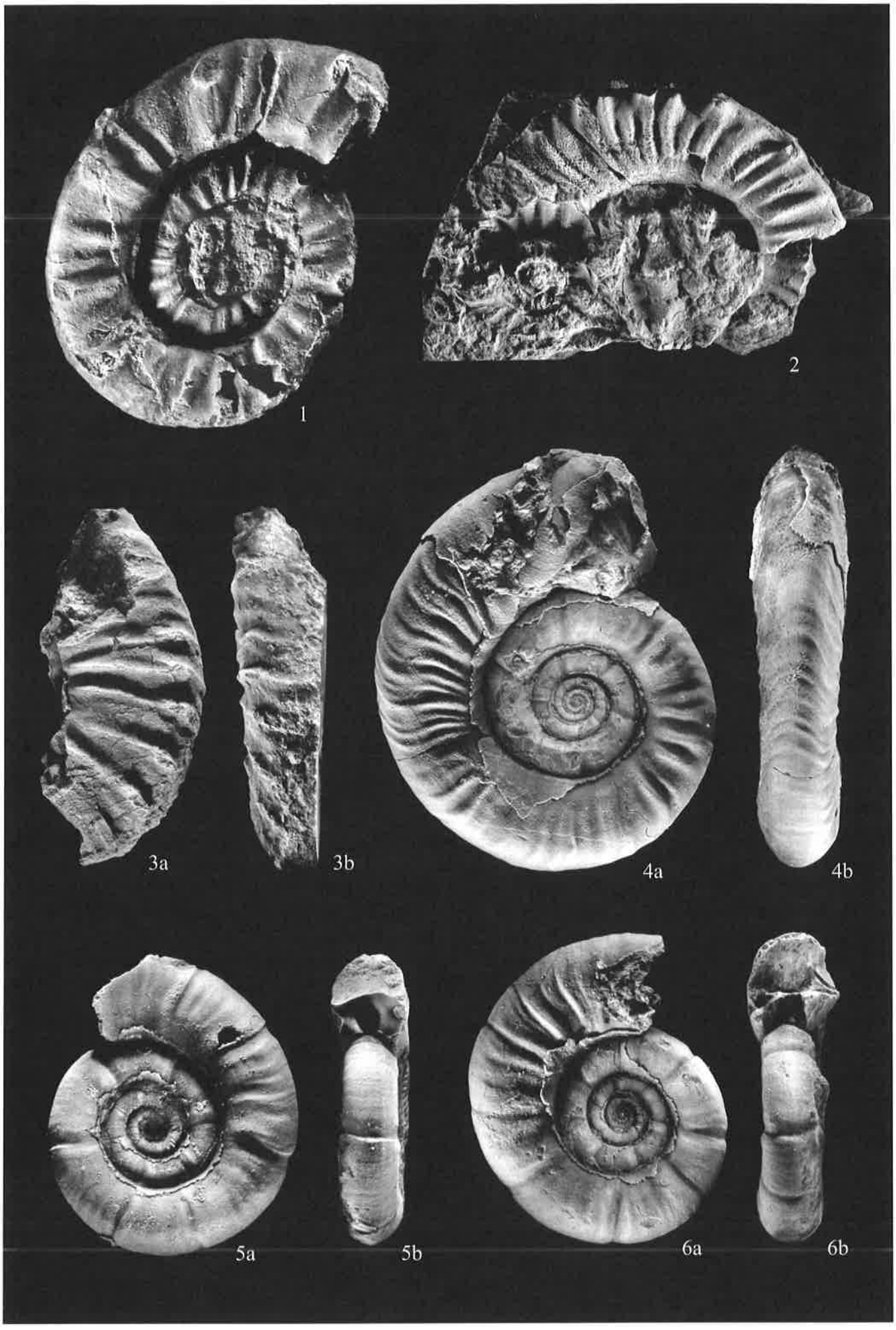
## Plate XLVII

Figs. 1-3. *Courtilloticeras stevensi* Guex et al.. Locality : Union Wash, Inyo Range, California.

1. holotype. Nr. JGX-1032. Lev. JGX-UWK. Diameter : 29 mm.
2. Nr. JGX-1041. Lev. JGX-UWK. Height : 13 mm.
3. Nr. JGX-1033. Lev. JGX-UWS. Height : 17 mm.

Figs. 4-6. *Inyoceras bittneri* (Hyatt & Smith). Locality : Union Wash, Inyo Range, California.

4. Nr. JGX-1019. Lev. JGX-UWH. Diameter : 31 mm.
5. Nr. JGX-1018. Lev. JGX-UWH. Diameter : 18 mm.
6. Nr. JGX-1021. Lev. JGX-UWH. Diameter : 19 mm.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5b
6a
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## Plate XLVIII

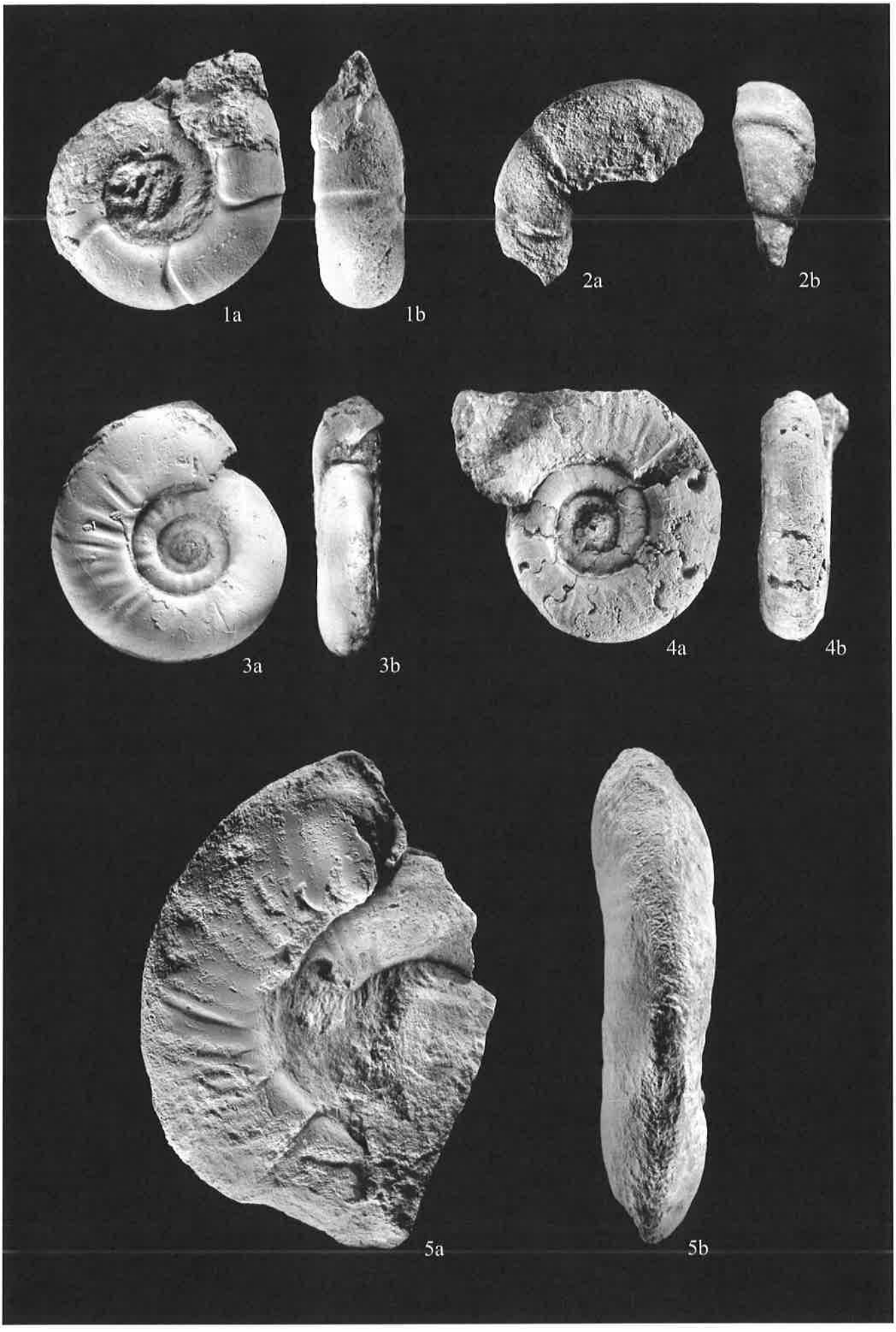
Figs. 1-2. *Eschericeratites lytoceratoides* Guex et al.

