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# A Study of the Limnetic Zooplankton of Five Flood Control Reservoirs

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# A STUDY OF THE LIMNETIC ZOOPLANKTON OF FIVE FLOOD CONTROL RESERVOIRS

by

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# INTRODUCTION

Limnological literature contains much valuable information on limnetic zooplankton communities (Edmondson, 1955; Hall, 1964; Pennak, 1957; Wright, 1965); however, the composition, structure and seasonal abundance of such communities is widely variable. Data collected in one lake, like fingerprints, are never quite the same for another. Little is known about the zooplankton of Nebraska and information on recently constructed reservoirs is badly needed.

Small, Great Plains Reservoirs, are characteristically shallow and subject to considerable nutrient enrichment from agricultural runoff, thus, are especially vulnerable to eutrophication and subsequent devaluation for human use, as described by Hasler (1947).

Many physical, chemical and biological parameters must be studied and understood before there is to be any hope of eventually slowing down the process of eutrophication so that our waters can be preserved, to some extent, for future use. Study of zooplanktonic herbivore communities is one means of beginning to unwind and understand the complex of changes occurring during the aging process of a lake.

Crustaceans (Cladocera and Copepoda) were chosen for study because of their well known importance in the limnetic food chain (Edmondson, 1957; Gibor, 1957; Wright, 1958).

## DESCRIPTION OF RESERVOIRS AND SAMPLING STATIONS

Branched Oak, Holmes, Pawnee, Stagecoach and Wagon-train Reservoirs, built as flood control and soil conservation projects in the Salt Valley Watershed by the United States Army Corps of Engineers, were studied from June 1968 through December 1970. The reservoirs are all located within a 20 mile radius of Lincoln, Nebraska.

Drainage areas consist primarily of agricultural and pasture lands. Spring and summer rains account for about three-quarters of the annual precipitation in this area, which averages about twenty-eight inches. Some outflow from the reservoirs may occur during spring runoff. The study reservoirs are relatively shallow and are often subjected to quite strong southerly winds in spring and summer; thus, thermal stratification does not occur. Pertinent morphometric data are given in Table I. Limnological data pertaining to the study are given in Table II.

### A. Branched Oak Reservoir

Branched Oak Reservoir is located 4 miles west of Raymond at Sections 33 and 28, T12N, R6E. Two branches of Oak Creek are the major streams flowing into the reservoir. The drainage area consists primarily of agricultural land.

During the summer of 1968 the mean depth was less

TABLE I

Morphometric data of the Study Reservoirs

| Name | Branched Oak | Holmes | Pawnee | Stagecoach | Wagontrain |
|---|---|---|---|---|---|
| Date Completed | 1967 | 1962 | 1965 | 1964 | 1962 |
| Watershed Area (Sq. miles) | 88.7 | 5.35 | 35.6 | 9.7 | 15.6 |
| Surface Area (Acres) | 1800 | 112 | 740 | 195 | 315 |
| Maximum Depth (Meters) | 8 | 4-5 | 8 | 5 | 6 |
| Mean Depth (Meters) | 4.4 | 1.9 | 3.7 | 3.0 | 2.6 |
| Depth at Station 1 (Meters) | 8 | 4 | 4 | 5 | 4 |
| Depth at Station 2 (Meters) | 8 | 5 | 5 | 2 | 5 |
| Depth at Station 3 (Meters) | 6 | 4 | 8 | - | 6 |

Table II. Summer Means of Selected Features of the Study Reservoirs.*

| | Secchi depth inches | Alkalinity mg/l as $CaCO_3$ | Ortho Phospate mg/l $PO_4$ | Total Phosphate mg/l $PO_4$ | Organic Nitrogen mg/l N | $NO_3$ Nitrogen mg/l N | Dissolved Solids mg/l | pH |
|---|---|---|---|---|---|---|---|---|
| Branched Oak | | | | | | | | |
| 1968 | 93 | 235 | 0.20 | 0.51 | 0.32 | 0.28 | 325 | 8.2 |
| 1969 | 68 | 200 | 0.22 | 0.36 | 0.21 | 0.48 | 335 | 8.2 |
| 1970 | 44 | 186 | 0.05 | 0.13 | 0.28 | 0.11 | 280 | 8.4 |
| Holmes | | | | | | | | |
| 1968 | 9 | 99 | 0.22 | 0.49 | 0.36 | 0.44 | 185 | 8.0 |
| 1969 | 10 | 102 | 0.27 | 0.35 | 0.21 | 0.99 | 181 | 8.1 |
| Pawnee | | | | | | | | |
| 1968 | 80 | 164 | 0.16 | 0.47 | 0.28 | 0.21 | 210 | 8.3 |
| 1969 | 72 | 139 | 0.05 | 0.29 | 0.28 | 0.30 | 198 | 8.4 |
| 1970 | 24 | 156 | 0.04 | 0.12 | 0.26 | 0.09 | 220 | 8.2 |
| Wagontrain | | | | | | | | |
| 1968 | 23 | 174 | 0.18 | 0.56 | 0.34 | 0.22 | 244 | 8.1 |
| 1969 | 11 | 129 | 0.14 | 0.25 | 0.31 | 1.49 | 221 | 7.9 |
| 1970 | 20 | 178 | 0.04 | 0.13 | 0.27 | 0.10 | 269 | 8.2 |
| Stagecoach | | | | | | | | |
| 1969 | 41 | 130 | 0.06 | 0.22 | 0.29 | 0.25 | 231 | 8.3 |
| 1970 | 27 | 135 | 0.04 | 0.12 | 0.42 | 0.08 | 243 | 8.7 |

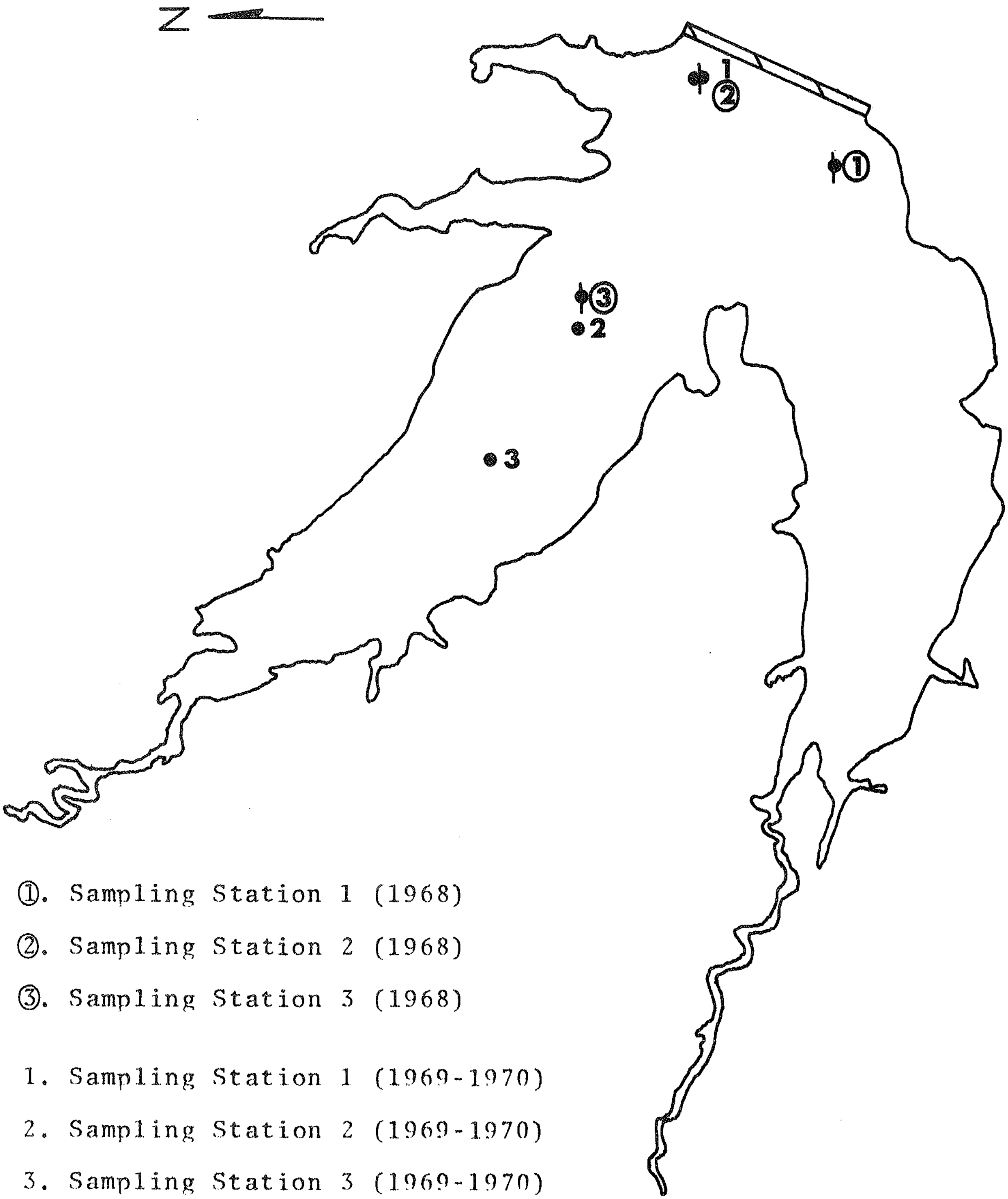
* Data from Hergenrader and Hammer (1971)

than 2 meters, but had increased to 4.4 meters the following summer as the reservoir filled. During 1968 submerged terrestrial and aquatic vegetation was abundant throughout the reservoir. During 1969 and 1970 the sampling stations were changed because of the increasing size of the reservoir (Figure 1). By mid-summer aquatic macrophytes, principally Potamogeton and Polygonum, emerge at stations 2 and 3. The approximate depths of the sampling stations are given in Table I. Recreational development is underway, with several access roads nearing completion and numerous shelter areas being constructed. Limited boat use is permitted for fishing but skiing and other sports requiring speed boating are not yet allowed.

B. Holmes Reservoir

Holmes Reservoir is located on the southeastern edge of the city of Lincoln at Section 4, T9N, R7E. Antelope Creek intermittently feeds the reservoir. Some farm and pasture land, as well as a golf course, are included in the drainage area. Wind action keeps the two shallow basins stirred. Sampling was discontinued in Holmes at the end of summer, 1969. The littoral area in Holmes Reservoir is extremely confined. The location of the sampling stations is given in Figure 2, sampling station depth in Table I. Holmes Park is used by the public for sailboating, fishing, picnicking and golfing.

Figure 1. Branched Oak Reservoir and Location of the Sampling Stations.




①. Sampling Station 1 (1968)

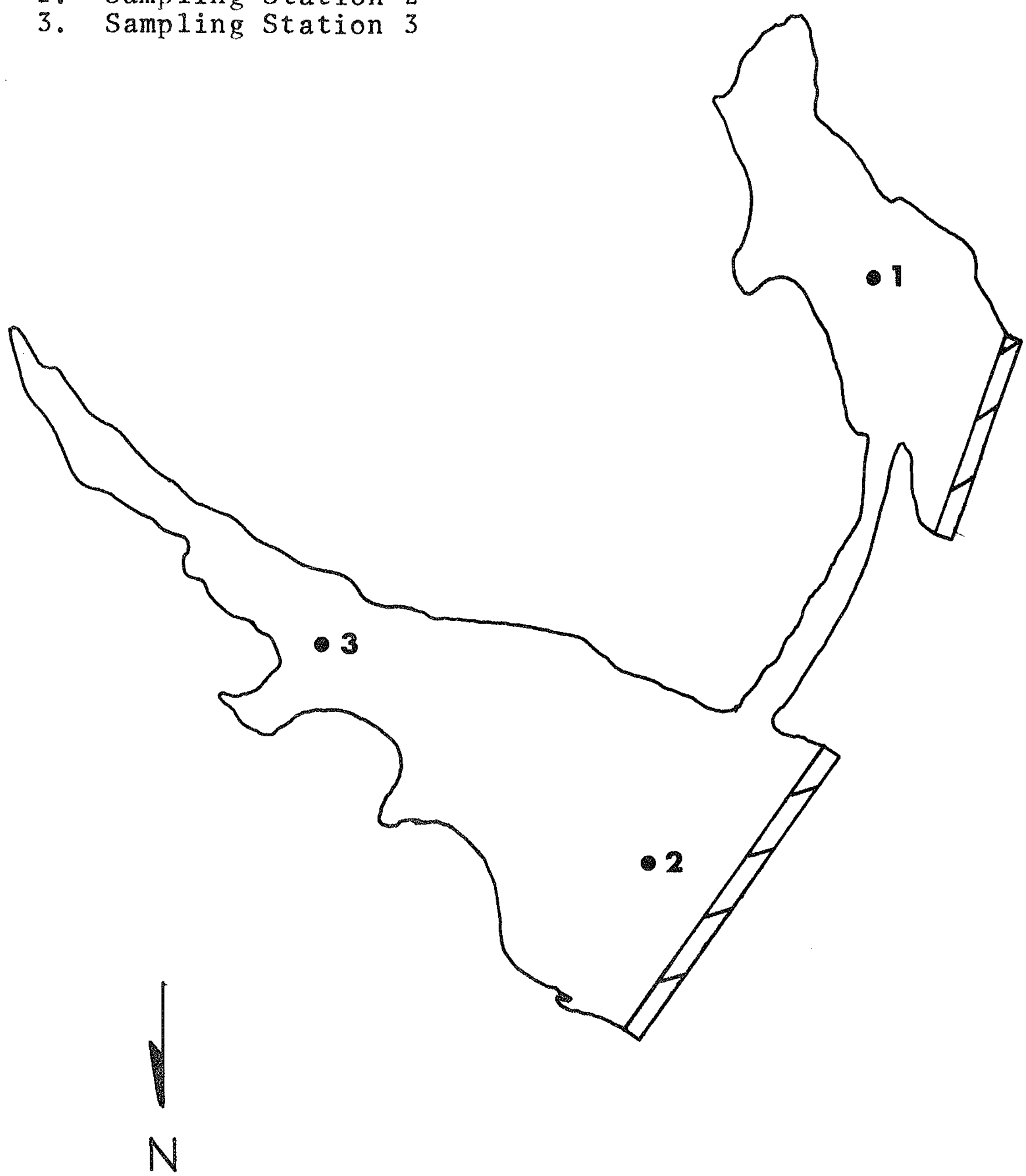
②. Sampling Station 2 (1968)

③. Sampling Station 3 (1968)

1. Sampling Station 1 (1969-1970)
2. Sampling Station 2 (1969-1970)
3. Sampling Station 3 (1969-1970)

Figure 2. Holmes Reservoir and Location of the Sampling Stations.

1. Sampling Station 1
2. Sampling Station 2
3. Sampling Station 3



## C. Pawnee Reservoir

Pawnee Reservoir is located 12 miles northwest of Lincoln at Section 8, T12N, R5E. The watershed consists of farm and pasture land. The town of Garland, a possible source of domestic sewage, is located within the drainage area. An intermittent stream, Middle Creek, is the major tributary feeding Pawnee.

Dead trees and brush emerge at the north end of the reservoir in the vicinity of the inundated river channel. Aquatic macrophytes grow out to a depth of about 5 meters in the summer. Plankton sampling problems caused by aquatic plants occur only at station 1 (Figure 3).

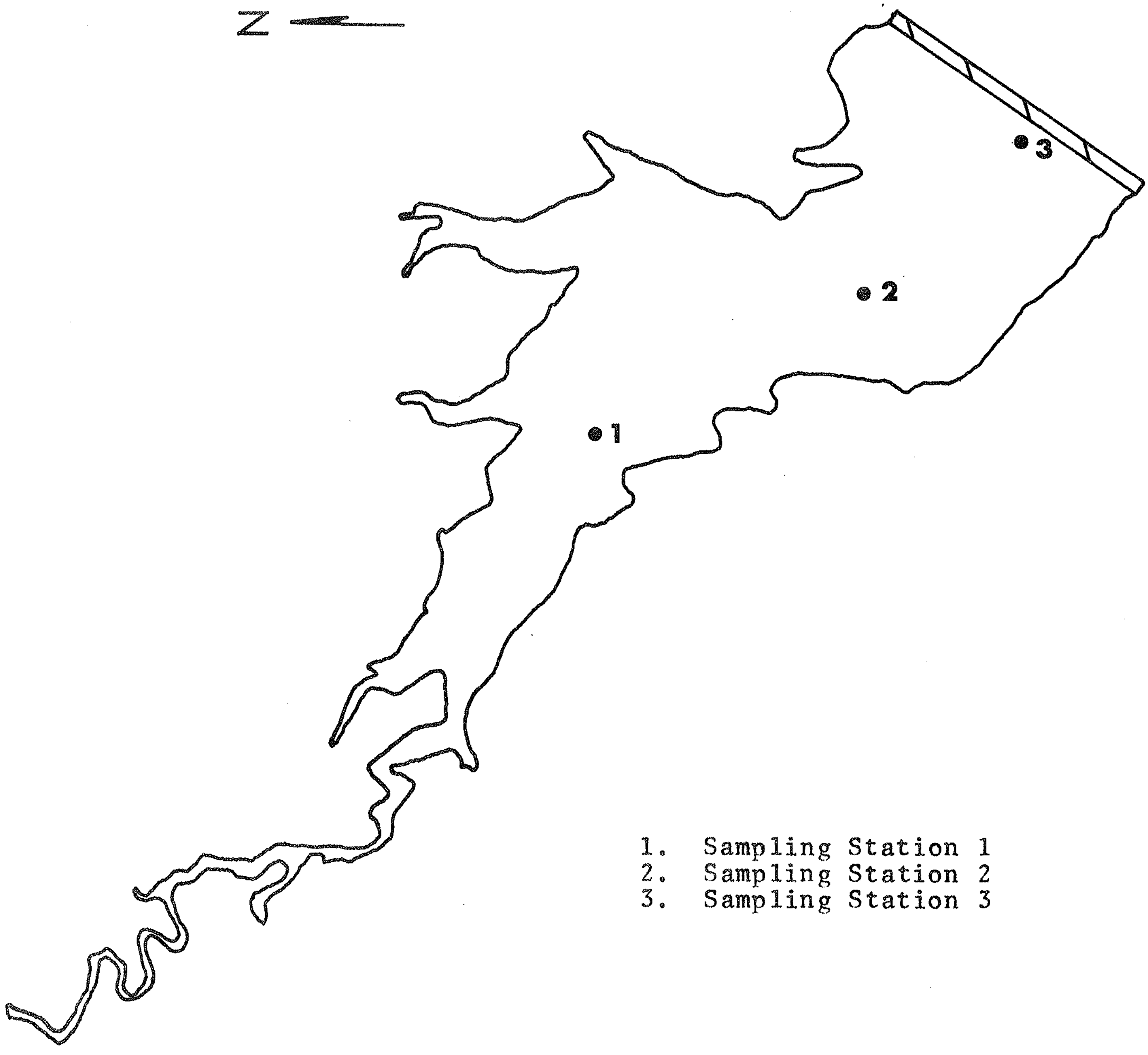
Pawnee was the only reservoir studied on a year-round basis. Extensive use is made of this reservoir for boating, camping, picnicking and fishing.

## D. Stagecoach Reservoir

Stagecoach Reservoir, located 13 miles southeast of Lincoln at Section 4, T7N, R7E, is fed by the south tributary of the Hickman Branch of Salt Creek.

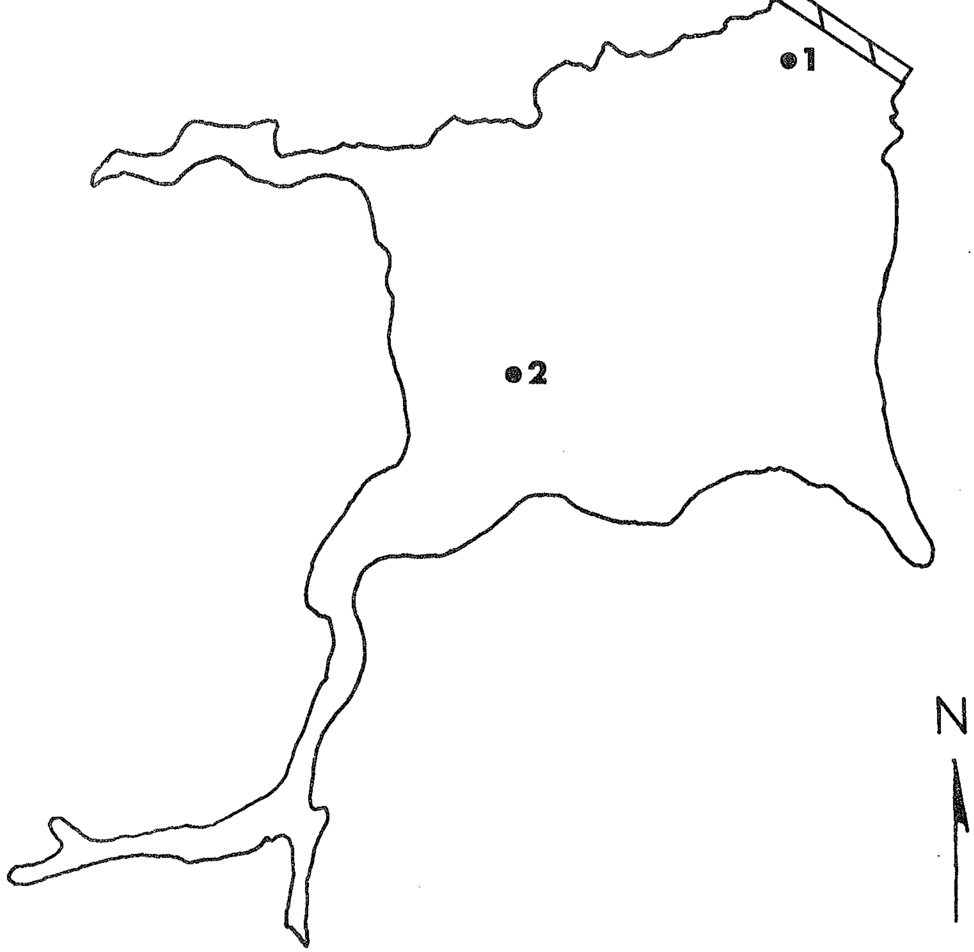
Stagecoach Reservoir and the sampling stations are quite shallow (Table I). Sampling station locations are shown in Figure 4. This reservoir was sampled during the summers of 1969 and 1970 only. Station 1, near the dam, is one of the few places where aquatic plants are not abundant because this is the deepest section of the reservoir. Station 2 is often difficult to

Figure 3. Pawnee Reservoir and Location of the Sampling Stations.




1. Sampling Station 1
2. Sampling Station 2
3. Sampling Station 3

Figure 4. Stagecoach Reservoir and Location of the Sampling Stations.


1
2
N

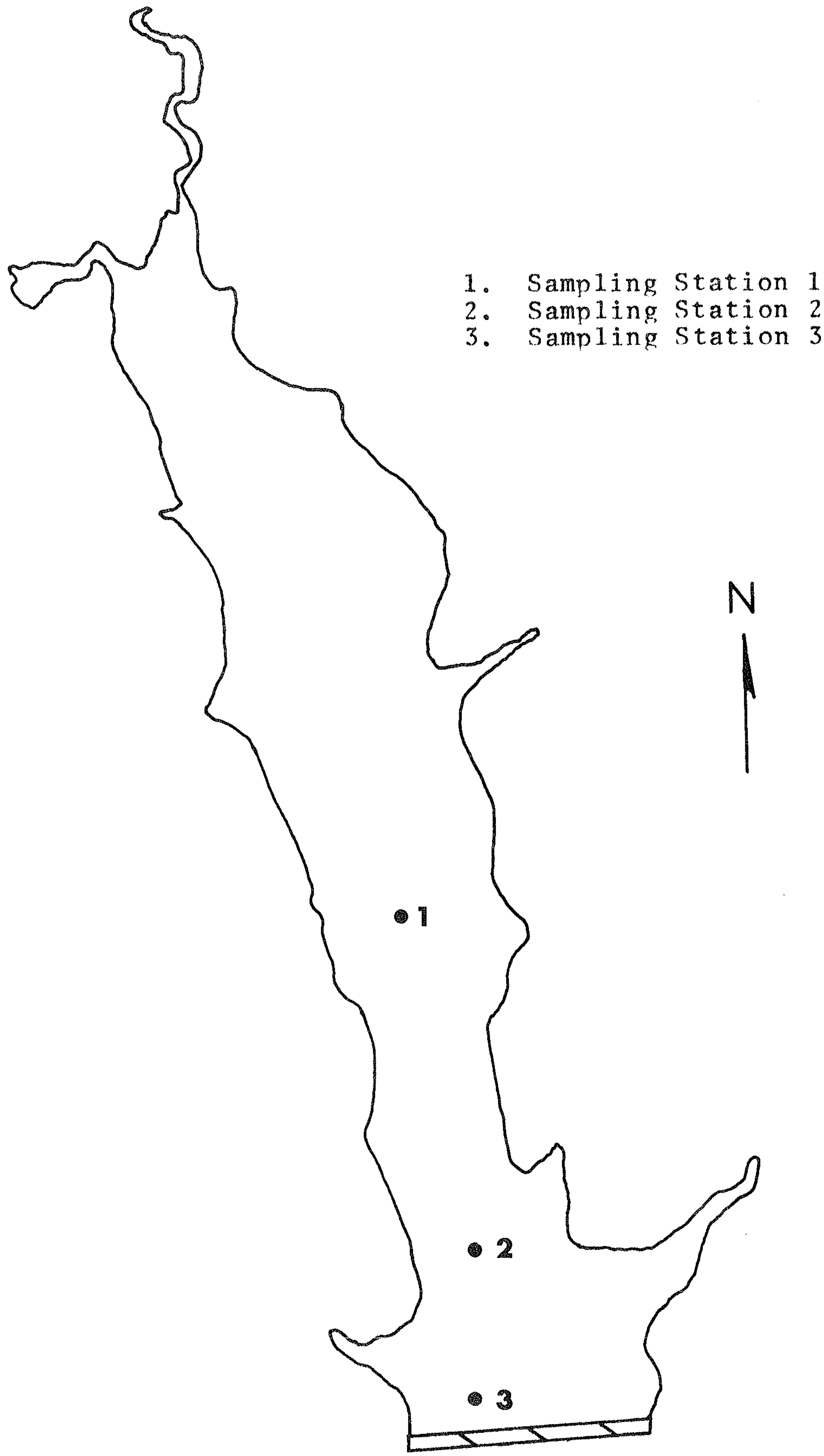
sample for zooplankton because of rooted aquatic plants. Farming and cattle grazing are practiced in the watershed while picnicking, fishing and limited boating are common forms of recreation at the reservoir site.

E. Wagontrain Reservoir

Wagontrain Reservoir is located 14 miles southeast of Lincoln at Section 36, T8N, R7E. This reservoir, along with Holmes, comprise the two turbid lakes studied. These reservoirs contain finely divided soil particles which are kept suspended by wind action. Runoff from cultivated fields and pasture lands enters the reservoir, as does runoff from a cattle feedlot located approximately one-fourth mile west. The north tributary of the Hickman Branch of Salt Creek feeds the reservoir.

Aquatic vegetation is sparse in Wagontrain, however, the upper regions contain numerous dead tree stumps which emerge from the surface. No samples were taken in this area. Figure 5 and Table I show sampling station location and pertinent morphometric data, respectively. Aquatic macrophytes are confined to narrow bands along the shoreline. Fishing, sailboating, limited motor boating, picnicking and camping are common forms of recreation at Wagontrain Reservoir.

Figure 5. Wagontrain Reservoir and Location of the Sampling Stations.


1. Sampling Station 1
2. Sampling Station 2
3. Sampling Station 3
N
1
2
3

# MATERIALS AND METHODS

Weekly samples were obtained from the five Salt Valley Reservoirs over a period of three summers. In Pawnee Reservoir sampling extended throughout the year with weekly samples being taken except during periods of ice cover when the sampling interval was usually four weeks. A total of 640 zooplankton samples were collected and analyzed.

Sampling stations were established in the lower, middle and upper areas of the reservoirs with the exception of station 1 in Holmes Reservoir which was located in a basin connected to the rest of the lake by a narrow channel (Figure 2). During the summer of 1968 station 1 in Branched Oak Reservoir was located near the south end of the dam (Figure 1) but was changed to an inundated stream location during the remainder of the sampling period.

Collecting procedures were uniform for all lakes. Zooplankton samples were taken in the late A.M. by making single oblique tows with a Clarke-Bumpus sampler, from bottom to surface, at each station. Oblique tows have an advantage over single depth tows in that zooplankters are captured which may be exhibiting the phenomenon of vertical migration described by many authors (Dumont, 1968, Grover and Coker, 1940, McLaren, 1963, Pennak, 1944, Woodmansee and Grantham, 1961). The sampler was lowered from a boat on a cable attached to a portable winch. Boat speed was kept uniform throughout each tow at about two knots. Welch (1948) reports variation in catch to be less than 5 percent when the sampler is operated at boat speeds of one-half to four knots. Variation in net speed in relation to catch has been shown to be species, as well as size, dependent (Aron and Collard, 1969, Fleminger and Clutter, 1965, Gardiner, 1931, McGowan and Fraundorf, 1966). Optimal net speed prevents net avoidance due to sight or mechanical disturbance of the water yet is slow enough to permit effective straining.

Flow rate was assumed to be 5 liters per revolution of the propeller of the uncalibrated sampler (based upon specifications supplied by the sampler manufacturer). A nylon plankton net equivalent to a No. 2 silk bolting cloth net was used. The lakes under study produced "blooms" of filamentous algae which would have been trapped on the sides of a smaller mesh net so that total straining area would be reduced (Yentsch and Duxbury, 1956). Captured animals are transported down the sides of the net into the collection cup during normal operation of the sampler; however, a clogged net may increase the calibration value (vol/count) until the propeller stalls (Yentsch and Duxbury, 1956). The No. 2 net has a mesh size of 0.366 millimeters. Saville (1958) points out that measurement of stages of development to determine the size of animals which can be captured is only an approximation since a direct relationship between mesh size and retention size may not exist. Secondly, there is a gradation from complete escape to complete retention with an increase in size of the organism.

The total volume of lake water filtered through the sampler was usually 700-1000 liters at stations over 4 meters in depth (Table 1). At shallower stations, in which rooted aquatics interfered with the tows, about 200-500 liters were filtered.

Zooplankton samples were preserved in 5 percent formalin solution and stored in wide mouth bottles with about 100 milliliters of preservative. Lackey (1938) found that concentrations lower than 5 percent kill too slowly and allow distortion or rupture to occur. At higher concentrations some forms swell and others shrink. Armstrong and Wickstead (1962) report a flocculent precipitate of iron occurs in samples stored a few months. In most cases the samples taken from the Salt Valley Reservoirs were preserved in excellent condition and no brown precipitate was formed. Occasionally, Cladoceran carapaces became ballooned and eggs were lost from the brood chambers; however, egg counts were still possible under these conditions.

Zooplankton samples were analyzed by diluting or concentrating to a fixed volume, stirring until well mixed, and using a 1-milliliter capacity Hensen-Stempel pipet to withdraw two to six 1-milliliter aliquots successively, with replacement after recording data from each aliquot. Adequate numerical and volumetric estimates of macroplankton can be secured from only 1 cell mount per sample (Kutkuhn, 1958). Usually a dilution factor of about 300 gave adequate subsample size yet did not cause crowding of animals in the counting chamber. A Sedgwick-Rafter cell served as a depression chamber in which counts were made. The entire contents of the cell were examined rather than simply counting a given number of fields as is usually the technique for phytoplankton analysis by this method (Littleford, Newcombe and Shepherd, 1940, Serfling, 1949). When zooplankton were scarce the entire contents of the sample were examined.

Ricker (1937a) demonstrated that a large count of a plankton species fits a Poisson frequency distribution when the variance is approximately equal to the mean and the standard deviation is approximately equal to the square root of the variance. The statistical analysis of a sample from Pawnee Reservoir (Table III) shows the organisms to have been distributed randomly. Ricker (1937a) points out that if bunching has occurred the variance will exceed the mean while in a spaced distribution the variance is less than the mean. The Chi-square values (Table III) lie between 0.80-0.70, 0.50-0.30, and 0.70-0.50, respectively, in the Chi-square

TABLE III

| Trial | Total Count | Daphnia | Copepoda |
|---|---|---|---|
| 1 | 100 | 88 | 12 |
| 2 | 105 | 88 | 17 |
| 3 | 118 | 107 | 11 |
| 4 | 116 | 105 | 11 |
| 5 | 96 | 88 | 8 |
| 6 | 101 | 84 | 17 |
| 7 | 96 | 83 | 13 |
| 8 | 109 | 95 | 14 |
| 9 | 105 | 93 | 12 |
| 10 | 113 | 99 | 14 |
| 11 | 113 | 98 | 15 |
| 12 | 123 | 106 | 17 |
| 13 | 122 | 108 | 14 |
| 14 | 100 | 81 | 19 |
| 15 | 115 | 107 | 8 |
| Mean | 108.80 | 95.33 | 13.47 |
| Variance | 82.74 | 94.49 | 10.46 |
| Standard Deviation | 9.09 | 9.72 | 3.23 |
| Chi-square | 10.65 | 13.78 | 10.97 |

distribution for 14 degrees of freedom. In no case is there a significant departure from expectation. If the samples had exceeded statistical expectation improvement in the subsampling technique would be warranted.

All organisms were identified to species in the 1969 and 1970 samples. In 1968 some were only identified to genus. A 30X binocular dissecting microscope and a Whipple micrometer, divided into 100 equal units, were used in routine analyses. Keying was accomplished with the use of a binocular compound microscope equipped with a 35-millimeter camera which was used to photograph life stages, adult zooplankters and morphological characters useful in identification. In each aliquot the number of cladoceran eggs and embryos was recorded as was the number contained in each brood pouch. Copepod egg sacs were recorded whenever present. Presence of males and ephippia was recorded. *Daphnia* measurements were made from the base of the spine to the anterior extension of the carapace (Brooks, 1946). An extra milliliter or so of concentrated sample was scanned for presence of rare species which may not have been present in the subsamples. Numbers per liter were calculated by multiplying the mean number observed in the subsamples by the dilution factor then dividing by the number of liters filtered through the Clarke-Bumpus sampler.

# TAXONOMY

Identification of zooplankton species requires careful examination, and often dissection, of several specimens. Characters may not be in the same plane or position as those illustrated in the keys, thus, small structures must often be manipulated on the slide. In addition, it is well-known that seasonal changes in body form (cyclomorphosis) take place in many planktonic species which may make identification more difficult (Brooks, 1946, Coker, 1939, Jacobs, 1961). Despite these difficulties, accurate identification is possible and becomes routine as one gains experience. Most of the zooplankters collected during the study are illustrated in Figures 6-10.

There is a dearth of information on the zooplankton species of Nebraska and no recent surveys have been conducted. Fordyce (1901) surveyed the cladocerans of Nebraska, including the Lincoln area, and a survey of copepod fauna was conducted by Pearse (1905).

## CLADOCERA

The order Cladocera is divided into two suborders, the Haplopoda and the Eucladocera (Hutchinson, 1967). *Leptodora kindtii* (Focke) 1844, a large, predaceous zooplankter, the only member of the Haplopoda, was not collected; however, several members of the Eucladocera are found in the Salt Valley Reservoirs. Members of the first superfamily to be considered, the Sidoidea, are usually benthic-littoral forms. Diaphanosoma leuchtenbergianum Fischer 1850, the only member of this superfamily encountered, is considered to inhabit the open waters of lakes (Brooks, 1959). This was a common, and often abundant, species in the study reservoirs.

The Daphnoidea, a superfamily well represented in the study reservoirs, contains three families of importance as planktonic filter feeders (Hutchinson, 1967). Brooks (1959) describes the typical morphology of the Daphnoidea as follows: A distinctive head is present, which bears two pair of antennae. The first are olfactory or tactile, while the second are locomotory in function. A compound eye and ocellus (sometimes absent) serve as light receptors. A folded cuticle (carapace) covers the body. The body is divided into three main parts, the thorax, abdomen and postabdomen (abreptor) which bears terminal claws.

Daphnia identification, as described in the following pages, follows descriptions in Brooks' (1957) monograph. Descriptions of calanoid and cyclopoid copepods follow the keys of M. S. Wilson (1959) and H. C. Yeatman (1959). Brooks (1959) was used in identification of cladocerans.

The family Bosminidae is represented in this study by two species, Bosmina coregoni Baird 1857 and Bosmina longirostris (O. F. Muller) 1785. B. coregoni (Figure 6, 1A) is a small plankter whose dorsal carapace is usually marked by a hump. The sense-hair (Figure 6, 1B) is near

Figure 6. Morphological characters useful in identification of zooplankton.

Row 1. *Bosmina coregoni*
- A. Female with eggs (0.42mm).
- B. Head, showing location of sense hair.
- C. Postabdominal claw.

Row 2. *Bosmina longirostris*
- A. Female with eggs (0.45mm).
- B. Head, showing location of sense hair.
- C. Postabdominal claw.

Row 3. *Diaphanosoma leuchtenbergianum*
- A. Female with eggs (0.93mm).
- B. Abreptor.

Row 4. *Ceridodaphnia lacustris*
- A. Female with eggs (0.78mm).
- B. Abreptor.

the base of the antennule. Figure 6 (1C) shows the typically large spines on the postabdominal claw which usually number 5-6.

Bosmina longirostris (Figure 6, 2A) differs morphologically from B. coregoni in that the sense-hair is more nearly centered between the eye and the base of the antennule (Figure 6, 2B). This distinction is not a clear-cut one. Jones (1958) also found difficulty in distinguishing the two species on this character. The postabdominal claw, which contains 3-4 large teeth (Figure 6, 2C), is a better specific characteristic.

Diaphanosoma leuchtenbergianum, a member of the Sidoidea, is easily recognized by the flattened second antennae, the dorsal rami of which are 2-jointed (Figure 6, 3A). In this species the reflexed antennae reach to or beyond the posterior valve margin. Figure 6 (3B) shows that the postabdomen lacks anal spines, a character of importance at the generic level.

Ceridodaphnia lacustris Birge 1893 (Figure 6, 4A), a member of the Daphnidae, is characterized by the small antennules which are never inserted at the anterior-ventral surface of the head. The head is small and depressed and a rostrum is not present. Ceridodaphnia is oval to round in shape. The postabdomen narrows toward the apex and possesses 7-9 anal spines (Figure 6, 4B). The fornices project into spinous processes which are not evident in the view shown but which are quite distinct in dorsal view. Another species C. quadrangula (O. F. Muller) 1785 was collected but is not represented in the photographs.

Alonella excisa (Fischer) 1854 (Figure 7, 2A), a Chydorid Cladoceran, was rare in the collections. Brooks (1959) does not consider this species to be planktonic. It was probably collected accidentally in the few samples in which it occurred. The postabdomen is angulated at the apex and the claw possesses 1 basal spine (Figure 7, 2B). The specimen shown is somewhat misshapen from preservation and handling.

