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John Withrow Burris

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BY

JOHN WITHROW BURRIS

Professor of Biology
(Director of the Thesis)

Professor of Biology

Professor of Biology

Acting Chairman of the
Department of Biology

Dean of the Graduate School

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JOHN WITHROW BURRIS

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INTRODUCTION

This study was undertaken to survey the representative bryozoans in Grenada and Sardis Reservoirs in northern Mississippi. In addition it was hoped that some ecological relationships of these animals might be established with respect to other organisms, particularly the phytoplankton and zooplankton. Pectinatella Magnifica Leidy, 1851, afforded a unique example of the phylum and was extensively collected and studied.

It is recognized that representatives of the bryozoans are widely distributed; however, the majority of extant species, about 4000, are marine. There are only 45 to 50 freshwater species throughout the world. Of these only four were found in the impounded waters of the local reservoirs. In this study emphasis was placed on those animals in reservoir embayments and shorelines and no attempt was made to survey tributaries or other waters not directly affected by drawdown of the reservoirs. This report is based on observations made at four different stations on Sardis Reservoir and four different stations on Grenada Reservoir. Figures indictating station locations are included in the Morphometry Section. The results of effects of reservoir drawdown on these animals is based almost exclusively on Sardis stations.

Bryozoans were first recognized, it is generally agreed, by Rondelet in 1558 who regarded them as sea plants, giroflade de mer (Hyman, 1959). Most of the early work was done on the marine forms recognized as the class Gymnolaemata under the contemporary classification system (Ryland 1970). Freshwater forms are of the class Phylactolaemata and are the focus of this work. Both classes are represented in the freshwater environment but the Phylactolaemata is confined to it exclusively. John Ellis, in 1755, published the Natural History of the Corallines from which Linnaeus later drew to supplement his 10th edition of Systema Naturae i 1758. This placed the animals, called Zoophyta by Linnaeus, in the animal kingdom for the first time. By 1820, J. V. Thompson, an Englishman, had thoroughly studied the Zoophyta on the southern shores of Ireland. Thompson named these animals Polyzoa, the name generally recognized in Britain and the commonwealth countries to the present day. In 1831, G. C. Ehrenberg, in Germany, published his work on these animals presumably without knowledge of Thompson's work and named them Bryozoa, the name now generally in use in America and mainland Europe. By majority usage the term Bryozoa is the more accepted term (Ryland, 1970).

A review of the literature reveals the first definitive work on the freshwater Bryozoans was done in 1856 by G. J. Allman in A Monograph of the Freshwater Polyzoa. Allman's monograph describes all the English species and other foreign species then known. Allman describes 21 distinct species 16 of which are British, "not one having been recorded or occurring south of the Mediterranean in the Old World or of Philadelphia in the New" (Allman 1856). In the century since Allman's work the number of recognized species has grown to 49 (Bushnell 1971). Work in the United States had only begun in 1850 and one of our most abundant species *Pectinatella magnifica* is only briefly mentioned by Allman. Leidy (1851, 1858) made a preliminary taxonomic study of the Bryozoa in America but his work was confined generally to the Philadelphia, Pennsylvania area and occasional reports from other eastern locations. *Pectinatella magnifica*, an exclusively American form was reported by Leidy in 1851 and according to Brooks (1929) has since been introduced to Germany and Japan. Since 1900 information concerning North American distribution has been included in the following references: Bushnell (1965, 1971) Michigan, Colorado, Mexico; Davenport (1904) U.S.A.; Rogick (1934, 1935, 1937, 1940, 1941, 1945), Michigan, Ohio. Rogick and van der Schalie (1950) in an extensive work list the species and variations for the north and central United States. Dendy (1963) provides most of the information concerning the bryozoans in the lower Mississippi Valley with most of his published work being primarily non-taxonomic and confined to eastern Alabama.

Little work has been done on the problem concerning the distribution of bryozoans or bryozoan ecology in Mississippi fresh waters. This study is directed to some observations of these organisms in the major reservoirs of northern Mississippi but no attempt was made to sample all impoundments or streams where water fluctuation is comparatively minimal.

A number of the many groups of organisms inhabiting the flood control reservoirs are directly affected by the rather extreme fluctuation of the water level. In Sardis Reservoir the water level may fluctuate between 235 and 275 feet above mean sea level with the highest levels occurring throughout the spring. Ritchie (1975 personal communication) reports that 90% of the water is impounded in the top 10% of the depth. A water level drop of 11 inches in one 24 hour period was observed during this study period. The majority of the water impounded is released during the drier summer months, the most productive time for many organisms, and a unique survival problem exists for sessile organisms or those not highly mobile.

During periods of low water, usually in late summer and early fall, the bryozoan *Pectinatella magnifica* can be observed drying in the sun in the trees and brush uncovered as the water recedes. Many variations in color have been observed and are thought to be primarily due to algae, McGaha (1973, unpublished data).

Studies concerning plankton in the reservoirs of Mississippi were conducted by Hanebrink (1965), McGaha and Knight (1966) and McGaha and Steen (1974). These studies though generally confined to the tributaries and limnetic zones of the lake, proved a valuable adjunct for study of ecological relations in the bryozoan population. The algae and other organisms found in close relation to the bryozoan colonies were compared to these previous studies.

Prior to the present, no known study of the extant bryozoans of local flood control impoundments or their relation to other organisms in these waters has been undertaken. The purpose of this paper is two fold: first, to identify those species present and second, to ascertain some of their ecological relations in the unique reservoir habitat.

The most common species found in both reservoirs was *Pectinatella magnifica* and it was this species that was used for the major portion of the ecological study. However, the survey also indicated that *Plumatella repens* Linnaeus 1758 is a common form and further study may indicate that there are more colonies of this species present than of *Pectinatella magnifica*.

Pectinatella magnifica represented the larger number of individuals and the size of the colonies enables instantaneous recognition therefore a casual survey may lead to an assumption of superior numbers. Records of colonies of

Pectinatella magnifica 1 m long by .3 m thick have been recorded in nearby waters (Dendy 1963). Similar observations have been made in local impoundments, but have not been recorded (McGaha 1973 personal communication). Colonies of Plumatella repens are much less conspicuous than those of Pectinatella magnifica and the casual observer may continually overlook them. The writer believes the relatively small size and wide variance in the general morphology of the Plumatella repens colonies may lead such observer to underestimate the total colony count of Plumatella repens greater than that of Pectinatella magnifica.

Early in the study it was determined that a definitive listing of the species should be made and is thus included. The four species observed in order of most common occurrance were: Pectinatella magnifica Leidy 1851, Plumatella repens (Linnaeus) (1758), Fredericella sultana, (Blumenbach) 1779 and Paludicella articulata (Ehrenberg) 1831. The occurrence of the two latter species is discussed along with theories concerning their local appearance. An apparent lack of diversity was noted in Mississippi of the representative of the phylum when compared to the north central states as recorded by Rogick (1934, 1935) and Bushnell (1966).

Though considerable work on these organisms has been done in other locations of the United States little has been recorded in Mississippi and particularly in the flood control waters. Previous studies make only short remarks concerning the numbers and locations of statoblasts in the many varieties of samples taken from the impoundments. This baseline study broadens the reported number of species in these waters by three. Scant reference to the fourth, Pectinatella magnifica was encountered. A detailed study of colonies of Pectinatella magnifica and the associated organisms was made. Observations began in March 1974 and terminated in July 1975.

true north. The conservation pool extends but 10 miles and usually is at this point in the last part of the calendar year, when rain is less frequent. Previous reservoir descriptions were made by McGaha (1966). During the study period the water level varied from a high of 275 feet MSL to a low of 236 feet MSL. During the year prior to the study the crest reached 282 feet MSL and a low of 236 feet.

