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A DATABASE ANALYSIS OF MISSISSIPPI'S OIL AND GAS PRODUCTION

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INTRODUCTION

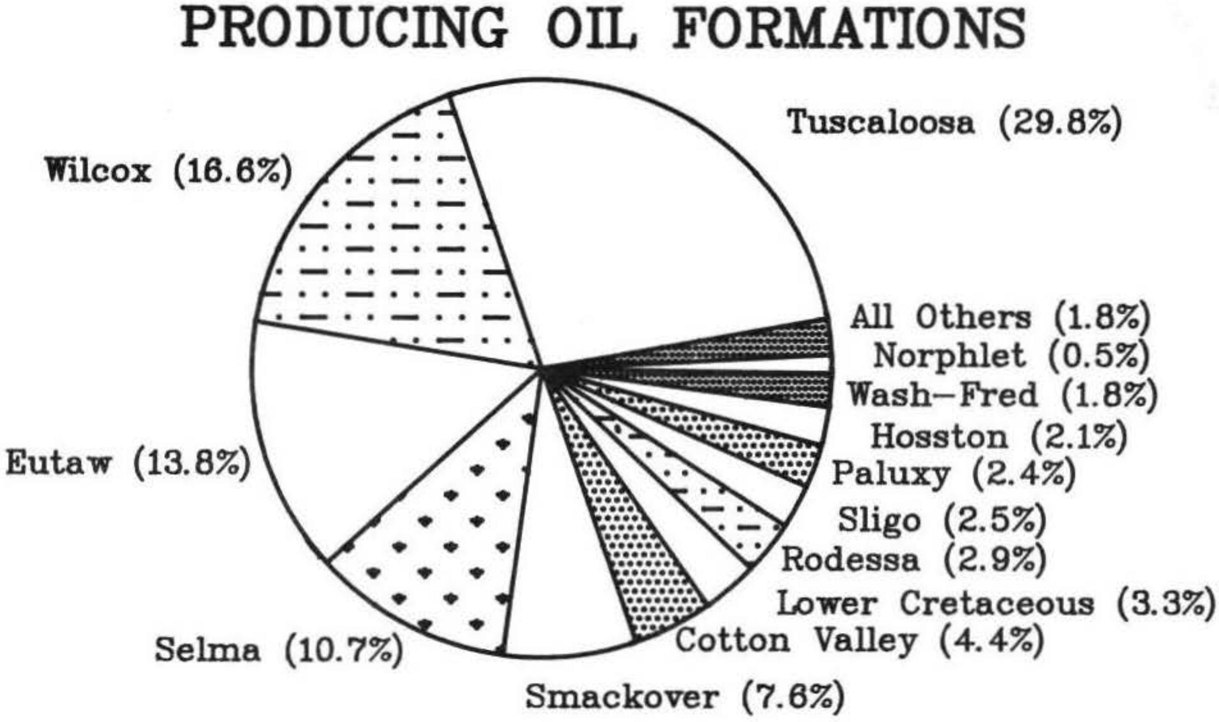
The purpose of this article is to present, at the "formation" level, Mississippi's gross oil and gas production. Hydrocarbon production began in Mississippi in 1926 with the discovery of Amory (gas) Field. The next major gas discovery occurred four years later at Jackson Field with production from the Selma Gas Rock. Oil production was first recorded at Tinsley Field, 1939. The 1940s marked the beginning of exploration in the Tuscaloosa Trend, the state's top producing formation. Lower Cretaceous activity picked up in the 1950s and the Jurassic was actively pursued during the late 60s. The Hosston gas play in the Interior Salt Basin was a primary target in the 70s (Devery, 1982). While there was a downturn in the industry in the 80s, exploration remained in established trends with no new trends dominating activity.

Even though industry has continued to operate under unstable conditions, there is still an effort to locate the remaining commercial reserves. In 1989, Mississippi contributed significant amounts of production on a national level. According to a recent Energy Information Administration report, Mississippi ranked 13th in annual crude oil production and 17th in annual natural gas production out of the 33 oil and gas producing states in the U.S. (1989 Annual Ranking).

METHOD AND RESULTS

A database was created by the Office of Geology which allows the analysis of production by formation, rather than pools, as is presented in the Mississippi State Oil & Gas Board 1989 Annual Production Report. Approximately 1391 pools were incorporated into the database. This represents all of the state's production except for that of the Wilcox Group. Due to the numerous pools and fields (358) in the Wilcox, it was decided to simply treat the Wilcox as a single record. Wilcox production was obtained by subtracting the database cumulative total from the Oil & Gas Board cumulative figures. This distinction has no effect on the values and tables that appear in this article.

Several points must be made about the database. The database does include abandoned production. Of the 1391 entries, there are 134 pools that have been abandoned. Also, a correction was made with regards to a typographical error in the Mississippi State Oil & Gas Board 1989 Annual Production Report. The cumulative production at Gwinville Field for the Eutaw-Upper Tuscaloosa gas pool is 1,122,392,637 MCF, not 112,392,637 MCF as appears in the past several volumes. While the purpose of the database was to analyze the production by formations, the Oil & Gas Board has several listings by system or series (e.g., Lower Creta-



Note: Cumulative Production Through 1989

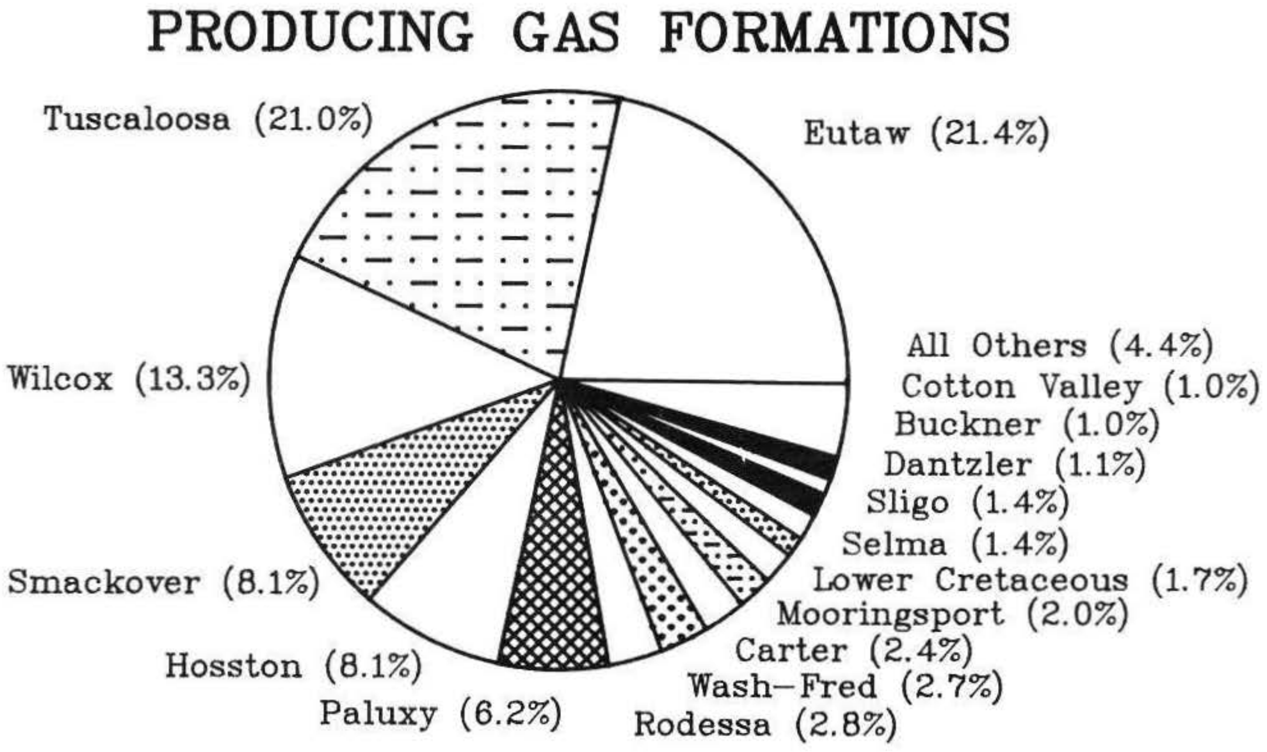
Figure 1.

ceous, Mississippian). No attempt was made to designate these listings to a particular formation.