Chydorus sphaericus (O. F. Muller) 1785 (Figure 7, 3A), another chydorid, is spherical or elliptical in outline. There is a prominent preanal angle on the postabdomen (Figure 7, 3B). Brooks (1959) reports it to be the most common of all cladocera.

Five species of Daphnia, members of the family Daphnidae, were collected during the study period. Brooks (1957) treats all 15 species of Daphnia found in North America in considerable detail. His key, and the descriptions which follow, are based upon characteristics of mature females.

Daphnia parvula Fordyce 1901 is a small species (Figure 7, 4A). The shell spine is short (less than one-fourth valve length) and the head is broadly rounded on the anterior-dorsal margin. The ventral margin of the head is concave. There are two long abdominal pro-

Figure 7. Morphological characters useful in identification of zooplankton.

Row 1. *Cyclops vernalis*
A. Female (1.1mm).
B. Caudal rami.
C. Leg 5.

Row 2. *Alonella excisa*
A. Female (0.53mm).
B. Abreptor.

Row 3. *Chydorus sphaericus*
A. Female (0.42mm).
B. Abreptor.

Row 4. *Daphnia parvula*
A. Female with eggs (0.96mm).
B. Abdominal processes.
C. Postabdominal claw.

Row 5. *Daphnia galeata mendotae*
A. Female with eggs (1.31mm).
B. Abdominal processes.
C. Postabdominal claw.

cesses, the third is considerably shorter and the fourth rudimentary (Figure 7, 4B). The teeth in the middle pecten of the claw are about twice as long as those of the distal comb and are nearly equal in length (Figure 7, 4C).

Daphnia galeata Sars 1864 mendotae Birge 1918 is a rather large species. When present the broad pointed helmet is distinctive (Figure 7, 5A). The ventral margin of the head is convex at the level of the eye. The second abdominal process is intermediate in length between the first and third while the fourth is rudimentary (Figure 7, 5B). All three pectens on the postabdominal claw are fine and short (Figure 7, 5C).

Daphnia pulex Leydig 1860 emend. Richard 1896 was the largest cladoceran encountered (Figure 8, 1A). The concave ventral margin of the head, large eye and ocellus, short shell spine and narrow pointed apical portion of the rostrum serve as recognition characters. The second abdominal process is nearly as long as the first. The second through fourth are hairy (Figure 8, 1B). The teeth of the middle pecten of the claw are very large with the largest being 3 or more times as long as those of the distal pecten (Figure 8, 1C).

Daphnia retrocurva Forbes 1882 is a distinctive species when tall, retrocurved helmets are present. The specimen shown (Figure 8, 2A) represents the maximum helmet size encountered. Valve and head shape in non-

Figure 8. Morphological characters useful in identification of zooplankton.

Row 1. *Daphnia pulex*
- A. Female with ephippium (2.11mm).
- B. Abdominal processes.
- C. Postabdominal claw.

Row 2. *Daphnia retrocurva*
- A. Female with eggs (1.40mm).
- B. Abdominal processes.
- C. Postabdominal claw.

Row 3. *Daphnia ambigua*
- A. Female with eggs (1.0mm).
- B. Abdominal processes.
- C. Postabdominal claw.

helmeted specimens (not shown) are similar to those of *D. pulex*. The teeth of the middle pecten of the postabdominal claw are stout (Figure 8, 2C) though were not always smaller than those of *D. pulex* as described by Brooks (1957). The first two abdominal processes are long, the second being one-half to two-thirds the length of the first (Figure 8, 2B). The slightly retrocurved helmet, lack of distinct ocellus and relatively longer shell spine serve to distinguish this species, on sight, from *D. pulex*.

*Daphnia ambigua* Scourfield 1947, like *D. parvula* is a small species. When present, the spike-like helmet is diagnostic (Figure 8, 3A). The first two abdominal processes are joined at the base (Figure 8, 3B). The postabdominal claw contains 3 pectens of fine teeth, nearly equal in length. Without dissection, a non-helmeted *D. ambigua* is distinguishable from *D. parvula* by its relatively smaller head and more conspicuous rostrum.

*Leydigia quadrangularis* (Leydig) 1860 was a rare species in the collections. It belongs to the family Chydoridae and usually inhabits weedy areas (Leonard and Ponder, 1949). The postabdomen is large and semielliptical with a cluster of large spines (Figure 9, 1A). The postabdominal claw has a basal spine (Figure 9, 1B).

## COPEPODA

The species of free-living copepods collected fall

Figure 9. Morphological characters useful in identification of zooplankton.

Row 1. *Leydigia quadrangularis*
A. Female with egg (0.81mm).
B. Postabdominal claw.

Row 2. *Mesocyclops edax*
A. Female with egg sacs (1.54mm).
B. Last segment of first antenna.
C. Leg 5.

Row 3. *Eucyclops agilis*
A. Female with egg sacs (1.22mm).
B. Caudal rami.
C. Leg 5.

into two orders, Cyclopoida and Calanoida. Cyclopoid copepods have short first antennae (6-17 segments) which are about one-half the length of the metasome while calanoids have long first antennae (23-25 segments), often as long as the metasome and urosome combined (Reid, 1961).

Mesocyclops edax (S. A. Forbes) 1891 is a member of the Cyclopoida. The fifth leg is armed with an apical seta and a long inner spine (Figure 9, 2C). The hyaline plate of the last segment of the first antenna bears a number of sharp notches (Figure 9, 2B). It was the cyclopoid encountered most frequently.

Eucyclops agilis (Koch) 1838 is easily recognized by the long caudal rami (Figure 9, 3A), at least 4 times as long as broad, with a row of conspicuous spinules on the outer edges (Figure 9, 3B). The fifth leg consists of 1 distinct segment and is armed with a strong inner spine and 2 setae on the outer portion (Figure 9, 3C).

Another cyclopoid, Cyclops vernalis Fischer 1853 is shown in Figure 7 (1A). The inner margin of the caudal ramus is without hairs (Figure 7, 1B). The second segment of the fifth leg has an apical seta and a small inner spine almost distal in position (obscured by apical seta, Figure 7, 1C).

Three species of calanoid copepods were collected (Figure 5). The right fifth leg of the male is very useful in identification. Males can be recognized by the modified (geniculate) right first antenna which is used for clasping the female in reproduction (Hutchinson, 1967).

Diaptomus clavipes Schacht 1897 was the largest copepod species encountered (Figure 10, 1A). Several segments of the left antenna of the male (both antennae in female) have hooked setae. One such seta, from segment 19, is shown in Figure 10 (1D). The right basal segment 2 of the fifth leg (male) has a hooklike process reaching near the end of the first exopod segment (Figure 10, 1C). Figure 10 (1B) shows typical right fifth leg and claw shape.

Diaptomus pallidus Herrick 1879 is shown in Figure 10 (2A). The inner process of left exopod 2 (right fifth leg) has a characteristic long curved seta which reaches beyond the end of the distal process (Figure 10, 2B).

Diaptomus siciloides Lilljeborg 1889 and D. pallidus are about the same size and are difficult to distinguish without dissection. The terminal claw of right exopod 2 is sickle-shaped in D. siciloides (Figure 10, 3B). The inner process of left exopod 2 is blunt in this species (Figure 10, 3B).

Figure 10. Morphological characters useful in identification of zooplankton.

Row 1. *Diaptomus clavipes*
A. Adult male (1.77mm).
B. Right leg 5.
C. Right leg 5, showing detail of basal segment 2.

Row 2. *Diaptomus pallidus*
A. Adult male (1.10mm).
B. Right leg 5.

Row 3. *Diaptomus siciloides*
A. Adult male (0.99mm).
B. Right leg 5.

## SPECIES COMPOSITION

The limnetic zone of a lake is considered to be the region of open water, from surface to bottom, bounded peripherally by emergent vegetation (Reid, 1961). The structure of plankton communities in the limnetic zone is relatively simple in contrast to that of littoral communities in which rooted aquatic plants provide a great variety of niches (Jones, 1958; Pennak, 1957). The samples collected in this study were limnetic zone samples.

Figures 11-15 illustrate most of the species collected from each study reservoir. Although some repetition occurs in the photographs, it is helpful to see a variety of individuals to acquire knowledge of the variability present within a species.

Thirteen species of zooplankters were collected from Branched Oak Reservoir, 5 copepods and 8 cladocerans (Figure 11). On no one sampling date were all species collected because of the cyclic nature of the populations (Comita, 1956; Pennak, 1949).

Determination of the momentary species composition (the mean number of species encountered during a given time period) is a means of better understanding the structure of a limnetic plankton community. The mean number of copepods and cladocerans collected during 1969 and 1970 (Table IV) shows the momentary composition of the summer zooplankton community consists of 2.4 copepod species and 3.6 cladocerans species. On 42 percent

Figure 11. Zooplankton collected in the limnetic zone of Branched Oak Reservoir during the study period.

A. *Daphnia pulex*
B. *Daphnia galeata mendotae*
C. *Daphnia parvula*
D. *Cyclops vernalis*
E. *Mesocyclops edax*
F. *Diaptomus siciloides*
G. *Diaptomus clavipes*
H. *Diaphanosoma leuchtenbergianum*
I. *Daphnia ambigua*
J. *Diaptomus pallidus*
K. *Bosmina longirostris*
L. *Ceridodaphnia lacustris*
*Ceridodaphnia quadrangula* *

* not illustrated.

Table IV. Number of species of copepods and cladocerans collected.

Branched Oak Reservoir

| Date | Copepoda | Cladocera | Date | Copepoda | Cladocera |
|---|---|---|---|---|---|
| 5 Jun 69 | 3* | 4** | 3 Jun 70 | 4* | 2 |
| 16 Jun 69 | 3* | 3** | 10 Jun 70 | 2 | 2 |
| 19 Jun 69 | 2 | 3** | 17 Jun 70 | 2 | 1 |
| 27 Jun 69 | 2 | 3** | 24 Jun 70 | 2 | 1 |
| 2 Jul 69 | 2 | 1 | 1 Jul 70 | 1 | 4 |
| 10 Jul 69 | 3* | 3** | 8 Jul 70 | 2 | 4 |
| 17 Jul 69 | 3* | 7** | 15 Jul 70 | 3* | 4** |
| 24 Jul 69 | 3* | 6** | 22 Jul 70 | 2 | 5** |
| 31 Jul 69 | 3* | 5** | 29 Jul 70 | 2 | 3 |
| 7 Aug 69 | 1 | 5** | 12 Aug 70 | 3 | 3 |
| 14 Aug 69 | 2 | 6** | 19 Aug 70 | 2 | 3** |
| 22 Aug 69 | 3* | 5** | | | |
| 28 Aug 69 | 3* | 4** | | | |
| Mean | 2.5 | 4.2 | | 2.3 | 2.9 |

* Congeneric occurrence of *Diaptomus* species.

** Congeneric occurrence of *Daphnia* species.

of the sampling dates more than one species of the same genus (*Diaptomus*) of copepod occurred while on 62 percent of the sampling dates co-occurrences of *Daphnia* species were found. It was not uncommon to find three species of *Daphnia* occurring at the same time.

Ten species were collected from Holmes Reservoir in 1969, 4 copepods and 6 cladocerans (Figure 12). *Leydigia quadrangularis* (Figure 12, 1), not usually a limnetic species (Brooks, 1959), was occasionally taken in our collections. In Holmes the mean number of species of copepods exceeded the mean number of cladoceran species (Table V). The phytoplankton community of the turbid reservoirs, Holmes and Wagontrain, was usually dominated by small diatoms (*Melosira*, *Cyclotella*, *Stephanodiscus*) in contrast to Branched Oak, Pawnee and Stagecoach Reservoirs which were usually dominated in summer by green and blue-green algae. Although nutrition studies were not conducted, it is possible that the diatoms of Holmes do not provide adequate nutrition to support a predominately cladoceran community while in Wagontrain, they might. In addition, unidentified chemical factors may exclude a variety of cladoceran species from Holmes Reservoir. On 93 percent of the sampling dates two species of *Diaptomus* occurred concurrently. Only 2 species of *Daphnia* occurred in Holmes. *Daphnia retrocurva* was present for the entire sampling period and *Daphnia ambigua* was collected on only

Figure 12. Zooplankton collected in the limnetic zone of Holmes Reservoir during the study period.

A. *Diaptomus clavipes*
B. *Cyclops vernalis*
C. *Mesocyclops edax*
D. *Daphnia retrocurva*
E. *Diaptomus siciloides*
F. *Bosmina coregoni*
G. *Ceridodaphnia quadrangula*
H. *Diaphanosoma leuchtenbergianum*
I. *Leydigia quadrangularis*
J. *Daphnia ambigua*

Table V. Number of species of copepods and cladocerans collected.

Holmes Reservoir

| Date | Copepoda | Cladocera |
|---|---|---|
| 2 Jun 69 | 2* | 2 |
| 9 Jun 69 | 3* | 3 |
| 16 Jun 69 | 3* | 3 |
| 23 Jun 69 | 3* | 2 |
| 30 Jun 69 | 4* | 2 |
| 7 Jul 69 | 3* | 2 |
| 14 Jul 69 | 4* | 2 |
| 21 Jul 69 | 3* | 2 |
| 28 Jul 69 | 3* | 3** |
| 4 Aug 69 | 3* | 3** |
| 11 Aug 69 | 2* | 2 |
| 18 Aug 69 | 1* | 2 |
| 28 Aug 69 | 2* | 2 |
| 8 Sep 69 | 3 | 2 |
| Mean | 2.8 | 2.3 |

* Congeneric occurrence of *Diaptomus* species.

** Congeneric occurrence of *Daphnia* species.

two occasions. Congeneric *Daphnia* occurrences are not common as is the case in the other 4 reservoirs, probably because of the lack of available food niches to support both species.

Pawnee Reservoir, even though sampled year-round, produced only 13 species, 4 copepods and 9 cladocerans (Figure 13). *Alonella excisa* (Figure 13, E) was collected on only two occasions in 1968. It is not considered to be a limnetic species (Brooks, 1959). Pawnee is also rather simple in the structure of its limnetic zooplankton populations (Table VI). The average number of species in winter and spring are similar to those of the summer while cladoceran species become somewhat more abundant in the fall than during the other seasons (Table VII). Congeneric *Diaptomus* associations are rare in Pawnee during all seasons while more than one *Daphnia* species occur together 69 percent of the time during summer.

Ten species were collected from Stagecoach Reservoir, 4 copepods and 6 cladocerans (Figure 14). Table VIII shows that the mean number of copepod species is lower than that found in the other reservoirs. Only Holmes Reservoir had fewer species of cladocerans. Stagecoach, a highly productive reservoir, supports dense zooplankton populations but the species variety is small. Yount (1956) found that diatoms follow this pattern in lakes with high productivity. He suggests that the species which are

Figure 13. Zooplankton collected in the limnetic zone of Pawnee Reservoir during the study period.

A. *Daphnia pulex*
B. *Daphnia galeata mendotae*
C. *Daphnia ambigua*
D. *Bosmina longirostris*
E. *Alonella excisa*
F. *Mesocyclops edax*
G. *Daphnia parvula*
H. *Chydorus sphaericus*
I. *Eucyclops agilis*
J. *Ceridodaphnia lacustris*
K. *Diaphanosoma leuchtenbergianum*
L. *Diaptomus pallidus*
*Cyclops vernalis* *

* not illustrated.

Table VI. Number of species of copepods and cladocerans collected.

Pawnee Reservoir

| Date | Copepoda | Cladocera | Date | Copepoda | Cladocera |
|---|---|---|---|---|---|
| 3 Jun 69 | 3 | 2 | 2 Jun 70 | 2 | 3** |
| 10 Jun 69 | 3 | 2 | 9 Jun 70 | 3 | 4** |
| 17 Jun 69 | 3 | 2 | 16 Jun 70 | 3 | 5** |
| 24 Jun 69 | 2* | 3 | 23 Jun 70 | 3 | 3** |
| 2 Jul 69 | 2 | 4 | 30 Jun 70 | 1 | 6** |
| 8 Jul 69 | 3 | 2** | 7 Jul 70 | 3 | 4** |
| 15 Jul 69 | 3 | 4** | 14 Jul 70 | 2 | 4** |
| 22 Jul 69 | 3 | 4** | 21 Jul 70 | 2 | 5** |
| 29 Jul 69 | 3 | 5** | 28 Jul 70 | 2 | 6** |
| 5 Aug 69 | 3 | 4** | 4 Aug 70 | 3 | 6** |
| 12 Aug 69 | 2 | 4** | 11 Aug 70 | 3 | 3 |
| 19 Aug 69 | 3 | 5** | 18 Aug 70 | 3 | 3 |
| 26 Aug 69 | 2 | 4** | 25 Aug 70 | 3 | 5** |
| Mean | 2.7 | 3.5 | | 2.5 | 4.4 |

* Congeneric occurrence of Diaptomus species.

** Congeneric occurrence of Daphnia species.

Table VII. Mean number of species of copepods and cladocerans collected in Pawnee Reservoir during seasons of the year other than summer.

| Date | Copepoda | Cladocera |
|---|---|---|
| Jan - Feb 69 | 2.0 | 3.3** |
| Mar - May 69 | 2.4 | 2.6** |
| Sep - Nov 69 | 2.2* | 4.1** |
| Dec 69 - Feb 70 | 2.0 | 4.0** |
| Mar - May 70 | 1.9 | 2.5** |
| Sep - Nov 70 | 1.9 | 4.4** |
| Mean (winter) | 2.0 | 3.6 |
| Mean (spring) | 2.2 | 2.6 |
| Mean (fall) | 2.1 | 4.2 |

* Congeneric occurrence of *Diaptomus* species.

** Congeneric occurrence of *Daphnia* species.

Figure 14. Zooplankton collected in the limnetic zone of Stagecoach Reservoir during the study period.

A. *Daphnia parvula*
B. *Daphnia ambigua*
C. *Daphnia galeata mendotae*
D. *Bosmina longirostris*
E. *Ceridodaphnia lacustris*
F. *Diaphanosoma leuchtenbergianum*
G. *Mesocyclops edax*
H. *Diaptomus pallidus*
I. *Diaptomus clavipes*
J. *Cyclops vernalis*

Table VIII. Number of species of copepods and cladocerans collected.

Stagecoach Reservoir

| Date | Copepoda | Cladocera | Date | Copepoda | Cladocera |
|---|---|---|---|---|---|
| 4 Jun 69 | 3 | 4** | 4 Jun 70 | 2 | 3** |
| 11 Jun 69 | 3 | 4** | 11 Jun 70 | 3* | 3** |
| 18 Jun 69 | 2 | 3** | 18 Jun 70 | 1 | 3 |
| 26 Jun 69 | 2* | 4** | 25 Jun 70 | 2 | 3 |
| 1 Jul 69 | 1 | 3** | 9 Jul 70 | 2 | 3 |
| 9 Jul 69 | 1 | 2 | 16 Jul 70 | 1 | 3 |
| 16 Jul 69 | 1 | 2 | 23 Jul 70 | 3 | 3 |
| 23 Jul 69 | 2 | 2 | 30 Jul 70 | 2 | 2 |
| 30 Jul 69 | 2 | 2 | 6 Aug 70 | 1 | 2 |
| 6 Aug 69 | 2 | 2 | 13 Aug 70 | 1 | 2 |
| 13 Aug 69 | 2 | 2 | 20 Aug 70 | 1 | 2 |
| 20 Aug 69 | 2 | 2 | 27 Aug 70 | 1 | 1 |
| 27 Aug 69 | 1 | 3** | 3 Sep 70 | 1 | 2 |
| 3 Sep 69 | 1 | 2 | | | |
| 10 Sep 69 | 1 | 1 | | | |
| Mean | 1.7 | 2.5 | | 1.6 | 2.5 |

* Congeneric occurrence of <u>Diaptomus</u> species.

** Congeneric occurrence of <u>Daphnia</u> species.

better adapted to crowded conditions survive at the expense of those less well adapted. Congeneric occurrences were rare for Diaptomus and only occurred on 29 percent of the sampling dates for Daphnia.

Eleven species were found in Wagontrain Reservoir, 4 copepods and 7 cladocerans (Figure 15). The mean number of cladoceran species exceeded the mean number of copepod species (Table IX). At least 2 Daphnia species were found together on 71 percent of the sampling dates. More than 1 species of Diaptomus was found 80 percent of the time in 1969 but congeneric occurrences did not occur in 1970.

From studies on 27 Colorado lakes, Pennak (1957) concluded that the momentary structure of the majority of limnetic communities consists of 1-2 copepod species and 1-3 species of cladocerans. Comparing these figures with lakes of the world he found that there were usually 3 copepod species and 2-4 species of cladocerans. Armitage (1961) found six Kansas lakes to average 2.3 copepods and 3.0 cladocerans. The values for eleven Australian lakes were found to be 2.3 copepod and 2.0 cladoceran species (Timms, 1968). If the five Salt Valley Reservoirs are considered together one finds the structure most similar to that of the Kansas lakes (Table X).

Pennak (1957) observed that when two species of the same genus occur together one is usually 20 or more

Figure 15. Zooplankton collected in the limnetic zone of Wagontrain Reservoir during the study period.

A. *Ceridodaphnia quadrangula*
B. *Diaphanosoma leuchtenbergianum*
C. *Bosmina coregoni*
D. *Daphnia pulex*
E. *Daphnia ambigua*
F. *Daphnia galeata mendotae*
G. *Daphnia parvula*
H. *Cyclops vernalis*
I. *Diaptomus clavipes*
J. *Mesocyclops edax*
K. *Diaptomus siciloides*

Table IX. Number of species of copepods and cladocerans collected

Wagontrain Reservoir

| Date | Copepoda | Cladocera | Date | Copepoda | Cladocera |
|---|---|---|---|---|---|
| 4 Jun 69 | 4* | 3** | 4 Jun 70 | 2 | 3** |
| 11 Jun 69 | 3* | 3** | 11 Jun 70 | 3 | 5** |
| 18 Jun 69 | 3* | 4** | 18 Jun 70 | 2 | 3** |
| 26 Jun 69 | 3* | 3 | 25 Jun 70 | 2 | 5** |
| 1 Jul 69 | 3 | 4 | 9 Jul 70 | 2 | 5** |
| 9 Jul 69 | 4* | 5** | 16 Jul 70 | 2 | 4** |
| 16 Jul 69 | 4 | 4** | 23 Jul 70 | 2 | 3** |
| 23 Jul 69 | 3* | 3 | 30 Jul 70 | 1 | 3** |
| 30 Jul 69 | 4* | 4** | 6 Aug 70 | 3 | 4** |
| 6 Aug 69 | 3* | 3** | 13 Aug 70 | 3 | 3 |
| 13 Aug 69 | 4* | 3** | 20 Aug 70 | 1 | 2 |
| 20 Aug 69 | 3* | 3** | 27 Aug 70 | 1 | 3 |
| 27 Aug 69 | 3* | 5** | 3 Sep 70 | 1 | 3 |
| 3 Sep 69 | 2 | 3** | | | |
| 10 Sep 69 | 3* | 3 | | | |
| Mean | 3.3 | 3.5 | | 1.9 | 3.5 |

* Congeneric occurrence of *Diaptomus* species.

** Congeneric occurrence of *Daphnia* species.

Table X. Mean number of copepod and cladoceran species collected from the study reservoirs in the summers of 1969 and 1970.

| Reservoir | Copepoda | Cladocera |
|---|---|---|
| Branched Oak | 2.4 | 3.6 |
| Holmes | 2.8* | 2.3* |
| Pawnee | 2.6 | 4.0 |
| Stagecoach | 1.6 | 2.5 |
| Wagontrain | 2.6 | 3.5 |
| Mean | 2.4 | 3.2 |

* 1969 data only.

times as abundant as the other. Hammer and Sawchyn (1968) found the extent of the dominance in _Diaptomus_ to be far short of that suggested by Pennak. In Holmes Reservoir _Diaptomus siciloides_ and _D. clavipes_ occurred in the same samples at a ratio of about 2.3 to 1. Congeneric occurrence of _D. clavipes_ and _D. siciloides_ has been reported from Arizona (Cole, 1961). In Branched Oak Reservoir _D. pallidus_ was about 4 times as abundant as _D. clavipes_ when congeneric occurrences were observed. _D. siciloides_ was collected on 3 sampling dates in two summers at Branched Oak, but was extremely rare and did not occur in the routine subsampling procedure. _D. siciloides_ was about 3 times as abundant as _D. clavipes_ in Wagontrain Reservoir while _D. pallidus_ outnumbered _D. clavipes_ in Stagecoach Reservoir about 15 to 1. Congeneric occurrence of _D. pallidus_ and _D. clavipes_ were rare in Pawnee Reservoir, the ratio being about 62 to 1.

In Holmes, Branched Oak and Wagontrain Reservoirs, in which congeneric _Diaptomus_ occurrences were common, they usually occurred at a ratio of about 3 to 1, a considerably higher value than reported by Pennak (1957). Consequently, his generalizations regarding such ratios should be applied with caution as they probably hold only for alpine lakes.

When closely allied species of calanoid copepods occur together they are frequently of different sizes (Hutchinson, 1951). Examination of gut contents of a large Diaptomid, D. gracilis Sars. and D. laticips Sars, a smaller species, showed that food habits were quite different (Fryer, 1954), thus, interspecific competition for food may be reduced much in the same manner as takes place in bird populations inhabiting a given area (Johnsgard, 1967). D. siciloides and D. clavipes are separable by size differences (Figure 15); therefore, coexistence may occur commonly - as it does in several Salt Valley Reservoirs.

The genus Daphnia is frequently found in large species associations (Tappa, 1965). In Branched Oak, Wagontrain, and Stagecoach Reservoirs Daphnia parvula, D. ambigua and D. galeata mendotae were frequently found in the same sample and often with about the same relative abundance. D. pulex was found in a 17 July 1969 sample with these three other species in Branched Oak Reservoir; however, none of the 4 species were abundant at the time. Two species of Daphnia, usually D. galeata mendotae and D. parvula or D. ambigua, were a regular occurrence in most reservoirs during the study. It was not unusual to find D. parvula and D. ambigua, two species of approximately the same size, in the sample. Vertical distribution data were not taken; however, it is possible that different strata of water were inhabited by the different Daphnia species so that coexistence could occur.

Species composition of phytoplankton and benthos communities has been used as a measure of the trophic state of lakes. Indicator species may be present which are characteristic of eutrophic or polluted waters (Beeton, 1961; Patrick, 1949; Rawson, 1956). Holmes and Wagontrain, the least productive of the study reservoirs, were inhabited by *Bosmina coregoni*, a species characteristic of oligotrophic conditions. *Bosmina longirostris* has been found to replace *B. coregoni* in the plankton of an enriched lake (Brooks, 1969). *B. longirostris* was found in Branched Oak, Pawnee and Stagecoach, the more productive of the five study reservoirs; thus, the use of *Bosmina* as an indicator species seems to be a valid concept. Brooks notes, however, that caution must be exercised in interpretation of such shifts because predation by planktivorous fish may alter *Bosmina* species while chemical or biological enrichment of the lake may not have occurred.

## SEASONAL ABUNDANCE

Plankton populations change qualitatively and quantitatively in a lake as the seasons progress. This succession usually involves growth and decay of multiple generations of a variety of species of organisms. Pennak (1949), from a study of small to medium-sized lakes, concluded that a general or consistent cycle of zooplankton does not exist, even though the lakes are within the same geologic area.

Factors affecting population cycles are varied and complex. Food supply has been shown to be related to zooplankton pulses (Anderson, Comita and Engstrom-Heg, 1955; Comita and Anderson, 1959; Edmondson, 1957) while zooplankton in turn may serve as food for fishes (Applegate and Mullan, 1967) or for other zooplankters (McQueen, 1969). Water temperature is known to influence zooplankton population cycles (Pratt, 1943) and to a lesser extent photoperiod, dissolved oxygen and total alkalinity (Hazelwood and Parker, 1961). Boreckey (1965) interprets significant correlations in cladoceran numbers with organic and inorganic parameters to actually be reflections of photosynthetic activity which, indirectly, affect zooplankton density.

Spatial differences in zooplankton population density are often found within the same lake. Patalas (1969) found species composition and abundance to vary from station to station in Lake Ontario. River flow, local sources of pollution, wind and temperature were major factors determining population characteristics at the different areas. In a lake in Nebraska (Lewis and Clark), Benson and Cowell (1968) found little horizontal stratification of limnetic zooplankton. For the most part, our sampling stations were situated in similar areas within each reservoir. In large reservoirs, with isolated, sheltered bays and several inflowing streams one would be more likely to find horizontal stratification. In Pawnee Reservoir total zooplankton abundance was usually somewhat greater at the mid-reservoir station (2) and at the station near the dam (3) than at station 1 located nearer the upper stream area. In Stagecoach Reservoir, station 1 was usually higher in total zooplankton numbers than was station 2, located in the upper reservoir area. Benson and Cowell (1968) found that reservoir areas nearer inflowing streams were highest in zooplankton density while Applegate and Mullan (1967b) found greatest densities at the mid-reservoir area of Bull Shoals Reservoir. The upper reservoir stations of Pawnee and Stagecoach Reservoirs abound with aquatic macrophytes in the summer. Such areas may indeed provide more niches but do not necessarily contain greater numbers of individuals of limnetic species. Applegate and Mullan (1967) found *Diaptomus* spp. and *Daphnia galeata* to be the primary food of young-of-the-year largemouth bass, *Micropterus salmoides*, in the spring when these plankters are abundant. *Diaptomus pallidus* and *D. galeata mendotae* are usually numerically dominant in Pawnee and Stagecoach Reservoirs. Their reduced numbers at the weedy (upper) stations in both reservoirs may be due to more intense predation by fishes.

In Branched Oak Reservoir the trend, for the three year period, was also to find somewhat fewer zooplankters at the station (3) in which aquatic macrophytes are abundant. Holmes and Wagontrain Reservoirs were essentially the same, in terms of zooplankton abundance, at all three stations. No rooted aquatics are found in these reservoirs at the sampling sites.

Simple mechanical transport by wind probably does not account for higher densities near the dam in any of the reservoirs. Southerly winds prevail in summer and in none of the study reservoirs is a dam located on the north end. Slightly higher zooplankton abundance occurred at station 3 in Pawnee during ice cover. Warmer (4°C), denser water would be expected to sink and flow toward this station, the deepest section of the reservoir; thus, slightly higher metabolism, growth and reproduction would be expected to occur there.

In reservoirs with widely varied morphometry, or large surface area, population studies are often conducted on samples from one station only (Applegate and Mullan, 1969; Wright, 1965); however, to discuss the entire reservoir, and to make comparisons between reservoirs possible, data averaged from several stations should be more representative. Most data in the discussion to follow represent the means of the sampling stations on each sampling date.

Diaptomus pallidus

Population data for *Diaptomus pallidus* in Pawnee Reservoir show a spring maximum of about 11 organisms per liter in 1969 and 1970 (Figure 16). In 1968 sampling was begun late in May and appeared to include the end of a pulse which occurred earlier that spring. Minor summer pulses occurred in all three summers followed by a collapse lasting until October or November. Numbers increased to 25.5 per liter in January 1969. No January or February samples were taken in 1970 for comparison.

The summer cycle in Stagecoach was similar, with declines occurring in late summer (Figure 17). *D. pallidus* was less abundant in 1970 than in 1969; however, other species were found in greater abundance which kept the total zooplankton levels up in the early part of both summers.

A June or July pulse of *D. pallidus* followed by a decline to low numbers through August was observed in 1968 and 1970 in Branched Oak Reservoir; however, a one week pulse of 49.7 organisms per liter was found on 7 August 1969 (Figure 18). Zooplankton are known to aggregate in an area in the form of a plankton patch (Wiebe and

Figure 16. Mean Annual Population Cycles of Cladocerans and Copepods in Pawnee Reservoir.

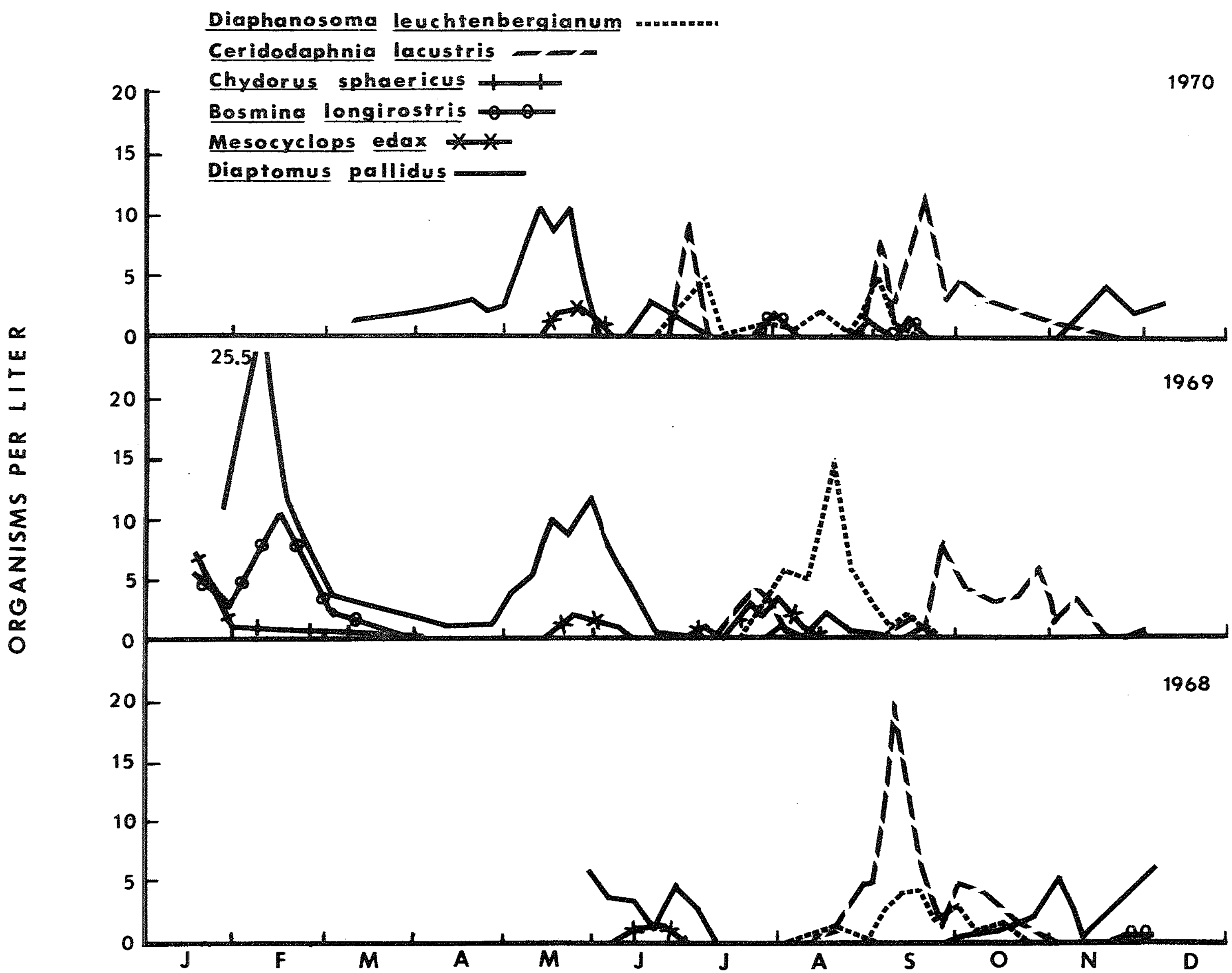
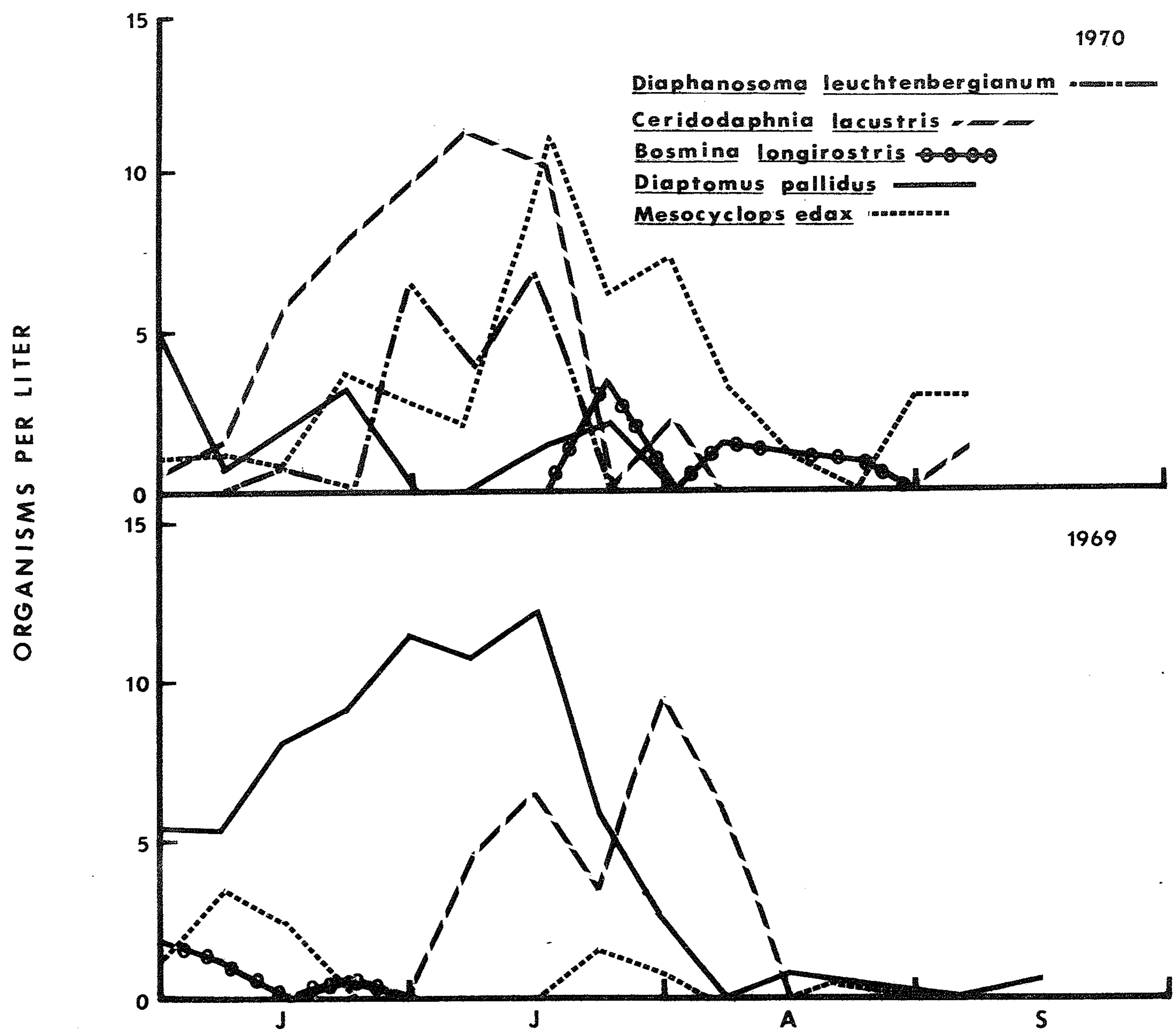
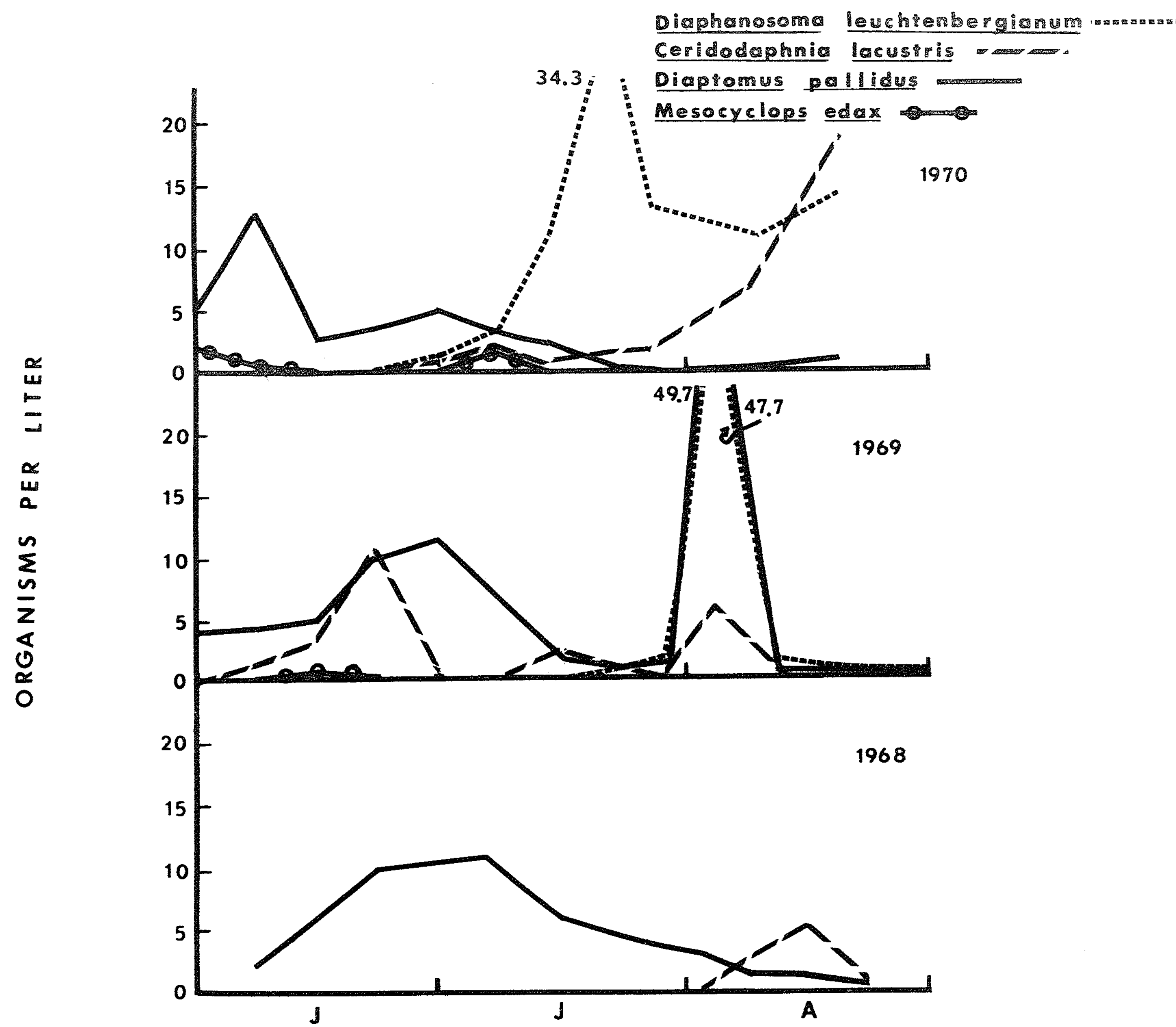

Diaphanosoma leuchtenbergianum
Ceridodaphnia lacustris
Chydorus sphaericus
Bosmina longirostris
Mesocyclops edax
Diaptomus pallidus
1970
1969
1968
25.5
ORGANISMS PER LITER
J F M A M J J A S O N D

Figure 17. Mean Summer Population Cycles of Cladocerans and Copepods in Stagecoach Reservoir.