The reservoir is surrounded by wooded area into which the water floods when the lake is above 255 feet MSL. This level is usually reached or exceeded from February through October. Much of the vegetation bordering the original streambed has been killed in the ensuing years since the water was impounded in 1940. Only a few large tree stumps remain in the conservation pool and provide a substrate for sessile organisms. Further inland in the flooded area mostly *Salix nigra* Marsh, and *Taxodium distichum* (L.) Rich survive and provide an abundant substrate.

Station 1, Toby Tubby drainage, has an abundance of *Betula nigra* L. on which many *Pectinatella magnifica* were found. This station consisted of flat fields and open woods inundated throughout the spring and summer of both 1974 and 1975. The deepest water at this station was 3 meters and usually averaged less than 1.5 m. Water had been drawn down from this area by August 23, 1974, leaving the bottom exposed.

Station 2, Coontown Crossing, borders the open lake and extends one-half mile along the shoreline in both direction

MORPHOMETRY OF SARDIS RESERVOIR

Sardis Reservoir is one of four major flood control reservoirs in the northern half of the state of Mississippi. It is part of the flood control protection for the Yazoo Valley and the Mississippi backwater area. The dam and appurtenances are located on the Little Tallahatchie River about 14 miles west north west of The University of Mississippi. The drainage area totals 1,545 square miles most of which lies to the north and east of the University. The dam is earth filled with a concrete spillway and adjustable gates to regulate the water. The upstream side of the dam is revetted with a thick layer of very large limestone boulders extending down into the water to the base of the dam which is an average of 18 feet below the surface. A wide variation in the dimension of the lake exists because of the flood control design. The mean flood control pool elevation is 281.5 feet MSL and has a surface area of 58,500 acres providing a shoreline of 370.0 statute miles. The conservation pool, in contrast, has a lowest level of 234.5 feet MSL and a surface area of 9,800 acres providing a shoreline of 60.0 miles. When filled to the emergency spillway crest the lake extends 30 miles in a direction of 050° from

from the boat launching ramp. Vegetation consists mainly of *Liquidambar styraciflua* L., *Salix nigra*, *Betula nigra*, *Taxoidium distichum*, *Nyssa* sp,, and small unidentified shrubs and vines. This station affords the opportunity of following the receding water to the limits of the inundated vegetation as the water is drawn down. A variety of jetsam and drift-wood is present along the shoreline providing a good habitat for many species of sessile organisms.

Station 3, East Dam, was chosen because of the extensive amount of large rocks which were used in constructing the dam and protecting the boat launching ramp. The station is defined as extending from the stairway from the overlook eastward to the second boat launching ramp. Some vegetation occurs, the majority of which is *Salix nigra*. Most of the area is exposed limestone boulders with some rock and mud shoreline. This area includes the reservoir outlet.

Station 4, Clear Creek Landing, borders the north side of the bay formed by Clear Creek. It extends one-half mile on either side of the boat launching ramp. Vegetation consists mainly of *Salix nigra*. The bottom consists of some small rocks embedded in clay but is mainly sand and clay. This provided a poor substrate for sessile organisms. Water levels below 250 feet MSL exposes virtually uninhabitable mudflats in the station area.

Physical and Chemical Aspects of Sardis Reservoir

The physical and chemical conditions of the reservoir have been carefully recorded over a period of years by McGaha (1966) and McGaha and Knight (1966), (U. S. Army Corps of Engineers reports and other unpublished data), and by McGaha and Millican (1967). These reports indicate that over many years the surface to one meter in depth water temperature generally does not drop below 6 C and often does not go below 10 C. Water temperature rose above 15 C during the period April 7-11, 1974, and April 15-18, 1975. It remained above 20 C until the period of October 22-27, 1974. The highest surface to one meter temperature was recorded at station 1, Toby Tubby drainage, on July 30, 1974. The temperature was 35.0 C to .5 meter depth which was the bottom and the air temperature was 34.5 C immediately above the surface. The pH was 6.8 during April, 7.0 during May and June, 7.2 July through September and dropped to 6.8 in October. Though stratification occurs in the reservoir it does not become a factor until the water is several meters in depth. Carbonates are usually not recorded except during high temperature encountered in the summer. Bicarbonates may range from 15.0 to 25.0 ppm. Free carbon dioxide varies from 1.0 to 2.0 ppm in the top meter of water. Dissolved oxygen was not monitored during this study; however, Lind (1974) indicates that the solubility of oxygen in pure water at 760 mm Hg would range from 9.76 ppm at 15 C to 7.04 at the highest temperature recorded at 35.0 C. Turbidity may range from less than 5.0 ppm to more than 100.0 ppm with lowest turbidity occurring during the summer and fall. Studies by the writer in other work indicate variable light energy penetration depth ranges from 1.2 meters in January to a maximum of 7.0 meters during July. These measurements were at maximum sensitivity of 560 NM and reflect the magnitude of the euphotic zone variation generally found in Sardis Reservoir.

Figure 1. Map of Sardis Reservoir showing sampling stations.

MORPHOMETRY OF GRENADA RESERVOIR

Grenada Reservoir, constructed in 1953, is the southernmost of the four major flood control impoundments in northern Mississippi. It is part of the Yazoo Basin Headwater Project for control of floods in the Mississippi River alluvial valleys. The dam is earth fill and lies astride the Yalabusha River approximately 40 miles southwest of the University of Mississippi. The face of the dam is revetted with a thick layer of large limestone boulders extending into the water to the base of the dam. The spillways are concrete and water drawdown is controlled by an outlet at the south end of the dam. The backwater forms a horizontal "Y" shaped lake with the southern arm, the Yalabusha River, oriented due east. The other arm, the Skuna River, extends approximately 045° from true north. The flood pool area is 64,600 acres with a shoreline of 282 miles. The pool elevation is 231.0 feet MSL and extends 22 miles up the northeast arm and 19 miles up the east arm at this elevation. The conservation pool encompasses an area of 9,800 acres with a shoreline of 54.0 miles. The lowest pool elevation is 193.0 feet MSL. During the period of this study the reservoir varied from a level of 225 feet to 198 feet MSL.

The reservoir is immediately surrounded on all sides by hardwood and pine forests. The water level usually reaches into the bordering *Salix nigra* and *Betula nigra* growth along the upper shoreline and exposes many decaying stumps as the water recedes to the conservation pool. Sand and mud-clay flats are exposed as the water is drawdown below 210 feet MSL. This usually occurs during September and October.

Station 1, Piney Woods, includes the Knight Creek drainage to Piney Woods boat ramp. Numerous small *Salix* plants are inundated in this area during the early spring and summer providing ample substrate for many *Pectinatella magnifica* colonies. Floating logs and other materials are abundant in the quiet backwaters providing shelter and substrate for *Plumatella repens* colonies. This area was practically devoid of backwater after September 10, 1974.

Station 2, Graysport, encompassed the area roughly contained to the west of Graysport high level crossing and east of Choctaw Landing. Direct access to the lake is restricted to two points in this area. Many stumps of varying sizes protrude at all water levels and provided abundant collecting points for *Pectinatella magnifica* colonies up to the time cold weather causes their death.

Station 3, Hugh White Park, includes the area west of the Piney Woods boat ramp to the Marina at Hugh White State Park. Steep banks of hard clay, sandstones and loose sand predominate in this area. At high water the small embayments trap floating logs and debris providing a number of productive substrates for many sessile organisms.

Station 4, Skuna-Turkey, encompasses roughly the entire pool of the Skuna River drainage to Gum's High Level Crossing A variety of habitats abound in this area, but collections were restricted because of difficulty of access. Dried remains of colonies were collected for study from this area in March 1975. Habitats are very similar to those at Station 2.

