

FAUNA OF THE GLEN ROSE

Approved:

F. L. Whitney

E. H. Sellards

M. Morand

Approved:

Henry W. Harper

Dean of the Graduate School
August 23, 1929.

FAUNA OF THE GLEN ROSE

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas in Partial Fulfill-
ment of the Requirements

For the Degree of

MASTER OF ARTS

By

Minette Lillian Ries, B.A.
(Houston, Texas)

Austin, Texas
August, 1929

PREFACE

The species described in this thesis constitute only a small part of the fauna of the Glen Rose formation. Until recently, no intensive paleontological work had been done on the formation, but at present Dr. F. L. Whitney of the University of Texas is preparing an exhaustive study of the stratigraphy and paleontology of the Glen Rose. For this reason only a few of the more diagnostic species have been discussed in this paper. The material, collected mainly from Travis, Hays, Blanco, Comal, Kendall, and Bandera counties, was furnished by Dr. Whitney and type specimens of new species described are in his collection.

The writer wishes to express her sincere appreciation to Dr. Whitney for the use of this material as well as for his helpful criticism and suggestions. He also kindly donated the use of his library and did the photographic work. Mrs. Helen Jeanne Plummer very generously offered her advice and assistance in many ways in the preparation of this paper. Acknowledgements are also due to Mr. W. S. Adkins for the use of several references and to Mr. H. G. Damon for his constant help and encouragement.

CONTENTS

	Page
Preface	
Descriptions of Species	1
Family Parallelodontidae	1
Genus Cucullaea	1
brilli	1
comanchensis	2
gracilis	3
gratiota	4
simondsi	6
terminalis	7
Family Pectinidae	9
Genus Pecten	9
guadalupensis	9
stantoni	10
sp.	11
Genus Neithea	12
irregularis	12
Family Limidae	14
Genus Lima	14
blancoensis	14
comalensis	16
Family Pleurophoridae	17
Genus Arctica	17
banderaensis	17
comalensis	19
guadalupensis	20
medialis	21
navicularia	23
plummerae	24
pseudo-texana	26
roemeri	27
texana	23
whitneyi	29
Bibliography	31
Plates .	

DESCRIPTIONS OF SPECIES

Mollusca

Pelecypoda

Parallelodontidae

Genus Cucullaea Lamarck

Cucullaea brilli n. sp.

Plate I, Figures 1, 2.

Description--Shell medium, elongated posteriorly, ventricose, anterior margin gently rounded, about two-thirds the height of the valve; posterior margin straight, longer than anterior margin; ventral margin direct, truncate; beaks heavy, incurved, about two-thirds the length of the shell from the anterior margin; anterior umbonal slope arcuate; posterior umbonal slope elliptically convex; interior plate impression distinct, extending from umbones to midway on the posterior margin. The shell is covered with moderately coarse growth lines that are especially outstanding on the ventral margin. Fine ribs extending from the beaks to the upper part of the anterior margin make that portion of the shell reticulate. These ribs are elsewhere lacking.

Dimensions--Length 115 mm., height 96 mm., thickness 74 mm.,

Affinities--Cucullaea brilli very closely resembles Cucullaea gratiota, but differs from it in being more ventricose and cordate and in having a proportionately shorter hinge line. The margins of C. gratiota are blade-like, those of C. brilli are all slightly truncate and relatively longer.

Cucullaea comanchensis Hill

Plate II Figures 2a, b.

Cucullaea comanchensis Hill 1893.

Wash. Biol. Soc. Proc., vol. 3, p. 25, pl. 3, figs. 1, 2.

Description--Cast medium to large, cordate, ventricose, subquadrate; anterior margin thin, rounded, a little more than half the height of the cast; posterior margin slightly thicker and shorter than the anterior margin, arched; ventral margin thin, bow shaped; beaks pointed, distant, slightly inwardly curved, situated about two-fifths the length of the valve from the anterior margin; anterior umbonal slope truncate near beaks, regularly concave near anterior margin; posterior umbonal slope gently inwardly curved; interior plate impressions distinct, extending from near the end of the umbones to about one-third the length of the posterior margin from the basal margin; muscle scars indistinct; pallial line simple, obscure. Since none of the shell of this species has been preserved, nothing is known of the ornamentation.

Dimensions--Length 120 mm., height 100 mm., thickness 90 mm.

Affinities--Of the species of Cucullaea in the Glen Rose, C. comanchensis more closely resembles C. gratiota. These species can, however, be readily differentiated by the thicker, less excavated, and more anterior beaks, less sharply rounded ventral margin, and longer posterior margin of the latter species. Because of its arched ventral margin and nearly centrally located beaks, C. comanchensis is entirely different from any species of Cucullaea figured.

Occurrence--Cucullaea comanchensis is scarce in the formation but has been found at localities 60' and 200' above the base.

Number of specimens--3.

Cucullaea gracilis Cragin

Plate II Figures 1a, b.

Cucullaea gracilis Cragin 1893.

Tex. Geol. Sur., 4th Ann. Rept., p. 173, no pl.

Description--Cast small to medium, elongate, compressed; anterior margin thin, arcuate, about two-thirds the height of the valve; posterior margin sharp, sloping until near the basal margin where it becomes arched, length same as anterior margin; ventral margin blade-like, straight; beaks compressed, narrow, slightly incurved, located one-quarter of the length of the cast from the anterior margin; anterior umbonal slope convex near umbones and then gently rounded; posterior umbonal slope truncate near beaks, sloping; interior plate impression heavy near posterior margin, more distinct than that of Cucullaea simondsi; muscle scars prominent; pallial line entire. The species is known from the cast only.

Dimensions--Length 93 mm., height 64 mm., thickness 54 mm.; length 60 mm., height 43 mm., thickness 29 mm.

Affinities--Cucullaea gracilis is similar to Cucullaea simondsi, but is distinguished from that species by being more compressed and by having approximate, smaller, and less anteriorly

pointed beaks. Both species are decidedly elongate.

It differs from C. terminalis by being less ventricose, more elongate, and by having thinner beaks.

Occurrence--Cucullaea gracilis is common in the Glen Rose and has been collected from localities 50' to 60' above the base and in the Salenia texana horizon of that formation.

Number of specimens--3, including Cragin's type.

Cucullaea gratiota Hill

Plate II Figures 3a, b.

Arca gratiota Hill 1833.

Ark. Geol. Sur. Rept., vol. 2, p. 133, pl. 14, figs. 2, 2a.

Cucullaea gratiota Hill 1893.

Wash. Biol. Soc. Proc., vol. 3, p. 25.

Cucullaea gratiota (Hill) Cragin 1893 (erroneously spelled gratioti)

Tex. Geol. Surv., 4th Ann. Rept., p. 173, no pl.

Description--Cast small to medium, subquadrangular, ventricose; anterior margin blade-like, regularly rounded, about one-half the height of the valve; posterior margin truncate, thin in larger specimens, slightly longer than anterior margin; ventral margin thin, arcuate; beaks heavy, inwardly curved, about one-third the length of the cast from the anterior margin; anterior umbonal slope inflected, slightly concave near anterior margin; posterior umbonal slope gently curved; internal plate impression deep, extending to the middle of the posterior margin; muscle scars faint; pallial line simple. A portion of the shell preserved on one of the specimens is heavy

and covered with irregular, concentric lines of growth.

Dimensions--Length 84 mm., height 71 mm., thickness 53 mm.; length 39 mm., height 33 mm., thickness 23 mm.

Affinities--Cucullaea gratiota is very similar to Cucullaea brilli, but differs in having thin and more arcuate margins. This is especially true of the posterior margin, for in the gratiota form it is flared, while in the new species it is straight.

C. gratiota resembles C. inermis Gabb, of the California Cretaceous, but these species differ in the proportionately greater length, straighter margins, and more approximate beaks of the California species.

This cast also has close affinity to Arca tumida D'Orbigny, of the Senonian, but can be readily distinguished from it by the pointed, approximate beaks and longer posterior margin of the latter species. The cast of that species also has prominent longitudinal ribs.

Cucullaea gratiota bears a slight resemblance to C. terminalis, but can be differentiated from that form by its more sub-quadrangular shape. C. terminalis has its greatest thickness in a direct line from the beaks to the posterior edge of the basal margin while the thickness in C. gratiota is practically uniform. The umbones of C. gratiota are inwardly curved, whereas those of C. terminalis are directed anteriorly.

Occurrence--Cucullaea gratiota has been found from 40' to 225' above the base of the Glen Rose and in the Salenia texana horizon.

Number of specimens--8.

Cucullaea simondsi n. sp.

Plate III Figures 1, 2.