1. holotype. Nr. JGX-710. Locality : northern Humboldt Range, Nevada.
Lev. JGX-NHR-2360. Diameter : 22 mm

2. Nr. JGX-455. Locality : Hammond Creek, Bear Lake Valley, Idaho.
Lev. JGX-HC1. Height : 6 mm.

Figs. 3-5. *Tapponnierites tenuicostatus* Guex et al.. Locality : Lev. JGX-HC30, Hammond Creek, Bear Lake Valley, Idaho.

3. holotype. Nr. JGX-419. Lev. JGX-HC30. Diameter : 23 mm.
4. Nr. JGX-418. Lev. JGX-HC30. Diameter : 22 mm.
5. Nr. JGX-417. Lev. JGX-HC30. Diameter : appx. 73 mm.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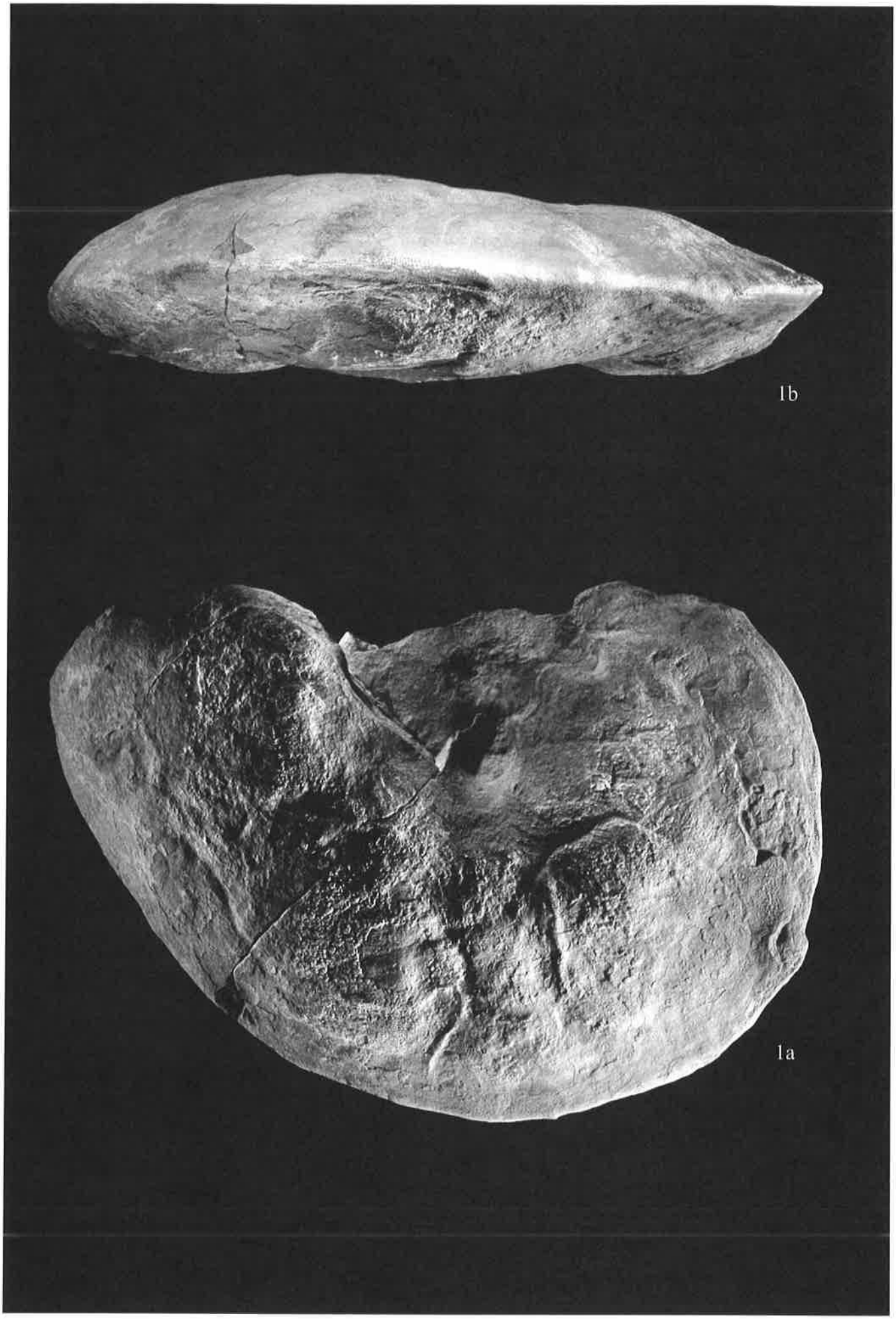
## Plate XLIX

Fig. 1. Gymnotoceratidae ? sp.indet.. Nr. JGX-490. Locality : Lev. JGX-HCT, Hammond Creek, Bear Lake Valley, Idaho. Diameter : appx. 160 mm.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## Plate L

Figs. 1-3.*Tirolites harti* Smith.. Locality : *Tirolites* beds, Paris Canyon, Bear Lake Valley, Idaho.

1. Nr. JJ-HT1-803. Jenks Coll.. Diameter : 58 mm.
2. Nr. JJ-HT2-804. Jenks Coll.. Height : 41 mm.
3. Nr. JJ-126c-805. Jenks Coll.. Height : 51 mm.

Fig. 4. *Paragoceras* ? sp.indet.. Nr. JGX-800. Locality : Lev. JGX-BETA-HS1, Hot Springs, Bear Lake Valley, Idaho. Diameter : 13 mm.

