THREE REPORTS DEALING WITH THE CLAM-SHELL INDUSTRY OF THE TENNESSEE RIVER VALLEY.

by

A.R.Cahn

1936

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THE MOLLUSCAN FAUNA OF THE CLINCH RIVER BELOW NORRIS DAM UPON THE COMPLETION OF THAT STRUCTURE.

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STATEMENT.

The object of this paper is to present a list of the clams or Pelecypod mollusks found in the Clinch River below Norris Dam, Tennessee, at the time of impounding the water behind that dam. The impounding of the water to form the Norris Reservoir must, because of the very anatomical and physiological structure of the organisms, have a profound effect upon the pelecypod fauna both above and below the dam. Already (November, 1936), this effect is to be noted below the dam, where the entire molluscan population has been wiped out. This is due to a combination of at least two factors: 1) the change in temperature of the water now flowing from the dam (which is 51°F as compared with 75° to 80° previously at the same time of the year); and 2) the great change in the oxygen content of the water, which has dropped to from 1 to 6 parts per million. Thus the shell industry, which gave work and livlihood to many men who gathered the shells for the pearl button industry as well as for the exquisite gems sometimes to be found in these lowly organisms, has been eliminated from at least a great stretch of the river. It is altogether possible that sooner or later experiments will be undertaken leading toward a rehabilitation of this industry. Before such experiments can be undertaken, it is essential that the species native to this region be known. Therefore this list has been prepared. It includes only the larger species of clams, and does not include the "finger-nail" shells of the genera Pisidium and Musculium, important as these are as items of fish food.

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THE MOLLUSCAN FAUNA OF THE CLINCH RIVER BELOW NORRIS DAM UPON THE COMPLETION OF THAT STRUCTURE.

Object:

The object of this paper is to present to and preserve for posterity a list of the pellecopod mollusks (clams) which occurred in the Clinch River immediately below the Norris Dam at the time that structure was completed and the water above the dam impounded--namely, as of March 4, 1936.

Introduction:

Taking it by and large, the biota of the southern states is but very imperfectly known when compared with the states to the north, east and west. Intensive studies in this region are few and far between and, while mention of faunal forms appear scattered broadly through scientific literature, the fact remains that these records are largely incidental and casual. Of all the vertebrate groups, the birds alone have received attention in a more or less extensive manner, due largely to the popularity of the group and secondarily to its economic importance. That this second factor is not primarily the stimulus is indicated by the fact that other equally important groups, from an economic point of view, are and have been neglected. This applies especially to the fish and mammals of the south.

Among the invertebrate groups, the mollusks, including both the Pelecypods (clams) and Gastropods (snails) have probably received the most attention, and since this group is distinctly less economic in value than many others which could be named, the fact is interesting. The explaination lies probably in the fact that certain of the southern areas hold interesting transition forms in many cases,

and hence have proven a key to an understanding and interpretation of molluscan conditions in other regions. A glance at the conchological literature of Tennessee alone reveals the names of the greatest of all conchologists, showing these specialists as having focused their attention on that region: F.C.Baker, Binney, Call, Clapp, Dall, Goodrich, Hinkley, Lea, Lewis, Ortmann, Pilsbry, Rafinesque, Simpson, Tryon, and Walker appear as contributers to a knowledge and an understanding of the mollusca of that area. And it is not surprising that this should be the case, for Tennessee, starting from the Mississippi River on the west, rises slowly and majestically to the heights of the Great Smoky Mountains on the eastern margin--from 235 feet on the east to 6,642 feet on the west. This concerns itself with terrestrial elevations, but streams and rivers are everywhere, and with them is associated a molluscan fauna. Notwithstanding which the terrestrial mollusks (land snails) are the best known of the group and have been most intensively studied. Detailed studies of the Pelecypods of the region are almost entirely lacking, despite the fact that this group alone is of great economic importance. Hence it is seen that economic importance is not always, as we have indicated, the stimulus to scientific investigation.

Habitat:

The aquatic habitat is among the most stable of all known environments. Here changes are fewer, slower and less violent than under terrestrial conditions. Hence any factors which tend to upset or in any way change the conditions of this aquatic environment prove themselves at once of great importance to all aquatic organisms. And this is only natural and to be expected, for an organism, living under conditions which, year after year, tend to change but little,

have lost that power of wide adaptability to be found among animal forms living in an environment exhibiting a wide natural and normal variation. The construction of the various dams on the Tennessee river system are just such challenging factors, for each dam exerts a profound influence on the aquatic environments both above and below it.

Each species of clam is in itself the result of a long period of adaptive modification to a certain mode of life--to a life under a given set of physical and chemical conditions. Some are found in deep, slow-flowing or quiet water; others amid rapids and turbulent water; some on soft, oozy bottom; others amid rocks and boulders, and others still on sand. Because of the awkward, slow moving posibiliti of these organisms, because of their almost sedentary mode of life (an adult often does not move two feet in ten years) each species has become highly adapted to a definite depth of water, a definite oxygen-carbon dioxide relationship, a definite type of water flow, a definite bottom medium in which to rest or move, a definite temperature range. Thus a rapid-water, rock bottom, high oxygen requiring species, because of the very nature of its physiological composition which has been moulded to suit just these conditions, can not and does not survive in deep, quiet, low oxygen-holding water. It is a matter of being physically and physiologically atuned and balanced with the environment which makes spedific as well as indificual survival possible. Change these conditions materially, and the organism suddenly finds itself amid conditions which are beyond its adaptability, which it can not meet, because such conditions are beyo its physical and chemical (physiological) tollerance. The result is obvious. With a radical change of conditions an organism must adjust itself or porish. If the change is so profound as to preclude this

adjustment, only extinction (both individual and specific) can result

Therefore it is of great economic as well as scientific interest that a record be made of the molluscan fauna of the Tennessee river system under the natural conditions which have become established through immeasurable time. Of scientific interest because it is inevitable that the construction of the dams throughout the course of thi system will exert a profound influence upon this fauna, and unless a study be made before the dams are completed, no clue will be available in the future as to what these changes actually have been. Of economic importance because the clams have afforded in the past a livlihood for many people in the Valley who have collected them in vast quantities as the basis of the pearl button industry as well as for the exquisite treasures certain individuals develop within their dark and mysterious interiors. In passing it may be said that the finest fresh water pearls known have come from clams of the Clinch river.

In order that posterity may know something of the fauna of the Clinch river as it existed prior to the construction of the Norris Dam, and in order that this posterity may be in a position to study any changes in the molluscan population of this river which may (and which certainly will) follow the erection of this dam, the present paper has been prepared.