ORGANISMS PER LITER
15
10
5
0
1970
Diaphanosoma leuchtenbergianum
Ceridodaphnia lacustris
Bosmina longirostris
Diaptomus pallidus
Mesocyclops edax
15
10
5
0
1969
J
J
A
S

Figure 18. Mean Summer Population Cycles of Cladocerans and Copepods in Branched Oak Reservoir.


Diaphanosoma leuchtenbergianum
Ceriodaphnia lacustris
Diaptomus pallidus
Mesocyclops edax
34.3
1970
49.7
47.7
1969
1968
ORGANISMS PER LITER
20
15
10
5
0
J
J
A

Holland, 1968); however, on this date numbers were very high at all three stations. Such a marked increase may have been caused by sampling error.

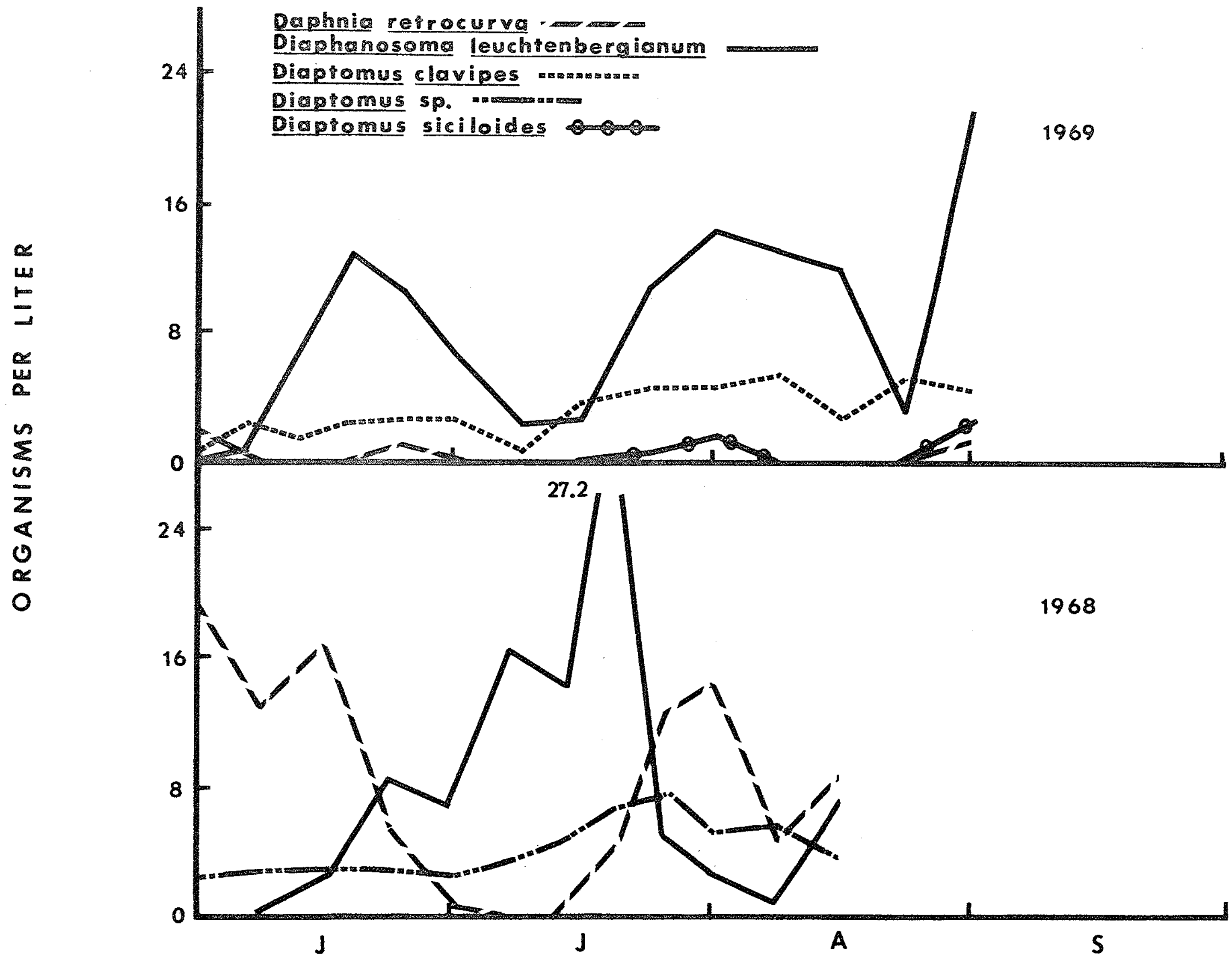
Calanoid copepods may live up to 13 months, which is usually a longer life cycle than is found in cladocerans or cyclopoid copepods (Hutchinson, 1967). Resting eggs are formed by many calanoid copepods; however, these species usually are inhabitants of temporary bodies of water. It is likely that some *D. pallidus* lived from the fall to the time of the following spring pulse; however, resting eggs may have been produced.

Females carrying egg sacs were least abundant in late summer and in the fall indicating that turnover rate was probably slight as well as were numbers of individuals. *D. pallidus* was the numerically dominant calanoid copepod in all lakes in which it occurred.

### *Diaptomus clavipes*

*Diaptomus clavipes* was numerically important only in the plankton of Holmes Reservoir (Figure 19). This species was not distinguished from *D. siciloides* in Holmes in 1968; however, in 1969 it was relatively abundant throughout the summer. Only 5.5 per liter were found during the maximum in early August but this was a substantial proportion of the total zooplankton biomass. A few *D. clavipes* were found in June of both summers in Stagecoach Reservoir. It only occurred in 1969 in Branched Oak and

Figure 19. Mean Summer Population Cycles of Cladocerans and Copepods in Holmes Reservoir.

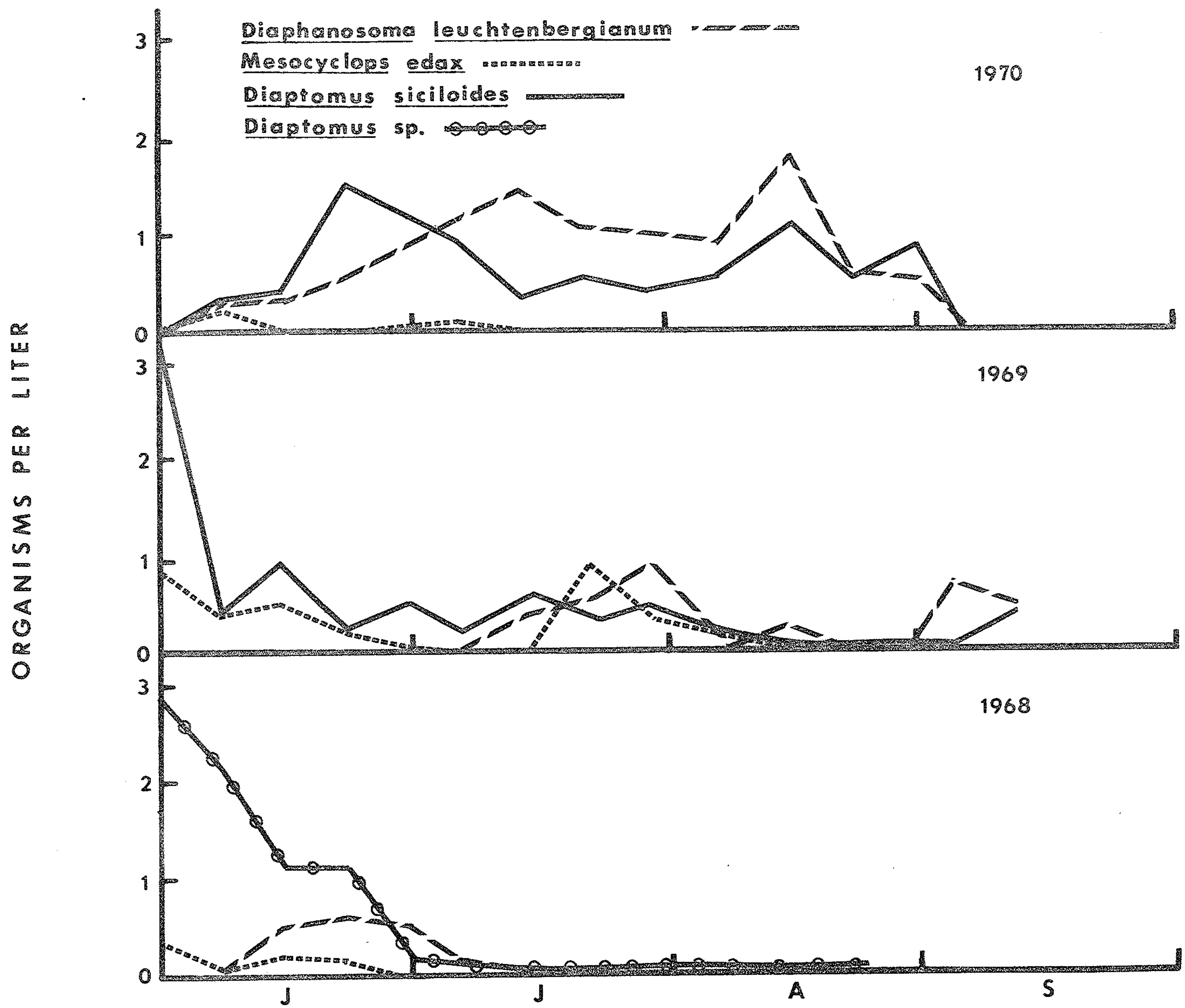

Daphnia retrocurva
Diaphanosoma leuchtenbergianum
Diaptomus clavipes
Diaptomus sp.
Diaptomus siciloides
ORGANISMS PER LITER
24
16
8
0
1969
27.2
1968
J
J
A
S

Wagontrain Reservoirs, being most abundant in late July. The only occurrences in Pawnee were on June 24 and September 16, 1969. It was too rare to be encountered in routine subsamples. Armitage (1961) found this species to occur at various seasons, depending on the lake. The reason *D. clavipes*, the largest diaptomid encountered, thrives best in Holmes is unclear. Perhaps fish predation is too slight to cause reduction and replacement by smaller species.

*Diaptomus siciloides*

*Diaptomus siciloides* was common in Wagontrain and Holmes Reservoirs. It was found occasionally in Branched Oak along with *D. pallidus*, but was too rare to count routinely. It is extremely difficult to distinguish *D. pallidus* and *D. siciloides* when they occur together, thus, *D. siciloides* may have been present in Pawnee and Stagecoach Reservoirs occasionally also. In 1968 diaptomids from Wagontrain were only identified to genus; however, *D. clavipes* was usually rare whenever present so that the curve for *Diaptomus* spp. probably represents mostly *D. siciloides* (Figure 20). The greatest number of *D. siciloides* recorded in Wagontrain was 3.3 per liter on June 4, 1969 (Figure 20). The curve shown appears to represent the end of a spring maximum which occurred before sampling was begun. Less than 1 individual per liter remained throughout most of the summer and by late

Figure 20. Mean Summer Population Cycles of Copepods and a Cladoceran in Wagontrain Reservoir.



Diaphanosoma leuchtenbergianum
Mesocyclops edax
Diaptomus siciloides
Diaptomus sp.
1970
1969
1968
ORGANISMS PER LITER
0
1
2
3
J
J
A
S

August less than 0.1 per liter remained. In 1970 no spring decline is indicated. Small increases in abundance occurred in late June and again in August. In Holmes Reservoir (1968) the population curve of *Diaptomus* spp. resembles that of *D. clavipes* in the following summer so it might be assumed that the population in 1968 was comprised largely of *D. clavipes*, even though diaptomids were not at that time keyed to species. *D. siciloides* reached maximum densities in late July and late August of 2.1 and 2.7 per liter, respectively. It was least abundant in early summer in Holmes. *D. siciloides* was the dominant calanoid in Wagontrain but not in Holmes.

*Mesocyclops edax*

*Mesocyclops edax* usually reached late spring or early summer peaks in Pawnee Reservoir which coincided with small pulses of *Diaptomus pallidus*. Mean peak abundance for *M. edax* was 2.6 per liter in 1968 (Figure 16). In 1969 maximum density occurred in mid-summer at 3.3 per liter. In 1968 and 1970 very small numbers were found in mid-summer. *M. edax* was usually present to some extent during all seasons. In Branched Oak and Wagontrain small increases in abundance occurred in June, followed by a decline and minimal comeback in July. A few were present throughout the summer. *M. edax* was most abundant in Stagecoach Reservoir (Figure 17). In 1969 population density increased in June, late July and late August. In 1970 peak density was recorded on July 16, at 11.3 per liter. Fryer (1954) found cyclopoids to better withstand crowding than calanoids. Stagecoach, with a summer mean of 147.8 zooplankters per liter, was certainly the most crowded reservoir studied which may be the reason *M. edax* was numerically dominant over *Diaptomus pallidus* in 1970. In Holmes Reservoir (1968) only mid-July and early August samples contained *M. edax*. In 1969 it was present during all the summer months. Although this species usually contributed little to the total standing crop in the study reservoirs it was the dominant cyclopoid copepod. Armitage (1961) found similar patterns in Kansas lakes. Woodmansee and Grantham (1961) observed that *M. edax* was benthic during the day. Late copepodids and adult cyclopoids are predaceous upon other zooplankters (McQueen, 1969), thus, a species living near the bottom and not utilizing phytoplankton in its diet is not likely to encounter much competition from herbivorous limnetic plankters. The cyclopoid life span is reported to be from 4 to 14 months (Hutchinson, 1967), thus, overwintering as adults would be possible. Adult *M. edax* were found under the ice in Pawnee Reservoir.

A phenomenon of great importance in cyclopoid seasonal cycles, in which adverse conditions can be avoided, is the ability to undergo diapause during development.

Cole (1953) reported an encysted resting stage, in a definite instar, in the ontogeny of Cyclops bicuspidatus thomasi Forbes, the presence or absence of which could not be correlated with any obvious environmental conditions. He notes (Cole, 1961) that closely related species of cyclopoids may utilize the same environment, but at different times, since one may be abundant while the other is encysted in the sediments.

Cyclops vernalis

Cyclops vernalis, the second most common cyclopoid encountered, was never abundant. It seldom reached greater density than 1 organism per liter in any of the study reservoirs. Scattered summer occurrences were observed in all reservoirs and a few were found in spring and fall in Pawnee. Whittaker and Fairbanks (1958) found this species to be most abundant in spring. This species probably undergoes diapause in the Salt Valley Reservoirs since none were found during the winter in Pawnee. Armitage (1961) reported it from varied aquatic habitats year-round. It was the most abundant copepod in a study by Prophet (1957) in Kansas.

Eucyclops agilis

The only other cyclopoid collected, Eucyclops agilis, was found only in Pawnee Reservoir. Numerically, it reached about 0.1 per liter in April of 1969 and was found again in September of 1970. It is reported to be a bottom dweller, often in association with rooted aquatics (Pennak, 1955).

*Alonella excisa* and *Leydigia quadrangularis*

*A. excisa*, found on two occasions in the summer of 1968 at Pawnee Reservoir and *L. quadrangularis*, found in June, 1969 in Holmes Reservoir were too rare to determine seasonal cycles. These species are not important in the limnetic community (Brooks, 1959).

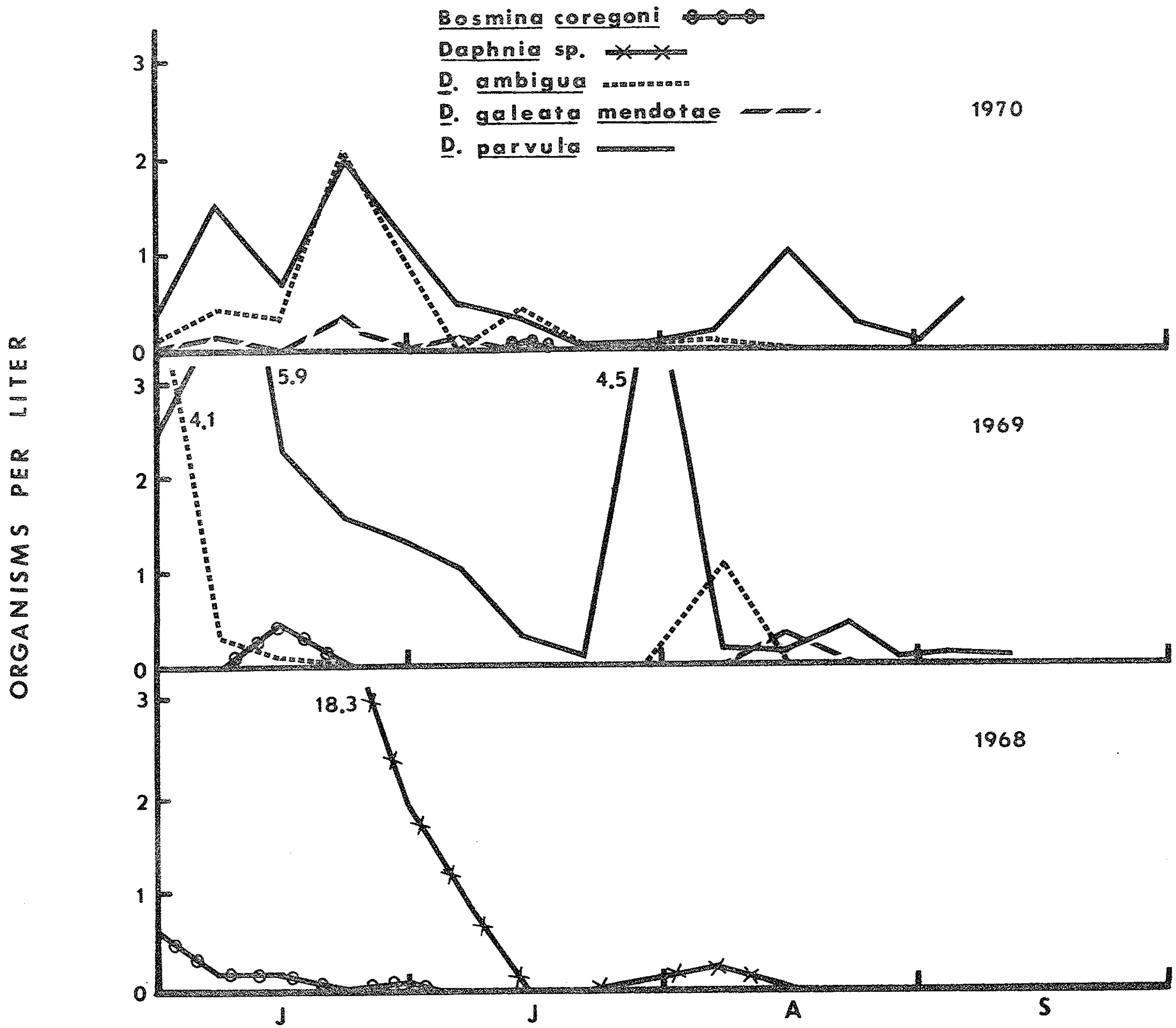
*Chydorus sphaericus*

*C. sphaericus* was found only in Pawnee Reservoir, where it occurred from January through early March of 1969 (Figure 16). Maximum density was 5.5 per liter on January 22. This is a very small species and may well have been present at other times but not retained by the No. 2 net. Samples in which it occurred were taken with a VanDorn water bottle under the ice. *C. sphaericus* is often found associated with aquatic plants. Quade (1969) found it on *Potamogeton* and *Ceratophyllum* in June.

*Bosmina coregoni*

*B. coregoni* was present only in Wagontrain (Figure 21) and Holmes Reservoirs. In Wagontrain it reached maximum abundance in June of 1968 and 1969 (less than 1 per liter), then declined to negligible numbers for the remainder of the summer. In 1970 it was found on only one date (23 July)

Figure 21. Mean Summer Population Cycles of Cladocerans in Wagontrain Reservoir.



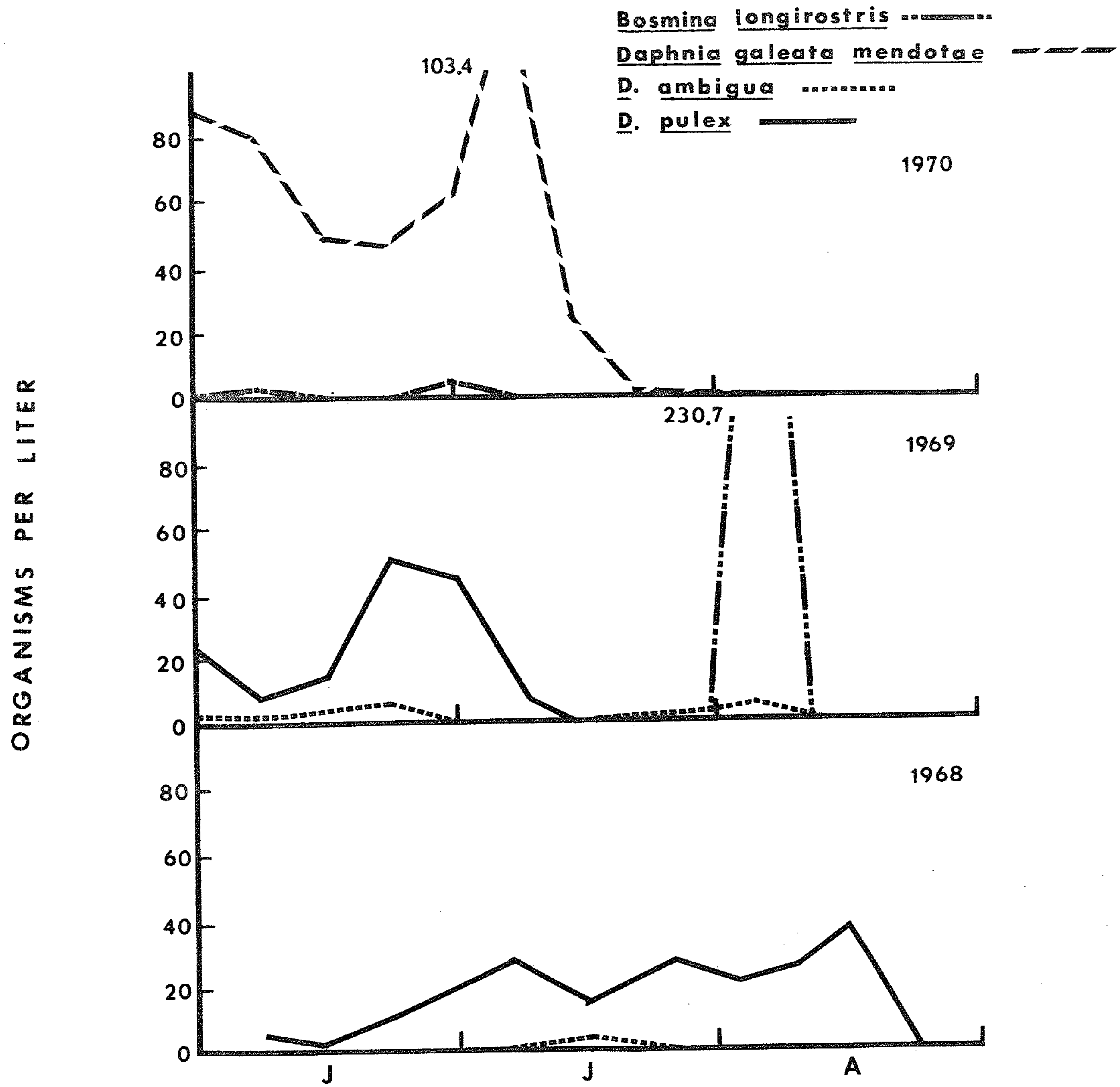
Bosmina coregoni
Daphnia sp.
D. ambigua
D. galeata mendotae
D. parvula
1970
1969
1968
ORGANISMS PER LITER
0
1
2
3
5.9
4.1
4.5
18.3
J
J
A
S

at an abundance of 0.1 per liter. *B. coregoni* was even more rare in Holmes, occurring on June 9 and June 16, 1969 only. It was too rare to be counted in routine subsamples.

*Bosmina longirostris*

*B. longirostris* was found in the other three study reservoirs. In July of 1968 it occurred regularly in Pawnee but was rare (less than 0.1 per liter). Maximum density was reached under the ice (12.5 per liter) on February 18 (Figure 16). Scattered occurrences were recorded during other seasons. In Stagecoach, peak density of 3.4 per liter was reached in June, 1968. It was absent in July and August. Figure 17 shows that it reached 3.3 per liter in late July of 1969 while about 1 animal per liter remained throughout most of August. *B. longirostris* did not occur in Branched Oak samples in 1968 but did occur on 3 sampling dates in August, 1969. On August 7, 230.7 per liter were collected (Figure 22). It was unusually abundant at all three stations on this date. Such a large population occurring suddenly, without prior indication of a buildup, and being gone again suddenly is suspect. In addition, many copepod nauplii were captured on this date, a rare occurrence because mesh size is too small to capture them. Chlorophyll values were at a summer high at that time which indicates that a bloom of blue-green algae was underway. It is possible that a

Figure 22. Mean Summer Population Cycles of Cladocerans in Branched Oak Reservoir.



Bosmina longirostris
Daphnia galeata mendotae
D. ambigua
D. pulex
1970
103.4
1969
230.7
1968
ORGANISMS PER LITER
80
60
40
20
0
J
J
A

clogged net prevented escape of Bosmina which normally would have escaped due to its small size. This would indicate that much higher standing crops of Bosmina may have occurred than are actually recorded; however, in terms of total biomass, they would still contribute relatively little because of their small size. B. longirostris occurred on five scattered sampling dates in 1970 at Branched Oak. Maximum abundance was 5.0 per liter on July 1. Hoff (1943) found this species to be associated with aquatic vegetation more often than not. In summer samples from Pawnee Reservoir it is just as abundant in the lower reservoir stations (2 and 3) as at station 1 where aquatic macrophytes are found. In Stagecoach Reservoir over 60 percent of the occurrences were from station 1, the deeper station, not surrounded by rooted aquatics.

Ceridodaphnia quadrangula

C. quadrangula was found in Holmes and Wagontrain Reservoirs. It was very rare in Holmes, occurring only on July 28 and August 4, 1969. Less than 0.01 animals per liter were recorded on both dates. Maximum abundance in Wagontrain occurred in June, usually at about 0.3 per liter. A few were found throughout the summer in 1968 and 1970; however, in 1969 it disappeared from the plankton in late July. This species occurred at the same time as C. lacustris on two occasions in July (1969) in Branched

Oak Reservoir. It was extremely rare. Pawnee and Stagecoach Reservoirs were not inhabited by C. quadrangula.

It is interesting to note that the turbid, less productive reservoirs (Wagontrain and Holmes) were inhabited only by C. quadrangula while C. lacustris was the predominant species of this genus in the others. C. quadrangula is a somewhat larger species and may be somewhat less subject to predation amidst the turbidity. In addition, there may be some adaptive advantage in having the larger eye of C. quadrangula in turbid reservoirs.

Ceridodaphnia lacustris

The remaining cladocerans to be discussed (Ceridodaphnia lacustris, Diaphanosoma leuchtenbergianum and Daphnia spp.) contribute far more to the zooplankton standing crop than those animals discussed on preceeding pages. Ceridodaphnia lacustris was most abundant in Pawnee Reservoir during summer and fall (Figure 16). Maximum abundance in 1968 occurred on September 11 when 20.0 per liter were found. The 1969 peak was on September 30, at 7.9 per liter. In 1970 the maximum population size occurred on September 22 at 14.3 per liter. Regular occurrences were found from June through November. This species was not present at all from January through May. Armitage (1901) also found it to be widespread in the fall. Ephippial production occurred in Pawnee from September through mid-November. The first individuals to appear in the following summer probably resulted from the resting eggs.

In Stagecoach Reservoir (1969) C. lacustris reached a peak density of 9.4 organisms per liter on July 30 (Figure 17). In 1970 the summer maximum occurred slightly earlier, reaching 11.2 per liter. Late September samples were not taken to compare with Pawnee in terms of a fall increase in numbers. This species was not common in Branched Oak in 1968 (Figure 18) with only about 5 per liter being found on August 16. In 1969 a June maximum was observed, followed by a decline to very low numbers until early August when about 6 per liter were found. It did not occur in 1970 samples until July 1. The population climbed to 18.9 per liter in mid-August and probably reached a peak by late August. Ephippial production occurred from September through mid-November of 1968.

Diaphanosoma leuchtenbergianum

D. leuchtenbergianum was a very common component of the zooplankton. This species was common to and relatively abundant in all of the study reservoirs except Stagecoach. Its "commonness" in most of the study reservoirs may result from its relative immunity to predation by facultative planktivores (Brooks, 1969). In Pawnee this species was usually found July through

November. None occurred in the months of January-May which indicates that it is probably an aestival species (overwinters in the form of resting eggs). The population cycle in 1968 paralleled that of Ceridodaphnia lacustris (Figure 16). The population density reached 4.6 per liter on September 10, followed by a decline to negligible numbers from October through November and absence until late June of the following summer. Peak density occurred somewhat earlier in 1969 (mid-August) and greater numbers were reached (16.6/l). A mean of less than 1 individual per liter was observed from mid-September until mid-November, when the species disappeared entirely until mid-June of 1970. Two small peaks of about 4 organisms per liter occurred in the summer of 1970. Low numbers were found (usually less than 0.5/l) until mid-November when the population declined to 0.

In Holmes Reservoir D. leuchtenbergianum was an abundant cladoceran. In 1968, 27.2 per liter occurred (July 22) after a gradual buildup in June and early July (Figure 19). Two distinct peaks occurred in 1969, one in late June and the other in early August. On the final sampling date for that summer, 21.9 animals per liter were present. At the end of both summers population numbers were on the upswing, probably to reach a fall maximum in September. D. leuchtenbergianum became progressively more abundant in Wagontrain Reservoir each summer. In 1968 only 0.6 per liter were found at the time of peak abundance (Figure 20). In July and August less than 0.1 per liter was normal. In 1969 the peak population size occurred later (July 30). Mean water temperatures were more than 3°C higher in June of 1968 than in 1969, which may have been more nearly optimal for growth and reproduction in this species. Water temperatures in June of 1970 were similar to those of 1968 and the peak population size was reached in late July (0.9/liter). On September 3 numbers had reached 0.7/liter following August lows. In 1970 summer maxima of 1.4 and 1.8 per liter were observed. A relatively large population for the reservoir was maintained throughout the summer. *Daphnia* spp. (Figure 21) were probably more competitive in 1969 than in 1970, because of their larger numbers. Reduced interspecific competition would have allowed *D. leuchtenbergianum* to become more abundant in 1970 - as it did.

*D. leuchtenbergianum* did not occur in the summer of 1968 in Branched Oak Reservoir; however, it began to occur regularly after mid-July 1969 (Figure 18). It is interesting to note that, until this date, *Daphnia pulex* had been abundant. It then disappeared from the plankton and was not recorded again. Competition from *Daphnia pulex* certainly could have kept *D. leuchtenbergianum* from reaching detectable numbers. On August 7, 1969 a peak of 47.7 per liter occurred. This, again, was the date in which all species numbers were high in Branched Oak, probably due to sampling error; however, a June through August increase did occur to some extent. On July 1, 1970 *D. leuchtenbergianum* returned to detectable numbers and climbed to peak density of 34.3 per liter in late July. Following a decline to about 12 per liter in early August, the population was increasing on the final sampling date of the summer. Chlorophyll values were quite high in July and early August of 1970. A rich food supply may have enabled the zooplankton to increase at the end of summer.

*D. leuchtenbergianum* was not common in Stagecoach Reservoir occurring in 1969 on August 27 only, at less than 0.1 per liter. In 1970 it occurred on 5 sampling dates. About 6 per liter was the maximum abundance attained on each of 2 peaks in July (Figure 17). Maximum abundance coincided with similar peaks of *Ceridodaphnia lacustris*. Prophet (1957) reported *D. leuchtenbergianum* to be a summer form; however, Pennak (1949) found it mostly in late summer and early fall.

*Daphnia retrocurva*

Holmes was the only reservoir in which *D. retrocurva* occurred. In 1968 it was quite abundant (Figure 19), with maximum density on June 4 (19.7/liter). It appears as if the population was declining from even higher levels.

It was absent from the samples by early July but a second summer peak of 14.3 per liter was reached in early August. The previously described increase in abundance of *Diaphanosoma leuchtenbergianum* occurred between the *Daphnia retrocurva* pulses to keep the total zooplankton population above 20 per liter for the entire summer. Ephippia were found in August of 1968. Evidence points toward declining food supply as a controlling factor in ephippial production (Hutchinson, 1967). Chlorophyll values were not low in August in Holmes Reservoir, but, it is possible that *D. retrocurva* was selectively feeding on a species or group of algae which was declining at this time. A few males were found in early June and again in late July of 1969. Banta and Brown (1929) found that male production, which is related to accumulation of an unidentified excretory product, occurs when crowding of the population exists. *Diaphanosoma leuchtenbergianum* was relatively abundant in late July, (14.2/1) but this is hardly a crowded population. In early June the total zooplankton was at its lowest summer level (about 4 organisms/1) so again male production at this time did not occur according to patterns set forth in the literature. In 1969 abundance of *D. retrocurva* was much lower with a maximum of 2.2 organisms per liter in early June (Figure 19). Higher total zooplankton values for the summer of 1968 were primarily caused by the greater numbers of *D. retrocurva* present that year.