Physical and Chemical Aspects of Grenada Reservoirs

The physical and chemical conditions of Grenada Reservoir are similar in most respects to those of Sardis Reservoir with a few major differences. Data obtained by McGaha (1966) and McGaha and Millican (1967), provide most of the information used to evaluate average conditions. Abnormally high rainfall during the period immediately prior to the present study was taken into account when the data were compared. These reports indicate the lowest surface tc 1 m temperature to be 7.6 C and in some years rarely goes below 10 C. The surface water temperature rose above 15 C during the period of April 2-7, in both 1974 and 1975, and continued to rise to above 20 C where it remained until the period of October 26 to November 1, 1974. The highest surface temperature observed was 32.5 C at station 3 on August 18, 1974, and the lowest was 8.0 C on

January 15, 1975 at all stations. The pH ranged from a high of 7.4 in October to a low of 6.6 in February. Stratification occurs during the summer months but was not considered a contributing factor in this study. Carbonates were recorded in other studies as occurring during summer months. Bicarbonates were not monitored but may be expected to range between 16.0 and 27.0 ppm according to McGaha (1966). Dissolved oxygen was not monitored during this investigation; however McGaha (1966) had previously recorded dissolved oxygen as 10.5 ppm at 8.0 C and 6.9 ppm at 32.5 C and these data were considered as indicative of reservoir oxygen content for purposes of this study. The turbidity varies widely and is a major difference in the properties of Grenada Reservoir and of Sardis Reservoir. It ranged from a low of 19 ppm in June to a high of 140 ppm in February. Previous studies indicate turbidity above 1000 ppm in the upper major tributaries. Though the silt load has been reduced from this level by the time the water reaches the study stations, a value above 100 ppm is quite common. The effect of this amount of material on filter feeders is not known. Independent studies indicate that light penetration is limited and the euphotic zone extends to 3.5 m during the summer months to occasional limits of .5 m after heavy runoff in the early spring.

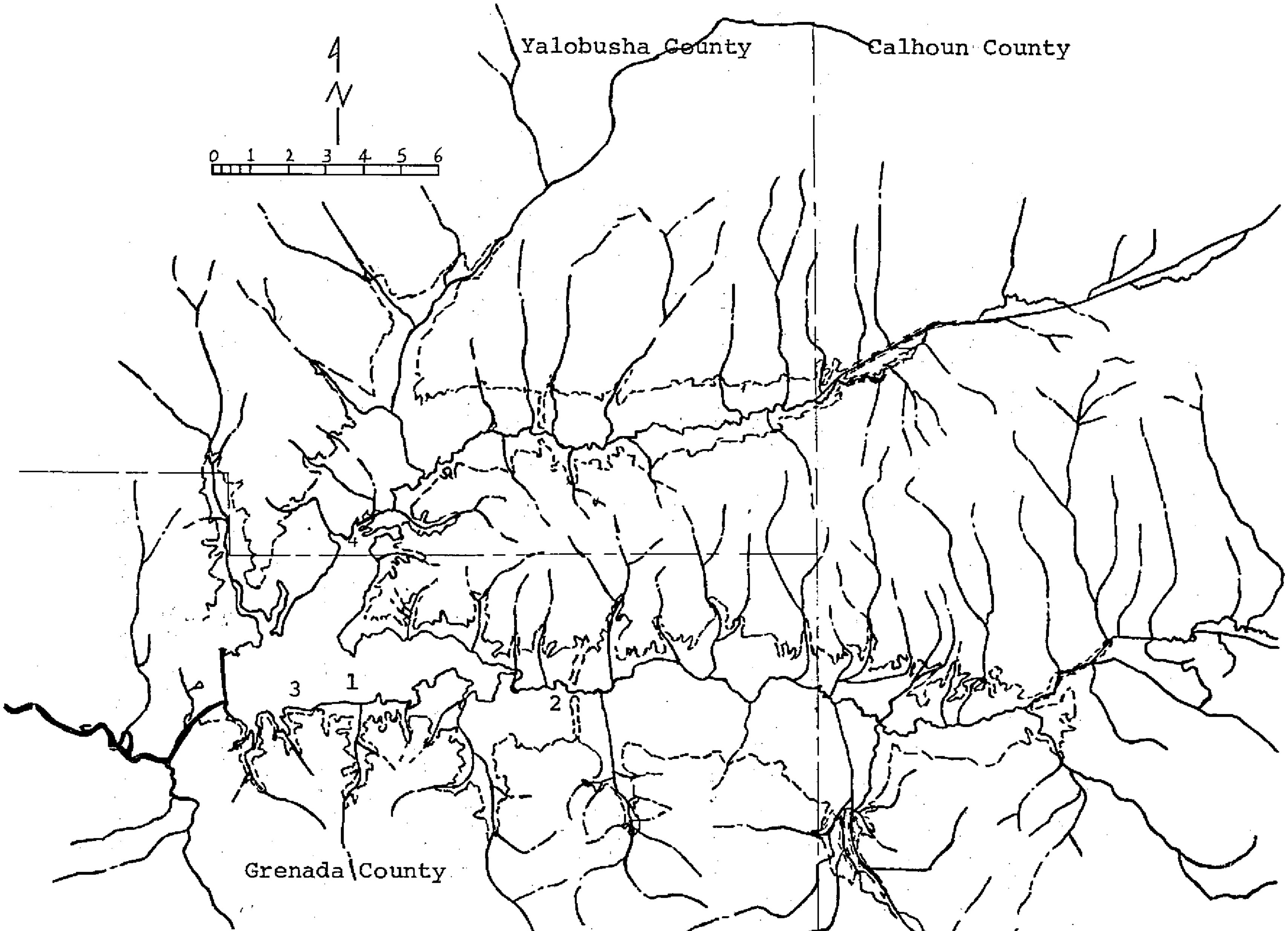

Figure 2. Map of Grenada Reservoir showing sampling stations

MATERIALS AND METHODS

Bryozoan colonies used in this study were all collected by hand from a variety of substrates. On each collecting trip containers of differing volumes up to one gallon capacity were carried to the site. Each collecting vessel was one-third full of 10% formalin to preserve the specimens. In addition, several clean, empty containers for live specimens were included. A large plastic washbasin was carried as it was necessary to dissect the larger *Pectinatella magnifica* colonies prior to preservation in order to pass them through the container mouth. The material left after dissection was then poured into the same vessel to be preserved. As each colony was collected it was cut from any vegetative substrate so that no more than 1 cm protruded from the colony. In the case of thin, extended colonies (e.g. *Plumatella repens*), attempt was made to confine the size of the substrate, but the laboratory survey of associated animals was confined to a distance of 1 cm from the colony. As each colony was collected it was immediately immersed in the formalin. Air temperature; water temperature at collecting level; type of substrate, pH; exposure to wave action; sun and shade; depth of capture and site were then noted. The collection was then returned to the laboratory for further study.

Collection sites were established to provide a variety of substrates. Also, ease of access for Sardis sites was a consideration so that *in situ* studies of live specimens could be made. The sites at Toby Tubby and Coontown Crossing supplied habitats quite suitable for most purposes. Descriptions of these sites are found in the section on Morphometry of Sardis Reservoir.

