

## FOSSILS

### Fossils of the Paleozoic Formations of Southeastern Arizona

by Jan Wilt and Dietmar Schumacher, 1978

This article is a guide to some of the more diagnostic and easily identified fossils from Paleozoic formations in southern Arizona. Emphasis is on fossil groups rather than species and genera, and particularly on those which a geologist could identify in the field with minimum chances of error. The groups stressed are fusulinid foraminifera, stromatoporoids, corals, brachiopods, gastropods, pelecypods, cephalopods, and trilobites.

This guide is oriented toward the field geologist with little or no training in paleontology. It should be used in conjunction with the Bryant (1968) article from Arizona Geologic Society Guidebook II. The fossil illustrations were based, wherever possible, upon specimens in the University of Arizona collection. For correct generic or specific identification, consult a professional paleontologist or refer to paleontology reference books, such as Moore, Lalicker, and Fisher (1952, Invertebrate Fossils); Shrock and Twenhofel (1953, Principles of Invertebrate Paleontology); Shimer and Shrock (1944, Index Fossils of North America); and the various volumes of the Treatise on Invertebrate Paleontology (1953 to date).

#### Cambrian

Recognition of Cambrian strata should be based on a profusion of trilobites to the exclusion of nearly all other fauna, except hyolithids, inarticulate brachiopods (such as Lingulepis, etc.), and a few primitive articulate brachiopods. Corals, bryozoans, and stromatoporoids common in younger Paleozoic strata are not found in Cambrian rocks. Cephalopods, gastropods, and articulate brachiopods should be rare or absent.

Examples of Middle and Upper Cambrian trilobites include Agraulos, Olenoides, Maladia, Elvinia, and Tricrepecephalus. Examples of Upper Cambrian brachiopods include Micromitra, Dicellomus, Billingsella, Lingulepis, and Stenothecca.

#### Ordovician

In Arizona, both Lower and Upper Ordovician strata are present in the extreme southeastern portion of the state (but not in the Tucson area). The Lower Ordovician is difficult to recognize paleontologically and is best done by the absence of certain groups - stromatoporoids, corals, and bryozoans. Gastropods, such as Raphistoma and Ophileta, nautiloid cephalopods such as Orthocena, and a few trilobites and articulate brachiopods occur in the Lower Ordovician, but they cannot easily be distinguished from those in the Upper Ordovician.

#### Silurian

Silurian rocks have not been recognized in Arizona, but they do occur in neighboring New Mexico.

### **Devonian**

Recognition of the lower Upper Devonian is based on the brachiopod genus, Atrypa. Important associated taxa are the tabulate corals, Favosites and Coenites, the colonial rugose corals, Hexagonaria and Pachyphyllum, hemispherical and branching stromatoporoids, and a few other forms. Spiriferid, productid, and rhynchonellid brachiopods first appear in force in the Devonian, but all continue into the Upper Paleozoic. Vertebrate remains, represented by fish teeth, bones, and plates, are locally abundant, but similar remains also occur in younger Paleozoic formations.

Upper Upper Devonian strata are characterized by the absence of the aforementioned corals and brachiopods and the presence of the sponge, Ensiferites, and the large rhynchonellid Paurorhyncha, and the large spiriferids, Syringospira and Cyrtospirifer.

### **Carboniferous (Mississippian-Pennsylvanian) and Permian**

Productid brachiopods -- dictyoclostids, linoproductids, and echinoconchids -- are by far the most diagnostic indicators for the Permo-Carboniferous. These productids should be associated with a rich and varied fauna of spiriferid brachiopods, fenestellid bryozoans, and, in the younger strata, fusulinids.

Common, but less diagnostic, associates are the productellid, rhynchonellid, rostrospiriferid, leiiorhynchid, strophomenid, punctospiriferid, and terebratulid brachiopods. Trilobites, goniatite and nautiloid cephalopods and pectinoid pelecypods may be found but are usually rare. Particularly noteworthy is the complete absence of the stromatoporoids.