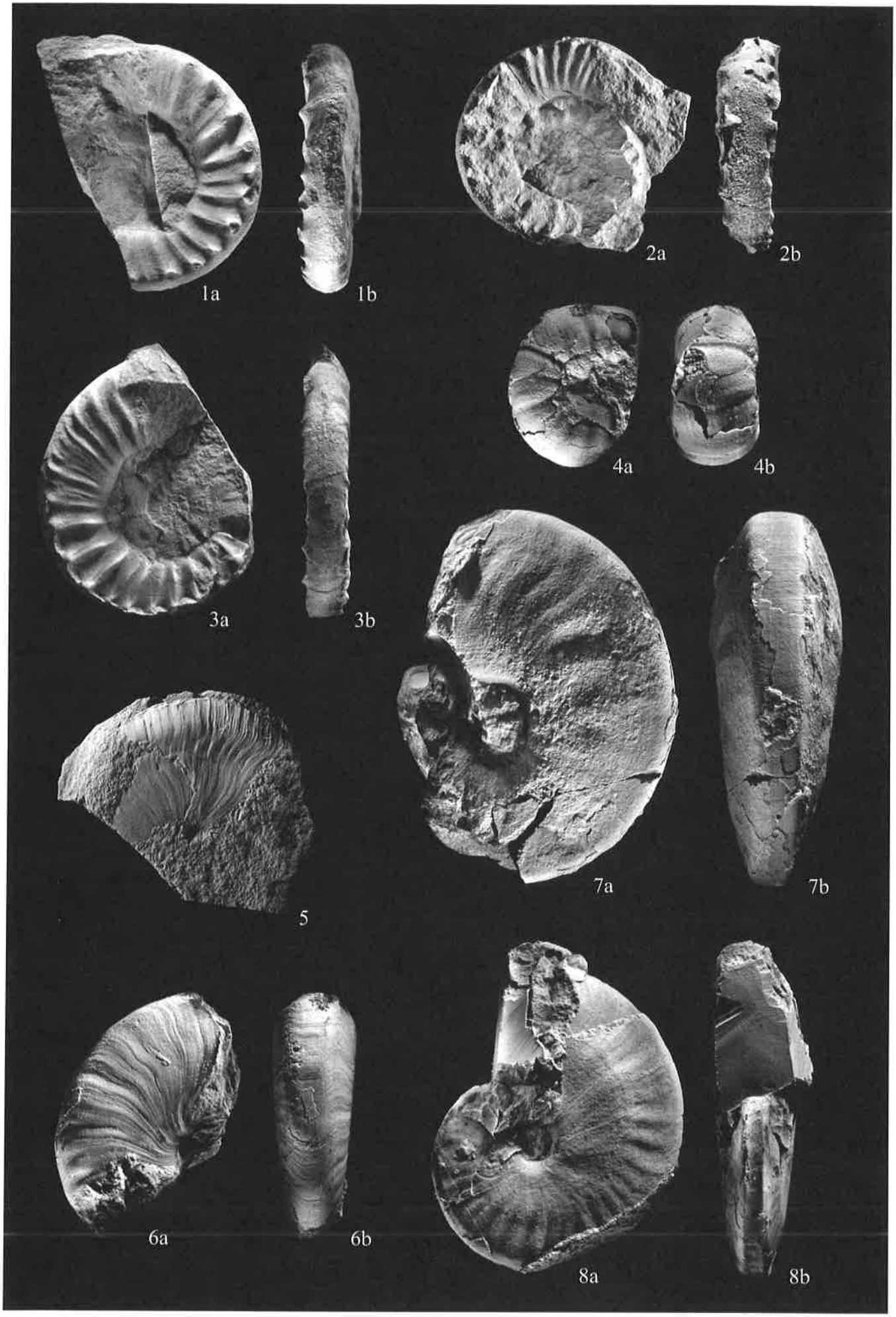
Fig. 5. *Metadagnoceras* ? sp.indet.1. Nr. JGX-820. Locality : Lev. JGX-HC18a, Hammond Creek, Bear Lake Valley, Idaho. Height : 20 mm.

Fig. 6. *Metadagnoceras* sp.indet.2. Nr. JGX-801. Locality : Lev. JGX-NHR-2360B, northern Humboldt Range, Nevada. Height : 20 mm.

Fig. 7. *Metadagnoceras* sp.indet 3 Nr. JJ-1371c-809. . Jenks Coll. Locality : Lev. Neopopanoceras haugi Zone, JGX-NHR-2360B, USGS Loc. 2834, northern Humboldt Range, Nevada. Diameter : 65 mm.

Fig. 8. *Stacheites carinae* sp.nov., holotype. Nr. JGX-1688b-688. Locality : northern Humboldt Range, Nevada. Lev. JGX-NHR-1688B. Diameter : 52 mm.

**Plate L**



## Plate LI

Figs. 1-2. Intermediate forms between *Silberlingeria* and *Prohungarites*. Locality : Hammond Creek, Bear Lake Valley, Idaho.

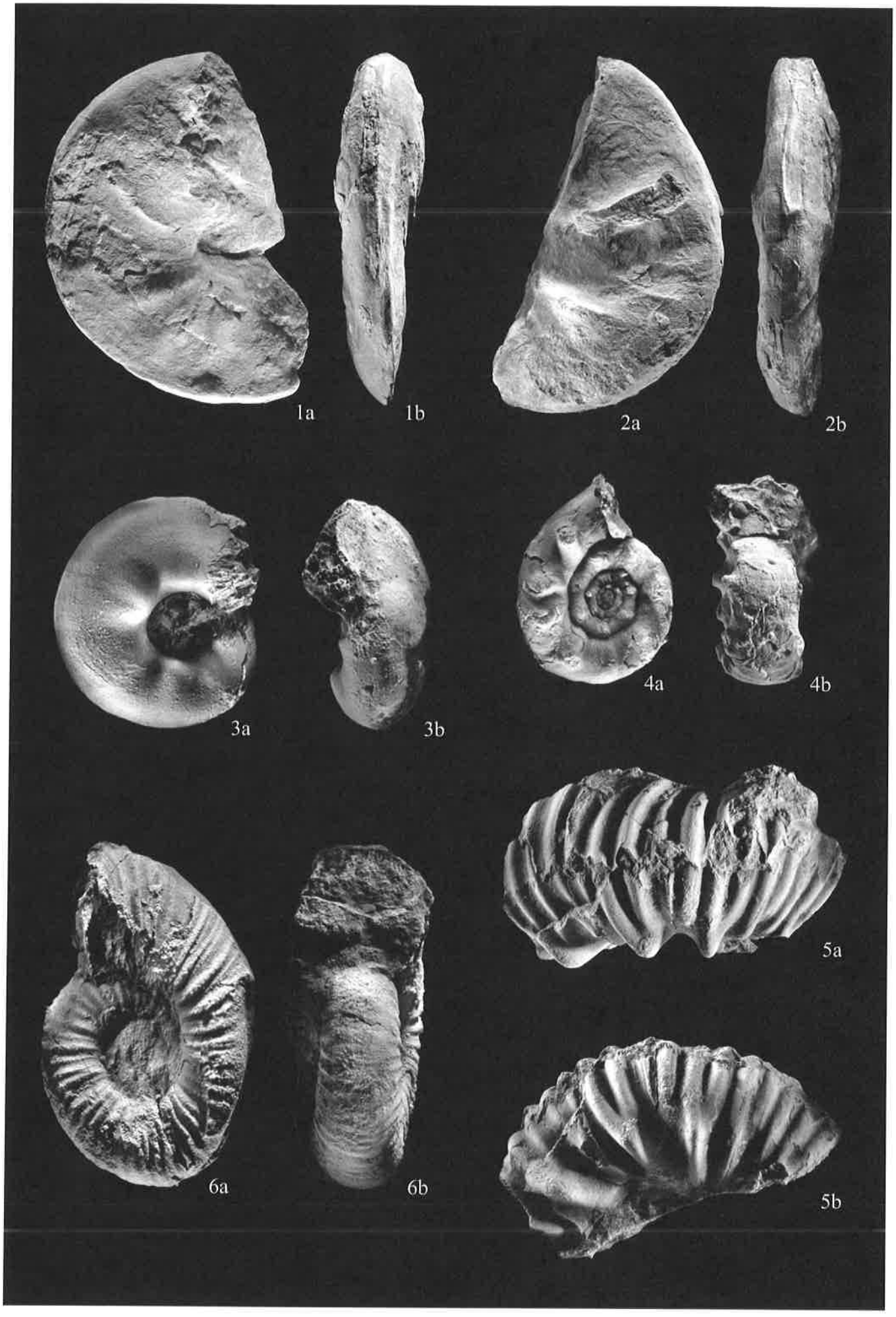
1. Nr. JGX-812. Lev. JGX-HM28. Diameter : 94 mm.
2. Nr. JGX-813. Lev. JGX-HM28. Diameter : 98 mm.

