

Records of Oklahoma Riffle Beetles and a Description of the larva of *Hexacyloepus* (Coleoptera: Dryopoidea)

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During the summer of 1953 Brown made several trips to Reagan, Oklahoma, to search for larvae of the elmid *Hexacyloepus ferrugineus* Horn, previously known from there on the basis of an adult collection in Pennington Creek by Dr. H. H. Ross in 1937. For the same purpose three additional trips were made to the ecologically similar Devil's Den area between Tishomingo and Reagan, and to Turner Falls. These searches were highly successful in that not only were associated adults and larvae of *Hexacyloepus* found, but also other species of Elmidae and the related family Limnichidae.

Ortenburger, Hatch, and others from 1929 to 1937 published records and summaries of Oklahoma Coleoptera, but no species in the superfamily Dryopoidea (Dryopidae, Elmidae, Limnichidae, Psephenidae) were recorded until Sanderson (4) described two species of the elmid genus *Stenelmis* based in part on Oklahoma specimens. In view of the paucity of Oklahoma records of Dryopoidea, it appears appropriate to record all species collected by Brown, to include additional records from other sources, and to describe the larvae of *Hexacyloepus*. In the present report 15 species of Elmidae, 1 species of Limnichidae, 2 species of Psephenidae, and 1 species of Dryopidae are recorded.

RECORDS OF OKLAHOMA DRYOPOIDEA

Family Elmidae

Hexacyloepus ferrugineus Horn

Reagan, Pennington Creek, June 1, 1937, H. H. Ross (1 adult); Sept. 19, 1953, H. P. Brown (55 adults, 13 larvae)
Devil's Den, July 18, 1953, H. P. Brown (2 adults, 2 larvae)
Turner Falls, July 27, 1953, H. P. Brown (1 adult)

Dubiraphia quadrinotata Say

Devil's Den, July 18, 1953, H. P. Brown (1 adult)
Turner Falls, July 27, 1953, H. P. Brown (1 adult)

Heterelmis sp.

Devil's Den, Sept. 19, 1953, H. P. Brown (1 adult)

Microcyloepus pusillus LeConte

Reagan, Pennington Creek, Sept. 19, 1953, H. P. Brown (+100 adults, 20 larvae)
Devil's Den, July 18, 1953, H. P. Brown (+225 adults, 45 larvae); Sept. 19, 1953, H. P. Brown (+75 adults, 40 larvae); July 16, 1953, Esslinger (53 adults)
Turner Falls, July 27, 1953, H. P. Brown (12 adults)

Stenelmis scabriceata Sanderson

Reagan, Pennington Creek, Sept. 19, 1953, H. P. Brown (1 adult)

Stenelmis convexula Sanderson

Devil's Den, July 18, 1953, H. P. Brown (2 adults)

Stenelmis exilis Sanderson

Muse, June 24, 1939, M. W. Sanderson, at light (4 adults)

Stenelmis markell Motschulsky

Tahlequah, June 17, 1939, Kaiser & Nailon (2 adults)

Stenelmis tarsalis Sanderson

Ottawa County, Cave Springs, Warren's Branch, June 4, 1930; July 30, 1934, M. W. Sanderson (Sanderson, 1938; paratypes)

- Stenelmis parva* Sanderson
Latimer County, July 12, 1931, W. Fisher (Sanderson, 1938; holotype, paratype)
- Stenelmis lateralis* Sanderson
Tahlequah, June 17, 1939, Kaiser & Nailon (4 adults)
Ottawa County, Cave Springs, Warren's Branch, July 30, 1934, M. W. Sanderson (2 adults)
- Stenelmis exigua* Sanderson
Broken Bow, June 13, 1939, Kaiser & Nailon (8 adults)
Sherwood, June 27, 1937, Standish & Kaiser (3 adults)
Hochatown, Mt. Fork River, June 8, 1940, at light, Mrs. Roy Weddle (1 adult)
- Stenelmis bicarinata* LeConte
Claremore, June 20, 1939, Kaiser & Nailon (2 adults)
- Stenelmis beameri* Sanderson
Strang, June 18, 1939, Kaiser & Nailon (1 adult)
Westville, June 15, 1939, Kaiser & Nailon (5 adults)
Wyandotte, June 10, 1939, Kaiser & Nailon (2 adults)
- Optioservus ovalis* LeConte
Ottawa County, Cave Springs, Warren's Branch, July 30, 1934, M. W. Sanderson (many adults and larvae)

Family *Dryopidae*

- Helichus suturalis* LeConte
Reagan, May 1, 1939, J. A. and H. H. Ross (1 adult)

