

Upper margin gently arched in longitudinal direction and slightly divergent with reference to the lower margin; in transverse section it is thickly rounded at the distal end and narrows down somewhat toward the proximal end; it carries an irregular row of small, vertical, cylindrical tubercles of various sizes. Lower margin is straight as seen from the side, but curves into the lower margin of the curved fixed finger as seen from below; it is thickly rounded in transverse section; its ornamentation is the same as the one of the outer surface. Outer surface with many, low, distally inclined tubercles, which are more prominent toward the distal end and the upper margin; at the latter they grade into the vertical tubercles of the upper margin, at the former they continue without change on the fixed finger. Inner surface with similar and similarly distributed but weaker tubercles.

Fingers fitting closely together as seen from outer surface. Fixed finger a little less than half as high at base as it is long and continuing so to near the middle; there begins a quick taper producing a hump at the middle of the finger. Tip curved inward and outward. Prehensile edge from median hump to tip with about 14 rounded tubercles; no tubercles on proximal half of this edge from the interdigital sinus to the median hump. An edge extends from the tip to the sinus on the inner surface. At the tip this inner edge carries about 4 rounded tubercles similar to those of the prehensile edge. Between these two edges the fixed finger has a concave surface into which the mobile finger fits. Mobile finger is hinged obliquely; the inner hinge point is much lower than the outer one; the latter is very near the upper margin of the finger. Top of mobile finger fits into a concave place on fixed finger.

Left manus smaller than right, about as long as it is high, oblique-quadrangular in outline. Outer surface convex, with a median, longitudinal, convex ridge. Many low tubercles of several sizes cover the outer surface. Inner surface with a diagonal, straight ridge arising near the lower proximal corner and extending diagonally to the base of the movable

finger. Above this ridge the inner surface is deeply concave, making the upper margin crest-like. Many low tubercles cover the inner surface except the concave portion, which has only two feeble rows of them. Upper margin gently arched in longitudinal direction and slightly convergent distally with reference to the lower margin; in transverse section it is narrow, crest-like; the crest carries two rows of tubercles; the inner row has 7 tubercles each with a hair-pit on top; the outer row has about 7 feebler tubercles. Lower margin very thickly rounded to flat. Fixed finger uniformly tapering; lower margin angular in cross section carrying a row of squamiform tubercles; prehensile edge sharp carrying a single row of crowded, tubercular teeth. Outer surface of fixed finger convex and covered with tubercles as the manus. Inner surface with an obscure ridge, which originates on the lower margin of the manus, carrying tubercles and hair-pits.

A fragment of an ambulatory leg is available. It is 15 mm. long, curved. The outside has 4 longitudinal rows of fine tubercles, between which are 3 rows of widely spaced, large hair-pits. The inner surface has two rows of widely spaced, small hair-pits.

Dimensions.—Figured right chela, length, 26.7 mm., height, 14.2 mm., thickness, 9.0 mm.; figured left chela, length, 16.2 mm., height, 7.4 mm., thickness, 5.1 mm.; figured right fixed finger, length of fragment, 17.2 mm. Ambulatory leg fragment, length, 15.0 mm.

Remarks.—The superfamily Paguridea is rather poorly represented in the Cretaceous, although it is better represented in Jurassic and very well represented in recent faunas. In this connection the material described here is a welcome addition to the knowledge. The two species of *Pagurus* from the Cretaceous of Texas also help to extend the range of the genus into the Lower Cretaceous. Before *Pagurus banderensis* was described by M. J. Rathbun, the oldest known *Pagurus* was Eocene in age.

One of the important points of the present paper is the discovery and description of the left chela of *Pagurus banderensis* Rathbun, of which only the

right chela had been known before. As the two chelae differ very considerably in shape and ornamentation and as they were found loose among chelae of other crustaceans, it is only by inference that both can be placed in the same species. Among the other chelae found by Mr. Watkins at the same locality there are some which obviously can have nothing to do with *Pagurus*, because they belong clearly to other well-established and unrelated genera such as *Callianassa*. Some of the other chelae are present in pairs of right and left, thus eliminating all chances that one of them might be part of *Pagurus banderensis* Rathbun. Such processes of elimination leave unaccounted for several left manus, right manus, right fixed fingers, and the leg fragment. The right manus have no other match except the left manus and vice versa, leaving no doubt that they belong to the same species, which has to be *P. banderensis* Rathbun because the right manus and fingers belong there. This species is the most abundant crustacean at this locality.

Type data.—Figured specimens, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Locality.—On State highway No. 16 (Bandera-Pipe Creek road), 2 miles east of Bandera, Bandera County, Texas. M. J. Rathbun's monotype came from 1 mile east of Bandera on the same road as the other material.

Another right chela was found by Mr. Carl Chelf in an excavation on the northwest side of an isolated hill with road metal pits, 0.15 mile south of State highway No. 29 (Burnet-Austin road), and 0.07 mile east of the Southern Pacific Railroad track, 1.42 miles airline distance east of the courthouse in Burnet, Burnet County, Texas.

Geologic horizon.—The material collected by Mr. Watkins and described above was found together with *Douvilleiceras* sp. probably *D. mammillatum* (Schlotheim) and *Salenia texana* Credner in the Glen Rose formation, Comanche series, Cretaceous (lower Albian).

PAGURUS TRAVISSENSIS Stenzel, n.sp.

Pl. 45, figs. 16-18

Description.—Right manus short and high. Upper margin gently curved in longitudinal direction and distally divergent from lower margin; in transverse section narrow and crest-like, surmounted by two rows of tubercles. The inner row consists of 7 tubercles decreasing in size distally; the proximal 5 are nearly vertical, high cones, the distal two are small cones. The outer row is less conspicuous and consists of 4 unevenly spaced small cones in the proximal half of the margin. Lower margin straight, well though narrowly rounded in transverse section, covered with tubercles like the outer surface. Outer surface convex in middle, concave along lower margin, faintly concave along upper margin; covered with many small conical tubercles; weathering has etched part of the surface into a reticulate, pitted framework. Inner surface concave except for a small portion at the upper proximal corner, which is faintly concave; covered with many low, conical tubercles, which are slightly larger and in obscure rows near the upper margin.

Dimensions.—Monotype, right manus, length, 21.6 mm., height, 22.8 mm., greatest thickness, 10.8 mm.

Remarks.—This species is readily distinguished from *Pagurus banderensis* Rathbun by the greater height of the manus in proportion to its length. In addition *P. travisensis* Stenzel is much less tumid than the other species; whereas the right manus of *P. banderensis* Rathbun is thick or even perhaps tumid, the same manus of *P. travisensis* Stenzel is compressed. In keeping with the shape of the manus both margins are narrower in *P. travisensis* Stenzel than the corresponding margins in the other species.

Type data.—Monotype, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—Cut on south side of road on road leading from Bull Creek valley westward to Lake Austin Park and abandoned CCC Camp MA-3-T, CO No. 1805, 0.7 mile from road fork in West Bull Creek valley, 1 mile north of Lake

Austin or 3.4 miles northwest of Mt. Bonnell (airline distance), northwest of Austin, Travis County, Texas.

Geologic horizon.—In nodular, fossiliferous limestone, the basal bed of the Comanche Peak formation, Fredericksburg group, Comanche series, Cretaceous (middle Albian). The fossil was found approximately 10 feet above the basal disconformity of the Fredericksburg group. The specimen was collected by Mr. Chester Wallace.

Tribe BRACHYURA Latreille

Subtribe GYMNOPLURA Bourne

Family RANINIDAE Dana

Genus NOTOPOCORYSTES F. McCoy, 1849

On the classification of some British fossil Crustacea, with notices of new forms in the University collection at Cambridge: *Annals and Mag. Nat. History*, ser. 2, vol. 4, p. 169.

Genotype.—*Notopocorystes stokesii* (Mantell) from the Gault (Albian) of England.

NOTOPOCORYSTES DICHROUS Stenzel, n.sp.

Pl. 43, figs. 5-7; text fig. 13

Notopocorystes dichrous Stenzel in *Dallas Petroleum Geologists, Geology of Dallas County, Texas*, p. 37, fig. 10, 1941.