Figs. 3. *Silberlingeria* sp., juvenile specimen.. Nr. JGX-802. Locality : Lev. JGX-2360B, northern Humboldt Range, Nevada. Diameter : 18 mm.

Figs. 4. *Keyserlingites pacificus* (Hyatt & Smith).. Nr. JJ-1370c-810. Jenks Coll.. Locality : Neopopanoceras haugi Zone, USGS Loc. 2834, northern Humboldt Range, Nevada. Diameter : 15 mm.

Figs. 5. *Pseudacrochordiceras inyoense* (Smith).. Nr. JJ-1367c-808. Jenks Coll.. Locality : Neopopanoceras haugi Zone, USGS Loc. 2834, northern Humboldt Range, Nevada. Height : 25 mm.

Figs. 6. *Pseudacrochordiceras* sp.. Nr. JJ-1374c-811. Jenks Coll.. Locality : John Brown Canyon, northern Humboldt Range. Diameter : 40 mm.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## Plate LII

Fig. 1. *Nordophiceratoides bartolinae* sp.nov.

1a. Height : 29mm.
1b. Height : 17 mm.

Fig. 2. *Eschericeratites lytoceratoides* Guex et al., paratype. Height : 5 mm.

Fig. 3. *Albanites sheldoni* (Kummel). Height : 20 mm.

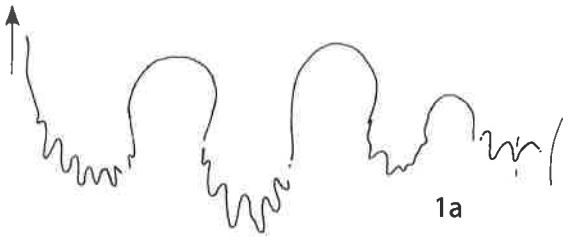
Fig. 4. *Cordillerites angulatus* Hyatt & Smith. Height : 16mm.

Fig. 5. *Cowboyiceras farwestense* Guex et al.

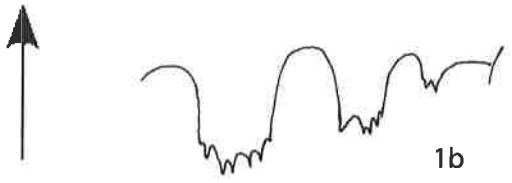
5a. holotype. Height : appx. 18 mm.
5b. Height : 22 mm.

Fig. 6. *Dagnoceras* (?) sp.indet.. Height : 5 mm.

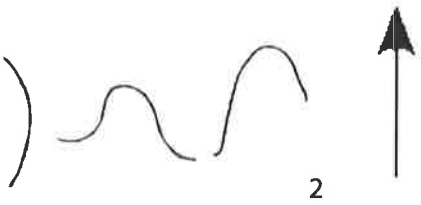
Fig. 7. *Stacheites concavus* Shevyrev. Height : 12 mm.



1a



1b



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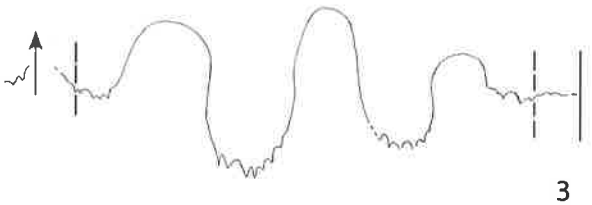

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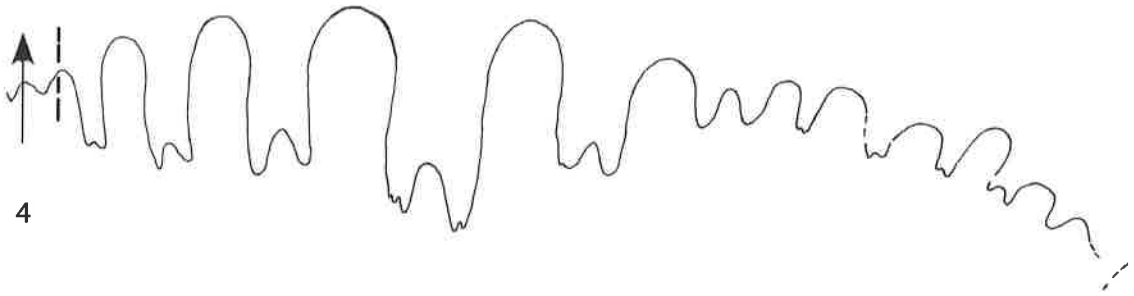

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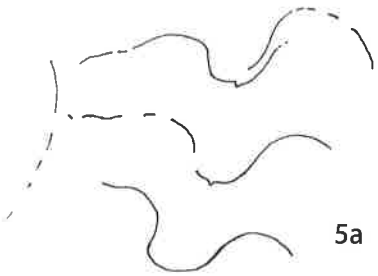
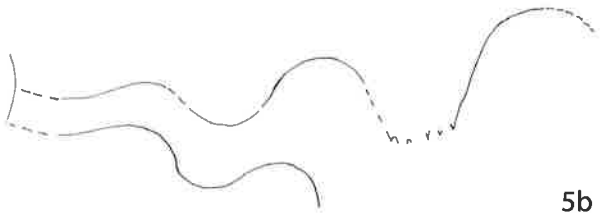


5a



5b

6

7

## Plate LIII

Fig. 1. *Stacheites floweri* Kummel. Height : 20 mm.

Fig. 2. *Tirolites smithi* Kummel. Height : 16 mm.

Fig. 3. *Tirolites* aff. *Smithi*. Height : 16 mm.

Fig. 4. *Rudolftruempyiceras* gen.nov. *apostolicum* (Smith). Height : 4 mm.

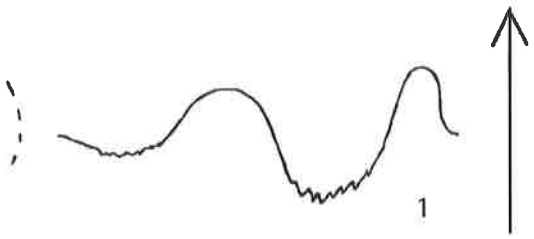
Fig. 5. *Columbites parisianus* Hyatt & Smith. Height : 5 mm.

Fig. 6. *Columbites* aff. *dolnapaensis* Kiparisova. Height : 5.5 mm.

Fig. 7. *Columbites crassicostatus* Guex et al.

7a. Height : 5 mm.
7b. Height : 4.5 mm.
7c. Height : 5 mm.

Fig. 8. *Columbites isabellae* Guex et al.. Height :5 mm.