In situ studies were made by tagging the site with a small plastic florist's marker cut to about 1 cm^2 and attached to the substrate with thin wire. White markers were chosen for ease of visibility. The colony number and a rough sketch of the smaller colonies was made to include the branching and the number of zooids present. A count through a 3 power, 3 inch glass was made. No attempt was made to differentiate between the zooecia containing live zooids and those which had expired. For the large colonies of *Pectinatella magnifica*, only clones were counted and a total volume was recovered. The volume was measured by filling the clean container to the maximum then introducing the living colony. The water thus displaced was caught and measured in a 100 ml graduated cylinder and the colony was then returned to the water and secured for later study. No volumetric study was feasible on the smaller colonies, but more accurate growth of the colony could be established as the total number of zooids was usually small.

At the *in situ* study sites a washing was taken before each volume determination. This was done by using a standard laboratory wash bottle of previously boiled and cooled lake-water. Those organisms thus collected were brought live to the laboratory. Some organisms were recorded from the washings that were not found -- or at least not recognized -- in the preserved specimens. These washings were made only from *Pectinatella magnifica* colonies as it appeared the nature of the other three species would prevent an accurate analysis of this type. Live unwashed specimens were included in the collection for further analysis.

Observations of the living zooids and colonies were made using a Bausch and Lomb Stereozoom dissecting microscope with 10x ocular. Evaluation of the microscopic organisms was made with a Bausch and Lomb Standard Laboratory Microscope with a 10x eyepiece, a 16 mm, 4 mm and an 1.8 mm oil immersion objective. For study of the extended zooid the method stated by Knudsen (1966) using menthol crystals sprinkled on the water was used. The narcotized polyps were then preserved in 5% formalin with the lophophores extended. These relaxed and preserved specimens were mounted in Hoyer's fluid without further clearing, and proved adequate for the present study.

A qualitative study of those organisms associated with the colonies was also made in the laboratory using the preserved specimens. The small Pectinatella magnifica colony or the complete colony of Plumatella repens was placed in a petri dish under the dissecting microscope and all larger organisms then removed with sharp pointed forceps or small pipettes. The organisms were sorted by phylum into plastic (7.5 cm^2) weigh trays containing 5% formalin. Larger colonies of Pectinatella magnifica were removed from the preservative and dissected in a plastic tray and organisms placed in the weigh tray. It was found that the clones of Pectinatella magnifica could be easily removed so that the underlying gel was exposed for study. The material left in the preserving jar was then decanted and the residue examined for those animals that were dislodged when the mass was preserved.

The organisms were identified where possible to genus with some identified to species. The sources used in identification were Buchanan and Gibbon (1974), Cooper (personal communication) Davis (1955), Forest (1954), Eddy (1961), Jahn (1949), Knight (1969, unpublished dissertation, University of Mississippi), Needham and Needham (1962), Pennak (1953), Prescott (1962)(1970), Vinyard (1974), Ward and Whipple (1959), and Young (personal communication).

DISCUSSION OF THE SPECIES

Four species, each of which represented a separate genus were observed in the two reservoirs. One representative of the Class Gymnolaemata and three representatives of the Class Phylactolaemata were recorded during this 16 month study. The one species of the Class Gymnolaemota was represented by only four colonies all found in Sardis reservoir. Only one species *Pectinatella magnifica* was found at all eight stations.

Class Gymnolaemata

Paludicella articala Ehrenburg 1831,,the least common species found in both Sardis and Grenada Reservoirs, was the only representative of this class collected. The four colonies recorded were all located within the area of Sardis station 2. The first three colonies were found together on a floating log approximately 100 cm in diameter by 2 m long in .5 m of water. They were located in an inundated copse of trees about 200 m northeast of the boat launching ramp at Coontown Crossing. These were first encountered on June 12, 1974. The temperature in the shallow water at that point was 24 C. These were tagged as colonies PA 1,2, and the third was removed and preserved in 5% formalin for later positive identification.

The fourth colony, PA 4, was located within 50 m of the boat launching ramp in about 20 cm of water. This colony was found June 25, 1974 on the underside of a floating well worn board approximately 2 cm by 10 cm by .5 m, and the water temperature was recorded as 26.5 C. This was apparently a young colony as only eleven zooecia were then present. Further development was not evident the following week on July 5, and no trace of the colony was found on July 16. The other two colonies, PA 1 and PA 2, consisted initially of 17 and 25 zooecia respectively. Both colonies were formed in a straight line with a branch appearing first at the ninth zooecia on PA 1 and the twelfth on PA 2, and with a tertiary branching on PA 2. Only colony PA 2 increased in size during the observation period and this was by two zooecia, both on the secondary branch. Bushnell (1966) constructed straight line graphs to exhibit the growth rate of polypides using the equation:

$$Nt = N_o e^{rt}$$

"where N_o is the initial number of polypides in a colony or the mean of polypides (in the case of multiple colony graphs) at the time observation was begun, and N_t represents the population number at the end of t days. The base of Naperian logarithms is e, and r is the instantaneous growth rate." Applying this to the observed colonies suggests that a mere survival was being maintained by all three examples. He also suggests that some species are temperature specific and though he does not mention _P. articulata_ as one of these he records it as fairly common in many Michigan lakes. All three colonies appeared to be disentigrating after the water temperature rose above 27 C.

The three colonies could only be incidentally observed for their relationship with other animals. Predation by fishes has been observed for other species by Dendy (1963) and Rogick (1959) and must be assumed possible. Although none was evident many small fish ranging from fry to several centimeters in length were frequently observed in the vicinity. A hand lens revealed many small invertebrates and alqae on the substrate. Pieces of wood were removed approximately 10 cm away from the colonies -- to preclude disturbing them -- and brought to the laboratory for observation. These along with the previously preserved specimens were picked apart. Analysis of organisms from so few specimens may not necessarily be representative.

Representative Associated Organisms

Algae -- The algae observed in association with _Paludicella articulata_ were primarily of the Phylum Cyanophyta. Of these the predominate genus was _Oscillatoria_. These were found in close association with all colonies, though not sufficiently abundant to obstruct the lophophores. Several species of Chrysophyta, most of which were unidentified diatoms, were observed on the debris and fecal pellets at the base of the colonies. Specimens of Chlorophyta, of the flagellated Pyrrhophyta and Englenophyta were not found. Algae of the phylum Phaeophyta or Rhodophyta were not present on either substrate.

Protozoa -- There were many motile protozoans of both Subphyla Mastigophora and Ciliophora present but no attempt to further classify them was made. Of the sessile ciliates an abundance of Vorticella spp. virtually covered the substrate and many were seen attached to older zooecia. The Subphylum Sarcodina was represented equally by the shelled amoeba genera Arcella and Centropyxis. Several different species of Arcella were observed. Normally they were associated with the bryozoan fecal pellets.

Porifera.-- Though no Spongillidae colonies were observed on either of the two substrates many gemmules were attached. These were tentatively identified as belonging to the genus Spongilla based on the fact that no spicules other than acerate type were present. These gemmules were present in large numbers on all colonies of the four bryozoan species. An abundance of this sponge is known to grow in both reservoirs.

Coelenterata.-- The coelenterates were represented by only one species, Hydra americana Hyman 1929. One example was observed in close association with the bryozoan colony.

It was less than 10 mm from the colony but was assumed not to be in symbiotic relation as there were three more attached at various distances from the colony. No other members of the genus were found, however, this species was fairly common on debris at Sardis Reservoir Station 2. Cordylophora spp. was observed on several occasions during the search for bryozoan colonies. It was seen most frequently in Grenada Reservoir. None occurred in close proximity to the bryozoans in either reservoir.

Platyhelmenthes.-- Platyhelmenthes were not observed on or near the Paludicella articulata colonies; however, Pennak (1953) stated that the bryozoans are an incidental element in the diet of planarians. Bushnell (1966) recorded in his observations that certain species of Ectoprocta may be more free from predation than others. Insufficient observations were made to draw conclusions from the present study.