### **Mississippian**

Mississippian rocks can be rather difficult to delineate paleontologically because so much of the fauna is rather bland spiriferid and productid brachiopods which can easily be interpreted as Permo-Pennsylvanian. The absence of the morphologically distinct fusulinids and the brachiopods Neospirifer, Juresania, and Derbyia, which are all characteristic of the Pennsylvanian and Permian, suggests rocks of Mississippian age.

The Mississippian bears an abundant spiriferid fauna which generally lacks rib bundling. Along with these will be a fair complement of dictyoclostid, echinoconchid, and linoproductid brachiopods that are typically smaller than many of their Permo-Pennsylvanian descendants.

Corals, both solitary and colonial, are a common element of most Mississippian rocks where carbonate is the major lithology. In Arizona, the easily recognized Lithostrotionella is found only in the Mississippian. Syringoporid corals are also common in Mississippian strata, but they also occur in the Pennsylvanian and Permian. The distinctive bryozoan Archimedes has only been reported from the Upper Mississippian Paradise Formation.

### **Permo-Pennsylvanian**

Arizona's Pennsylvanian and Permian formations are characterized by fusulinids, Neospirifer, Derbyia, Meekella, Juresania, and the solitary rugose coral Lophophyllidium. Along with these should be a fair productid population consisting of echinoconchids, linoproductids, and dictyoclostids.

### **Pennsylvanian**

The Pennsylvanian may be difficult to distinguish from the Permian because they contain the same fossils with little diagnostic for the early or late portions. The fusulinids of the Pennsylvanian are, on the average, considerably smaller than those of the Permian.

In southern Arizona, the easily recognized colonial coral Chaetetes occurs only in the Pennsylvanian Black Prince and lower Horquilla/Naco formations. The distinctive bryozoan Prismopora also is a good guide fossil for the Horquilla and Naco formations.

### **Permian**

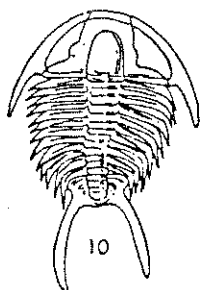
The Permian has, in addition to the characteristic Permo-Pennsylvanian fossils, several very diagnostic and easily identifiable forms. The large gastropod Omphalotrochus is one of the more common fossils in the Colina Limestone and serves as a guide fossil for that formation. The sponge Actinocoelia is also restricted to the Permian, occurring in considerable abundance in the Concha Limestone.

List of Common Paleozoic Fossils

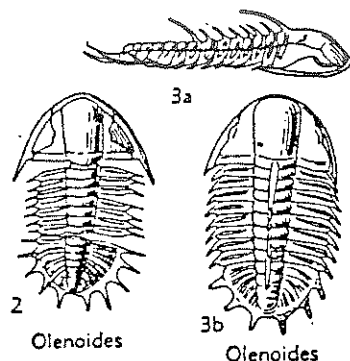
Most common Paleozoic invertebrate fossils- S.E. AZ

Cambrian	Pennsylvanian
brachiopods	corals
Dicellomus	Caninia
Lingulella	Chaetetes
Lingulepis	Lophophyllidium
Micromitra	Michelinia
Billingsella	Syringopora
trilobites	bryozoans
Cedaria	Prismopora
Eldoradia	brachiopods
Tricrepicephalus	Antiquatonia
Elvinia	Composita
algal pisolites	Derbyia
trilobites trails	Echinaria
	Juresania
	Linoproductus
Ordovician	Neospirifer
gastropods	Rhipidomella
Ophileta	Anthracospirifer
Raphistoma	
cephalopods	Permian
Endoceras	corals
	Lophophyllidium
Devonian	brachiopods
corals	Derbyia
Hexagonaria	Neospirifer
Pachyphyllum	gastropods
Coenites	Omphalotrochus
brachiopods	echinoids
Atrypa	Archaeocidaris
Spinatrypa	sponges
Cyrtospirifer	Actinocoelia
Tenticospirifer	scaphopods
Paurorhyncha	Plagioglypta
Platyrachella	
Schizophoria	also brach's
Theodossia	Peniculauris (Dictyoclostus)
Devonoproductus	Chonetes
stromatoporoids	gast
Amphipora	Euomphalus
sponge	pelecy
Ensiferites (percha)	Aviculopinna
Astraeospongia	Myalina
Mississippian	
corals	
Vesiculophyllum	
Amplexizaphrentis	
Lithostrotionella	
Syringopora	
bryozoans	
Archimedes	
brachiopods	
Rhipidomella	
Echinoconchus	
crinoid stems	