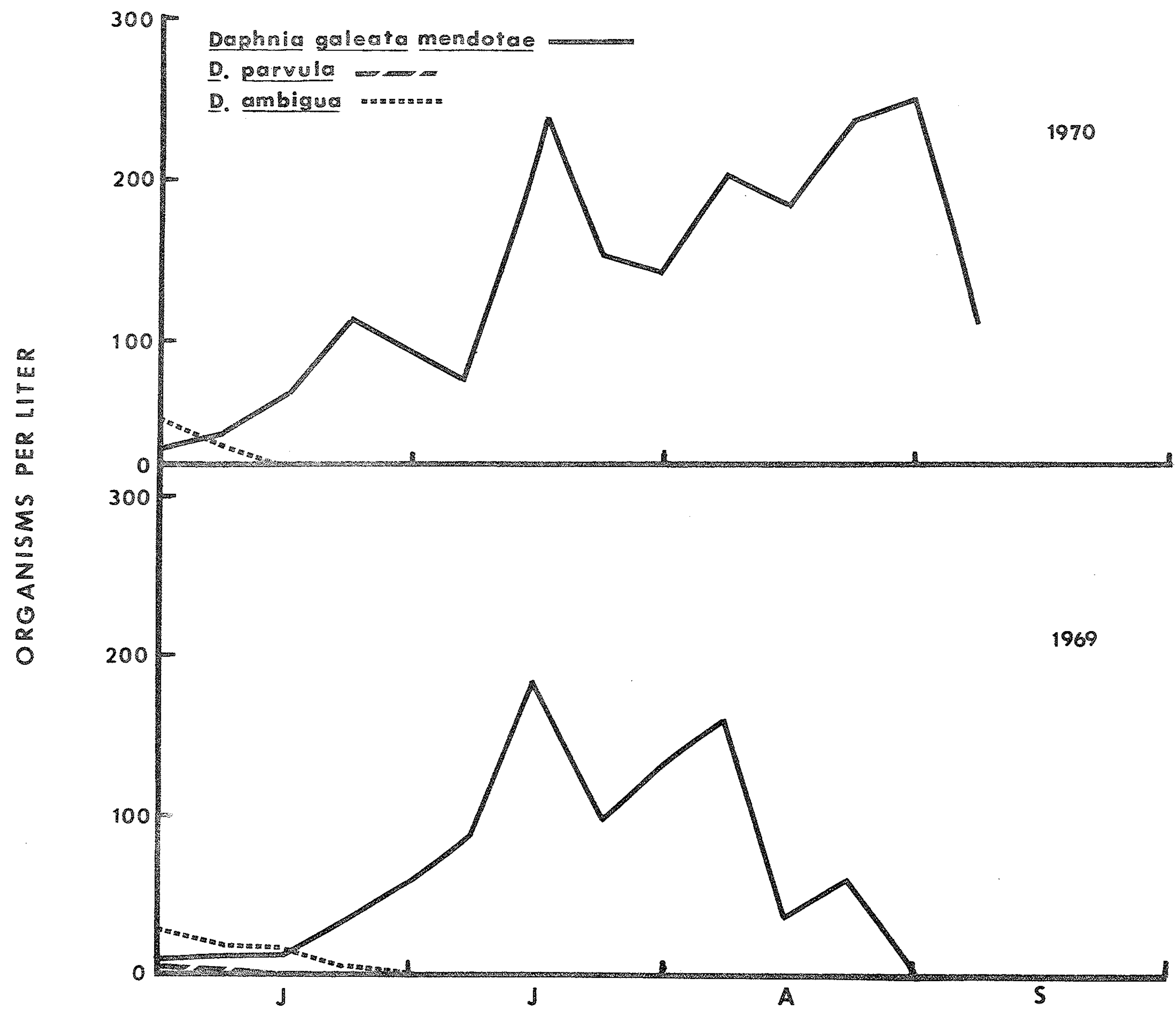
*Daphnia ambigua*

*D. ambigua* was rare in Holmes Reservoir, occurring on only 2 sampling dates (July 28 and August 4, 1969). Maximum abundance was 0.6 per liter. *Daphnia* species were not distinguished in 1968 in Wagontrain Reservoir; however, the population cycle of *Daphnia* resembles the curve of *D. parvula* for the following summers (Figure 21) which indicates that *D. parvula* was probably the predominant species in 1968. On June 4, 1969, 4.1 *D. ambigua* per liter were found in early summer as the population was declining from higher spring levels. Males were present on this date (Figure 25). By the end of June it had disappeared from the samples to return once in August at a density of 1.2 per liter. In 1970 the cycle resembled that of *D. parvula*, reaching maximum abundance of 2.2 per liter in late June.

*D. ambigua* occurred only in early summer in Stagecoach Reservoir. About 25 per liter were found as sampling began in 1969 and 1970 (Figure 23). Higher spring levels were probably present. The population declined to 0 by early July 1969 and by mid-June 1970.

In Branched Oak Reservoir (1968) *D. ambigua* was rare, being found in small numbers from late June to mid-August. Peak abundance was 1.9 per liter on July 18 (Figure 22).

Figure 23. Mean Summer Population Cycles of *Daphnia* Species in Stagecoach Reservoir.



Daphnia galeata mendotae
D. parvula
D. ambigua
1970
1969
ORGANISMS PER LITER
300
200
100
0
J
J
A
S

In 1969 small June and August increases occurred in which the population reached 6.4 per liter. This species was absent from the zooplankton in 1970; however, much higher levels of D. g. mendotae were found then.

D. ambigua was not abundant in Pawnee Reservoir either. It first occurred in mid-February of 1969 (Figure 24), reaching 8.4 per liter by early April. By late April it was absent from the zooplankton. In 1970 this species occurred sparingly from March through late September with a peak of 12.8 per liter being reached in late June. Ephippia were found in mid-May of 1970 only. D. ambigua, in general, is a spring species as is also the case in Bull Shoals Reservoir (Applegate and Mullan, 1969).

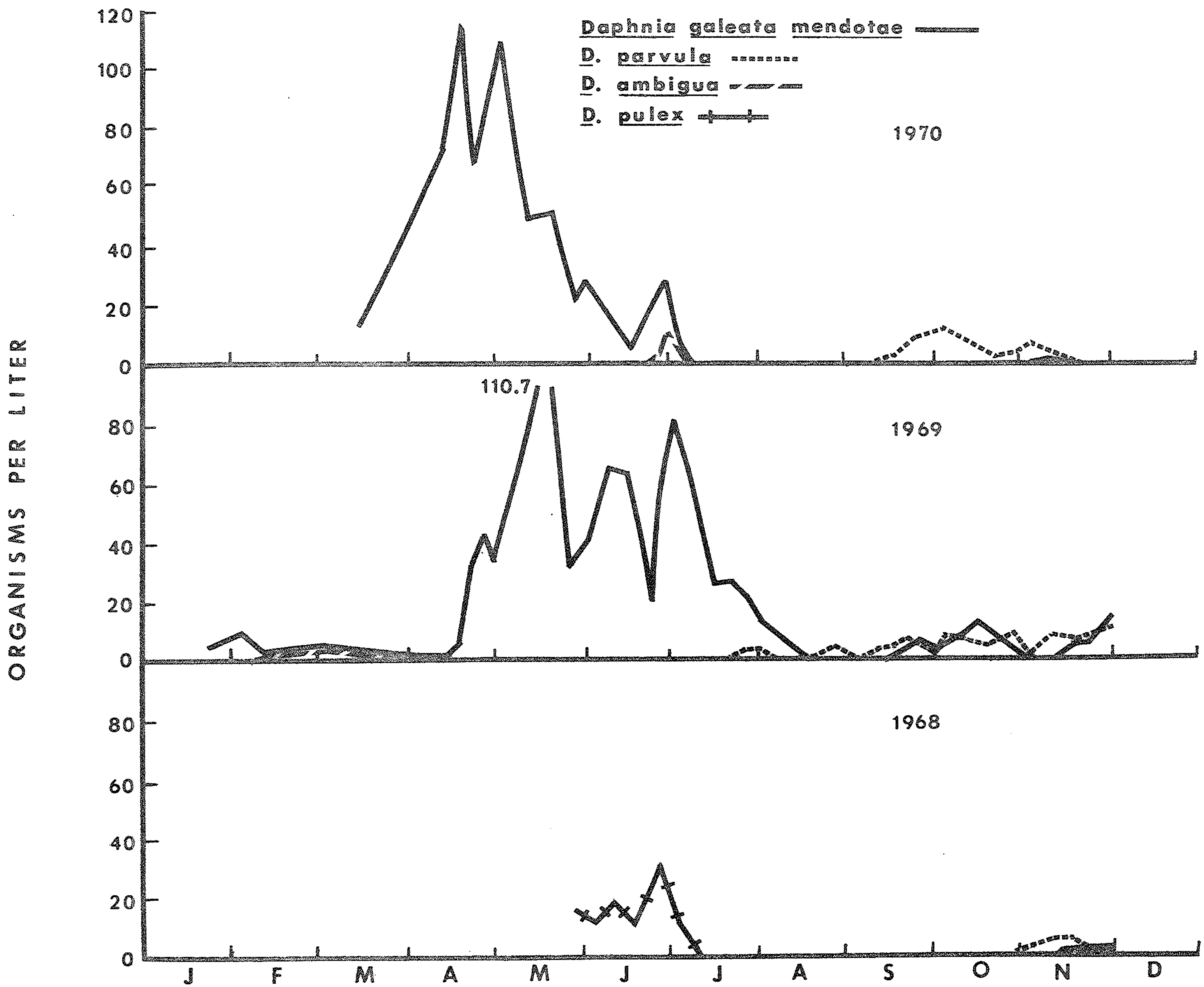
Daphnia parvula

D. parvula like D. ambigua was never abundant in Branched Oak Reservoir. Small numbers were found at intervals in July and August of 1968 and 1970; however, in 1969 it occurred on each sampling date from mid-July until the end of the summer at levels of about 1 organism per liter.

In Stagecoach Reservoir about 6.4 D. parvula per liter were found in early summer 1969, followed by a decline and disappearance by late June (Figure 23). In late summer low levels (less than 0.1/1) occurred. It was rare but present on two occasions in June of 1970.

D. parvula was an important species in Wagontrain

Figure 24. Mean Annual Population Cycles of *Daphnia* Species in Pawnee Reservoir.


Daphnia galeata mendotae
D. parvula
D. ambigua
D. pulex
1970
1969
1968
110.7
ORGANISMS PER LITER
120
100
80
60
40
20
0
J
F
M
A
M
J
J
A
S
O
N
D

Reservoir. The seasonal cycles of D. parvula are reflected strongly in the total zooplankton cycles. Two summer peaks, one in June and one in late July are characteristic in Wagontrain (Figure 21). Maximum abundance was only 5.9 per liter (18 June 1969); however, the total zooplankton population averages only about 3-4 organisms per liter.

D. parvula, though seldom relatively abundant in Pawnee Reservoir,was often present from early summer to late fall. Maximum densities occurred after the larger species of Daphnia had declined. Scattered occurrences of D. parvula were found from late June until early December in 1968, with a maximum of 1.3 per liter in mid-November (Figure 24). It was rare in the spring of 1969 but occurred regularly from mid-July to early December with a 2-4 organisms per liter being present through September and October. In 1970 a few March occurrences at low population levels were recorded. The species was absent until June when low numbers occurred and were maintained throughout the summer. Maximum density was reached in early October at 13.3 per liter (Figure 24).

A few ephippia were found in July of 1968; however, they occurred commonly in November and December of 1969 and 1970. Chlorophyll values usually decline rapidly in October and November at which time the production of ephippia enables D. parvula to overwinter in the form of resting eggs. Males were observed in the population simultaneously, although total zooplankton levels were low. It would seem that male production is induced, in part, in *D. parvula* by factors other than crowding. Perhaps decline in temperature or change in photoperiod as winter approaches are important.

*Daphnia pulex*

*D. pulex* was found on only one occasion in Wagontrain Reservoir (0.1/l). It did not occur in Stagecoach or Holmes. In June and July of 1968 this was the dominant zooplankter in Pawnee. On June 26, 31.1 per liter were present (Figure 24). Ephippia were found in late May when *D. pulex* was rather abundant. Perhaps heavy grazing of an April phytoplankton pulse resulted in an inadequate food supply and stimulated ephippial production. The population had collapsed by mid-July. Species of *Daphnia* were rare until *D. g. mendotae* began to occur, for the first time, in late fall. For the duration of the study, *D. pulex* was found on only 1 occasion (2 July 1969). A similar situation existed in Branched Oak Reservoir. *D. pulex* was numerically dominant in 1968 and for the first half of the summer in 1969 (Figure 22). Peak densities of 37.7 per liter and 50.4 per liter in 1968 and 1969, respectively, were recorded. Ephippia were common in June of 1968. A large species like *D. pulex* at such densities accounts for a large portion of the total standing crop. After July 24, 1969, D. g. mendotae began to occur in the plankton and completely replaced D. pulex in 1970. According to Brooks (1970) a shift in dominance from large to smaller-bodied zooplankters implies increased intensity of predation by planktivorous fishes. Beeton (1965) found D. pulex to be replaced by D. g. mendotae in Lake Erie with increased eutrophication.

Daphnia galeata mendotae

D. g. mendotae made by far the most important contribution to the zooplankton in Stagecoach Reservoir. In 1969 major mid-summer peaks of 183.8 and 160.4 organisms per liter occurred (Figure 23). The population had declined by early September. The population density in 1970 was even higher with sustained levels, in July and August, of over 200 organisms per liter. Such high densities of a moderate-sized zooplankter represent a quite large standing crop in terms of weight.

D. g. mendotae in Branched Oak Reservoir was not significant in 1968 and in early summer, 1969, when D. pulex was present. Regular occurrences at low population levels were found in July and August of 1969. By 1970 D. g. mendotae was the numerically dominant zooplankter (Figure 22). The declining curve through June 3 (83.2/1) indicates that even higher spring levels occurred. A second peak (103.4/1) was found to occur in early July. Males were found in July and early August while ephippia were present in late July. This was a time in which crowded populations existed. In addition, blooms of blue-green algae were occurring, which dominated the phytoplankton and were probably poor food for the *Daphnia* since clumps of *Anabaena* or *Aphanizomenon*, common components of blooms in Branched Oak, cannot be swallowed by many zooplankton (Edmondson, 1957).

In Pawnee Reservoir *D. g. mendotae* began to occur regularly in September, 1968 and reached 3 large peaks of abundance during the summer (Figure 24). From mid-April to mid-July an average population density of over 50 per liter was sustained. Numbers were low by early August and remained low throughout fall and winter. In 1970 peaks of 113.1 per liter (21 April) and 110.6 per liter (5 May) were followed by slow decline to low levels after mid-July. In spring and summer of 1969 and 1970 curves representing total zooplankton numbers reflect those of *D. g. mendotae*, indicating its importance to the total zooplankton.

*D. g. mendotae* was not abundant in Wagontrain Reservoir. Maximum density seldom reached 0.5 organisms per liter (Figure 21). Scattered occurrences at levels below 0.1 per liter occurred during all summer months. A single male was found on August 6, 1969.

Ephippia were produced in June, 1969 in Pawnee Reservoir (Figure 25). Males were common from late April

Figure 25. Organisms and structures of importance in the sexual cycles of cladocerans or copepods.

A. *Daphnia ambigua* male from Wagontrain Reservoir (June 4, 1969).

B. *Daphnia galeata mendotae* male from Pawnee Reservoir (May 13, 1969).

C. Spermatophore attached to genital opening of *Diaptomus pallidus* female (May 6, 1969).

D. Ephippium of *Daphnia galeata mendotae* from Pawnee Reservoir (June 3, 1969).

through early August (Figure 25) at a time when population levels were high and crowding could well have been a factor in male induction. Males and ephippia were common in Stagecoach Reservoir in July and early August of 1970. Population levels were very high at this time. Chlorophyll concentrations were also quite high at this time; however, these values represent blooms of blue-green algae which may have been abundant while other, perhaps more edible, species were declining.

*D. g. mendotae* was also most abundant in spring or early summer in Bull Shoals Reservoir (Applegate and Mullan, 1969). Standing crop, in terms of dry weight, is about 65 percent greater when a population of *D. g. mendotae* is present rather than equal numbers of smaller forms such as *D. parvula* or *D. ambigua* (Applegate and Mullan, 1967b). This indicates that even greater biomass differences exist between Wagontrain and the clearer reservoirs (Pawnee, Stagecoach and Branched Oak) than is evidenced by the numerical differences.

## Cyclomorphosis

Planktonic organisms frequently undergo seasonal polymorphism termed cyclomorphosis (Hutchinson, 1967). Although copepods may exhibit this phenomenon, it is generally more noticeable in animals which reproduce parthenogenetically such as members of the Cladocera. The dorsal margin of the carapace in *Bosmina coregoni* may become strongly humped in summer while some *Ceridodaphnia* may undergo reduction in body size and increase in head height and eye diameter (Hutchinson, 1967).

Most work in this area has been conducted on species of *Daphnia* in which helmets are formed during warm seasons. Earlier investigators felt that temperature (Wesenberg-Lund, 1908; Coker and Addlestone, 1938) or food supply (Woltereck, 1909) were the most important environmental causes of helmet formation. Brooks (1946, 1947) discovered that temperature and turbulence could both be correlated with helmet growth. Consolidating available information on the subject of cyclomorphosis, Brooks (1965) pointed out that temperature and turbulence do seem to be the primary determinants of helmet size, with light playing a role in that it is needed for turbulence to be effective. Smallest helmets are usually found in winter and early spring when water temperature is below $10^{\circ}C$. In summer, when water temperature is above $18^{\circ}$-$20^{\circ}C$, large helmets are found in many species.

Helmet variation in *Daphnia galeata mendotae* from Pawnee Reservoir is shown in Figures 26 and 27. In April when water temperatures were below $12^{\circ}C$ non-helmeted individuals were found (Figure 26, 1A-1B). In May, when temperatures rose to $16^{\circ}$-$19^{\circ}C$, many juveniles (Figure 26-2B) were found with pronounced helmets. On most juveniles and some adults helmets were present through June and July

Figure 26. Adult and juvenile *Daphnia galeata mendotae* from Pawnee Reservoir in 1969.

1A. Adult, April 15.
1B. Juvenile, April 15.

2A. Adult, May 13.
2B. Juvenile, May 13.

3A. Adult, June 17.
3B. Juvenile, June 17.

4A. Adult, July 15.
4B. Juvenile, July 15.

5A. Adult, August 12.
5B. Juvenile, August 12.

6A. Adult, September 16.
6B. Juvenile, September 16.

Figure 27. Adult and juvenile *Daphnia galeata mendotae* from Pawnee Reservoir in 1969.

1A. Adult, October 15.
1B. Juvenile, October 15.

2A. Adult, November 11.
2B. Juvenile, November 11.

3A. Adult, December 2.
3B. Juvenile, December 2.

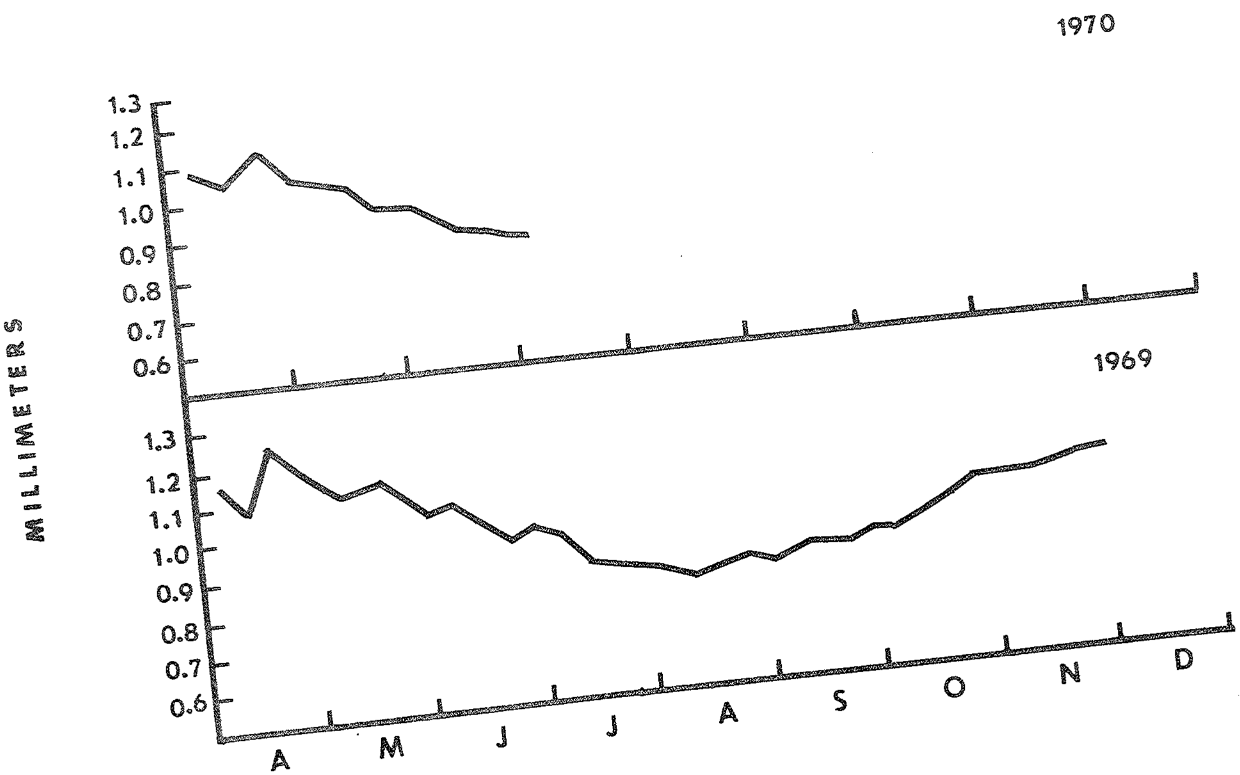
when temperatures were 20°-25°C. The most pronounced helmets on adults were observed through August, September and early October. Mean water temperatures ranged from over 25°C in August to about 20°C in late September. Temperatures fell rapidly through October, from about 19°C to about 7°C, and by November only small spikes remained on a few adults (Figure 27-2A). The small-helmeted December adults (Figure 27-3A) had probably been survivors of preceeding months when water temperatures were warmer.

There was a trend toward declining carapace lengths of reproductive females from late April through mid-August (Figure 28), as helmets became more pronounced. Brooks (1965) suggested that transparent helmets and smaller body size are important adaptations to reduce predation by sight-feeding fishes. One would expect that young-of-the-year planktivorous fishes would have exerted the greatest amount of pressure on *D. g. mendotae* during these months. Adult carapace lengths gradually rose through the fall (Figure 28) as water temperatures declined and predation was probably less intensive.

## Total Zooplankton

Pennak (1946) notes that mean annual standing crop (No./l) may serve as a general index of total ecological conditions in a lake. Using numbers per liter to compare reservoirs has the disadvantage that rate of production is not indicated. Hall (1964) estimates the turnover rate

Figure 28. Mean carapace length of reproductive adult *Daphnia galeata mendotae* in Pawnee Reservoir.

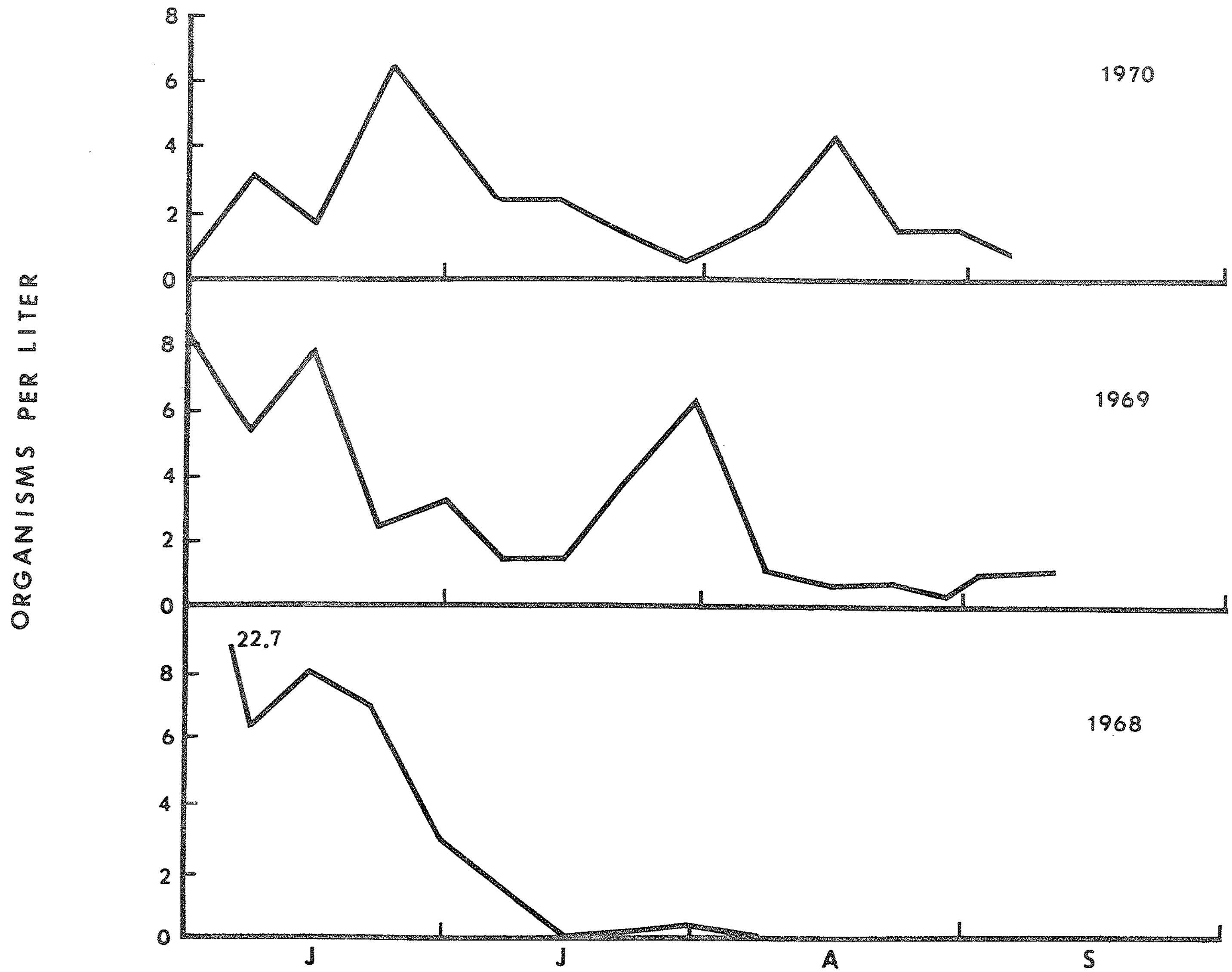

1970
1969
MILLIMETERS
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
A
M
J
J
A
S
O
N
D

of numbers and biomass of Daphnia galeata mendotae to be once every 4 days in summer; however, a reservoir with poor food supply and little predation may sustain large numbers of plankters but have much longer turnover rates. Consequently, production may actually be low.

Data collected year-round in Pawnee Reservoir show that much zooplankton production occurs in the spring, before our sampling began in the other reservoirs. To make comparison of reservoirs possible it is necessary to assume that similar seasonal patterns occur when collections are not being made. Since time does not permit regular year-round collections in all reservoirs, summer samples should serve to best study the ecology of each since total production, for the most part, proceeds fastest at the higher summer temperatures.

In Wagontrain Reservoir (Figure 29) total mean summer zooplankton numbers were found to be 4.0 per liter in 1968, 3.0 per liter in 1969 and 3.1 per liter in 1970. No trend toward increased productivity is indicated by these summer means. Summer mean chlorophyll values vary somewhat each summer but no trend toward higher primary production occurred using this parameter either (Table XI). July mean chlorophyll concentrations were higher than those of June and August. The late-July and August zooplankton highs follow the July chlorophyll increase indicating that a grazing relationship existed. Such a lag period between

Figure 29. Mean summer population cycles of total zooplankton in Wagontrain Reservoir.



ORGANISMS PER LITER
8
6
4
2
0
1970
1969
1968
22.7
J
J
A
S

Table XI. Mean Chlorophyll Concentrations ($mg/m^3$) in the Study Reservoirs.*

| Reservoir | Date | June | July | August | Summer |
|---|---|---|---|---|---|
| Wagontrain | 1968 | 18.75 | 27.99 | 27.27 | 24.67 |
| | 1969 | 16.51 | 22.07 | 19.10 | 19.23 |
| | 1970 | 24.05 | 31.10 | 23.46 | 26.20 |
| Holmes | 1968 | 8.64 | 19.78 | 11.84 | 13.42 |
| | 1969 | 10.50 | 20.06 | 22.97 | 17.85 |
| Pawnee | 1968 | 4.23 | 9.92 | 30.00 | 14.72 |
| | 1969 | 19.92 | 18.95 | 36.43 | 25.10 |
| | 1970 | 38.25 | 52.86 | 62.86 | 51.32 |
| Branched Oak | 1968 | 6.03 | 4.32 | 10.10 | 6.82 |
| | 1969 | 26.53 | 16.84 | 38.05 | 27.14 |
| | 1970 | 14.87 | 79.64 | 64.23 | 52.91 |
| Stagecoach | 1969 | 22.53 | 50.46 | 59.27 | 44.09 |
| | 1970 | 99.02 | 144.98 | 95.19 | 89.74 |

* Data from Hergenrader and Hammer (1971)

phytoplankton and zooplankton maxima occurs since a certain amount of time is required for the better fed zooplankton population to build up (Steemann Nielsen, 1937). Zoo-phytoplankton relationships, of course, require much more detailed analysis since high chlorophyll values may be associated with species of algae which are not necessarily valuable in the diet of the zooplankton.

In Holmes Reservoir total summer zooplankton means decreased from 20.2 organisms per liter in 1968 to 13.3 per liter in 1969 (Figure 30). This difference was largely due to relative decline of *Daphnia retrocurva* numbers in 1970. At any rate, no increased production is indicated from the zooplankton data. Chlorophyll values (Table XI) were somewhat higher during the second summer. High chlorophyll values in July were probably partly responsible for late July increases in zooplankton abundance.

In Pawnee Reservoir summer zooplankton means were 9.6 organisms per liter in 1968, 42.7 per liter in 1969 and 13.2 per liter in 1970 (Figure 31). The peak abundance of total zooplankton occurred earlier in 1970 and is not taken into consideration in the preceeding figures. If yearly abundance is compared one finds a mean of 30.0 organisms per liter in 1969 and 25.8 per liter in 1970, much closer values, which give a better indication of production. Chlorophyll values increased each summer (Table XI), so that there is not clear agreement between

Figure 30. Mean summer population cycles of total zooplankton in Holmes Reservoir.

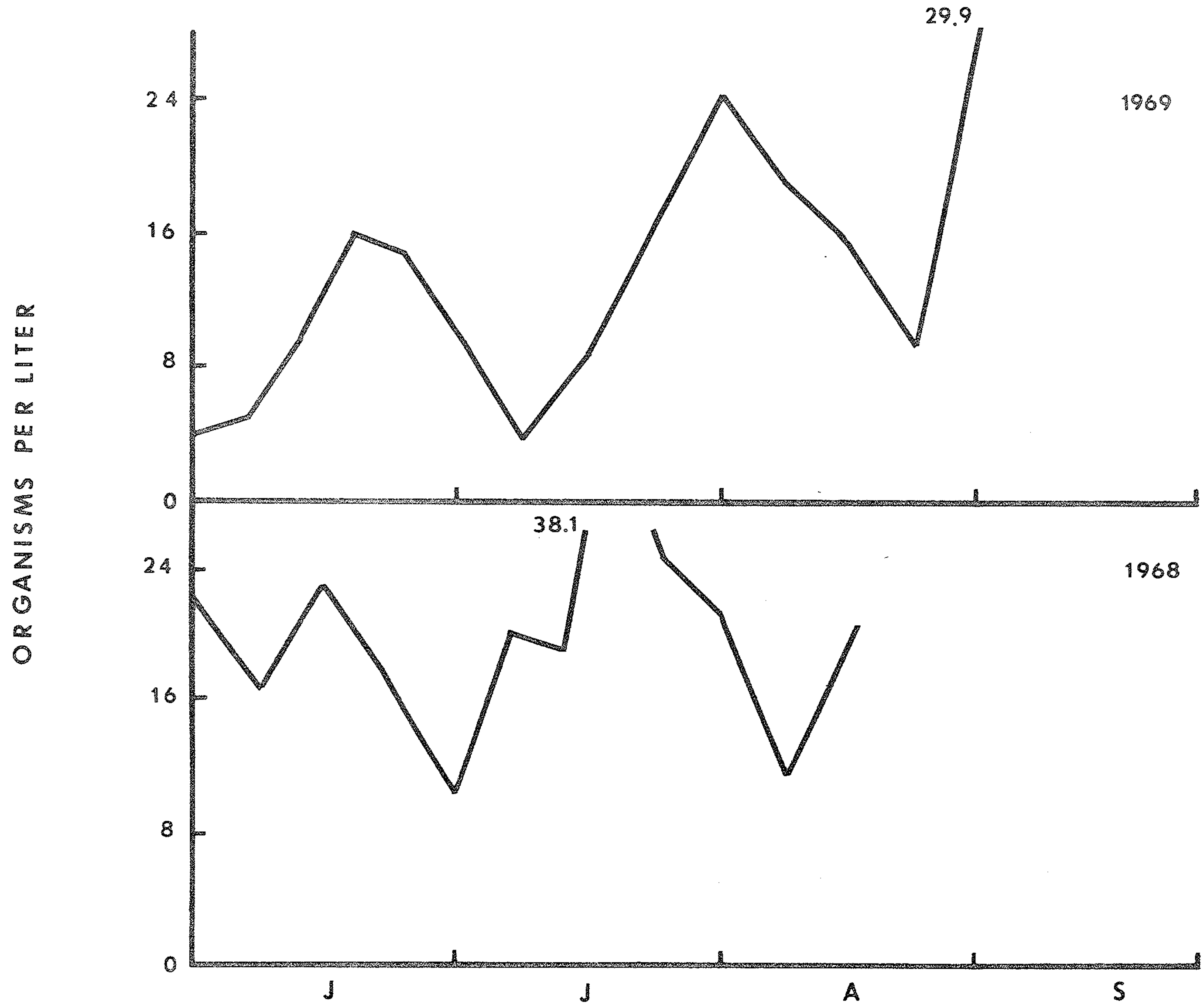
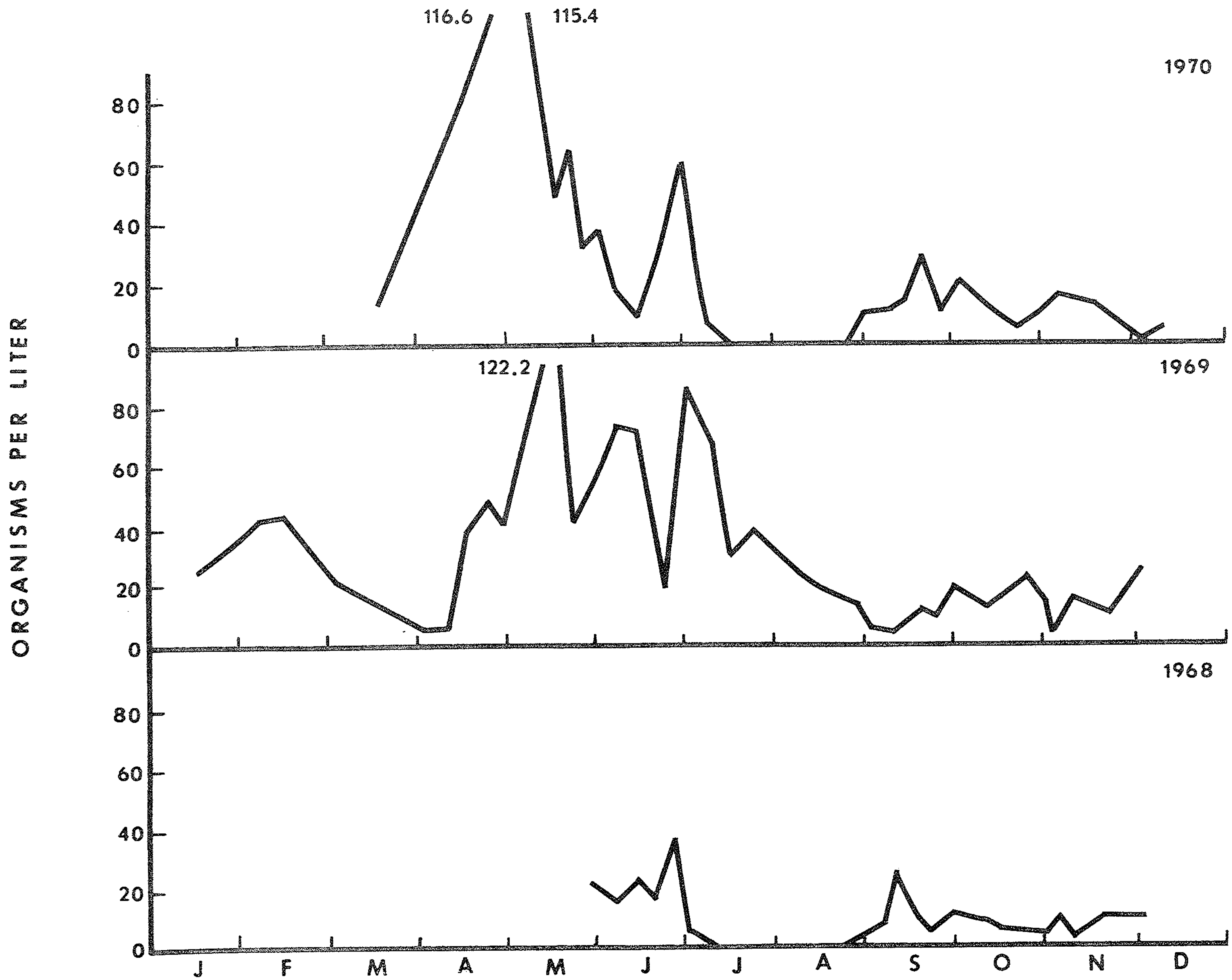

ORGANISMS PER LITER
29.9
1969
24
16
8
0
38.1
1968
24
16
8
0
J
J
A
S

Figure 31. Mean annual population cycles of total zooplankton in Pawnee Reservoir.


116.6
115.4
1970
122.2
1969
1968
ORGANISMS PER LITER
80
60
40
20
0
J
F
M
A
M
J
J
A
S
O
N
D

phytoplankton and zooplankton production in Pawnee Reservoir.

Summer chlorophyll values in Branched Oak Reservoir increased progressively during the study period (Table XI). Mean zooplankton numbers climbed from 22.9 organisms per liter in 1968, to 45.4 per liter in 1969 and to 59.1 per liter in 1970 (Figure 32). On August 7, 1969, questionably high numbers of zooplankton were recorded. Had this figure been lower the 1969 mean of 45.4 per liter would, of course, have been lowered also; however, the number still would have fallen between the 1968 and the 1970 figures. Good agreement is obtained between primary and secondary production indicators so that this reservoir would indeed seem to have become more eutrophic each year.

Both chlorophyll values (Table XI) and zooplankton numbers (Figure 33) more than doubled between the two summers in Stagecoach Reservoir. Mean total zooplankton per liter was 71.2 in 1969 and 147.8 in 1970. This reservoir, also, seems to have become considerably more productive from 1969 to 1970.

By ranking the study reservoirs in order of trophic state for each summer according to standing crop, chlorophyll, total zooplankton numbers (secondary production), and primary productivity one finds the order to be quite similar (Table XII). The data show a distinct trend toward a higher state of eutrophication in the clearer lakes

Figure 32. Mean summer population cycles of total zooplankton in Branched Oak Reservoir.