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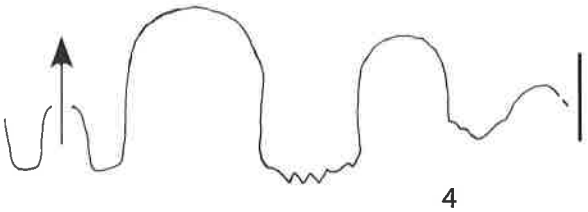

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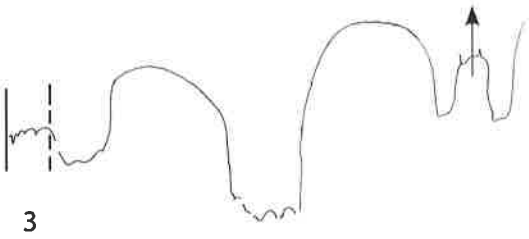

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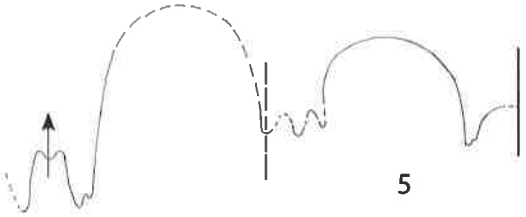

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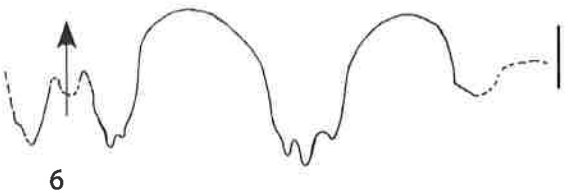

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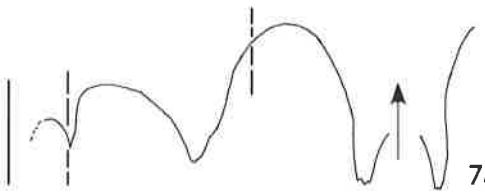
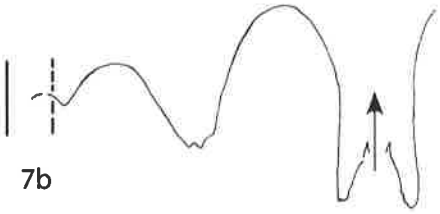
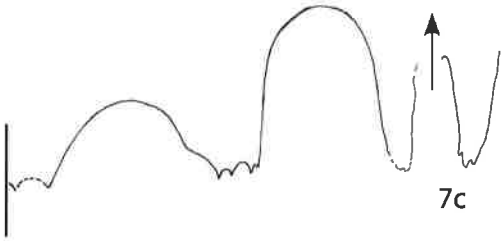


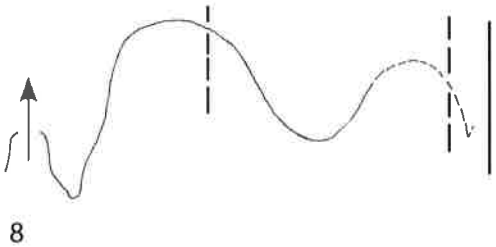
7a



7b



7c



8

## Plate LIV

Fig. 1. *Columbites* aff. *minimus* Smith.

1a. Height : 5 mm.
1b. Height : 8 mm.
1c. Height : 5 mm.

Fig. 2. *Yvesgalleticeras montpelierense* (Kummel). Height : 7.5 mm.

Fig. 3. *Marcouxia astakhovi* (Kummel). Height : 10 mm.

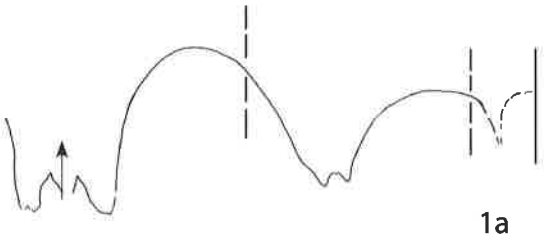
Fig. 4. *Procolumbites karataucicus* Astachova. Height : 11 mm.

Fig. 5. *Tardicolumbites tardicolumbus* Guex et al.. Height : 5 mm.

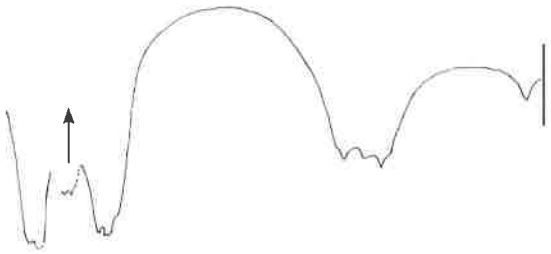
Fig. 6. *Hellenites elegans* Guex et al.. Height : 4.5 mm.

Fig. 7. *Metadagnoceras unicum* Kiparisova. Height : 16 mm.

Fig. 8. *Yvesgalleticeras raphaeli* sp.nov.,holotype. Height : 7 mm.



1a



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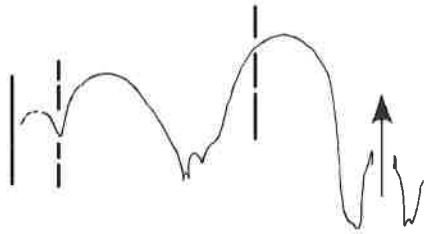

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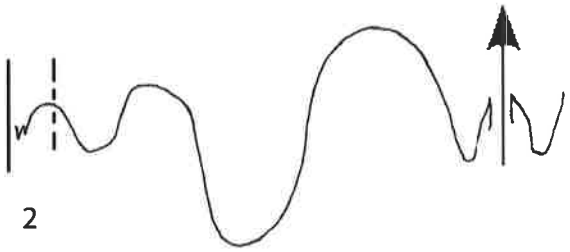

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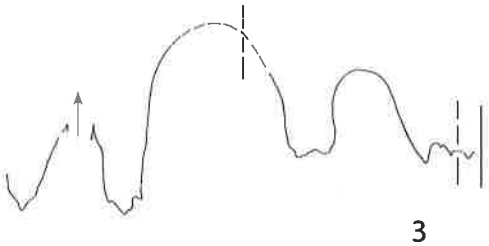

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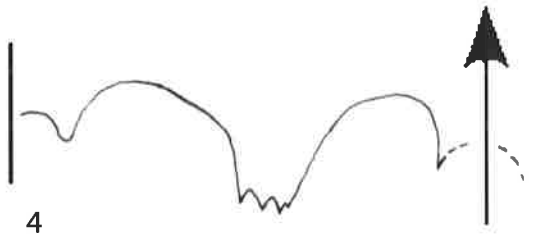
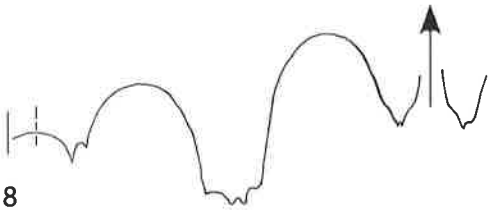


4

6

5



8

7

## Plate LV

Fig. 1. *Neopopanoceras haugi* (Hyatt & Smith).

Fig. 2. *Kazakhstanites dolnapensis* Shevyrev.

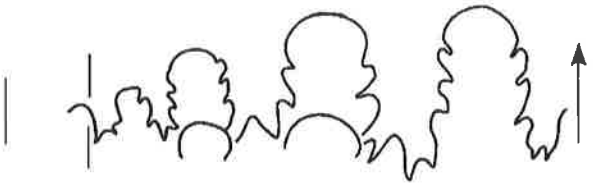
2a. Height : 8 mm.
2b. Height : 9 mm.
2c. Height : 11 mm.
2d. Height : 7.5 mm.

Fig. 3. *Svalbardiceras sulcatum* Guex et al.

3a. Height : 9 mm.
3b. Height : 8 mm.
3c. Height : 4.5 mm.
3d. Height : 5 mm.

Fig. 4. *Svalbardiceras* aff. *spitzbergensis* (Frebold). Height : 10 mm.

Fig. 5. *Keyserlingites pacificus* (Hyatt & Smith).