Description.—Carapace elongate, nearly $\frac{1}{4}$ longer than wide, greatest width through the last lateral spines. Fronto-orbital width between $\frac{4}{5}$ and $\frac{4}{6}$ of that of the carapace. Carapace flattish, very gently convex from front to back, more convex from side to side. Rostrum four-pointed and bifid, ending in 2 short, diverging points, convexly curved with its tip pointing downward and forward; sinus between the advanced points is rounded; the second pair of rostral points is on the lateral margin of the rostrum a short distance back of the other points; midline of the rostrum is occupied by a narrow median ridge flanked by slightly wider, deep grooves; the median ridge extends to the frontal sinus of the rostrum, but the grooves diverge forward and open into the lateral sinuses between the 2 pairs of points of the rostrum. Orbits wide, about 3 times as wide as high, and slightly contracted in middle; slanting downward and outward with the lateral slope of the carapace. Upper

orbital margin with 2 fissures; adjoining the rostrum there is a broad, rounded sinus, which ends against a short spine at the inner fissure; between the 2 fissures there are 2 obtuse points close together; beyond the outer fissure is a short obtuse point, which is separated from the outer orbital spine by a rounded sinus; outer orbital spine long and slightly in-curved. Antero-lateral margin with 5 spines, of which the orbital spine is the first; the size of the spines decreases posteriorly; the last is a mere point; the sinuses are unequal in depth, the last is very shallow, the first and third are a little deeper than the second, the first three sinuses are rounded. Postero-lateral margin gently flexuous to straight, well defined, obtusely angulated and carinated with the aid of coarse, crowded tubercles strung up along it. This marginal row of tubercles begins at the fourth antero-orbital spine. Posterior margin concave and short.

Surface of carapace smooth as a whole, the regions poorly defined. The most conspicuous division occurs along a jagged line running from the root of the rostrum to the end of the postero-lateral margin. This line divides the carapace into two unequal portions; the portion anterior to the line is rough with widely spaced, small granules; the portion posterior to the line is smooth with granules, which have flat, polished tops and are so densely crowded that their interspaces are mere chinks or occasional pits; the two portions also differ in color in all well-preserved specimens; the anterior portion is the darker and bluish, the posterior portion is light gray; the posterior portion is higher than the anterior portion of the carapace along this line, so that the line presents a step or scarp a fraction of a millimeter high. This boundary line is jagged because it has 8 forward-pointing, rounded lobes, that is, 4 on each side; and 7 backward-pointing, sharp-pointed recesses, of which one is median and the others paired. The third lobe of this line (counting from the midline of the carapace) is the most elevated and narrowest in outline. From the fourth lobe to the posterior the boundary line runs alongside the postero-lateral margin of the carapace. The por-

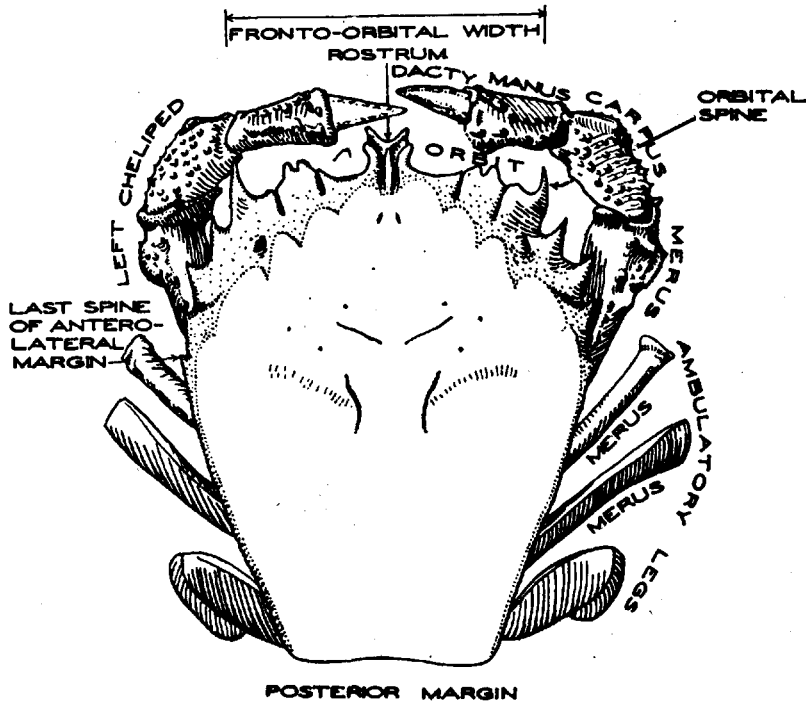


Fig. 13. *Notopocorystes dichrous* Stenzel, x2; composite of several specimens; complete animal except for the eyes, abdomen, last legs, and distal parts of other ambulatory legs.

tion of the carapace anterior to this boundary line is devoid of sculpture except for the above-mentioned granules, a short, spinous tubercle on each hepatic region, and a groove which starts at the antero-lateral margin between the third and fourth spines and extends a short distance forward and inward in the direction of the tip of the fourth lobe of the boundary line. The portion of the carapace posterior to the boundary line is devoid of spines or swellings but has an obtuse, rounded, obsolete median keel, which is best developed between the cardiac groove pair and disappears in a short distance both in front of the cervical groove and behind the cardiac grooves. The cervical groove consists of a pair of short, straight, linear grooves, which do not join in the midline. They form an obtuse angle of about 120 degrees. A pit is situated about 1 millimeter forward and inward from the outer end of each groove. The cardiac grooves are short and curved. In a line with the anterior prong of each of the cardiac grooves lie

2 pits, of which the posterior one is the deeper and about 2.2 mm. apart from both the outer pit and the end of the cardiac groove. A third groove pair lies a short distance posterior to the end of the median ridge of the rostrum. These grooves are very short, straight, linear, and separate and make an acute angle of 45 degrees.

Chelipeds equal in size. Merus thick and rounded except for the flat surface in contact with the carapace; its posterior edge armed with spinules; the outer or posterior surface has an inclined, curved, sharp ridge situated near the distal end of the merus. This ridge is sharp-crested and carries tubercles on the crest. Spinules cover the outer surface of the merus. Outer surface of carpus with spinules and a short, straight, inclined ridge ending in a distal spine and situated near and parallel with the manus-carpus joint. Manus compressed; the lower edge with tubercles, narrowly rounded at proximal end, increasing in sharpness to a sharp edge toward the

distal end, and continuing in that shape on the fixed finger. Outer surface of manus nearly flat and covered with scattered spinules. Upper surface of manus narrow and flat, edged with a row of spinuous tubercles to either side. Dactylus gently curved in outline and rectangular in cross section; its upper, outer, and inner surfaces flat and smooth; occluding surface with flat teeth. Merus of all ambulatory legs compressed, its upper edge tubercle-bearing, its lower edge spinule-bearing.

The ambulatory legs are unequal, the first two are equal, the third pair is small, and the fourth is tiny. The latter is missing in nearly all specimens. The ambulatory legs are compressed in cross section.

Dimensions.—Figured syntype, length of carapace, 34.3 mm., width of carapace, 27.0 mm., fronto-orbital width, 20.0 mm.; largest syntype, width of carapace, 47.4 mm.

Remarks.—This species is well characterized by the jagged line which divides the carapace into two unequal portions. This line is well developed and conspicuous in all specimens. However, in this feature it is not unique among the species of *Notopocorystes*. *Notopocorystes broderipii* (Mantell), *N. carteri* McCoy,³⁰ and *N. syriacus* Withers³¹ and possibly other species have this line or portions of this line, but in these species the line is easily overlooked, because other structural features overshadow its importance. The same line occurs well developed in *Ranina trechmanni* Withers,³² but in this form the line is more advanced in position and lies closer to the antero-lateral and orbital margins of the carapace. The Jamaican species is also very similar in the peculiar ornamentation of the carapace. Both *Ranina trechmanni* Withers and *Notopocorystes dichrous* Stenzel have

the major portion of the carapace, that is, the portion posterior of the above-mentioned jagged line, covered with minute, flattened granules, which are so closely set that the interspaces are mere chinks. However, in *Ranina trechmanni* Withers there are occasional small pits, around which the granules are arranged in circlets of four; the same pits occur in *Notopocorystes dichrous* Stenzel but the circlets are indistinct and made up of 5 or 6 granules. It seems that *Notopocorystes dichrous* Stenzel is a connecting link about halfway between *Notopocorystes broderipii* (Mantell) and *Ranina trechmanni* Withers. For that reason *Ranina trechmanni* Withers should perhaps be included in the genus *Notopocorystes* and not in *Ranina*.

Among the species of *Notopocorystes* it is *N. broderipii* (Mantell) which is the nearest relation of *N. dichrous* Stenzel. The differences between the two species are not large. The cervical grooves and the grooves delimiting the anterior process of the mesogastric region are longer in *N. broderipii* (Mantell) than in *N. dichrous* Stenzel. Also, *N. broderipii* (Mantell) has one spine less on the antero-lateral carapace margin than *N. dichrous* Stenzel; the median keel is longer and more prominent in *N. broderipii* (Mantell) extending very nearly to the posterior carapace margin.

Two other species of *Notopocorystes* are known from the Cretaceous of Texas. They are *N. punctatus* Rathbun and *N. parvus* Rathbun.³³

The specific name *dichrous* is derived from the Greek adjective διχρῶος, "two-colored," and refers to the two-colored carapace of the species, which is its most striking feature.

Type data.—Several syntypes, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—Same as *Linuparus grimmeri* Stenzel.

Geologic horizon.—Same as *Linuparus grimmeri* Stenzel.