Description--Cast large, ventricose, length exceeding height, greatest thickness from beaks to posterior edge of basal margin; anterior margin arched, about half the height of the cast; posterior margin flared, arcuate, slightly shorter than anterior margin; ventral margin thin, straight; beaks gaping, thin, incurved, less than one-fourth the length of the valve from the anterior margin; anterior umbonal slope truncate, convex near beaks; posterior umbonal slope gently curved, convex near umbones; interior plate impression prominent near posterior margin; muscle scars more prominent than in any of the other Glen Rose species of Cucullaea; pallial line distinct. None of these specimens have their shell preserved, but it was probably heavy and decorated with concentric lines of growth. The cast itself is ornamented with irregular ribs that are especially prominent near the pallial line.

Dimensions--Length 114 mm., height 34 mm., thickness 55 mm.

Affinities--Cucullaea simondsi resembles C. gracilis, but is easily differentiated from that species by being more ventricose and by having more excavated and distant beaks. The ventral margin of Cucullaea gracilis is more rounded and the beaks are less anteriorly situated.

This species is also similar to C. terminalis in that the

greatest thickness in both species is along the posterior umbonal slope. The species are, however, different in the proportionately greater length and posterior elongation of Cucullaea simondsi. The muscle scars in C. simondsi are more prominent than those in C. terminalis and, whereas the interior plate impression in the latter species is very heavy throughout its entire length, it is distinct near the posterior margin only in Cucullaea simondsi.

Arca diceras Seguenze, of the Cenomanian of Italy, is the closest affinity to Cucullaea simondsi. These species are alike as to shape and size, but differ in that the latter species is proportionately higher and that the beaks are stronger and less anteriorly located. The muscle scars of both species are exceptionally prominent.

Occurrence--This form has not been found very frequently in the formation but has been collected 265' above the base and in the Salenia texana horizon.

Number of specimens--5.

Cucullaea terminalis Conrad

Plate IV Figures 1,2.

Cucullaea terminalis Conrad 1857.

Rep. U. S. and Mex. Bound Surv., vol. 1, pt. 2, p. 148,
pl. 4, figs. 2, 2a.
Wash., T. A. Conrad.

Cucullaea terminalis (Conrad) Cragin 1893.

Tex. Geol. Surv., 4th Ann. Rept., p. 174, no pl.

Cucullaea terminalis (Conrad) Hill 1893.

Wash. Biol. Soc. Proc., vol. 3, p. 26, no pl.

Description--Cast small to medium, triangular, posteriorly elongated, ventricose, greatest thickness from beaks to posterior edge of basal margin; anterior margin arched, about three-fifths the height of the valve; posterior margin curved, slightly shorter than anterior margin; ventral margin thin, straight; beaks heavy, incurved, situated about one-fourth the length of the cast from the anterior margin; anterior umbonal slope convex near beaks, sloping inwardly to protruding margin; posterior umbonal slope regularly rounded; interior plate impression heavy, extending to middle of the posterior margin; muscle scars prominent in larger specimens; pallial line distinct. Cucullaea terminalis is known only from the cast, but the shell was probably ornamented with coarse, irregular lines of growth. The cast has long, longitudinal ribs similar to those on Cucullaea simondsi.

Dimensions--Length 107 mm., height 93 mm., thickness 79 mm.; length 61 mm., height 49 mm., thickness 40 mm.

Affinities--Because of its triangular shape, C. terminalis is decidedly different from any of the Glen Rose forms. It bears, however, a slight resemblance to Arca (Trigonarca) thevestensis Coquand, of the lower Turonian, in general outline. The species differ in the greater posterior elongation, more direct basal margin, and proportionately shorter posterior border of C. terminalis.

Occurrence--Cucullaea terminalis is one of the most abundant species of the Glen Rose and is especially common in the

Salenia texana horizon.

Number of specimens--14.

Pectinidae

Genus Pecten Mueller

Pecten guadalupensis n. sp.

Plate V Figure 1.

Description--Shell medium to large, apical angle 105 degrees; ventral margin semicircular, scalloped; ears large, marked with numerous fine lines; hinge line long, straight.

The right valve of the species is not known.

Left valve slightly convex; beaks pointed, slightly incurved. The valve is ornamented with from 14 to 16 equal, very strong, radiating ribs. These are rounded and decidedly elevated. The intercostal spaces are wide and concave. Comparatively fine, numerous concentric lines cover the shell.

Dimensions--Length 95 mm., height 92 mm.; length 70 mm., height 67 mm. Since both valves have not been found, the thickness of the species can not be given.

Affinities--The writer has found no species similar to this, but its simple sculpturing reminds one of some Miocene Pectens.

Occurrence--Pecten guadalupensis is common in the lower Glen Rose, but it has also been found 115' above the base.

Number of specimens--13.

Pecten stantoni Hill

Plate VI Figure 2.

Pecten stantoni Hill 1893.

Wash. Biol. Soc. Proc., vol. 6, p. 24, pl. 2, figs. 3, 3a.

Description--Shell small to medium, apical angle of 79 degrees and 30 minutes, thin; ventral margin arched, undulating, blade-like; ears rugose, prominent; hinge line straight.

Right valve slightly elevated; beaks small, pointed, gently incurved. The ornamentation is rather complex and consists of 20 prominent bifurcated ribs, each with a depression throughout its entire length and bordered on either side by minute secondary ribs. Alternating with these are narrower, slightly rounded ribs that make an angle of 6 degrees. All of these ribs are fairly flat and slightly elevated. The split ribs are especially noticeable on the cast. The furrows are shallow and gently rounded. Fine, minute, concentric lines of growth cover the valve and ears.

Left valve flattened. The shell of this valve was not entirely preserved on any of the specimens, but from a few of the fragments, the ornamentation appears to consist of alternating bifurcating and single ribs, which are crenulated toward the margin. The lines of growth are similar to those on the right valve.

Dimensions--Length 43 mm., height 45 mm., thickness 5 mm.; length 64 mm., height 69 mm.

Affinities--Pecten stantoni resembles Pecten bonnellensis Kniker, of the Georgetown limestone, in general shape and size,

but differs from it in having bifurcating ribs. Both species are marked with the smaller costae alternating with the larger, more prominent ones. In Pecten bonnellensis, these are irregularly distributed. The fine, minute ribs are lacking on the Georgetown species. The depressions on the latter species are also deeper.

Pecten stantoni is also similar in shape to Pecten chihuahuensis Boese, of the Cenomanian, but is differentiated from it in that the primary ribs in the latter species bifurcate several times more before reaching the basal margin.

Occurrence--Pecten stantoni is common throughout the lower part of the Glen Rose up to 330' above the base.

Number of specimens--20.

Pecten sp.

A small, smooth species of Pecten also occurs in the Glen Rose, but because of insufficient material, it will not be described. Only one poorly preserved valve of this species was found. This has very pointed beaks, semicircular ventral margin, and is covered with minute, concentric lines that become prominent toward the basal margin.

This valve showed similarity to the left valve of Pecten operculiformis Gabb, of the California Cretaceous, but the ears of P. operculiformis extend dorsally from the beaks whereas the imperfect ones on the specimen from the Glen Rose show a tendency to extend more antero-posteriorly.

Another close affinity to this valve is Pecten obovatus Stoliczka, of the Ootatoon group of southern India. The latter species is, however, proportionately higher and the ventral margin is not quite so perfectly semicircular in outline as that of the Glen Rose species.

The only locality at which this species has been found is 120' above the base of the Glen Rose.

Genus Neithea Drouet

Neithea irregularis (Boese)

Plate VI Figures 1a, b.

Vola irregularis Boese 1910.

Inst. Geol. de Mexico. bol. 25, p. 27, lam. 15, figs. 10-13.

Neithea irregularis (Boese) Kniker 1918.

Univ. of Texas Bull. 1917, p. 13, pl. 2, figs. 1-6.

Pecten irregularis (Boese) Adkins and Winton 1919.

Univ. of Texas Bull. 1945, p. 67, pl. II, figs. 11-15.

Description--Shell small to medium, subtrigonal, height exceeding length; ventral margin polygonal, arched; ears prominent; hinge line straight, little more than one-third the length of the shell.

Right valve rounded, with greatest convexity immediately behind the beaks, extending to about half the height of the shell and then sloping to the basal margin; beaks pointed, incurved, protruding about 3 millimeters below the hinge line. The valve is ornamented with 6 primary ribs that extend slightly beyond the ventral margin. These are narrow, rounded, and higher than the others. Between them are narrower, secondary

ribs which are also rounded, but the depressions separating them are not so deep as those on either side of the primaries. Small, tertiary ribs adjoin many of the primaries. These are irregular in their occurrence and are most obvious at the base of the snell. Coarse, concentric lines of growth cover the valve.

