

To Dr. W. D. Leonard

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Some Aquatic Neuropteroid Insects of Lake George.

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During the summer of 1920, while living on Juanita Island, Lake George, New York, engaged in biological work for the State Conservation Commission, incidentally to that work a good many aquatic insects were collected and preserved for future study. Recently I have been going over these collections, and I find them to be mainly neuropteroids and midges. They are mostly well-known species, but the collecting methods used in that work (which was directed toward learning biological conditions affecting the welfare of fishes in the lake) differ from those of ordinary entomological collecting, and I believe they reveal new facts concerning the habitat and habits of these insects that are worthy to be put on record.

Juanita Island is in the "Narrows," near the middle of the lake. Its location, as well as that of other places mentioned in the following pages, is well shown on a map accompanying the Lake George circular that is distributed by the New York State Conservation Commission. It is one of the smaller rock-bound, tree-covered, picturesque islands of that charming lake. Hydrographic maps of its environs accompany a report, "A Biological Survey of Lake George, New York," that was published by the State Conservation Commission in 1922. Most of the records of the following list are from that island, and that is because morning and evening twilight afforded the best opportunities for observations on those crepuscular insects, and these times were mostly spent at camp.

There were, however, two other rather unusual collecting localities. One was the "Coop," a small, sheltered area of shoal water adjacent to Gourd Island, and surrounded by a broken rim of rocky islets. A magnificent bed of long-leaved pondweed (*Potamogeton proclongus*) covered the bottom in 14 feet of water, and this was a rich foraging ground for adult fishes, because it contained innumerable larvae of neuropteroids and midges, as well as snails and scuds. The other locality to which I refer is "Chives Rock," a flat, vertical rock face that rises directly out of the deep water of the lake at the foot of Black

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Mountain. The bottom is strewn with great fallen blocks of stone, among which collecting is extremely difficult. It is a lotic situation of an inaccessible sort. But some of the neuropteroids that live among these rocks climb the flat face of the cliff to transform, and leave their cast skins hanging there. These furnish records not otherwise so readily obtainable.

The materials of the following list were collected by my assistant, Mr. C. K. Sibley, and myself. As a list it is very incomplete, both because other work than collecting demanded our time and because the best season for neuropteroid emergence had passed before our arrival at the lake. Yet it will give an idea of what neuropteroids a summer vacation resident on a Lake George island may expect to find.

Four orders of aquatic insects, Plecoptera, Ephemera, Odonata and Neuroptera, are listed here, with some stray notes on others with which these were associated. The Trichoptera will be recorded by Mr. Sibley elsewhere.

The Diptera of the following lists were determined by Dr. O. A. Johannsen.

PLECOPTERA: Stoneflies.

1. *PTERONARCYS* sp? A big stonefly of the *P. proteus* group, inhabiting the more rapid and stony lower portions of Shelving Rock Brook, had transformed before our arrival at Lake George and had left a few cast skins clinging to the under surfaces of the larger rocks that rose above the surface of the water. Probably not found in the lake itself, except as the cast skins, loosened from the rocks, drift in from the streams.

2. *ACRONEURIA TRIJUNCTA*. A single female of this long-lost species was captured on a stone at the edge of the water on Juanita Island on July 20, 1920. A number of detached wings from other specimens probably indicated the spot where early birds had made a breakfast of stoneflies. A number of cast nymphal skins that may well have belonged to this species were found clinging to the vertical surface of Chives Rock several feet above the water.

3. *PERLA* sp? Cast skins of an undetermined species of this genus were intermingled with the *Acroncuria* skins above

mentioned at Chives Rock, and were several times more numerous than those.

Doubtless other stoneflies of a number of genera might be found in the brooks that come tumbling down the mountainsides into the lake. Lacustrine stoneflies are found only on wave-washed, rocky shores, where lotic conditions prevail.

EPHEMERIDA: Mayflies.

1. *HEXAGENIA BILLNEATA*. This fine big species is an inhabitant of the deeper waters of the central basin of the lake. Its nymph is a burrower in the bottom ooze. Its season of transformation is July and August. Cast nymphal skins drifted in considerable numbers upon lee shores about Juanita Island in late July and August. A fine, belated, solitary male subimago was taken on that island on August 21.

2. *EPHEMERA SIMULANS*. This handsome species is earlier in season, having its maximum of abundance on the wing about the latter end of June. Its burrowing nymphs inhabit the mud bottoms of the shallower cross channels and inlets. Two grown nymphs were found in the sandy bottom beside the boat landing of Juanita Island, June 20. Cast nymphal skins were floating everywhere on June 24, and the piers and docks about Glen Island were thickly covered with recently emerged subimagos.

Apparently the nymphs of this species do not at once begin burrowing in the bottom when hatched, for our collections from submerged weed beds yielded considerable numbers of them in various sizes, all less than a fifth grown.

I one day observed a little stilted fly, *Dolichopus batillifer*, that was not uncommon on the beach of the island, feeding upon these nymphs. A submerged silt-covered stump had just been withdrawn from the water, and small nymphs of *Ephemera* were exposed where the silt that had covered them slipped away. The little fly was quick to take advantage of the situation. It would pounce upon a nymph, striking it midships, and then hold it aloft, struggling, impaled upon the proboscis tip, while sucking its blood. I saw this fly also dealing similarly with a small midge larva from the same source.

3. *LEPTOPHLEBIA MOLLIS*. On the east shore of the lake,

at Flat Iron Point, opposite Log Bay Island, a few males of this species were observed flying in company at the shoulder of the jutting rocks some 15 or 20 feet above the water on the afternoon of June 20, and a few of them were taken. Some nymphs of this genus were found later in the weed beds of the "Coop."