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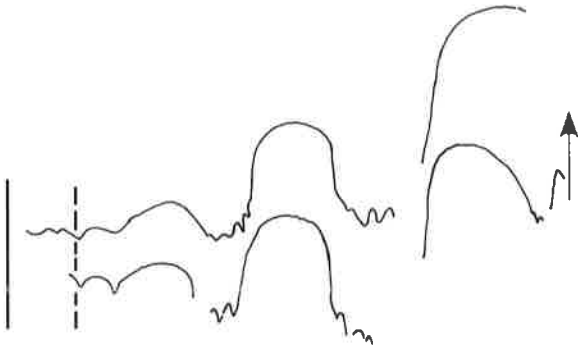
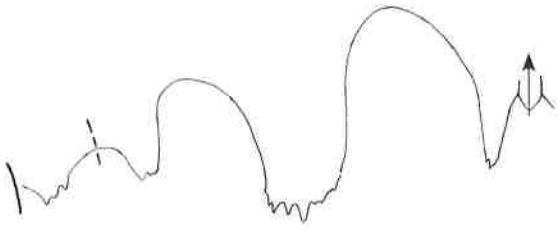


2a

2b



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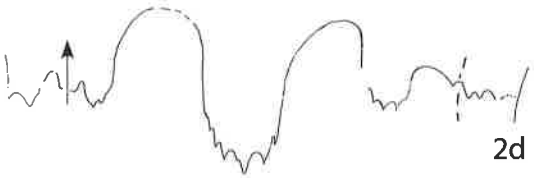
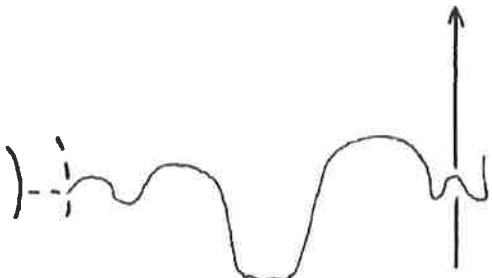


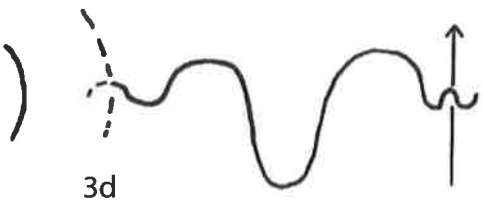
2d

3a



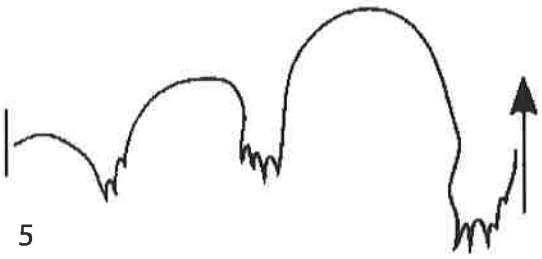
3b

3c



3d

4



5

## Plate LVI

Fig. 1. *Pseudacrochordiceras inyoense* (Smith).

Fig. 2. *Kiparisovites* aff. *ovalis* Shevyrev. Height : min. 4 mm.

Fig. 3. *Prohungarites gutstadti* Kummel. Height : 9.5 mm.

Figs. 4. *Prohungarites mckelvei* Kummel. Height : 9.5 mm.

Fig. 5. *Prohungarites beyrichitoides* Guex et al., Height : 3.5 mm.

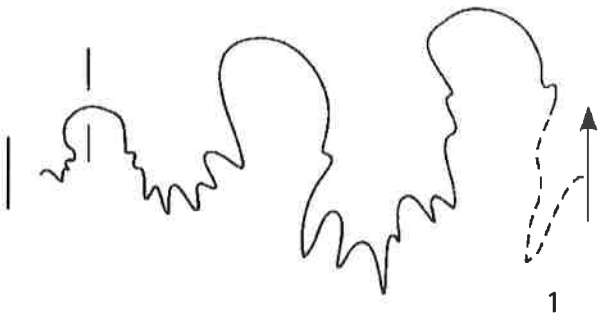
Fig. 6. *Silberlingeria bearlakensis* (Kummel).

6 a. Height : 23 mm.
6 b. Height : 15 mm.

Fig. 7. *Silberlingeria sarahjanae* Guex et al.. Height : 19 mm.

Fig. 8. *Tapponnierites tenuicostatus* Guex et al.,paratype. Height : 7 mm.

Fig. 9. *Palaeophyllites* ? sp.. Height : 10 mm.



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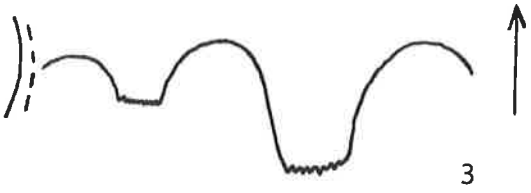
2



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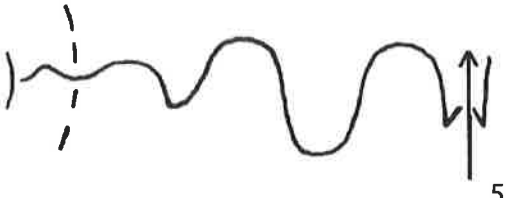

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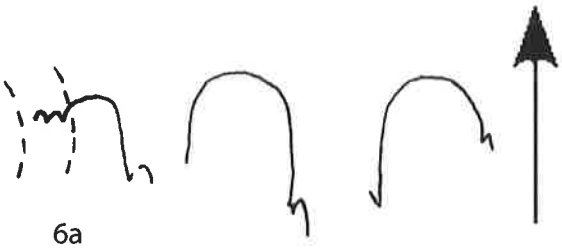
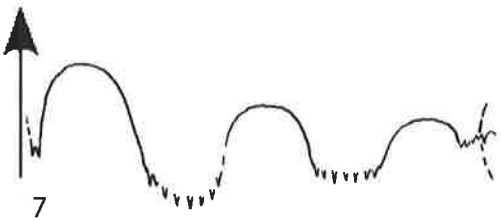


6a

6b



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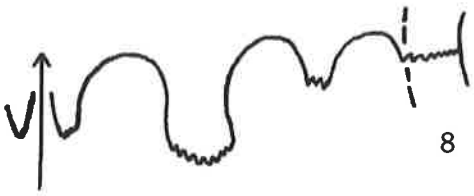

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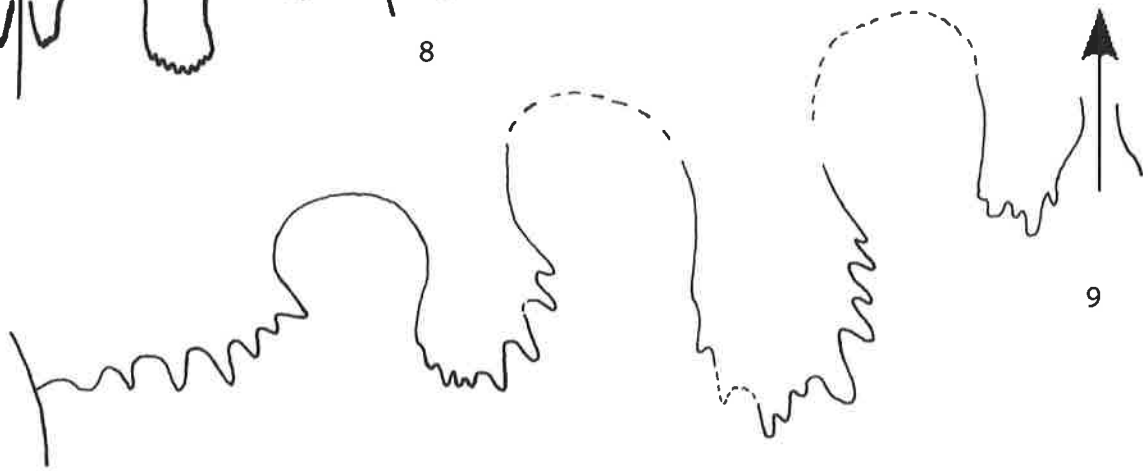


9

## Plate LVII

Fig. 1. *Deweveria dudresnayi* Guex et al..

