The Bottom Fauna Development of a Newly Constructed Pond in Central Oklahoma[1]

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This investigation was conducted to learn when the various organisms appeared and to follow their population development. The study was started when the pond received its first water and continued throughout most of the following year.

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The pond was formed by an earthen dam constructed by the Soil Conservation Service six and one-half miles east and one-half mile south of Stillwater, Oklahoma, (S½, SW¼, NE¼, S24, T19N, R3E). Soil for the dam was removed from the area to be impounded, leaving montmorillonite clay exposed on about three-fourths of the basin. The dam was completed in February, 1948, and the first water entered the basin in March.

If filled, the pond would have approximately one-half acre of surface water and a maximum depth of ten feet. The pond did not fill completely during the investigation. The maximum depth was seven feet and the maximum surface area was one-third acre. Little decrease from evaporation or seepage was noticeable because of the unusually frequent summer rains.

The pond remained muddy until a vegetated area, equal to about one-eighth of the total surface area, was inundated between June 16 and 24. Clarification occurred approximately one month later, between July 23 and August 1.

The water was alkaline, usually having a *p*H of 8.2 to 8.4; however, extremes of 7.6 and 9.9 were found.

No higher aquatic plants or fishes inhabited the impoundment during the period of study. Frogs and tadpoles appeared plentiful almost immediately; however, no sign of crayfish was found until the summer following the study. The nearest permanent body of water, a muddy one-acre pond with very little aquatic vegetation, was in a separate ravine about 300 yards distant.

Table I shows the date, time, *p*H, air temperature, surface water temperature, and the greatest water depth at the time of each collection.

TABLE I

Collection Date, Time, pH, Air Temperature, Surface Temperature, and Maximum Water Depth at Time of Collections

Collection Date		Time	pH	Air Temperature	Surface Temperature	Water Depth Maximum
April	1	9:30 AM	8.2	14°C	13°C	3 ft.
	14	9:00 AM	8.3	15°C	14°C	3 ft.
	21	9:00 AM	8.3	27°C	20°C	3 ft.
	30	9:00 AM	8.3	25°C	21°C	3½ ft.
May	6	5:00 PM	8.4	24°C	23°C	3½ ft.
	13	10:30 AM	8.3	28°C	25°C	3½ ft.
	21	9:00 AM	8.4	27°C	23.5°C	3½ ft.
	28	10:30 AM	8.4+	31°C	29°C	4 ft.
June	11	2:30 PM	8.9	37°C	33°C	4 ft.
	16	2:00 PM	8.7	34.5°C	31°C	4 ft.
	24	5:00 PM	8.3	31°C	29.5°C	7 ft.
July	2	2:00 PM	9.3	32°C	29.5°C	7 ft.
	13	4:30 PM	9.9	32°C	37.5°C	7 ft.
	23	9:00 AM	7.8	21.5°C	27.5°C	7 ft.
Aug.	1	6:30 PM	8.2	33.5°C	31.5°C	7 ft.
	17	9:00 AM	—	33°C	28.5°C	7 ft.
	25	5:00 PM	8.2	31°C	29°C	7 ft.
Sept.	7	9:00 AM	7.6	30°C	26°C	7 ft.
	15	11:00 AM	8.1	33°C	28°C	7 ft.
Oct.	26	3:00 PM	8.2	25°C	16.5°C	7 ft.
Nov.	10	2:30 PM	—	——	12°C	7 ft.
	23	4:30 PM	8.0	21°C	7°C	7 ft.
Dec.	23	2:30 PM	8.1	4.5°C	5.5°C	7 ft.

Bottom samples were taken with a Peterson dredge that sampled 100 square inches. Random type samples, taken while wading or from a boat, were obtained from all slopes of the pond. A sample consisted of one to three dredges taken at a uniform depth. Although occasional samples were taken at one-foot intervals of depth, samples were usually taken at one, three, five, and seven-foot depths.