³⁰Compare Bell, Th., A monograph of the fossil malacostracous Crustacea of Great Britain, pt. 2, Crustacea of the Gault and Greensand: Palaeontograph. Soc., vol. 14, pp. 14-15, 17-18; pl. 2, figs. 8-13, 14-17, 1863.

³¹Withers, T. H., New Cretaceous crabs from England and Syria: Annals Mag. Nat. History, ser. 10, vol. 2, pp. 459-460; pl. 13, figs. 1-3, 1928.

³²Withers, T. H., *Ranina trechmanni*, a new Cretaceous crab from Jamaica: Geol. Mag., vol. 64, no. 754, pp. 176-180, pl. 7, 1927.

³³Rathbun, M. J., Fossil Crustacea of the Atlantic and Gulf Coastal Plain: Geol. Soc. Amer., Spec. Paper 2, pp. 48-49; pl. 12, figs. 14-16 and 11-13, 1935.

Subtribe OXYSTOMATA De Haan

Family CALAPPIDAE Alcock

Genus *NECROCARCINUS* Th. Bell, 1863

A monograph of the fossil malacostracous Crustacea of Great Britain, pt. 2, Crustacea of the Gault and Greensand: Palaeontograph. Soc., vol. 14, p. 19.

Genotype.—*Necrocarcinus labeschii* (Deslongchamps) from the Cambridge greensand, Cretaceous (Albian), of England.

NECROCARCINUS MOSELEYI Stenzel, n.sp.

Pl. 41, fig. 12; text fig. 15

Description.—Monotype is a carapace fragment. Carapace small, apparently circular in outline, greatest width of carapace anterior of its center, lateral extremity rounded. Carapace slightly convex from front to back, less so from side to side. Rostrum missing. Orbits medium, pointing forward and upward, wider than high. Upper orbital margins upturned and mostly broken away; but a fissure is visible on the right orbit near the outer orbital corner. Lower orbital margins with two fissures, of which the outer one is twice as deeply incised as the inner. Right antero-lateral margin is preserved but somewhat decorticated; it has 8 tiny tubercles, of which 6 occur anterior to the hepatic notch. At the lateral extremity there are 3 small tubercles grouped together with the high epibranchial tubercle. Postero-lateral and posterior margins mutilated.

Dorsal surface of carapace with many bosses. Each protogastric subdivision with 2 broad bosses; of these bosses the inner one is high, transverse, and conspicuous, the outer is merely a slight rise on the long outer slope of the other. All 4 protogastric bosses form a broad, low, continuous, transverse ridge. A broad, rounded median ridge extends from the mesogastric to the cardiac region; it is surmounted by a short, elongate and a short, transverse tubercle in metagastric position arranged in the shape of an inverted T; the cardiac region of this median ridge is slightly higher but it is not well separated from the gastric region. Hepatic region is a depressed basin with the deepest place posterior to the outer orbital angle and a small tubercle near its postero-lateral

corner. A low, broad ridge extends from the mesobranchial back through the metabranchial subdivision; this ridge has two swellings near its anterior end. The ridge connects at its anterior end with the similar, but short and transverse, epibranchial ridge. At the outer end of the epibranchial ridge is the elongate epibranchial tubercle, which is very near the lateral extremity of the carapace.

The entire carapace surface is covered with very fine granules, which are coarser toward the tops of the major tubercles and ridges; the granules are also coarser on the branchial region.

The branchial regions are separated from the gastric and cardiac regions by a pair of broad, rounded grooves traversing the carapace and merging to the anterior with the hepatic depression. A pair of short, linear, subparallel grooves outlines the anterior extension of the mesogastric subdivision. A pair of very short, linear, transverse pits are set 1 millimeter apart, one at each side of the front tip of the metagastric tubercles which form an inverted T. From each of the pits extends a dark line for about 2 millimeters obliquely outward and forward; these two lines form a broad obtuse V. The semilunar branchio-cardiac grooves are well marked.

Dimensions.—Fronto-orbital width, 7 mm.; width of carapace (reconstructed), 13.5 mm.

Remarks.—This is another species of *Necrocarcinus* which is transitional to *Cenomanocarcinus*. In *Necrocarcinus moseleyi* Stenzel the metabranchial and epibranchial ridges are well developed and in these two features the species comes very close to *Cenomanocarcinus*. However, both ridges are short and carry only a few tubercles. On the other hand, the hepatic ridge, which is so well developed in *Cenomanocarcinus*, is reduced in this species to a single small tubercle.

The *Necr. moseleyi* Stenzel finds its place among the following related species: *Necr. graysonensis* Rathbun, *Necr. texensis* Rathbun, and *Necr. tricarinatus* Bell.

There are numerous differences in the number and arrangement of the carapace

tubercles among these species. The differences are shown by text figure 15.

The species is named in honor of Mr. Fred T. Moseley of Dallas, who discovered the monotype.

Type data.—Monotype, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—From an ant hill located in the dell between two hills, of which the northern one is cut by State highway No. 114, about 2 miles northwest of Roanoke on highway No. 114 and about 200 feet south of the highway, Denton County, Texas.

Geologic horizon.—Pawpaw shale, Washita group, Comanche series, Cretaceous (upper Albian). A rich fauna of micromorphs occurs with this crab.

NECROCARCINUS (?) OVALIS Stenzel, n.sp.

Pl. 41, figs. 7-9; text figs. 14, 15

Necrocarcinus ovalis Stenzel in Dallas Petroleum Geologists, Geology of Dallas County, Texas, p. 39, fig. 12, 1941.

Description.—Carapace small, transverse-oval, $\frac{1}{2}$ wider than long, outline rounded; greatest width of carapace falling through its center, lateral extremity rounded. Carapace slightly convex from side to side, slightly more convex from front to back. Rostrum convex from front to back, pointing forward and downward, with a broad, obtusely V-shaped median groove, which back of the root of the rostrum forks into two rapidly shallowing grooves, which diverge at an acute angle. Orbits medium, deeply emarginate, only slightly wider than high, with elevated margins; the orbits look forward and upward and slightly outward. Nearly all orbital margins are broken off at the edge, but at least one notch is visible near the outer end of the upper margin. Antero-lateral margin short and convex in outline, interrupted by a deep, rounded hepatic notch. Margin in front of hepatic notch with a group of 2 subequal tubercles; these 2 tubercles are connected by a short, narrow ridge; anteriorly they are separated by a shallow, broad groove from the elevated orbital rim. Antero-lateral margin behind the hepatic notch with 2 groups of 2 subequal tubercles each, each group being

similar to the group on the hepatic portion. The 2 groups are separated by a small and shallow notch. The anterior group is smaller; the posterior one lies at the lateral extremity of the carapace and adjoins the large epibranchial tubercle of the carapace surface. Postero-lateral margin longer than antero-lateral, convex in outline, rounded to subangulated, free of tubercles except for one very small one near the lateral extremity of the carapace. Posterior margin short, concave in outline.

Dorsal surface of carapace with many bosses. Subdivisions of gastric region very poorly defined. Mesogastric subdivision with one central boss, from which a low median ridge slopes downward and backward. A very slight rise on this ridge indicates a uro- or metagastric boss. Each protogastric subdivision with 2 low, broad, poorly defined swellings; these four swellings lie in a straight, transverse line; a very inconspicuous tubercle lies at the end of the protogastric subdivision back of and near the outer orbital corner. Hepatic region small, with a small, well-defined boss near the hepatic notch. Branchial subdivisions very poorly defined. A large, broad boss on the mesobranchial subdivision; the epibranchial subdivision with a high, transverse boss near the extremity of the carapace; a broad swelling on the meta-branchial subdivision. Cardiac region with a large boss. Intestinal region simple, without any bosses. Cervical grooves deep and broad, extending to the margin of the carapace. A narrow and short but deep groove divides the hepatic region. A broad, shallow groove bounds the posterior of the orbital rims. The cardiac region is bounded on all sides by deep and broad grooves.

Ventral surface of carapace descends vertically from the margin and is smooth. A groove originates at the hepatic notch. This groove descends at first vertically, but later curves forward and extends parallel with the antero-lateral margin, and finally abuts against the middle of the lower orbital margin.

Dimensions.—Length, 12.0 mm., width, 15.3 mm., fronto-orbital width, 7.3 mm.