1a. Height : 9 mm.
1b. Height : 10 mm.

Fig. 2. *Deweveria crenulata* sp.nov..

Fig. 3. *Ussurites submansfeldi* sp.nov.. Height : 7 mm.

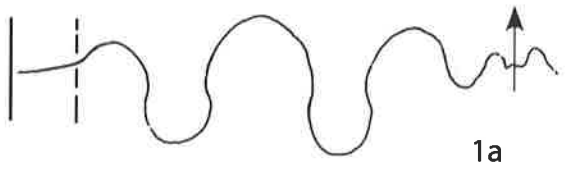
Fig. 4. *Coscaites crassus* Guex et al.. Height : 30 mm.

Fig. 5. *Nordophiceratoides catherinae* Guex et al..

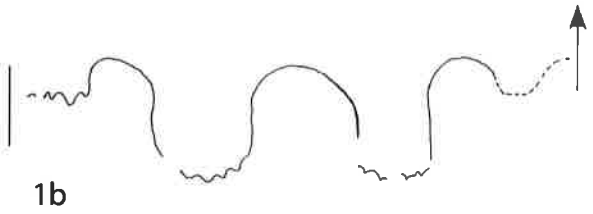
5a. Height : 14 mm.
5b. Height : 4 mm.

Fig. 6. *Nordophiceratoides adriani* Guex et al..

6a. Height : 13 mm.
6b. Height : 13.5 mm.



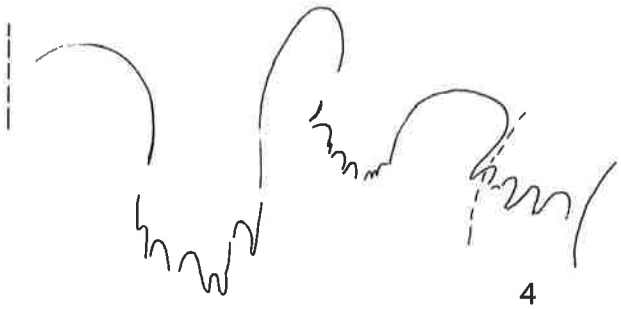
1a



1b

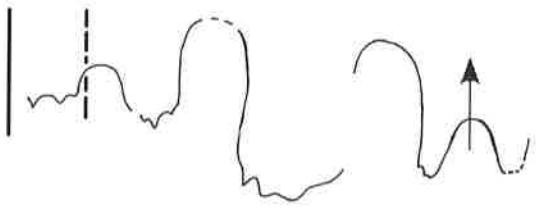
2

3



4

5a



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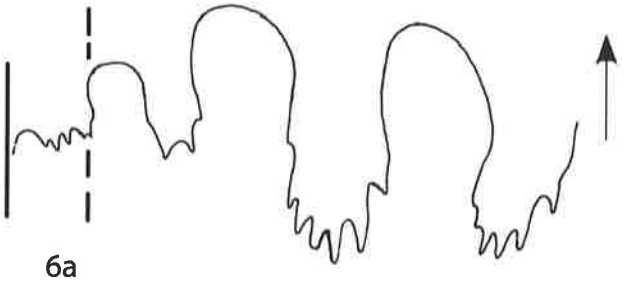
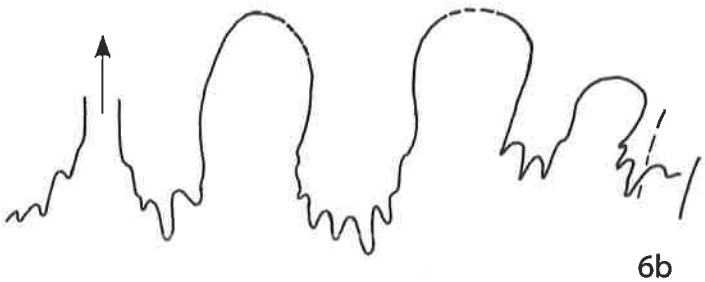


6a



6b

## Plate LVIII

Fig. 1. *Bajarunia pilata* (Hyatt & Smith).

1a. Height : 20 mm.
1b. Height : 19 mm.
1c. Height : 17 mm.
1d. Height : 20 mm.

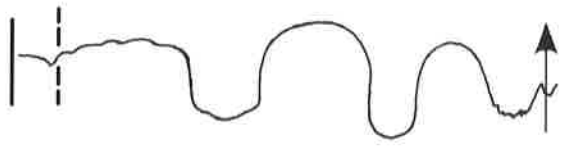
Fig. 2. *Bajarunia confusionensis* Guex et al..

2a. holotype, Height : 16 mm.
2b. Height : 14 mm.

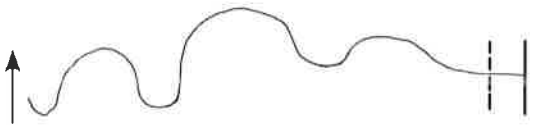
Fig. 3. *Arctomeekoceras popovi* Guex et al..

3a. Height : 24 mm.
3b. Height : 22 mm.

Fig. 4. *Arctomeekoceras tardum* Guex et al.. Height : 18 mm.

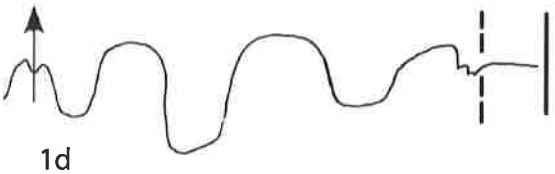


1a

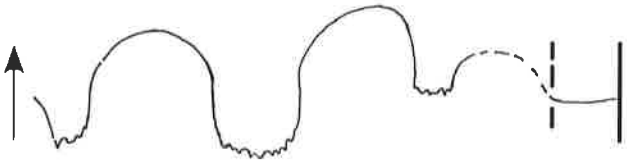


1b

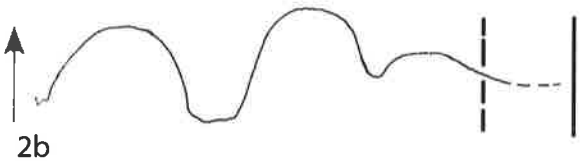
1c



1d

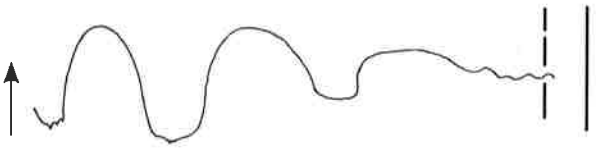


2a



2b

3a



3b

4

## Plate LIX

Fig. 1. *Carteria hotspringensis* Guex et al..

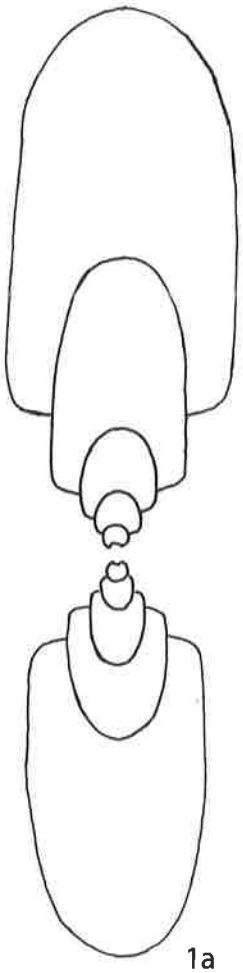
1a. Diameter: 65 mm.
1b. Height : 19 mm.

