UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Corals as guides to divisions of the Pennsylvanian System in the western interior region

by

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Open-File Report 84-79

1984

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ILLUSTRATIONS

TABLE

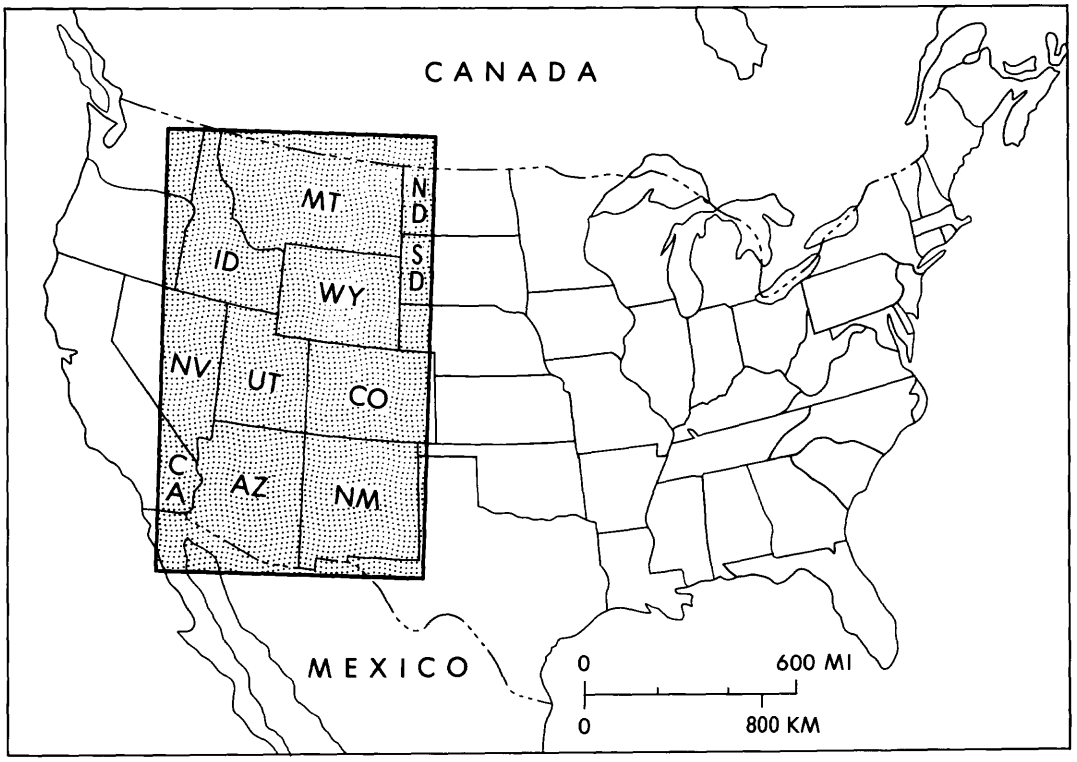


Figure 1.- Map of the conterminous USA showing location of the western interior region including States where Pennsylvanian corals occur. Shaded area is area shown on Figures 2-4.

GENUS	PENNSYLVANIAN								TOTALS
	LOWER	MIDDLE			UPPER			UNDIFFER-ENTIATED	
	Morrowan	Atokan	Desmoines-ian	Undiffer-entiated	Missourian	Virgilian	Undiffer-entiated		
Acaciapora			1			3			4
Amandophyllum		2	4	2	5	1	1	2	17
Amplexizaphrentis	5	1	1	1					8
Amplexocarinia	3								3
Amplexus	4	2	3	1	1	1	1		13
Barytichisma	11	4	3	1					19
Bayhaium						2			2
Bothrophyllum		3	1				1		5
Bradyphyllum	9		1		1	1			12
Chaetetes	3	27	16	10	1			15	72
Chaetetipora		1							1
Cladochonus						4			4
Cornwallatia						1			1
Crataniophyllum	6								6
Durhamina						1			1
Fasciculiamplexus	1								1
Geyerophyllum				1	2	2	1		6
Heintzella	13	1				5	2	5	26
Lophamplexus			3		1				4
Lophophyllidium	6	10	39	17	4	1	10	14	101
Michelinia	5	1	1	1	1		4	4	17
Multithecopora	7	22	27	11	8	5	6	19	105
Neokoninckophyllum	13	1	1	1	1			1	18
Neomultithecopora			4	2	1	4	2	2	15
Neosyringopora			4		6	5	12	4	31
Palaeacis			1						1
Petalaxis			1						1
Pseudozaphrentoides		15	61	23	28	16	23	28	194
New genus off. *Kleopatrina*						1	2		3
TOTALS	86	90	172	71	60	53	65	94	691

Table 1.- Distribution of coral genera in series and provincial series of the Pennsylvanian in the western interior region. Numbers are numbers of occurrences.