Each sample was screened through a No. 30 mesh sieve having openings 0.0198 inch square, and the residue was stored in jars. Water was added to the jars to keep the organisms alive. The organisms were sorted from the debris and preserved in 70 per cent alcohol.

After preservation, the organisms were identified, sorted, and counted. Volumetric measurements were made of all organisms within a sample. Where possible, the volume of each group of like organisms within a sample was measured.

The volumes were determined by displacement. Preservative was placed in a centrifuge tube (graduated to 0.1 ml.) and a reading, estimated to 0.05 ml., was taken. The organisms were dried until the visible liquid was gone, then placed in the centrifuge tube and another reading was taken. The difference between the two readings was recorded as the volume of the organisms.

Identifications were usually carried to genera by means of keys from Comstock (1), Johannsen (2 ,3, 4), Johannsen and Thomsen (5), Needham and Needham (6), and Ward and Whipple (7).

Twenty genera of five orders of Insecta and other groups in small numbers were collected during the investigation. Table II shows the first date that each organism was collected.

TABLE II

Time of Appearance of Organisms

April	14	*Chironomus*	July	13	*Gyrinus*
April	21	*Chrysops*			*Pachydiplax*
April	30	*Chaoborus*	July	23	*Hydrophilus*
		Oligochaeta	Aug.	17	*Berosus*
May	21	*Caenis*	Sept.	7	*Enallagma*
		Stilobezzia	Sept.	15	*Hexagenia*
June	11	Palpomyia Group	Oct.	26	*Plathemis*
		Hydracarina	Nov.	10	*Gynacantha*
		Thermonectes			*Clinotanypus*
June	16	Nematoda	Nov.	23	Psychomyidae
July	2	*Laccophilus*			*Gomphus*
			Dec.	23	*Peltodytes*

One specimen of Oligocheata was taken April 30 from a one-foot depth. It was the only representative of this group collected.

Three Hydracarina were collected: two from the one-foot depth on June 11, and one from the three-foot depth on December 23.

Nematoda were collected only in June following the three-foot rise in water level. One was taken at a depth of two feet, and one at a depth of five feet.

COLEOPTERA. Adult members of the family Gyrinidae were first seen on the pond April 1; however, the larvae of this order were seldom collected. Most of the Coleoptera were taken from one-foot depths in areas having some dead vegetation. One *Gyrinus* larva was collected on July 13. Two *Peltodytes* larvae and one pupa, believed to be *Peltodytes*, were found December 23.

Three larvae of Berosus were taken, one each on August 7, September 15, and November 10. One *Hydrophilus* was collected at a depth of three feet on July 23.

Three larvae of *Laccophilus* were collected: one July 2 at one foot, one July 13 at three feet, and one August 17 at three feet. One *Thermonectes* was collected July 11 from one foot.

DIPTERA. *Chironomus* larvae were most numerous in the one-foot zone (Fig. 1). They reached a peak of abundance in August with an average of