Nemtaoda.-- Several nematodes were observed in and near the colony. One specimen was found coiled within an empty zooecia but there was no obvious evidence of predation. These worms were all apparently of the Class Adenophorea. Live specimens were not used in identification which made classification difficult. These organisms were common on nearby substrates.

Rotifera -- Several species of rotifers were observed in the container after the specimen was preserved. Of the free-living rotifers Brachionus spp. the most abundant. They appeared to be common in the area near the colony. Knight (1969, unpublished dissertation, University of Mississippi) reported Branchionus havanaensis Rousselet, 1911 to be common at a station approximately .5 mile from Sardis Station 2. Of the sessile rotifers, Limnias spp. were present on the substrate but more distant than 10 mm from the colony. This genus was fairly common in relation to the other bryozoan species with some found in between the branches of Plumatella repens and Fredericella sultana. The rotifer genus Limnias was found to be more abundant in Grenada Reservoir than in Sardis Reservoir.

Bryozoa.-- Other species of bryozoan were not present at the two locations; however, frequent sharing of substrates was seen for other species in Sardis Reservoir. More samples of Paludicella articulata may be expected to indicate a casual sharing of substrate.

Annelida -- Representatives of the phylum Annelida were common. The dominant genus was the oligochaet Stylaria. Five representatives of this genus were found in the one colony dissected and all were in or around the zooecial tubes.

Arthropoda.-- The dominant arthropods were Crustaceans. Three equally common representatives were of the subclasses Ostracoda, Copepoda, and Branchiopoda. The class Arachnida was represented by a single mite which was not classified further. Although the class Insecta was not found, Bushnell (1966) notes that heavy predation by Trichopteran larvae is common to bryozoan colonies. He also stated that Chironominae larvae are noteworthy preditors of ectoprocts. No indication of the presence of these larvae was noted but they were encountered frequently with colonies of other bryozoan species collected from both reservoirs.

Class Phylactolaemata

The Phylactolaemata was represented in the two impoundments by three species, each of a different genus. They are represented in both impoundments by Pectinatella magnifica, Plumatella repens and Fredericella sultana.

Fredericella sultana Blumenbach 1779

Fredericella sultana was found at stations 2 and 4 in Sardis reservoir and only at station 3 in Grenada Reservoir. A total of 19 colonies was observed. The majority was found in May, 1975 at which time 11 colonies were observed at Grenada, Station 3. Most colonies are quite inconspicuious and the number present in the reservoirs may be underestimated. The largest colony was a highly branched example measuring 3.3 cm by 2.1 cm at Grenada Station 3 and containing a total of 53 zooecia. The substrate was a 5 cm x 10 cm x 4 m board floating in 1 m of water. The top of the board remained out of the water and the colonies were distributed on the under surface. The board was found in a protected cove bordering the east campground at Hugh White State Park. The surface water temperature was 25.0 C and the pH 6.8. These 11 colonies constitute the only record of the genus in Grenada Reservoir.

The colonies were observed at Sardis Reservoir Stations 2 and 4, Station 2 having five colonies and Station 4 only two. Station 2 produced four colonies on a single decaying log located approximately 200 m south of the launching boat ramp, in mid July of 1974. The second colony was approximately 100 m north of the ramp and was found in late July of 1974. The water depth averaged .5 m with a surface temperature of 30.5 C and a pH of 7.1. The remaining two Sardis Reservoir colonies were found on September 22, 1974 at station 4 approximately 400 m southeast of the boat ramp. They were on the same base which appeared to be an old cedar stump approximately 20 cm in diameter and extending into the water to an undetermined depth. The water temperature was recorded at the surface at 28.5 C. Colonies of Fredericella sultana were frequently encrusted with debris and usually colored dark brown making detection difficult. The writer believes the genus to be more common than this study indicated. A detailed record of the growth rate and continued colony counts were not made.

All substrates except the soft, decaying log at Sardis Station 2 proved to be too firm to remove the organisms without unacceptable destruction. The live colonies were taken from that location for study upon which the following is based.

Representative Associated Organisms

Algae.-- An apparent bloom of Spirogyra spp. was observed concurrently with the study at Sardis Station 2. Numberous filaments were found closely associated with the bryozoans but did not appear to hinder the extension or retraction of the lophophores. Though Spirogyra spp. was the dominant genus Oscillatoria was also common. Numerous diatoms were present with some attached to the older zooecia but no obvious symbiotic relation was detected.

Protozoa.-- Two organisms of the Family Amoebidae together with many active unidentified ciliates were distributed in the detritus and fecal pellets. On the substrate and scattered throughout the colony were many Vorticella spp. These were commonly observed with all colonies of bryozoans except those of Pectinatella magnifica.

Porifera.-- Sponge colonies were not observed on the substrate but the ubiquitous gemmules were found within the perimeter of the colony.

Nematoda.-- Several nematodes of the Class Adenophorea were within 10 mm of the colony. No actual predation or evidence of it was observed.

Rotifera.-- The most abundant free-living rotifera observed all belonged to the genus Brachionus, but several Monostyla spp. were also recorded. One representative of the genus Conochilus were also recorded. One representative of the genus Conochilus was on the substrate within 10 mm of the colony but appeared to be a transient from an earlier bloom of the colonies. Limnias spp. were the most common sessile cohabitor.

Bryozoa.-- The Reservoir colonies were not usually accompanied by other bryozoans. However, the colonies observed late in the study at Grenada Station 3 were sharing the substrate with many colonies of Plumatella repens, several of which were less than 10 mm apart.

Annelida.-- An abundance of oligochaetes was found in the immediate vicinity of the bryozoan colonies investigated. The only genus positively identified was Stylaria spp. which was secondary in numbers. An unidentified worm was observed to crawl over one of the lophophores with impunity, but no evidence of attempted predation was indicated.

Arthropoda.-- The dominant arthropods in evidence were only an incidental small Acari. All were apparently of the same genus since they possessed a bright silver "Y" on the dorsal hysterosoma. They were associated with the fecal pellets and no predation was indicated. Unexplicably there were few crustaceans, the most of which were ortracods and copepods of unidentified genera. There was no evidence of any of the Chironominae or any other insect predation on the specimens taken to the laboratory. However, the colonies at Grenada Station 3 showed evidence of predation from unknown sources and several Dipteran larvae were sharing the substrate, among these were several of the genus Tendipes spp. However, no actual predation was observed and these colonies were returned to the water while the Tendipes spp. larvae preserved for further study. Evidence of Tendipes spp. association with the bryozoans was infrequently observed.

Plumatella repens (Linnaeus) 1758

Plumatella repens was numerically surpassed only by the colonies of Pectinatella magnifica. Plumatella repens was observed at two stations in Grenada Reservoir and three stations in Sardis Reservoir. An abundance of colonies were present at both Grenada Stations 3 and 4. Sardis Stations 1 and 2, had a number of colonies but they were not as abundant as in Grenada Reservoir.

The presence of Plumatella repens in Sardis Reservoir was suspected after many statoblasts were observed enmeshed in an old Spongilla spp. colony found at Sardis Station 1 in early April, 1974. These statoblasts were carefully removed from the sponge and placed in a large petri dish with water from the reservoir. The water was left at room temperature which averaged 21 C. A single zooid emerged on the eighth day and three more were thriving by the tenth day. These were kept alive for an average of 29 days each with occasional water changes and an infusion of *Euglena* spp. and wheat grain bacteria culture. Evidence that the *Euglena* spp. were consumed was obvious by the green fecal pellets. No further growth or colony formation was attained with these organisms.