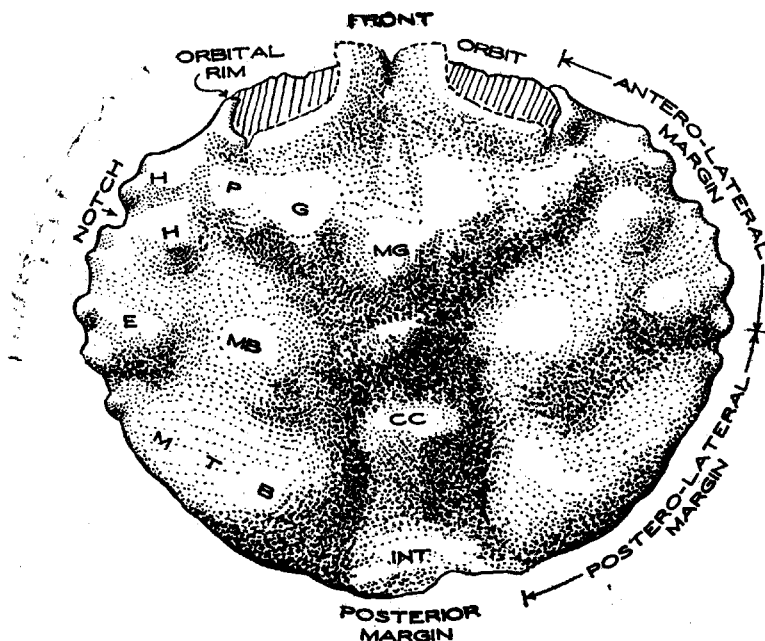


Fig. 14. *Necrocarcinus ovalis* Stenzel, x6; monotype; carapace. CC, cardiac; E, epibranchial; H, hepatic; INT, intestinal; MB, mesobranchial; MG, mesogastric; MTB, metabranhial; PG, protogastric areolation.

Remarks.—This species does not conform closely to the genotype species of *Necrocarcinus* and should be placed in a new genus presumably. However, at this stage of knowledge and with the material at hand, it is inadvisable to propose a new genus.

The species has been placed temporarily in *Necrocarcinus*(?), because its nearest relations seem to be with the genus *Necrocarcinus* and because it is related to *Necrocarcinus graysonensis* (Rathbun).

The holotype of *Necrocarcinus graysonensis* Rathbun is a small fragment of a carapace. As far as structural features are preserved in that fragment they agree closely with those of *N. (?) ovalis* Stenzel. The differences between the two species are mainly in the shape and to lesser degree in the number of the tubercles. Those tubercles which are common to both species are in the same structural position in both.

Type data.—Monotype, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—Three and one-half miles west of Cedar Hill, Dallas County,

Texas (Bureau of Economic Geology Coll. No. 460). Collected by Mr. Q. O. Gaither and submitted by Mr. V. V. Waite, Atlantic Oil Producing Company, Dallas, Texas.

Geologic horizon.—Eagle Ford group, Gulf series, Cretaceous (Turonian). In the same collection are the following fossils:

Clidastes sp., lower jaw fragments
Ptychodus cf. whippleyi Marcou
Fish vertebrae
Gastropod cast near Actaeon
Gastropod cast near Natica
Inoceramus prisms and hinge fragments
Worm tubes

The first three fossils listed were identified by Dr. J. T. Gregory.

NECROCARCINUS RENFROAE Stenzel, n.sp.

Pl. 41, fig. 13; text fig. 15

Description.—Carapace medium in size, subcordiform in outline; greatest width of carapace anterior of its center, width and length about equal; lateral extremity with a spine but not conspicuous. Carapace flattish, slightly more convex from side to side than from front to back.

Rostrum broken off but apparently projecting beyond the orbits. Orbits comparatively large, emarginate, more than twice as wide as high, constricted in the middle, their long transverse axis slanting downward and outward from the mid-line of the carapace; the orbits look forward and upward. Upper orbital margin turned up and cut by two fissures, one of which is in the middle of the upper margin; the other is halfway between the former and the outer orbital angle. Outer orbital tooth simple, projecting, and with triangular base. Lower orbital margin projecting farther than the upper one, cut by a fissure about halfway between the orbital hiatus and the outer orbital tooth. Antero-lateral margin short, strongly convex, and rapidly receding, acutely angulated in cross section, armed with 4 flat, projecting teeth, of which the last is at the lateral ex-

tremity of the carapace. The 4 teeth are approximately evenly spaced; the sinuses between them are shallow and evenly rounded except the sinus between the second and third tooth, which is deeper and unevenly rounded so that its greatest recess is nearer the third than the second tooth; this is the hepatic notch. Postero-lateral margin longer than antero-lateral and slightly sinuous, obtusely angulated in cross section, armed with one inconspicuous tooth a short distance behind the lateral extremity of the carapace and 6 or 7 tiny teeth near its middle. Posterior to these 6 to 7 teeth the postero-lateral margin loses its definition and angulation. Posterior margin comparatively long, slightly concave, with a thin, raised edge.

Dorsal surface of carapace with narrow ridges and tubercles. A tiny, round tubercle is in the groove which encircles

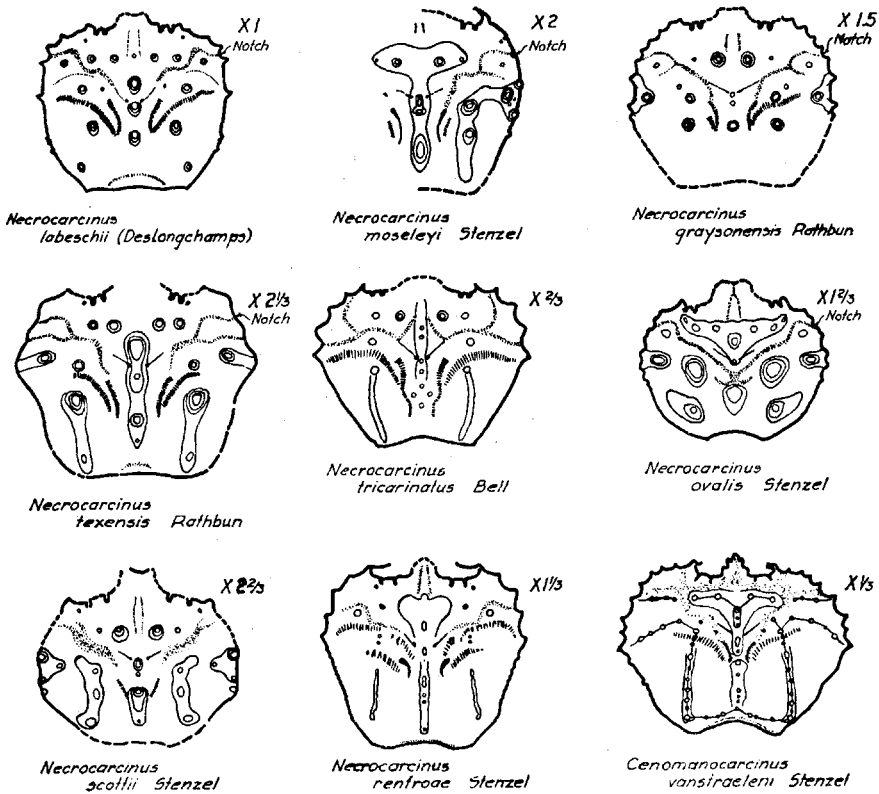


Fig. 15. Outlines of the carapaces of *Necrocarcinus* and *Cenomanocarcinus*. Height and shape of tubercles and swellings are outlined by form contour lines, grooves by stipples, and muscle imprints by cross-hatchures.

the upper orbital margins; it is near and to the outside of the outer orbital fissure. Gastric subdivisions of the carapace poorly defined. The frontal extension of the mesogastric region defined by a pair of parallel, shallow grooves. A small, elongate, narrow, median tubercle is in mesogastric and a similar one is in metagastric position on a median ridge. The median ridge extends from the mesogastric region through to the intestinal region; it carries besides the meso- and metagastric tubercles about 7 unevenly spaced tubercles of which some are narrow and elongate. To either side of the last of these tubercles is a low tubercle very near the posterior margin. Each protogastric region has a very low, broad swelling and a conical tubercle; these four lie in a transverse and nearly straight line with the tubercles at the outside; the tubercles are also in line with the metabranchial ridges. Each hepatic region with a low tubercle. A group of 2 small tubercles arranged longitudinally occupies mesobranchial position. From this group extends a low, rounded, slightly curved ridge outward to the tooth at the lateral extremity of the carapace. Another ridge extends from the same mesobranchial tubercles backward toward the ends of the posterior margin. This metabranchial ridge carries about 10 tiny tubercles in a row. This tubercle row is connected in front by a low, tubercle-free portion of the metabranchial ridge with the mesobranchial tubercles; the last of the 10 tubercles is the highest; with this high tenth tubercle the ridge ends without reaching the posterior margin.

The semilunar branchio-cardiac grooves are deep; obliquely in front of their end is a slightly elongate pit. A pair of short, linear grooves forming a right-angle V is on the median ridge with its tip centering in the metagastric tubercle. A tortuous depression extends from each branchio-cardiac groove forward around and in front of the mesobranchial and the hepatic tubercles and ends in the hepatic notch.

Dimensions.—Holotype: fronto-orbital width, 9.8 mm., width, 18.7 mm., length, 18.0 mm.

Type data.—Holotype and two paratypes, Bureau of Economic Geology, The University of Texas, Austin, Texas.

The species is named in honor of Mrs. J. H. Renfro, of Fort Worth, Texas.