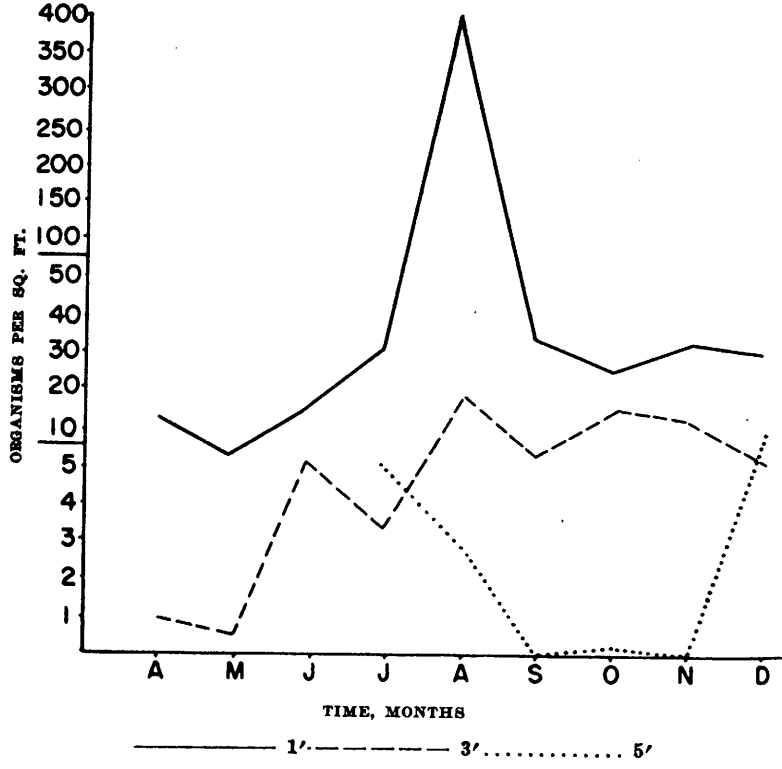

FIGURE 1. Chironomus Population.

380 specimens per square foot in the one-foot depth and 17 specimens per square foot in the three-foot depth. Specimens were found at seven feet on June 24 after the three-foot rise in the water level. *Chironomus* pupae were collected on four dates as follows: one, May 21, from a one-foot depth; four, June 11, from one foot; two, June 24, from three feet, following the three-foot rise in water level; 10, August 17, from one foot, and one from three feet.

Clinotanypus larvae were collected on two occasions; one, November 10, at one foot, and another on November 23 at three feet.

Chrysops larvae were taken on four occasions: one, April 21, from three feet; one, May 28, from three feet; one, July 13, from two feet; and one, August 17, from one foot.

Specimens of *Chaoborus* were consistently taken beginning April 30, when both larvae and pupae were collected. Pupae were again found, May 28, from three feet; June 11, from four feet; June 24, from six feet; and August 23, from five feet. The larvae were abundant in water depths of three to seven feet. Their numbers reached a maximum in November (Fig. 2).

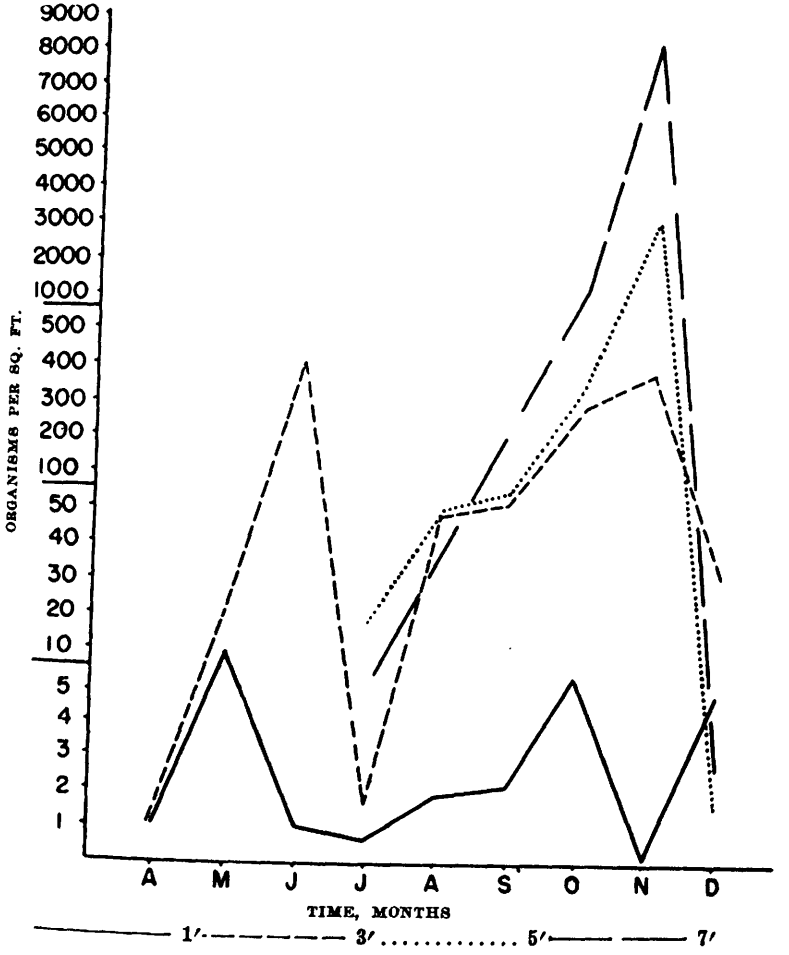

FIGURE 2. Chaoborus Population.