The first field colonies were not observed until July 17, 1974 at Sardis Station 1. The habit of growing on the underside of objects or within crevices and, many times, between the loose bark and the stump of old inundated trees makes this species quite inconspicuous. No colonies were observed on substrates commonly reported by other workers. The limestone rocks at Sardis Stati-ns 3 and 4 were periodically monitored for colonies but yielded no evidence of this species. In both reservoirs the most common occurrences were observed on the underside of wide, flat floating objects and old tree bark, particularly *Salix nigra*. Equal preference for both horizontal and vertical orientation of colonies was indicated. The colonies were encountered most often in protected areas where wave action was minimal.

Four colonies of *Plumatella repens* located in Sardis at Station 1 were marked for growth study. These colonies, along with nearby colonies of *Pectinatella magnifica*, were monitored approximately every seven days for six weeks in July and August, 1974. The *Plumatella repens* colonies were located on a 5 cm x 10 cm x 3 m piece of rough lumber awash in the Toby Tubby Creek backwater. Access was gained by walking to the site approximately one mile north of Mississippi Highway 314.

The four colonies were labeled R-1, R-2, R-3 and R-4 for identification. The following table indicates the data recorded:

Table 1. Number of Zooids per *P. repens* Colony by Date.

Colony	7/17	7/23	7/31	8/5	8/13	8/22
R-1	73	81	87	95	109	118
R-2	27	29	30	30	27	28
R-3	52	56	63	70	73	74
R-4	22	21	21	22	19	17

A decrease in reproduction rate was indicated sometime after August 5. Though Colony R-1 continued steadily to add zooecia the other three slowed. Water temperature at this time had reached 31.5 C which may have had an effect on the colonies. The large colony was branched, and adding organisms at the top of the branches would make the growth rate appear greater with respect to a smaller or less branched colony. Bushnell (1966) indicated in his study of Michigan ectoprocts that the theoretical increase in polypides beginning from one polypide would reach the July 17 size of colony R-4 in 24-26 days and the size of R-1 in 33-35 days. Projecting the curve for R-1 the theoretical size should have been 150 zooids at the end of 38 days. Apparently the local colonies were not conforming to this theoretical rate. Further study over an earlier and longer period is indicated in order to compare data on growth rate.

The water level of Sardis Reservoir was drawn down rapidly during August and it became no longer feasible to protect the colonies from dessication, and on September 6th two of the substrates were dry. The zooecia were removed from the substrate and brought to the laboratory to be examined for statoblasts. None was contained within a dessicated zooecia but several were attached to the nearby substrate.

Live colonies of Plumatella repens were collected from Grenada Reservoir in June, 1975 for study of associated organisms. All colonies were collected from Grenada Stations 3 and 4. Two colonies on the inner bark of a Salix nigra stump were taken at Station 4 and three from the underside of a large floating board at Station 3. The two collection points were less than two miles apart and were considered to be of the same environment for purposes of the ecological investigation.

Representative Associated Organism

Algae.-- Few examples of algae were observed with the exception of Oscillatoria spp. and Fragilaria spp. The location of the bryozoans on the underside of objects out of direct light could hinder photosynthetic organisms. Oscillatoria spp. were associated only with those colonies on floating objects and were not found on any of the Salix nigra bark substrates. A paucity of the algae in these locations could be explained by insufficient light or chemical interference from the substrate but evidence is inconclusive and further study is indicated. A few filaments of Spirogyra spp. were usually encountered with the Oscillatoria spp. but never in quantity. Ribbons of Fragilaria spp. were attached to the floating substrates and were frequently growing in between the Plumatella repens branches or under the zooids. Fragilaria spp. were the dominant algae found with many colonies of the bryozoans with the exception of Pectinatella magnifica. Representatives of Pyrrhophyta and Phaeophyta were not found.

Protozoa.-- With the exception of the sponges the most intimate association between any other organisms and the bryozoans was that of the protozoa. Numerous Vorticella spp. covered the substrate and the zooecia of most colonies including those on the Salix nigra. Some of these were seen on the atrium of several zooids and were nearly retracted inside the zooecia with the lophophore when the zooid was irritated. Water currents created by the feeding zooid were seen producing current in the vicinity of the *Vorticella* spp. There was an unexplained abundane of the genus *Dileptus* in the fecal pellets of *Plumatella repens* taken at Grenada Station 3 in June.

Porifera.-- *Spongilla* spp. association had been previously noted by Bushnell (1966) in Michigan. Twenty random colonies from Grenada Reservoir indicated that 35% of the time there was a *Spongilla* spp. colony in intimate contact with *Plumatella repens* colonies. Statoblasts from the bryozoans were encountered in a large number of dried sponge colonies in both reservoirs.

Coelenterata.-- *Hydra americana* was present on the substrate of some Sardis Reservoir colonies but was not found closer than 1 cm to a *Plumatella repens* colony.

Platyhelmenthes.-- *Dalyella* spp. were encountered with every colony collected on Grenada Reservoir, but no predation was observed.

Rotifera.-- The third most abundant sessile organism found with *Plumatella repens* was the rotifer of the genus *Limnias*. These were found attached to the substrate in all observations. Though none was actually adhering to the zooecia many were within the apex of branching colonies. Water currents created by the bryozoans were observed to swirl around the rotifers.

Bryozoa.-- Plumatella repens was observed to be sharing the same substrate with Fredericella sultana on one occasion, at Grenada Station 3. Several colonies of both were enmeshed with one chain of zooecia crossing the other.

Annelida.-- The annelida were represented exclusively by the oligochaetes which continually appeared to represent the largest total biomass other than the bryozoan colony itself. The majority of those encountered were of the Genus Stylaria.

Arthropoda.-- The arthropods were most commonly represented by crustaceans, the majority of which were of the ostracod family Cytheridae. Several genera of cladocerans were observed but not identified further. The insects were represented by a single small Caenis spp. naiad found with one colony and many small Chironomus spp. larvae found randomly scattered in several colonies. The Acari were present in small numbers and consisted entirely of small unidentified aquatic mites.

Chordata.-- Most of the collecting sites for Plumatella repens exhibited numerous small fish associated with them. Colonies of bryozoans in this environment showed a marked branching with stellate growth. Those found on protected Salix nigra bark were usually single column and not highly branched. Dendy (1963) showed conclusive evidence of Lepomis spp. predation on Plumatella repens colonies in Alabama farm ponds.

Pectinatella magnifica Leidy 1851

Pectinatella magnifica is found in abundance in both

Grenada and Sardis Reservoirs and was the only bryozoan recorded at all eight stations. An estimate based on the average number of colonies counted in one mile along the 200 mile shoreline in July, 1974 indicated there were more than 30,000 colonies in Sardis reservoir larger than 5 cm long.

Most of the colonies encountered were attached to small limbs of inundated trees, tree trunks and shrubs. Rarely were they found on a flat substrate as were those of other species and were usually oriented vertically. Colonies inhabited locations varying from full sun to those in more than 50% shade, but were not encountered in habitats where there was no direct sunlight for at least some part of the day. They inhabited quiet backwaters and the open lake where 1 m waves are common most of the year. Evidence indicates that they exist from the surface to at least 3 m depth with some colonies surviving out of the water as long as wave action bathes them occasionally.

Statoblasts in the laboratory will hatch in about seven days when the water is above 15 C with an optimum temperature above 20 C. Brooks (1929) indicated that in water below 20 C the colony begins to decline and 10 C can be endured for only a very brief time. The water temperature in Sardis Reservoir can be expected to rise above 15 C by mid April and drop below 20 C by mid October. The earliest encounter of a *Pectinatella magnifica* colony during this study was on May 10, and the last functioning one was recorded on November 14th.