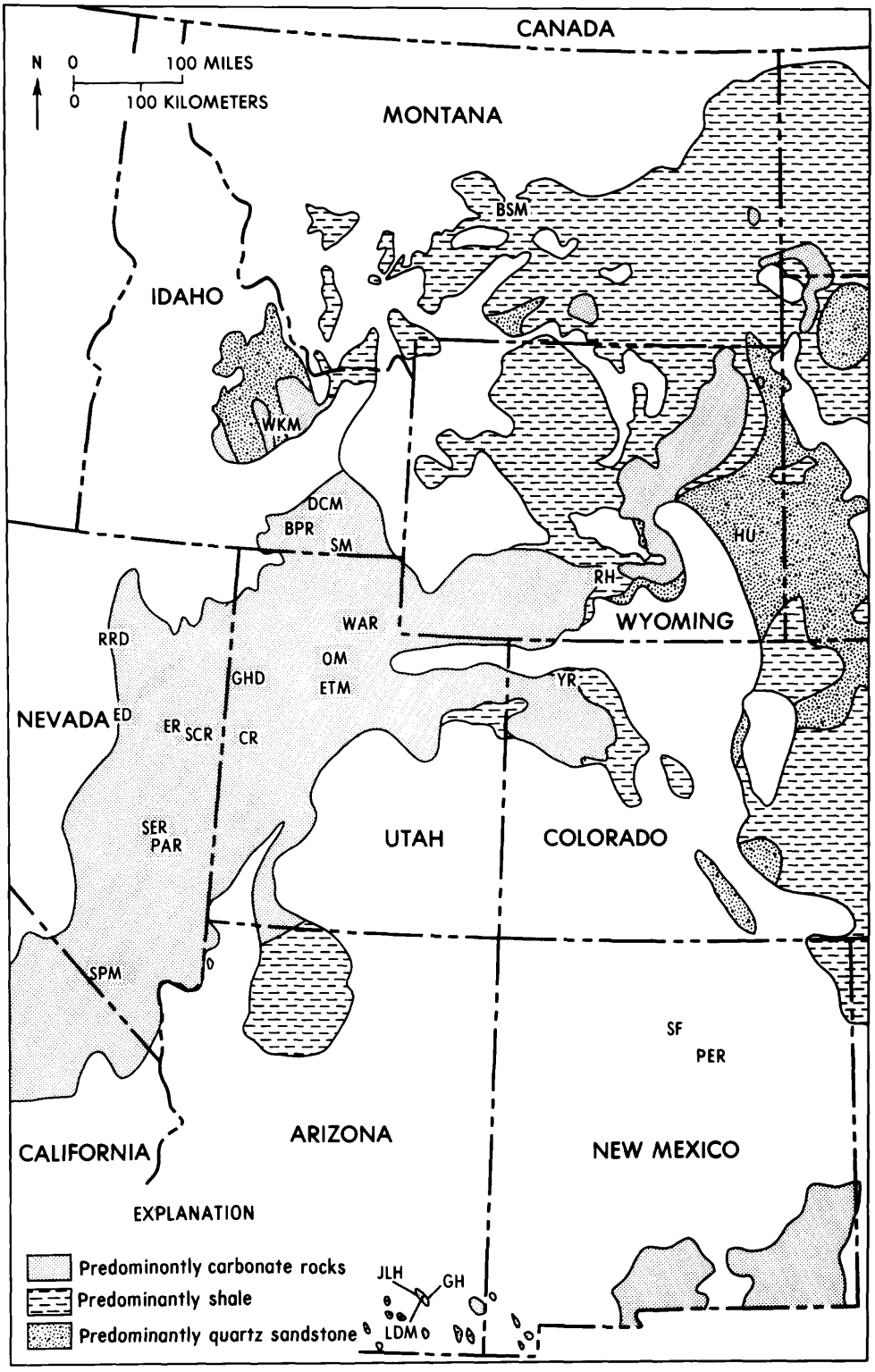
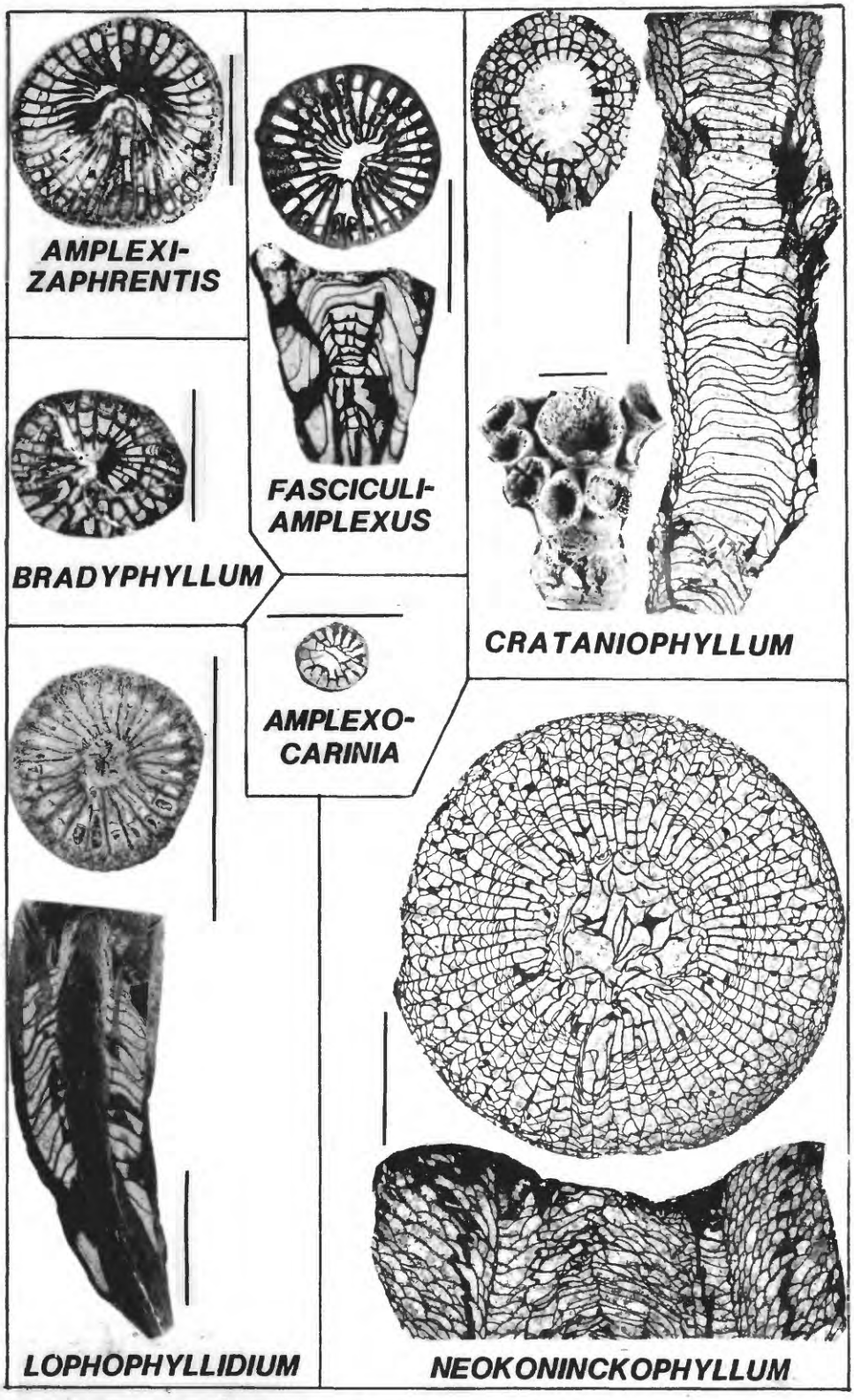
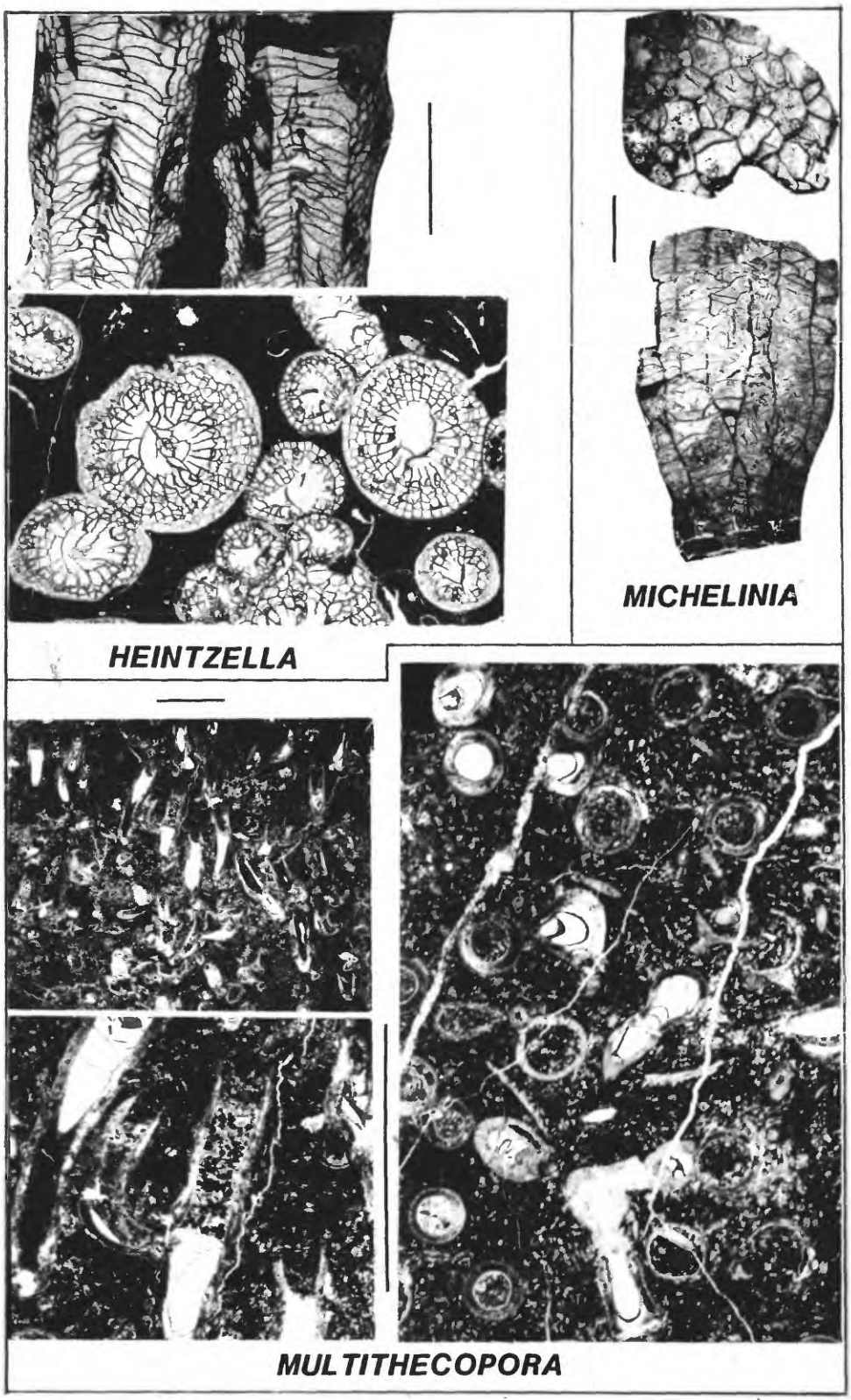