Specimens of the Palpomyia group were most numerous in the one- and three-foot zones, appearing June 11 and reaching their largest population in November and December. *Stilobezzia* represented by one larva was collected at one foot on May 21.

EPHEMEROPTERA. *Caenis* and *Hexagenia*, the only mayfly naiads taken, were collected in water from one to five feet in depth.

Caenis appeared May 21 and reached its maximum population in November (Fig. 3). *Hexagenia* naiads were collected as follows: one from

one foot, September 15; two from four feet, November 10; two from one foot, and three from three feet, November 23.

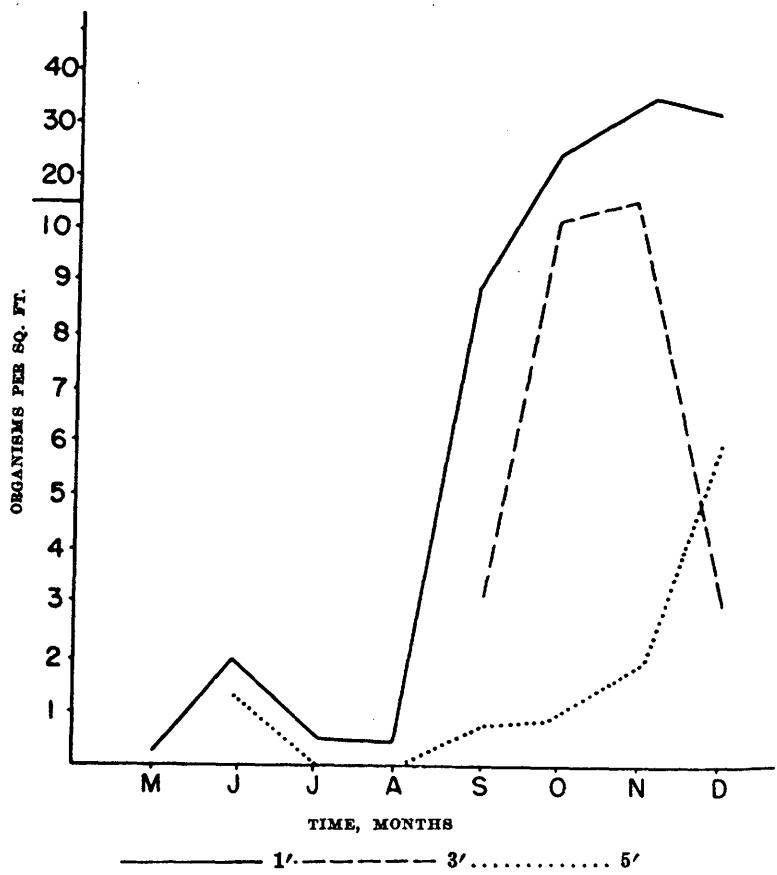

FIGURE 3. Caenis Development.

ODONATA. Large populations of damselfly and dragonfly naiads were not found, but an emergence of both groups was indicated by the presence of exuviae on emergent stems of dead weeds. The dragonflies emerged between July 23 and August 1. The damselflies emerged between August 1 and 17. Specimens of this order were collected only from one-foot depths.

Enallagma, the only damselfly taken, was collected in small numbers during September, October, November, and December.

Only one specimen of *Gomphus*, *Pachydiplax*, and *Gynacantha* were collected (Table II). *Plathemis* was taken several times during October, November, and December.