Fig. 2. *Xenoceltites crenulatus* Guex et al.. Height : 6 mm.

Fig. 3. *Xenoceltites spencei* (Hyatt & Smith). Height : 4 mm.

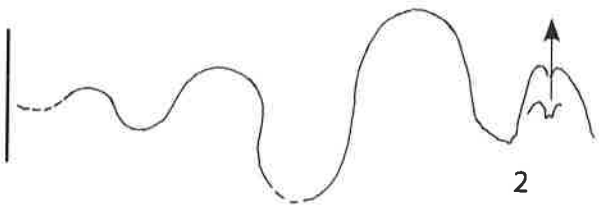
Fig. 4. *Jeanbesseiceras jacksoni* (Hyatt & Smith ).

4a. Height : 11 mm.
4b. Height : 9 mm.
4c. Height : 5 mm.
4d. Height : 5 mm.

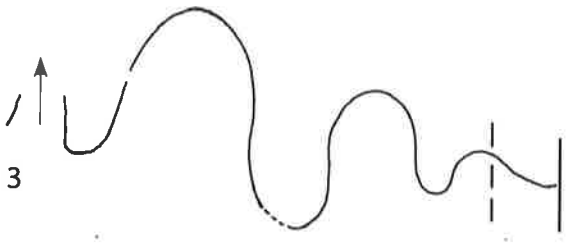


1a

1b



2



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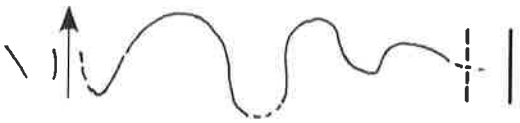
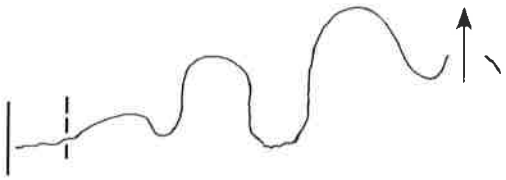


4a



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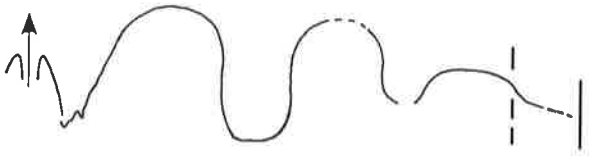
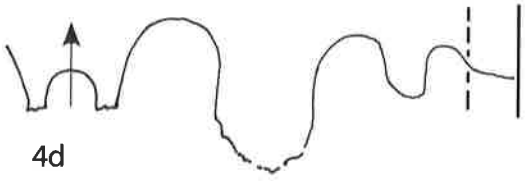


4c



4d

## Plate LX

Fig. 1. *Hemilecanites paradiscus* Kummel. Height : 6 mm.

Fig. 2. *Hemilecanites fastigatus* Guex et al..

Fig. 3. *Eodanubites* (*Dumitricaceras*) *judae* (Guex et al.).

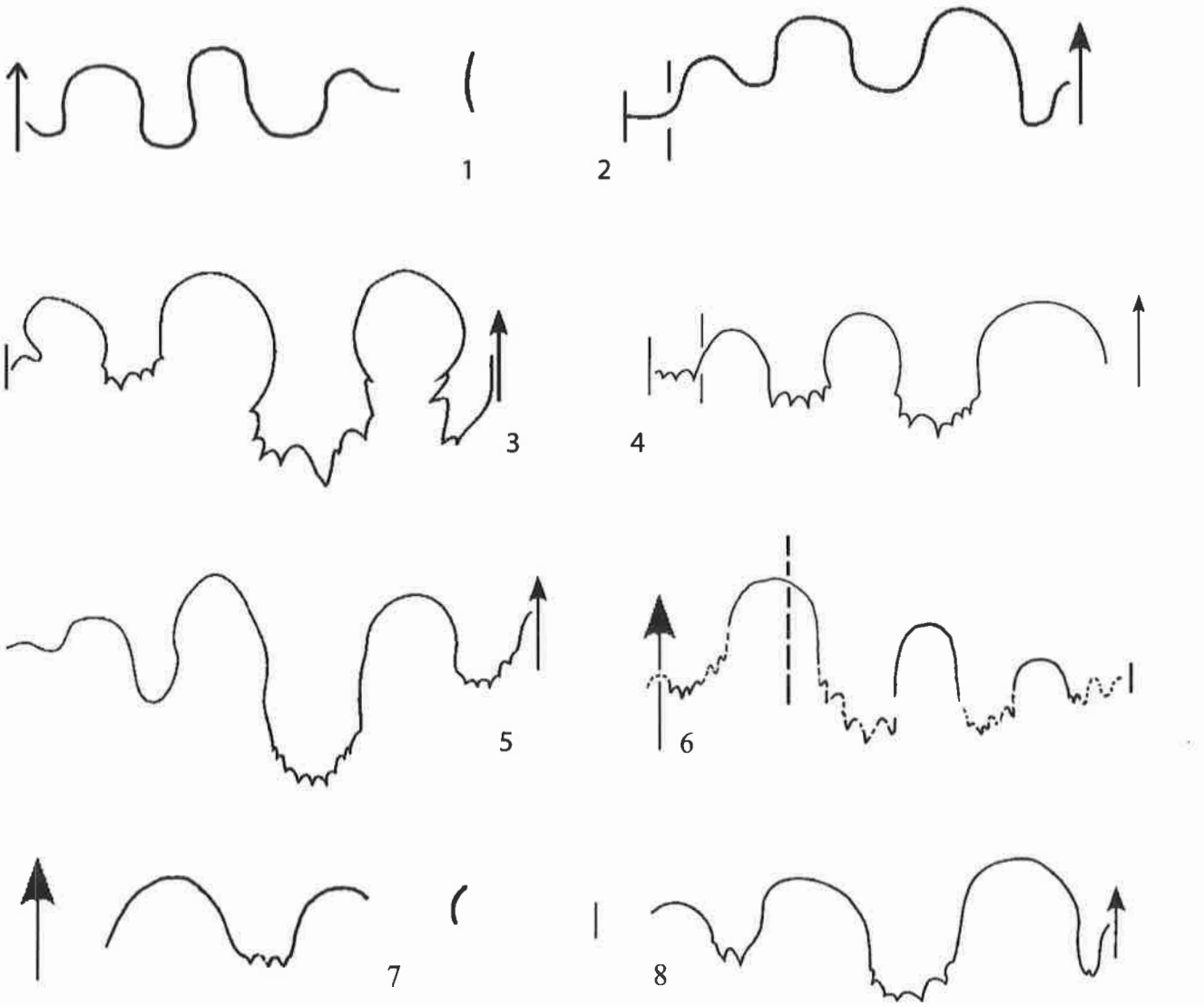
Fig. 4. *Courtilloticeras stevensi* Guex et al..

Fig. 5. *Inyoceras bittneri* (Hyatt & Smith).

Fig .6. *Gaudemerites rectangularis* Guex et al.. Height : 18 mm.

Fig. 7. *Ceccaisculitoides elegans* Guex et al., paratype. Nr. JGX-720. Height : 6 mm.

Fig. 8. *Goricanites noblei* Guex et al., holotype. Height : 7 mm.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