Figure 2.- Map of the western interior region showing distribution of Lower Pennsylvanian lithofacies and coral occurrences. Letters marking coral occurrences refer to names of mountain ranges and other geographic areas.



LOWER PENNSYLVANIAN SOLITARY RUGOSANS

Plate 1



LOWER PENNSYLVANIAN COLONIAL CORALS

Plate 2

Lophophyllidium, and Neokoninckophyllum appear for the first time in the western interior record. Crataniophyllum and Fasciculiamplexus are the only solitary genera restricted to the Lower Pennsylvanian.

Colonial corals.--The colonial corals of the Lower Pennsylvanian are shown on Plate 2. Chaetetes, which is very rare, is not shown here but may be seen on Plate 4. The phaceloid genus Heintzella appears for the first time. The long-ranging tabulate Michelinia is represented by different species than those that occur in the underlying Chesterian. Multithecopora is the only syringoporoid; it is represented by reptant, sheet-forming coralla unlike those found in the Mississippian.

MIDDLE PENNSYLVANIAN

Distribution.--Middle Pennsylvanian was a time of significant expansion of the area of marine sedimentation and consequent expansion of the coral fauna (Fig. 3). Corals are again concentrated in areas dominated by carbonate strata, but there are also more occurrences in predominantly terrigenous sequences and even in evaporitic sequences. Middle Pennsylvanian occurrences constitute 56 percent of the total occurrences datable to series (Table 1). Generic diversity increased by more than 50 percent to 21 genera. Within the Middle Pennsylvanian, corals are more common in the Desmoinesian than in the Atokan.

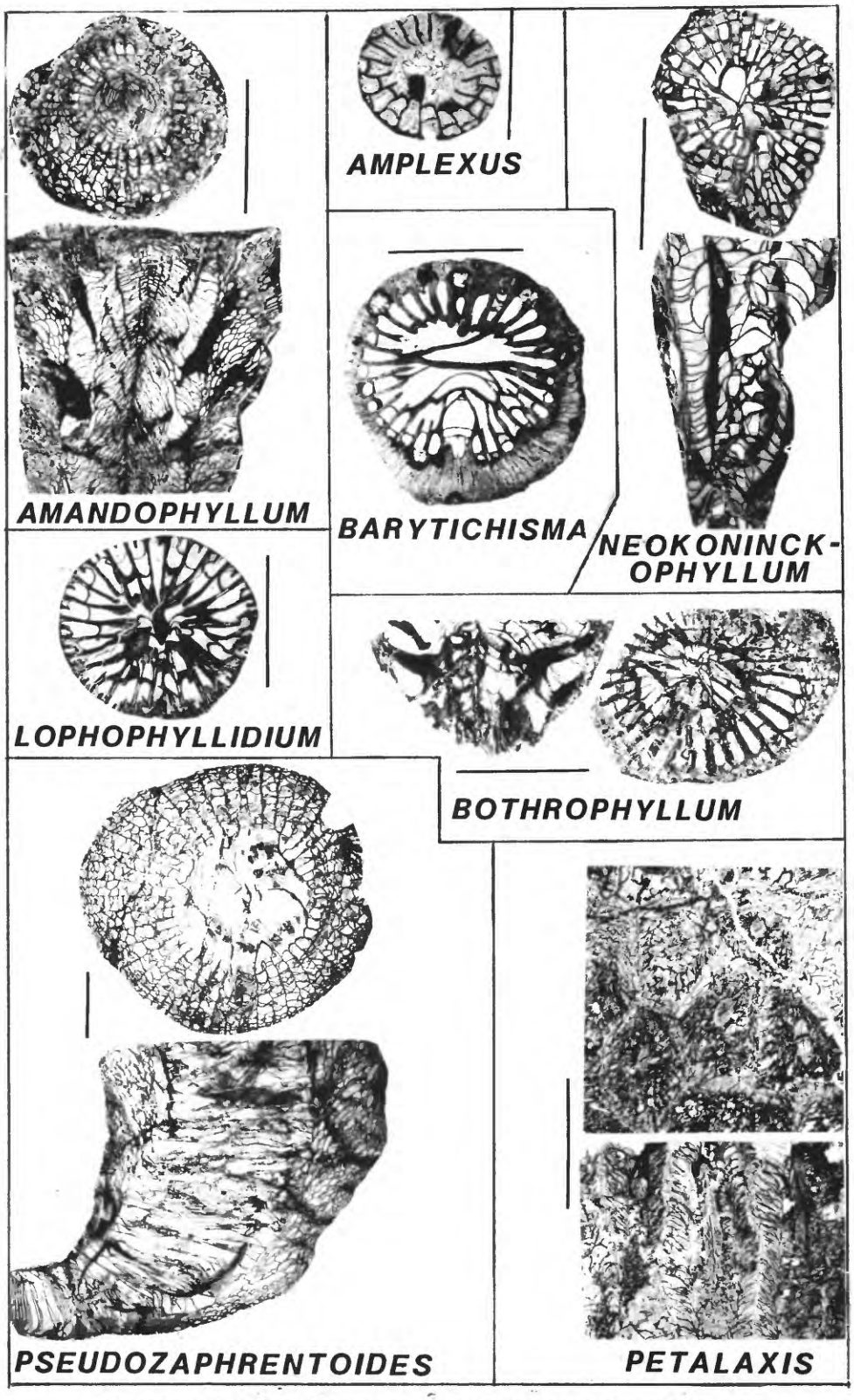
Solitary and colonial rugosans.--Plate 3 shows characteristic Middle Pennsylvanian rugose coral genera. Genera that appear for the first time are Amandophyllum, Bothrophyllum, Geyerophyllum (see Plate 7), Lophamplexus (see Plate 7), and Pseudozaphrentoides. Amplexocarinia, Crataniophyllum, and Fasciculiamplexus disappear from the western interior record. Petalaxis, which is very rare, and Heintzella (see Plate 2) are the only colonial rugose corals. Amplexizaphrentis and Bradyphyllum (see Plate 1) are rare.