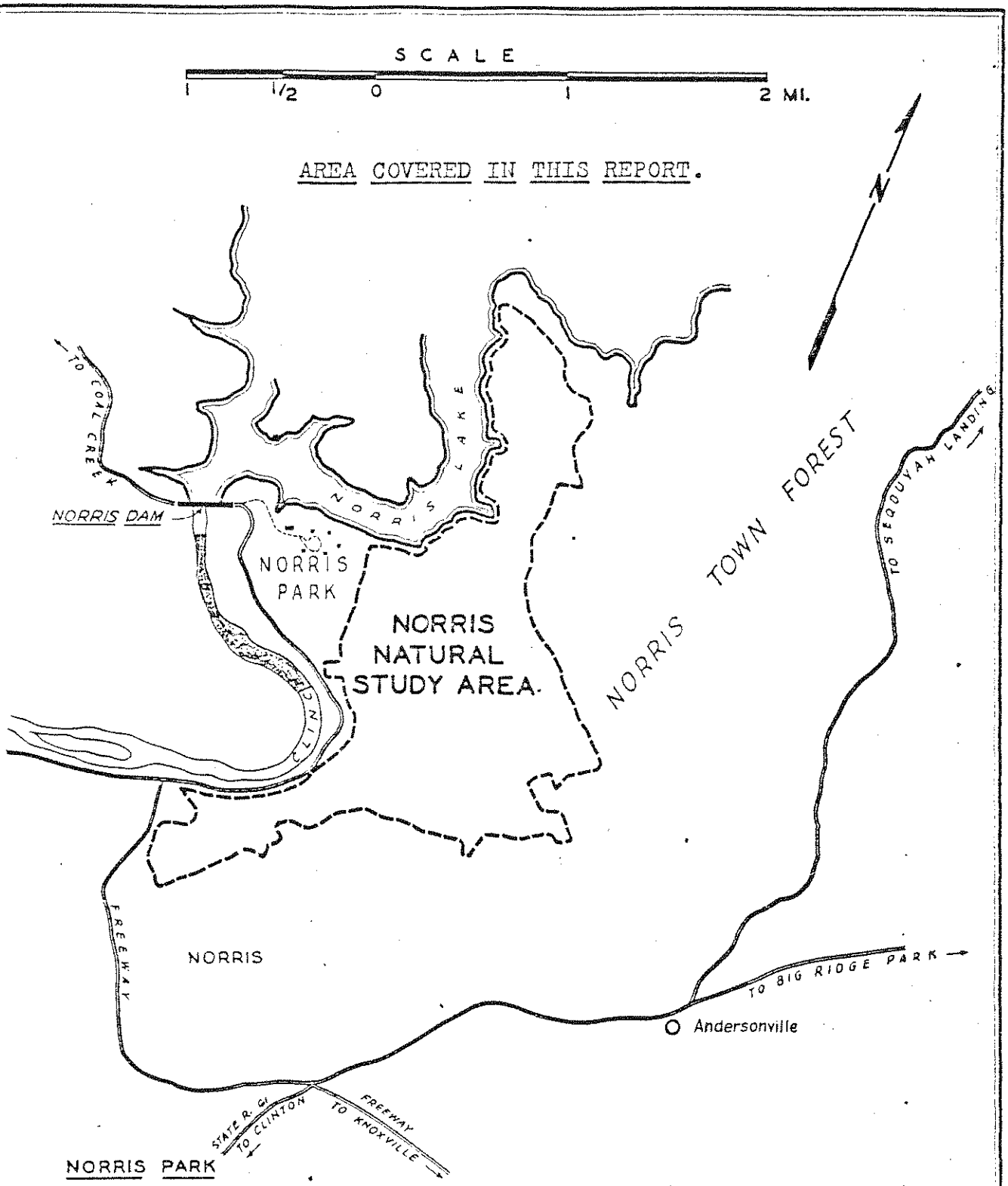
The Clams of the Region:

On the afternoon of March 4, 1936, the waters of the Clinch River above the Norris Dam were shut off from circulation by the closing of the gates of that great dam. Since the closing was complete, no further water came down the river, excepting only that which enter the main channel of the Clinch from small tributary creeks such as Clear Creek for example. The water level therefore fell, and three

days later the river bed below the Norris dam was dry except for stranded pools for a distance of nearly a mile (see figure 1). Under these ideal conditions it was possible to walk dry-shod over a large part of the river bed and to investigate the standing pools without difficulty. This permitted a careful and detailed study of the molluscan fauna exposed to full view in the drained areas and, because of the great clearness and shallowness of the standing pools, to work those areas as well. Between that date of closure and the first of June, 1936, repeated trips were made over this area. Thousands of shells were handled and picked over, studied, and the species represented recorded, together with a full representative collection developed of all of these species in both adult and immature stages. The importance of obtaining this information was brought keenly home to the writer in October when, with the water again at low stage, another examination of the region failed to bring to sight a single specimen of living clam. Such are the changes wrought by dam construction on the molluscan fauna.

The drop of the water revealed the fact that the bottom of the Clinch river is composed very largely of rock and heavy gravel, with occasional rock ledges emerging to the surface at various angles, depending upon the angle of dip of the strata. In some areas a thin coating of mud or silt was found among the rocks, but over most of the area for a mile below the dam, such sedimentary deposits were absent. The bottom proved to be very level, though little sub-channels were found to have been cut to form minor depressions in some localities. It was between the rocks and in the gravel areas that the live clams were collected, and vast numbers of dead shells were found strewn over the bed of the river and piled especially thickly along the edges of the bed where the

Figure 1



NORRIS PARK

Under administration of Town of Norris. An intensively developed area containing cabins available for tourist use. Accessible by automobile from the Freeway.

NORRIS NATURAL STUDY AREA

Under administration of the T.V.A. Forestry Division. Available for horseback riding and hiking, but not for intensive recreational use. No hunting, camping, or camp fires permitted at any time. Primary use is for scientific study of changes in natural cover over a period of years without interference by man.

PREPARED BY FORESTRY [illegible] APRIL 1936.

current had caused the accumulation of especially the smaller and lighter shells. After ten weeks, during which collections were made at various times, no species had been found represented in the "dead" material that careful search did not reveal to be present in the living material.

The number of species of clams represented in this very limited area has proven to be very large. The following list includes those forms identified:

Actinonaias carinata (Barnes)

Alasmidonta holstonia (Lea)

Alasmidonta marginata Say

Amblema costata Raf.