As part of the present study an attempt was made to grow the zooids in the laboratory to ascertain whether they could be useful for other biological investigation (e.g. genetics). Fulton (1960) experimented with *Artemia* spp. larvae as a food source and was successful in culture of colonial hydroids. Brandwein (1938) used *Chilomonas* spp. and *Colpidium* spp. with success and also found that *Paramecium* spp., *Blepharisma* spp., *Arcella* spp., and *Monostyla* spp. would maintain a colony of *Pectinatella magnifica*. Though it was not within the scope of the present study to determine which types of organisms would best maintain a colony, it was observed that protozoans are apparently essential. Wheat grain bacteria infusion alone was not sufficient though protozoans such as *Euglena* spp. would sustain the zooids. Fingerbowl cultures using nutrient agar have been tried with success and allow subculture from the parent zooid. Asexual budding occurs approximately once in seven days with about five such cycles in the normally expected culture lifespan of 35 days. Only a preliminary feasibility study was accomplished and further investigation is thought to be necessary.

Growth studies of *in situ* colonies were made at Sardis Reservoir Station 1. The colonies observed were marked M-1 through M-4 consecutively for recording growth. Measurements of volume and a baseline count of clones were made for each colony. Davenport (1904) observed that Lake Michigan

Pectinatella magnifica colonies had clones containing twelve to eighteen individuals. The Sardis Reservoir study indicates an average of 37 per clone on a colony 10 cm long displacing approximately 20 ml. Table shows the data recorded during a six week period in July and August, 1974. The study was terminated when rapid reservoir drawdown made further study impractical.

Table 2. Volume-clone relationship in ml and clones per colony for P. magnifica found in Sardis Reservoir.

Colony	7/17		7/23		7/31		8/5		8/13		8/22	
	Vol.	Cl.	Vol.	Cl.	Vol.	Cl.	Vol.	Cl.	Vol.	Cl.	Vol.	Cl.
M-1	21	71	22	72	25	72	26	75	27	75	27	77
M-2	33	72	33	73	34	75	35	75	34	76	34	76
M-3	87	96	88	96	86	97	87	98	87	101	88	104
M-4	53	80	53	81	53	83	55	84	55	84	56	84

Staboblast production was observed as early as July 3rd in Sardis Reservoir and was a common occurrence in all colonies larger than a 25 ml volume by early August. All of the preserved specimens from both reservoirs showed evidence of ciliated embryos as late as October. New colonies apparently originating from these embryos were frequently encountered when the older very large colonies were collected. Live embryos were occasionally collected and placed in fingerbowls for observation. They are thought to be potentially more practical than statoblasts or colony fragments for laboratory growth studies.

Physiological studies of Pectinatella magnifica and other bryozoans have been thoroughly recorded in the literature. Both Brooks (1929) and Hyman (1959) have extensive line drawings to aid in organ identification, but studies of these drawings fail to reveal the nature of a particular structure observed on older zooids found in Sardis and Grenada Reservoirs. This structure consists of a pair of white oval objects the approximate diameter of the tentacle, located at the extreme distal end of the lophophore. They would not stain with acid or neutral red and would not indicate a positive iodine test for starch.

The physical nature of the underlying gel was also investigated. A melting point of 100 + C, a specific gravity of 1.018 and a water content of 99.52% were determined from laboratory analyses. The gel was not soluble in common organic solvents such as hexane, benzene, chloroform, ether, or ethyl alcohol. Solution of 10% HCl or 10% KOH did not dissolve or lyse the material, and it remained stable in distilled water for more than one year. The material is destroyed readily, however, by a 50% H_2SO_4 solution. Air drying the colony produces a thin cellophane-like residue of undetermined chemical composition which comprises the remaining .48% of the original gel.

Representative Associated Organisms

Bacteria.-- *Rhodospirillum* spp. colonies within the *Pectinatella magnifica* gel are apparently common from late July until disentigration of the gel occurs in the autumn. These bacteria form diffused, pink ribbons throughout the mass and are easily maintained for several months in the laboratory if they are allowed to remain in the original moist gel at room temperature. They are most often encountered in *Pectinatella magnifica* colonies over 3 cm in radius in water above 25 C.

Algae.-- A wide variety of algae was observed in relation to the *Pectinatella magnifica* colony and was most often encountered at the gel-water interface rather than embedded in the mass. The algae is most commonly observed in quantity after reservoir drawdown begins to expose the gel to air and sunlight. Analyses of associated algae were made with live Sardis Reservoir samples only, however, the same relationship is expected to exist in Grenada Reservoir.

The largest number of algae genera most frequently recorded in association with *Pectinatella magnifica* were Chlorophyta. Seven genera were as commonly found with the colonies from July through October. *Chlorella* is the most common genus and appeared to be the source of most of the green color of the bryozoans during this time. Though Chlorella spp. are found at any time, they predominate when the mass is exposed to the sun and out of the water. Four other genera: Scenedesmus, Xanthidium, Pediastrum, and Closterium, are common phytoplankters found at various stations and depths in the reservoir and are also present in common association with Pectinatella magnifica in late summer. Selanastrum spp. and Ankistrodesmus spp. which are not found in abundance in the reservoirs, were represented in most bryozoan colonies that had been out of the water for several days. The Cyanophyta were represented by two common genera, Oscillatoria and Lyngbya with Oscillatoria contributing a blue-green color most often associated with the gel which had been in contact with the substrate. A third genus of blue-green alga tentatively identified as Raphidiopsis was occasionally encountered. Asterionella and Synedra, two common genera diatoms, were most often encountered in early summer bryozoans but had declined significantly by mid September. Phaeophyta and Rhodophyta were not found in association with Pectinatella magnifica colonies collected from either Sardis or Grenada Reservoirs.

Protozoa.-- Representatives of four genera of shelled amoebas were frequent cohabitors with Pectinatella magnifica. Arcella, Difflugia, Centropyxis, and Euglypha were often encountered in the fecal pellets and in the detritus swept in by feeding zooids. They were common in every live specimen examined but *Centropyxis* spp. were the least often encountered. Members of the Family Amoebidae were observed in the same environment with the shelled amoeba but much less frequently.

Porifera.-- Sponges were not observed in close association with the colonies of *Pectinatella magnifica* but were often present on the same substrate. No intimate association such as that observed between *Plumatella repens* and *Spongilla* spp.

Platyhelmenthes.-- Planarians of the family Dalyelloidae were encountered in few colonies and were not considered common.

Nematoda.-- Nematodes were not present in large numbers on or in *Pectinatella magnifica* colonies and appeared to be only incidental members of the community showing no predation.

Rotifera.-- Numerous free-living rotifers were encountered in the water collected secondarily with the bryozoan colony. Smaller individuals were often swept into the lophophore and are apparently a major food source.

Sessile rotifers were not associated with in *Pectinatella magnifica* at any time in contrast to an abundance seen with other bryozoan species.

Bryozoa.-- Infrequent substrate sharing with other bryozoan colonies was observed and no intimate contact with any of the other common bryozoans was recorded.

Annelida.-- The oligochaetes were the only examples of these worms associated with *Pectinatella magnifica*. Several unidentified genera were observed among the detritus and fecal pellets trapped between the zooids. Stylaria spp. were recorded in significant numbers in most bryozoan specimens.

Arthropoda.-- Insects were the most abundant arthropod and the genus Chironomus was most often encountered. Examples of Cryptochironomus spp. were also collected from several bryozoans in both reservoirs. These Dipteran larvae burrow into bryozoan colonies apparently for protection and abandoned tubes can be seen throughout the gel. Several unidentified specimens thought to be Cryptochironomus Pectinatella Dendy and Sublette (1959) await further confirmation. Infrequent observations of the naiads of Caenis spp. were recorded in some Pectinatella magnifica colonies. Although evidence is inconclusive, Caenis spp. seem to be more prevalent in bryozoan specimens collected in open water of Grenada Reservoir. The Hydracarina were very infrequently observed on all colonies investigated. Crustaceans were encountered frequently but were considered as incidentally introduced with the colony when it was collected. Small copepods were usually abundant also and were apparently food source.