Tabulates.--Middle Pennsylvanian tabulates, exclusive of the syringoporoids, are shown on Plate 4. Chaetetes is abundant and widespread in Middle Pennsylvanian rocks; it has been used as a stratigraphic marker in some areas for many years. Chaetetipora is a very rare coral restricted to the Middle Pennsylvanian. Palaeacis, which occurs widely throughout the Mississippian, is a very rare coral in the Middle Pennsylvanian. Acaciapora is also very rare. Michelinia is common and is represented by diminutive species.

Syringoporoids.--Plate 5 shows the Middle Pennsylvanian syringoporoid fauna, which becomes more common and more diversified at the Atokan-Desmoinesian boundary. Multithecopora is abundant and is represented by the same reptant, sheetlike forms as found in the Lower Pennsylvanian. Two genera, Neosyringopora and Neomultithecopora, appear at the base of the Desmoinesian for the first time.

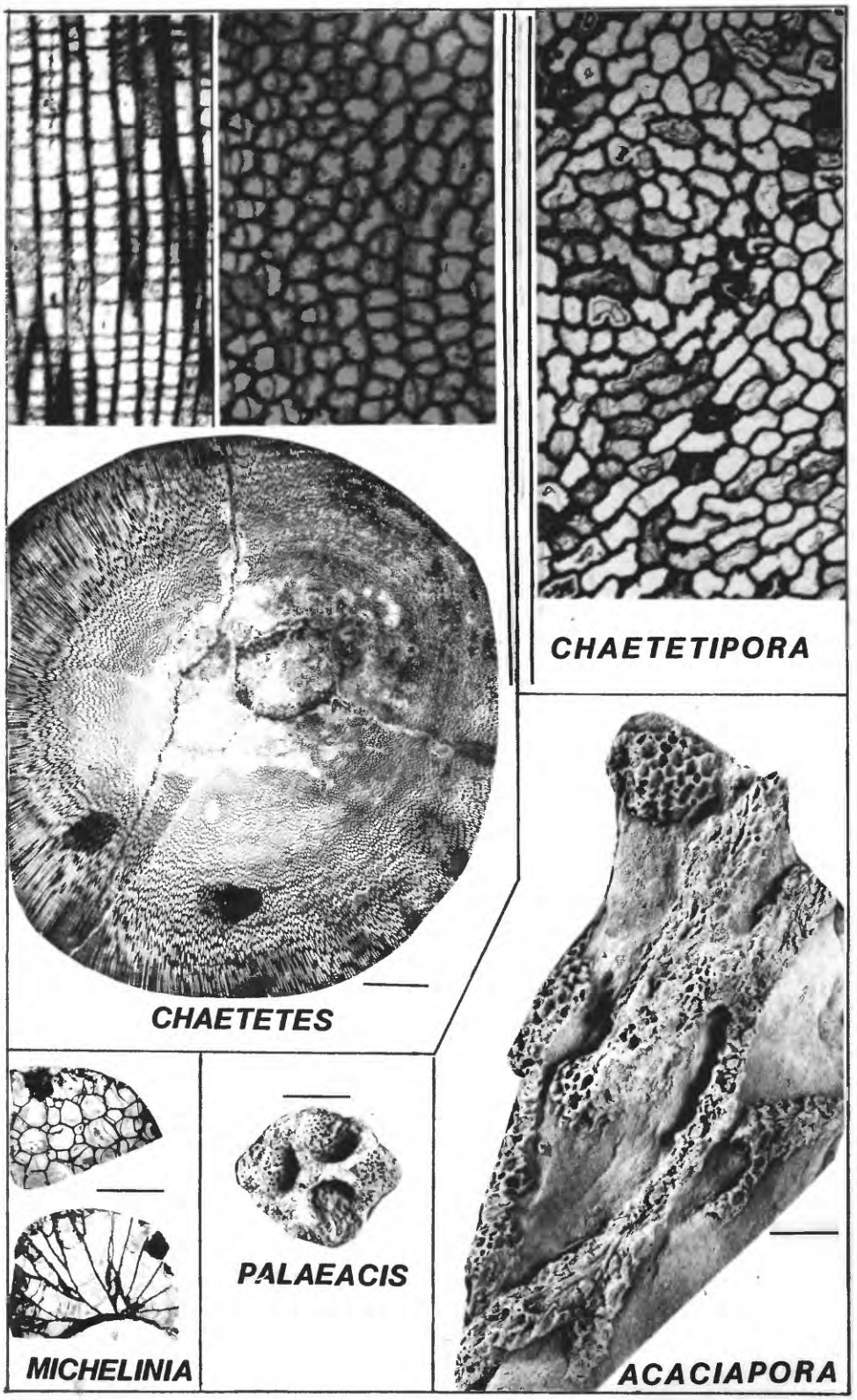
UPPER PENNSYLVANIAN

Distribution.--The area of Upper Pennsylvanian sedimentation is somewhat reduced from that of the Middle Pennsylvanian (Fig. 4). The coral fauna is again concentrated in areas dominated by carbonate strata, but corals are also found in areas of predominantly terrigenous sedimentation. The Upper