Carunculina glans (Lea)

Carunculina parva (Barnes)

Cyclonaias tuberculata (Raf)

Cyprogenia alberti (Lea)

Cyprogenia irrorata (Lea)

Dromus dromas caperatus

Dysnomia brevidens (Lea)

Dysnomia capsaeformis (Lea)

Dysnomia florentina (Lea)

Dysnomia haysiana (Lea)

Dysnomia triquetra (Raf)

Elliptio crassidens (Lam)

Elliptio dilatatus (Raf)

Elliptio dilatatus subgibbosus (Lea)

Eurynia obscura (Lea)

Fusconaia cuneolus

Fusconaia edgarianum (Lea)

Fusconaia pilaris lesueriana

Fusconaia tuscumbensis (Lea)

Lampsilis fasciola (Raf)

Lampsilis orbiculata (Hild)

Lampsilis ovata (Say)

Lampsilis ovata ventricosa

Lasmigona costata Raf.

Ligumia iris (Lea)

Ligumia recta latissima (Raf)

Margaritana monodonata Say

Medionidus conradicus (Lea)

Micromya nebulosa

Obliquaria reflexa (Raf)

Pleurobema cordatum (Raf)

Pleurobema cordatum pyramidatum

Pleurobema plenum (Lea)

Proptera alata megaptera (Raf)

Ptychobranchus phaseolus (Hild)

Quadrula cylindrica (Say)

Quadrula metanevra (Raf)

Quadrula pustulosa (Lea)

Truncilla brevidens (Lea)

Truncilla donaciformis

Truncilla truncata (Raf)

The above list enumerates 45 species, and does not include the small "finger-nail" shells of the genus Pisidium and related forms.

After a careful survey of the river bottom conditions had been made so as to determine the various dominant bottom types existing in the area, two regions were selected for a detailed study, the objective of which was to estimate the clam population of the Clinch river in terms of clams marketable for the pearl button industry. Region A was composed of typical rocky bottom, wherein the composing rocks average around three to eight inches i size and form the dominant feature of the surface. Region B was selected as having a preponderance of sand or fine gravel or silt, deposited between rocks of considerable size, this deposit forming not less than 50% of the bottom surface within the area. These two area types constitute the habitat of the larger, economically important clam species; the third type, the rock ledges, are few in number and are free of these animals in a living condition. One strip representing Region A and another representing Region B, each measured to include 100 feet of shore-line of the river and extending across the width of the river (in this region of the Clinch averaging 300 feet) were selected. In each of these areas the total number of living, fully adult--hence economically market able--clams of the more important pearl-button shell species was counted. Ten species were included in the study. The resulting count gave the total number of adults of these species living in 200 feet of river involving the two dominant environmental bottom types. The figure for Regions A and B were then added together ar divided by two, thus giving an average for both types of habitat for 100 feet of river length.

In any attempt to estimate the number of clams in the whole length of the Clinch river, the results can at best be only

theoretical unless a great deal of time is available for a study extending throughout the length of the river. Such time has very definitely been available to this writer, hence he has based this phase of the work on the assumption that the populations within the areas studied are typical for the river. This assumption is not without justification. From brief studies of the Clinch river both above and below Norris Dam it has been quite evidently seen that rock bottom and sand-gravel bottom are about equal in distribution and that they cover about equal areas; that solid rock areas--and hence mollusk free areas--are few and insignificant both in extent and in distribution; and finally that the species considered are fairly consistent in their habitat preference as well as in their abundance per unit area. This latter fact would seem to indicat that the condition studied represents what might perhaps be called a "saturated population density", a density limited primarily by the factors of food supply and abundance.

The results of this study are presented and summarized in the following table:

TABLE I

DATA ON THE ABUNDANCE OF 9 SPECIES OF CLAMS PER UNIT AREA AND IN THE LENGTH OF THE CLINCH RIVER

Species	Av. per 100 ft. river	No. per mile of river	No. in 297 mi. of river	Weight per shell oz.	No. per ton	No. tons in river	Value of shells at $18 per ton
Lampsilis ovata	91	4823	1432431	10.0	32[illegible]	448	$8064
Ligumia recta latissima	76	4028	1196316	6.0	6400	187	$3366
Lampsilis orbicularia	68	3604	1070388	8.0	4000	268	$4824
Amblema costata	88	4664	1385208	9.0	3555	387	$6866
Quadrula metanevra	82	4346	1290782	6.0	5333	242	$4356
Cyclonaias tuberculata	74	3922	1164834	9.0	3555	328	$5904
Pleurobema cordatum	132	6996	2080112	7.0	4570	454	$8072
Lampsilis ventricosa	83	4199	1247103	11.0	2927	425	$7650
Actinonaias carinata	121	6413	1904661	6.0	5333	357	$6426
TOTAL		44995	12772835			3096	$55728

CONCLUSIONS.

In any interpretation of the preceding table, one fact must be kept clearly in mind: the figures refer only to mature, adult, fully grown clams of a marketable group. If such fully adult individuals be not gathered and utilized, they represent just so r economic loss. To permit them simply to remain in the river and to die of old age is akin to the policy which permits timber to remain standing after it has reached maturity until it dies of old age. Besides these mature individuals, the river contains, within the same unit areas from which these adults came, hundreds of immature specimens or young adults which are approaching maturity Hence the class indicated as mature represents a harvestable crop of a monetary value indicated in the last column. But it represe even more than that: it represents approximately a yearly harvest crop--a crop which could be taken annually to the extent listed without imparing the supply in the least. For with the eliminati of this fully mature group, more food and more area becomes available for the younger individuals, which will then, due to th betterment of the environmental conditions, grow to maturity more rapidly, thus yielding the annual crop supply.

From the above brief account of the clams of the Clinch Rive Tennessee, it is evident that: 1) the number of species is great; 2) the supply is great; and 3) the market value of the annual crop is certainly not inconsiderable.

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For the benefit of those interested, a key is herewith presented which should aid in the identification of the more abund- and species represented in the area.

A KEY TO THE COMMONER ADULT PELECYPODS OF THE CLINCH RIVER BELOW THE NORRIS DAM

A. Surface of shell at least in part either tuberculate, ridged or fluted. (AA)

B. Outline of shell roughly triangular or approaching a square: not bluntly rectangular. (BB)

C. Surface ridged or fluted, not tuberculate. (CC)

D. Surface with deep ridges or folds which tend to radiat from the umbellicus. Amblema costata.

DD. Surface with distinct fluting confined to distal third of shell. Lasmigona costata.

CC. Surface with wart-like tubercles. (C)

E. Tubercles numerous. (DD)

F. Tubercles relatively small and inconspicuous; edge of shell even, not lobate. (FF)

G. Shell distinctly compressed; umbellicus posterio in position. (GG)

H. Shell tending toward triangular; greenish in color; tubercles faint and located near distal third; nacre white. Cyprogenia alberti.

HH. Shell approaching a square; brown in color; tubercles covering about two thirds of shell; nacre purple. Cyclonaias tuberculata.