Sketches of Cambrian Fossils

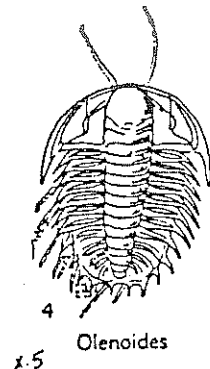


10  
Tricrepicephalus

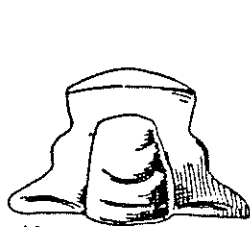


2  
Olenoides

3b  
Olenoides



4  
x.5  
Olenoides



11a

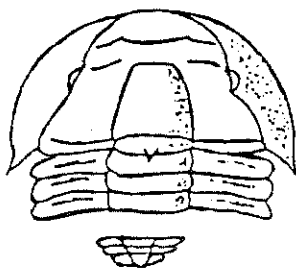


11b

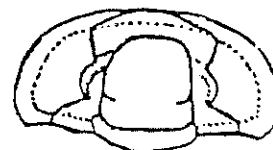
Elvinia



Agraulos



Agraulos, ME



Maladia, UE



9

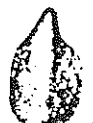


11



12

Stenorheca



13



14

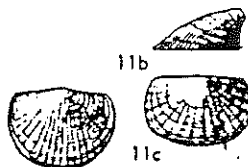


5a



5b

Lingulepis



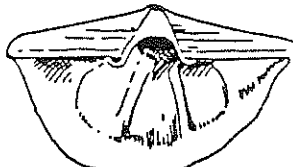