The slightly concave left valve is decorated with 16 or 17 prominent ribs that correspond to the depressions of the opposite valve. Five of these ribs are simple and separated by split ribs which correspond to the furrows between the primary and tertiary ribs on the right valve. Since these tertiary ribs and their depressions occur irregularly on the right valve, their corresponding ribs and furrows on the left valve are also irregularly distributed. The intercostal spaces are rounded and between the split ribs are especially deep. This valve is also decorated with coarse, concentric lines of growth.

Dimensions--Length 35 mm., height 40 mm., thickness 12 mm., length 29 mm., height 31 mm., thickness 9 mm., length 16 mm., height 20 mm., thickness 5 mm.

Affinities--As indicated by Miss Kniker,¹ Neithea irregularis is closely related to N. subalpina (Boese), of the Del Rio and the Buda, as to size and general shape. It differs from that species in being proportionately higher and shorter

¹ Univ. of Texas Bull. No. 1317, 1913, p. 19.

for the average height of *N. subalpina* is 29 mm.² and the length 27 mm. The characteristic tertiary ribs of *N. irregularis* are never found in *N. subalpina*, also, the primary and secondary ribs of the former species are more triangular. Since *N. subalpina* does not have the tertiary ribs on the right valve, the paired ribs on the left valve are also lacking.

Occurrence--*N. irregularis* is very abundant and has been collected from 50' to 267' above the base. It is common in the *Salenia texana* horizon.

Number of specimens--38.

Limidae

Genus *Lima* Bruguiere

Lima blancoensis n. sp.

Plate VI Figures 3.

Description--Shell small to medium, oblique, compressed; anterior margin straight, truncate; posterior margin direct, inclined toward basal margin, slightly extending beyond beaks, gently curved from greatest protuberance in back of beaks to umbones; ventral margin arched; beaks thin pointed, moderately incurved. The ornamentation of both valves consists of about 20 radiating ribs. On top these are narrow, sharply keeled, and then widen toward the intercostal spaces. The majority

² Ibid., p. 23.

of these ribs are about one and one-half millimeters apart, but a few are slightly closer. In the smaller specimens fine secondary ribs occur between the primaries, which are covered with minute striations. This decoration of the primary ribs is not very distinctly observed in the adult forms, and in the smaller forms the ribs on the posterior margin are lacking near the beaks. Concentric lines of growth are very prominent over the entire shell, but are especially noticeable on the margins.

Dimensions--Length 25 mm., height 41 mm., thickness 9 mm., length 11 mm., height 20 mm., thickness 4 mm.

Affinities--In general outline Lima blancoensis closely resembles Lima comalensis, but differs from that species in possessing wider, striated ribs with fine secondary riblets present in the younger forms. The lines of growth are also more prominent in the former species.

There is a striking similarity between Lima blancoensis and L. parallela D'Orbigny, of the Gault or Albian. The posterior margin nearest the beaks in the Glen Rose species protrudes slightly beyond the umbones while this irregularity is not present in the Albian form. The unusual ornamentation of both species is very similar for both have prominent keeled and striated ribs, and in the Albian species these are also crenulated. The small, secondary ribs are lacking in the latter form.

These secondary ribs are featured in Lima cottaldina

D'Orbigny, of the Aptian, but the narrow primary costae are neither keeled nor striated. Lima blancoensis is also proportionately higher than the foreign form.

Occurrence--This species has been collected from the Salenia texana horizon and from 110' to 210' above the base of the Glen Rose.

Number of specimens--5.

Lima comalensis n. sp.

Plate VI Figure 4.

Description--Cast small to medium, oval, compressed; anterior margin straight, truncate near beaks and then convexly inclined toward ventral margin; posterior margin gently curved toward basal margin, portion near umbones truncate; ventral margin scalloped, elliptical; beaks stout, pointed, slightly incurved; ears not preserved. The ornamentation is simple and consists of about 22 radiating, wide, rounded ribs. The intercostal spaces are shallower and curved. Numerous, fine lines of growth that become especially heavy along the margins cover the valves.

Dimensions--Length 24 mm., height 34 mm., thickness 14 mm., length 29 mm., height 40 mm., thickness 15 mm.

Affinities--This species resembles Lima cottaldina D'Orbigny, of the Aptian, but differs from it in being proportionately higher and by lacking the secondary ribs of the latter species. The primary ribs of the Aptian species are also more angular.

Lima comalensis has a very close affinity in Lima shastaensis Gabb, of the Shasta Group of California, but these species are easily distinguished by the more protruding and more anteriorly located beaks of the Glen Rose form. The ventral margin of L. shastaensis is regularly rounded, whereas that of Lima comalensis is oblique.

Lima comalensis differs from Lima blancoensis in that the latter species has its greatest thickness immediately back of the beaks, whereas the thickness of the former species is uniformly distributed. The highly diversified ornamentation of Lima blancoensis also readily distinguishes the two species.

Occurrence--This species is common in the basal Glen Rose and is found up to 179' above the base.

Number of specimens--5.

Fleurophoridae

Genus Artica Schumard

Artica banderaensis n. sp.

Plate VII Figures 1a, b.

Description--Cast very high, decidedly narrow, ventricose, greatest thickness back of beaks; anterior margin truncate, straight, but curved near ventral border, about two-thirds the height of the valve; posterior margin curved with greatest rounding near the basal border, about one-half the height of the cast; ventral margin thin, truncate, slightly inflected; beaks very thick, fairly distant, parallel to the hinge line,

pointed anteriorly, excavation making more than a semicircle with the muscle scars, located about one-quarter of the height of the valve from the anterior margin; anterior umbonal slope bow shaped; posterior umbonal slope gently curved with greatest convexity near the beaks; muscle scars prominent; pallial line indistinct. None of the specimens of the species indicates any of the shell sculpture, but in comparison with the other species of this genus, it was doubtlessly heavy and decorated with lines of growth.

Dimensions--Length 87 mm., height 105 mm., thickness 59 mm., length 79 mm., height 36 mm., thickness 48 mm.

Affinities--Arctica banderaensis has a marked similarity to Arctica whitneyi, but differs in its decidedly stout beaks and proportionately greater height. As a whole the latter species is more arcuate and lacks the extraordinary thickness adjacent to the umbones.

The beaks of the smaller specimens of Arctica banderaensis are slightly similar to those of A. comalensis but are more excavated and lack the breadth of those of the latter species. Other differences between these species are the proportionately greater height of A. banderaensis and the flared posterior margin of Arctica comalensis.

Number of specimens--4.

Arctica comalensis n. sp.

Plate VIII Figures 1a, b.

Description--Cast small, ventricose, slightly flared anteriorly; anterior margin about one-half the height of the cast, thin, arched; posterior margin regularly rounded, equal in length to the anterior border; ventral margin bow shaped; beaks fairly distant, heavy, a little incurved, situated slightly posteriorly; anterior umbonal slope inflected toward the protruding muscle scars; posterior umbonal slope faintly curved; muscle scars heavy, a trifle distant from the edge of the anterior margin; pallial line indistinct. This species is known only from the cast.

Dimensions--Length 79 mm., height 70 mm., thickness 55 mm.; length 66 mm., height 60 mm., thickness 42 mm.

Affinities--Because of the proportionately great height and rounded form, this species is entirely different from any form figured. In these respects it also differs from the smaller specimens of Arctica whitneyi. Other differences between these species are the posterior elongation of the latter species and the arched ventral margin, flaring anterior margin, and the faint pallial line of Arctica comalensis.

Occurrence--Arctica comalensis has been collected from only two localities, one 270' and the other 523' above the base of the Glen Rose.

Number of specimens--2.

Arctica guadalupensis n. sp.

Plate VII Figures 2a, b.

Description--Cast small to medium, ovate; anterior margin thin, flared, decidedly rounded, about two-thirds the height of the valve; posterior margin not quite so long as the anterior margin, slightly truncate except for portions nearest the hinge line and the ventral margin which are sharply curved; ventral margin arcuate; beaks stout, moderately incurved, slightly anteriorly located; anterior umbonal slope gently inflected; posterior umbonal slope straight, truncate; muscle scars faint in the smaller specimens, but prominent in the larger ones; pallial line obscure in the younger forms, but becoming nearly as distinct as that in Arctica texana in the more adult forms. This species is also known only from the cast.

Dimensions--Length 50 mm., height 41 mm., thickness 21 mm., length 62 mm., height 52 mm., thickness 24 mm.