GG. Shell thick through umbellicus, which is locate at median axis of shell; tubercles scattered; color light yellow brown with tendency toward bands of green, these composed of tiny green do

Cyprogenia irrorata.

FF. Tubercles large, numerous, conspicuous; edge of shell distinctly lobate. Quadrula metanevra.

EE. Tubercles few, large and conspicuous. (E)

I. Usually about two large prominent tubercles, one near umbellicus, one near center of shell; color dark brown. Obliquaria reflexa.

II. About eight distinct, rounded tubercles on lower half of shell; color light yellow brown with greenish tinge locally. Quadrula pustulosa.

BB. Shell approximately twice as long as high; distinctly and bluntly rectangular; distal half exceedingly rough. Quadrula cylibdrica.

AA. Surface smooth (concentric growth striae notwithstanding). (A)

J. Shell long and slender; length twice the height or more. (J

K. Nacre white (KK)

L. Distal end of shell truncate; ventral margin distinctl concaved; surface dark brown and without markings. Margaritana monodonata.

LL. Distal end of shell not truncate; longest axis dorsal to mid line; color dark brown with yellowish lines radiating from hindge in central region. Ligumia recta latissima.

KK. Nacre purple. Elliptio dilatatus.

JJ. Length of shell less than twice its height. (J).

M. Shell distinctly triangular. (MM)

N. Nacre white. (NN)

O. Large species (over 3"). Pleurobema cordatum.

OO Smaller species (under 1 1/2"). Fusconaia edgarianum.

NN. Nacre pinkish purple. Pleurobema plenum.

MM. Shell not triangular. (M)

P. Fragile, thin-shelled species. (PP)

Q. Cylindrical; length nearly twice height; buffy green with dark green bands radiating from hinge

Ligumia iris.

QQ. Length much less than twice the height.

R. Distal end much higher than proximal end.

Proptora fragilis.

RR. Distal end not higher than proximal end.

Alasmidonta holstonia.

PP. Shell thicker; not fragile. (P)

S. Small species, normally less than 2 1/2". (SS)

T. Shell cylindrical in outline. (TT)

U. Length 1 1/2"; nacre white; distal end turning to truncate. Carunculina parva.

UU. Length around 1 1/4"; nacre purplish; no truncate. Carunculina glans.

TT. Not Cylindrical; height approximately 2/3 o length. (T)

V. Shell very deep through distal surface.

W. Distal edge of shell margin finely serrated. Dysnomia triquetra.

WW. Distal face fluted; edges of shell n serrated. Alasmidonta marginata.

VV. Shell not deep thru distal surface. (V)

X. Distal margin strongly decurved. (X

Y. Distal margin terminating in a ve tral lobe. (YY)

Z. Lobe small; same color as shell.

Dyn[illegible]idens.

ZZ. Ventral lobe large, bright green.
Dysnomia florentina (Young)

YY. No ventral lobe present; shell somewh triangular. (Y)

a. Shell yellow-brown, with green lin composed of small dots radiating from hinge. Truncilla truncata.

aa. Shell yellow-brown, with solid, n dotted, green radiating lines. Fusconaia tuscumbensis.

XX. Distal margin not strongly decurved. (X)

b. Nacre pale purple. Eurynia obscura.

bb. Nacre white; distal end with a median ridge. Dysnomia florentina (adult).

SS. Large species, over 2 1/2" long.

c. Nacre salmon pink. Lampsilis orbiculata.

cc. Nacre white.

d. Shell with inconspicuous fine green lines radiating from hinge.

e. Hinge very thick, set in a conspicuous hump; distal end more pointed than the proximal; few green lines, these most conspicuous on the hump. Lampsilis ovata

ee. Green lines numerous and very fine; hin not on a hump. Lampsilis fasiola.

dd. Shell without radiating green lines.

F. Distal margin gently decurved, making ventral lip practically a straight lin and having a truncate tip; nacre tinte

with purple. Elliptio crassidens.

ff. Ventral margin upturned at distal end; distal tip in uniform curve with margi of shell, hence not truncate.

Actinonaias carinata.

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PLATE L.

Fig. 1

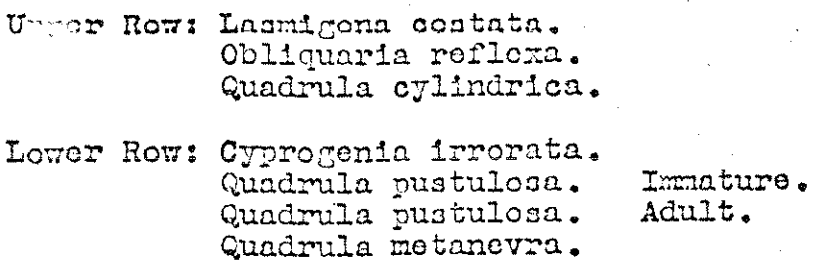


Fig. 2.

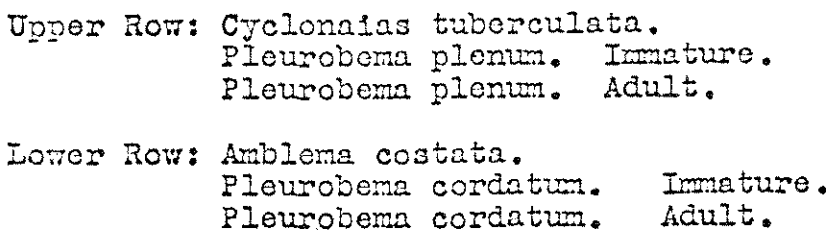


PLATE III.

Fig. 5

Upper Row: Proptera alta megaptera.
Elliptio dilatatus. Immature.
Elliptio dilatatus. Adult.

Middle Row: Alasmodonta holstonia.

Lower Row: Ptychobranchus phaseolus.
Alasmodonta marginata.
Lampsilis fasciola.

Fig. 6

Upper Row: Ligumia recta latissima.

Lower Row: Margaritana monodonata.