11a

Micromitra



11b

11c



11a

Billingsella



4a

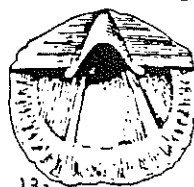


4b



4c

Dicellomus



13a



13b

Billingsella



13c



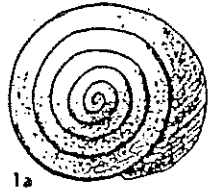
13d



11b

Billingsella

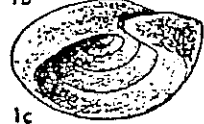
Ordovician



1a



1b



1c

Ophileta

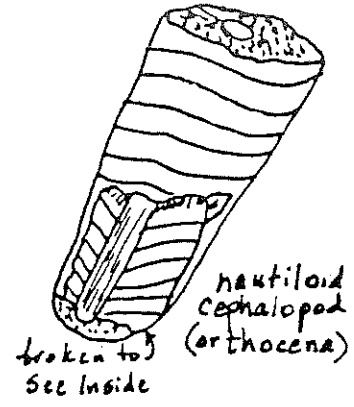


8a



8b

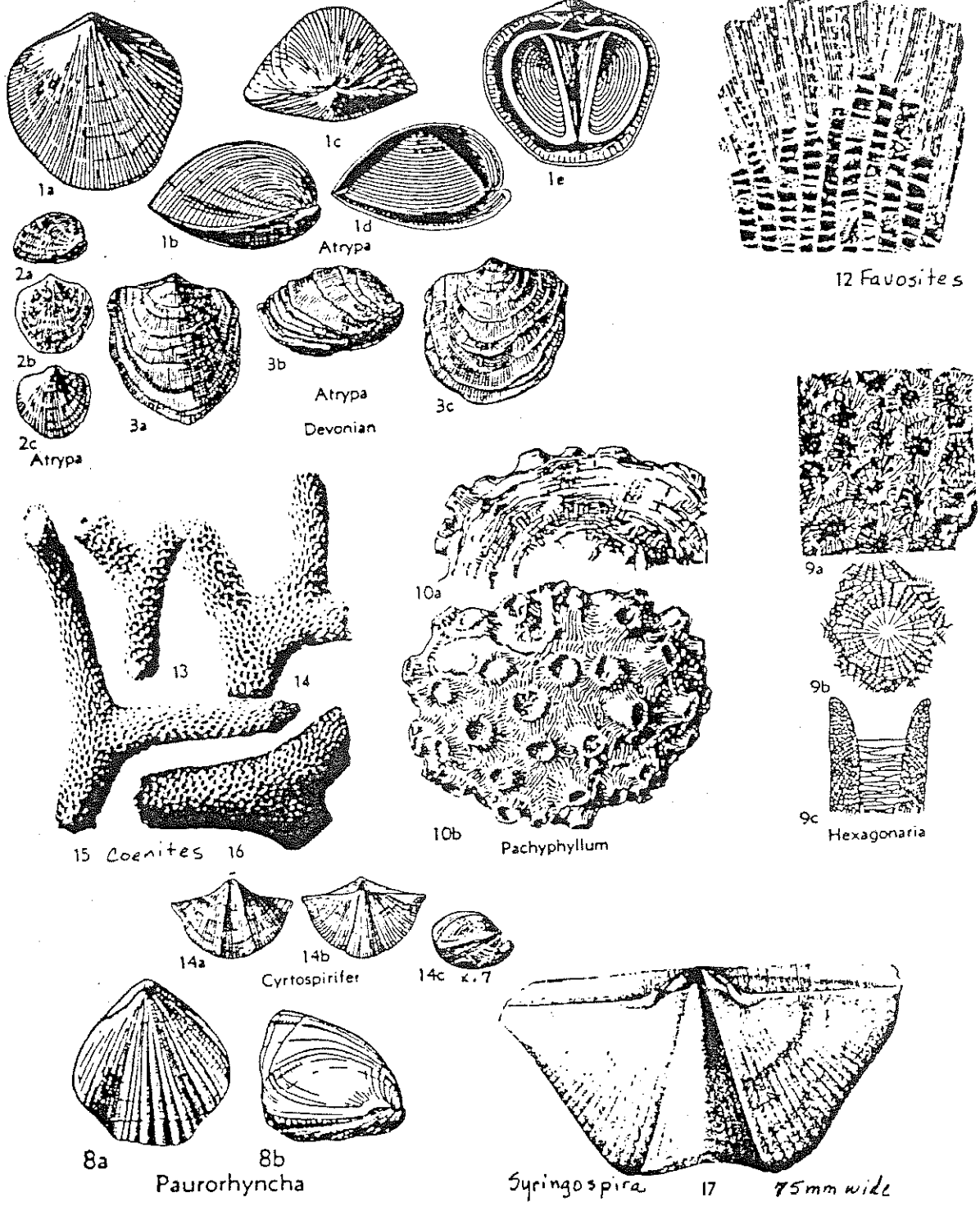
Raphistoma



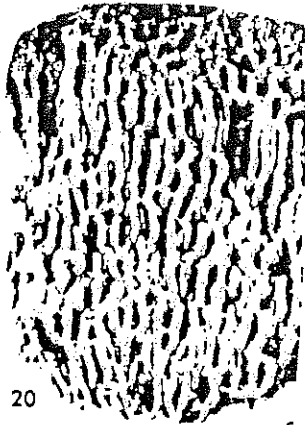
nautiloid  
cephalopod  
(orthocena)