Type locality.—Watauga; slopes at the head of a short, right tributary to a wide, flat-bottomed branch, which is a left tributary of Big Fossil Creek; 0.51 mile east of U. S. highway No. 377 (Fort Worth-Denton road) or 0.40 mile east and 0.08 mile north of Watauga schoolhouse, northern Tarrant County, Texas (Bureau of Economic Geology locality No. 219-T-4); holotype.

Watauga; gullies in pasture about 0.1 mile east and within sight of U. S. highway No. 377, opposite a Texas & Pacific Railroad trestle and 0.2 mile north of Watauga schoolhouse (Bureau of Economic Geology locality No. 219-T-3); paratype.

Buffalo Creek; hills surrounding the headwaters of Buffalo Creek, about 0.2 mile east of south-north road, which leads to Haslet, about 0.35 mile south of the road cross, about 0.5 mile airline distance southeast of Blue Mound and 2.2 miles south of Haslet, northern Tarrant County, Texas (Bureau of Economic Geology locality No. 219-T-2); paratype.

Geologic horizon.—Pawpaw shale, Washita group, Comanche series, Cretaceous (upper Albian). The following fossils occur at the same locality and horizon as the holotype:

Arthropoda—Crustacea:

Caloxanthus americanus Rathbun
Ophthalmoplax comancheensis Rathbun
Xanthosia aspera Rathbun
Notopocorystes punctatus Rathbun
Ischnodactylus texanus Rathbun
Homarus

Mollusca—Cephalopoda:

Engonoceras serpentinum (Cragin)
Turrilites worthensis Adkins and Winton
Submantelliceras worthense (Adkins)

NECROCARCINUS SCOTTII Stenzel, n.sp.

Pl. 41, figs. 10, 11; text fig. 15

Description.—Carapace small, oval in outline, width to length in proportion of 5 to 4, greatest width of carapace falling through its center, lateral extremity rounded. Carapace slightly convex both in longitudinal and transverse directions.

Rostrum longitudinally convex, pointing forward and downward; it is broken off, but the imprint indicates that it is far advanced and bifid at the tip. Rostrum with a median groove, which splits back of the root of the rostrum into a pair of short, shallow, parallel, and closely spaced grooves. This groove pair reaches almost to the high tubercles of the protogastric region. Orbits large, poorly preserved. Antero-lateral margin evenly convex in outline; a small tubercle halfway between orbit and lateral extremity of carapace; two larger, conical, equal tubercles, closely spaced, one behind the other, at the lateral extremity of the carapace. Immediately behind the posterior one of these two tubercles there is a small one at the postero-lateral margin of the carapace. A fourth, epibranchial tubercle is on the dorsal surface of the carapace placed in an equilateral triangle with the two large tubercles of the lateral extremity of the carapace. All four tubercles are on an eminence which occupies the lateral extremity of the carapace. Postero-lateral margin nearly straight, poorly preserved, with only one tubercle, which has been described above. Posterior margin not preserved.

Dorsal surface of carapace with 17 tubercles. Mesogastric region without tubercles or swellings and triangular in outline; its anterior extremity long, narrow, and parallel-sided, extending forward between the two short parallel grooves to the root of the rostrum. Protogastric region each with 2 conical tubercles in a transverse row so that all 4 tubercles are in one transverse line. Of these 4 tubercles the inner pair is high, the outer pair low. Metagastric region with a slightly elongate, round-topped tubercle. On the posterior slope of this tubercle is a small, round tubercle, which is urogastric in position. Cardiac region with a high, rounded tubercle, whose anterior slope is steeper than the posterior. Posterior to this tubercle there is a low median ridge, which bears two slight swellings. Mesobranchial region each with two small tubercles forming a short, oblique line. Epibranchial region each with one tubercle near the extremity of the carapace mentioned

above. Metabranchial region each with two large, conical tubercles in a longitudinal row.

A pair of broad, continuous grooves separates the branchial from the cardiac and gastric regions. A short, linear groove extends from each side of the metagastric tubercle forward and outward, both grooves forming a broadly obtuse V. Posterior to these grooves are the semilunar branchio-cardiac impressions.

Left carpus small, a little longer than high; the outer surface with 6 equal tubercles. Left manus not quite twice as long as it is high; its lower margin very narrow but rounded in cross section, slightly convex as seen from the outer side; its outer surface gently convex in longitudinal direction, but more convex in transverse direction; the upper portion of the outer surface is turned inward so much as to form a nearly flat, wide upper surface for the manus; outer surface with 3 to 4 obscure, longitudinal rows of about 5 tubercles each; upper margin narrow but rounded in cross section; inner surface of manus with a slightly oblique, longitudinal row of 3 tubercles extending from the manus-carpus joint to the center; inner surface slightly concave just below the upper margin and gently convex through the center.

Dimensions.—Length of carapace without rostrum, 7.8 mm., width of carapace, about 9.4 mm.; height of left manus, 3.6 mm., length of left manus, 5.8 mm.

Remarks.—This species is related to *Necrocarcinus(?) ovalis* Stenzel. The two species have in common the general shape of the carapace and the group of 4 tubercles at the lateral extremity of the carapace. This group is nearly identical in the two species. The only differences are that the epibranchial tubercle of this group is much larger and placed more inward in *N. ovalis* Stenzel than in *N. scotti* Stenzel. The other tubercles of the carapace are similar in a general way in both species, but there are numerous differences between them as to number, shape, and relative position of the tubercles.

Type data.—Monotype, carapace, left manus, and carpus, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—Above a muddy tank to the left of the Frisco Railroad tracks, 1 mile northeast of Denison, northeastern Grayson County, Texas (Texas Christian University Coll. No. M542, G852).

Geologic horizon.—Denton clay, Washita group, Comanche series, Cretaceous (upper Albian).

Genus **CENOMANOCARCINUS** V. Van Straelen, in Stenzel, new gen.

VAN STRAELEN, V., Crustacés décapodes nouveaux ou peu connus de l'époque crétacique: Mus. royal histoire nat. Belgique Bull., vol. 12, no. 45, pp. 37-39, 1936.

STENZEL, H. B., Decapod crustaceans from the Cretaceous of Texas: Univ. Texas Pub. 4401, 1944 [1945].

Genotype.—*Cenomanoarcinus inflatus* (A. Milne-Edwards ms.) from the Cenomanian sands of Le Mans, France, is herewith designated the genotype. The genoholotype is the specimen figured by Van Straelen on Plate 4, figure. 8.

Remarks.—When Van Straelen proposed this genus in 1936 he assigned two species to it: *C. inflatus* (A. Milne-Edwards ms.) Van Straelen, which he described for the first time, and *C. oklahomensis* (Rathbun), to which he gave a pertinent literature reference. However, Van Straelen failed to designate which of the two species is the genotype. According to article 25c(3) of the International Rules of Zoological Nomenclature, it is absolutely necessary to designate definitely and unambiguously the genotype species if the genus is to be valid. This rule applies to all generic names proposed after December 31, 1930. Hence, *Cenomanoarcinus* Van Straelen 1936 is not valid. In order to preserve the name, *Cenomanoarcinus* is herewith proposed anew, and a definite type is proposed. Were it not for the impossibility of getting in touch with Dr. Van Straelen at this time, he would have been asked to validate the genus himself.

CENOMANOCARCINUS VANSTRAELENI Stenzel, n.sp.

Pl. 44; text fig. 15

Description.—Carapace large, transverse-oval, $\frac{1}{4}$ wider than long; greatest width of carapace through its middle and

the lateral spines; lateral extremity with a spine. Carapace equally convex in transverse and longitudinal direction. Fronto-orbital width slightly more than $\frac{1}{3}$ of the carapace width. Rostrum convex from front to back; tip pointing forward and downward; outline triangular; with 3 points, the 2 lateral tips turned up; a broad, deep, rounded, V-shaped groove along the middle. Orbits small, deeply emarginate, pointing forward and upward and slightly outward; height about $\frac{5}{8}$ of width. Upper orbital margins are turned upward. In going around the orbital margins there is an obtuse dent at the inner end of the upper margin, a well-developed sinus, a short, obtuse point adjoining the first fissure, a short, obtuse point between the two fissures, then follows the second and deeper fissure, a sinus, and the strong outer orbital dent; on the lower margin there is a small point near the outer orbital dent. Antero-lateral margin is acutely angular in cross section and at first nearly straight and transverse, then curving convexly to the lateral extremity. There are 9 spinous tubercles on the antero-lateral margin, the outer orbital dent is the first and the lateral spine the ninth of these. Tubercles 2 to 5 are increasing in size to the posterior, they are separated from the next by the deep, rounded hepatic sinus; among the next tubercles the eighth is the smallest, the seventh is next in size, and the ninth or last is the largest. The postero-lateral margin is gently sinuous; it is obtusely angular in cross section and has only minor tubercles. The first of these tubercles is not far from the lateral spine, the second and third are near the middle of the postero-lateral margin, the others follow immediately behind and are decreasing in size. Posterior margin convex from side to side and concave as seen from above; it is delimited by a groove and narrow rim.