Fig. 5

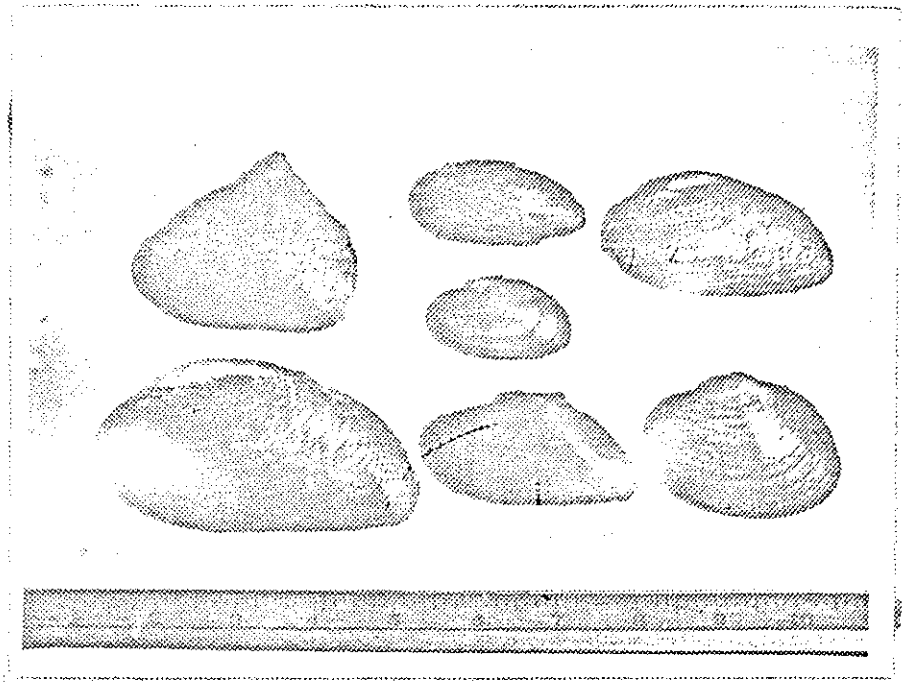


Fig. 6

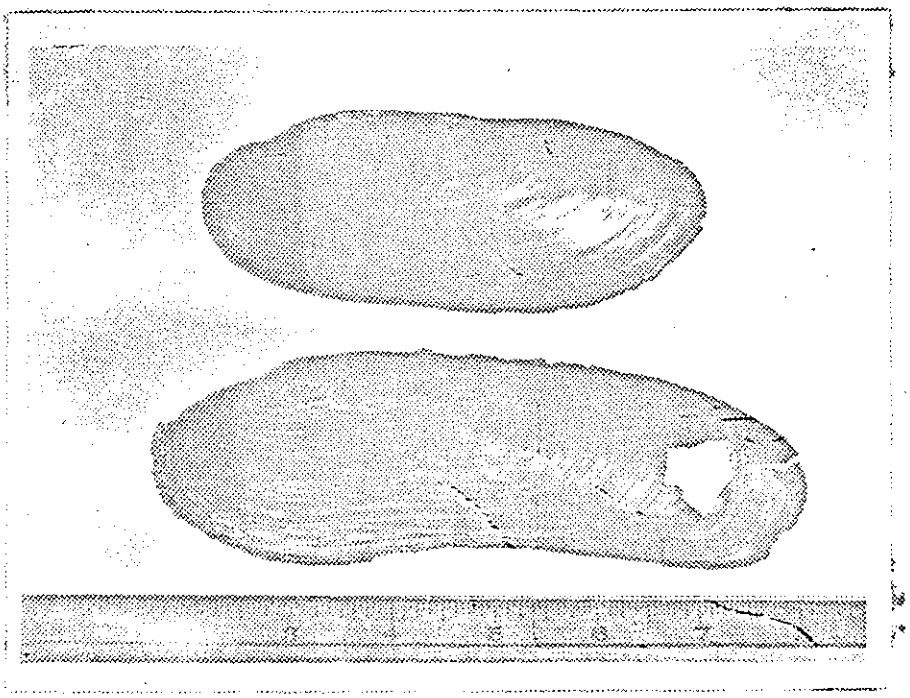


PLATE IV.

Fig. 7

Upper Row: Carunculina parva. External.
Carunculina glans. External.

Lower Row: Carunculina parva. Internal.
Carunculina glans. Internal.

Fig. 8

Internal Surface.

Upper Row: Lampsilis orbiculata. (Salmon pink)
Elliptio dilatatus. (Deep Purple)
Amblema costata. (White)

Lower Row: Proptera alta megaptera. (Purple)
Cyclonaias tuberculata. (Purple)
Pleurobema plenum. (Pink)