Affinities--This species shows very clearly the gradation common among the species of this genus. It is very similar to and some specimens show a transition into Arctica navicularia, but these species differ in the long, straight umbonal slope and in the anteriorly excavated beaks of A. guadalupensis. The more prominent muscle scars of Arctica navicularia are another means of differentiation.

The larger forms of A. guadalupensis show a similarity to those of A. plummerae and one specimen in particular occupies an intermediate position between the two species. The species can, nevertheless, be readily separated by the posterior elongation

of Arctica plummerae. The thin beaks and the prominent muscle scars of A. plummerae are also obvious means of differentiation.

But the nearest affinity of this species is the rounded Arctica medialis. The two species differ in the proportionately greater height, truncate posterior umbonal slope, and the thin, flared anterior margin of A. guadalupensis.

Occurrence--Arctica guadalupensis is not very abundant in the Glen Rose, but has been collected from the Salenia texana horizon. It is in many places associated with Arctica plummerae.

Number of specimens--11.

Arctica medialis (Conrad)

Plate VIII Figures 3a, b.

Cardium mediale Conrad 1857.

Rep. U. S. and Mex. Bound. Survey, vol. 1, pt. 2,
p. 19, pl. 4, figs. 4a, b.
Wash., T. A. Conrad.

Cyprina mediale (Conrad) Cragin 1893.

Texas Geol. Survey; 4th Ann. Rept., p. 173, no pl.

Isocardia (?) medialis (Conrad) Hill 1893.

Wash. Biol. Soc. Proc., vol. 3, p. 31, pl. 2, figs. 4,5;
pl. 3, fig. 6.

Description--Cast ovate, small to medium; anterior margin regularly rounded; posterior margin truncate; ventral margin decidedly arched; beaks massive, obtuse, approximate, excavated anteriorly, curved inwardly, situated about one-quarter of the height of the valve from the anterior margin; anterior umbonal slope gently arcuate; posterior umbonal slope straight, slightly truncate; muscle scars relatively prominent; pallial line entire.

Since this species is known only from the cast, nothing can be said about the ornamentation, but it probably consisted of concentric lines of growth. Fischer considers this ornamentation a generic characteristic.³

Dimensions--Length 62 mm., height 53 mm., thickness 41 mm., length 76 mm., height 72 mm., thickness 44 mm.

Affinities--This species resembles the cast of Cyprina rostrata Fitton, of the Neocomain, in general outline, but it has a more sharply curved ventral margin and it lacks the posterior elongation of the latter species. Cyprina rostrata has less prominent muscle scars and more anteriorly curved beaks.

As is common with all the species of Arctica in the Glen Rose, the specimens of this one exhibit transitions into the other species. One specimen in particular resembles Arctica plummerae, but this similarity is very unusual and the two forms can easily be distinguished by the steep, anterior umbonal slope, thicker beaks, and very arcuate ventral margin of A. medialis.

A very obvious affinity of Arctica medialis is Arctica guadalupensis. These species can, however, be distinguished by the thin, sharply arched margins, approximate beaks, fairly straight umbonal slope, faint muscle scars, and small size of A. guadalupensis.

A still closer resemblance is in Arctica navicularia, but

³ Fischer: Manuel de Conchyliologie et de Paleontologie Conchyliologique, 1837, p. 1071.

the species are distinguished by the elliptical ventral margin extending slightly beyond the umbonal slope, by the closer beaks, and the proportionately less height of Arctica navicularia.

Occurrence--This abundant species is very common in the Salenia texana horizon and has also been collected from 130' to 230' above the base of the Glen Rose.

Number of specimens--10.

Arctica navicularia n. sp.

Plate VII Figures 3a, b.

Description--Cast small to medium, ventricose, length exceeding height; anterior margin arched, blade-like, slightly flared; posterior margin about half the height of the anterior margin, sharply curved; ventral margin thin, regularly rounded; beaks stout, approximate, slightly posteriorly located, curved inwardly and rather anteriorly; anterior umbonal slope gently inflected, three-fourths the height of the posterior slope; posterior umbonal slope moderately truncate, the portion nearest the beaks the more nearly rounded; muscle scars faint in the small forms, but relatively prominent in the larger specimens; pallial line distinct anteriorly. The species is known only from the cast, but it no doubt possessed a heavy shell with lines of growth.

Dimensions--Length 56 mm., height 41 mm., thickness 22 mm., length 35 mm., height 67 mm., thickness 44 mm.

Affinities--This species is very similar to the other small species of this genus in the Glen Rose and especially

to A. guadalupensis. It differs, however, from the latter species in its relatively short posterior umbonal slope and slightly posterior beaks. The beaks on Arctica guadalupensis are more excavated and the ovately rounded margins are slightly thinner.

Arctica medialis is more elongate and less ventricose than Arctica navicularia. The beaks in the former species are also more distant and the ventral margin more sharply arched.

Occurrence--Arctica navicularia is rather sparingly found in the formation, but has been collected from near the top and from 130' to 200' above the base of the Glen Rose.

Number of specimens--8.

Arctica plummerae n. sp.

Plate VIII Figures 2a, b.

Description--Cast medium, sub-trigonal; anterior margin sharply curved, flared, about half the height of the valve; posterior margin regularly rounded, thin, slightly longer than anterior margin; ventral margin gently inflected, blade-like; beaks distant, thin, pointed anteriorly, situated about one-quarter of the height of the valve from the anterior margin; anterior umbonal slope curved, slightly excavated; posterior umbonal slope slightly truncate; muscle scars relatively high, prominent; pallial line fairly distinct. As in the other species of this genus, the ornamentation was probably concentric lines of growth, but none of the specimens retain any of

the shell.

Dimensions--Length 71 mm., height 63 mm., thickness 59 mm.

Affinities--At first glance Arctica plummerae seems to resemble Cyprina ligeriensis D'Orbigny, of the Turonian, but the latter species is more elongate, having a length of 90 mm., height of 72 mm., and a thickness of 19 mm.⁴ Also, in this species the line from the beaks to the ventral margin is proportionately longer than that in Arctica plummerae. The beaks in the Turonian form are more compressed and more posteriorly located. The posterior muscle scars in this species are prominent while they are lacking in Arctica plummerae.

Arctica plummerae differs from Arctica pseudo-texana in being proportionately shorter and higher. The beaks in Arctica pseudo-texana are more distant and the anterior umbonal slope is more excavated. Some specimens of Arctica plummerae, however, show a slight gradation into A. pseudo-texana.

Arctica plummerae differs decidedly from A. texana by being smaller, more compressed, by having more approximate, anteriorly pointed beaks, and a very rounded ventral margin.

Occurrence--Arctica plummerae is one of the most abundant species in the Glen Rose and has been found in the Salenia texana horizon and from 270' to 330' above the base of the Glen Rose.

Number of specimens--22.

⁴ d'Orbigny: "Description des Mollusques et Rayonnés Fossiles Terraines Crétacés, Lamellibranches," Paléontologie Française, 1843-1847, p. 103.

Arctica pseudo-texana n. sp.

Plate IX Figures 2a, b.

Description--Cast medium, triangular, elongated posteriorly; anterior margin about one-third the height of the valve, thin, sharply rounded; posterior margin narrow, truncate opposite the beaks and then decidedly arcuate to the umbonal slope and basal margin; ventral margin thin, slightly truncate, gently inflected from the elongation of the posterior margin to the decidedly rounded anterior margin; beaks fairly distant, narrow, slightly incurved, situated about one-third the length of the cast from the anterior margin; anterior umbonal slope sharply curved; posterior umbonal slope nearly straight, slightly truncate; muscle scars prominent; pallial line very distinct. Nothing is known of the shell, but it was probably heavy and decorated with lines of growth.

Dimensions--Length 94 mm., height 35 mm., thickness 46 mm., length 56 mm., height 64 mm., thickness 34 mm.

Affinities--Arctica pseudo-texana has its nearest affinities in the species of this formation. It is very similar to Arctica plummerae and might easily be mistaken for it except for its posterior elongation. The slightly truncate posterior and ventral margins and the decidedly excavated beaks also aid in distinguishing Arctica pseudo-texana since the margins of Arctica plummerae are gently arcuate and the beaks less undercut. In the latter species the anterior border flares out a little beyond the muscle scars while in Arctica pseudo-

texana the scars are located on the edge of the margin.

The anteriorly located beaks, blade-like and more elliptical anterior and ventral margins readily differentiate this form from Arctica texana.

Occurrence--Arctica pseudo-texana is very scarce in the formation, but it has been found in the Salenia texana horizon and 330' above the base.

Number of specimens--4.

Arctica roemeri (Cragin)

Plate X Figures 1, 2.

Cyprina roemeri Cragin 1893.

Tex. Geol. Survey; 4th Ann. Rept., p. 179, pl. 33, figs. 1, 2.