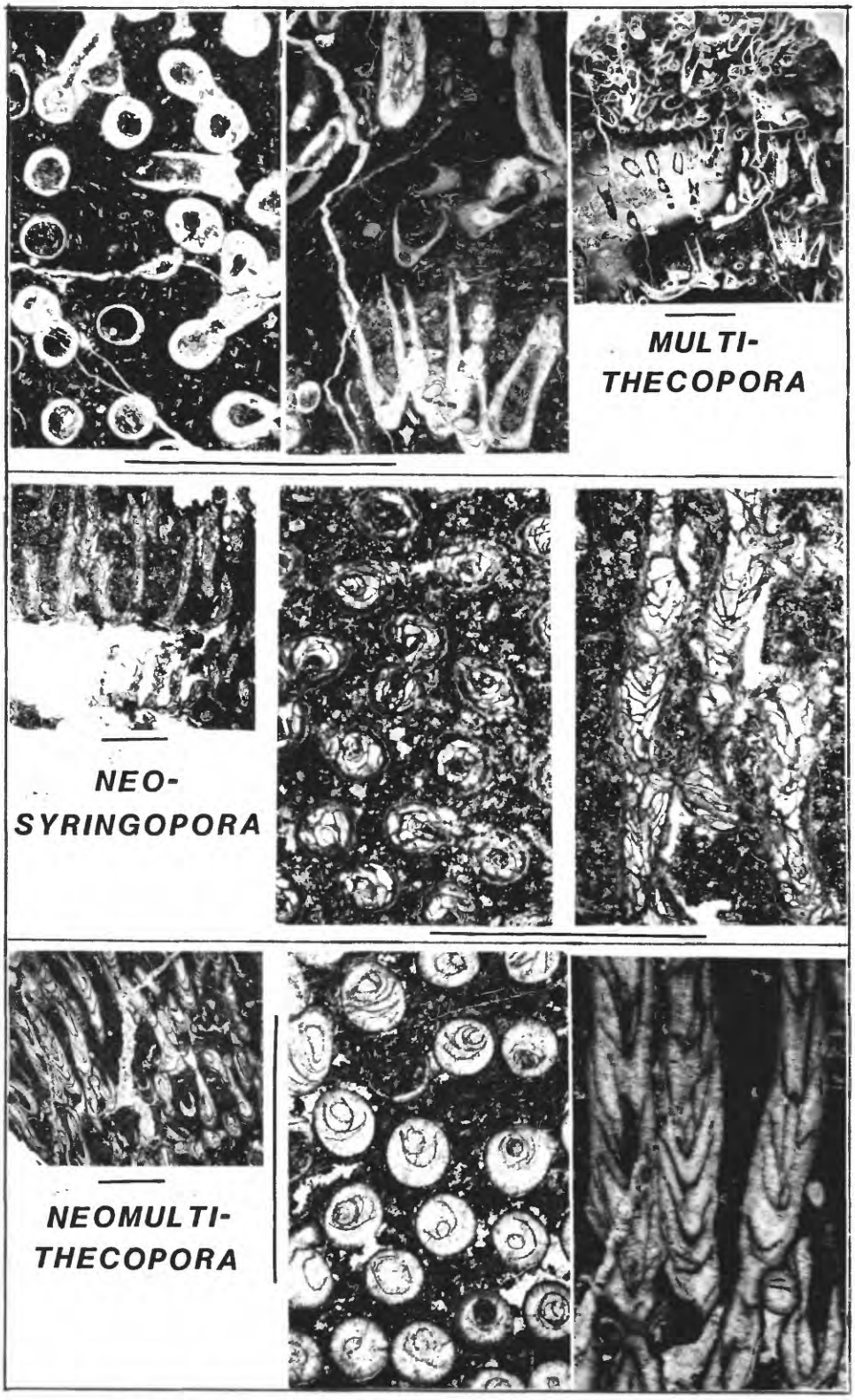
MIDDLE PENNSYLVANIAN SOLITARY
AND COLONIAL RUGOSANS

Plate 3



MIDDLE PENNSYLVANIAN TABULATES

Plate 4



MIDDLE PENNSYLVANIAN TABULATES

Plate 5

Pennsylvanian coral fauna is less widespread than that of the Middle Pennsylvanian. Upper Pennsylvanian occurrences comprise 30 percent of the total occurrences datable to series (Table 1). Generic diversity is about the same as that of the Middle Pennsylvanian. Missourian and Virgilian coral occurrences are nearly equal in number.

Colonial rugosans.--Plate 6 shows the Upper Pennsylvanian colonial rugose corals. Heintzella, which first appeared in the Lower Pennsylvanian, is a common coral in the Upper Pennsylvanian. Durhamina, which is a common Lower Permian coral, is very rare in Upper Pennsylvanian rocks. Another rare coral is an undescribed fasciculate genus that has the internal stucture of the Lower Permian genus Kleopatrina.

Solitary rugosans and tabulates.--Plate 7 shows characteristic Upper Pennsylvanian solitary corals, which continue to form a significant part of common element. Neokoninckophyllum and Lophophyllidium are both rare. Other solitary corals not shown here, are Amplexus (see Plate 1), and Bothrophyllum (see Plate 3). Among the tabulates, we have Acaciapora, which is very rare, and Bayhaium, a syringoporoid that ranges into the Lower Permian.

Syringoporoids.--Syringoporoid corals, although rare in the Upper Pennsylvanian, are quite diversified. Plate 8 shows Upper Pennsylvanian Multithecopora and Neomultithecopora, which are present in the Middle Pennsylvanian and range into Lower Permian. Upper Pennsylvanian Neosyringopora and Cornwallatia are shown on Plate 9. Cornwallatia appears for the first time, and both genera range into the Lower Permian.

BIOSTRATIGRAPHIC ANALYSIS

Figure 5 shows the stratigraphic ranges of the western interior Pennsylvanian corals. Although the coral succession contains many long-ranging genera, there are some discontinuities that can be used for distinguishing series and provincial series. The biostratigraphic utility of these data is limited by the following factors: 1) Dating of specimens used in the study did not discriminate time-stratigraphic intervals of lesser rank than provincial series, 2) Complete sequences of corals were collected at only a few localities, and 3) No attempt was made to identify species and determine their ranges.

If we look at the discontinuities in the succession, we find that the Mississippian-Pennsylvanian boundary is marked by the first appearance of five genera in the western interior. The contrast is actually greater than shown on the diagram because I have not shown genera that are restricted to the underlying Chesterian. The change in the syringoporoid fauna at this boundary is particularly significant.

Within the Pennsylvanian, five genera first appear at the base of the Middle Pennsylvanian or Atokan and three genera disappear at this level.

The Atokan-Desmoinesian boundary is also well-marked by the first appearance of four genera and the disappearance of one genus.

The base of the Upper Pennsylvanian or Missourian is less well-marked by the disappearance of three genera and the first appearance of one genus.