TRICHOPTERA. Caddisfly larvae of the family Psychomidae were found only on November 3, four from the one-foot zone and one from the three-foot zone.

The volume of organisms per square foot is shown in Fig. 4. The low volume found in all zones during July may be due to the three-foot rise in water level on June 24. For two weeks following this rise no organisms were found in the one- and two-foot zones and only a few in the three-foot zone. This seems to indicate little migration of bottom organisms to newly inundated areas.

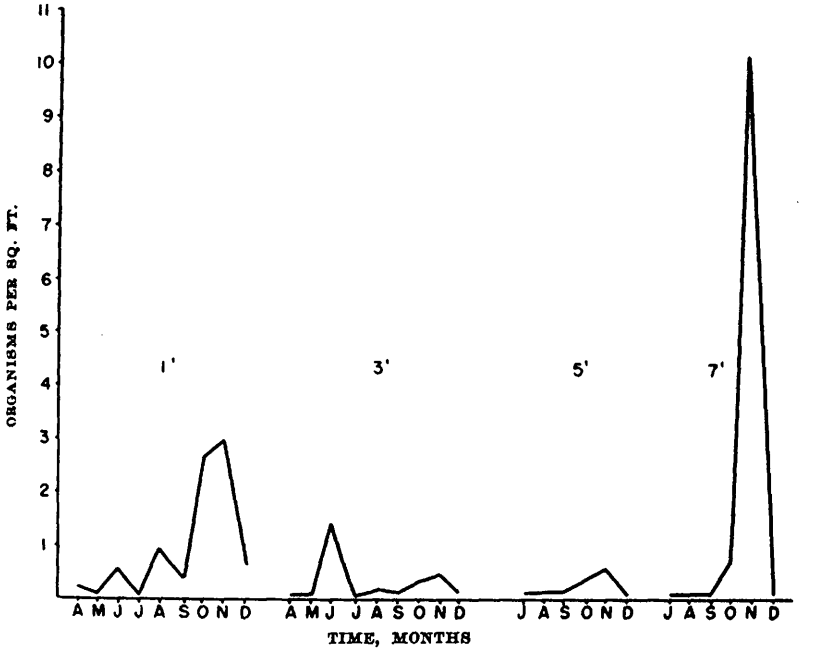

FIGURE 4. Volume per Square Foot of All Organisms

The peak population and largest quantity of organisms were found in November. The estimated average volume for November was 1.5 cubic feet (11.3 gallons) of bottom fauna for the pond, or 4.2 cubic feet (31.5 gallons) per acre. These figures were based on samples from depths of one, three, five, and seven feet and respective surface areas.

The volume reached in November was not as large as the volumes estimated from occasional samplings of older ponds in the same area. It could not be determined whether or not the presence of fish would have decreased the total volume of food produced. The investigation did show that bottom fauna became fairly well established the first year. *Chironomus* and *Chaoborus* were apparently well established whereas the genera having larger immature forms were scarce or absent.

Wickliff (8) stated from preliminary studies in Ohio that the counts of bottom organisms, especially the midge larvae, which are the second food stage of a number of our game fishes, are in general as high in the newly impounded waters as in some of the older waters.

It seems likely that other new ponds and reservoirs could develop a similar population and volume of bottom fauna within the first year. Similar investigations of other impoundments need to be made before general conclusions can be drawn.

SUMMARY

1. A quantitative and qualitative analysis of bottom fauna development was made on a pond during the first year of impoundment.
2. Specimens of the phyla Annelida, Nemathelminthes, and Arthropoda (20 genera of Insecta) were collected.
3. A peak population and volume for the entire pond was reached in November, eight months after the first water became available.
4. *Chironomus* and *Chaoborus* were the most numerous bottom organisms, *Chironomus* chiefly in the one- and three-foot zones, and *Chaoborus* principally in the deeper zones.
5. A sudden rise in water level may have caused a decrease in the bottom fauna population of the pond.
6. It is probable that the bottom organisms present did not migrate to newly inundated areas.

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