Description--Cast small to fairly large, slightly ovate; anterior margin regularly rounded; posterior margin truncate opposite beaks, elsewhere curved; ventral margin slightly truncate, inflected; beaks sharply pointed anteriorly, excavated, situated about one-quarter the length of the cast from the anterior margin; anterior umbonal slope sharply rounded; posterior umbonal slope truncate, greatest convexity nearest the beaks; muscle scars prominent; pallial line entire, distinct. A small portion of the shell itself remaining on one of the casts shows that the lines of growth are regular and coarse.

Dimensions--Length 120 mm., height 131 mm., thickness 65 mm.; length 69 mm., height 74 mm., thickness 35 mm.

Affinities--A. roemeri has its closest affinity in A. medialis.

This is especially true in the smaller specimens of the former species. These species can be differentiated by the bow-shaped ventral margin, less excavated and centrally located beaks, and straight posterior umbonal slope of Arctica medialis.

The larger specimens might be mistaken for Arctica whitneyi, but the difference in the beaks readily distinguishes them. In both species the beaks are parallel to the hinge line, but in the new species they are more inwardly and anteriorly curved. The ventral margin in Arctica roemeri is also proportionately longer.

Occurrence--Arctica roemeri is very common in the formation in the Salenia texana bed and from 70' to 230' above the base of the Glen Rose.

Number of specimens--20.

Arctica texana (Conrad)

Plate IX Figures 1a, b.

Trigonia texana Conrad 1857.

Rep. U. S. and Mex. Bound. Survey; vol. 1, pt. 2,
p. 143, pl. 3, figs. 3a-c.
Wash. T. A., Conrad.

Cyprina texana (Conrad) Cragin 1893.

Tex. Geol. Survey; 4th Ann. Rept., p. 130, no pl.

Description--Cast large, trigonal, very ventricose; anterior margin short, curved; posterior margin short, regularly rounded; ventral margin thin, truncate; beaks straight, excavated anteriorly, distant, heavy; anterior umbonal slope arcuate; posterior umbonal slope straight, truncate; muscle scars prominent, protruding, parallel to the sides of the cast; pallial

line very prominent anteriorly. As in the other species of Arctica, the ornamentation was probably concentric lines of growth.

Dimensions--Length 99 mm., height 93 mm., thickness 67 mm.

Affinities--This species is similar to the smaller specimens of Arctica whitneyi in size, but is easily distinguished from them by its straight, distant beaks and by its truncate ventral margin.

Arctica texana also shows an affinity to A. pseudo-texana, but lacks the posterior elongation that is characteristic of that species. The beaks in Arctica pseudo-texana are also thinner, more approximate, and anteriorly located.

Occurrence--Near the Salenia texana bed was the only locality from which Arctica pseudo-texana was collected.

Number of specimens--2.

Arctica whitneyi n. sp.

Plate XI Figures 1, 2.

Description--Cast decidedly large and ventricose, triangular-ovate, elongated posteriorly, greatest diameter in a line drawn from the anterior extremity of the beaks to the basal margin; anterior margin truncate, curved near muscle scars and basal margin; posterior margin gently rounded from the umbonal slope to the ventral margin; basal margin sharply inflected; beaks heavy, slightly pointed, inwardly curved, more parallel than transverse to the hinge line, relatively distant;

anterior umbonal slope decidedly rounded; posterior umbonal slope decreasing in convexity from the umbones to the base; muscle scars prominent, large; pallial line entire, distinct. None of the shell was preserved on these specimens, but it was probably heavy and ornamented with coarse, irregular concentric lines of growth.

Dimensions--Length 149 mm., height 169 mm., thickness 90 mm., length 126 mm., height 160 mm., thickness 37 mm.

Affinities--Because of its large size and rounded beaks, A. whitneyi is readily distinguished from the other species of this genus in the Glen Rose. It has, however, the same position of beaks and the same basal slope as Cyprina quadrata D'Orbigny, of the Turonian, but is easily differentiated from this species by its great height and lack of posterior muscle scars that are so prominent in the Turonian species.

Arctica whitneyi has a close affinity in Arctica roemeri, but these species differ by the posterior elongation of the new species as well as by its inflected instead of rounded ventral margin. A. whitneyi has narrow beaks that are directed only slightly anteriorly, whereas those of Arctica roemeri are decidedly anteriorly curved.

A. whitneyi differs from the attenuate A. banderaensis in the proportionately greater length and the broad, thick umbones of Arctica banderaensis.

Occurrence--This very diagnostic species is rather sparingly found, but has been collected from 210' to 230' above the base of the Glen Rose.

Number of specimens--6.

BIBLIOGRAPHY

- Adkins, W. S.: "Handbook of Texas Cretaceous Fossils," Univ. of Texas Bull. 2333, 1923.
- Adkins, W. S. and Winton, W. M.: "Paleontological Correlation of the Fredericksburg and Washita Formations in North Texas," Univ. of Texas Bull. 1945, 1919, p. 67, figs. 11-15.
- Boese, Emilio: "La Fauna de Moluscas del Senomano de Cardenas, San Luis Potosí," Instituto Geologica de México, bol. 24, 1906.
- Boese, Emilio: "Monografía Geológica y Paleontológica del Cerro de Muleras (etc.)", Inst. Geol. Méx., bol. 25, 1910.
- Boyle, C. B.: "A Catalogue and Bibliography of North American Mesozoic Invertebrata," U. S. Geol. Survey, Bull. 102, 1893.
- Choffat, Paul: "Espèces Nouvelles ou peu Connues," Recueil D'Etudes Paléontologiques sur la Faune Crétacique du Portugal, vol. 1, 1886.
- Conrad, T. A.: "Description of Cretaceous and Tertiary Fossils," W. H. Emory, Report of the U. S. and Mex. Bound. Survey, vol. I, pt. 2, 1857.
- Coquand, M. G.: Monographie Paléontologique de L'Étage Aptien de L'Espagne, Marseille, 1865.
- Cragin, F. W.: "A Contribution to the Invertebrate Paleontology of the Texas Cretaceous," Tex. Geol. Survey, 4th Ann. Rept., 1892.
- "New and Little-Known Invertebrata from the Neocomian of Kansas," American Geologist, vol. 14, 1894.
- "Paleontology of the Malone Jurassic Formation of Texas," U. S. Geol. Survey, Bull. 266, 1905.
- Deshayes, G. P.: Description des Coquilles Fossiles des Environs de Paris, Paris, 1824.
- Fischer, Paul: Manuel de Conchyliologie et de Paléontologie Conchyliologique, Paris, 1887.
- Gabb, W. M.: "Description of the Cretaceous Fossils--Paleontology of California," Geol. Survey of Calif., vol. 1, sec. 4, 1864.

- Gabb, W. M.: "Cretaceous and Tertiary Fossils--Paleontology of California," Geol. Survey of Calif., vol. 2, 1869.
- Greco, B.: "Fauna Cretacea dell' Egitto Raccolta dal Figari Bey; Lamellibranchi del Turoniano e del Cenomaniano," Paleontographia Italica, vol. 24, 1913.
- Hill, R. T.: "Paleontology of the Trinity Division," Ark. Geol. Survey, Ann. Rept., vol. 2, 1888.
- "Paleontology of the Cretaceous Formations of Texas," "The Invertebrate Paleontology of the Trinity Division," Proceedings of the Biol. Soc. of Wash., vol. 3, 1893.
- Kniker, H. T.: "Comanchean and Cretaceous Pectinidae of Texas," Univ. of Texas Bull. 1317, 1913.
- De Loriol, P.: "Monographie des Couches de l' Etage Valanginen des Carrières d'Arzier (Vaud)," Materiaux pour Paleontologie Suisse, 1863.
- Morton, S. G.: Synopsis of the Organic Remains of the Cretaceous Group of the U. S., Key and Biddle, Philadelphia, 1834.
- D'Orbigny, Alcide: "Description des Mollusques et Rayonnés Fossiles Terraines Crétacés, Lamellibranches," Paléontologie Française, 1345-1347.
- Pervinquière, L.: "Études de Paléontologie Tunisienne; Gastropodes et Lamellibranches des Terrains Crétacés," Carte Géologique de la Tunisie, Paris, 1912.
- Pictet, F. J. et Campiche, G.: "Description des Fossiles du Terrain Crétacé des environs de Saint Croix," Matér. pour la Paléont. Suisse, Genève et Bâle, 1853-1873.
- Pictet et De Loriol: "Description des Fossiles Continus dans le Terrains Néocomien des Voirons," Matér. pour la Paléont. Suisse, Genève, 1850.
- Pictet et Renevier: "Description des Fossiles du Terrain Aptien de la Perte du Rhone et des environs de St. Croix," Matér. pour la Paléont. Suisse, Genève, 1853.
- Roemer, Ferdinand: Die Kreidebildungen von Texas und Ihre Organischen Einschlüsse, Bonn, 1852.
- Stoliczka, J.: "Cretaceous Pelecypoda of Southern India," Memoirs of the Geol. Survey of India, vol. 3, pts. 1-13, 1871