Fig. 7

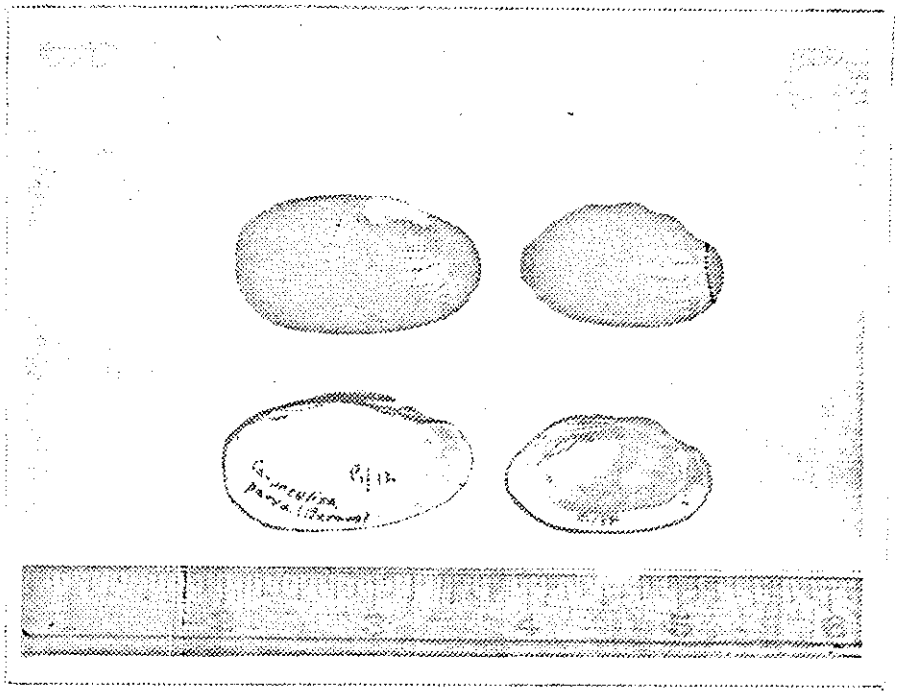
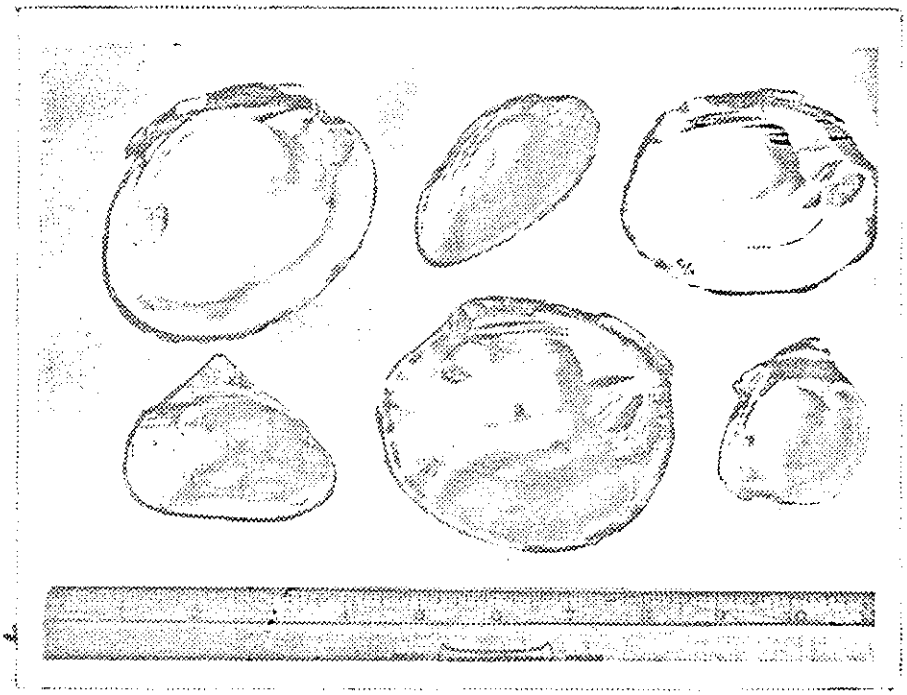
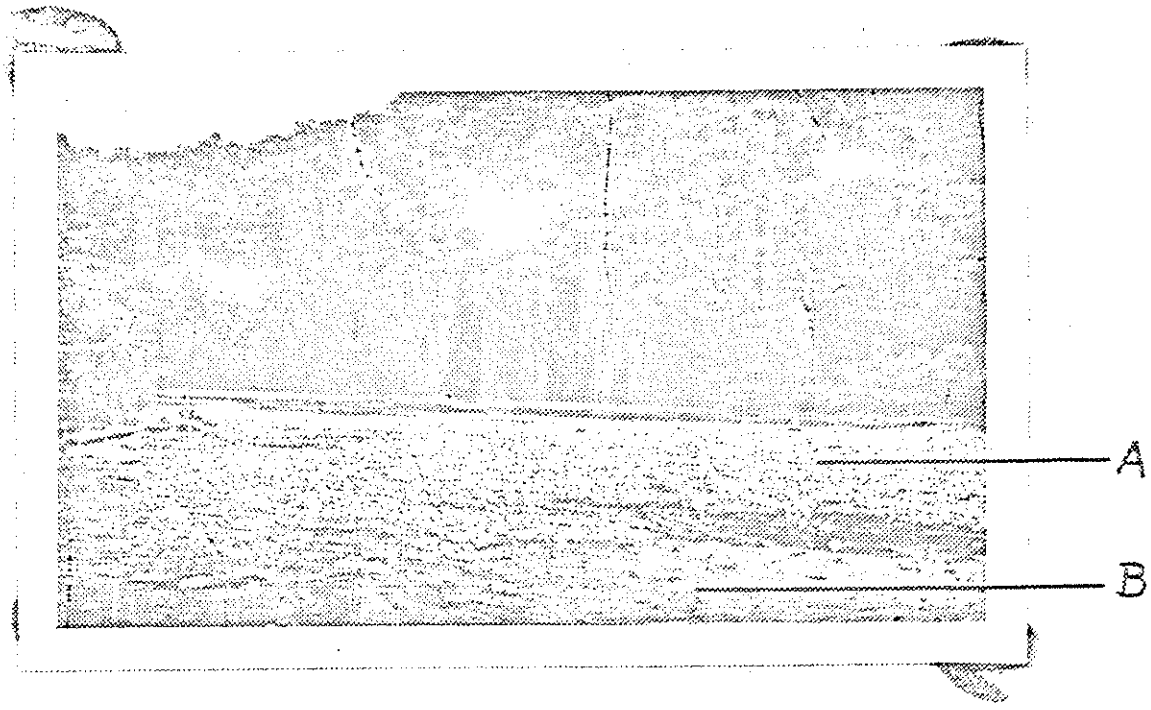


Fig. 8



BOTTOM TYPES: CLINCH RIVER.



1. Typical rocky bottom: Region A.

2. Typical sand-gravel-silt bottom: Region B.

TENNESSEE RIVER SHELL MOUNDS.

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1936

TENNESSEE RIVER SHELL MOUNDS.

Scattered along the banks of the Tennessee River, over a great portion of its course, are to be found interesting "shell mounds". In some areas, especially throughout northern Alabama, these mounds are very numerous, occurring every few miles on the high banks overlooking the river above flood stage. In extent they vary from a few square yards to upward of three and four acres, and frequently are from three to fifteen feet in depth. In composition they represent a very carefully selected group of species of fresh water clams and large snails; occasionally a bit of broken pottery is to be found, and bits of worked flint and fragments of arrow-heads are sometimes very abundant.

These shell mounds, which are known to ethnologists as "kitchen middens", represent the refuse dumps of ancient Indian encampments. The high ground on which they are found prevented encroachment of flood and permitted the best possible view of the stretches of the river above and below the campsite, so as to guard against surprise attack. Most often they are located on sandy soil, affording good drainage. In some cases they are located quite a distance from the present course of the river, and in these cases it may well be that the river has changed its course considerably during the intervening time interval, as Indian camps are almost invariably located on river banks, as the rivers afforded both transportation and food supply. The huge and astonishing numbers of clams which make up these heaps indicate that these early Indians depended upon the molluska of the Tennessee River to no little extent for food, though it is highly probably that the degree of dependence upon this type of food was seasonal. The clams and snails were undoubtedly gather

by hand, probably by the women and children, killed and cooked in boi water, and the shells dumped upon one constantly growing pile. This pile we find today practically intact and undisturbed except for superficial surface weathering. Hunderds and hundreds of thousands of shells compose these middens, and as they weather out at the surface or are exposed by slipping banks, the shells are found *in situ* in such perfect condition that they appear as if but recently placed there. Only the somewhat chalky condition indicated their age. So whole and perfect are they that their identification is as easy as that of living specimens. The shells found in these piles are definitely not all of the species represented in the river today, nor can it be said that a single species is to be found in the shell piles that is not found as living in the river to-day. Therefore it seems probable that the Indians selected those species for food which proved most palatable to them, and rejected those species which, for some reason or other, they found unsuited to their taste. The following are the species found in these mounds, listed in the order of their relative aburdance:

CLAMS (PELECYPODS)

Fusconia edgariana.

Elliptio dilatatus.

Quadrula pustulosa.

Elliptio cassidens.

Pleurobema plenum.

Amblema costata.

Proptera alta megaptera.

Plethobasus cyphyus.