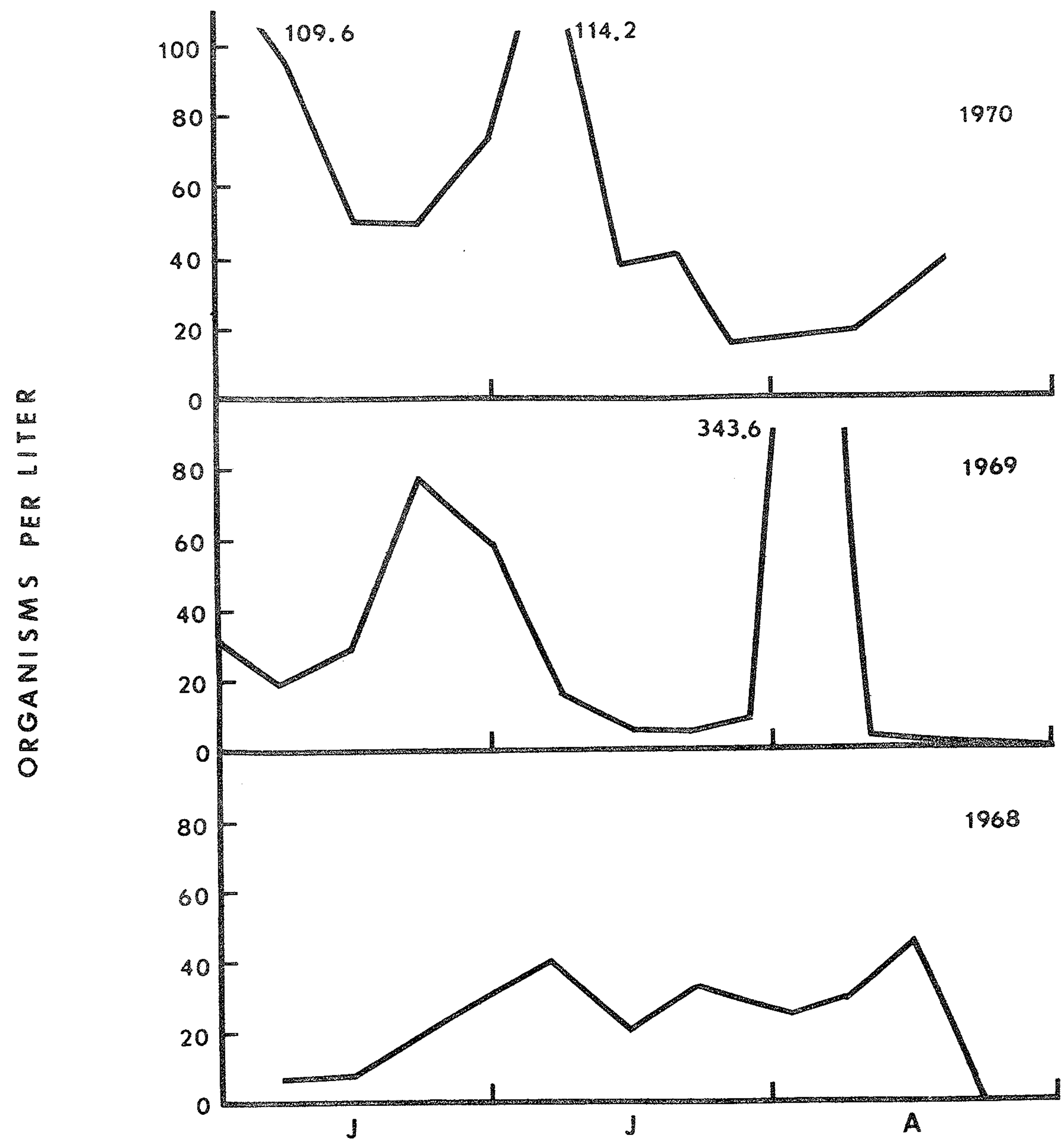

ORGANISMS PER LITER
109.6
114.2
1970
343.6
1969
1968
100
80
60
40
20
0
J
J
A

Figure 33. Mean summer population cycles of total zooplankton in Stagecoach Reservoir.

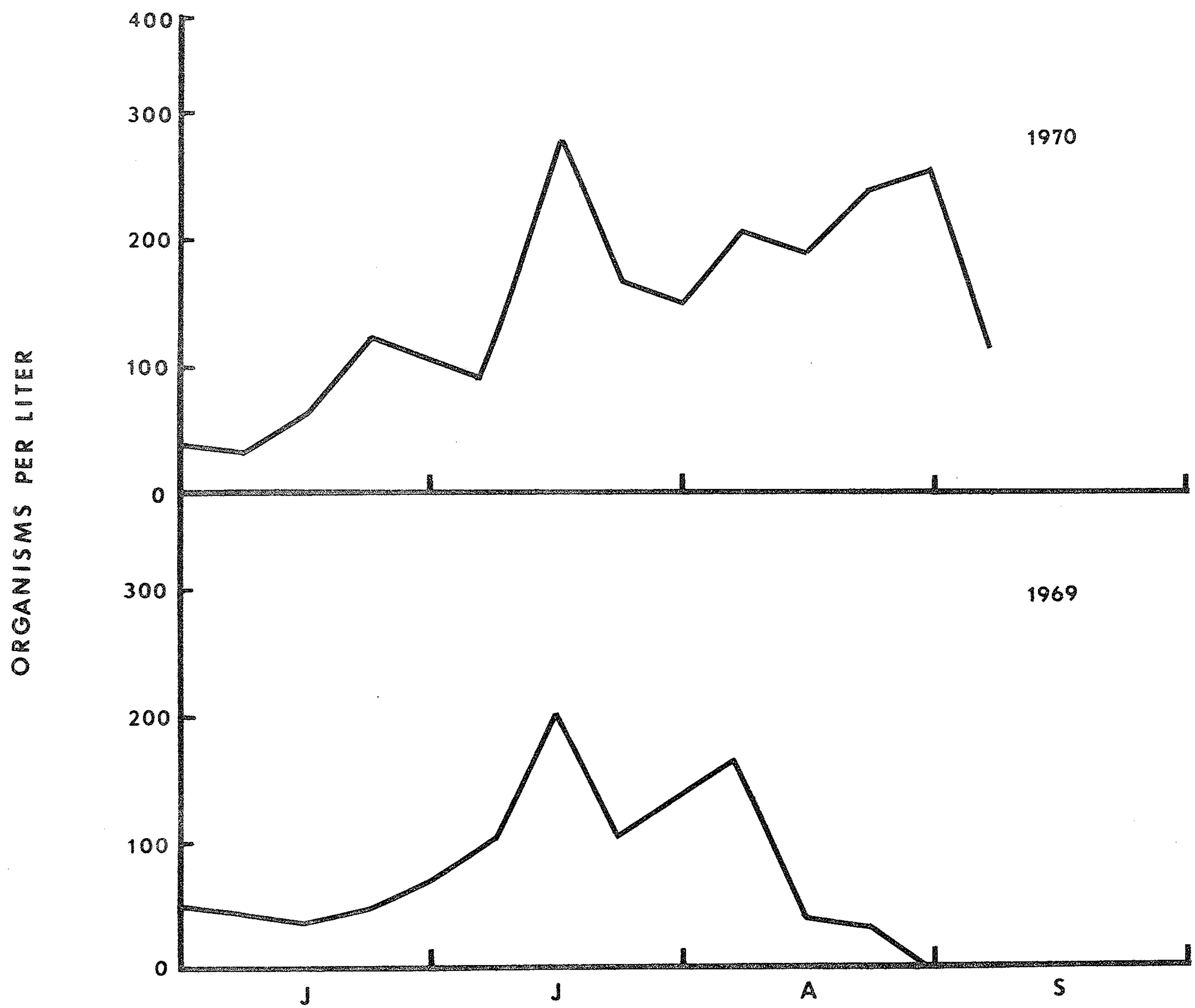

ORGANISMS PER LITER
400
300
200
100
0
1970
1969
J
J
A
S

Table XII. Comparison of the trophic state of the study reservoirs using three biological parameters.

Increasing chlorophyll concentration ↓

| 1968 | 1969 | 1970 |
|---|---|---|
| Holmes | Holmes | Wagontrain |
| Wagontrain | Wagontrain | Pawnee |
| Branched Oak | Pawnee | Branched Oak |
| Pawnee | Branched Oak | Stagecoach |
| | Stagecoach | |

Increasing numbers of total zooplankton ↓

| 1968 | 1969 | 1970 |
|---|---|---|
| Wagontrain | Wagontrain | Wagontrain |
| Pawnee | Holmes | Pawnee |
| Holmes | Pawnee | Branched Oak |
| Branched Oak | Branched Oak | Stagecoach |
| | Stagecoach | |

Increasing primary productivity* ↓

| 1968 | 1969 | 1970 |
|---|---|---|
| Holmes | Holmes | Holmes |
| Wagontrain | Wagontrain | Wagontrain |
| Pawnee | Pawnee | Pawnee |
| Stagecoach | Stagecoach | Stagecoach |
| Branched Oak | Branched Oak | Branched Oak |

* Data from Andersen (1971).

(Pawnee, Branched Oak and Stagecoach), and that production has increased considerably in the three year period. It is unlikely that the turbid, light-limited, reservoirs will have problems in terms of algal blooms and growth of rooted aquatics; however, the clear water reservoirs seem to be proceeding quickly toward a highly eutrophic state.

# SUMMARY

1. A study of the limnetic zooplankton in five flood control reservoirs in Southeastern Nebraska was conducted during the period, May 1968 to January 1970. Four reservoirs were studied in summer and one was studied year-round.

2. Important morphological characters used in identification of component limnetic zooplankton organisms (Cladocera and Copepoda) are described and illustrated.

3. The limnetic summer zooplankton community in the five reservoirs consisted, on the average, of 3.2 cladoceran species and 2.4 copepod species. Congeneric occurrences of *Diaptomus* and *Daphnia* species were common. Means of maintaining reduced interspecific competition are discussed.

4. *Bosmina longirostris*, a species characteristic of eutrophied waters, was found in the clear water reservoirs (Branched Oak, Pawnee and Stagecoach) in which primary production was greatest. *B. coregoni*, often associated with oligotrophism, was found to occur in the turbid, less-productive reservoirs (Holmes and Wagontrain).

5. Seasonal cycles and abundance of each species of limnetic zooplankter from each of the five reservoirs

are compared and discussed. Temperature, predation, food supply and life cycles are important factors in determination of zooplankton succession.

*Daphnia pulex* (the largest cladoceran encountered) was the dominant zooplankter, during initial months of the study, in Pawnee and Branched Oak Reservoirs. It was replaced almost entirely by the smaller *Daphnia galeata mendotae*, a phenomenon directly associated with more intensive fish predation and indirectly with increasing eutrophication.

6. Seasonal form change (cyclomorphosis) is analyzed in *Daphnia galeata mendotae*. Declining carapace length and increasing helmet size occur from early spring through summer. Such changes most likely render the organisms less vulnerable to predation due to minimum visibility.

7. Summer zooplankton standing crops (No./l) were compared through time in each reservoir. Holmes and Wagontrain Reservoirs supported lower standing crops during the final, than in the initial, summer of study. Summer zooplankton production (based on numbers/l) in Pawnee Reservoir increased between 1968 and 1969 but declined from 1969 to 1970. The apparent decline between the last two years was primarily caused by an earlier pulse in 1970. Mean annual densities were much closer in 1969 and 1970 than are the summer values. Standing crop data indicate that production in Branched Oak and

Stagecoach Reservoirs more than doubled during the duration of the study period.

8. Mean standing crops (No./l) of zooplankton for the entire study period indicate that Wagontrain Reservoir is probably the least productive at the secondary production level, followed by Holmes, Pawnee, Branched Oak and Stagecoach Reservoirs.

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# APPENDICES

A. QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

B. QUANTITATIVE DATA - HOLMES RESERVOIR

C. QUANTITATIVE DATA - PAWNEE RESERVOIR

D. QUANTITATIVE DATA - STAGECOACH RESERVOIR

E. QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

<u>*Diaptomus pallidus*</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 13 Jun 68 | 1.9 | 2.1 | --- | * | * |
| 20 Jun 68 | 3.9 | 5.8 | 7.8 | * | * |
| 27 Jun 68 | 10.4 | 10.2 | 9.5 | * | * |
| 11 Jul 68 | 10.8 | 11.9 | 9.2 | * | * |
| 18 Jul 68 | 3.1 | 6.2 | 9.6 | * | * |
| 25 Jul 68 | 7.2 | 2.1 | 2.8 | * | * |
| 1 Aug 68 | 3.6 | 3.1 | 3.3 | * | * |
| 9 Aug 68 | 2.0 | 2.0 | 0.4 | * | * |
| 16 Aug 68 | 1.3 | 2.1 | - | * | * |
| 22 Aug 68 | 0.5 | 0.2 | 0.3 | * | * |
| 5 Jun 69 | 6.2 | 3.0 | 2.3 | * | * |
| 16 Jun 69 | 3.7 | 4.5 | 4.7 | * | * |
| 19 Jun 69 | 8.7 | 4.8 | 1.7 | * | * |
| 27 Jun 69 | 16.3 | 11.6 | 0.6 | * | * |
| 2 Jul 69 | 11.0 | 16.3 | 7.1 | * | * |
| 10 Jul 69 | 7.1 | 5.7 | 6.4 | * | * |
| 17 Jul 69 | 3.5 | 0.6 | 0.6 | | * |
| 24 Jul 69 | 0.3 | 1.2 | 1.4 | * | * |
| 31 Jul 69 | 2.1 | 1.4 | 0.5 | | * |
| 7 Aug 69 | 49.7 | 15.4 | 84.0 | * | * |
| 14 Aug 69 | 0.7 | * | 0.2 | | * |
| 22 Aug 69 | 0.6 | 0.004 | 0.2 | | * |

* Present in sample

## QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Diaptomus pallidus*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 28 Aug 69 | 0.4 | 0.004 | 0.05 | | * |
| 3 Jun 70 | 7.0 | 4.0 | --- | | * |
| 10 Jun 70 | 16.5 | 14.0 | 7.7 | | * |
| 17 Jun 70 | 1.7 | 3.4 | 2.5 | | * |
| 24 Jun 70 | 3.4 | 1.6 | 4.9 | | * |
| 1 Jul 70 | 5.0 | --- | --- | | |
| 8 Jul 70 | 1.6 | 2.5 | 6.1 | * | * |
| 15 Jul 70 | 3.3 | 1.0 | 2.9 | * | * |
| 22 Jul 70 | * | 1.0 | - | | * |
| 29 Jul 70 | - | - | * | | |
| 12 Aug 70 | 0.6 | - | - | | |
| 19 Aug 70 | - | - | 3.1 | | * |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

<u>Diaptomus clavipes</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 5 Jun 69 | - | * | - | | |
| 16 Jun 69 | 0.5 | - | - | | |
| 19 Jun 69 | - | - | - | | |
| 27 Jun 69 | - | - | - | | |
| 2 Jul 69 | - | - | - | | |
| 10 Jul 69 | - | - | - | | |
| 17 Jul 69 | - | 0.1 | - | | |
| 24 Jul 69 | * | 0.2 | 0.4 | * | * |
| 31 Jul 69 | * | * | - | | |
| 7 Aug 69 | - | - | - | | |
| 14 Aug 69 | - | - | - | | |
| 22 Aug 69 | 0.03 | 0.002 | - | | |
| 28 Aug 69 | * | 0.004 | - | | |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

Mesocyclops edax
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 13 Jun 68 | 0.8 | - | --- | * |
| 20 Jun 68 | 0.6 | 1.2 | - | |
| 27 Jun 68 | - | - | - | |
| 11 Jul 68 | - | - | - | |
| 18 Jul 68 | - | - | - | |
| 25 Jul 68 | - | - | 1.6 | * |
| 1 Aug 68 | - | - | - | |
| 9 Aug 68 | - | - | - | |
| 16 Aug 68 | - | - | 0.7 | |
| 22 Aug 68 | - | - | - | |
| 5 Jun 69 | - | * | - | |
| 16 Jun 69 | 0.4 | 0.5 | 1.2 | |
| 19 Jun 69 | 0.6 | 2.1 | 0.6 | * |
| 27 Jun 69 | * | 1.6 | - | |
| 2 Jul 69 | - | - | 1.4 | |
| 10 Jul 69 | 0.8 | 0.4 | * | |
| 17 Jul 69 | - | 0.2 | - | * |
| 24 Jul 69 | 0.1 | 0.2 | 0.6 | |
| 31 Jul 69 | 0.3 | * | * | |
| 7 Aug 69 | - | - | - | |
| 14 Aug 69 | - | * | * | |
| 22 Aug 69 | - | 0.002 | 0.18 | |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

<u>Mesocyclops edax</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 28 Aug 69 | 0.1 | 0.02 | - | * |
| 3 Jun 70 | 4.1 | - | --- | |
| 10 Jun 70 | - | 2.7 | - | |
| 17 Jun 70 | 1.7 | - | * | * |
| 24 Jun 70 | - | - | 3.2 | * |
| 1 Jul 70 | - | --- | --- | |
| 8 Jul 70 | - | - | 5.4 | |
| 15 Jul 70 | - | 2.1 | 1.0 | * |
| 22 Jul 70 | 0.5 | 1.6 | 0.8 | * |
| 29 Jul 70 | - | 1.2 | - | |
| 12 Aug 70 | 1.8 | 1.1 | - | |
| 19 Aug 70 | 1.8 | - | 6.1 | |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

Cyclops vernalis
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 13 Jun 68 | - | - | - | |
| 20 Jun 68 | - | * | - | |
| 27 Jun 68 - 22 Aug 68 -- Not present | | | | |
| 5 Jun 69 | 1.6 | - | 0.5 | * |
| 16 Jun 69 - 2 Jul 69 -- Not present | | | | |
| 10 Jul 69 | - | 0.4 | - | * |
| 17 Jul 69 - 28 Aug 69 -- Not present | | | | |
| 3 Jun 70 | 1.4 | - | --- | |
| 10 Jun 70 - 29 Jul 70 -- Not present | | | | |
| 12 Aug 70 | 0.6 | 0.3 | - | * |
| 19 Aug 70 | - | - | - | |

Diaptomus siciloides
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 5 Jun 69 - 2 Jul 69 -- Not present | | | | | |
| 10 Jul 69 | * | - | - | | |
| 17 Jul 69 - 28 Aug 69 -- Not present | | | | | |
| 3 Jun 70 | * | - | - | | |
| 10 Jun 70 - 8 Jul 70 -- Not present | | | | | |
| 15 Jul 70 | * | - | - | | |
| 22 Jul 70 - 19 Aug 70 -- Not present | | | | | |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

<u>Bosmina longirostris</u>
(No./l)

| Date of Sample | No./l Sampling Station 1 | 2 | 3 | Eggs/l Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 69 - 31 Jul 69 -- Not present | | | | | | |
| 7 Aug 69 | 74.6 | 519.4 | 108.0 | 17.6 | 128.6 | 21.6 |
| 14 Aug 69 | 0.1 | 0.3 | - | - | - | - |
| 22 Aug 69 | - | - | 0.09 | - | - | - |
| 28 Aug 69 | - | - | - | - | - | - |
| 3 Jun 70 | - | 1.6 | --- | - | 3.3 | --- |
| 10 Jun 70 | 1.8 | 2.7 | 1.9 | - | 5.5 | - |
| 17 Jun 70 - 24 Jun 70 -- Not present | | | | | | |
| 1 Jul 70 | 5.0 | --- | --- | 3.8 | --- | --- |
| 8 Jul 70 | 1.6 | - | - | - | - | - |
| 15 Jul 70 | - | - | - | - | - | - |
| 22 Jul 70 | 1.1 | - | - | 1.1 | - | - |
| 29 Jul 70 - 19 Aug 70 -- Not present | | | | | | |

<u>Ceridodaphnia quadrangula</u>
(No./l)

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 Jun 69 - 10 Jul 69 -- Not present | | | | | | |
| 17 Jul 69 | * | - | - | - | - | - |
| 24 Jul 69 | * | - | - | - | - | - |
| 31 Jul 69 - 28 Aug 69 -- Not present | | | | | | |

## QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

### *Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 69 | 1.6 | - | - | 1.6 | - | - |
| 16 Jun 69 - 10 Jul 69 -- Not present | | | | | | |
| 17 Jul 69 | 0.3 | - | - | 0.6 | - | - |
| 24 Jul 69 | 0.1 | 0.2 | 1.0 | 0.2 | - | 1.2 |
| 31 Jul 69 | 2.1 | 2.4 | 0.8 | 1.3 | 0.7 | 0.5 |
| 7 Aug 69 | 27.0 | 36.0 | 78.0 | 2.0 | 15.4 | 14.4 |
| 14 Aug 69 | 3.0 | 0.5 | 0.1 | 2.0 | 0.8 | - |
| 22 Aug 69 | 0.06 | 0.005 | 1.4 | 0.03 | - | 0.9 |
| 28 Aug 69 | 0.1 | 0.03 | 0.01 | - | 0.004 | 0.008 |
| 3 Jun 70 - 24 Jun 70 -- Not present | | | | | | |
| 1 Jul 70 | 1.2 | --- | --- | - | --- | --- |
| 8 Jul 70 | 3.2 | 0.5 | 3.6 | 1.6 | - | - |
| 15 Jul 70 | 6.7 | 13.5 | 13.7 | 3.3 | 9.4 | 18.6 |
| 22 Jul 70 | 41.7 | 24.1 | 37.1 | 15.0 | 8.4 | 12.9 |
| 29 Jul 70 | 11.7 | 4.7 | 23.7 | 1.2 | - | 8.5 |
| 12 Aug 70 | 29.1 | 3.7 | 2.5 | 1.2 | 0.6 | 1.4 |
| 19 Aug 70 | 21.4 | 9.9 | 12.2 | 8.9 | 4.6 | 24.4 |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Ceridodaphnia lacustris*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 13 Jun 68 | - | - | - | - | - | - |
| 20 Jun 68 | - | 0.25 | 0.4 | - | 0.25 | - |
| 27 Jun 68 | - | - | - | - | - | - |
| 11 Jul 68 | - | - | - | - | - | - |
| 18 Jul 68 | - | - | - | - | - | - |
| 25 Jul 68 | - | - | - | - | - | - |
| 1 Aug 68 | - | - | 0.6 | - | - | - |
| 9 Aug 68 | - | - | 9.0 | - | - | 5.6 |
| 16 Aug 68 | - | - | 14.6 | - | - | 18.0 |
| 22 Aug 68 | 0.9 | 0.6 | 0.3 | 1.4 | 0.8 | 0.4 |
| 5 Jun 69 | - | - | - | - | - | - |
| 16 Jun 69 | 1.4 | 3.0 | - | 0.9 | 8.5 | - |
| 19 Jun 69 | 4.7 | 2.1 | 1.7 | 10.5 | 4.1 | 6.7 |
| 27 Jun 69 | 10.8 | 11.5 | 8.4 | 1.2 | 3.3 | 3.6 |
| 2 Jul 69 | - | - | - | - | - | - |
| 10 Jul 69 | 1.6 | 0.4 | * | 1.8 | 1.4 | - |
| 17 Jul 69 | 6.8 | * | 0.2 | 17.4 | - | 0.2 |
| 24 Jul 69 | 0.4 | 1.2 | 0.8 | 0.3 | 0.6 | - |
| 31 Jul 69 | 0.8 | 0.7 | 0.3 | - | - | 0.3 |
| 7 Aug 69 | 7.2 | 8.0 | 2.0 | 1.0 | - | 3.6 |
| 14 Aug 69 | 0.1 | * | - | - | - | - |
| 22 Aug 69 | - | - | - | - | - | - |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

Ceridodaphnia lacustris

| Date of Sample | No./l Sampling Station 1 | 2 | 3 | Eggs/l Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 Aug 69 | - | 0.006 | - | - | 0.009 | - |
| 3 Jun 70 | - | - | - | - | - | - |
| 10 Jun 70 | 0 | - | - | - | - | - |
| 17 Jun 70 | - | - | - | - | - | - |
| 24 Jun 70 | - | - | - | - | - | - |
| 1 Jul 70 | 1.2 | --- | --- | - | --- | --- |
| 8 Jul 70 | 3.2 | * | 2.5 | 1.6 | - | - |
| 15 Jul 70 | - | 1.0 | - | - | 1.0 | - |
| 22 Jul 70 | 1.6 | 2.6 | - | 0.5 | 2.1 | - |
| 29 Jul 70 | 0.6 | 2.4 | 1.9 | 0.6 | 1.2 | 1.9 |
| 12 Aug 70 | 17.1 | 2.3 | 2.2 | - | 0.6 | 0.7 |
| 19 Aug 70 | 21.4 | 1.5 | 33.9 | - | 0.8 | 9.2 |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Daphnia parvula*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 3 Jun 68 - 18 Jul 68 -- Not present | | | | | | |
| 25 Jul 68 | * | - | - | - | - | - |
| 1 Aug 68 | - | - | - | - | - | - |
| 9 Aug 68 | - | * | - | - | - | - |
| 16 Aug 68 - 10 Jul 69 -- Not present | | | | | | |
| 17 Jul 69 | - | - | * | - | - | - |
| 24 Jul 69 | 0.1 | 0.3 | 0.6 | - | 0.6 | 0.8 |
| 31 Jul 69 | 1.6 | 1.0 | 0.2 | 2.9 | 0.7 | 0.3 |
| 7 Aug 69 | - | - | * | - | - | - |
| 14 Aug 69 | 0.5 | 0.2 | 0.2 | 0.5 | 0.3 | 0.3 |
| 22 Aug 69 | * | - | * | - | - | - |
| 28 Aug 69 | 0.1 | 0.02 | 0.02 | 0.3 | - | 0.03 |
| 3 Jun 70 - 8 Jul 70 -- Not present | | | | | | |
| 15 Jul 70 | - | - | 1.0 | - | - | 1.0 |
| 22 Jul 70 | - | 0.5 | - | - | 0.5 | - |
| 29 Jul 70 | - | - | - | - | - | - |
| 12 Aug 70 | - | - | - | - | - | - |
| 19 Aug 70 | - | - | 3.1 | - | - | 6.1 |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Daphnia ambigua*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 13 Jun 68 - 18 Jul 68 -- Not present | | | | | | |
| 25 Jul 68 | 4.0 | - | - | 1.6 | - | - |
| 1 Aug 68 | - | - | - | - | - | - |
| 9 Aug 68 | - | - | 0.3 | - | - | - |
| 16 Aug 68 | 0.6 | - | - | - | - | - |
| 22 Aug 68 | - | - | - | - | - | - |
| 5 Jun 69 | 1.6 | 3.0 | 1.9 | - | - | 0.5 |
| 16 Jun 69 | 3.2 | 5.3 | 2.4 | 1.4 | 5.3 | 2.9 |
| 19 Jun 69 | 12.2 | 2.1 | 0.6 | 5.8 | 1.4 | - |
| 27 Jun 69 | 14.0 | 4.9 | - | 7.0 | - | - |
| 2 Jul 69 | - | - | - | - | - | - |
| 10 Jul 69 | - | - | - | - | - | - |
| 17 Jul 69 | 0.3 | - | - | 0.6 | - | - |
| 24 Jul 69 | 0.9 | 1.8 | 2.1 | 2.3 | 2.6 | 0.8 |
| 31 Jul 69 | 3.4 | 3.1 | 0.7 | 4.4 | 1.7 | 0.7 |
| 7 Aug 69 | 4.1 | 15.4 | * | 3.1 | - | - |
| 14 Aug 69 | 0.5 | 0.2 | 0.2 | 0.5 | 0.3 | 0.3 |
| 22 Aug 69 | 0.03 | 0.005 | 0.2 | - | - | 0.2 |
| 28 Aug 69 | 0.7 | 0.02 | 0.02 | - | 0.004 | 0.008 |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Daphnia galeata*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 69 - 2 Jul 69 -- Not present | | | | | | |
| 10 Jul 69 | - | - | 0.3 | - | - | - |
| 17 Jul 69 | - | - | * | - | - | - |
| 24 Jul 69 | 0.1 | * | 0.8 | - | - | 2.3 |
| 31 Jul 69 | * | * | 0.2 | - | - | 0.5 |
| 7 Aug 69 | - | - | - | - | - | - |
| 14 Aug 69 | 0.2 | * | - | 0.3 | - | - |
| 22 Aug 69 | 0.03 | 0.004 | * | 0.06 | - | - |
| 28 Aug 69 | - | - | - | - | - | - |
| 3 Jun 70 | 82.0 | 84.3 | --- | 6.0 | 29.8 | --- |
| 10 Jun 70 | 75.3 | 67.3 | 94.8 | 16.5 | 11.0 | 9.7 |
| 17 Jun 70 | 39.1 | 50.4 | 43.1 | 9.3 | 0.8 | 10.1 |
| 24 Jun 70 | 57.0 | 34.4 | 47.0 | 18.2 | 14.7 | 4.1 |
| 1 Jul 70 | 62.9 | --- | --- | 8.8 | --- | --- |
| 8 Jul 70 | 105.1 | 105.0 | 100.0 | 11.1 | 40.0 | 29.1 |
| 15 Jul 70 | 26.7 | 19.8 | 25.4 | 13.3 | 4.2 | 4.9 |
| 22 Jul 70 | 3.2 | 3.7 | - | - | - | - |
| 29 Jul 70 | 1.2 | 1.2 | 0.9 | 1.2 | - | 0.9 |
| 12 Aug 70 | 1.2 | 0.3 | 0.4 | - | - | - |
| 19 Aug 70 | - | - | - | - | - | - |

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

*Daphnia pulex*

| Date of Sample | No./l Sampling Station 1 | 2 | 3 | Eggs/l Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 13 Jun 68 | 3.0 | 8.3 | --- | - | 0.3 | --- |
| 20 Jun 68 | 1.0 | 0.9 | 3.8 | 1.1 | 1.1 | 7.6 |
| 27 Jun 68 | 6.9 | 3.1 | 20.2 | 12.5 | 7.5 | 20.2 |
| 11 Jul 68 | 24.6 | 43.8 | 16.6 | - | - | 0.7 |
| 18 Jul 68 | 5.0 | 8.7 | 28.7 | 0.5 | 0.2 | 3.3 |
| 25 Jul 68 | 35.5 | 21.5 | 24.3 | 1.3 | 0.3 | 13.8 |
| 1 Aug 68 | 18.0 | 36.2 | 13.3 | 2.4 | 5.6 | 2.3 |
| 9 Aug 68 | 51.6 | 18.6 | 1.5 | 1.5 | 7.1 | 0.4 |
| 16 Aug 68 | 107.7 | 5.2 | 0.3 | 78.7 | 2.7 | 2.6 |
| 22 Aug 68 | 0.1 | 0.5 | 2.9 | 0.4 | 0.4 | 1.5 |
| 5 Jun 69 | 46.9 | 18.9 | 1.9 | 15.6 | 7.6 | 2.3 |
| 16 Jun 69 | 14.7 | 6.0 | 5.9 | 4.1 | 3.0 | 3.5 |
| 19 Jun 69 | 19.2 | 17.9 | 6.1 | 4.7 | 10.3 | 3.9 |
| 27 Jun 69 | 60.7 | 55.9 | 34.8 | 5.8 | 11.5 | 8.4 |
| 2 Jul 69 | 71.7 | 38.8 | 27.1 | 0.8 | 12.2 | 4.3 |
| 10 Jul 69 | 8.1 | 5.7 | 2.6 | 6.6 | 9.3 | 4.6 |
| 17 Jul 69 | 0.3 | 0.1 | - | 0.6 | - | - |

24 Jul 69 - 28 Aug 69 -- Not present

QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 13 Jun 68 | 5.7 | 10.4 | --- | 8.1 |
| 20 Jun 68 | 4.9 | 7.6 | 13.3 | 8.6 |
| 27 Jun 68 | 17.3 | 13.3 | 29.7 | 20.1 |
| 11 Jul 68 | 35.4 | 55.7 | 25.8 | 39.0 |
| 18 Jul 68 | 8.1 | 15.0 | 38.3 | 20.4 |
| 25 Jul 68 | 42.7 | 23.6 | 32.8 | 33.0 |
| 1 Aug 68 | 20.4 | 39.4 | 17.2 | 25.6 |
| 9 Aug 68 | 53.6 | 20.6 | 10.8 | 28.3 |
| 16 Aug 68 | 109.7 | 5.2 | 14.7 | 44.2 |
| 22 Aug 68 | 2.4 | 1.6 | 3.5 | 2.5 |
| 5 Jun 69 | 57.9 | 25.7 | 8.0 | 30.5 |
| 16 Jun 69 | 24.8 | 19.2 | 14.2 | 19.4 |
| 19 Jun 69 | 45.4 | 29.0 | 10.7 | 28.4 |
| 27 Jun 69 | 101.8 | 85.4 | 43.8 | 77.0 |
| 2 Jul 69 | 82.7 | 55.1 | 35.6 | 57.8 |
| 10 Jul 69 | 18.2 | 12.6 | 9.3 | 13.4 |
| 17 Jul 69 | 11.8 | 1.0 | 0.8 | 4.5 |
| 24 Jul 69 | 1.9 | 5.1 | 7.3 | 4.8 |
| 31 Jul 69 | 10.3 | 8.6 | 2.7 | 7.2 |
| 7 Aug 69 | 164.6 | 594.2 | 272.0 | 343.6 |
| 14 Aug 69 | 5.1 | 1.2 | 0.6 | 2.3 |
| 22 Aug 69 | 0.21 | 0.1 | 2.0 | 0.75 |

## QUANTITATIVE DATA - BRANCHED OAK RESERVOIR

### Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 28 Aug 69 | 1.5 | 0.1 | 0.1 | 0.56 |
| 3 Jun 70 | 126.6 | 92.5 | --- | 109.6 |
| 10 Jun 70 | 93.6 | 88.1 | 106.3 | 96.0 |
| 17 Jun 70 | 42.5 | 63.8 | 45.6 | 50.6 |
| 24 Jun 70 | 60.4 | 36.0 | 55.1 | 50.5 |
| 1 Jul 70 | 74.1 | --- | --- | 74.1 |
| 8 Jul 70 | 114.7 | 110.0 | 117.6 | 114.2 |
| 15 Jul 70 | 36.7 | 37.4 | 43.1 | 39.1 |
| 22 Jul 70 | 48.6 | 33.5 | 37.9 | 40.0 |
| 29 Jul 70 | 13.5 | 9.5 | 26.5 | 16.5 |
| 12 Aug 70 | 48.4 | 7.7 | 5.8 | 20.6 |
| 19 Aug 70 | 44.6 | 12.2 | 58.4 | 38.4 |

## QUANTITATIVE DATA - HOLMES RESERVOIR

### *Diaptomus* spp.
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 4 Jun 68 | 2.8 | 1.2 | 3.0 | * | |
| 10 Jun 68 | 1.6 | 2.9 | 4.2 | * | * |
| 17 Jun 68 | 2.0 | 2.9 | 4.0 | * | * |
| 24 Jun 68 | 2.4 | 4.1 | 2.3 | * | * |
| 1 Jul 68 | 4.2 | 1.6 | 5.0 | * | * |
| 8 Jul 68 | 4.3 | 4.1 | 1.8 | * | * |
| 15 Jul 68 | 5.6 | 4.2 | 3.1 | * | * |
| 22 Jul 68 | 8.7 | 7.5 | 3.1 | * | * |
| 29 Jul 68 | 11.3 | 6.9 | 4.4 | * | * |
| 5 Aug 68 | 5.0 | 5.1 | 3.2 | * | * |
| 12 Aug 68 | 3.7 | 2.8 | 11.0 | * | |
| 19 Aug 68 | 4.2 | 3.2 | 4.4 | | |

### *Diaptomus clavipes*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 2 Jun 69 | 0.9 | 0.5 | 1.0 | * | |
| 9 Jun 69 | 2.3 | 1.6 | 3.1 | * | * |
| 16 Jun 69 | 2.8 | 1.0 | 1.2 | * | * |
| 23 Jun 69 | 3.8 | 0.9 | 2.9 | * | * |
| 30 Jun 69 | 2.5 | 2.6 | 2.9 | * | * |
| 7 Jul 69 | 4.9 | 2.5 | 1.1 | * | * |
| 14 Jul 69 | 2.3 | 0.3 | - | * | |
| 21 Jul 69 | 4.4 | 3.5 | 3.8 | * | * |

* Present in sample

QUANTITATIVE DATA - HOLMES RESERVOIR

*Diaptomus clavipes*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 28 Jul 69 | 3.5 | 4.3 | 5.7 | * | * |
| 4 Aug 69 | 3.3 | 4.2 | 6.1 | * | * |
| 11 Aug 69 | 5.9 | 3.9 | 6.7 | * | * |
| 18 Aug 69 | 2.4 | 1.8 | 3.9 | * | |
| 25 Aug 69 | 5.7 | 7.2 | 2.6 | * | * |
| 8 Sep 69 | 3.3 | 2.6 | 6.8 | * | * |

*Cyclops vernalis*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 2 Jun 69 - 23 Jun 69 -- Not present | | | | |
| 30 Jun 69 | - | - | * | |
| 7 Jul 69 | - | - | - | |
| 14 Jul 69 | * | - | - | |
| 21 Jul 69 | 0.8 | 1.9 | 0.5 | |
| 28 Jul 69 | 0.6 | 0.9 | 0.6 | * |
| 4 Aug 69 - 8 Sep 69 -- Not present | | | | |

QUANTITATIVE DATA - HOLMES RESERVOIR

*Diaptomus siciloides*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 2 Jun 69 | 1.0 | 0.8 | 0.8 | * | |
| 9 Jun 69 | 0.5 | 0.4 | 2.4 | * | |
| 16 Jun 69 | - | 0.8 | 1.2 | * | * |
| 23 Jun 69 | 0.5 | - | 1.2 | | |
| 30 Jun 69 | 0.5 | 0.2 | 0.6 | * | |
| 7 Jul 69 | * | * | * | | |
| 14 Jul 69 | * | - | * | | |
| 21 Jul 69 | 2.0 | 0.7 | 1.1 | * | |
| 28 Jul 69 | 1.6 | * | - | | |
| 4 Aug 69 | 0.5 | 2.4 | 3.5 | * | |
| 11 Aug 69 | - | - | - | | |
| 18 Aug 69 | - | - | - | | |
| 25 Aug 69 | - | 0.6 | 0.3 | | |
| 8 Sep 69 | 2.7 | 1.5 | 3.8 | * | |

QUANTITATIVE DATA - HOLMES RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 4 Jun 68 | 0.4 | - | - | - | - | - |
| 10 Jun 68 | 0.6 | 0.4 | 0.4 | - | - | - |
| 17 Jun 68 | 3.2 | 2.9 | 1.8 | - | - | - |
| 24 Jun 68 | 9.3 | 6.1 | 9.8 | 2.4 | 0.6 | 0.3 |
| 1 Jul 68 | 6.7 | 6.8 | 7.0 | 0.7 | 1.6 | 1.1 |
| 8 Jul 68 | 20.6 | 20.9 | 8.1 | 2.3 | 8.4 | 0.7 |
| 15 Jul 68 | 15.0 | 15.4 | 11.9 | 2.4 | 3.2 | 2.4 |
| 22 Jul 68 | 17.1 | 25.7 | 38.8 | 4.5 | 8.6 | 15.4 |
| 29 Jul 68 | 12.4 | 0.9 | 0.3 | 0.26 | - | - |
| 5 Aug 68 | 6.2 | - | 0.6 | 2.9 | - | - |
| 12 Aug 68 | 1.3 | 0.7 | 0.3 | 0.4 | - | 0.6 |
| 19 Aug 68 | 11.5 | 7.5 | 3.2 | 13.2 | 3.8 | 2.8 |
| 2 Jun 69 | - | 0.2 | 0.2 | 0.1 | 0.4 | - |
| 9 Jun 69 | 0.2 | 1.3 | 1.1 | 0.2 | 3.0 | 1.6 |
| 16 Jun 69 | 3.0 | 8.8 | 8.3 | 5.8 | 14.6 | 8.8 |
| 23 Jun 69 | 11.8 | 8.5 | 17.6 | 16.6 | 6.1 | 14.7 |
| 30 Jun 69 | 13.5 | 8.0 | 10.6 | 2.5 | 0.2 | - |
| 7 Jul 69 | 4.1 | 13.6 | 2.2 | 0.4 | 0.6 | - |
| 14 Jul 69 | 4.7 | 0.6 | 2.0 | 2.8 | 0.2 | 1.8 |
| 21 Jul 69 | 2.8 | 3.3 | 1.6 | 0.4 | 1.9 | 1.1 |
| 28 Jul 69 | 11.1 | 10.6 | 10.2 | 9.8 | 14.9 | 4.0 |