Although there is no differentiation in the 1989 Annual Report as to the type of gas produced in the state, it should be mentioned that there are four fields in Mississippi that are essentially pure producers of carbon dioxide. They are Gluckstadt, Goshen Springs, Hollybush Creek, and South Pisgah. The carbon dioxide production is out of the upper Buckner and Norphlet formations. It is interesting to note that carbon dioxide production is responsible for 90% of the state's cumulative Norphlet gas production and 94% of the Buckner gas production.

Moring (1990) stated that Mississippi has five active enhanced oil recovery projects. Shell is presently utilizing carbon dioxide miscible flooding at Olive, Mallalieu, and Little Creek fields, and Pennzoil has tertiary carbon dioxide operations at Tinsley Field. These four carbon dioxide projects, along with Chevron's application of the in-situ combustion method at West Heidelberg Field, were responsible for 8.5% of the state's daily oil production in 1989.

There are 879 fields (Wilcox inclusive) in Mississippi that produce hydrocarbons. Sixty of these fields, located in the Black Warrior Basin in the northeastern part of the state, are productive from Paleozoic reservoirs. Mississippian age rocks account for 97% of the production out of the Paleozoic, with minor contributions from the Devonian and Ordovician. What has been listed as Knox production in the oil and gas records is now believed to be Ordovician production from the "Snow Zone" of the Stones River Dolostone (Henderson, 1991). While there is no Knox production in the Black Warrior Basin thus far, the Knox play does have great potential.



Note: Cumulative Production Through 1989

Figure 2.

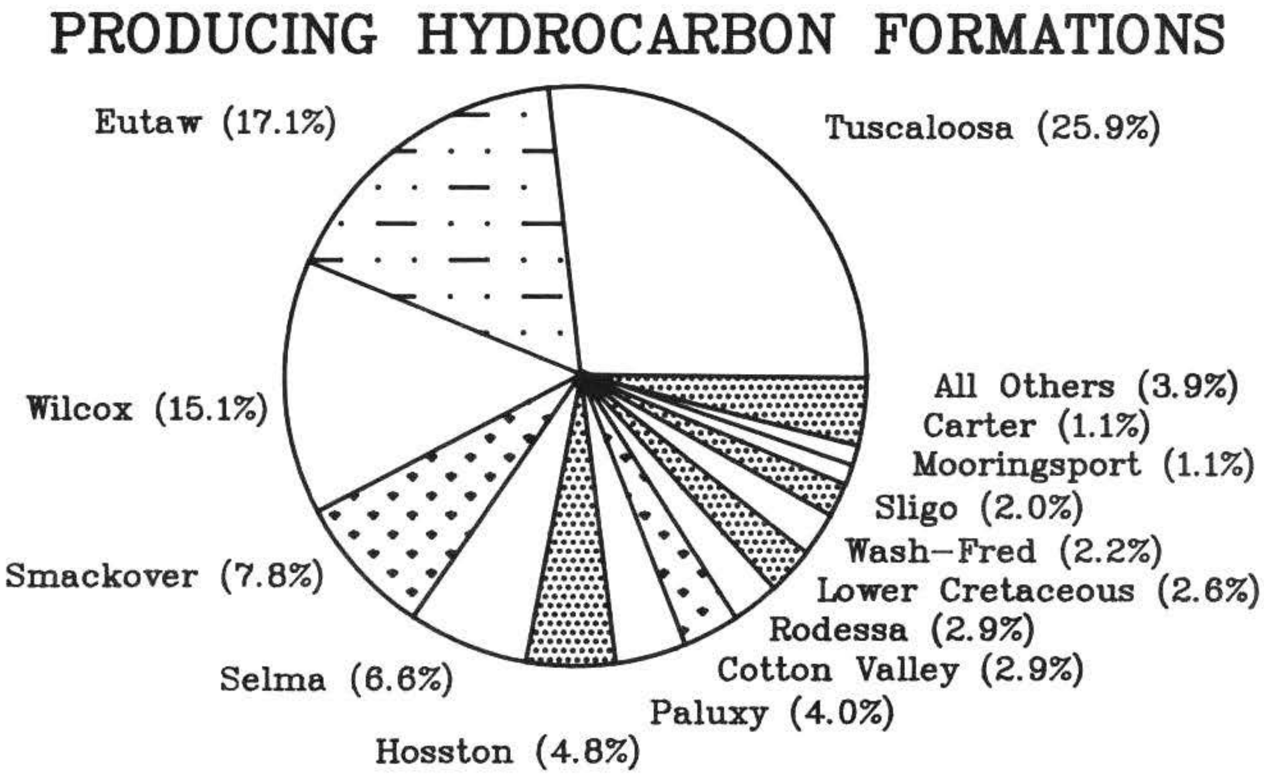
The majority of the remaining 819 fields are situated in or near the Interior Salt Basin in southern Mississippi. The following formations were most frequently targeted in this region during the past year: Wilcox, Eutaw, Lower Tuscaloosa, and Norphlet-Smackover (Geological Consulting Services, 1989). The Frio also showed substantial drilling activity.

DATABASE SUMMARY

Figure 1 illustrates the fact that the Tuscaloosa formation has accounted for 29.8% of the state's oil production. There are 221 Tuscaloosa pools that have produced from 156 fields. The Wilcox formation has generated 16.6% of oil production out of 358 fields. The Eutaw and Selma formations have produced 13.8% and 10.7% from 38 and 18 fields respectively. Tinsley and Flora fields are responsible for the vast majority of Selma production. See Table 1 for a listing of the major oil producing formations, in descending order, that have grossed over 10 million barrels of oil (MMBO).

Table 2 shows Mississippi's gross gas production and lists the major gas producing formations, in descending order, that have grossed over 10 billion cubic feet (BCF). The Eutaw formation, the biggest gas producer in the state, has been an exploration target since the 1940s. The recent discovery of Trimble Field demonstrates that even well-established trends must still be considered good sources for new reserves. Although the Frio formation is not listed in Table 2, this play, which only started in 1989, will contribute additional gas to the state's Tertiary production. See Figure 2 for the state's top 17 producing gas formations.

Table 3 categorizes Mississippi's overall hydrocarbon production for the formations that have grossed over 100



Note: Cumulative Production Through 1989

Figure 3.

million barrels of oil equivalent. Gas production is converted to oil equivalent using a 0.178 conversion factor; i.e., 1,000,000 MCF X .178 = 178,000 BOE.

Figures 3, 4, and 5 deal with Mississippi's total hydrocarbon production. This production includes oil (BBLS) plus gas to oil equivalent (BOE). While Figure 3 shows the top 15 producing formations that account for the state's total hydrocarbon production, Figure 4 gives the breakdown by age for these formations. Figure 5 shows the same formations, in descending order of production (from Figure 3), and graphically depicts the number of fields that represent this production.

CONCLUSION

In order to survive these hard times in the oil and gas industry, the need to better maximize time, money, and energy is essential. One of the valuable tools used to achieve this goal will be deciding where to focus exploration efforts. It is hoped that the information provided here will be of help in assessing formations and evaluating what trends to pursue.

NOTE: The Mississippi State Oil & Gas Board is the source for all of the figures contained in this article.

REFERENCES CITED

Devery, D.M., 1982, An overview of oil and gas potential in Mississippi: Mississippi Geology, v. 3, no. 2, p. 6-10.

Energy Information Administration/Natural Gas Annual, 1989, p. 21.

Energy Information Administration/Petroleum Supply Annual, 1990, p. 163.