- White, C. A.: "Contributions to the Paleontology of Brazil; Cretaceous Invertebrate Fossils mainly from the Provinces of Sergipe, Pernambuco, Para, and Bahia," Archivos do Museu Nacional do Rio de Janeiro, vol. 7, 1938.
- Whiteaves, J. J.: "Mesozoic Fossils," Geol. Survey of Canada, vol. 1, pts. 1-5, 1876.
- Whitney, F. L.: Bibliography and Index of Mesozoic Invertebrata, Harris Company, 1928.
- Woods, Henry: "A Monograph of the Cretaceous Lamellibranchia of England," Paleontographical Society, vol. 56, pt. 4; vol. 57, pt. 5; vol. 58, vol. 2, pt. 1; vol. 60, vol. 2, pt. 3; vol. 61, vol. 2, pt. 4; vol. 66, pt. 4; 1902-1912.

P L A T E S

PLATE I

Cucullaea brilli n. sp.

Figures --

1. Dorsal view of holotype, x 1.
2. Lateral view of holotype. x 1.

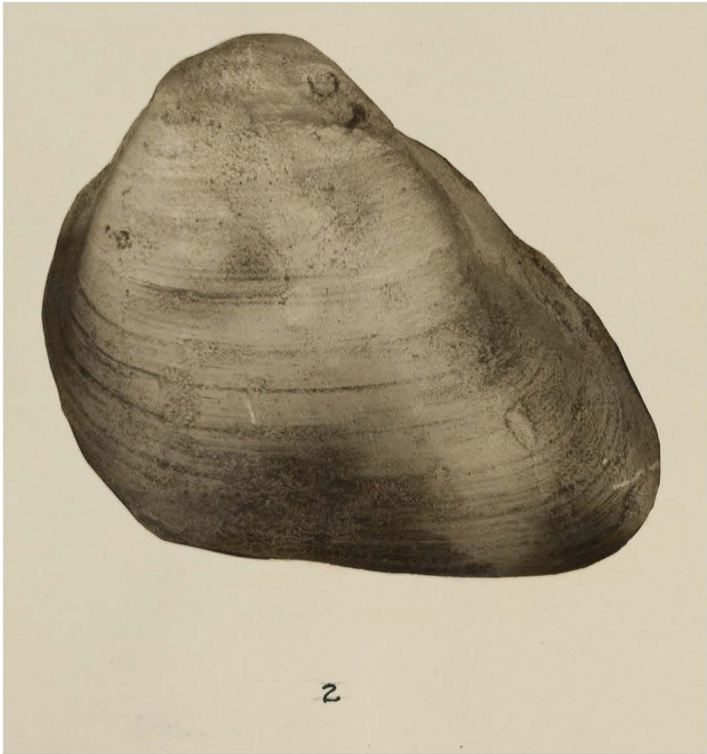


PLATE II

Figures --

1. Cucullaea gracilis Cragin.
 - a. Dorsal view of holotype. x 1.
 - b. Lateral view of holotype. x 1.
2. Cucullaea comanchensis Hill.
 - a. Dorsal view of plesiotype. x 1.
 - b. Lateral view of plesiotype. x 1.
3. Cucullaea gratiota Hill.
 - a. Dorsal view of plesiotype. x 1.
 - b. Lateral view of plesiotype. x 1.

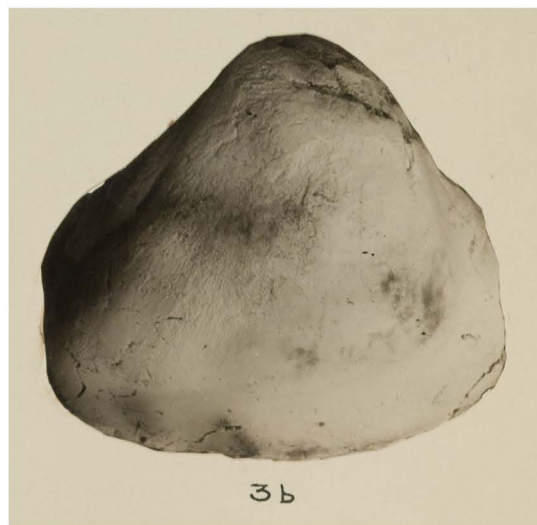
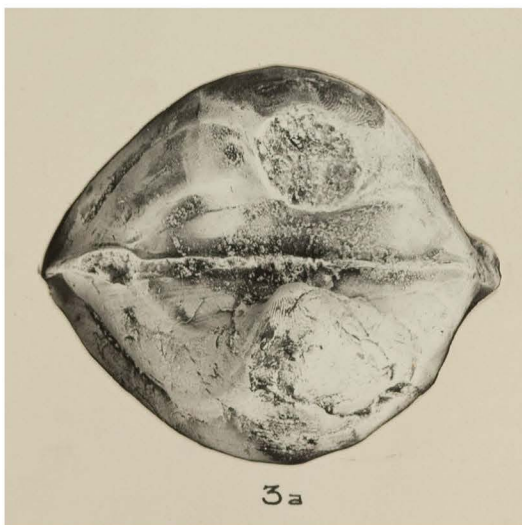
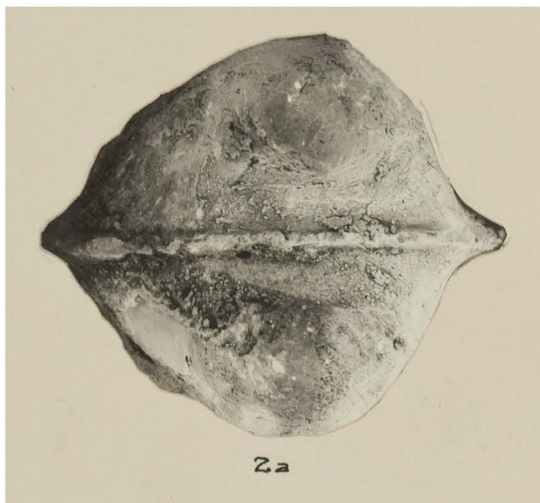
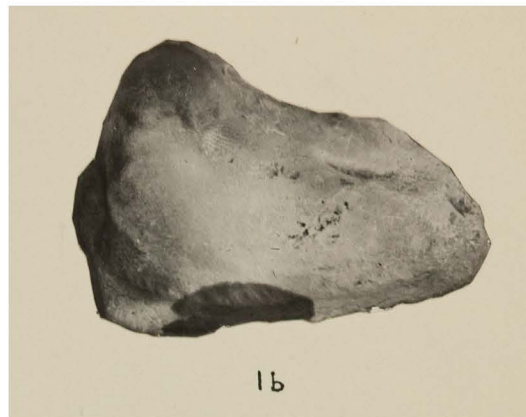
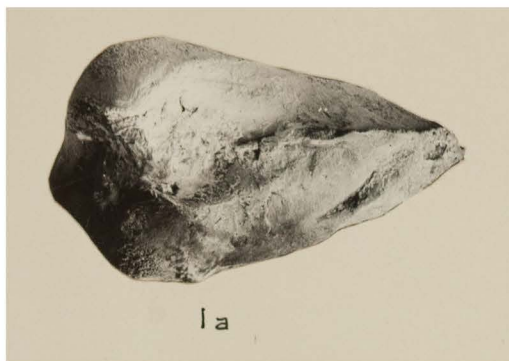


PLATE III

Cucullaea simondsi n. sp.