Chordata.-- Predation of Pectinatella magnifica colonies by a chordate was not observed, however, Osburn (1921) reported finding statoblasts in the stomach of Pomoxis spp., Lepomis spp., Micropterus spp., and Dorosoma spp., all of which are common in local reservoirs. Brown (1933) observed viable statoblasts that had passed through the digestive tract of ducks and reptiles.

CONCLUSIONS

Sardis and Grenada Reservoirs have been in existence for more than 20 years and many of their associated biological aspects have not been thoroughly examined. The present study of the bryozoan fauna has included several interesting aspects of this phylum and represents an initial investigation of these animals in local impoundments.

The drawdown of the reservoirs has little apparent affect on the continued survival of Pectinatella magnifica and Plumatella repens. Insufficient data concerning Fredericella sultana and Paludicella articulata was gathered to indicate survival problems over any length of time. Fredericella sultana was observed during two separate growing seasons and is assumed to be established. Paludicella articulata was infrequently encountered and should be considered rare when compared to the other three species.

Paludicella articulata forms hibernacula and Fredericella sultana forms a sessoblast for survival under adverse conditions. No evidence of these bodies has been found either floating on the lake or in plankton samples. Rogick (1959) indicated that hibernacula of Paludicella articulata are cemented to the substrate and are presumably denied as wide a distribution as might be expected from a statoblast producing bryozoan such as Pectinatella magnifica. Fredericella sultana produces a sessoblast with an average dimension of .5 mm by .25 mm which does not float. These sessoblasts have not been recorded in plankton samples from either reservoirs and are probably not as readily dispersed as statoblasts floating on the surface. Both Sardis Stations 1 and 2 are located within a few miles of a State Wildlife Refuge where many transient waterfowl gather throughout the winter. Statoblasts, sessoblasts and hibernacula may have been introduced on the feet of ducks and geese or from their digestive tracts. Bushnell (1973) observed that birds may be able to disperse the organisms for more than 600 km. in this manner. Paludicella articulata was recorded in Sardis Reservoir at a location frequented by large numbers of migratory waterfowl but was not observed in 1975. The species is therefore thought to be either not well established or a transient in northern Mississippi.

The record of so few observed colonies of Fredericella sultana in both reservoirs may be attributed to several alternative conclusions. The possibility exists that the maximum growth of members of this genus takes place earlier than the observed time when the water is cooler and the organism has a dormant period during the summer months. Bushnell (1966) observed living colonies from December to

March in water of 1.5 C to 2 C in several Michigan lakes. *Fredericella sultana* may be a transient and be seasonably introduced by other means though the presence of the species at diverse locations and times would tend to refute this. The most plausable explanation is probably that the genus is more commonly represented than indicated and was overlooked on many substrates.

Plumatella repens growth studies were compared to the theoretical rate established by Bushnell (1966) for Michigan bryozoans. Since the growing season is longer in Mississippi water, it is probable that the rate is a simple geometric one. The possibility exists that there was an environmental stress such as low free oxygen and high temperature combination that caused a temporary reduction in reproductive activity which, if dessication had not occurred, would have been resumed during the cooler season. The data in Table 1 are belived to be inconclusive in that they represent a relatively short period of time in the life of the whole colony and are therefore not truly representative.

Pectinatella magnifica colonies are very prolific in northern Mississippi impoundments. Statoblasts of the species are found in abundance in both plankton and benthos samples and form windrows along the reservoir shores.

Observations of the feeding habits of bryozoans based on samples taken from Sardis Reservoir indicate that the primary food source consists of is protozoans and rotifers. No preference to phytoplankton or zooplankton was indicated by these observations. The relation of the spong and bryozoan colonies is not clear but it appears to be simply the sharing of an ecological niche by two prolific organisms. Hydra americana and Cordylophora spp. were the only two colenterates observed and are assumed to be only an incidental association. The platyhelmenths were infrequnetly observed and their role as predators of bryozoans was not established in the present study. Nematodes and oligochaetes were most often encountered in connection with detritus and the fecal pellets. Their function along with many protozoans was observed to be primarily fragmenting and consuming the fecal pellets and associated materials lodged within the colony. Sessile protozoans such as Vorticella spp., and the rotifer, Limnias spp., appear to benefit from sharing the bryozoan substrate. These animals capture other organisms swept past the lophophore of the much larger bryozoans and are assumed to benefit from the exposure to a larger volume of water. The arthropods encountered most often were several species of insect larva, and those found with Pectinatella magnifica were apparently utilizing the gel as a source of protection. No predation of bryozoans by the larvae was observed as might be expected. The relation of vertebrates with the bryozoans could not be directly determined, however, the presence of insect larvae must present a food source for fishes and incidental feeding on zooids very likely occurs. Direct feeding on the zooids probably accounts for the different growth habit of *Plumatella repens* colonies found in Grenada reservoir.

Pectinatella magnifica forms a gel underlying the zooids of the colony. Laboratory analysis of this material revealed several unexpected properties. The material is stable for long periods when moisture is maintained and may provide a valuable bacterial culture medium. Although no plants other than the algae were observed to be growing in the medium, the clear gel may also function as a simple substrate for germination studies.

SUMMARY

1. A survey of the bryozoans of Sardis and Grenada Reservoirs was conducted from March 1, 1974 to July 10, 1975.

2. Collecting stations were established at four locations on each reservoir for a total of eight stations.

3. Methods for determining numbers and species of bryozoans are not well established and analyses of samples may not reflect a true representation.

4. The bryozoans were found to be represented by four species: *Pectinatella magnifica*, *Plumatella repens*, *Fredericella sultana*, and *Paludacella articulata*.

5. *Pectinatella magnifica* is well established in the impoundments and survival of the species does not appear to be affected by reservoir drawdown.

6. *Plumatella repens*, *Fredericella sultana* and *Paludacella articulata* have not been previously reported in northern Mississippi waters.

7. *Paludacella articulata* is a suspected transient, thought to be introduced by wildfowl in Sardis Reservoir.

8. Small organisms such as the sessile rotifers protozoans and bacteria apparently form commensal relations with some bryozoans.

9. Protozoans and oligochaetes are mutualistic consorts with most bryozoans.

10. Protozoans and small rotifers are the dominant food source for the colony.

11. Algae associated with *Pectinatella magnifica* are prolific only after the death of the bryozoan colony when the moist gel provided a suitable substrate.

12. Predation of colonies of bryozoans is indicated but may be secondary to other food sources in or on the colony.

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BIOGRAPHICAL SKETCH OF THE AUTHOR

John Withrow Burris, the son of Mrs. Henrey J. Richard and Christopher J. Burris Sr., was born in Badin, North Carolina in 1930. He was educated in the Virginia and North Carolina school systems and graduated from high school in 1948. His formal education was interrupted by the Korean War after two years of college. Mr. Burris remained in the Air Force after the conflict but took a leave of absence in 1965 to complete the requirements for a B.A. degree awarded by St. Andrews Presbyterian College in 1966. He returned to duty with the Air Force to serve in the Indochina conflict and flew 126 combat missions with the Strategic Air Command. Mr. Burris retired from the service in 1973 as a Lieutenant Colonel and has since been attending the University of Mississippi. He plans to pursue the Ph.D. degree and enter the profession of college teaching. His permanent home address is: 2539 North Washington Boulevard, Arlington, Virginia 22201.