Geological Consulting Services, Inc., 1989, Annual Review,

TABLE 1. OIL FORMATIONS > 10 MMBO PRODUCTION
(Figures are cumulative through December 1989)

"FORMATION"	CUMULATIVE OIL (Bbls)	CUMULATIVE WATER (Bbls)	CUMULATIVE GAS (Mcf)
Tuscaloosa	603,494,338	2,101,356,174	1,872,553,108
Wilcox	335,712,080	2,780,014,406	1,184,996,127
Eutaw	278,570,507	1,275,041,832	1,907,485,205
Selma	215,711,682	468,222,301	128,050,815
Smackover	153,956,495	152,130,148	726,404,920
Cotton Valley	88,214,213	143,445,378	88,931,031
L. Cretaceous	66,177,026	65,545,389	146,860,065
Rodessa	59,573,075	57,092,032	249,721,450
Sligo	51,301,704	38,740,625	123,609,065
Paluxy	47,561,809	147,132,005	552,786,544
Hosston	42,865,193	42,934,673	725,757,475
Wash-Fred	35,872,798	187,781,563	239,571,280
Norphlet	11,013,916	15,331,010	68,546,220

TABLE 2. GAS FORMATIONS > 10 BCF PRODUCTION
(Figures are cumulative through December 1989)

"FORMATION"	CUMULATIVE GAS (Mcf)	CUMULATIVE WATER (Bbls)	CUMULATIVE OIL (Bbls)
Eutaw	1,907,485,205	1,275,041,832	278,570,507
Tuscaloosa	1,872,553,108	2,101,356,174	603,494,338
Wilcox	1,184,996,127	2,780,014,406	335,712,080
Smackover	726,404,920	152,130,148	153,956,495
Hosston	725,757,475	42,934,673	42,865,193
Paluxy	552,786,544	147,132,005	47,561,809
Rodessa*	260,557,731	57,133,408	59,623,793
Wash-Fred	239,571,280	187,781,563	35,872,798
Carter	215,062,401	584,852	357,999
Mooringsport	177,730,190	6,681,952	7,623,195
L. Cretaceous	146,860,065	65,545,389	66,177,026
Selma	128,050,815	468,222,301	215,711,682
Sligo	123,609,065	38,740,625	51,301,704
Dantzler	98,381,867	3,717,419	1,395,180
Buckner	92,647,601	990,999	3,352,898
Cotton Valley	88,931,031	143,445,378	88,214,213
Mississippian	73,693,100	536,477	381,294
Norphlet	68,546,220	15,331,010	11,013,916
James	51,882,617	277,858	300,464
Sanders	49,541,395	235,853	285,310
Lewis	43,307,194	155,014	1,001,440
Nason	43,128,839	171,066	13,826

(* Includes Ware zone cumulatives)

TABLE 3. TOTAL HYDROCARBON PRODUCTION > 100 MMBOE

"FORMATION"	TOTAL HYDROCARBON (BOE)
Tuscaloosa	936,808,791
Eutaw	618,102,873
Wilcox	546,641,391
Smackover	283,256,571
Selma	238,504,727
Hosston	172,050,024
Paluxy	145,957,814
Cotton Valley	104,043,937
Rodessa	104,023,493

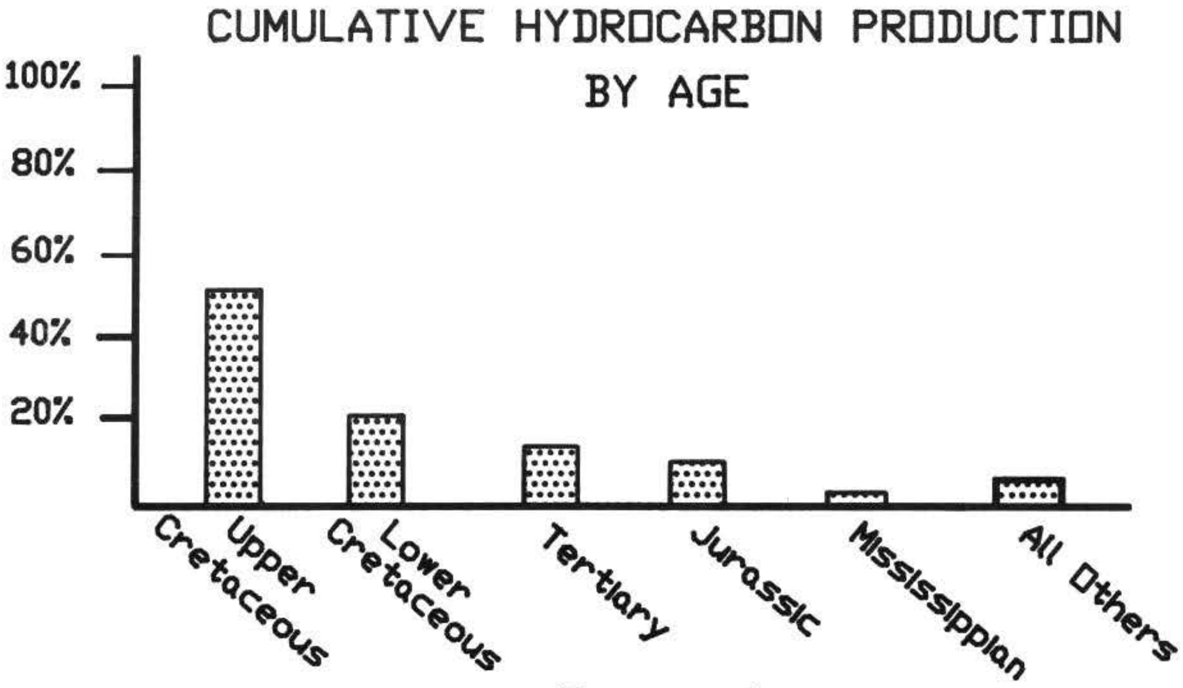


Figure 4.