QUANTITATIVE DATA - HOLMES RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 4 Aug 69 | 9.4 | 16.7 | 16.7 | 3.8 | 6.0 | 7.9 |
| 11 Aug 69 | 15.3 | 14.3 | 9.5 | 15.8 | 5.2 | 2.9 |
| 18 Aug 69 | 12.9 | 11.6 | 11.6 | 1.8 | 0.7 | 0.9 |
| 25 Aug 69 | 4.6 | 2.7 | 3.7 | 1.4 | 0.9 | 0.9 |
| 8 Sep 69 | 20.2 | 28.2 | 17.2 | 13.1 | 10.3 | 4.5 |

*Daphnia retrocurva*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 4 Jun 68 | 39.2 | 8.7 | 11.1 | 9.9 | 2.8 | 2.7 |
| 10 Jun 68 | 17.6 | 12.6 | 9.6 | 0.4 | 1.2 | 0.9 |
| 17 Jun 68 | 15.6 | 17.3 | 18.2 | 6.8 | 4.1 | 2.2 |
| 24 Jun 68 | 8.8 | 5.3 | 3.3 | 0.3 | - | - |
| 1 Jul 68 | 0.6 | 0.8 | 0.6 | 0.4 | - | - |
| 8 Jul 68 | - | - | - | - | - | - |
| 15 Jul 68 | - | - | 0.7 | - | - | 1.7 |
| 22 Jul 68 | 2.1 | 4.6 | 6.6 | 2.6 | 14.9 | 16.8 |
| 29 Jul 68 | 9.8 | 21.2 | 6.8 | 2.4 | - | 0.3 |
| 5 Aug 68 | 7.3 | 32.4 | 3.2 | 4.0 | 14.5 | 1.3 |
| 12 Aug 68 | 6.7 | 5.5 | 2.4 | 6.1 | 5.2 | 2.1 |
| 19 Aug 68 | 0.9 | 15.7 | 8.8 | 3.4 | 25.0 | 13.4 |

QUANTITATIVE DATA - HOLMES RESERVOIR

*Daphnia retrocurva*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 2 Jun 69 | 0.3 | 4.8 | 1.6 | 0.1 | 2.4 | 0.6 |
| 9 Jun 69 | 0.3 | 0.6 | 0.4 | 0.1 | - | 0.3 |
| 16 Jun 69 | 0.8 | 0.8 | * | 1.4 | 1.0 | - |
| 23 Jun 69 | - | 0.9 | - | - | 1.2 | - |
| 30 Jun 69 | 0.5 | 1.8 | 0.9 | - | - | 0.6 |
| 7 Jul 69 | 0.8 | 0.6 | 0.2 | 1.2 | 1.0 | - |
| 14 Jul 69 | * | - | 0.6 | - | - | - |
| 21 Jul 69 | - | 0.2 | - | - | - | - |
| 28 Jul 69 | 1.0 | 0.3 | * | 1.0 | - | - |
| 4 Aug 69 | - | 0.6 | - | - | - | - |
| 11 Aug 69 | 0.5 | 0.3 | - | - | - | - |
| 18 Aug 69 | * | 0.2 | 0.4 | - | - | - |
| 25 Aug 69 | - | - | 0.3 | - | - | - |
| 8 Sep 69 | 2.2 | 0.5 | 0.8 | 1.6 | 1.0 | 2.2 |

QUANTITATIVE DATA - HOLMES RESERVOIR

*Mesocyclops edax*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 4 Jun 68 - 8 Jul 68 -- Not present | | | | |
| 15 Jul 68 | 0.7 | 0.7 | - | * |
| 22 Jul 68 | - | - | - | |
| 29 Jul 68 | - | - | - | |
| 5 Aug 68 | - | 1.1 | - | |
| 12 Aug 68 | - | - | - | |
| 19 Aug 68 | - | - | - | |
| 2 Jun 69 | - | - | - | |
| 9 Jun 69 | - | 0.2 | 0.2 | |
| 16 Jun 69 | - | 0.2 | - | |
| 23 Jun 69 | * | * | - | |
| 30 Jun 69 | * | - | - | |
| 7 Jul 69 | * | * | - | |
| 14 Jul 69 | * | - | 0.2 | * |
| 21 Jul 69 | - | - | - | |
| 28 Jul 69 | - | - | - | |
| 4 Aug 69 | 0.9 | 2.4 | 2.6 | |
| 11 Aug 69 | * | 0.3 | - | |
| 18 Aug 69 | - | - | - | |
| 25 Aug 69 | - | - | - | |
| 8 Sep 69 | * | - | - | |

QUANTITATIVE DATA - HOLMES RESERVOIR

Daphnia ambigua
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 |
| --- | --- | --- | --- |
| 2 Jun 69 - 21 Jul 69 -- Not present | | | |
| 28 Jul 69 | 0.3 | - | - |
| 4 Aug 69 | 1.9 | - | - |
| 11 Aug 69 - 8 Sep 69 -- Not present | | | |

Ceridodaphnia quadrangula
(No./l)

| | | | |
| --- | --- | --- | --- |
| 2 Jun 69 - 21 Jul 69 -- Not present | | | |
| 28 Jul 69 | * | - | - |
| 4 Aug 69 | * | - | - |
| 11 Aug 69 - 8 Sep 69 -- Not present | | | |

Bosmina coregoni
(No./l)

| | | | |
| --- | --- | --- | --- |
| 2 Jun 69 | - | - | - |
| 9 Jun 69 | - | * | - |
| 16 Jun 69 | - | * | - |
| 23 Jun 69 - 8 Sep 69 -- Not present | | | |

QUANTITATIVE DATA - HOLMES RESERVOIR

Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 4 Jun 68 | 42.8 | 9.9 | 14.1 | 22.3 |
| 10 Jun 68 | 19.8 | 15.9 | 14.2 | 16.6 |
| 17 Jun 68 | 20.8 | 23.2 | 24.0 | 22.7 |
| 24 Jun 68 | 20.5 | 15.4 | 15.4 | 17.1 |
| 1 Jul 68 | 8.5 | 9.6 | 12.6 | 10.2 |
| 8 Jul 68 | 24.9 | 25.0 | 10.0 | 20.0 |
| 15 Jul 68 | 20.6 | 20.4 | 15.7 | 18.9 |
| 22 Jul 68 | 27.9 | 37.9 | 48.5 | 38.1 |
| 29 Jul 68 | 33.4 | 29.0 | 11.5 | 24.6 |
| 5 Aug 68 | 19.3 | 37.5 | 6.4 | 21.1 |
| 12 Aug 68 | 11.7 | 9.1 | 13.7 | 11.5 |
| 19 Aug 68 | 16.6 | 26.5 | 16.4 | 19.8 |
| 2 Jun 69 | 2.1 | 6.2 | 3.7 | 4.0 |
| 9 Jun 69 | 3.4 | 4.2 | 7.3 | 5.0 |
| 16 Jun 69 | 6.6 | 11.4 | 10.8 | 9.7 |
| 23 Jun 69 | 16.1 | 10.3 | 21.8 | 16.1 |
| 30 Jun 69 | 17.0 | 11.3 | 15.9 | 14.7 |
| 7 Jul 69 | 9.9 | 16.7 | 3.4 | 10.0 |
| 14 Jul 69 | 7.0 | 0.9 | 2.8 | 3.6 |
| 21 Jul 69 | 10.0 | 9.7 | 7.0 | 8.9 |
| 28 Jul 69 | 18.0 | 16.0 | 16.4 | 16.8 |

## QUANTITATIVE DATA - HOLMES RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 4 Aug 69 | 16.0 | 26.9 | 29.0 | 24.0 |
| 11 Aug 69 | 21.7 | 18.8 | 16.2 | 18.9 |
| 18 Aug 69 | 15.3 | 13.6 | 15.9 | 14.9 |
| 25 Aug 69 | 10.4 | 10.5 | 6.8 | 9.2 |
| 8 Sep 69 | 28.4 | 32.8 | 28.5 | 29.9 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Diaptomus pallidus*
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 28 May 68 | 5.6 | 5.8 | 5.4 | * | * |
| 6 Jun 68 | 5.0 | 2.2 | 1.7 | * | * |
| 12 Jun 68 | 5.7 | 1.9 | 1.7 | * | * |
| 19 Jun 68 | 0.2 | 2.5 | 0.5 | * | * |
| 26 Jun 68 | 1.2 | 4.4 | 7.5 | * | * |
| 3 Jul 68 | 6.4 | 1.6 | 0.1 | | * |
| 10 Jul 68 | 1.3 | 0.02 | 0.09 | * | * |
| 17 Jul 68 | 0.01 | 0.01 | 0.001 | | * |
| 24 Jul 68 | 0.03 | 0.01 | 0.1 | * | * |
| 31 Jul 68 | 0.01 | 0.003 | 0.01 | * | * |
| 7 Aug 68 | 0.5 | 0.1 | 0.1 | * | * |
| 14 Aug 68 | 0.6 | 0.1 | 0.6 | * | * |
| 21 Aug 68 | 0.1 | 0.5 | - | | * |
| 28 Aug 68 | 0.5 | 0.2 | 0.1 | * | * |
| 5 Sep 68 | 0.2 | 0.1 | 0.6 | | * |
| 10 Sep 68 | - | - | 1.1 | | * |
| 17 Sep 68 | 0.4 | 0.6 | 0.5 | * | * |
| 24 Sep 68 | 0.2 | 0.6 | 1.1 | * | * |
| 1 Oct 68 | 1.6 | 0.4 | 2.4 | * | * |
| 8 Oct 68 | 1.3 | 1.5 | 2.2 | * | * |
| 15 Oct 68 | 0.1 | 3.6 | 4.8 | * | * |
| 22 Oct 68 | 1.5 | 4.3 | 4.0 | * | * |

* Present in sample

# QUANTITATIVE DATA - PAWNEE RESERVOIR

## <u>Diaptomus pallidus</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 29 Oct 68 | 2.9 | 5.4 | 2.1 | * | * |
| 5 Nov 68 | 2.9 | 3.5 | 11.8 | * | * |
| 12 Nov 68 | 1.5 | 1.1 | 2.0 | * | * |
| 19 Nov 68 | 8.7 | 2.2 | 4.3 | * | * |
| 3 Dec 68 | 2.8 | 12.6 | 4.5 | * | * |
| 22 Jan 69 | 20.0 | 5.9 | 8.1 | * | |
| 6 Feb 69 | 1.1 | 67.3 | 8.3 | * | |
| 18 Feb 69 | 21.4 | --- | 5.0 | * | * |
| 4 Mar 69 | 4.4 | 4.8 | 1.5 | * | * |
| 10 Apr 69 | 0.3 | 0.5 | 3.7 | * | * |
| 15 Apr 69 | 0.5 | 4.0 | 0.5 | * | * |
| 22 Apr 69 | 2.2 | 2.5 | 0.5 | * | * |
| 29 Apr 69 | 1.1 | 2.6 | 2.0 | | * |
| 6 May 69 | 1.1 | 1.8 | 5.0 | * | * |
| 13 May 69 | 5.0 | 9.1 | 3.0 | * | * |
| 20 May 69 | 14.1 | 8.6 | 3.5 | * | * |
| 27 May 69 | 1.4 | 18.1 | 4.2 | * | * |
| 3 Jun 69 | 2.4 | 12.8 | 20.0 | * | * |
| 10 Jun 69 | 2.2 | 17.8 | 1.4 | * | * |
| 17 Jun 69 | 2.7 | 9.7 | 5.0 | * | * |
| 24 Jun 69 | 0.3 | - | - | * | |
| 2 Jul 69 | - | * | - | | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Diaptomus pallidus*
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 8 Jul 69 | 0.8 | - | - | | * |
| 15 Jul 69 | * | - | - | | |
| 22 Jul 69 | 1.8 | - | 1.1 | * | * |
| 29 Jul 69 | 0.2 | 2.1 | 1.5 | * | * |
| 5 Aug 69 | 3.0 | 2.0 | 1.2 | * | * |
| 12 Aug 69 | 0.5 | 2.1 | 0.3 | | * |
| 19 Aug 69 | 7.4 | 0.2 | 0.6 | * | * |
| 26 Aug 69 | 2.8 | - | 0.3 | * | * |
| 2 Sep 69 | 1.8 | 0.3 | - | | * |
| 9 Sep 69 | 0.8 | - | 0.2 | * | * |
| 16 Sep 69 | 4.2 | 1.4 | 0.1 | * | * |
| 23 Sep 69 | 0.8 | 0.8 | 0.7 | * | * |
| 30 Sep 69 | 1.4 | 1.1 | 0.3 | * | * |
| 7 Oct 69 | - | - | 0.4 | * | |
| 15 Oct 69 | 1.6 | - | 0.2 | | |
| 21 Oct 69 | - | 0.1 | --- | | |
| 28 Oct 69 | 0.3 | 0.8 | 0.4 | | * |
| 4 Nov 69 | 0.8 | 0.6 | - | * | |
| 11 Nov 69 | 0 2 | 0.5 | 1.2 | | * |
| 25 Nov 69 | 0.7 | 0.6 | 0.8 | | |
| 2 Dec 69 | 2.4 | 0.8 | 1.3 | | |
| 17 Mar 70 | 1.6 | 1.5 | 0.7 | * | * |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>*Diaptomus pallidus*</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 17 Apr 70 | 2.8 | 2.1 | 2.0 | * | * |
| 21 Apr 70 | 3.8 | 1.0 | 4.8 | | |
| 28 Apr 70 | 3.2 | - | 2.0 | * | * |
| 5 May 70 | 1.7 | 2.4 | 3.4 | | * |
| 12 May 70 | 0.9 | 17.3 | 4.7 | | * |
| 19 May 70 | --- | 7.8 | 13.1 | * | * |
| 26 May 70 | 4.2 | 12.2 | 9.1 | * | * |
| 2 Jun 70 | 8.8 | 11.1 | 8.9 | * | * |
| 9 Jun 70 | * | - | 0.9 | | * |
| 16 Jun 70 | - | 0.2 | - | | * |
| 23 Jun 70 | - | 7.1 | 1.6 | * | * |
| 30 Jun 70 | 1.6 | --- | --- | | * |
| 7 Jul 70 | 0.1 | 1.0 | 0.8 | | * |
| 14 Jul 70 | * | 0.03 | 0.04 | * | * |
| 21 Jul 70 | 0.04 | - | 0.1 | * | * |
| 28 Jul 70 | - | - | - | | |
| 4 Aug 70 | - | - | 0.2 | * | |
| 11 Aug 70 | - | - | 0.2 | | * |
| 18 Aug 70 | 0.3 | - | - | | |
| 25 Aug 70 | 0.6 | 0.2 | 0.3 | | * |
| 1 Sep 70 | 4.3 | 0.5 | 0.4 | * | * |
| 8 Sep 70 | 0.1 | 2.0 | 0.2 | | * |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Diaptomus pallidus*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 15 Sep 70 | - | 1.3 | 1.1 | * | |
| 22 Sep 70 | 1.8 | 0.1 | 0.2 | | * |
| 29 Sep 70 | 0.4 | - | 1.8 | * | * |
| 6 Oct 70 | * | 0.4 | 1.0 | | * |
| 13 Oct 70 | - | 0.3 | - | | |
| 20 Oct 70 | 0.2 | - | 0.04 | | |
| 27 Oct 70 | 0.1 | * | 0.8 | * | |
| 10 Nov 70 | 1.2 | 3.8 | 1.1 | * | |
| 17 Nov 70 | 1.6 | 0.4 | 8.8 | * | |
| 1 Dec 70 | 0.6 | 0.5 | 5.6 | * | |
| 8 Dec 70 | 3.8 | 2.8 | 0.8 | * | * |

QUANTITATIVE DATA - PAWNEE RESERVOIR

Diaptomus clavipes
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 24 Jun 69 | - | * | - | | |
| 16 Sep 69 | * | - | - | | |

Mesocyclops edax
(No./l)

| Date of Sample | 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 22 Jan 69 | - | 0.7 | - | |
| 6 Feb 69 | - | 1.9 | - | |
| 18 Feb 69 | 0.9 | --- | - | |
| 4 Mar 69 | - | - | - | |
| 10 Apr 69 | - | 0.2 | 4.0 | |
| 15 Apr 69 | 0.1 | 0.4 | 0.1 | * |
| 22 Apr 69 | 2.2 | - | - | * |
| 29 Apr 69 | - | - | 0.5 | * |
| 6 May 69 | - | - | - | |
| 13 May 69 | 0.6 | 0.9 | 0.8 | |
| 20 May 69 | 3.4 | 2.3 | 0.9 | |
| 27 May 69 | 1.4 | 2.2 | 2.1 | |
| 3 Jun 69 | 1.8 | 0.7 | 2.4 | * |
| 10 Jun 69 | - | 1.9 | 1.5 | * |
| 17 Jun 69 | * | - | - | |
| 24 Jun 69 | - | - | 0.8 | * |
| 2 Jul 69 | 4.3 | * | - | * |

QUANTITATIVE DATA - PAWNEE RESERVOIR

Mesocyclops edax
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 8 Jul 69 | 0.8 | 0.9 | 0.5 | * |
| 15 Jul 69 | 0.4 | 3.8 | 1.4 | * |
| 22 Jul 69 | 6.3 | 0.8 | 2.8 | * |
| 29 Jul 69 | 1.1 | 3.5 | 2.0 | * |
| 5 Aug 69 | 4.0 | 3.0 | 2.5 | |
| 12 Aug 69 | 1.5 | - | 1.4 | |
| 19 Aug 69 | 0.5 | 0.4 | - | |
| 26 Aug 69 | * | - | - | |
| 2 Sep 69 | 0.4 | 0.1 | - | |
| 9 Sep 69 | 0.6 | - | * | |
| 16 Sep 69 | 0.4 | 0.4 | 0.3 | |
| 23 Sep 69 | 0.5 | 0.4 | - | |
| 30 Sep 69 | 0.1 | - | 0.3 | |
| 7 Oct 69 | - | - | 0.2 | |
| 15 Oct 69 | 0.3 | - | - | |
| 21 Oct 69 | - | - | --- | |
| 28 Oct 69 | - | * | - | |
| 4 Nov 69 | - | - | - | |
| 11 Nov 69 | - | 0.2 | 0.2 | |
| 25 Nov 69 | - | - | * | |
| 2 Dec 69 | * | - | - | |
| 17 Mar 70 | - | - | - | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Mesocyclops edax*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 17 Apr 70 | - | - | - | |
| 21 Apr 70 | - | - | - | |
| 28 Apr 70 | - | - | * | |
| 5 May 70 | 1.7 | - | - | * |
| 12 May 70 | 0.9 | - | - | |
| 19 May 70 | --- | 1.1 | 2.7 | |
| 26 May 70 | 1.9 | 2.7 | 2.6 | * |
| 2 Jun 70 | 2.4 | 2.5 | * | * |
| 9 Jun 70 | - | 2.0 | - | * |
| 16 Jun 70 | 0.4 | 0.2 | - | * |
| 23 Jun 70 | 0.8 | 0.9 | - | |
| 30 Jun 70 | - | --- | --- | |
| 7 Jul 70 | - | 1.0 | 0.7 | * |
| 14 Jul 70 | - | - | 0.1 | * |
| 21 Jul 70 | 0.003 | 0.02 | - | |
| 28 Jul 70 | - | - | 0.1 | |
| 4 Aug 70 | - | - | - | |
| 11 Aug 70 | - | 0.2 | 0.4 | * |
| 18 Aug 70 | 0.2 | * | - | |
| 25 Aug 70 | - | - | 0.1 | |
| 1 Sep 70 | - | - | - | |
| 8 Sep 70 | 0.1 | 1.3 | - | |

# QUANTITATIVE DATA - PAWNEE RESERVOIR

## Mesocyclops edax
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 15 Sep 70 | - | - | - | |
| 22 Sep 70 | - | - | - | |
| 29 Sep 70 | - | - | - | |
| 6 Oct 70 | * | - | 0.5 | |
| 13 Oct 70 | - | - | 0.1 | |
| 20 Oct 70 | - | 0.2 | 0.04 | |
| 27 Oct 70 | - | 0.6 | - | |
| 10 Nov 70 | - | - | - | |
| 17 Nov 70 | - | - | - | |
| 1 Dec 70 | - | - | - | |
| 8 Dec 70 | - | - | - | |
| | | | | |
| 28 May 68 | - | 0.4 | - | * |
| 6 Jun 68 | 0.1 | 0.3 | 0.5 | |
| 12 Jun 68 | 0.8 | 0.8 | 1.4 | * |
| 19 Jun 68 | 0.5 | 1.5 | 1.6 | * |
| 26 Jun 68 | - | 0.3 | 1.2 | * |
| 3 Jul 68 | - | - | 0.1 | * |
| 10 Jul 68 | - | - | - | |
| 17 Jul 68 | 0.004 | - | - | |
| 24 Jul 68 | 0.004 | 0.02 | - | |
| 31 Jul 68 | 0.003 | 0.01 | 0.001 | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Mesocyclops edax*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 7 Aug 68 | 0.2 | 0.1 | - | * |
| 14 Aug 68 | - | - | 0.2 | |
| 21 Aug 68 | - | - | 0.1 | |
| 28 Aug 68 | - | - | 0.2 | |
| 5 Sep 68 | - | - | - | |
| 10 Sep 68 | - | - | - | |
| 17 Sep 68 | - | 0.2 | - | |
| 24 Sep 68 | - | 0.7 | 0.5 | |
| 1 Oct 68 | - | 0.8 | 0.5 | |
| 8 Oct 68 | 0.2 | 0.8 | - | |
| 15 Oct 68 | 0.1 | 0.2 | 0.5 | |
| 22 Oct 68 | - | - | - | |
| 29 Oct 68 | - | - | - | |
| 5 Nov 68 | - | 0.1 | - | |
| 12 Nov 68 | - | 0.1 | 0.1 | |
| 19 Nov 68 | 0.2 | 0.2 | - | |
| 3 Dec 68 | - | 0.3 | 0.2 | |

*Cyclops* spp.

| | | | | |
|---|---|---|---|---|
| 6 Jun 68 | - | - | * | |
| 3 Jul 68 | * | - | - | |
| 12 Nov 68 | * | - | - | |

# QUANTITATIVE DATA - PAWNEE RESERVOIR

## Eucyclops agilis
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 10 Apr 69 | 0.1 | 0.2 | - | * |
| 15 Apr 69 | 0.04 | - | 0.1 | |
| 22 Apr 69 | * | * | - | |
| 29 Apr 69 - 1 Sep 70 -- Not present | | | | |
| 8 Sep 70 | - | 2.0 | - | * |
| 15 Sep 70 - 8 Dec 70 -- Not present | | | | |

## Cyclops vernalis
(No./l)

| Date of Sample | 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 6 May 69 | 0.5 | - | 0.4 | |
| 13 May 69 | - | - | - | |
| 20 May 69 | * | - | - | |
| 27 May 69 | - | * | - | |
| 3 Jun 69 | 0.5 | 0.7 | 0.8 | * |
| 10 Jun 69 | * | - | - | |
| 17 Jun 69 | - | - | 1.0 | |
| 24 Jun 69 | - | - | - | |
| 2 Jul 69 | - | - | - | |
| 8 Jul 69 | - | 0.9 | - | |
| 15 Jul 69 | - | - | 2.1 | * |
| 22 Jul 69 | - | - | 0.6 | |
| 29 Jul 69 | - | 0.7 | 0.5 | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Cyclops vernalis</u>
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 5 Aug 69 | - | * | - | |
| 12 Aug 69 | - | - | - | |
| 19 Aug 69 | - | - | * | |
| 26 Aug 69 | - | - | - | |
| 2 Sep 69 | - | - | - | |
| 9 Sep 69 | - | - | - | |
| 16 Sep 69 | * | - | - | |
| 23 Sep 69 - 28 Oct 69 -- Not present | | | | |
| 4 Nov 69 | - | - | 0.2 | |
| 11 Nov 69 | - | 0.3 | - | |
| 25 Nov 69 | - | * | - | |
| 2 Dec 69 | - | - | - | |
| 17 Mar 70 | - | - | - | |
| 17 Apr 70 | * | - | 0.6 | |
| 21 Apr 70 | - | - | - | |
| 28 Apr 70 | 0.8 | - | - | |
| 5 May 70 - 2 Jun 70 -- Not present | | | | |
| 9 Jun 70 | - | - | 0.6 | |
| 16 Jun 70 | - | - | * | |
| 23 Jun 70 | - | - | * | * |
| 30 Jun 70 | - | - | - | |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Cyclops vernalis
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 7 Jul 70 | - | 0.5 | 0.2 | |
| 14 Jul 70 | - | - | - | |
| 21 Jul 70 | - | - | - | |
| 28 Jul 70 | - | - | 0.1 | |
| 4 Aug 70 | - | - | 0.1 | * |
| 11 Aug 70 | - | - | 0.1 | |
| 18 Aug 70 | 0.3 | - | 0.1 | |
| 25 Aug 70 | - | - | 0.1 | |
| 1 Sep 70 - 20 Oct 70 -- Not present | | | | |
| 27 Oct 70 | - | - | * | |
| 10 Nov 70 | - | - | 0.4 | |
| 17 Nov 70 | 0.6 | - | - | |
| 1 Dec 70 | - | 0.1 | - | |
| 8 Dec 70 | 0.2 | - | - | |

### Chydorus sphaericus

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 22 Jan 69 | 9.4 | 5.9 | 1.2 | - | - | - |
| 6 Feb 69 | 2.2 | 1.9 | - | - | - | - |
| 18 Feb 69 | 2.7 | --- | - | - | - | - |
| 4 Mar 69 | 3.1 | - | 0.7 | - | - | - |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### *Ceridodaphnia lacustris*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 - 12 Jun 68 -- Not present | | | | | | |
| 19 Jun 68 | - | 0.3 | - | - | 1.9 | - |
| 26 Jun 68 | - | - | - | - | - | - |
| 3 Jul 68 | - | - | - | - | - | - |
| 10 Jul 68 | 0.01 | - | 0.001 | 0.1 | - | - |
| 17 Jul 68 | 0.02 | 0.03 | 0.001 | - | 0.1 | 0.01 |
| 24 Jul 68 | 0.03 | 0.02 | - | 0.1 | 0.1 | - |
| 31 Jul 68 | 0.02 | 0.04 | 0.01 | 0.03 | 0.1 | 0.003 |
| 7 Aug 68 | 0.1 | 0.1 | 0.04 | 0.02 | 0.05 | 0.04 |
| 14 Aug 68 | - | 0.6 | 0.4 | - | 0.4 | 0.3 |
| 21 Aug 68 | 0.6 | 0.8 | 1.4 | 0.7 | 0.5 | 0.8 |
| 28 Aug 68 | 6.0 | 2.3 | 5.2 | 3.9 | 1.1 | 1.4 |
| 5 Sep 68 | 1.2 | 1.6 | 11.4 | 0.4 | - | 8.8 |
| 10 Sep 68 | 10.0 | 10.4 | 39.7 | 10.6 | 13.0 | 56.1 |
| 17 Sep 68 | 4.9 | 5.5 | 6.9 | 1.6 | 0.4 | 0.5 |
| 24 Sep 68 | 0.03 | 1.2 | 1.4 | - | 0.2 | - |
| 1 Oct 68 | 1.5 | 5.6 | 9.0 | 0.8 | 5.0 | 11.6 |
| 8 Oct 68 | 2.8 | 3.3 | 7.1 | 2.2 | 1.0 | 3.1 |
| 15 Oct 68 | 1.5 | 4.9 | 2.5 | 0.7 | 2.4 | 1.8 |
| 22 Oct 68 | 0.7 | 3.3 | 2.9 | 0.1 | 0.8 | 1.3 |
| 29 Oct 68 | 0.6 | 0.4 | 0.9 | 0.2 | 0.7 | 0.6 |
| 5 Nov 68 | 0.5 | 1.1 | 0.7 | 0.2 | 1.0 | 0.4 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

Ceridodaphnia lacustris

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 12 Nov 68 | 0.2 | 0.3 | 0.5 | 0.3 | 0.2 | 0.1 |
| 19 Nov 68 | - | 0.1 | - | - | - | - |
| 3 Dec 68 - 17 Jun 69 -- Not present | | | | | | |
| 24 Jun 69 | 0.1 | - | - | 0.2 | - | - |
| 2 Jul 69 | 2.6 | - | - | 5.1 | - | - |
| 8 Jul 69 | - | - | 0.3 | - | - | - |
| 15 Jul 69 | 0.3 | 0.6 | 5.5 | 0.7 | 3.2 | 8.3 |
| 22 Jul 69 | 4.4 | 2.4 | 6.6 | 7.8 | 3.2 | 3.9 |
| 29 Jul 69 | 2.1 | 2.4 | 3.9 | 1.7 | 0.7 | 0.5 |
| 5 Aug 69 | 1.5 | 0.5 | - | 0.5 | 2.0 | - |
| 12 Aug 69 | 1.0 | 0.3 | - | 1.0 | 0.3 | - |
| 19 Aug 69 | 0.5 | 0.2 | 0.6 | - | - | - |
| 26 Aug 69 | - | 0.2 | 0.2 | - | 0.1 | 0.2 |
| 2 Sep 69 | - | 0.6 | 0.1 | - | 0.4 | 0.1 |
| 9 Sep 69 | 0.7 | 1.4 | 0.5 | 0.1 | 0.5 | 0.2 |
| 16 Sep 69 | 5.8 | 0.9 | 0.7 | 3.8 | 0.2 | - |
| 23 Sep 69 | 1.2 | 2.6 | 1.7 | 1.0 | 1.9 | 1.0 |
| 30 Sep 69 | 8.1 | 7.9 | 7.8 | 9.6 | 7.1 | 6.5 |
| 7 Oct 69 | 0.5 | 2.2 | 9.4 | 0.3 | 0.8 | 1.6 |
| 15 Oct 69 | 2.6 | 4.0 | 2.8 | 0.5 | 1.3 | 0.8 |
| 21 Oct 69 | 6.1 | 1.1 | --- | 2.0 | 0.1 | --- |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Ceridodaphnia lacustris*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 Oct 69 | 8.5 | 4.7 | 5.6 | 5.9 | 1.7 | 2.6 |
| 4 Nov 69 | 1.1 | 2.3 | 0.9 | 0.7 | 1.1 | 0.1 |
| 11 Nov 69 | 4.0 | 2.1 | 2.0 | 1.3 | 0.5 | 1.0 |
| 25 Nov 69 | 0.7 | - | 0.4 | - | - | - |
| 2 Dec 69 | - | - | * | - | - | - |
| 17 Mar 70 - 26 May 70 -- Not present | | | | | | |
| 2 Jun 70 | - | - | 1.5 | - | - | 3.0 |
| 9 Jun 70 | - | 0.7 | - | - | 2.0 | - |
| 16 Jun 70 | - | - | 0.3 | - | - | - |
| 23 Jun 70 | - | - | - | - | - | - |
| 30 Jun 70 | 9.9 | --- | --- | 26.4 | --- | --- |
| 7 Jul 70 | 0.1 | 0.5 | 0.5 | - | - | - |
| 14 Jul 70 | - | 0.1 | 0.3 | - | - | 0.1 |
| 21 Jul 70 | - | 0.1 | - | - | - | - |
| 28 Jul 70 | 0.1 | 0.4 | 0.1 | 0.2 | - | - |
| 4 Aug 70 | - | 0.6 | 0.3 | - | - | - |
| 11 Aug 70 | 0.1 | 0.3 | 0.5 | 0.1 | 0.3 | 0.5 |
| 18 Aug 70 | 1.9 | 1.5 | - | 0.5 | 0.5 | - |
| 25 Aug 70 | - | 0.5 | 2.8 | - | 0.2 | 0.2 |
| 1 Sep 70 | 12.0 | 4.6 | 4.8 | 8.0 | 2.9 | 3.2 |
| 8 Sep 70 | 0.3 | 5.9 | 3.5 | - | 0.7 | - |
| 15 Sep 70 | 8.4 | 4.8 | 4.0 | 4.2 | 0.3 | 2.3 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Ceridodaphnia lacustris*

| Date of Sample | No./l Sampling Station 1 | 2 | 3 | Eggs/l Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 22 Sep 70 | 35.7 | 2.0 | 5.3 | 14.3 | 1.4 | 1.2 |
| 29 Sep 70 | 1.7 | 3.6 | 3.6 | 0.4 | - | - |
| 6 Oct 70 | 3.5 | 5.0 | 5.8 | 1.4 | 3.3 | 1.9 |
| 13 Oct 70 | 1.4 | 4.8 | 1.2 | 0.4 | 1.7 | 0.8 |
| 20 Oct 70 | 3.1 | 1.8 | 0.5 | 0.6 | 0.8 | - |
| 27 Oct 70 | 0.1 | 1.7 | 3.1 | 0.1 | - | 0.2 |
| 10 Nov 70 | 0.6 | 2.2 | 0.7 | - | 1.6 | 0.4 |
| 17 Nov 70 | - | 0.4 | 1.1 | - | - | 1.1 |
| 1 Dec 70 | - | - | - | - | - | - |
| 8 Dec 70 | - | - | - | - | - | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

Diaphanosoma leuchtenbergianum

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 - 26 Jun 68 -- Not present | | | | | | |
| 3 Jul 68 | 0.1 | - | - | - | - | - |
| 10 Jul 68 | - | - | 0.002 | - | - | - |
| 17 Jul 68 | 0.004 | 0.01 | 0.001 | - | 0.01 | 0.002 |
| 24 Jul 68 | 0.01 | 0.02 | 0.004 | 0.02 | 0.04 | - |
| 31 Jul 68 | 0.03 | 0.02 | 0.001 | 0.03 | 0.003 | - |
| 7 Aug 68 | 0.3 | 1.1 | 0.8 | 0.1 | 1.5 | 1.7 |
| 14 Aug 68 | 2.6 | 1.0 | 0.5 | 1.4 | 0.7 | 0.2 |
| 21 Aug 68 | 0.3 | 2.1 | 0.8 | 0.1 | 1.6 | 0.3 |
| 28 Aug 68 | 0.7 | 1.0 | 0.6 | 0.2 | 0.1 | 0.5 |
| 5 Sep 68 | 3.8 | 1.1 | 4.7 | 1.0 | 0.5 | 1.9 |
| 10 Sep 68 | 5.2 | 3.5 | 5.0 | 4.9 | 2.9 | 6.1 |
| 17 Sep 68 | 4.2 | 5.8 | 3.4 | 1.2 | 0.6 | 0.8 |
| 24 Sep 68 | 0.3 | 4.5 | 2.3 | 0.3 | 0.6 | 0.2 |
| 1 Oct 68 | 0.1 | 3.9 | 4.4 | - | 4.0 | 5.1 |
| 8 Oct 68 | 0.4 | 1.0 | 2.2 | 0.6 | 1.5 | 5.6 |
| 15 Oct 68 | 0.2 | 1.5 | 4.1 | - | 0.3 | 2.5 |
| 22 Oct 68 | - | - | - | - | - | - |
| 29 Oct 68 | 0.04 | 0.7 | 0.4 | - | 0.7 | - |
| 5 Nov 68 | 0.1 | 0.6 | 1.2 | - | 0.8 | - |
| 12 Nov 68 | 0.1 | - | - | 0.1 | - | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Diaphanosoma</u> <u>leuchtenbergianum</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 19 Nov 68 | 0.2 | - | 0.7 | - | - | - |
| 3 Dec 68 | 0.1 | 0.3 | - | - | - | - |
| 22 Jan 69 - 17 Jun 69 -- Not present | | | | | | |
| 24 Jun 69 | 0.3 | - | 1.6 | - | - | - |
| 2 Jul 69 | - | - | - | - | - | - |
| 8 Jul 69 | - | - | - | - | - | - |
| 15 Jul 69 | 0.2 | 0.6 | 0.7 | 0.1 | - | - |
| 22 Jul 69 | 0.4 | 2.4 | 0.6 | - | - | 0.6 |
| 29 Jul 69 | 2.1 | 1.7 | 6.3 | 0.2 | 0.7 | 1.5 |
| 5 Aug 69 | 3.5 | 8.4 | 4.6 | 4.0 | 2.9 | 1.2 |
| 12 Aug 69 | 1.0 | 7.9 | 7.5 | 16.4 | 3.4 | 1.4 |
| 19 Aug 69 | 31.0 | 5.6 | 13.2 | 11.1 | 1.8 | 4.8 |
| 26 Aug 69 | 13.8 | 1.3 | 3.3 | 11.6 | 0.9 | 0.5 |
| 2 Sep 69 | 5.2 | 0.9 | 1.0 | 3.4 | 0.4 | 0.1 |
| 9 Sep 69 | 2.3 | 0.4 | 0.3 | 0.8 | 0.7 | 0.1 |
| 16 Sep 69 | 5.8 | 0.4 | 0.7 | 2.7 | - | 0.1 |
| 23 Sep 69 | 0.5 | 1.5 | 0.5 | 0.3 | 0.1 | 0.5 |
| 30 Sep 69 | 1.4 | 0.4 | - | 0.1 | - | - |
| 7 Oct 69 | - | 0.2 | 0.4 | - | - | - |
| 15 Oct 69 | - | - | - | - | - | - |
| 21 Oct 69 | - | - | --- | - | - | --- |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 Oct 69 | 0.3 | 1.9 | 0.2 | 0.3 | - | - |
| 4 Nov 69 | - | - | 0.1 | - | - | - |
| 11 Nov 69 | 0.3 | - | - | - | - | - |
| 25 Nov 69 - 9 Jun 70 -- Not present | | | | | | |
| 16 Jun 70 | - | - | 0.3 | - | - | 0.3 |
| 23 Jun 70 | 0.4 | 1.8 | 0.8 | 0.4 | 1.8 | 4.1 |
| 30 Jun 70 | 3.3 | --- | --- | 6.1 | --- | --- |
| 7 Jul 70 | - | 11.0 | 3.1 | - | 5.5 | 0.5 |
| 14 Jul 70 | - | - | 0.2 | - | - | 0.1 |
| 21 Jul 70 | 0.01 | 0.4 | 0.2 | - | 0.2 | - |
| 28 Jul 70 | 0.2 | 2.3 | 0.9 | 0.3 | 2.1 | 0.5 |
| 4 Aug 70 | 0.01 | 2.2 | 0.8 | - | 2.6 | 0.1 |
| 11 Aug 70 | 0.4 | 0.9 | 1.1 | 0.2 | 0.3 | 0.6 |
| 18 Aug 70 | 0.5 | 3.5 | 2.4 | 0.3 | 0.8 | 0.3 |
| 25 Aug 70 | 0.8 | - | 0.6 | - | - | 0.1 |
| 1 Sep 70 | 3.6 | 3.4 | 0.5 | 5.0 | 2.4 | 0.6 |
| 8 Sep 70 | 0.6 | 11.2 | 1.9 | 0.3 | 2.6 | 1.2 |
| 15 Sep 70 | - | 1.3 | 1.1 | - | - | - |
| 22 Sep 70 | - | 0.1 | 0.5 | - | 0.1 | - |
| 29 Sep 70 | - | - | 0.9 | - | - | - |
| 6 Oct 70 | - | - | 0.5 | - | - | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 13 Oct 70 | - | - | 0.1 | - | - | - |
| 20 Oct 70 | 0.2 | - | 0.1 | - | - | - |
| 27 Oct 70 | - | - | - | - | - | - |
| 10 Nov 70 | 0.6 | - | - | - | - | - |
| 17 Nov 70 - 8 Dec 70 -- Not present | | | | | | |