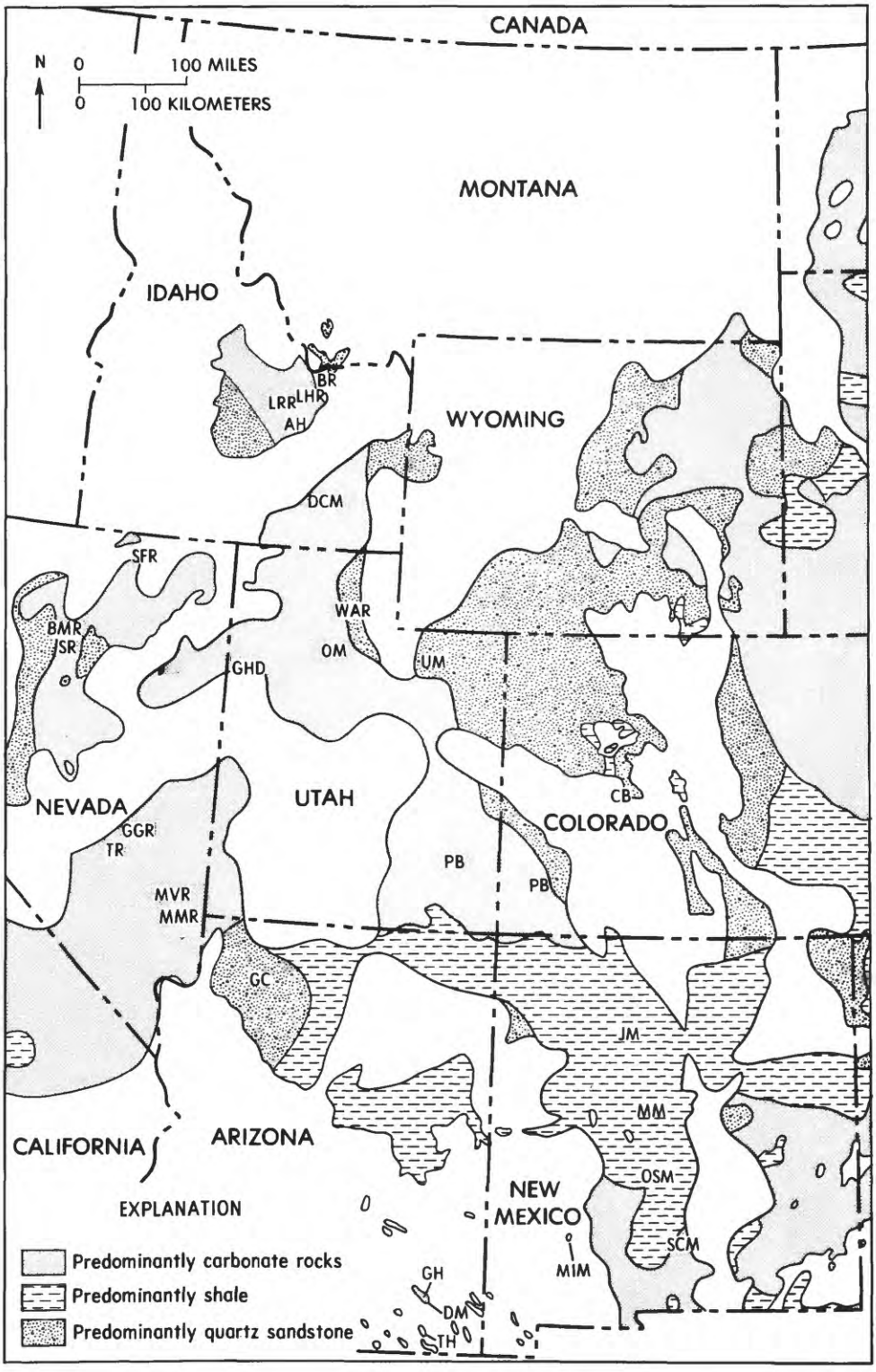
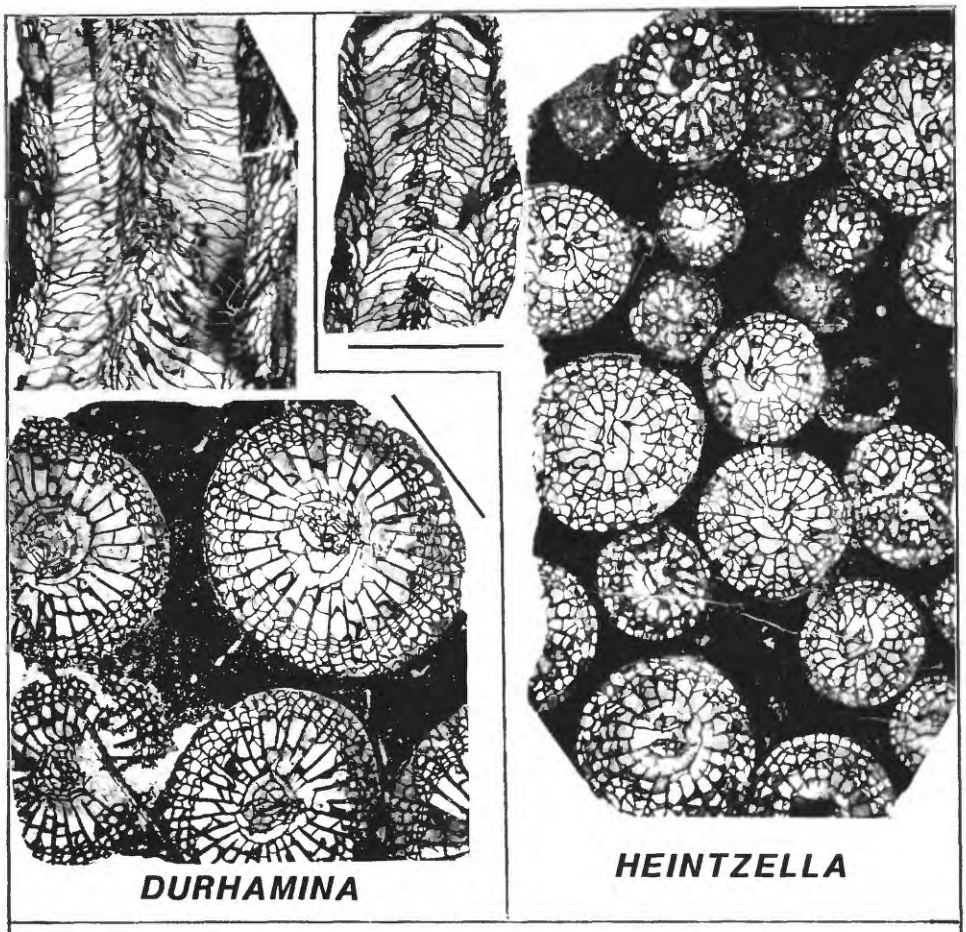
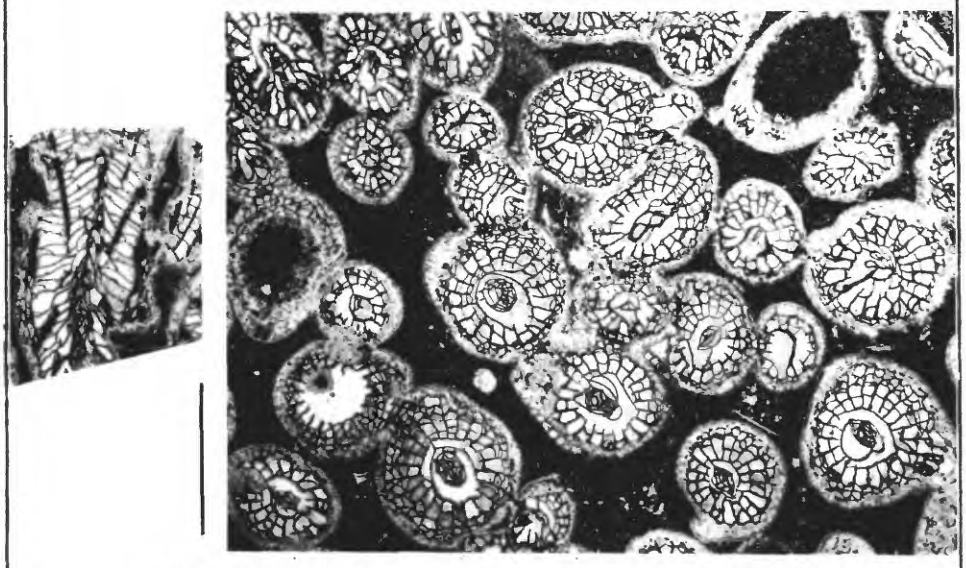


Figure 4.- Map of the western interior region showing distribution of Upper Pennsylvanian lithofacies and coral occurrences. Letters marking coral occurrences refer to names of mountain ranges and other geographic areas.