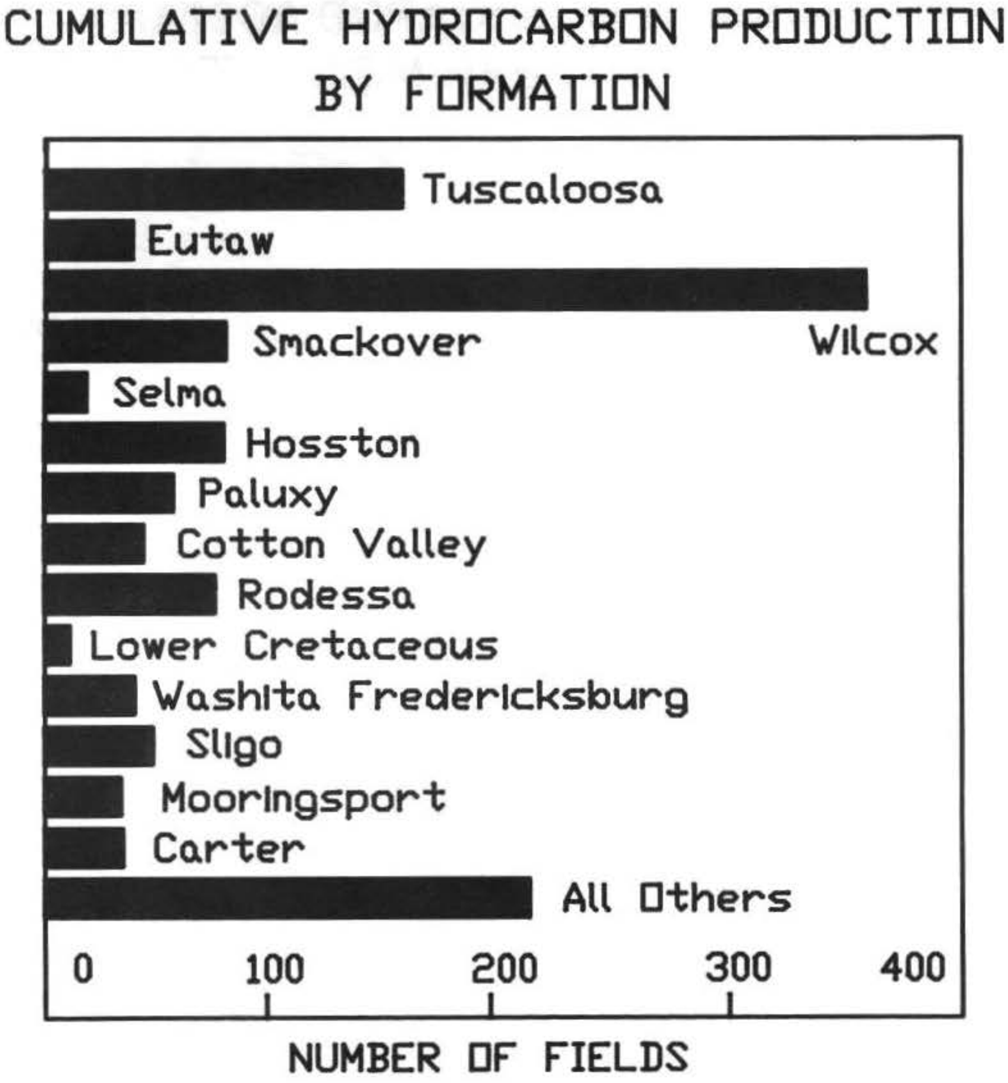


Figure 5.

Chart: 1989 Formations at TD.

Henderson, Kevin S., 1991, Cambro-Ordovician subsurface stratigraphy of the Black Warrior Basin in Mississippi: Mississippi Office of Geology, Report of Investigations 2, p. 9.

Mississippi State Oil & Gas Board, 1989, Mississippi Oil & Gas 1989 Annual Production Report.

Moring, Jane A., 1990, Economic feasibility of Mississippi CO2 miscible flooding: Mississippi State University, Master's Thesis, p. 18.

NOTE: Diskettes are available at the Office of Geology which detail information for all formations/zones contained above. There are 64 individual reports set up in Dbase IV which contain the following:
*Field *Reservoir *Discovery Date *County *Location *Number of Producing Wells *Name of Discovery Well *Cumulative Oil Production *Cumulative Water Production *Cumulative Gas Production *Additional Information (Additional Lotus Spreadsheets that summarize database information are included.)

THE COON CREEK DECAPOD ASSEMBLAGES OF NORTHERN MISSISSIPPI

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ABSTRACT

Two decapod assemblages occur in the Upper Cretaceous Coon Creek Formation of the northern Mississippi Embayment. The Blue Springs Assemblage is similar to the South Dakota *Dakoticancer* Assemblages in faunal composition, mode of preservation and possibly distribution, but differs significantly in taxa present and taphonomic relationships. The *Avitelmessus* Assemblage consists of the single decapod taxon, *Avitelmessus grapsoideus*, and is preserved as a discrete fauna, probably a biocoenosis, in shale-rich or clay-rich lithosomes. The Blue Springs Assemblage, a complex of two or more preservational cycles, is preserved over-printed on molluscan thanatocoenosis. These two discrete assemblages represent Cretaceous crab paleocommunities. A new hermit crab, *Palaeopetrochirus enigmus* new species, is described from the Coon Creek Formation.

INTRODUCTION

Decapods have long been known to occur in the Upper Cretaceous sediments of the Mississippi Embayment (Rathbun, 1926; Stephenson and Monroe, 1940; Russell, 1965; Russell et al., 1982; Bishop, 1986a). Much of this work is relatively unavailable to students of the Mississippi Embayment. Collecting done since 1976 by myself, colleagues, and paraprofessionals has yielded impressive decapod collections including the Blue Springs Collection (Locality GAB 37; 1,081 specimens), described in the *Journal of Crustacean Biology* (Bishop, 1983a). Utilizing this publication vehicle removed these data from easy access by geologists and paleontologists. This note is intended to partially remedy this problem by republishing part of the content of the previous paper while combining it with some additional material to make the data more available to geologists and paleontologists.

The Mississippi Embayment was a shallow epicontinental sea that extended as an arm of the Tethys Seaway northward from Mississippi and Louisiana to Cairo, Illinois. Sediments deposited in the Mississippi Embayment are time-transgressive lithosomes of clastic sediments to the north and carbonate sediments to the south. A composite lithologic sequence published by Russell et al. (1982, fig. 4) allows the stratigraphic placement of the two distinct decapod assemblages, the *Avitelmessus* Assemblage and the Blue Springs Assemblage.

THE BLUE SPRINGS ASSEMBLAGE

The decapods described as the Blue Springs Assemblage were collected from a road outcrop (Figure 1) at the junction of new U.S. Highway 78 and Mississippi Route 9 southwest of Blue Springs, in the E 1/2, NW 1/4, Sec. 16, T8S, R4E, Union County, Mississippi. The road cut exposes approximately 6 m (19.7 ft.) of gray, glauconitic, micaceous clayey sand that contains abundant fossils. This sediment lies in the lower Coon Creek Formation (Ripley of Russell et al., 1982) and is early Maastrichtian in age. This outcrop (Figure 2) was computed to lie 30.5-36.6 m (100-120 ft.) above the top of the Demopolis Formation.

Among the abundant fossils preserved in these rocks are numerous decapods (Figure 3, Table 1). The decapods are preserved as relatively unaltered remains and as black or brown phosphatic nodules. The phosphatized crabs must represent one cycle of preservation and exhumation as some nodules show abrasion and overgrowth by the oyster *Exogyra*. Bishop (1981b) described an *Exogyra* attachment scar which preserved the impression of the carapace of *Linuparus*. Relatively few of the abundant phosphatic nodules can be identified as organic remanie. The taphonomy of these specimens has been investigated in a senior thesis by Brent Jacobs at Georgia Southern University.

Unphosphatized decapods are found enclosed in the sediment amongst the phosphatic nodules. The specimens are rarely collected with exoskeleton intact; it is extremely fragile and readily exfoliates, leaving behind a steinkern.

The fossil decapods are found throughout the exposure but seem to be concentrated in a 2 m interval marked by the abundant phosphatic nodules. The decapod portion of the assemblage (see Figure 3 and Table 1; 1,081 specimens) is dominated by the crab *Dakoticancer australis* Rathbun, 1935 (48.9%), with abundant mud shrimp, *Protocallianassa mortoni* (Pilsbry, 1901) (26.9%), and lobsters, *Hoploparia tennesseensis* Rathbun, 1926 (10.1%). Other decapods include *Linuparus canadensis* (Whiteaves, 1885) (4.7%), *Parapaguristes whitteni* (Bishop, 1983) (2.8%) (see Bishop, 1986c), *Notopocorystes testacea* (Rathbun, 1926) (2.7%),