Cyprogenia alberti.

Of the species listed above, only the latter is very rare, and, since it is a very small species (only about 1 1/4 inches in length at the most) it probably played but a small part in the diet of the people.

SNAILS (GASTROPODS)

Campeloma ponderosum.

Pleurocera undulatum.

Pleurocera affine.

Polymera clausa.

Angitrema verrucosa.

Discus patulus.

In the above list of snails, the first three species are aquatic forms, the last three terrestrial. Here again, the last species mentioned is very rare and so small as to be discounted as a food species.

In studying the abundance of the various species in the mounds themselves, a great deal of variation has been noted. One example only is given to illustrate the variation: In a shell mound in the immediate vicinity of the Guntersville Dam, the large river snail Campeloma ponderosum is by far the most abundant mollusk noted, and probably forms at least 50% of all the shells in the mound, and also about 50% of the bulk of the shells themselves. In the mound at the mouth of the Flint River, this snail is not nearly as common, and fo only a small part of the bulk of the shell material of the mound.

As to the amount of material which makes up these mounds, an investigation was made of the mound lying at the western edge of the present mouth of the Flint River as it enters the Tennessee River in Marshall county, northern Alabama. With the impounding of the water [illegible] Wheeler Dam, this mound will be permanently submerged. This

mound covers approximately three acres, and the shells occur as practically a solid mass to a depth of three feet on an average. Three areas of one cubic foot were selected and the component material separated and counted; an average between the three counts was taken as an average typical cubic foot for the shell mound. Fragments, unless they represented at least the hinge, were ignored in the tabulation:

Average number of clam shells in 1 cu.ft.	56
Average number of snails in 1 cu.foot	5
Estimated number of clam shells in the mound	19,863,360
Estimated number of clams in the mound	9,931,680
Estimated number of snails in the mound	2,611,500

This particular mound is a very large one, and the material composing it is almost entirely calcarious; there is hardly a trace of soil or sand in the body of the mound. The condition and the abundance of this shell material is shown in the photographs accompanying this report.

When one considers that these enormous numbers represent merely the individual mollusks on this one mound, and when one recalls that these mounds are scattered, as mentioned, every few miles along both sides of the Tennessee River, one begins to appreciate the part which this form of food must have played in the lives of the ancient inhabitants of the region.

These shell piles are interesting in that they show the history of the mollusk life of the Tennessee River for perhaps several hundred years back. They show that intensive claming did not destroy the industry upon which it was based; that clams and snails are fit for human food; that innumerable individuals have served as food for

the Indian tribes in the past; that these people undoubtedly knew how to prepare them to suit their tastes. The same species of clams which the Indians used for food are still to be found in the Tennessee River to-day, in approximately the same abundance in which they existed in the days of the Indian, and are available as food to-day as they were in the past. Here, then, is a food reserve which has not yet been tapped or seriously experimented with. The evidence at hand shows that others have tried the food and found it at least sustaining. The same food supply is still available.

A.R.Cain.

A.R.Cain.

Figures 1 and 2.

Showing the great abundance of mollusk shells in the ancient Indian mound at the mouth of Flint River in northern Alabama. The shells here are simply weathering out as the surface of the mound gradually yields to the elements.

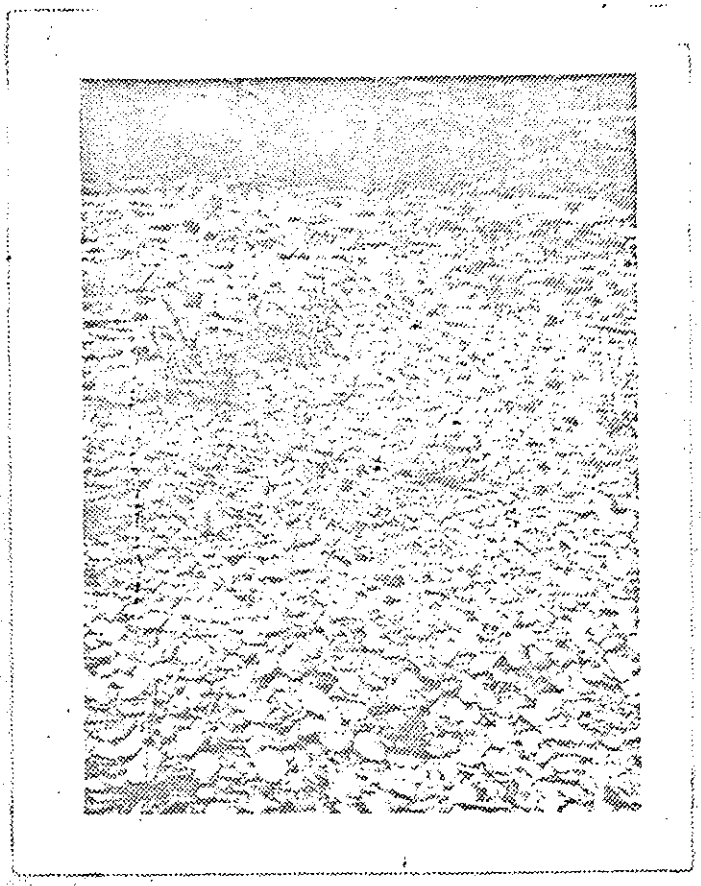

Fig. 1

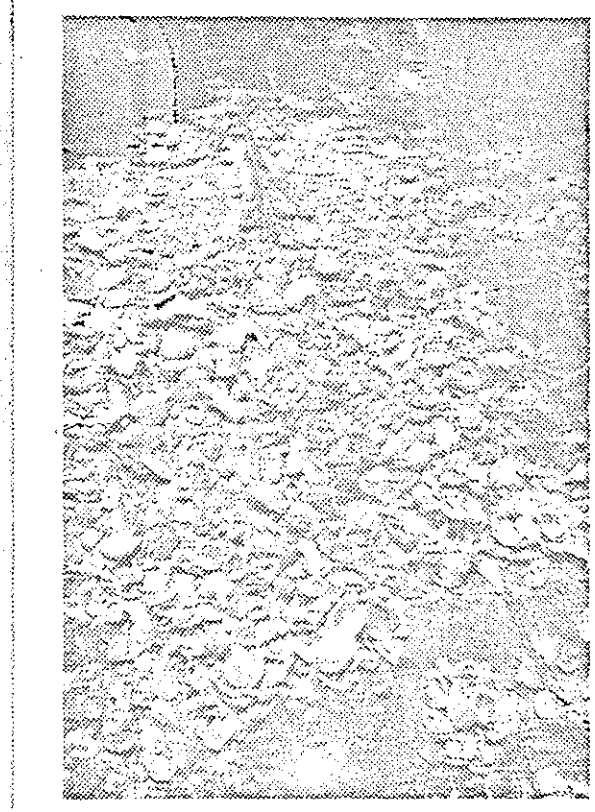

Fig. 2

Figures 3 and 4.