DURHAMINA

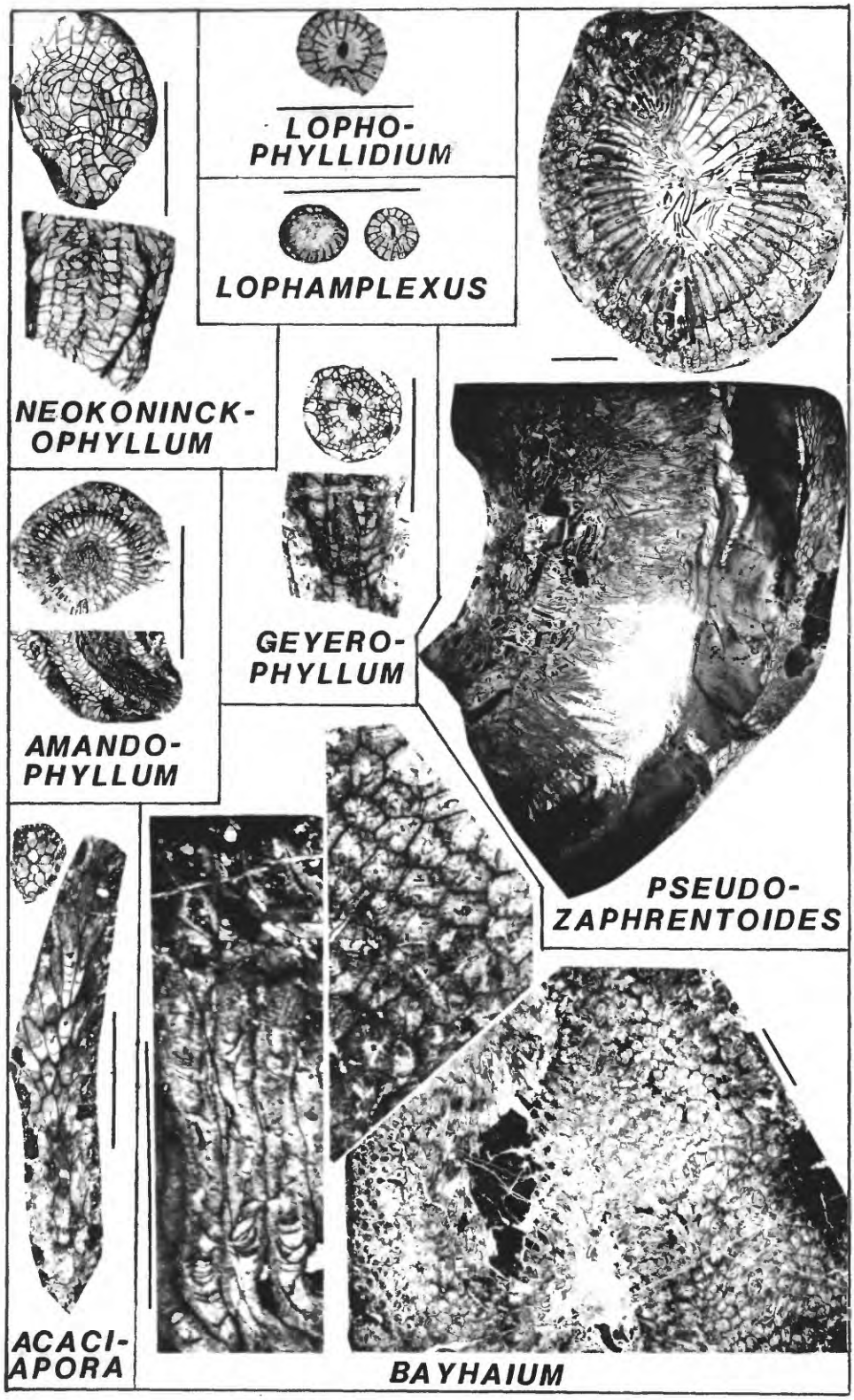
HEINTZELLA



NEW GENUS AFF. *KLEOPATRINA*

UPPER PENNSYLVANIAN COLONIAL RUGOSANS

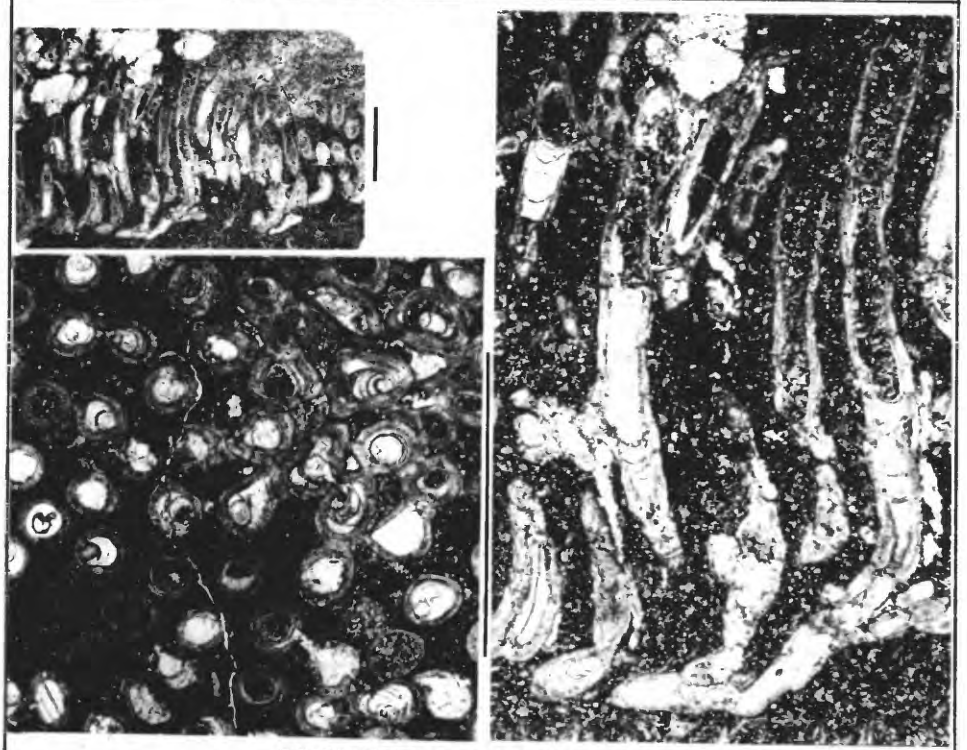
Plate 6



UPPER PENNSYLVANIAN SOLITARY
RUGOSANS AND TABULATES

Plate 7

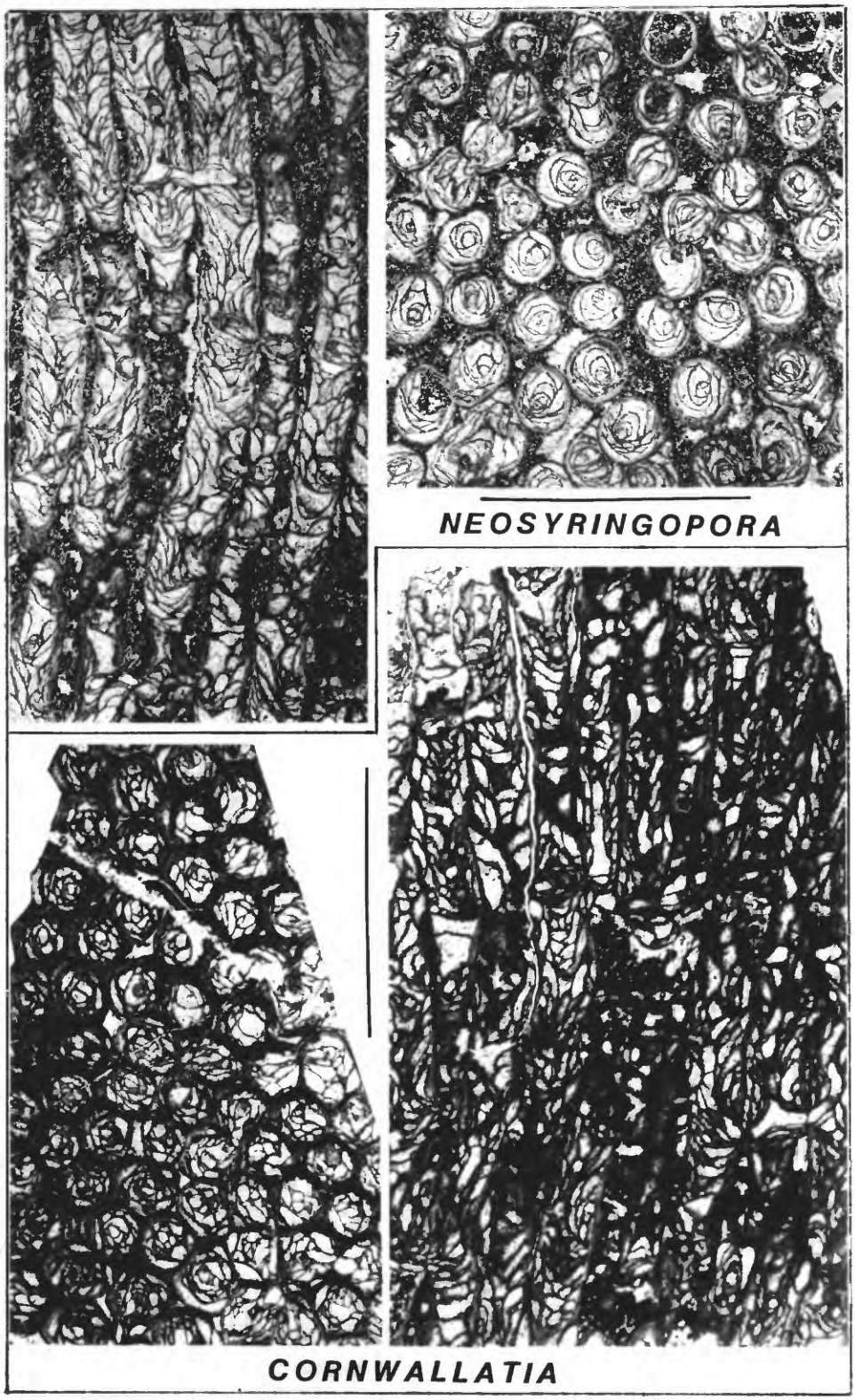
NEOMULTITHECOPORA



MULTITHECOPORA

UPPER PENNSYLVANIAN TABULATES

Plate 8



UPPER PENNSYLVANIAN TABULATES

Plate 9

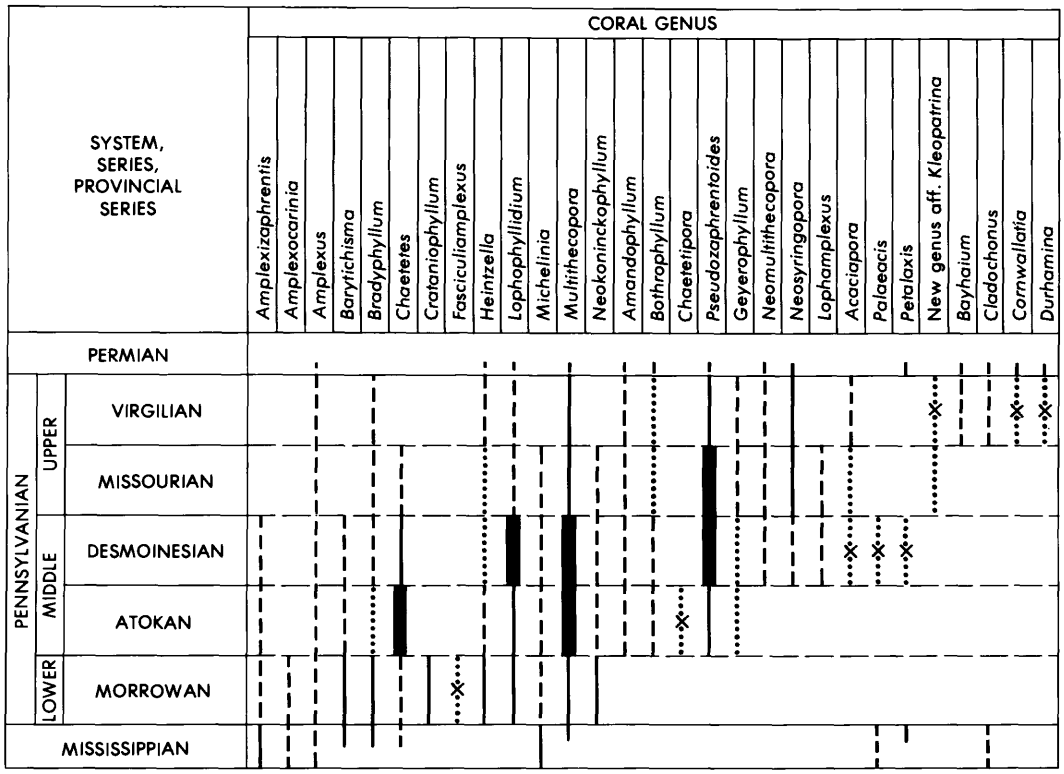


Figure 5.- Stratigraphic ranges of Pennsylvanian coral genera in the western interior region. Genera are arranged by ascending bases of ranges in the Pennsylvanian. X, single occurrence; dashed line, rare (1-5 occurrences); solid line, common (6-19 occurrences); bar, abundant (20 or more occurrences); dotted line, position identified only to series or inferred from occurrences above and/or below.

The base of the Virgilian is somewhat better marked by the first appearance of three genera and the disappearance of four genera.

Although four genera disappear at the top of the Pennsylvanian, most of the Virgilian genera range into the Lower Permian, making it difficult to distinguish the Pennsylvanian-Permian boundary using corals.

CONCLUSIONS

Although corals are not common enough in the western interior Pennsylvanian to be as useful as fusulinids, conodonts, and brachiopods, this study provides range data that create new biostratigraphic tools. Investigation of species ranges, particularly in the syringoporoids, should result in even greater biostratigraphic capability within the western interior region.

CORRECTIONS

After this report was submitted for approval new information became available on the occurrence of Petalaxis. This genus is known only from a single locality (USGS 3608-PC, green label) in the Organ Mountains of New Mexico, where fossils were collected by W. T. Lee in 1905. The coral was dated by brachiopods, identified as Desmoinesian by B. R. Wardlaw, in the same collection. P. K. Sutherland went to this locality in October, 1983, and found Petalaxis in place associated with Morrowan brachiopods 130-140 feet above the base of the La Tuna Formation. According to Sutherland, Lee probably collected from an arroyo below these outcrops, where fossils of Desmoinesian age from the Berino Formation are mixed with the corals in float. Therefore, the age of Petalaxis in this report should be changed from Desmoinesian to Morrowan.

A change was also made in the recorded distributions of Durhamina and new genus aff. Kleopatrina. Restudy of the three specimens assigned to the new genus revealed that one of them is actually a Durhamina. This revision results in transfer of one of the localities recorded for the new genus to Durhamina.