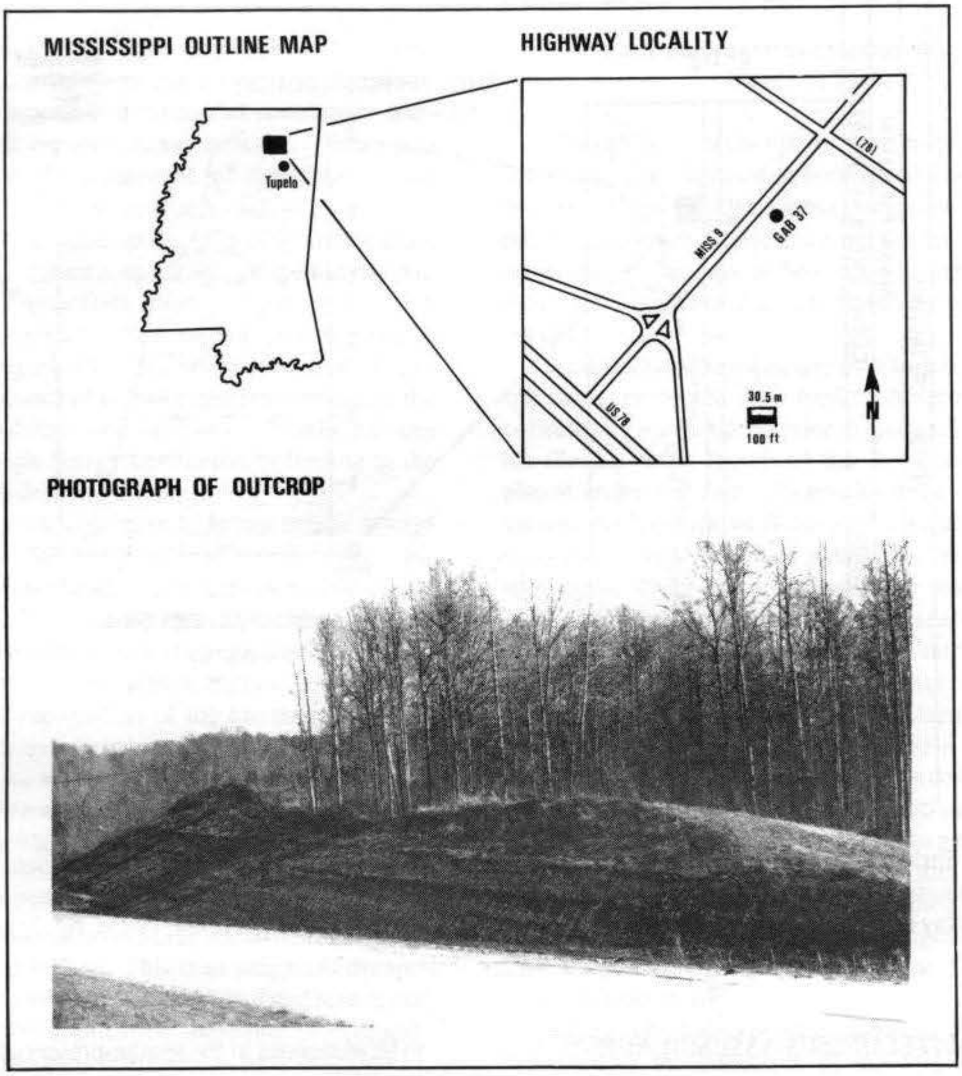

Figure 1. Map showing location in Mississippi of the Blue Springs Locality relative to U. S. Highway 78 and Mississippi 9, and a photograph of the road cut exposure of the Coon Creek Formation. (Reprinted with permission, Bishop, 1983a, fig. 1; *Journal of Crustacean Biology*.)

Tetracarcinus subquadratus Weller, 1905 (2.6%), *Raninella tridens* Roberts, 1962 (0.8%), "*Eryma*" *flecta* Rathbun, 1926 (0.3%), *Cristipluma mississippiensis* Bishop, 1983a (0.1%), *Prehepatus harrisi* Bishop, 1985 (0.1%), *Seorsus wadei* Bishop, 1988 (0.1%), and *Palaeopetrochirus enigmus* n. sp. (0.1%). This unusual occurrence of decapods was interpreted (Bishop, 1983a) to be an analog of the better known *Dakoticancer* Assemblages of South Dakota (Bishop, 1981a). The Blue Springs Assemblage is similar in faunal diversity and perhaps similar in distribution. It is now known to extend over about 18 square kilometers (7 square miles) though a questionably thin interval, approximately 4 m (13 ft.) thick, from the Blue Springs locality to two nearby outcrops. The modes of preservation of the Blue Springs Assemblage, apparently representing at least two episodes of opportunistic crab population growth, confounds the taphonomic interpretation of the assemblage. It is known that fecal pellets are present in the Blue Springs phosphatic nodules just as they are in the South Dakota *Dakoticancer* Assemblages. It remains to be demonstrated, however, that the mode of preservation of the two *Dakoticancer* Assemblages is the same. In any case, the existence of the Blue Springs Assemblage, probably superimposed on a "normal" molluscan thanatocoenosis, is quite apparent. The accumulated data suggest that such crab assemblages represent opportunistic species capable of rapid population growth, perhaps to exploit burgeoning worm populations, followed by a less rapid decline as a positive taphonomic short cycle becomes operative (Bishop, 1986b; Bishop and Williams, 1986; Bishop, 1987). These opportunistic crab "communities" seem in many cases to be overprinted on "normal" molluscan thanatocoenoses or biocoenoses (Bishop, 1986b).

taxa occur at Union County Lake (Rathbun, 1926). This pattern of occurrence supports the conclusion that these assemblages represent discrete preserved community fractions of opportunistic decapod communities. As further data are accumulated on the occurrence of *Avitelmessus* and *Dakoticancer*, this hypothesis can be tested.

The discovery and description of a new hermit crab, *Palaeopetrochirus enigmus* n. sp., is a significant addition to our knowledge of Cretaceous decapods (Figure 5). The record for North American hermit crabs is still very sparse and incomplete (Figure 6). The incompleteness of our knowledge of the history of hermit crabs is partly due to the generally shallow habitats preferred by hermit crabs, habitats which tend to be high energy environments leading to the rapid destruction of decapod remains.

The assignment of fossil taxa to extant taxa is always difficult and often misleading because characteristics utilized in biological classification and paleontological classification rest with soft and hard part morphologies, respectively. The assignment of this new species to an extant genus, *Petrochirus* Stimpson, 1859, was strongly considered, but declined due to the recognition of the extreme age of the specimen and its fragmentary nature. As more material becomes available for study in the future, such assignments will become testable and a more stable systematics will result. As a paleontologist, I must emphasize the probability of numerous convergences in morphology of the decapods, which, when articulated with the low preservation potential and fragmentary nature of hermit crab remains, could lead to significant misinterpretation. This is an enigma of decapod paleontology. The preservation of such isolated hermit crab claws (Stenzel, 1945) implies the sheltering of decapods, probably in large gastropod shells. Such shells are present in the Coon Creek faunas (Wade, 1926) but they remain to be examined for taphonomic evidence of habitation by hermit crabs (Walker, 1988).

SYSTEMATIC PALEONTOLOGY

Superfamily Paguroidea Latreille, 1803
Family Paguridae Latreille, 1802
Subfamily Diogeninae Ortmann, 1892
Genus *Palaeopetrochirus* new genus

Diagnosis: Chelae large, equal or subequal; strongly arched upper margin, slightly sinuous lower margin, propodal-carpal articulation perpendicular to lower margin, propodal-dactyl articulation inclined; fixed finger short, stout, triangular, and straight, movable finger longer, narrower, and arched, occlusional surfaces of fingers with crushing teeth; surface ornamented with tubercles more-or-less clumped into groups or ridges.

Type Species: The type species of *Palaeopetrochirus* is *Palaeopetrochirus enigmus* new species.

Palaeopetrochirus enigmus new species
Figure 5, Table 2

Diagnosis: Left cheliped robust; merus long, triangular in cross section, flattened on bottom and front; posterior edge with *en echelon* crinkles; carpus short; claw longer than high, outer face convex, lower margin level but slightly sinuous, upper margin strongly arched; fixed finger relatively short, stout, and triangular; dactylus relatively long, narrow, and curved.

Sample Size, Preservation, and Occurrence: The unique specimen, preserved in a black, phosphatic nodule, was collected by Ralph Harris prior to his death in 1986. During his illness, Ralph requested that his fossil collections be placed under my care. Examination of those collections yielded the holotype of *Palaeopetrochirus enigmus*, which was found associated with a box of crabs containing 52 specimens, 49 of them *Dakoticancer australis* Rathbun, 1935, the hermit crab claw, and a lobster abdomen. No data were found with the box. However, during the previous decade Ralph had been collecting only two localities carrying the Coon Creek *Dakoticancer* Assemblage, the Blue Springs Locality (Bishop, 1983a) and a nearby locality. These specimens are typical of previous collections made by Ralph Harris and myself from these two outcrops of the Coon Creek *Dakoticancer* Assemblage within a mile of his home. I feel certain the specimen originated from one of these two localities, as Ralph would have informed me of any additional Coon Creek collecting site he might have discovered. The Coon Creek Formation at Blue Springs is Early Maastrichtian in age.