Figures --

1. Dorsal view of holotype. x 1.
2. Lateral view of holotype. x 1.

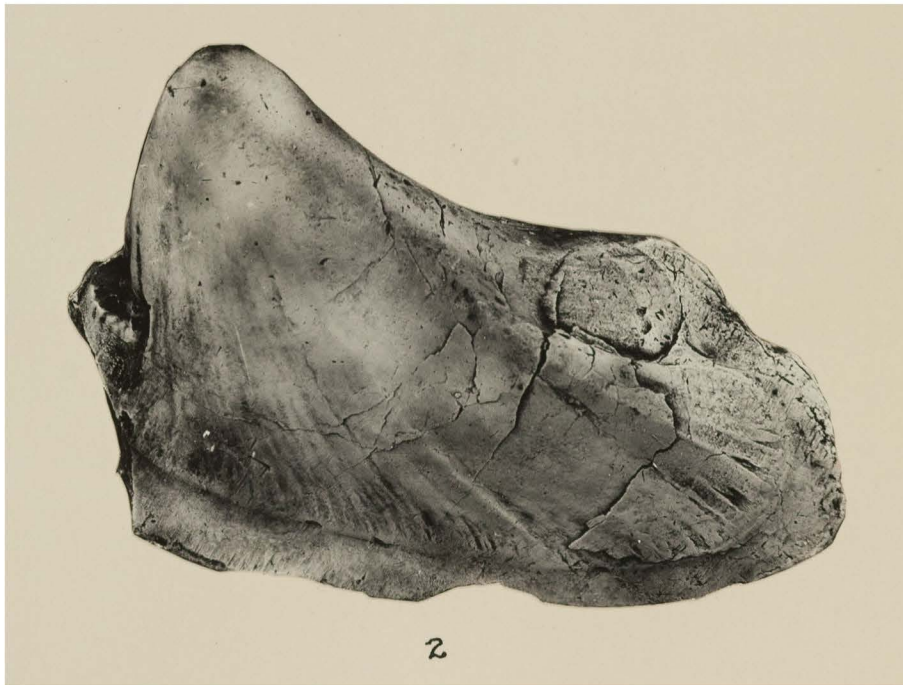
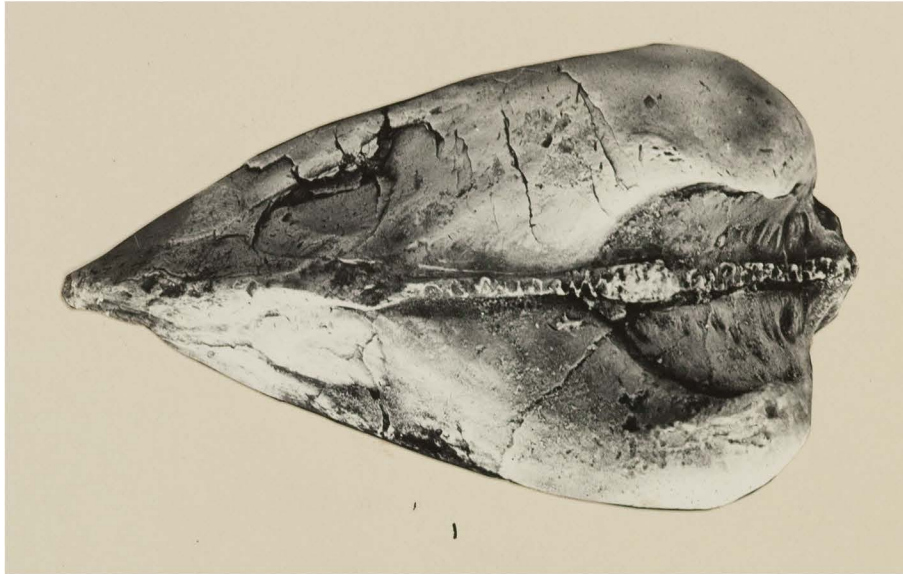


PLATE IV

Cucullaea terminalis (Conrad)

Figures --

1. Dorsal view of plesiotype. x 1.
2. Lateral view of plesiotype. x 1.

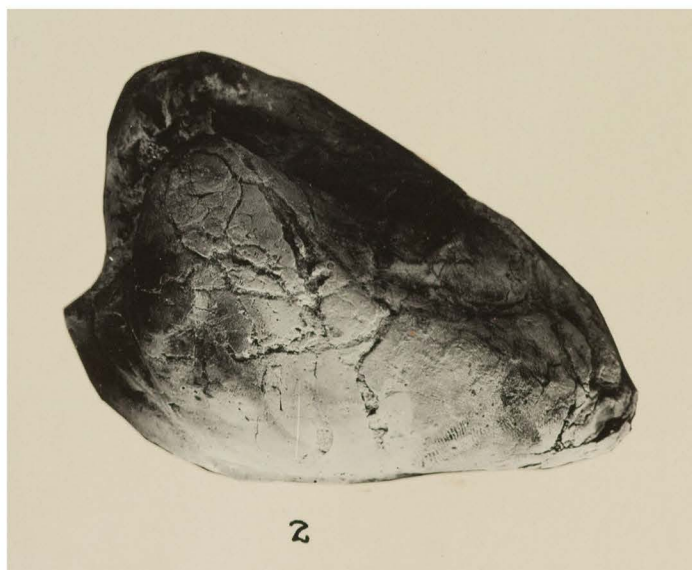
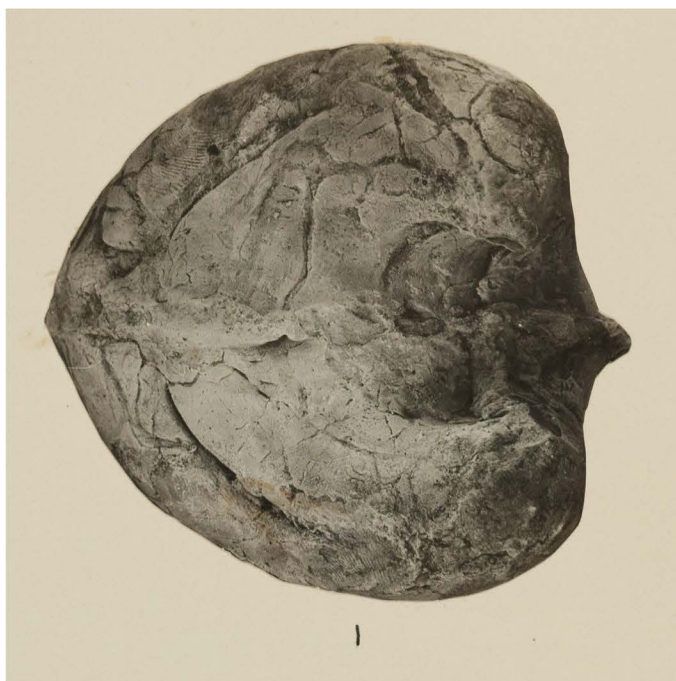


PLATE V

Pecten guadalupensis n. sp.

Figure --

1. Lateral view of holotype. x 1.



1

PLATE VI

Figures --

1. Neithea irregularis (Boese).
 - a. Left valve of plesiotype. x 1.
 - b. Right valve of plesiotype. x 1.
2. Pecten stantoni Hill, right valve
of plesiotype. x 1.
3. Lima blancoensis n. sp., right valve
of holotype. x 1.
4. Lima comalensis n. sp., right valve
of holotype. x 1.

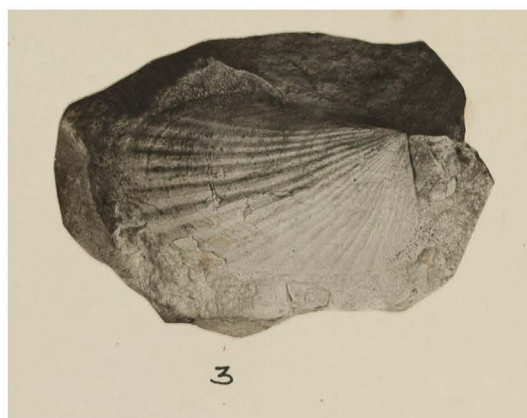
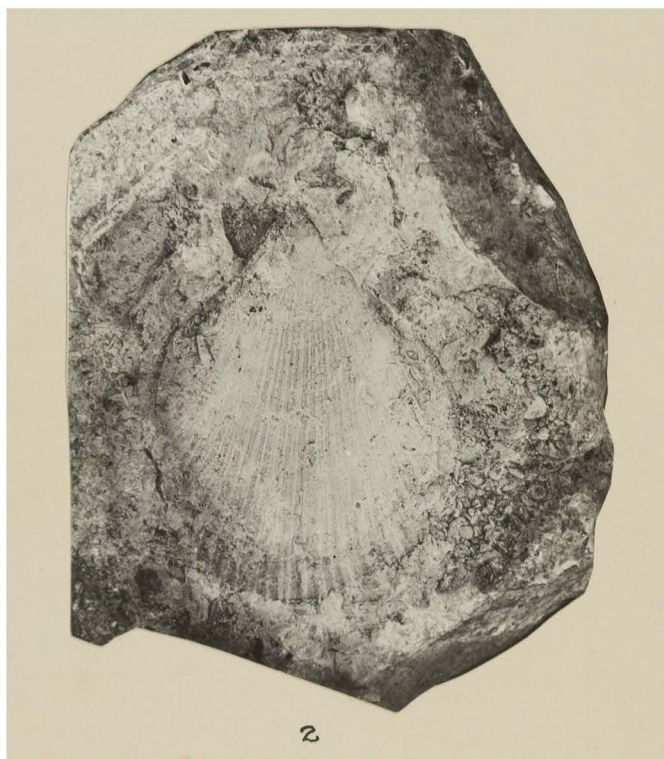
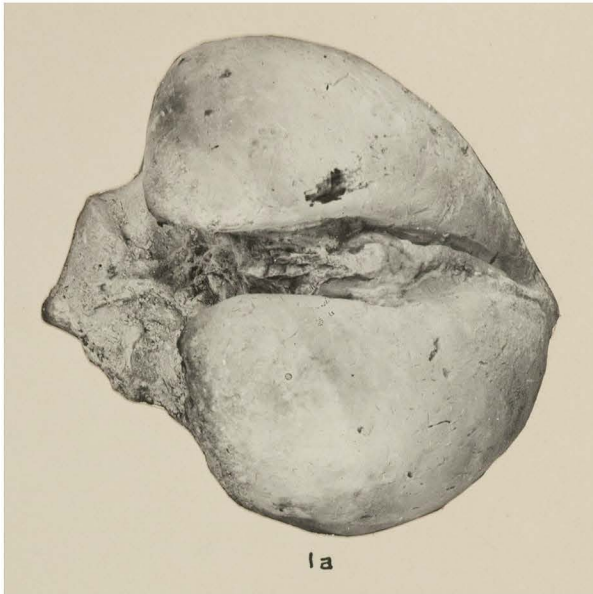