Dorsal surface of carapace with several tubercle-carrying ridges, of which the 3 posterior ones are most conspicuous. The entire surface of the carapace carries granules, but these are coarser and more crowded on the crest of the ridges and the orbital margins. A median

ridge extends from the mesogastric to the intestinal region; it is crossed by a deep and broad saddle at the gastro-cardiac boundary. This ridge carries one elongate tubercle on the mesogastric and one on the metagastric region; each of these tubercles is higher in front than in back; on the posterior slope of the metagastric one is a tiny urogastric tubercle. Six tubercles unequal in size and spacing are on the median ridge in the cardiac and intestinal regions. A pair of posteriorly divergent and gently curved ridges begins at the mesobranchial region and extends to the ends of the posterior margin. Each of these ridges has 10 tubercles of unequal size and spacing. The last of the 10 tubercles is the strongest. A transverse ridge connects the two last tubercles; this transverse ridge is very near the posterior margin; it carries up to 9 tubercles of which the median one and the 2 outermost are also on the above described ridges. A curved ridge is on each epibranchial region; it connects with the second tubercle of the other branchial ridge on one side and with the lateral spine on the other side. There are 4 tubercles on this ridge, not counting the lateral spine. A short, curved ridge is on each hepatic region; it connects with the sixth spine of the antero-lateral margin and carries 3 tubercles. There are 2 tubercles on each protogastric region arranged transversely. In old age many tubercles of the ridges become nearly confluent and indistinct (see Pl. 44, fig. 2); they are most clearly visible on interior casts of the carapace.

The semilunar branchio-cardiac grooves are deep; their posterior ends are connected by a transverse saddle over the median ridge. Nearly in prolongation of their anterior prong is an isolated pit. A pair of linear and shallow grooves, at right angles one to the other, is on the slope of the median ridge. A tortuous depression extends from the branchio-cardiac grooves forward and outward and delimits the outside of the gastric region; this depression swings outward, just anterior to the hepatic region, and ends in the notch between the fifth and sixth antero-lateral spines. This depression is well marked in the young, but becomes shallow with age.

Coxa of cheliped narrow L-shaped, armed with 4 to 5 spinous tubercles, one of which is very large. Basis is as long as wide. Ischium wider at the anterior side than the posterior, with 3 spines at the distal margin and one spine at the anterior proximal corner. Merus strong, rounded-triangular in cross section; its 3 edges armed with strong spines; additional spines on the lower anterior surface of the merus. Carpus unknown. Manus compressed-oval in cross section, its upper and lower margins straight and divergent; outer surface gently convex and with an obscure, spinulous, longitudinal ridge through its middle; spinules arranged in obscure rows on the outer surface; upper and lower surface narrow and with spinules along their edges. Pollux and dactylus slender, compressed, and high; rectangular in cross section; rows of spinules along their outside edges; toward the curved tips the spinules disappear and are replaced by narrow keels; outer surface of dactylus and pollux with obscure rows of fine spinules; occludent margins with about 6 triangular teeth. Coxa of first ambulatory leg with 2 spines in the middle and 2 small spines at the distal margin; basis short; ischium with 2 spines at the distal margin; merus compressed; rectangular in cross section, armed with small spines along the edges. Second ambulatory leg similar, but its coxa has the two median spines smaller and the two distal spines larger and the ischium has additional spines at its posterior edge. Third ambulatory leg has the coxa with a flaring, spinous, distal edge and the ischium with a rectangular cross section and spines along its edges. The fourth ambulatory leg is missing (see Pl. 44, fig. 3); there is room only for a small leg.

Outer maxilliped is slender; the merus of the endognath widens distally.

Abdomen of female is known (see Pl. 44, fig. 3). The first segment is unknown. The second to fifth segments are short and wide and have three transverse tubercles in a row; these tubercles are transversely elongate; the median tubercle is higher than the lateral pair; on the fourth and fifth segments a transverse ridge starts at the lateral tubercles and extends to the

lateral margin; these 4 ridges may carry minor tubercles. The sixth abdominal segment is rectangular, a little wider than long; its 3 tubercles are not in line; the median tubercle is in or near the center, the lateral ones are near the proximal region; all 3 are smaller than those of the preceding segment; the distal corners of the sixth segment are turned up. The seventh segment is poorly preserved; it is presumably triangular. Two continuous, longitudinal depressions extend from segment to segment between the 3 tubercles.

Dimensions.—Syntype 1: fronto-orbital width, 19.5 mm., length of median ridge, 34.5 mm.; syntype 2: width of carapace (restored), 37 mm., fronto-orbital width, 14.5 mm., length of median ridge, 19.7 mm.; syntype 3: greatest width of abdomen, 21 mm.

Remarks.—The genus *Cenomanocarcinus* contains at present the following species:

- Cen. inflatus* (A. Milne-Edwards), upper Cenomanian, France
Cen. armatus (Rathbun),⁸⁴ upper Albian, Texas
Cen. oklahomensis (Rathbun),⁸⁵ upper Albian, Oklahoma
Cen. vanstraeleni Stenzel, Turonian, Texas

There are also certain species which are transitional between *Cenomanocarcinus* and *Necrocarcinus*. These species are:

- Necr. tricarinatus* Bell,⁸⁶ Cenomanian, England
Necr. texensis Rathbun,⁸⁷ upper Albian, Texas
Necr. graysonensis Rathbun,⁸⁸ upper Albian, Texas

⁸⁴Rathbun, M. J., Fossil Crustacea of the Atlantic and Gulf Coastal Plain: Geol. Soc. Amer., Spec. Paper 2, pp. 50-51; pl. 11, figs. 32, 33, 1935.

⁸⁵Rathbun, M. J., *op. cit.*, pp. 44-45; pl. 11, fig. 9.

⁸⁶Bell, Thomas, A monograph of the fossil malacostracous Crustacea of Great Britain, pt. 2, Crustacea of the Gault and Greensand: Palaeontograph. Soc., vol. 14, pp. 21-22; pl. 4, figs. 9-11, 1863.

⁸⁷Rathbun, M. J., *op. cit.*, pp. 45-46; pl. 11, figs. 20-22.

⁸⁸Rathbun, M. J., *op. cit.*, p. 45; pl. 11, figs. 23-25.

Whereas in the genus *Cenomanocarcinus* the carapace ridges on the carapace are distinctive, the transitional species have the ridges entirely or partially dismembered into rows of separate tubercles. In *Necrocarcinus texensis* Rathbun the carapace ridges are intact on the metabranchial and gastric regions; but the median ridge is not developed on the cardiac region, where a large solitary round tubercle replaces the ridge. In *Necrocarcinus graysonensis* Rathbun there are no ridges, but the tubercles are arranged in rows and these rows coincide in position with the ridges of *Cenomanocarcinus*. In typical *Necrocarcinus*, that is, in the genotype species *N. labeschii* (Deslongchamps), the tubercles are also arranged in obscure rows and these rows coincide in position with the ridges of *Cenomanocarcinus*, but the number of tubercles is reduced making the arrangement in rows rather obscure.

Among the species of *Cenomanocarcinus*, *Cen. armatus* (Rathbun) is somewhat doubtful, because it is based merely on a part of the abdomen. It was described by Rathbun as *Raninella*(?), but the abdomen is almost exactly like the one of *Cen. vanstraeleni* Stenzel, except that it is much smaller and that the median spines are much larger in proportion. Therefore, it seems probable that this abdomen represents a *Cenomanocarcinus* or possibly a genus very nearly related to *Cenomanocarcinus*, such as *Necrocarcinus*. On the other hand, the stratigraphic position of *Cen. armatus* (Rathbun) precludes the possibility that it be the abdomen of a young *Cen. vanstraeleni* Stenzel.

Differences between the other three species of *Cenomanocarcinus* are summarized below.

SPECIES	NUMBER OF TUBERCLES ON RIDGES				
	PROTO-GASTRIC	HEPATIC	EPI-BRANCHIAL	MESO-META-BRANCHIAL	CARDIAC-INTESTINAL
<i>Cen. inflatus</i> (A. Milne-Edwards)	2	2	2	8	3
<i>Cen. oklahomensis</i> (Rathbun)	2	2	2	8	3
<i>Cen. vanstraeleni</i> Stenzel	2	3	4	10	6

Cenomanocarcinus vanstraeleni Stenzel is the most spinous and most tuberculate of the three species. It is named in honor of Dr. Victor Van Straelen, director of the Musée royal d'Histoire naturelle de Belgique.

Type data.—Nine syntypes, Bureau of Economic Geology, The University of Texas, Austin, Texas.³⁹

Type locality.—Same as *Linuparus grimmeri* Stenzel.

Geologic horizon.—Same as *Linuparus grimmeri* Stenzel.

Subtribe DROMIACEA de Haan

Superfamily DROMIDEA Alcock

Family PROSOPONIDAE von Meyer

Genus RATHBUNOPON Stenzel, new gen.

Genotype.—*Rathbunopon polyakron* Stenzel, n.sp.