Type: The holotype of *Palaeopetrochirus enigmus* is deposited in the collection of the Mississippi Office of Geology, Jackson, Mississippi.

Etymology: The trivial name is selected from the Latin, "*enigma*: something obscure, inexplicable, a riddle, mystery..," to emphasize its enigmatic origins, in terms of the phylogeny of hermit crabs, the mysterious question of whether or not such crabs actively sheltered, the dominant preservation of hermit crabs as only cheliped disassociation units, and the question of the place of collection of the holotype.

Description: Left cheliped large and robust, massive; ornamented by abundant tubercles and rows of tubercles arranged into ridges.

Left claw large, longer than high; outer face convex; inner face probably slightly convex; lower margin relatively level, broadly rounded proximally, slightly sinuous distally; upper margin strongly arched, and probably crest-like; fixed finger stout, short, and triangular. Movable finger (dactylus) longer, narrower, strongly arched into curve of upper margin of claw. Articulation between carpus and propodus nearly perpendicular to lower margin, slanting slightly forward toward upper margin. Articulation between propodus and movable finger (dactylus) inclined downward and forward taxa occur at Union County Lake (Rathbun, 1926). This pattern of occurrence supports the conclusion that these assemblages represent discrete preserved community fractions of opportunistic decapod communities. As further data are accumulated on the occurrence of *Avitelmessus* and *Dakoticancer*, this hypothesis can be tested.

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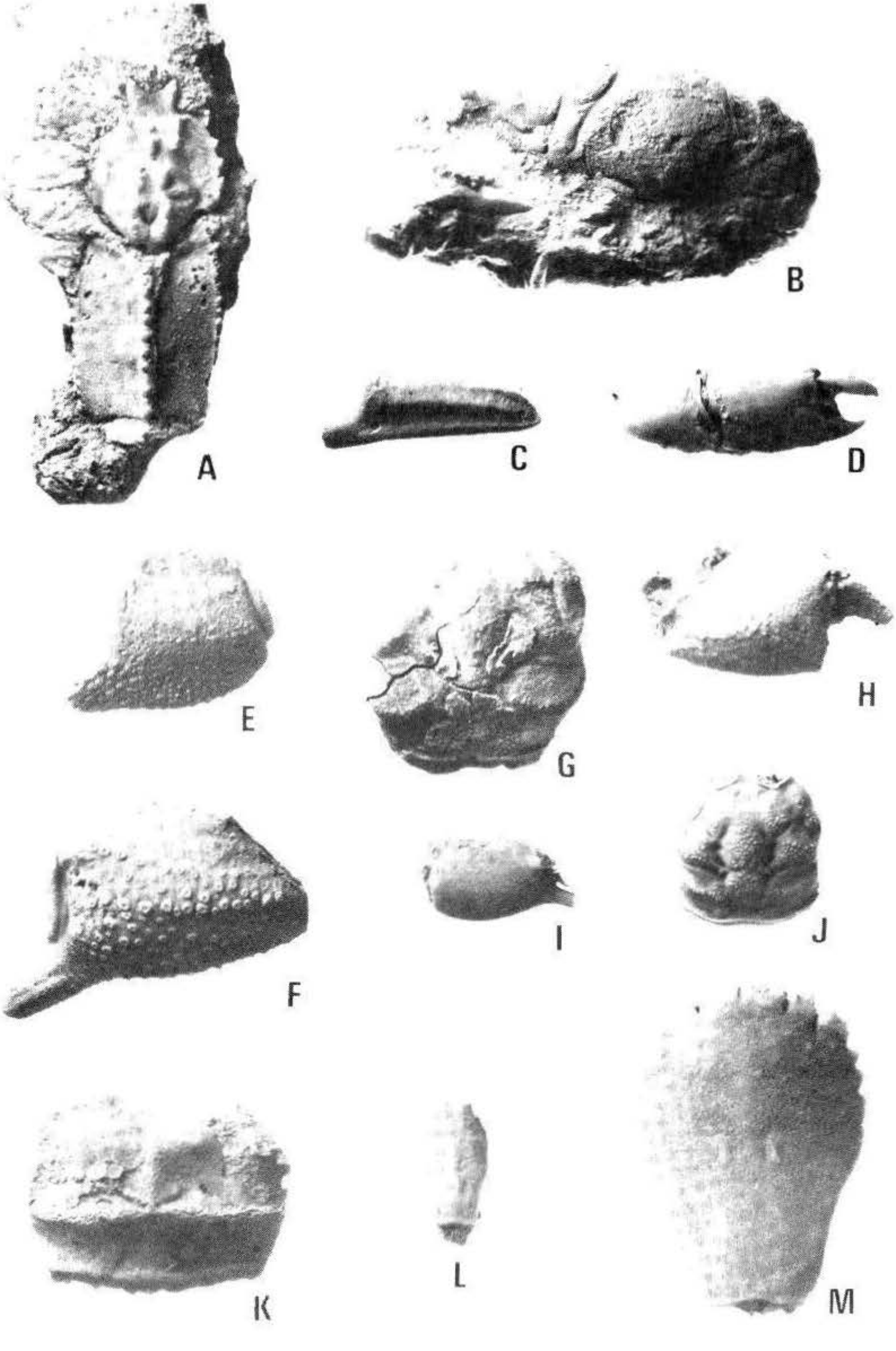

Figure 3. Decapod assemblage collected at the Blue Springs Locality. See Table 1 for identifications. (Reprinted with modification, Bishop, 1983a, fig. 3; *Journal of Crustacean Biology*.)

Table 1. Tabulation of fossil decapod crustaceans collected at the Upper Cretaceous Blue Springs Locality. This table lists the figures of decapods depicted in Figure 3 with figure numbers, magnifications, and specimen numbers. The numerical data do not include fragmentary specimens.

Taxon	Fig. No.	Mag.	Specimen No.	No. of specimens	% of Decapods
Linuparus canadensis (Whiteaves, 1885)	3A	1.5	GAB 37-1141	51	4.7
Hoploparia tennesseensis Rathbun, 1926	3B	0.75	GAB 37-56	109	10.1
"Eryma" flecta Rathbun, 1926*	3C	2.0	GAB 37-909	3	0.3
Protocallianassa mortoni (Pilsbry, 1901)	3D	1.0	GAB 37-162	290	26.9
Parapaguristes whitteni (Bishop, 1983)	3E	1.5	GSCM 1684	30	2.8
	3F	1.5	GSCM 1683		
Dakoticancer australis Rathbun, 1935	3G	1.0	GAB 37-515	528	48.9
	3H	2.0	GAB 37-1094		
Tetracarcinus subquadratus Weller, 1905	3I	2.0	GAB 37-1113	28	2.6
	3J	2.0	GAB 37-882		
Cristipluma mississippiensis Bishop, 1983	3K	2.0	GSCM 1685	1	0.1
Raninella tridens Roberts, 1962	3L	2.0	GAB 37-833	9	0.8
Notopocorystes testacea (Rathbun, 1926)	3M	2.0	GAB 37-844	29	2.7
Seorsus wadei Bishop, 1988	4E	2.0	GAB 37-1161	1	0.1
Prehepatus harrisi Bishop, 1985				1	0.1
Palaeopetrochirus enigmus n. sp.	5A-D	1-1.5		1	0.1
			Total	1,081	100.0

* "Eryma" flecta is now thought to be a brachyuran of undetermined affinities.

merging with the occlusional surface of the fixed finger which rapidly slants downward to tip; bordered on propodus by distinct ridge parallel to articulation. Propodus more or less transversely convex and longitudinally convex on outer face; transverse convexity disrupted by broad, shallow longitudinal groove just below and parallel to upper margin. Surface more or less ornamented by coarse tubercles arranged in three bands, one along upper margin, one across middle of claw, and a large field along the lower margin and nearly coalescing with the middle field. Most tubercles are asymmetrical, slanting distally; those on the lower margin increase in coarseness onto the edge of the claw, and are more or less formed into *en echelon* ridges inclined distally as they cross from the outer face to the inner face; some transverse reticulation is situated along maximum convexity of outer face where tuberculation decreases. Tubercles along upper margin coarsen toward upper edge, below which, in the shallow depression paralleling the upper margin, there are numerous vertically-oriented, reticulated patterns, some with small tubercles. Outer and lower faces of fixed finger (dactylus) coarsely tuberculate. Movable finger (dactylus) ornamented by at least two rows of coarse tubercles above, forming a faint crest, and a scattering of tubercles over outer face. Occlusional surface of pincers with two large, heavily mineralized teeth, the posterior being nearly three times the size of the anterior. Lower edge of inner face relatively smooth, somewhat crinkled by low ridges perpendicular to lower margin.