*Bosmina longirostris*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 10 Jul 68 | - | - | 0.001 | - | - | - |
| 24 Jul 68 | 0.02 | 0.01 | 0.004 | 0.02 | - | 0.004 |
| 31 Jul 68 | 0.01 | 0.003 | - | - | - | - |
| 7 Aug 68 | 0.03 | - | - | 0.02 | - | - |
| 10 Sep 68 | - | 0.6 | - | - | - | - |
| 24 Sep 68 | - | 0.4 | - | - | - | - |
| 22 Oct 68 | - | - | 0.2 | - | - | - |
| 5 Nov 68 | - | - | 1.0 | - | - | 2.8 |
| 12 Nov 68 | 0.2 | - | 0.5 | 0.6 | - | 1.8 |
| 19 Nov 68 | 0.2 | 0.6 | 1.7 | - | 1.7 | 7.0 |
| 3 Dec 68 | 1.4 | 0.3 | 0.5 | 5.6 | 1.1 | 2.3 |
| 22 Jan 69 | 1.9 | 4.4 | 6.9 | - | - | - |
| 6 Feb 69 | 3.8 | 3.8 | 1.4 | 1.5 | - | - |
| 18 Feb 69 | 9.8 | --- | 23.8 | 2.7 | --- | 12.5 |
| 4 Mar 69 | 5.0 | 4.8 | 1.5 | - | - | - |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### <u>Bosmina longirostris</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 22 Apr 69 | - | 1.9 | 1.5 | - | - | 2.0 |
| 29 Apr 69 | 0.6 | - | 1.0 | 1.1 | - | - |
| 6 May 69 | 0.5 | - | 1.2 | - | - | 0.8 |
| 13 May 69 | - | - | - | - | - | - |
| 20 May 69 | 1.1 | 0.6 | 0.9 | 2.2 | - | - |
| 27 May 69 | - | - | 0.8 | - | - | 0.8 |
| 3 Jun 69 | - | - | 0.8 | - | - | 2.4 |
| 10 Jun 69 | 0.9 | - | - | - | - | - |
| 17 Jun 69 | - | 1.2 | - | - | 1.2 | - |
| 24 Jun 69 | - | - | - | - | - | - |
| 2 Jul 69 | - | - | 0.9 | - | - | - |
| 29 Jul 69 | - | 0.4 | - | - | - | - |
| 19 Aug 69 | 0.2 | - | 0.2 | - | - | 0.4 |
| 23 Sep 69 | - | 0.1 | - | - | - | - |
| 15 Oct 69 | - | 0.2 | - | - | - | - |
| 25 Nov 69 | 0.4 | - | - | - | - | - |
| 2 Dec 69 | 0.8 | - | - | 1.6 | - | - |
| 17 Mar 70 | 0.2 | - | 0.1 | - | - | - |
| 17 Apr 70 | - | 2.1 | 0.6 | - | 6.2 | 2.0 |
| 21 Apr 70 | - | 1.0 | - | - | - | - |
| 28 Apr 70 | - | - | 0.4 | - | - | - |
| 5 May 70 | 0.3 | - | - | - | - | - |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### *Bosmina longirostris*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 30 Jun 70 | 1.8 | --- | --- | 1.8 | --- | --- |
| 28 Jul 70 | 0.1 | - | - | - | - | - |
| 4 Aug 70 | - | 2.1 | - | - | 0.5 | - |
| 25 Aug 70 | - | 0.2 | - | - | - | - |
| 8 Sep 70 | - | 1.3 | - | - | - | - |
| 15 Sep 70 | 1.1 | 1.9 | 3.4 | 1.1 | 1.3 | 2.3 |
| 22 Sep 70 | 2.5 | - | - | - | - | - |
| 29 Sep 70 | - | - | 0.9 | - | - | 0.4 |
| 6 Oct 70 | - | 0.4 | - | - | - | - |
| 10 Nov 70 | - | - | 0.4 | - | - | 1.4 |
| 17 Nov 70 | - | 0.4 | - | - | 0.7 | - |
| 8 Dec 70 | - | - | 0.1 | - | - | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia galeata mendotae</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 - 1 Oct 68 -- Not present | | | | | | |
| 8 Oct 68 | - | - | 0.3 | - | - | 1.9 |
| 15 Oct 68 | - | 0.8 | 0.2 | - | 1.5 | 0.7 |
| 22 Oct 68 | - | 0.1 | 0.4 | - | 0.1 | 3.0 |
| 29 Oct 68 | 0.5 | 0.2 | 0.4 | 1.2 | 1.9 | 0.4 |
| 5 Nov 68 | - | 0.4 | 0.9 | - | - | - |
| 12 Nov 68 | 0.2 | 0.9 | 1.1 | 0.2 | 5.2 | 1.0 |
| 19 Nov 68 | 4.1 | 0.2 | 1.3 | 16.3 | 1.1 | 5.4 |
| 3 Dec 68 | 0.5 | 3.2 | 2.2 | 0.7 | 9.8 | 7.6 |
| 22 Jan 69 | 6.2 | 2.9 | 6.2 | 1.2 | 0.7 | 1.2 |
| 6 Feb 69 | 0.8 | 17.3 | 15.3 | - | 3.8 | 4.2 |
| 18 Feb 69 | 0.9 | --- | 5.0 | - | --- | - |
| 4 Mar 69 | - | 12.5 | 5.1 | - | - | - |
| 10 Apr 69 | 1.3 | 0.2 | 5.2 | 1.8 | 0.2 | 6.8 |
| 15 Apr 69 | 0.5 | 13.3 | 0.2 | 0.5 | 66.2 | 0.9 |
| 22 Apr 69 | 38.9 | 38.4 | 31.5 | 158.9 | 32.7 | 36.0 |
| 29 Apr 69 | 34.5 | 48.5 | 50.3 | 11.3 | 6.0 | 12.3 |
| 6 May 69 | 24.5 | 30.3 | 55.3 | 11.2 | 4.0 | 7.3 |
| 13 May 69 | 42.4 | 73.6 | 49.7 | 26.4 | 45.4 | 36.2 |
| 20 May 69 | 90.1 | 97.0 | 145.1 | 4.5 | 9.1 | 25.7 |
| 27 May 69 | 22.9 | 38.3 | 34.2 | 1.0 | - | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia galeata mendotae</u>

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 3 Jun 69 | 26.6 | 29.8 | 62.4 | 8.4 | 34.1 | 97.6 |
| 10 Jun 69 | 18.6 | 130.8 | 51.4 | 4.1 | 29.0 | 2.9 |
| 17 Jun 69 | 50.2 | 100.6 | 42.6 | 28.7 | 14.5 | 10.1 |
| 24 Jun 69 | 2.2 | 21.2 | 39.1 | 2.0 | 2.2 | 13.0 |
| 2 Jul 69 | 76.6 | 68.7 | 98.3 | 49.4 | 40.0 | 59.6 |
| 8 Jul 69 | 85.9 | 87.2 | 43.9 | 10.1 | 14.4 | - |
| 15 Jul 69 | 2.5 | 40.5 | 30.3 | 3.8 | 33.4 | 19.3 |
| 22 Jul 69 | 17.8 | 44.2 | 20.4 | 20.4 | 22.9 | 6.6 |
| 29 Jul 69 | 9.8 | 22.0 | 32.7 | 3.8 | 9.4 | 8.8 |
| 5 Aug 69 | 12.6 | 11.9 | 13.3 | 15.7 | 7.4 | 3.3 |
| 12 Aug 69 | 2.1 | 4.8 | 6.4 | 1.5 | 3.8 | 3.4 |
| 19 Aug 69 | - | 0.5 | 1.3 | * | - | - |
| 26 Aug 69 | 0.9 | 0.4 | 0.5 | 0.9 | 0.4 | 0.7 |
| 2 Sep 69 | 0.4 | 0.8 | 0.6 | 0.6 | 0.7 | 0.4 |
| 9 Sep 69 | 1.1 | 0.8 | 0.5 | 1.1 | 1.1 | 0.2 |
| 16 Sep 69 | 1.9 | 1.2 | 0.9 | 2.7 | 0.6 | 0.4 |
| 23 Sep 69 | 6.8 | 3.4 | 1.8 | 6.3 | 4.9 | 1.0 |
| 30 Sep 69 | 2.9 | 3.6 | 3.4 | 3.5 | 4.6 | 5.3 |
| 7 Oct 69 | 2.9 | 2.2 | 1.8 | 2.3 | 3.4 | 2.1 |
| 15 Oct 69 | 7.9 | 8.6 | 3.8 | 4.2 | 4.8 | 2.3 |
| 21 Oct 69 | 27.3 | 2.5 | --- | 10.1 | 1.3 | --- |
| 28 Oct 69 | 3.2 | 3.4 | 3.3 | 4.0 | 7.6 | 6.7 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia galeata mendotae</u>

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 4 Nov 69 | 0.6 | 1.2 | 1.0 | 1.1 | 3.6 | 9.7 |
| 11 Nov 69 | 3.7 | 5.7 | 4.6 | 4.5 | 3.8 | 14.6 |
| 25 Nov 69 | 4.2 | 4.5 | 9.2 | 5.2 | 5.4 | 11.9 |
| 2 Dec 69 | 11.8 | 15.4 | 22.0 | 10.7 | 24.7 | 19.5 |
| 17 Mar 70 | 8.7 | 32.2 | 1.1 | 21.6 | 77.6 | 1.5 |
| 17 Apr 70 | 79.6 | 68.8 | 81.0 | 57.4 | 20.8 | 10.4 |
| 21 Apr 70 | 109.4 | 75.2 | 154.7 | 90.6 | 25.7 | 61.3 |
| 28 Apr 70 | 133.5 | 20.7 | 47.0 | 26.0 | 1.3 | 3.2 |
| 5 May 70 | 153.3 | 39.4 | 139.2 | 100.0 | 12.9 | 54.3 |
| 12 May 70 | 38.6 | 64.6 | 41.1 | 21.1 | 72.4 | 18.7 |
| 19 May 70 | --- | 25.6 | 78.5 | --- | 12.2 | 16.4 |
| 26 May 70 | 10.4 | 23.0 | 31.3 | 13.1 | 13.5 | 17.0 |
| 2 Jun 70 | 15.1 | 33.3 | 27.5 | 11.9 | 13.0 | 20.1 |
| 9 Jun 70 | 5.2 | 16.2 | 17.6 | 5.2 | 8.8 | 4.6 |
| 16 Jun 70 | 3.9 | 7.2 | 8.7 | 3.1 | 5.2 | 2.4 |
| 23 Jun 70 | 4.3 | 42.8 | 10.6 | 4.3 | 37.5 | 11.4 |
| 30 Jun 70 | 28.1 | --- | --- | 29.4 | --- | --- |
| 7 Jul 70 | 0.2 | 2.0 | 0.7 | - | - | 0.2 |
| 14 Jul 70 | - | 0.1 | 0.1 | - | - | 0.04 |
| 21 Jul 70 | 0.02 | - | 0.5 | 0.01 | - | - |
| 28 Jul 70 | 0.1 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 |
| 4 Aug 70 | - | 0.6 | 0.3 | - | - | 0.2 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

Daphnia galeata mendotae

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 11 Aug 70 | - | 0.4 | - | - | 0.2 | - |
| 18 Aug 70 | 0.3 | - | - | - | - | - |
| 25 Aug 70 | 0.9 | - | - | - | - | - |
| 1 Sep 70 | - | - | - | - | - | - |
| 8 Sep 70 | 0.1 | 0.7 | - | 0.2 | - | - |
| 15 Sep 70 | 1.1 | - | - | - | - | - |
| 22 Sep 70 | 1.8 | 0.6 | 0.2 | - | - | 1.4 |
| 29 Sep 70 | - | - | 2.2 | - | - | - |
| 6 Oct 70 | * | 0.4 | 0.5 | - | - | - |
| 13 Oct 70 | - | - | 0.3 | - | - | 0.6 |
| 20 Oct 70 | 0.2 | - | - | - | - | - |
| 27 Oct 70 | 0.1 | 0.6 | 0.2 | - | - | - |
| 10 Nov 70 | 1.7 | 2.2 | 0.7 | - | 3.0 | - |
| 17 Nov 70 | 0.3 | 0.1 | 1.1 | - | - | 5.5 |
| 1 Dec 70 | - | 0.1 | 1.1 | - | - | 2.4 |
| 8 Dec 70 | 1.5 | 0.7 | 0.2 | 0.7 | 1.6 | - |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia pulex</u>

| Date of Sample | (No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 | 4.8 | 11.3 | 32.4 | 0.2 | 1.2 | 3.8 |
| 6 Jun 68 | 5.5 | 16.3 | 22.0 | 0.1 | 0.3 | - |
| 12 Jun 68 | 19.8 | 14.2 | 20.3 | 10.3 | 2.0 | 1.6 |
| 19 Jun 68 | 5.1 | 17.1 | 19.4 | 10.9 | 20.5 | 9.6 |
| 26 Jun 68 | 1.4 | 37.5 | 56.9 | 0.1 | 0.9 | 7.5 |
| 3 Jul 68 | - | 11.9 | 1.5 | 0.2 | 10.7 | 0.8 |
| 10 Jul 68 | 0.1 | 0.03 | 0.01 | - | 0.1 | - |
| 17 Jul 68 - 24 Jun 69 -- Not present | | | | | | |
| 2 Jul 69 | * | - | - | - | - | - |
| 8 Jul 69 - 8 Dec 70 -- Not present | | | | | | |

<u>Daphnia ambigua</u>

| Date of Sample | 1 | 2 | 3 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 - 6 Feb 69 -- Not present | | | | | | |
| 18 Feb 69 | 0.9 | --- | 17.5 | - | --- | 16.2 |
| 4 Mar 69 | 1.3 | 6.4 | 9.6 | - | - | 0.7 |
| 10 Apr 69 | 0.5 | 0.4 | 2.2 | 0.9 | 1.1 | 8.5 |
| 15 Apr 69 | 0.2 | 0.9 | 0.3 | 0.5 | 10.2 | 2.4 |
| 22 Apr 69 | - | - | - | - | - | - |
| 29 Apr 69 | - | 0.8 | 1.0 | - | - | 0.5 |
| 6 May 69 - 2 Sep 69 -- Not present | | | | | | |
| 9 Sep 69 | 0.2 | - | - | 0.1 | - | - |
| 16 Sep 69 - 2 Dec 69 -- Not present | | | | | | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia ambigua</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 17 Mar 70 | 1.4 | 0.6 | - | 0.6 | 1.2 | - |
| 17 Apr 70 | - | 1.0 | - | 3.1 | - | - |
| 21 Apr 70 | - | - | - | - | - | - |
| 28 Apr 70 | - | 0.3 | - | - | - | - |
| 5 May 70 | 3.3 | - | - | 5.0 | - | - |
| 12 May 70 | - | - | * | - | - | - |
| 19 May 70 | --- | - | - | --- | - | - |
| 26 May 70 | - | 1.4 | - | - | 2.0 | - |
| 2 Jun 70 | - | - | 0.7 | - | - | 0.7 |
| 9 Jun 70 | 0.8 | 2.0 | - | 2.7 | 4.1 | - |
| 16 Jun 70 | 2.2 | 2.8 | - | 1.3 | 1.0 | - |
| 23 Jun 70 | 0.4 | 2.7 | 6.8 | - | 0.9 | 2.3 |
| 30 Jun 70 | 12.0 | --- | --- | 23.8 | --- | --- |
| 7 Jul 70 | - | - | - | - | - | - |
| 14 Jul 70 | - | - | - | - | - | - |
| 21 Jul 70 | - | - | 0.1 | - | - | - |
| 28 Jul 70 | - | - | 0.1 | - | - | - |
| 4 Aug 70 | - | - | 0.4 | - | - | - |
| 11 Aug 70 - 1 Sep 70 -- Not present | | | | | | |
| 8 Sep 70 | 0.1 | - | - | 0.1 | - | - |
| 15 Sep 70 - 8 Dec 70 -- Not present | | | | | | |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Daphnia parvula*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 28 May 68 - 10 Jul 68 -- Not present | | | | | | |
| 17 Jul 68 | 0.004 | 0.002 | - | 0.01 | 0.01 | - |
| 24 Jul 68 | 0.02 | 0.02 | - | 0.1 | 0.03 | - |
| 31 Jul 68 | 0.01 | 0.01 | - | 0.01 | 0.01 | 0.01 |
| 7 Aug 68 | 0.02 | - | - | 0.1 | - | - |
| 14 Aug 68 | - | - | - | - | - | - |
| 21 Aug 68 | - | - | 0.1 | - | - | 0.3 |
| 28 Aug 68 | - | - | 0.2 | - | - | 0.1 |
| 5 Sep 68 | - | - | - | - | - | - |
| 10 Sep 68 | - | 0.2 | - | - | 0.2 | - |
| 17 Sep 68 | - | - | - | - | - | - |
| 24 Sep 68 | 0.1 | 0.5 | - | 0.1 | - | - |
| 1 Oct 68 | 0.1 | 0.3 | 0.5 | 0.2 | - | 0.5 |
| 8 Oct 68 | - | 0.3 | - | - | 0.5 | - |
| 15 Oct 68 | - | 0.2 | 0.9 | - | 0.3 | 0.7 |
| 22 Oct 68 | 0.02 | 0.4 | 0.2 | - | 0.5 | 1.3 |
| 29 Oct 68 | 0.1 | 0.4 | 0.7 | 0.6 | 2.7 | 2.8 |
| 5 Nov 68 | 0.3 | 0.7 | 2.7 | 0.5 | 1.4 | 3.8 |
| 12 Nov 68 | 1.0 | 1.5 | 0.4 | 1.4 | 1.3 | 2.4 |
| 19 Nov 68 | 1.5 | 1.0 | 1.3 | 0.4 | 1.7 | 4.3 |
| 3 Dec 68 | 0.8 | 1.4 | 0.9 | 0.9 | 7.8 | 1.8 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia</u> <u>parvula</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 22 Jan 69 - 4 Mar 69 -- Not present | | | | | | |
| 10 Apr 69 | * | - | - | - | - | - |
| 15 Apr 69 | - | - | - | - | - | - |
| 22 Apr 69 | - | 0.6 | 1.5 | - | - | 1.5 |
| 29 Apr 69 | 1.1 | - | - | - | - | - |
| 6 May 69 - 8 Jul 69 -- Not present | | | | | | |
| 15 Jul 69 | 0.5 | 0.6 | - | 1.2 | 1.9 | - |
| 22 Jul 69 | 4.1 | - | 0.6 | 5.2 | - | 0.6 |
| 29 Jul 69' | 1.3 | 1.1 | 1.0 | 1.9 | 0.7 | 0.5 |
| 5 Aug 69 | 0.5 | 0.5 | 0.0 | 0.5 | - | - |
| 12 Aug 69 | - | 0.3 | 1.0 | - | 0.7 | 1.0 |
| 19 Aug 69 | 1.7 | 0.2 | 1.0 | 1.0 | 0.2 | 0.4 |
| 26 Aug 69 | 3.4 | 0.5 | 0.1 | 1.5 | 0.3 | - |
| 2 Sep 69 | 1.2 | 0.3 | 0.1 | 0.7 | 0.1 | 0.1 |
| 9 Sep 69 | 2.6 | 3.1 | 0.7 | 2.5 | 3.5 | 0.4 |
| 16 Sep 69 | 6.2 | 1.2 | 1.8 | 5.0 | 0.2 | 0.7 |
| 23 Sep 69 | 5.2 | 2.4 | 1.7 | 3.7 | 1.9 | 1.2 |
| 30 Sep 69 | 5.8 | 1.1 | 1.7 | 3.3 | 0.4 | 1.0 |
| 7 Oct 69 | 3.6 | 0.6 | 8.4 | - | 0.4 | 1.2 |
| 15 Oct 69 | 2.6 | 2.8 | 2.7 | 0.5 | 0.2 | 0.5 |
| 21 Oct 69 | 6.6 | 1.6 | --- | 2.0 | 0.1 | --- |
| 28 Oct 69 | 2.4 | 3.2 | 3.7 | 1.9 | 2.8 | 2.1 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

<u>Daphnia parvula</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 4 Nov 69 | 0.9 | 0.8 | 0.7 | 0.6 | 1.4 | 0.6 |
| 11 Nov 69 | 4.5 | 6.2 | 3.4 | 2.4 | 3.6 | 3.2 |
| 25 Nov 69 | 3.8 | 4.2 | 3.5 | 2.1 | 3.0 | 0.8 |
| 2 Dec 69 | 9.5 | 2.9 | 2.0 | 1.6 | 2.5 | 2.0 |
| 17 Mar 70 | - | - | 0.2 | - | - | - |
| 17 Apr 70 - 2 Jun 70 -- Not present | | | | | | |
| 9 Jun 70 | - | 0.7 | - | - | 2.0 | - |
| 16 Jun 70 | 0.4 | - | - | 1.3 | - | - |
| 23 Jun 70 | - | - | - | - | - | - |
| 30 Jun 70 | 1.6 | --- | --- | - | --- | --- |
| 7 Jul 70 | - | 0.5 | 0.7 | - | - | - |
| 14 Jul 70 | 0.02 | - | - | - | - | - |
| 21 Jul 70 | 0.04 | 0.3 | 0.6 | 0.03 | 0.1 | 0.1 |
| 28 Jul 70 | 0.5 | 1.2 | 1.2 | 0.6 | 2.3 | 2.1 |
| 4 Aug 70 | 0.1 | 0.6 | 0.4 | 0.1 | - | - |
| 11 Aug 70 | - | - | - | - | - | - |
| 18 Aug 70 | - | - | - | - | - | - |
| 25 Aug 70 | 0.4 | - | - | 0.2 | - | - |
| 1 Sep 70 | - | 0.2 | 0.5 | - | 0.7 | 0.2 |
| 8 Sep 70 | 0.2 | 0.9 | 0.8 | - | 1.3 | 1.2 |
| 15 Sep 70 | 3.2 | 2.3 | 2.8 | 2.1 | 2.3 | 5.7 |
| 22 Sep 70 | 25.0 | 1.8 | 3.1 | 45.0 | 2.9 | 5.3 |

QUANTITATIVE DATA - PAWNEE RESERVOIR

*Daphnia parvula*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 29 Sep 70 | 3.3 | 11.6 | 6.7 | - | 5.1 | 1.8 |
| 6 Oct 70 | 17.4 | 12.5 | 10.2 | 6.9 | 4.6 | 2.4 |
| 13 Oct 70 | 10.5 | 11.4 | 0.8 | 2.7 | 0.7 | 0.4 |
| 20 Oct 70 | 4.1 | 6.5 | 1.5 | 1.6 | 2.0 | 0.6 |
| 27 Oct 70 | 2.1 | 10.1 | 6.1 | 1.0 | 6.2 | 3.6 |
| 10 Nov 70 | 5.2 | 10.8 | 9.7 | 7.6 | 6.5 | 0.4 |
| 17 Nov 70 | 3.5 | 3.0 | 12.3 | 2.2 | 2.6 | 7.7 |
| 1 Dec 70 | 0.8 | 0.8 | 6.8 | 0.9 | 0.7 | 2.8 |
| 8 Dce 70 | 3.4 | 2.1 | 0.9 | 3.4 | 2.3 | 0.5 |

*Alonella excisa*

| | | | | | | |
|---|---|---|---|---|---|---|
| 28 May 68 | * | - | - | - | - | - |
| 17 Jul 68 | 0.01 | 0.01 | - | - | - | - |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 28 May 68 | 10.4 | 17.7 | 37.9 | 22.0 |
| 6 Jun 68 | 10.6 | 18.8 | 24.2 | 17.8 |
| 12 Jun 68 | 26.3 | 17.0 | 23.4 | 22.2 |
| 19 Jun 68 | 5.8 | 21.4 | 21.6 | 16.3 |
| 26 Jun 68 | 2.6 | 42.2 | 65.6 | 36.8 |
| 3 Jul 68 | 6.5 | 13.5 | 1.7 | 7.3 |
| 10 Jul 68 | 1.5 | 0.5 | 0.01 | 0.5 |
| 17 Jul 68 | 0.03 | 0.06 | 0.003 | 0.03 |
| 24 Jul 68 | 0.1 | 0.09 | 0.1 | 0.11 |
| 31 Jul 68 | 0.08 | 0.08 | 0.02 | 0.06 |
| 7 Aug 68 | 1.0 | 1.4 | 1.1 | 1.2 |
| 14 Aug 68 | 2.2 | 1.6 | 1.6 | 3.3 |
| 21 Aug 68 | 2.3 | 3.5 | 2.5 | 2.8 |
| 28 Aug 68 | 7.2 | 3.4 | 6.1 | 5.6 |
| 5 Sep 68 | 5.1 | 2.8 | 16.6 | 8.2 |
| 10 Sep 68 | 15.3 | 14.7 | 45.8 | 25.2 |
| 17 Sep 68 | 9.5 | 12.2 | 10.8 | 10.8 |
| 24 Sep 68 | 0.7 | 7.4 | 5.3 | 4.5 |
| 1 Oct 68 | 3.3 | 11.0 | 16.7 | 10.3 |
| 8 Oct 68 | 4.8 | 6.9 | 11.8 | 7.8 |
| 15 Oct 68 | 1.9 | 11.2 | 12.9 | 8.7 |
| 22 Oct 68 | 2.2 | 8.1 | 7.6 | 5.9 |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 29 Oct 68 | 4.1 | 7.0 | 4.5 | 5.2 |
| 5 Nov 68 | 3.8 | 6.1 | 18.3 | 9.4 |
| 12 Nov 68 | 3.4 | 3.9 | 5.5 | 4.2 |
| 19 Nov 68 | 15.0 | 4.2 | 9.3 | 9.5 |
| 3 Dec 68 | 5.6 | 18.1 | 8.3 | 10.7 |
| 22 Jan 69 | 37.5 | 19.8 | 22.5 | 26.6 |
| 6 Feb 69 | 7.9 | 92.3 | 25.0 | 41.7 |
| 18 Feb 69 | 36.6 | --- | 51.2 | 43.9 |
| 4 Mar 69 | 13.8 | 28.5 | 18.4 | 20.2 |
| 10 Apr 69 | 2.2 | 1.5 | 11.7 | 5.1 |
| 15 Apr 69 | 1.3 | 18.7 | 0.8 | 6.9 |
| 22 Apr 69 | 43.2 | 43.4 | 35.0 | 40.6 |
| 29 Apr 69 | 37.4 | 51.9 | 54.9 | 48.1 |
| 6 May 69 | 26.6 | 32.1 | 61.8 | 40.2 |
| 13 May 69 | 47.9 | 83.6 | 53.5 | 61.7 |
| 20 May 69 | 108.7 | 108.5 | 49.5 | 122.2 |
| 27 May 69 | 24.3 | 58.5 | 41.2 | 41.4 |
| 3 Jun 69 | 30.8 | 34.0 | 86.4 | 53.7 |
| 10 Jun 69 | 20.9 | 151.4 | 54.3 | 75.6 |
| 17 Jun 69 | 52.8 | 111.5 | 48.7 | 71.0 |
| 24 Jun 69 | 2.9 | 21.2 | 41.5 | 21.9 |
| 2 Jul 69 | 83.4 | 68.7 | 99.2 | 83.8 |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 8 Jul 69 | 87.6 | 19.0 | 44.6 | 73.7 |
| 15 Jul 69 | 3.8 | 46.2 | 40.0 | 30.0 |
| 22 Jul 69 | 34.8 | 49.7 | 32.5 | 39.0 |
| 29 Jul 69 | 15.3 | 33.8 | 47.8 | 32.3 |
| 5 Aug 69 | 25.3 | 26.3 | 21.7 | 24.4 |
| 12 Aug 69 | 26.1 | 15.5 | 16.6 | 19.4 |
| 19 Aug 69 | 41.1 | 7.0 | 16.8 | 21.6 |
| 26 Aug 69 | 20.6 | 2.4 | 4.4 | 9.1 |
| 2 Sep 69 | 8.9 | 3.0 | 1.8 | 4.6 |
| 9 Sep 69 | 8.2 | 5.7 | 2.2 | 5.4 |
| 16 Sep 69 | 24.2 | 5.5 | 4.5 | 11.4 |
| 23 Sep 69 | 15.0 | 11.2 | 6.5 | 10.9 |
| 30 Sep 69 | 19.7 | 13.9 | 13.6 | 15.8 |
| 7 Oct 69 | 7.0 | 5.2 | 20.8 | 11.0 |
| 15 Oct 69 | 15.0 | 15.8 | 9.4 | 13.4 |
| 21 Oct 69 | 39.9 | 5.2 | --- | 22.6 |
| 28 Oct 69 | 14.7 | 14.0 | 13.1 | 13.9 |
| 4 Nov 69 | 3.4 | 5.0 | 2.7 | 3.7 |
| 11 Nov 69 | 12.8 | 14.8 | 11.7 | 13.1 |
| 25 Nov 69 | 9.8 | 9.7 | 13.8 | 11.1 |
| 2 Dec 69 | 24.5 | 19.1 | 25.3 | 22.9 |
| 17 Mar 70 | 11.9 | 34.3 | 2.2 | 16.1 |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 17 Apr 70 | 82.4 | 74.0 | 84.2 | 80.2 |
| 21 Apr 70 | 113.2 | 77.2 | 159.5 | 116.6 |
| 28 Apr 70 | 137.5 | 21.0 | 49.4 | 69.3 |
| 5 May 70 | 161.7 | 41.8 | 142.6 | 115.4 |
| 12 May 70 | 39.5 | 71.9 | 45.8 | 52.4 |
| 19 May 70 | --- | 34.5 | 94.3 | 64.4 |
| 26 May 70 | 16.5 | 39.3 | 43.0 | 32.9 |
| 2 Jun 70 | 26.3 | 46.9 | 38.6 | 37.3 |
| 9 Jun 70 | 6.0 | 21.6 | 20.6 | 16.1 |
| 16 Jun 70 | 6.9 | 10.6 | 9.3 | 8.9 |
| 23 Jun 70 | 5.9 | 55.3 | 21.9 | 27.7 |
| 30 Jun 70 | 59.1 | --- | --- | 59.1 |
| 7 Jul 70 | 0.3 | 16.5 | 6.7 | 7.8 |
| 14 Jul 70 | 0.02 | 0.2 | 0.7 | 0.3 |
| 21 Jul 70 | 0.1 | 0.8 | 1.9 | 0.9 |
| 28 Jul 70 | 1.0 | 4.3 | 2.9 | 2.7 |
| 4 Aug 70 | 0.1 | 6.1 | 2.5 | 2.9 |
| 11 Aug 70 | 0.6 | 1.8 | 2.3 | 1.6 |
| 18 Aug 70 | 3.1 | 5.0 | 3.0 | 3.7 |
| 25 Aug 70 | 2.9 | 1.0 | 3.9 | 2.6 |
| 1 Sep 70 | 19.9 | 8.7 | 6.2 | 11.6 |
| 8 Sep 70 | 1.5 | 25.3 | 6.4 | 11.1 |

## QUANTITATIVE DATA - PAWNEE RESERVOIR

### Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 15 Sep 70 | 13.8 | 11.7 | 18.7 | 14.7 |
| 22 Sep 70 | 66.8 | 4.0 | 10.5 | 27.1 |
| 29 Sep 70 | 5.4 | 15.2 | 10.1 | 10.2 |
| 6 Oct 70 | 20.9 | 18.7 | 18.5 | 19.4 |
| 13 Oct 70 | 11.9 | 19.8 | 2.5 | 11.4 |
| 20 Oct 70 | 8.1 | 8.5 | 2.5 | 6.4 |
| 27 Oct 70 | 2.4 | 13.0 | 10.2 | 8.5 |
| 10 Nov 70 | 9.3 | 21.2 | 13.0 | 14.5 |
| 17 Nov 70 | 6.0 | 4.3 | 23.3 | 11.2 |
| 1 Dec 70 | 1.4 | 1.5 | 3.5 | 2.1 |
| 8 Dec 70 | 8.9 | 5.6 | 2.0 | 5.5 |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

<u>*Diaptomus pallidus*</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | Males | Egg Sacs |
|---|---|---|---|---|
| 4 Jun 69 | 4.6 | 6.4 | * | * |
| 11 Jun 69 | 5.3 | 5.4 | * | * |
| 18 Jun 69 | 12.2 | 4.0 | * | * |
| 26 Jun 69 | 14.3 | 10.9 | * | * |
| 1 Jul 69 | 16.2 | 6.8 | * | * |
| 9 Jul 69 | 6.3 | 15.2 | * | |
| 16 Jul 69 | 20.9 | 3.4 | | |
| 23 Jul 69 | 2.96 | 8.6 | | |
| 30 Jul 69 | 3.3 | 1.2 | | * |
| 6 Aug 69 | * | --- | | |
| 13 Aug 69 | 1.6 | * | | |
| 20 Aug 69 | 1.3 | --- | | |
| 27 Aug 69 | 0.2 | 0.2 | * | |
| 3 Sep 69 | 0.2 | - | | * |
| 10 Sep 69 | 0.39 | 0.85 | * | * |
| 4 Jun 70 | 2.9 | 7.0 | * | |
| 11 Jun 70 | 1.0 | - | | |
| 18 Jun 70 | - | - | | |
| 25 Jun 70 | 6.2 | 0.3 | | * |
| 9 Jul 70 | - | - | | |
| 16 Jul 70 | - | - | | |
| 23 Jul 70 | 3.3 | | | * |

* Present in sample

QUANTITATIVE DATA - STAGECOACH RESERVOIR

## *Diaptomus pallidus* (No./l)

| Date of Sample | Sampling Station 1 | 2 | Males | Egg Sacs |
|---|---|---|---|---|
| 30 Jul 70 | 4.1 | * | * | |
| 6 Aug 70 - 3 Sep 70 -- Not present | | | | |

## *Mesocyclops edax* (No./l)

| Date of Sample | Sampling Station 1 | 2 | Males | Egg Sacs |
|---|---|---|---|---|
| 4 Jun 69 | 1.1 | 0.8 | | * |
| 11 Jun 69 | 4.2 | 2.7 | | |
| 18 Jun 69 | 3.0 | 2.0 | | |
| 26 Jun 69 - 16 Jul 69 -- Not present | | | | |
| 23 Jul 69 | - | 2.8 | | |
| 30 Jul 69 | 1.6 | * | | |
| 6 Aug 69 | * | --- | | |
| 13 Aug 69 | * | * | | |
| 20 Aug 69 | 0.6 | --- | | |
| 27 Aug 69 - 10 Sep 69 -- Not present | | | | |
| 4 Jun 70 | 1.0 | 0.9 | | * |
| 11 Jun 70 | - | 2.1 | | * |
| 18 Jun 70 | - | 1.9 | | * |
| 25 Jun 70 | 6.2 | 1.2 | | * |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Mesocyclops edax*
(No./l)

| Date of Sample | Sampling Station 1 | Sampling Station 2 | Egg Sacs |
|---|---|---|---|
| 9 Jul 70 | 2.5 | 2.0 | * |
| 16 Jul 70 | 2.6 | 20.0 | * |
| 23 Jul 70 | 6.6 | 5.9 | * |
| 30 Jul 70 | 6.1 | 8.4 | * |
| 6 Aug 70 | 6.3 | * | * |
| 13 Aug 70 | * | 2.2 | |
| 20 Aug 70 | * | - | |
| 27 Aug 70 | 6.1 | - | |
| 3 Sep 70 | - | 6.2 | * |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Diaptomus clavipes*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | Males | Egg Sacs |
|---|---|---|---|---|
| 4 Jun 69 - 18 Jun 69 -- Not present | | | | |
| 26 Jun 69 | * | - | | |
| 1 Jul 69 - 30 Jul 69 -- Not present | | | | |
| 6 Aug 69 | - | --- | | |
| 13 Aug 69 | - | - | | |
| 20 Aug 69 | - | --- | | |
| 27 Aug 69 - 4 Jun 70 -- Not present | | | | |
| 11 Jun 70 | 1.0 | - | | * |
| 18 Jun 70 - 3 Sep 70 -- Not present | | | | |

*Cyclops vernalis*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | Males | Egg Sacs |
|---|---|---|---|---|
| 4 Jun 69 | 0.6 | - | | |
| 11 Jun 69 | - | * | | |
| 18 Jun 69 - 30 Jul 69 -- Not present | | | | |
| 6 Aug 69 | - | --- | | |
| 13 Aug 69 | - | - | | |
| 20 Aug 69 | - | --- | | |
| 27 Aug 69 - 25 Jun 70 -- Not present | | | | |
| 9 Jul 70 | 2.5 | - | * | |
| 16 Jul 70 | 1.1 | - | | |
| 23 Jul 70 | 1.1 | - | | |
| 30 Jul 70 - 3 Sep 70 -- Not present | | | | |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station 1 | 2 | Eggs/1 Sampling Station 1 | 2 |
|---|---|---|---|---|
| 4 Jun 69 - 30 Jul 69 -- Not present | | | | |
| 6 Aug 69 | - | --- | - | --- |
| 13 Aug 69 | - | - | - | - |
| 20 Aug 69 | - | --- | - | --- |
| 27 Aug 69 | 0.08 | 0.09 | - | - |
| 3 Sep 69 - 11 Jun 70 -- Not present | | | | |
| 18 Jun 70 | 1.6 | - | - | - |
| 25 Jun 70 | - | 0.3 | - | - |
| 9 Jul 70 | 12.6 | - | - | 12.6 |
| 16 Jul 70 | - | 8.0 | - | - |
| 23 Jul 70 | - | 11.9 | - | - |
| 30 Jul 70 - 3 Sep 70 -- Not present | | | | |