broken to  
see inside

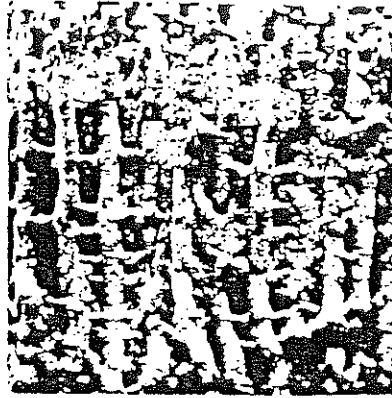
Sketches of Devonian Fossils



Sketches of Mississippian Fossils

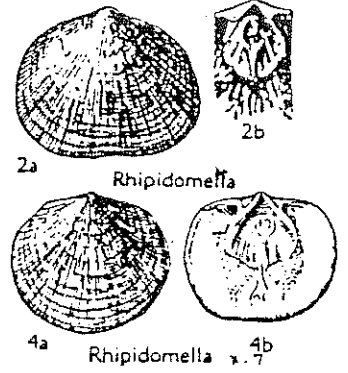


20



21

Syringopora



2a

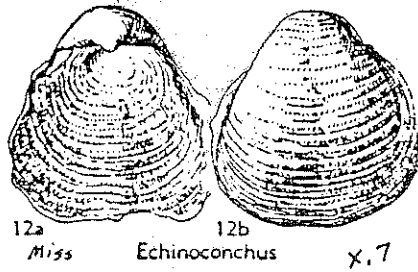
2b

Rhipidomella

4a

4b

Rhipidomella x.7



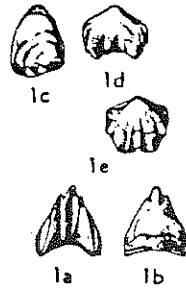
12a

12b

Miss

Echinoconchus

x.7



1c

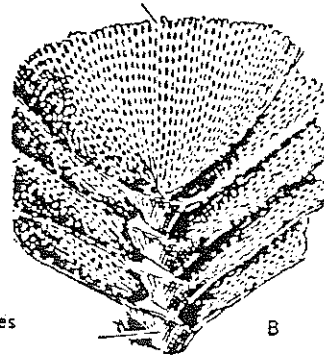
1d

1e

1a

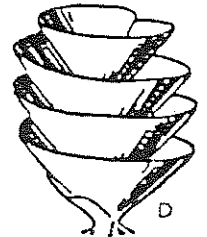
1b

x.7 Pugnoides Miss.



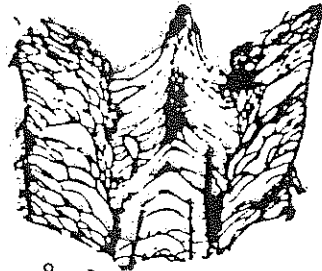
B

Archimedes

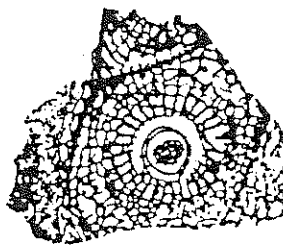


D

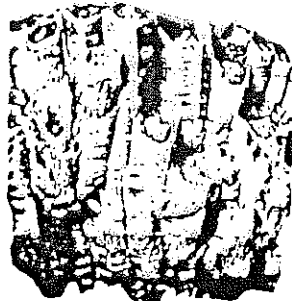
Archimedes



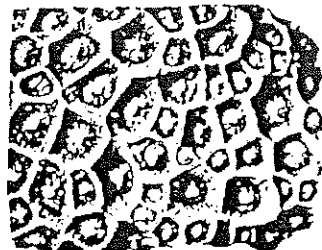
9 x.2



10 x.2



11 x.5



12 x.5



17

Lithostrotionella