This genus contains so far only two species; one is the genotype species, the other is *Rathbunopon oblitum* (Carter)⁴⁰ from the Cambridge greensand (upper Albian) of England. Carter had placed the species under the genus *Mithracia* Bell;⁴¹ however, Glaessner recognized that it did not belong there, but should be placed in a new genus. This was indicated by Glaessner⁴² in listing the species under "Nov. gen." As Glaessner did not propose a name for this new genus it is necessary to name it now. The name proposed is in honor of the late M. J. Rathbun, the outstanding carcinologist. The genus is based on the Texas species rather than the English one, because the former is better known to the writer.

Generic definition of Rathbunopon.—Carapace ovoid in outline, slightly longer than wide; fronto-orbital width about 3/4 of width. Frontal rostrum short, barely projecting, triangular and with a

median groove. Orbits well defined, about twice as wide as high, with two notches on the upper margin and a projecting dentiform tubercle on the lower margin. Lateral margins of carapace poorly defined. Cervical and other grooves deep. Urogastric and metagastric regions well separated and of the shape of transverse bars. Mesobranchial region bilobed toward the cardiac grooves. Metabranchial regions large, confluent or nearly confluent at midline.

The geological range of the genus is upper Albian and lower Cenomanian.

For convenience of comparison, the original description of *Rathbunopon oblitum* (Carter) is repeated below.

RATHBUNOPON POLYAKRON Stenzel, n.sp.

Pl. 41, figs. 18-21; text fig. 16

Description.—Carapace small, ovoid in outline, slightly longer than wide; greatest width of carapace across the middle of the posterior half of the carapace, lateral extremity ill defined. Carapace gently and uniformly convex in transverse direction, slightly more convex from front to back. Rostrum triangular in outline, convex so that the very tip points straight down; with a broad, obtusely V-shaped, pronounced median groove, which continues from the tip to the posterior and merges into the 2 grooves enclosing the mesogastric region. Orbits large, deeply emarginate, about twice as wide as high; their margins occupied by 4 dentiform tubercles, which are separated by grooves or deep notches; in going around the orbital margin there is an obtuse dent at the inner end of the upper margin, a deep groove follows, then a low, dentiform tubercle in the middle of the upper margin, a deep and narrow notch, a high, curved dent at the outer end of the orbit, another deep and narrow notch, then a flat, triangular dent in the middle of the lower margin, and last a deep and wide notch which is the orbital hiatus. The fronto-orbital width is large. Antero-lateral margin receding and nearly straight except for the interruptions of bosses and grooves. Notch separating orbital from hepatic portion of antero-lateral margin pronounced and narrow; notch separating

³⁹Assistance in the preparation of these materials was furnished by the Work Projects Administration Official Project No. 665-66-3-233.

⁴⁰Carter, James, A contribution to the paleontology of the decapod Crustacea of England: Geol. Soc. London Quart. Jour., vol. 54, pp. 31-32; pl. 2, fig. 4, 1898.

⁴¹Bell, Thomas, A monograph of the fossil malacostracous Crustacea of Great Britain, pt. 1, Crustacea of the London clay: Palaeontograph. Soc., vol. 10, p. 9, 1858. Genotype by monotypy, *Mithracia libinoides* Bell, from the Eocene of England.

⁴²Glaessner, M. F., Crustacea decapoda: Fossilium Catalogus, I, pt. 41, p. 427, 1929.

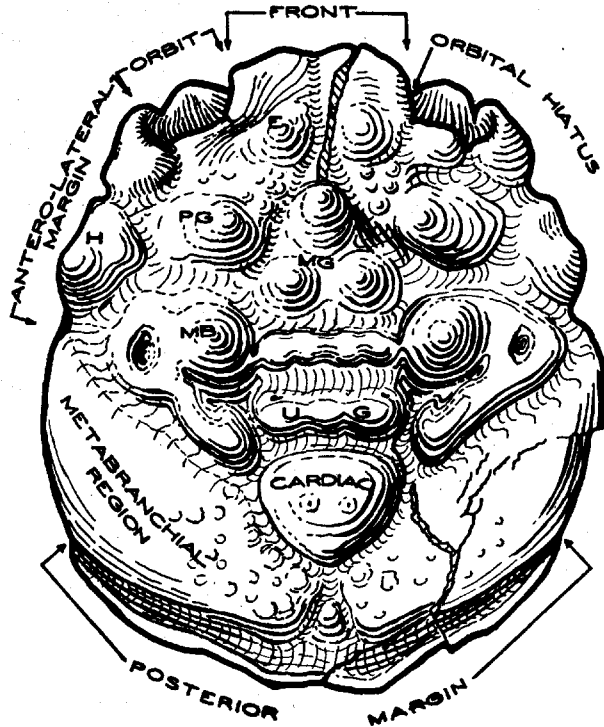


Fig. 16. *Rathbunopon polyakron* Stenzel, x6; monotype; carapace. E, epigastric; H, hepatic; MB, mesobranchial; MG, mesogastric; PG, protogastric; UG, urogastric areolation.

hepatic from metabranchial portion pronounced and wide. Hepatic portion of margin with a conical boss pointing up and out. Lateral margin of the metabranchial region narrowly rounded at its most anterior point, but rapidly and completely losing definition in posterior direction. Posterior margin raised for a width of about one-half millimeter, and separated from the remainder of the dorsal surface by a well-defined groove, which is wide in the middle but narrow toward both sides.

Dorsal surface of carapace with many bosses in its anterior half. Subdivisions of the regions very well defined by grooves. Mesogastric subdivision with 3 conical bosses in an equilateral triangle, the median and anterior one of the 3 bosses being the highest and sharpest. Each epigastric subdivision with a conical boss placed far forward between the orbits; each protogastric subdivision with a wide boss in line with the anterior

mesogastric cone; between these two bosses, the epigastric and protogastric, is a slightly swollen, granulated area; the protogastric boss has a steep inner slope and a gentler, humpy outer slope. Metagastric region is a narrow, round-topped, slightly humpy, transverse ridge connecting by a narrower extension with the large mesobranchial bosses to both sides. Urogastric region is also a narrow, round-topped, slightly humpy, transverse ridge, but it is slightly narrower in its middle than at the ends, its ends descend abruptly into a deep and narrow groove, and it has on its anterior slope two widely spaced pits, each near the end of the ridge. Cardiac region is a transverse triangle with curved sides; its top is gently curved, the sides descend steeply into the enclosing grooves; there are two tiny pits a little more than a millimeter apart in a transverse row on its top. Hepatic region very small, without boss except the one at the antero-lateral margin. Mesobranchial region

occupied by a high, hemispherical boss, which connects by a narrow ridge extension with the metagastric ridge; in lateral direction and outward from this boss lies a walled depression; a ridge extends from the wall of the depression in posterior and inward direction and ends abruptly toward a deep groove, which separates it from the lateral corner of the cardiac region. Metabranial region flat-topped and steeply descending to the grooves which limit it; its surface is slightly granulate in the corner nearest the cardiac and intestinal regions. Intestinal region very small, triangular, separated by a deep groove from the cardiac and by shallow grooves from the metabranial regions; it carries a very small conical tubercle near its anterior end.

The grooves of the carapace are numerous, deep and U-shaped in cross section.

Dimensions.—Length, 13.8 mm.; width, 12.1 mm.; fronto-orbital width, 7.8 mm.

Remarks.—Comparison between the two species of this genus is based in part on the description given by Carter, which is not clear in some points. It is impossible to compare the orbits in detail, because Carter neglected to describe them in *Rathbunopon oblitum* (Carter). The anterior half of the carapace is much more sculptured in *R. polyakron* Stenzel than in *R. oblitum* (Carter), particularly the mesobranial region. This region seems to be devoid of tubercles or depressions in *R. oblitum* (Carter), but has a high, hemispherical boss and a round depression in *R. polyakron* Stenzel. There is considerable difference in the shape of the hepatic region. The tubercles on the protogastric region are different or differently placed in the two species. The shape of the cardiac region is pentagonal in *R. oblitum* (Carter) and triangular in *R. polyakron* Stenzel. A small, triangular intestinal region such as is indicated in *R. polyakron* Stenzel is absent in *R. oblitum* (Carter), in which the two metabranial regions are joined in the center.

The specific name is derived from the Greek πολυς, "many," and ακρον, "height," and refers to the numerous elevations on the carapace.

Type data.—Monotype, Bureau of Economic Geology, The University of Texas, Austin, Texas.

Type locality.—Bluff on west or right bank of Shoal Creek about 900 feet south of West 34th Street bridge and northwest of the fault in northwestern Austin, Travis County, Texas.

Geologic horizon.—Grayson marl, Washita group, Comanche series, Cretaceous (lower Cenomanian). *Exogyra arietina* Roemer is a common fossil at this horizon. The matrix on which the carapace rests contains two upper valves of this oyster.