*Bosmina longirostris*

| Date of Sample | No./1 Sampling Station 1 | 2 | Eggs/1 Sampling Station 1 | 2 |
|---|---|---|---|---|
| 4 Jun 69 | 2.9 | 0.8 | 2.9 | - |
| 11 Jun 69 | - | 1.4 | - | - |
| 18 Jun 69 | - | - | - | - |
| 26 Jun 69 | 1.1 | - | - | - |
| 1 Jul 69 - 30 Jul 69 -- Not present | | | | |
| 6 Aug 69 | - | --- | - | --- |
| 13 Aug 69 | - | - | - | - |
| 20 Aug 69 | - | --- | - | --- |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Bosmina longirostris*

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 27 Aug 69 - 16 Jul 70 -- Not present | | | | |
| 23 Jul 70 | 6.6 | - | 6.6 | - |
| 30 Jul 70 | - | - | - | - |
| 6 Aug 70 | 2.5 | - | - | - |
| 13 Aug 70 | - | 2.2 | - | - |
| 20 Aug 70 | 2.0 | - | - | - |
| 27 Aug 70 - 3 Sep 70 -- Not present | | | | |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Ceridodaphnia lacustris*

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 4 Jun 69 - 18 Jun 69 -- Not present | | | | |
| 26 Jun 69 | 1.1 | - | 1.1 | - |
| 1 Jul 69 | * | - | - | - |
| 9 Jul 69 | 4.2 | 5.1 | - | - |
| 16 Jul 69 | 9.3 | 3.4 | 2.3 | 3.4 |
| 23 Jul 69 | 2.96 | 5.7 | 2.96 | 2.8 |
| 30 Jul 69 | 11.5 | 7.3 | 11.5 | 12.2 |
| 6 Aug 69 | 5.7 | --- | - | --- |
| 13 Aug 69 | * | - | - | - |
| 20 Aug 69 | * | --- | - | --- |
| 27 Aug 69 | - | 0.09 | - | - |
| 3 Sep 69 | - | 0.004 | - | 0.01 |
| 10 Sep 69 | - | - | - | - |
| 4 Jun 70 | - | 0.9 | - | - |
| 11 Jun 70 | 1.0 | 2.1 | - | - |
| 18 Jun 70 | - | 11.7 | - | 5.8 |
| 25 Jun 70 | 12.5 | 3.4 | 18.8 | 1.9 |
| 9 Jul 70 | 20.2 | 2.3 | 10.1 | 3.0 |
| 16 Jul 70 | 10.4 | 10.0 | 5.2 | - |
| 23 Jul 70 | - | - | - | - |
| 30 Jul 70 | 4.2 | - | - | - |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Ceridodaphnia lacustris*

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 6 Aug 70 - 27 Aug 70 -- Not present | | | | |
| 3 Sep 70 | - | 2.4 | - | - |

*Daphnia galeata*

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 4 Jun 69 | 9.7 | 8.0 | 8.0 | 1.6 |
| 11 Jun 69 | 6.3 | 16.3 | - | 13.6 |
| 18 Jun 69 | 13.9 | 5.0 | 7.6 | 12.0 |
| 26 Jun 69 | 39.7 | 14.5 | 8.8 | 6.1 |
| 1 Jul 69 | 71.1 | 38.0 | 51.7 | 3.0 |
| 9 Jul 69 | 96.8 | 73.6 | 25.3 | 12.7 |
| 16 Jul 69 | 211.0 | 156.6 | 39.4 | 30.6 |
| 23 Jul 69 | 112.6 | 82.8 | 34.8 | 42.8 |
| 30 Jul 69 | 160.6 | 95.1 | 129.5 | 104.9 |
| 6 Aug 69 | 160.4 | --- | --- | --- |
| 13 Aug 69 | 62.4 | 11.9 | 3.2 | 9.2 |
| 20 Aug 69 | 62.0 | --- | 16.4 | --- |
| 27 Aug 69 | 0.4 | 0.2 | 0.2 | 0.4 |
| 3 Sep 69 | 0.08 | 0.004 | 0.08 | 0.004 |
| 10 Sep 69 | - | - | - | - |
| 4 Jun 70 | 11.3 | 3.5 | 7.4 | 2.6 |
| 11 Jun 70 | 28.3 | 6.2 | 14.1 | 22.9 |
| 18 Jun 70 | 31.7 | 71.9 | 3.2 | 11.7 |
| 25 Jun 70 | 212.5 | 5.9 | 81.2 | 2.5 |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Daphnia galeata*

| Date of Sample | No/1 Sampling Station 1 | No/1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 9 Jul 70 | 121.5 | 31.3 | 91.1 | 16.1 |
| 16 Jul 70 | 148.1 | 336.0 | 22.2 | 60.0 |
| 23 Jul 70 | 168.6 | 130.7 | 22.0 | 23.8 |
| 30 Jul 70 | 100.0 | 175.8 | 16.3 | 71.2 |
| 6 Aug 70 | 278.5 | 125.6 | 93.7 | 10.2 |
| 13 Aug 70 | 241.1 | 130.4 | 10.7 | 43.5 |
| 20 Aug 70 | 318.4 | 163.1 | 53.1 | 27.7 |
| 27 Aug 70 | 409.1 | 92.0 | 24.2 | 109.1 |
| 3 Sep 70 | 121.4 | 94.7 | 14.3 | 18.9 |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

<u>Daphnia parvula</u>

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 4 Jun 69 | 5.7 | 7.2 | 0.6 | 3.2 |
| 11 Jun 69 | 7.4 | 4.1 | 5.3 | 1.4 |
| 18 Jun 69 | 1.5 | 0.5 | - | - |
| 26 Jun 69 - 30 Jul 69 -- Not present | | | | |
| 6 Aug 69 | - | --- | - | - |
| 13 Aug 69 | - | - | - | - |
| 20 Aug 69 | - | --- | - | --- |
| 27 Aug 69 | 0.2 | 0.1 | - | - |
| 3 Sep 69 | - | - | - | - |
| 10 Sep 69 | 0.07 | 0.11 | 0.11 | - |
| 4 Jun 70 | - | - | - | - |
| 11 Jun 70 | - | - | * | - |
| 18 Jun 70 | * | - | - | - |
| 25 Jun 70 - 3 Sep 70 -- Not present | | | | |

<u>Daphnia ambigua</u>

| Date of Sample | No./1 Sampling Station 1 | No./1 Sampling Station 2 | Eggs/1 Sampling Station 1 | Eggs/1 Sampling Station 2 |
|---|---|---|---|---|
| 4 Jun 69 | 34.8 | 17.6 | 53.7 | 27.2 |
| 11 Jun 69 | 27.4 | 12.2 | 36.8 | 16.3 |
| 18 Jun 69 | 21.3 | 6.0 | 15.2 | 8.5 |
| 26 Jun 69 | 4.4 | 3.6 | 1.1 | - |
| 1 Jul 69 | 3.2 | 1.5 | 3.2 | - |
| 9 Jul 69 - 30 Jul 69 -- Not present | | | | |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

*Daphnia ambigua*

| Date of Sample | No./1 Sampling Station | | Eggs/1 Sampling Station | |
|---|---|---|---|---|
| | 1 | 2 | 1 | 2 |
| 6 Aug 69 | - | --- | - | - |
| 13 Aug 69 | - | - | - | - |
| 20 Aug 69 | - | --- | - | --- |
| 27 Aug 69 - 10 Sep 69 -- Not present | | | | |
| 4 Jun 70 | 23.5 | 23.7 | - | 3.5 |
| 11 Jun 70 | 3.0 | 16.7 | 1.0 | 6.2 |
| 18 Jun 70 - 3 Sep 70 -- Not present | | | | |

## QUANTITATIVE DATA - STAGECOACH RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | Mean |
|---|---|---|---|
| 4 Jun 69 | 59.4 | 40.8 | 50.1 |
| 11 Jun 69 | 50.5 | 42.2 | 46.4 |
| 18 Jun 69 | 51.7 | 17.5 | 34.6 |
| 26 Jun 69 | 60.6 | 29.0 | 44.8 |
| 1 Jul 69 | 90.5 | 46.3 | 68.4 |
| 9 Jul 69 | 107.3 | 93.9 | 100.6 |
| 16 Jul 69 | 243.5 | 163.4 | 203.4 |
| 23 Jul 69 | 118.5 | 99.9 | 109.3 |
| 30 Jul 69 | 177.0 | 103.6 | 140.3 |
| 6 Aug 69 | 166.1 | --- | 166.1 |
| 13 Aug 69 | 64.0 | 11.9 | 38.0 |
| 20 Aug 69 | 63.9 | --- | 63.9 |
| 27 Aug 69 | 0.73 | 0.54 | 0.64 |
| 3 Sep 69 | 0.28 | 0.008 | 0.14 |
| 10 Sep 69 | 0.46 | 0.96 | 0.71 |
| 4 Jun 70 | 38.7 | 36.0 | 37.3 |
| 11 Jun 70 | 34.3 | 31.3 | 32.8 |
| 18 Jun 70 | 33.3 | 85.5 | 39.4 |
| 25 Jun 70 | 237.4 | 11.1 | 124.2 |
| 9 Jul 70 | 159.3 | 35.6 | 97.4 |
| 16 Jul 70 | 161.1 | 374.0 | 267.6 |
| 23 Jul 70 | 186.2 | 148.5 | 167.4 |

QUANTITATIVE DATA - STAGECOACH RESERVOIR

Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | Mean |
|---|---|---|---|
| 30 Jul 70 | 110.2 | 188.4 | 149.3 |
| 6 Aug 70 | 295.9 | 125.6 | 210.8 |
| 13 Aug 70 | 241.1 | 134.8 | 188.0 |
| 20 Aug 70 | 320.4 | 163.1 | 241.8 |
| 27 Aug 70 | 415.2 | 92.0 | 253.6 |
| 3 Sep 70 | 123.8 | 100.9 | 112.4 |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Diaptomus* spp.
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 5 Jun 68 | 3.7 | 3.2 | 1.8 | * | * |
| 11 Jun 68 | 1.6 | 2.6 | 2.2 | * | * |
| 18 Jun 68 | 1.3 | 1.2 | 0.7 | * | * |
| 25 Jun 68 | 0.8 | 1.2 | 1.3 | * | * |
| 2 Jul 68 | 0.4 | 0.1 | 0.1 | | * |
| 9 Jul 68 | 0.1 | 0.3 | 0.1 | | * |
| 16 Jul 68 | 0.01 | - | - | | * |
| 23 Jul 68 | - | 0.002 | 0.1 | | * |
| 30 Jul 68 | 0.01 | 0.01 | 0.2 | | * |
| 6 Aug 68 | 0.1 | - | 0.03 | * | * |
| 13 Aug 68 | 0.01 | 0.004 | 0.03 | * | * |
| 20 Aug 68 | 0.004 | - | 0.04 | * | * |

*Diaptomus siciloides*
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 4 Jun 69 | 1.8 | 1.1 | 7.0 | * | * |
| 11 Jun 69 | 0.2 | 0.9 | - | * | * |
| 18 Jun 69 | 0.7 | 0.6 | 1.3 | | * |
| 26 Jun 69 | 0.1 | 0.4 | 1.0 | | * |
| 1 Jul 69 | 0.3 | 0.1 | 1.2 | | * |
| 9 Jul 69 | 0.2 | 0.2 | --- | | * |
| 16 Jul 69 | 0.7 | 1.1 | 0.1 | * | * |
| 23 Jul 69 | - | 0.2 | 0.7 | * | * |

* Present in sample

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

<u>*Diaptomus siciloides*</u>
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 30 Jul 69 | 0.4 | 0.4 | 0.3 | * | * |
| 6 Aug 69 | 0.1 | 0.5 | 0.1 | * | |
| 13 Aug 69 | * | - | 0.1 | | * |
| 20 Aug 69 | - | 0.004 | * | | * |
| 27 Aug 69 | 0.003 | 0.01 | 0.05 | * | * |
| 3 Sep 69 | 0.1 | - | - | * | * |
| 10 Sep 69 | 0.1 | 0.1 | 0.9 | * | * |
| 4 Jun 70 | 0.1 | 0.04 | - | | * |
| 11 Jun 70 | 0.6 | 0.2 | - | * | * |
| 18 Jun 70 | 0.6 | 0.6 | 0.1 | | * |
| 25 Jun 70 | 1.2 | 1.5 | 1.8 | * | * |
| 9 Jul 70 | 1.0 | 0.2 | 1.4 | | * |
| 16 Jul 70 | 0.4 | 0.3 | 0.2 | * | * |
| 23 Jul 70 | 0.9 | 0.7 | 0.1 | * | * |
| 30 Jul 70 | * | 0.3 | 0.8 | | * |
| 6 Aug 70 | 0.4 | 0.1 | 1.3 | | * |
| 13 Aug 70 | 2.1 | 0.9 | 0.7 | * | * |
| 20 Aug 70 | 0.4 | 0.8 | 0.3 | * | * |
| 27 Aug 70 | 0.9 | 0.5 | 0.9 | * | * |
| 3 Sep 70 | 0.1 | 0.1 | 0.1 | | * |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Diaptomus clavipes*
(No./1)

| Date of Sample | Sampling Station 1 | 2 | 3 | Males | Egg Sacs |
|---|---|---|---|---|---|
| 4 Jun 69 | - | 0.13 | - | | |
| 11 Jun 69 | - | - | 0.4 | | |
| 18 Jun 69 | - | - | * | | |
| 26 Jun 69 | - | - | 0.1 | | * |
| 1 Jul 69 | - | - | - | | |
| 9 Jul 69 | 0.1 | * | - | | |
| 16 Jul 69 | - | - | - | | |
| 23 Jul 69 | - | - | * | | |
| 30 Jul 69 | * | - | 0.3 | | * |
| 6 Aug 69 | - | - | 0.4 | * | |
| 13 Aug 69 | * | - | - | | |
| 20 Aug 69 | - | - | 0.2 | | * |
| 27 Aug 69 | - | 0.003 | - | | * |
| 3 Sep 69 | - | - | - | | |
| 10 Sep 69 | - | * | - | * | |

* Present in sample.

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

<u>Mesocyclops edax</u>
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 5 Jun 68 | 0.8 | - | 0.1 | * |
| 11 Jun 68 | - | 0.1 | - | |
| 18 Jun 68 | 0.1 | - | 0.4 | * |
| 25 Jun 68 | 0.1 | - | 0.4 | * |
| 2 Jul 68 | - | - | - | |
| 9 Jul 68 | - | - | - | |
| 16 Jul 68 | - | - | - | |
| 23 Jul 68 | - | - | 0.05 | |
| 30 Jul 68 | 0.01 | - | 0.04 | * |
| 6 Aug 68 | - | - | - | |
| 13 Aug 68 | - | - | 0.01 | |
| 20 Aug 68 | - | - | - | |
| 4 Jun 69 | 2.3 | 0.13 | 0.31 | * |
| 11 Jun 69 | 0.3 | 0.5 | 0.4 | |
| 18 Jun 69 | - | 0.3 | 1.3 | * |
| 26 Jun 69 | - | 0.1 | 0.5 | * |
| 1 Jul 69 | 0.1 | - | 0.3 | * |
| 9 Jul 69 | 0.1 | * | - | |
| 16 Jul 69 | - | - | 0.1 | |
| 23 Jul 69 | 0.3 | 0.2 | 2.2 | * |
| 30 Jul 69 | 0.4 | 0.4 | - | * |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Mesocyclops edax*
(No./l)

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 6 Aug 69 | - | 0.2 | 0.4 | |
| 13 Aug 69 | * | - | 0.1 | |
| 20 Aug 69 | - | - | 0.1 | * |
| 27 Aug 69 | 0.003 | 0.01 | 0.2 | * |
| 3 Sep 69 | 0.4 | 0.1 | 0.1 | |
| 10 Sep 69 | - | - | 0.1 | |
| 4 Jun 70 | * | - | - | |
| 11 Jun 70 | * | 0.4 | - | |
| 18 Jun 70 | 0.2 | - | - | |
| 25 Jun 70 | * | 0.4 | - | |
| 9 Jul 70 | - | - | - | |
| 16 Jul 70 | - | * | - | |
| 23 Jul 70 | - | - | 0.1 | |
| 30 Jul 70 | - | - | - | |
| 6 Aug 70 | * | - | * | |
| 13 Aug 70 | - | - | 0.2 | |
| 20 Aug 70 | - | - | - | |
| 27 Aug 70 | - | - | - | |
| 3 Sep 70 | - | - | - | |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

<u>Cyclops vernalis</u>

| Date of Sample | Sampling Station 1 | 2 | 3 | Egg Sacs |
|---|---|---|---|---|
| 5 Jun 68 - 2 Jul 68 -- Not present | | | | |
| 9 Jul 68 | * | - | - | |
| 16 Jul 68 | - | - | - | |
| 23 Jul 68 | - | - | * | |
| 30 Jul 68 - 20 Aug 68 -- Not present | | | | |
| 4 Jun 69 | - | * | - | |
| 11 Jun 69 - 26 Jun 69 -- Not present | | | | |
| 1 Jul 69 | - | - | * | |
| 9 Jul 69 | * | - | - | |
| 16 Jul 69 | * | - | * | * |
| 23 Jul 69 | - | - | - | |
| 30 Jul 69 | * | - | - | |
| 6 Aug 69 | - | - | - | |
| 13 Aug 69 | - | * | - | |
| 20 Aug 69 - 4 Jun 70 -- Not present | | | | |
| 11 Jun 70 | 0.5 | - | - | |
| 18 Jun 70 - 25 Jun 70 -- Not present | | | | |
| 9 Jul 70 | - | - | 0.3 | |
| 16 Jul 70 - 30 Jul 70 -- Not present | | | | |
| 6 Aug 70 | * | - | * | |
| 13 Aug 70 | * | - | - | |
| 20 Aug 70 - 3 Sep 70 -- Not present | | | | |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

Bosmina coregoni

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 68 | 1.6 | 0.4 | 1.1 | - | - | 0.5 |
| 11 Jun 68 | 0.2 | 0.2 | 0.1 | - | - | - |
| 18 Jun 68 | - | 0.1 | 0.5 | - | 0.1 | 0.4 |
| 25 Jun 68 | - | 0.2 | 0.1 | - | - | 0.1 |
| 2 Jul 68 | 0.2 | 0.1 | 0.03 | - | - | - |
| 9 Jul 68 | 0.1 | 0.1 | 0.047 | - | 0.1 | - |
| 16 Jul 68 | 0.002 | - | - | - | - | - |
| 23 Jul 68 | - | - | - | - | - | - |
| 30 Jul 68 | - | - | 0.01 | - | - | 0.01 |
| 6 Aug 68 | 0.004 | 0.004 | 0.03 | - | 0.002 | 0.01 |
| 13 Aug 68 | - | - | - | - | - | - |
| 20 Aug 68 | - | - | 0.002 | - | - | - |
| 4 Jun 69 | - | 0.13 | - | - | - | - |
| 11 Jun 69 | - | - | - | - | - | - |
| 18 Jun 69 | 0.2 | - | 1.3 | - | - | 1.3 |
| 26 Jun 69 | 0.1 | 0.2 | 0.1 | - | 0.2 | - |
| 1 Jul 69 | * | 0.1 | - | - | - | - |
| 9 Jul 69 | * | * | --- | - | - | - |
| 16 Jul 69 | - | - | - | - | - | - |
| 23 Jul 69 | - | - | - | - | - | - |
| 30 Jul 69 | - | - | 0.2 | - | - | - |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

### *Bosmina coregoni*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 6 Aug 69 - 20 Aug 69 -- Not present | | | | | | |
| 27 Aug 69 | - | 0.003 | 0.003 | - | - | - |
| 3 Sep 69 | - | - | - | - | - | - |
| 10 Sep 69 | - | 0.01 | - | - | - | - |
| 4 Jun 70 - 16 Jul 70 -- Not present | | | | | | |
| 23 Jul 70 | 0.03 | - | - | - | - | - |
| 30 Jul 70 - 3 Sep 70 -- Not present | | | | | | |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Ceridodaphnia quadrangula*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 68 | - | - | - | - | - | - |
| 11 Jun 68 | - | - | - | - | - | - |
| 18 Jun 68 | - | 0.6 | 0.4 | - | 2.6 | 0.5 |
| 25 Jun 68 | 0.3 | 0.2 | 0.4 | 0.2 | 0.2 | 0.4 |
| 2 Jul 68 | 0.5 | 0.1 | - | 1.1 | 0.1 | - |
| 9 Jul 68 | - | 0.1 | 0.3 | - | 0.2 | 0.2 |
| 16 Jul 68 | - | - | - | - | - | - |
| 23 Jul 68 | - | - | 0.04 | - | - | 0.03 |
| 30 Jul 68 | - | 0.01 | 0.02 | - | 0.02 | - |
| 6 Aug 68 | - | 0.004 | 0.02 | - | 0.002 | 0.01 |
| 13 Aug 68 | - | - | 0.004 | - | - | 0.004 |
| 20 Aug 68 | 0.002 | - | 0.01 | - | - | 0.01 |
| 4 Jun 69 | - | - | - | - | - | - |
| 11 Jun 69 | 0.1 | - | - | - | - | - |
| 18 Jun 69 | 0.1 | - | - | 0.2 | - | - |
| 26 Jun 69 | 0.1 | - | 0.2 | - | - | 0.1 |
| 1 Jul 69 | * | 0.1 | 0.1 | - | 0.1 | - |
| 9 Jul 69 | * | - | --- | - | - | - |
| 16 Jul 69 | - | - | 0.1 | - | - | - |
| 23 Jul 69 | 0.1 | - | * | - | - | - |
| 30 Jul 69 | * | - | - | - | - | - |
| 6 Aug 69 | - | - | - | - | - | - |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

<u>Ceridodaphnia</u> <u>quadrangula</u>

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 13 Aug 69 | - | - | - | - | - | - |
| 20 Aug 69 | - | - | - | - | - | - |
| 27 Aug 69 | - | 0.003 | - | - | - | - |
| 3 Sep 69 | - | - | - | - | - | - |
| 10 Sep 69 | - | - | - | - | - | - |
| 4 Jun 70 | - | - | - | - | - | - |
| 11 Jun 70 | 0.5 | - | - | 2.2 | - | - |
| 18 Jun 70 | - | - | - | - | - | - |
| 25 Jun 70 | 0.2 | - | - | 0.8 | - | - |
| 9 Jul 70 | - | - | * | - | - | - |
| 16 Jul 70 | - | - | - | - | - | - |
| 23 Jul 70 | - | - | - | - | - | - |
| 30 Jul 70 | - | - | - | - | - | - |
| 6 Aug 70 | - | - | - | - | - | - |
| 13 Aug 70 | 0.1 | - | 0.2 | 0.4 | - | 0.7 |
| 20 Aug 70 | - | - | - | - | - | - |
| 27 Aug 70 | - | - | 0.2 | - | - | - |
| 3 Sep 70 | - | - | 0.1 | - | - | 0.9 |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

Daphnia spp.

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 68 | 31.7 | 18.2 | 5.1 | 34.2 | 22.8 | 8.5 |
| 11 Jun 68 | 6.4 | 2.6 | 2.9 | 2.8 | 2.6 | 1.2 |
| 18 Jun 68 | 4.7 | 3.6 | 7.6 | 10.4 | 8.5 | 15.3 |
| 25 Jun 68 | 2.1 | 4.3 | 3.4 | 1.1 | 1.1 | 1.2 |
| 2 Jul 68 | 2.9 | 0.7 | 0.4 | 7.6 | 1.3 | 1.3 |
| 9 Jul 68 | 0.4 | 0.8 | 0.6 | 0.8 | 1.2 | 0.8 |
| 16 Jul 68 | 0.02 | 0.05 | 0.02 | 0.02 | 0.05 | 0.1 |
| 23 Jul 68 | - | 0.002 | 0.1 | 0.3 | - | 0.3 |
| 30 Jul 68 | 0.04 | 0.2 | 0.2 | 0.1 | 0.8 | 1.2 |
| 6 Aug 68 | 0.04 | 0.01 | 0.03 | 0.1 | 0.01 | 0.06 |
| 13 Aug 68 | 0.02 | - | 0.1 | 0.01 | - | 0.4 |
| 20 Aug 68 | 0.01 | - | 0.07 | 0.02 | - | 0.2 |

Daphnia ambigua

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 4 Jun 69 | 2.3 | 2.9 | 7.0 | 0.9 | 1.7 | 2.0 |
| 11 Jun 69 | 0.1 | 0.5 | 0.4 | 2.1 | - | - |
| 18 Jun 69 | - | - | 0.4 | - | - | - |
| 26 Jun 69 | - | - | - | - | - | - |
| 1 Jul 69 | - | - | - | - | - | - |
| 9 Jul 69 | - | - | - | - | - | - |
| 16 Jul 69 | * | - | - | - | - | - |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

### *Daphnia ambigua*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 23 Jul 69 | - | - | - | - | - | - |
| 30 Jul 69 | - | - | - | - | - | - |
| 6 Aug 69 | 0.3 | 0.6 | 2.6 | - | 0.1 | 0.9 |
| 13 Aug 69 - 10 Sep 69 -- Not present | | | | | | |
| 4 Jun 70 | * | - | 0.5 | - | - | - |
| 11 Jun 70 | 0.3 | 0.8 | 0.2 | 0.9 | 0.8 | 0.4 |
| 18 Jun 70 | 0.5 | 0.08 | 0.3 | 0.2 | 0.2 | 0.4 |
| 25 Jun 70 | 1.0 | 1.5 | 4.1 | 1.9 | 3.8 | 6.2 |
| 9 Jul 70 | - | - | 0.1 | - | - | - |
| 16 Jul 70 | 0.2 | 0.8 | 0.2 | - | 2.0 | 0.4 |
| 23 Jul 70 | - | - | - | - | - | - |
| 30 Jul 70 | - | - | 0.2 | - | - | 0.8 |
| 6 Aug 70 | - | - | 0.4 | - | - | 0.6 |
| 13 Aug 70 - 3 Sep 70 -- Not present | | | | | | |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

Daphnia parvula

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 4 Jun 69 | 0.45 | 1.3 | 5.6 | - | - | 4.8 |
| 11 Jun 69 | 0.6 | 6.4 | 3.9 | 1.0 | 6.1 | 6.7 |
| 18 Jun 69 | 2.1 | 5.0 | 10.5 | 1.6 | 6.7 | 9.2 |
| 26 Jun 69 | 1.4 | 1.5 | 1.8 | 4.5 | 1.3 | 2.0 |
| 1 Jul 69 | 1.3 | 1.8 | 0.9 | 2.6 | 1.7 | 0.8 |
| 9 Jul 69 | 1.7 | 0.4 | --- | 2.5 | 0.2 | --- |
| 16 Jul 69 | * | 0.8 | 0.2 | 0.5 | - | 0.3 |
| 23 Jul 69 | 0.4 | 0.5 | 2.2 | 2.1 | 1.7 | 6.0 |
| 30 Jul 69 | 0.4 | 5.6 | 7.4 | 0.6 | 8.8 | 8.1 |
| 6 Aug 69 | * | 0.2 | 0.3 | - | - | - |
| 13 Aug 69 | - | 0.2 | 0.4 | - | - | 0.1 |
| 20 Aug 69 | 0.2 | 0.004 | 1.4 | 0.1 | 0.004 | 0.6 |
| 27 Aug 69 | 0.02 | 0.01 | 0.4 | 0.01 | 0.01 | 0.3 |
| 3 Sep 69 | 0.4 | - | 0.1 | 0.8 | - | - |
| 10 Sep 69 | 0.02 | 0.2 | 0.4 | 0.03 | 0.5 | 0.8 |
| 4 Jun 70 | 0.6 | 0.1 | 0.3 | 1.7 | 0.3 | 0.2 |
| 11 Jun 70 | 2.7 | 1.6 | 0.3 | 12.2 | 7.6 | 1.7 |
| 18 Jun 70 | 2.1 | * | 0.1 | 12.1 | - | 0.1 |
| 25 Jun 70 | 2.5 | 1.9 | 1.9 | 4.8 | 6.0 | 4.4 |
| 9 Jul 70 | 1.2 | - | 0.4 | 2.1 | - | 1.2 |
| 16 Jul 70 | - | 0.9 | 0.1 | - | 2.3 | 0.2 |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Daphnia parvula*

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 23 Jul 70 | * | - | 0.1 | - | - | 0.6 |
| 30 Jul 70 | - | - | 0.2 | - | - | 0.6 |
| 6 Aug 70 | 0.1 | 0.2 | 0.4 | - | - | 0.4 |
| 13 Aug 70 | - | 0.2 | 2.7 | - | 0.3 | 7.6 |
| 20 Aug 70 | 0.7 | 0.1 | 0.1 | 2.0 | 0.6 | 8.2 |
| 27 Aug 70 | 0.1 | - | 0.3 | - | - | 0.5 |
| 3 Sep 70 | - | 0.1 | 1.3 | - | - | 6.0 |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

Daphnia spp.

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 5 Jun 68 | - | - | - | - | - | - |
| 11 Jun 68 | - | - | 0.3 | - | - | - |
| 18 Jun 68 | 0.5 | 0.3 | 0.7 | 0.4 | 0.6 | 2.2 |
| 25 Jun 68 | 0.3 | 1.1 | 1.2 | 0.2 | 0.6 | 0.8 |
| 2 Jul 68 | 1.3 | 0.1 | 0.03 | 4.4 | 0.5 | 0.1 |
| 9 Jul 68 | 0.3 | 0.1 | 0.1 | 0.4 | 0.2 | 0.3 |
| 16 Jul 68 | 0.01 | - | - | 0.01 | - | - |
| 23 Jul 68 | - | - | - | - | - | - |
| 30 Jul 68 | - | - | - | - | - | - |
| 6 Aug 68 | - | - | 0.002 | - | - | - |
| 13 Aug 68 | - | - | - | - | - | - |
| 20 Aug 68 | 0.01 | 0.01 | - | - | 0.002 | - |

Daphnia galeata

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 Jun 69 - 1 Jul 69 -- Not present | | | | | | |
| 9 Jul 69 | 0.1 | - | - | - | - | - |
| 16 Jul 69 | - | - | - | - | - | - |
| 23 Jul 69 | - | - | - | - | - | - |
| 30 Jul 69 | * | - | - | - | - | - |
| 6 Aug 69 | 0.1 | - | - | - | - | - |
| 13 Aug 69 | 0.9 | - | - | 1.5 | - | - |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

### *Daphnia galeata*

| Date of Sample | No./l Sampling Station 1 | 2 | 3 | Eggs/l Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 20 Aug 69 | - | 0.002 | - | - | - | - |
| 27 Aug 69 | 0.003 | - | - | 0.01 | - | - |
| 3 Sep 69 | 0.1 | * | - | 0.5 | - | - |
| 10 Sep 69 | - | - | - | - | - | - |
| 4 Jun 70 | * | - | - | - | - | - |
| 11 Jun 70 | - | - | 0.07 | - | - | - |
| 18 Jun 70 | - | - | - | - | - | - |
| 25 Jun 70 | 0.4 | - | 0.6 | - | - | - |
| 9 Jul 70 | - | - | * | - | - | - |
| 16 Jul 70 | - | * | 0.3 | - | - | 0.3 |
| 23 Jul 70 | - | - | 0.1 | - | - | 0.1 |
| 30 Jul 70 | - | - | - | - | - | - |
| 6 Aug 70 | * | - | - | - | - | - |

13 Aug 70 - 3 Sep 70 -- Not present

### *Daphnia pulex*

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 Jun 69 | - | - | - | - | - | - |
| 11 Jun 69 | - | 0.4 | - | - | 0.4 | - |

18 Jun 69 - 10 Sep 69 -- Not present

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

Diaphanosoma leuchtenbergianum

| Date of Sample | No./1 Sampling Station 1 | 2 | 3 | Eggs/1 Sampling Station 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| 5 Jun 68 | - | - | - | - | - | - |
| 11 Jun 68 | 0.2 | - | - | - | - | - |
| 18 Jun 68 | - | 0.1 | 1.3 | - | 0.7 | 3.1 |
| 25 Jun 68 | 0.2 | 0.3 | 1.4 | - | 0.2 | 0.5 |
| 2 Jul 68 | 1.3 | 0.1 | 0.1 | 1.6 | - | 0.03 |
| 9 Jul 68 | 0.3 | 0.1 | 0.2 | 0.2 | 0.1 | - |
| 16 Jul 68 | 0.004 | - | - | - | - | - |
| 23 Jul 68 | 0.02 | 0.002 | 0.1 | - | - | 0.01 |
| 30 Jul 68 | 0.03 | 0.01 | 0.05 | 0.03 | 0.02 | 0.06 |
| 6 Aug 68 | 0.02 | 0.002 | 0.03 | 0.01 | - | 0.02 |
| 13 Aug 68 | 0.003 | 0.004 | 0.03 | 0.002 | - | - |
| 20 Aug 68 | 0.04 | - | 0.06 | 0.1 | - | 0.08 |
| 4 Jun 69 | - | - | - | - | - | - |
| 11 Jun 69 | - | - | - | - | - | - |
| 18 Jun 69 | - | - | - | - | - | - |
| 26 Jun 69 | - | - | - | - | - | - |
| 1 Jul 69 | 0.2 | 0.1 | - | 0.1 | 0.1 | - |
| 9 Jul 69 | 0.1 | * | --- | 0.1 | - | - |
| 16 Jul 69 | * | 0.9 | 0.3 | - | 0.6 | 0.1 |
| 23 Jul 69 | - | 1.3 | 0.2 | - | 0.6 | 0.2 |
| 30 Jul 69 | 0.9 | 1.1 | 0.6 | 0.8 | 3.4 | 1.4 |

QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

*Diaphanosoma leuchtenbergianum*

| Date of Sample | No./1 Sampling Station | | | Eggs/1 Sampling Station | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 |
| 6 Aug 69 | 0.1 | 0.1 | 0.1 | 0.1 | - | - |
| 13 Aug 69 | 0.3 | 0.5 | 0.1 | 0.1 | 0.2 | - |
| 20 Aug 69 | 0.1 | 0.1 | 0.2 | - | 0.002 | - |
| 27 Aug 69 | 0.04 | 0.1 | - | 0.01 | 0.03 | - |
| 3 Sep 69 | 1.6 | 0.2 | 0.3 | 1.2 | - | - |
| 10 Sep 69 | 0.2 | 0.6 | 0.7 | 0.2 | 0.4 | 0.6 |
| 4 Jun 70 | - | - | - | - | - | - |
| 11 Jun 70 | 0.8 | 0.2 | * | 0.3 | 0.8 | - |
| 18 Jun 70 | 0.4 | 0.2 | 0.2 | 0.2 | - | 0.1 |
| 25 Jun 70 | 0.2 | 0.4 | 1.2 | 0.4 | - | 0.6 |
| 9 Jul 70 | 0.7 | 0.3 | 2.2 | 0.4 | 0.4 | 1.2 |
| 16 Jul 70 | * | 2.2 | 2.0 | - | 2.9 | 2.8 |
| 23 Jul 70 | 1.4 | 0.8 | 1.0 | 1.4 | 0.5 | 10.2 |
| 30 Jul 70 | 0.2 | 0.1 | 0.2 | - | - | - |
| 6 Aug 70 | - | 0.3 | 2.4 | - | - | 3.1 |
| 13 Aug 70 | 0.4 | 0.2 | 4.9 | 1.0 | 0.3 | 3.7 |
| 20 Aug 70 | 0.8 | 0.4 | 0.7 | 0.8 | 0.3 | 0.3 |
| 27 Aug 70 | 0.4 | 0.2 | 0.9 | 0.9 | - | 1.9 |
| 3 Sep 70 | 0.1 | 0.2 | 0.4 | 0.2 | - | 0.2 |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

### Total Number of Organisms/1

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 5 Jun 68 | 37.9 | 21.9 | 8.2 | 22.7 |
| 11 Jun 68 | 8.4 | 5.5 | 5.5 | 6.5 |
| 18 Jun 68 | 6.7 | 5.9 | 11.7 | 8.0 |
| 25 Jun 68 | 4.0 | 7.2 | 8.2 | 6.4 |
| 2 Jul 68 | 6.7 | 1.2 | 0.6 | 2.8 |
| 9 Jul 68 | 1.1 | 1.4 | 1.4 | 1.3 |
| 16 Jul 68 | 0.04 | 0.05 | 0.02 | 0.04 |
| 23 Jul 68 | 0.02 | 0.01 | 0.3 | 0.12 |
| 30 Jul 68 | 0.07 | 0.2 | 0.6 | 0.27 |
| 6 Aug 68 | 0.14 | 0.02 | 0.14 | 0.1 |
| 13 Aug 68 | 0.03 | 0.004 | 0.2 | 0.07 |
| 20 Aug 68 | 0.06 | 0.01 | 0.17 | 0.08 |
| 4 Jun 69 | 6.8 | 5.6 | 13.5 | 8.6 |
| 11 Jun 69 | 1.4 | 8.7 | 6.1 | 5.4 |
| 18 Jun 69 | 3.1 | 5.8 | 14.7 | 7.9 |
| 26 Jun 69 | 1.6 | 2.1 | 3.8 | 2.5 |
| 1 Jul 69 | 1.9 | 2.2 | 2.5 | 3.2 |
| 9 Jul 69 | 2.3 | 0.6 | --- | 1.4 |
| 16 Jul 69 | 0.8 | 2.7 | 0.7 | 1.4 |
| 23 Jul 69 | 0.8 | 2.1 | 5.3 | 2.7 |
| 30 Jul 69 | 2.1 | 7.6 | 8.8 | 6.2 |

## QUANTITATIVE DATA - WAGONTRAIN RESERVOIR

### Total Number of Organisms/l

| Date of Sample | Sampling Station 1 | 2 | 3 | Mean |
|---|---|---|---|---|
| 6 Aug 69 | 0.6 | 1.6 | 1.2 | 1.1 |
| 13 Aug 69 | 1.2 | 0.4 | 0.6 | 0.7 |
| 20 Aug 69 | 0.3 | 0.1 | 1.7 | 0.7 |
| 27 Aug 69 | 0.1 | 0.3 | 0.6 | 0.3 |
| 3 Sep 69 | 2.6 | 0.2 | 0.5 | 1.1 |
| 10 Sep 69 | 0.3 | 0.9 | 2.1 | 1.1 |
| 4 Jun 70 | 0.7 | 0.1 | 0.4 | 0.4 |
| 11 Jun 70 | 5.4 | 3.2 | 0.6 | 3.1 |
| 18 Jun 70 | 3.8 | 0.9 | 0.7 | 1.8 |
| 25 Jun 70 | 5.1 | 5.7 | 9.0 | 6.6 |
| 9 Jul 70 | 2.9 | 0.5 | 4.4 | 2.6 |
| 16 Jul 70 | 0.6 | 4.2 | 2.8 | 2.5 |
| 23 Jul 70 | 2.6 | 1.5 | 0.5 | 1.5 |
| 30 Jul 70 | 0.2 | 0.4 | 1.4 | 0.7 |
| 6 Aug 70 | 0.5 | 0.6 | 4.5 | 1.9 |
| 13 Aug 70 | 2.6 | 1.3 | 8.7 | 4.2 |
| 20 Aug 70 | 2.0 | 1.3 | 1.1 | 1.5 |
| 27 Aug 70 | 1.4 | 0.7 | 2.3 | 1.5 |
| 3 Sep 70 | 0.2 | 0.3 | 2.1 | 0.9 |