Carpus short and triangular, tuberculate, mostly encased in concretion but with a few large tubercles visible on outer face.

Merus long, triangular in cross section, with lower face and frontal faces relatively flatish, posterior-dorsal face probably very arched. Anterior edge of lower face very angular, distal end with 4 or 5 subtle *en echelon* elongate tubercles oriented outward and posteriorly giving rise to a

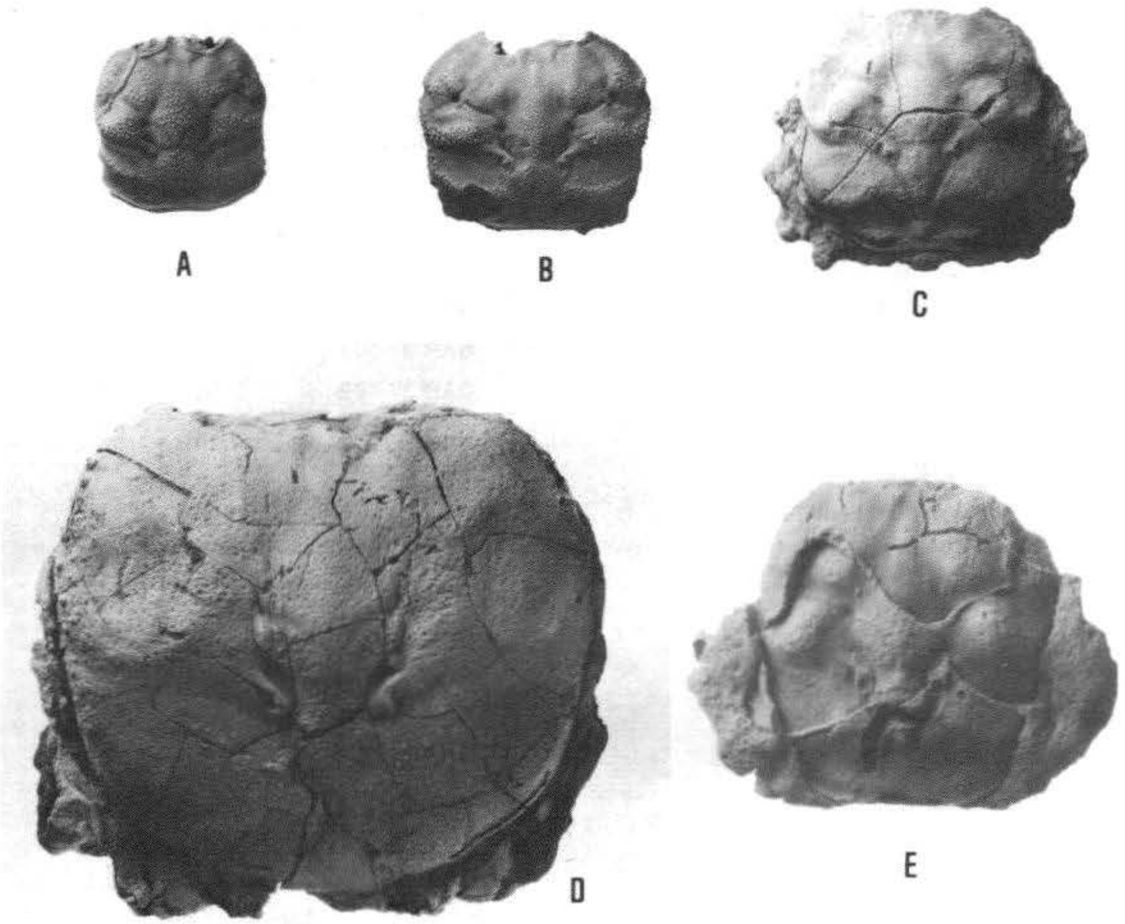

Figure 4. North American Cretaceous Dakoticancroid crabs: A. *Tetracarcinus subquadratus* Weller, 1905 (Blue Springs Locality, GAB 37-1113, x 2.0); B. *Dakoticancer overanus* Rathbun, 1917, (Mobridge, S. D., Sitting Bull Locality, GAB 4-2006, x 1.5); C. *Dakoticancer australis* Rathbun, 1935 (Blue Springs Locality, GAB 37-1150, x 1.0); D. *Avitelmessus grapsoideus* Rathbun, 1923 (USNM 25411, x 1.0); and E. *Seorsus wadei* Bishop, 1988 (Blue Springs Locality, GAB 37-1161, x 2.0).

faint ridging distally. Posterior edge of lower face very angular proximally, less so distally; 9 or 10 short, *en echelon* ridges are present on the posterior angle, all oriented parallel to the distal edge of the merus and thus are oriented slanting outward and forward; each ridge consists of 1 to 10 elongate, parallel tubercles arranged as to form the ridges or crinkles. Posterior-dorsal face embedded in nodule, but giving a suggestion of similar *en echelon* crinkles, at least distally along posterior angle. Anterior face relatively smooth and flatish, slightly sinuous.

Comparison: *Palaeopetrochirus enigmus* is easily distinguished from most other Cretaceous North American hermit crabs because of its large size, its shape, and its ornamentation. *Palaeopetrochirus enigmus* can not be confused with *Pagurus convexus* Whetstone and Collins, 1982, *Romerus robustus* Bishop, 1983b, nor *Paguristes ouachitensis* Rathbun, 1935. *Palaeopetrochirus enigmus* is similar in size to *Pagurus bandarensis* Rathbun, 1935 and *Parapaguristes whitteni* (Bishop, 1983a); it differs from the former by its significantly different outline, more pronounced tuberculate surface ornamentation, and horizontal rather than upturned orientation of the fixed finger, and from the latter by its outline, more extensive and less linear surface ornamentation, and straight rather than downturned fixed finger. The single eroded fixed finger fragment described by Rathbun (1935, p. 40, Pl. 3, figs. 1-3) as *Petrochirus taylori* Rathbun, 1935 is probably assignable to *Palaeopetrochirus*.

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Table 2. Measurements (mm) of *Palaeopetrochirus enigmus* n. sp.