4. *CHOROTERPES BASALIS*. Three males were taken singly hovering over the channel on the east side of Commissioner's Island on the afternoon of August 25, and another male alighted on our laboratory table on Juanita Island a few days earlier. No nymphs of this genus were observed. Perhaps they live only in tributary streams.

5. *EPHEMERELLA* sp? Two dusky-winged female subimagos were reared from nymphs collected on the shores of Juanita Island, one on the 23d and the other on the 28th of June. Similar nymphs were found on the *Potamogeton* beds in several places, notably in the "Coop." The species is much smaller than *E. excrucians*, but its nymph is of similar form, having abdominal segments 4 to 8 strongly depressed and broadly expanded and serrate-toothed on the lateral margins, and the gills of segment 4 operculate, covering all behind.

6. *CAENIS DIMINUTA*. A male of this species was taken at the shore line of Juanita Island on the 20th of August, and some grown nymphs that probably belonged to the same species we found on water weeds in Harris Bay a few days earlier.

7. *CHLOEON* sp? An undeterminable fragment of a species of this genus was found on Juanita Island on July 14.

8. *HEPTAGENIA PULCHELLA*. A single male of this species was taken on the north shore of Juanita Island on August 21.

9. *HEPTAGENIA INTERPUNCTATA*. This shy and delicate mayfly abounds on the rocky shores of Lake George. The flat nymphs cling to the submerged stones and feed upon their coatings of microscopic algae. We collected grown nymphs from the stones about the east shore of Fourteen Mile Island on June 26. The adults fly in the late twilight. So inactive and seclusive are they by day that a true idea of their abundance can be obtained only by observing them in their mating flight. This occurs only in the fading light, when the stars are

coming out to view, and even then they are only to be seen against the background of the lighted western sky. We found a vantage point for watching them in the low, rocky promontory that forms the southwest corner of Juanita Island. Here, during every clear evening in August, we watched them swarming by hundreds, until darkness closed them from view. The swarms were diffuse and the direction of flight was irregular, in curves extending obliquely upward and downward, in and out. The middle of the swarm was some 20 feet above the lake. Males were more numerous than females; the latter were slightly larger and flew a bit more slowly, being burdened with eggs. The eggs are salmon-red, and before they are laid they impart that tint to the body of the female (even in the grown nymphs they do this). They are finally carried extruded in flight, and they often fall off into a net when the female is captured.

The midges of these *Heptagenia* swarms were two common species of *Chironomus*; a rather large brownish species, *C. aberrans*, that was often nearly as abundant as were the mayflies, and a more delicate species, *C. decorus*, that was rather infrequent.

10. CALLIBAETIS sp. Nymphs of an undetermined species of this genus were common in the water weeds about the islands. In the fine *Potamogeton* beds at the "Coop" they were somewhat less abundant than were nymphs of *Leptophlebia*, but were more abundant than those of *Ephemera*.

ODONATA: Dragonflies and Damselflies.

1. GOMPHUS EXILIS. Nymphs were collected from the shores of Juanita and Fourteen Mile Islands in late June.
2. GOMPHUS PLAGIATUS. One nymph skin was collected at the north end of the lake near Baldwin on August 23.
3. HAGENIUS BREVISTYLUS. One nymph was collected in the Narrows at "the Fields" by Mr. C. K. Sibley in late June.
4. BASIAESCHNA JANATA. One nymph was collected from a submerged stump by the dock on Juanita Island July 14.
5. MACROMIA ILLINOIENSIS. One nymph was found sprawling on the sandy bottom at Juanita Island on June 22.

6. *DIDYMOPS TRANSVERSA*. One cast nymphal skin was sticking to the boat landing at Juanita Island June 22.

7. *NEUROCORDULIA OBSOLETA*. Four cast skins of this fine species were found on August 24 adhering to the face of Chives Rock where it rises from deep water; another was found on the face of the pier at Baldwin, also facing deep water.

8. *TETRAGONEURIA CYNOSURA*. A single cast skin of this species was also found on the face of Chives Rock on August 24, and eleven skins and a nymph ready for transformation were found at Northwest Bay on the day preceding.

9. *SYMPETRUM SEMICINCTUM*. A few adults of this species were constantly flying about the shoals of Pearl Point in August.

10. *ARGIA VIOLACEA*. This pretty damselfly was not uncommon about Pearl Point and Shelving Rock in August.

11. *ENALLAGMA CARUNCULATUM*. This was the commoner of the two damselflies seen on Juanita Island. It was collected at Harris Bay also.

12. *ENALLAGMA EBRIUM*. This was collected on Juanita Island.

In the small marshes adjacent to the lake several species of *Lestes* and *Libellula* were seen, but no nymphs of either of these elsewhere common groups were found by us in the lake itself.

NEUROPTERA.

1. *SIALIS INFUMATA*. The season of flight for this species was over before we reached Lake George in June, but many dried adults in fragments were still hanging in the spiders' webs that overspread the face of Chives Rock on the 24th of August. Young larvae were not uncommonly found in the weed beds of the Narrows, associated with midge larvae and with mayfly nymphs.

2. *CHAULIODES PECTINICORNIS*. A grown larva of this species was found on a submerged stump by the dock on Juanita Island July 14.

3. *CHAULIODES SERRICORNIS*. A young larva of this species was found in Northwest Bay.

4. CLIMACIA DICTYONA. During the latter part of July and the whole of August this species could be taken in flight at nightfall on Juanita Island, but it was not very common. Solitary individuals were often seen flying about the borders of a *Heptagenia* swarm, and a few were collected. A few larvae were observed upon some of the fresh-water sponges found in the bays.