Showing where a slip of the bank, due to undercutting by the river, has exposed a vertical section of a portion of the Indian mound, revealing the mollusk shells in their original position. Note that there is practically nothing but calcarious material in the structure of this mound.

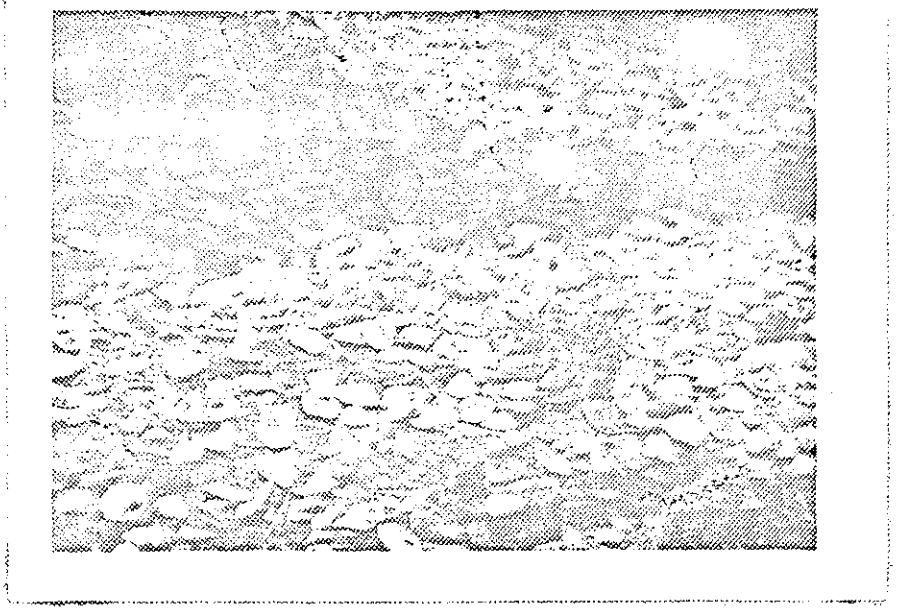

Fig. 3

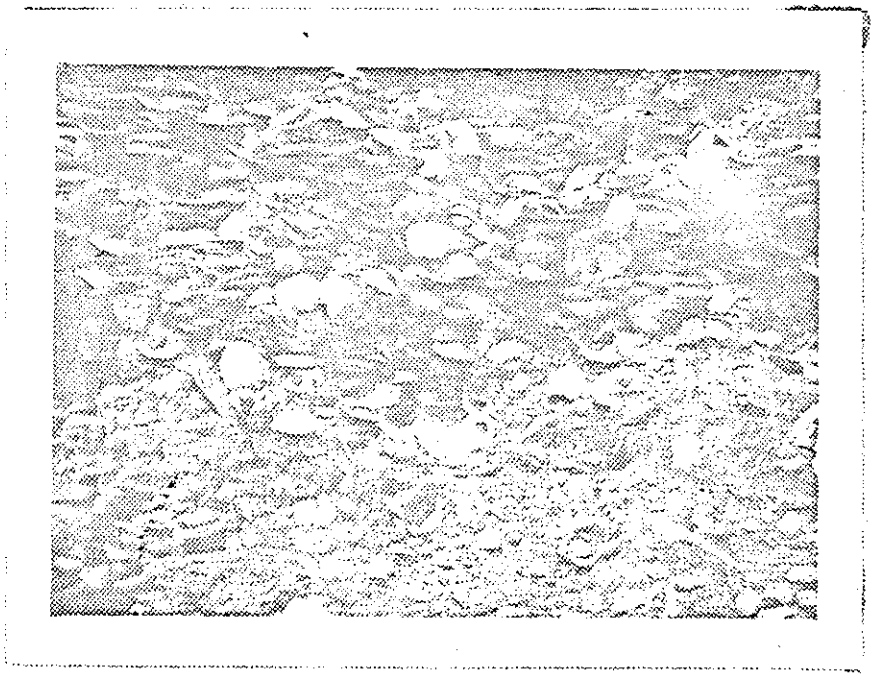

Fig. 4

THE MUSSEL INDUSTRY IN THE WHEELER RESERVOIR AREA

by

A.R.Cahn.

1936

THE MUSSEL INDUSTRY IN THE WHEELER RESERVOIR AREA.

The pearl-button shell industry is one of the important means of livlihood of many men in that portion of the Tennessee River in northern Alabama which is to become the Wheeler Reservoir following the impounding of the water behind the Wheeler Dam. One of the reports presented in this set of three has stated that the clams, because of their inactivity and inability to move rapidly enough to avoid disaster, are pre-doomed to suffer a profound change in their environment, which change will beyond doubt destroy the animals and with them the industry based on them. It is the intent of this brief note merely to point out the status which this little understood industry has assumed in that very limited portion of the Tennessee Valley.

The industry is in the hands of well developed organizations located in the larger nearby cities, which buy up collected mussel shells and ship them to the centers of the pearl button industry. For this region of northern Alabama, one of the chief centers is Paducah, Kentucky, because of its accessibility for shipment of the shells by way of the Tennessee River. Several shell-buying organizations operate from this center. The exact number is not at present known, but is reported to be six. But two of these have been located and contacted and these have both gladly furnished the brief information contained in the statistical table of this report.

The gathering of the shells is the work of local clam fishers, and these men are for the most part old hands at the task, for it requires no little skill to gather the shells from

of shells. The shells brought into Decatur, Alabama, are shipped by water to the Pioneer Button Company at Paducah, Kentucky, or by rail to the McKay Button Company at Muscatine, Iowa, or to various factories in New York State.

The following table shows the extent of the industry insofar as present information has revealed it. The data has been furnished by two buyers, Mr. O.L.Newson of Decatur, Alabama, and by Mrs. Thomas of Paducah, Kentucky.

Table 1.

Year	Buyer	Area	Tons	Value per Ton	Total Value
1933	Newson	Decatur	240	16.00	3,840.00
1934	Newson	Decatur	325	18.00	5,850.00
1935	Newson	Decatur	80	14.00	1,120.00
1936	Newson	Decatur	250	18.00	4,500.00
1936	Thomas	Florence	6000	18.00	108,000.00

CONCLUSIONS.

The muscle gathering industry involves a great deal of experience and ability in order to produce satisfactory results. The shell gatherers do nothing else; they are a class unto themselves. The industry is no small item in the economics of the area. With the erection of the Wheeler Dam and the establishment of the Wheeler Reservoir, it will be wiped out.

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