RATHBUNOPON OBLITUM (Carter)

Pl. 41, fig. 17

Mithracia oblita Carter, James, A contribution to the palaeontology of the decapod Crustacea of England: Geol. Soc. London Quart. Jour., vol. 54, pp. 31-32; pl. 2, fig. 4, 1898.

Original description.—Carapace broadly ovoid in outline, rather longer than wide, highly vaulted transversely, strongly deflexed in front. Rostrum small, entire. Orbito-frontal border equal to two-thirds the length of the carapace. Posterior border slightly wider than the orbito-frontal. A sharp cervical sulcus indents the antero-lateral border, crosses the carapace, and marks off the cephalic region, which occupies scarcely the anterior third of the dorsal area, and is rendered nodular by the prominent gastric lobes. The two nodules near the base of the rostrum represent the epigastric lobes; a small tubercle intervenes between the epigastric and the orbit; three nodules occur upon the mesogastric, and one on each metagastric;⁴⁸ the hepatic lobe is very small; the urogastric is unusually large; cardiac lobe pentagonal, and slightly elevated. A deep sulcus extends from the angles of the cardiac lobe and runs parallel with the cervical sulcus. Epibranchial lobe piri-form; inner half of the mesobranial bilobed; metabranials large and confluent posteriorly. The whole of the dorsal surface of the carapace bears traces of depressed tubercles of moderate size. Orbits small, round, four diameters apart. Abdomen of the female seven-jointed (?); each segment trilobed, and the penultimate the largest; telson rather small. Limbs and other appendages undetermined. Length of carapace=16 mm. Width (metabranial)=15 mm.

Original remarks.—This species has a general resemblance to *M. libinioides* of the London Clay, of which it is probably an ancestral form. It is

⁴⁸Carter presumably means the protogastric region in this instance [Stenzel].

of smaller size, and may be further distinguished from that species by the more delicate granulation of the surface, and by the nodulated cephalic area; the hepatic and branchial lobes are less inflated, and the anterior branchial lobes relatively larger, consequently the space between the

cervical and transverse branchial sulci is greater than in *M. libinioides*. The granulation of the dorsal surface being much less distinctly marked than in *M. libinioides* renders the carapace comparatively smooth.

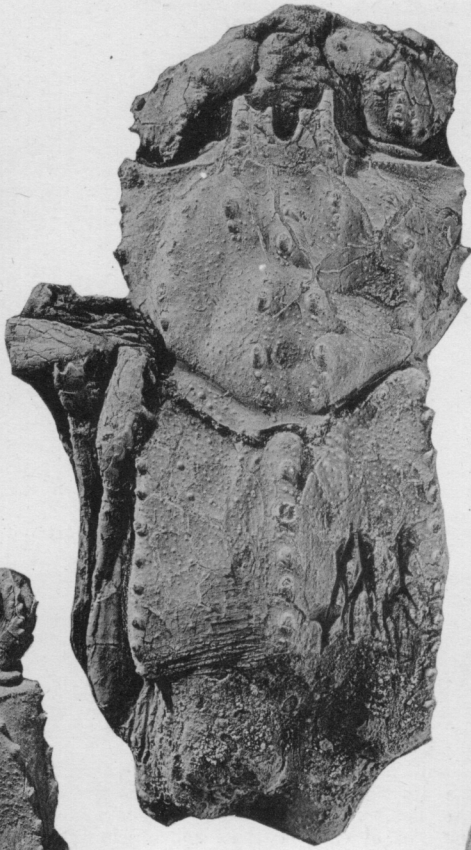
Distribution.—Cambridge Greensand.

PLATE 34

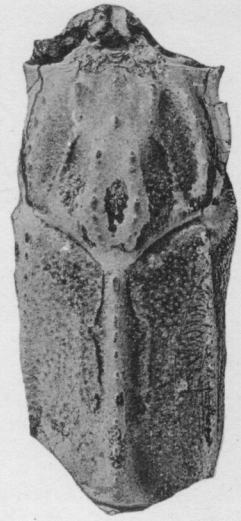
- | | PAGE |
|--|------|
| <i>Linuparus grimmeri</i> Stenzel, n.sp., x2 | 406 |
| <p>1, 2. Dorsal view of carapace, syntype 2. Figure 2 shows traces of the natural coloration. Figure 1 was photographed after coating with white ammonium chloride sublimate.</p> <p>3, 4. Dorsal and ventral views of portion of carapace anterior to postcervical grooves with the first antennar segment attached, syntype 3.</p> <p>From California Crossing, north-facing bluff on right bank of Elm Fork of Trinity River upstream from and at Chicago, Rock Island & Pacific Railroad bridge, in southwest corner of Joshua McCants survey, on O'Connor dairy land, about 10 miles northwest of Dallas, Dallas County, Texas; Britton formation of Eagle Ford group, Gulf series, Cretaceous (lower Turonian or Salmurian).</p> | |
| <i>Linuparus watkinsi</i> Stenzel, n.sp., x2 | 408 |
| <p>5. Dorsal view of carapace with first antennar segment and some legs, syntype 3.</p> <p>6. Dorsal view of complete abdomen, syntype 4. This is the same specimen as Plate 45, figure 2; the abdomen was unrolled for this figure by taking separate photographic exposures of each segment and assembling the photographs in sequence.</p> <p>7, 8. Ventral and dorsal views of carapace, syntype 2. Note the prominent jaws in figure 7; sternum and parts of 5 pairs of ambulatory legs are also visible.</p> <p>From California Crossing, north-facing bluff on right bank of Elm Fork of Trinity River upstream from and at Chicago, Rock Island & Pacific Railroad bridge, in southwest corner of Joshua McCants survey, on O'Connor dairy land, about 10 miles northwest of Dallas, Dallas County, Texas; Britton formation of Eagle Ford group, Gulf series, Cretaceous (lower Turonian or Salmurian).</p> | |



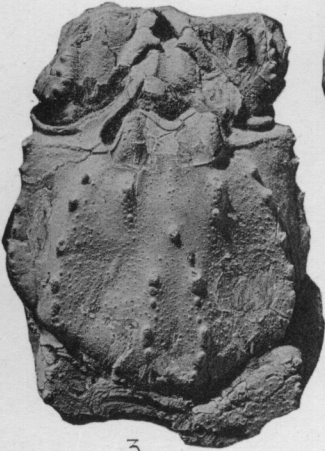
1



5



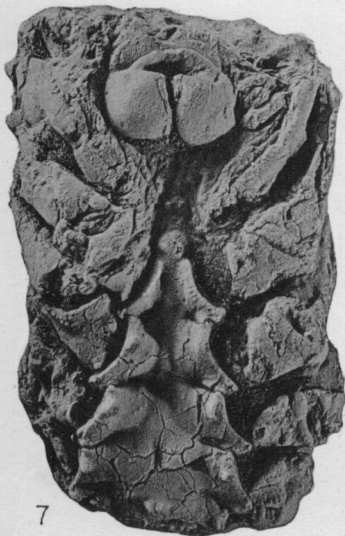
2



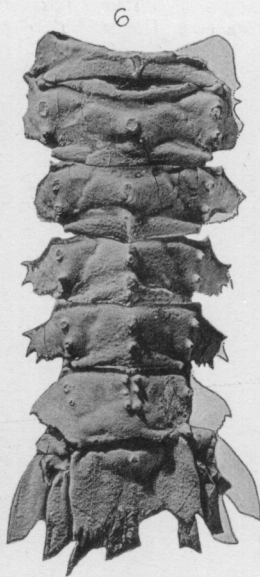
3



4



7



6



8

PLATE 35

	PAGE
<i>Linuparus grimmeri</i> Stenzel, n.sp.	406
1. Oblique dorsal view of nearly complete specimen lying on the matrix of a long calcareous concretion, syntype 1, $\times 1\frac{1}{2}$.	
5, 6. Ventral and dorsal views of carapace and attached abdomen, syntype 4, $\times 2$. From California Crossing, north-facing bluff on right bank of Elm Fork of Trinity River upstream from and at Chicago, Rock Island & Pacific Railroad bridge, in southwest corner of Joshua McCants survey, on O'Connor dairy land, about 10 miles northwest of Dallas, Dallas County, Texas; Britton formation of Eagle Ford group, Gulf series, Cretaceous (Lower Turonian or Salmurian). Syntype of figure 1 collected by Mr. R. A. Grimmer.	
<i>Astacodes maxwelli</i> Stenzel, n.sp., $\times \frac{3}{4}$	410
2. Oblique dorsal view of specimen with eyes, some legs, and extended abdomen, syntype 4.	
3, 4. Dorsal and lateral views of specimen with traces of antennae and partly rolled-in abdomen, syntype 1. From quarries on east side of State highway No. 188 (Roxton-High road) extending from the vicinity of Arkansas Church, 2.1 miles, to 1.1 miles north of the railway depot at Roxton, southwestern Lamar County, Texas; Roxton limestone, top part of Gober chalk tongue of Austin chalk, Gulf series, Cretaceous (Santonian).	