	Propodus	Dactylus	Carpus	Merus
Length	43.1	28.0	n.d.	28.6
Height	28.3	19.3	n.d.	19.2

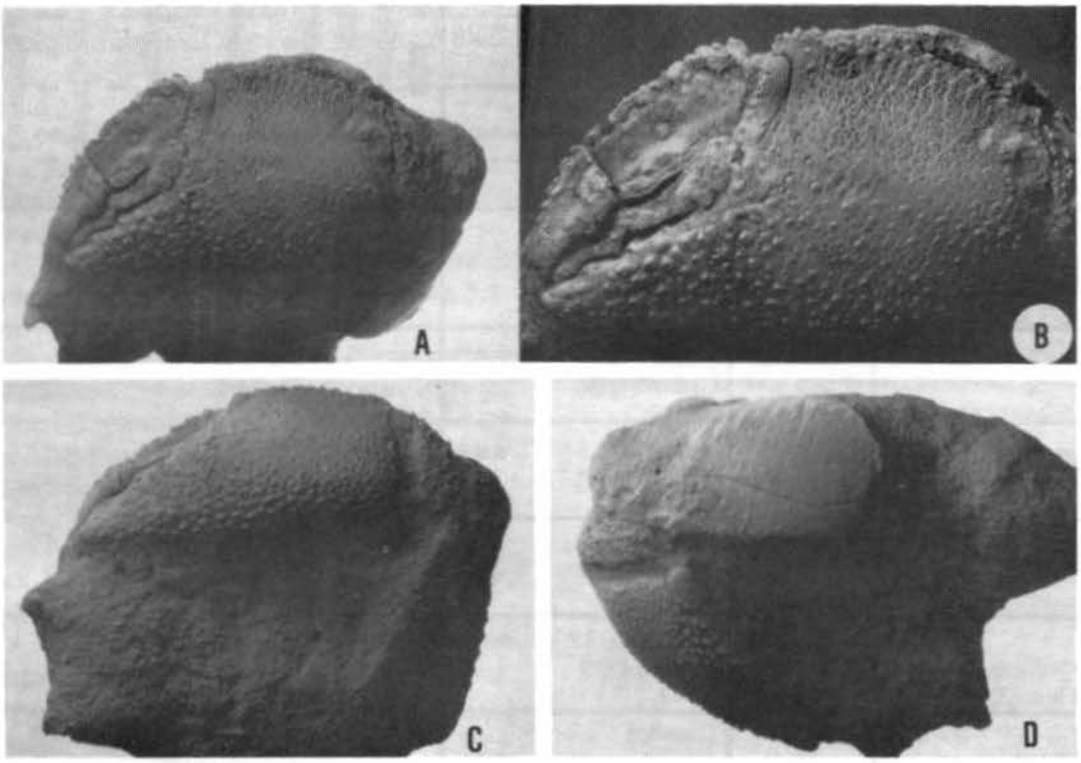

Figure 5. The holotype (1700 MGS) left cheliped of *Palaeopetrochirus enigmus* n. sp.: A. Outer face of claw (x 1.0); B. Outer face of claw (x 1.5); C. Lower edge of claw (x 1.0); and D. Lower edge of merus (x 1.0).

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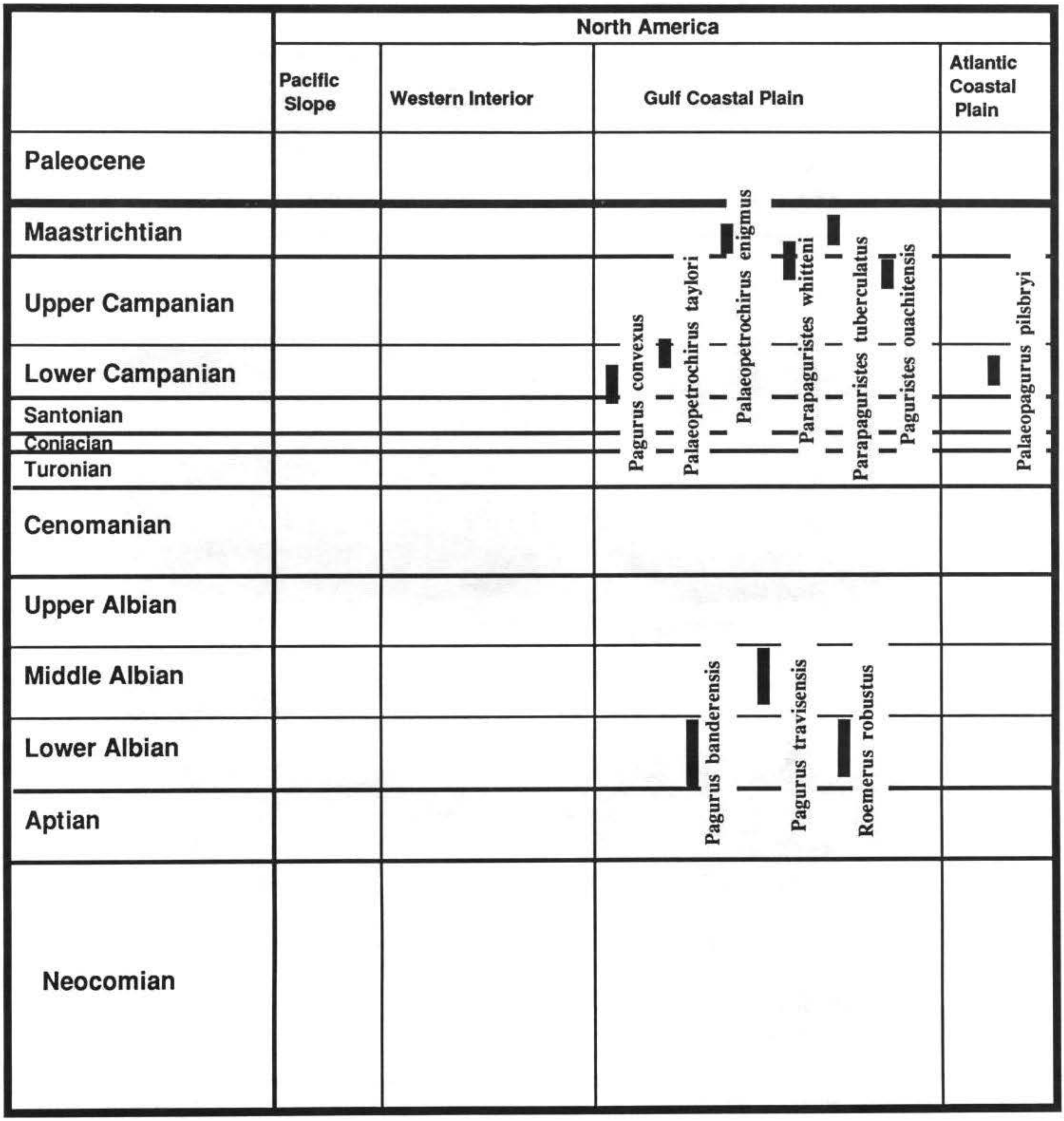

Figure 6. Stratigraphic and paleobiogeographic distribution of North American Cretaceous hermit crabs.

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Mississippi Geology was created in 1980 as a journal for short scientific papers, summary works, and items of interest concerning the geology of Mississippi and neighboring regions. Toward this goal it has proven successful. Over the last eleven years, a number of authors and institutions have published papers in this journal on a diversity of subjects. Some of these papers were solicited by the editors and apart from *Mississippi Geology* may never have been published. As a result of these many contributions, the Mississippi Office of Geology has tapped a large pool of expertise and obtained the results of scientific research into the State's geology at virtually no cost to the agency. *Mississippi Geology* now provides an efficient means for answering the many requests for information that the Office of Geology receives daily; often the requested information is provided in one of the journal's articles.

Another way in which *Mississippi Geology* has proven to be successful is in its reception by the public and scientific communities. We receive numerous requests for current issues, back issues, and subscriptions. These requests come from a variety of individuals and institutions inside and outside the field of geology. We plan to continue providing a quarterly journal with a mix of articles about the geology, paleontology, and mineral resources of Mississippi. Our hope is that each reader will find something of interest in every issue.

As the first issue of *Mississippi Geology* was published in September 1980, previous volumes of this quarterly journal have spanned two calendar years with the September and December issues in one year and the March and June issues in the next. Beginning with this issue, the format will change so that each volume will fall within one calendar year. This issue includes numbers 1 and 2 of Volume 12, and the December 1991 issue will include numbers 3 and 4. The March 1992 issue will begin the number 1 issue of Volume 13.

There are some other changes in the format beginning with this issue. Page numbers will run in sequence through an entire volume rather than starting with 1 in each issue. The footer will contain complete citation information on each page. Please let us know what you think about these changes.

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