PLATE VII

Figures --

1. Arctica banderaensis n. sp.
 - a. Dorsal view of holotype. x 1.
 - b. Lateral view of holotype. x 1.
2. Arctica guadalupensis n. sp.
 - a. Anterior view of holotype. x 1.
 - b. Lateral view of holotype. x 1.
3. Arctica navicularia n. sp.
 - a. Anterior view of holotype. x 1.
 - b. Lateral view of holotype. x 1.



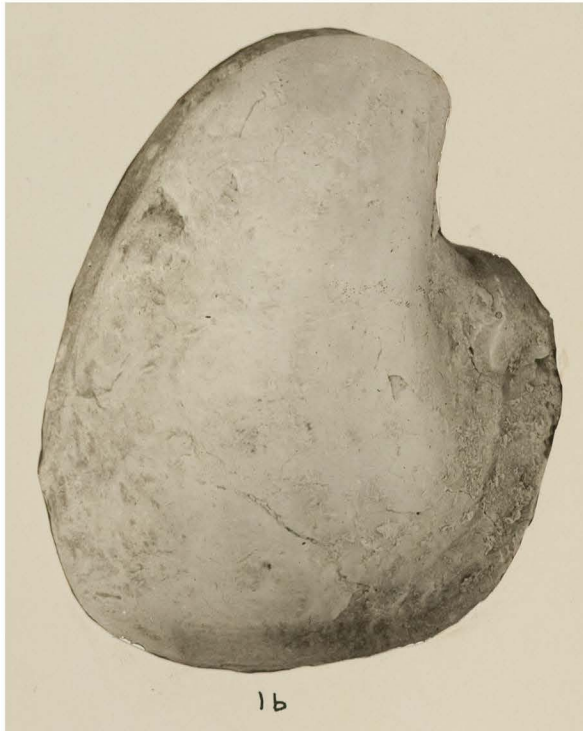
1a



2a



2b



1b



3a



3b

PLATE VIII

Figures --

1. Arctica comalensis n. sp.
 - a. Anterior view of holotype. x 1.
 - b. Lateral view of holotype. x 1.

2. Arctica plummerae n. sp.
 - a. Anterior view of holotype. x 1.
 - b. Lateral view of holotype. x 1.

3. Arctica medialis (Conrad)
 - a. Anterior view of plesiotype. x 1.
 - b. Lateral view of plesiotype. x 1.

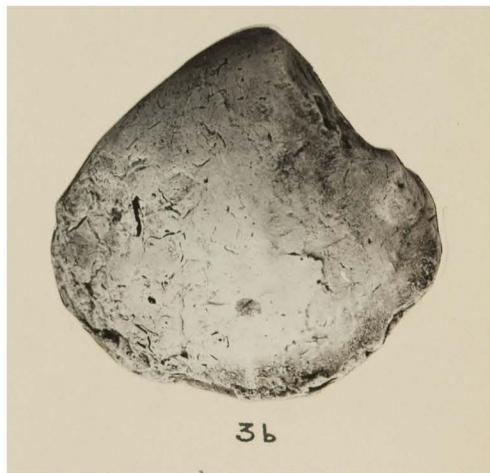
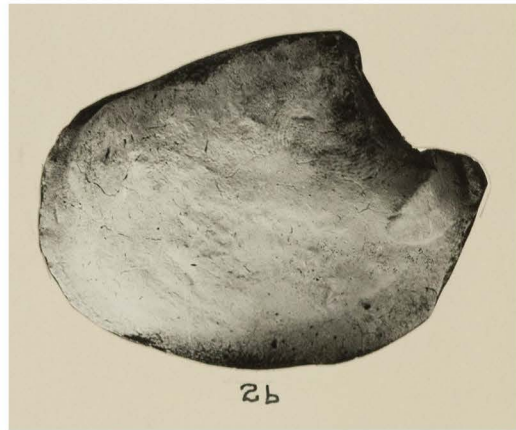
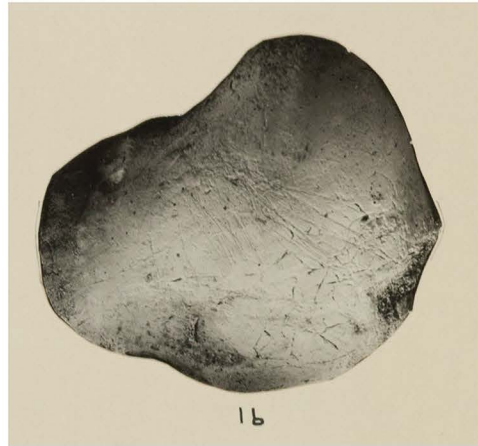


PLATE IX

Figures --

1. Arctica texana (Conrad)
 - a. Dorsal view of plesiotype. x 1.
 - b. Lateral view of plesiotype. x 1.

2. Arctica pseudo-texana n. sp.
 - a. Lateral view of holotype. x 1.
 - b. Dorsal view of holotype. x 1.



1a

2a

2b

1b

PLATE X

Arctica roemeri (Cragin)

Figures --

1. Dorsal view of plesiotype. x 1.
2. Lateral view of plesiotype. x 1.

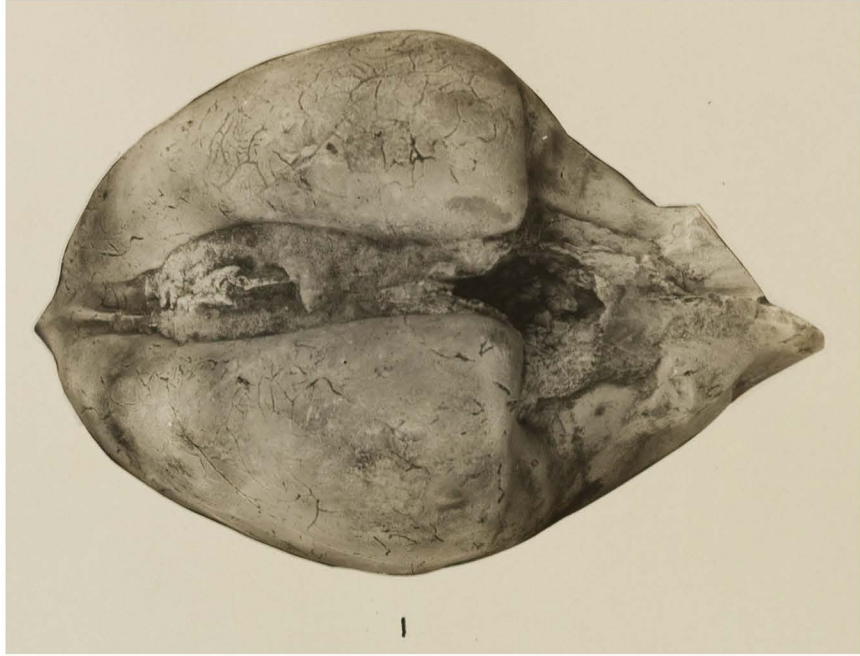


PLATE XI

Arctica whitneyi n. sp.

Figures --

1. Anterior view of holotype. x 1.
2. Lateral view of holotype. x 1.