Family *Limnichidae*

- Lutrochus laticeps* LeConte
Devil's Den, July 18, 1953, H. P. Brown (11 adults, 4 early instar larvae);
Sept. 19, 1953, H. P. Brown (9 adults, 17 early instar larvae)
Turner Falls, July 27, 1953, H. P. Brown (25 adults)

Family *Psephenidae*

- Psephenus herricki* DeKay
Ottawa County, Cave Springs, Warren's Branch, June 9, 1932; July 30, 1934, M. W. Sanderson (adults, larvae, pupae)
Grove, July 30, 1934, M. W. Sanderson (1 adult)
- Ectopria nervosa* Melsheimer
Turner Falls, June 2, 1937, H. H. Ross (1 adult)
Smithville, Mt. Fork River, May 30, 1941, Mrs. Roy Weddle, at light (260 adults)

Ecological Notes

As suggested by the common name "riffle beetles," this group of insects characteristically occurs in shallow, clear, fast-running streams. The beetles treated in this study were collected in or near such streams. Yet these collecting sites, within the Red and Arkansas River drainage systems, represent but a small fraction of the presumably suitable habitats in Oklahoma. The fact that practically every collecting trip for Dryopodea made by Brown turned up new state records is highly indicative of the incomplete knowledge of the group within this region. On the basis of the scanty data here presented, it would appear that the species listed are quite localized in distribution, suggesting the possibility of significant ecological differences in the streams.

It will be noted from our records (supra) that each species is recorded from only one major watershed, and in practically every case from a very restricted portion of that watershed. *Hexacyloepus*, *Dubiraphia*, *Heterelmis*, *Microcyloepus*, *Stenelmis sexlineata*, *S. convexula*, *Helichus*, and *Lutrochus* were taken only from the tributaries of the Washita River

arm of the Red River drainage in south-central Oklahoma. Four of them were taken from but one of the two creeks sampled in the area. As these are represented by extremely small samples, however, little can be said about habitat preferences. *Ectopria* was taken from both the Washita and Mountain Fork-Little River arms of the Red River but was represented in the former by only a single specimen. Brown has seen no water pennies of the genus *Ectopria* in the Washita tributaries, but has observed them in both the Mountain Fork and Little River in southeastern Oklahoma. *Stenelmis exigua* was taken only along the Mountain Fork River, and *S. exilis* is represented by four adults taken at a light near the Kiamichi River. The remaining species listed were collected only from tributaries of the Arkansas River. *Stenelmis parva* was taken solely from Latimer County (presumably from the Poteau River arm of the Arkansas), while *S. bicarinata* is represented by two adults taken on the Verdigris River arm of the Arkansas. *Stenelmis lateralis*, *S. beameri*, and *Psephenus* were collected from two parallel arms of the Arkansas (the Illinois and the Grand (Neosho) River basins), *S. markeli* only from the Illinois, and *S. tarsalis* and *Optioaervus* from Warren's Branch, a tributary of the Neosho basin (via Spring River) located in the extreme northeastern corner of the state.

Because a majority of the species were collected within a small area along two creeks at sites about thirty miles apart, it might be worthwhile to describe the region in some detail with the possibility that ecological conditions required by the various species of riffle beetles might be suggested.

Honey Creek and Pennington Creek are tributaries of the Washita River and are both within the area called the Arbuckle Mountains (3). The Honey Creek region might reasonably be referred to as mountainous, although the Pennington Creek region hardly merits the term, being an area of low, rounded hills. The specimens collected from Honey Creek were taken within a radius of approximately 100 yards of Turner Falls (both above and below the falls) in Murray County. Collections from Pennington Creek were made just south of the bridge east of Reagan and a few miles downstream in the Devil's Den recreational area, both sites being in Johnston County.

Climatic data from Sulphur, Oklahoma, are probably representative of all the collecting sites involved on the Washita arm of the Red River, and may be of relevance. Quoting from Dale (2):

"... the summers are long and generally hot with the maximum temperatures often above 100 degrees F. between June and September. The winters are usually mild and of short duration, although the temperature may stay below freezing for several days. January is the coldest month with a mean temperature of 41 degrees, and August is the warmest, with a mean temperature of 83.2 degrees. The annual mean temperature is 62.9 degrees. Extremes are 115 degrees and -15 degrees. The average date for the last killing frost in the spring is March 29, while the average date for the first killing frost in the fall is November 2, giving an annual growing season of 218 days.

"The average annual precipitation is 38.65 inches, with much of it occurring in April, May, and June. The driest months are November, December, and January, but drought conditions as reflected by the appearance of the vegetation usually occur in July and August, sometimes extending well into September. Average annual snowfall is about 5 inches, most of it falling in January and February, but it seldom stays on the ground more than a few days at a time. About 70 percent of the precipitation occurs during the growing season."

The foregoing data on precipitation suggest generally dry local conditions, and were it not for the fact that both streams under study are largely spring-fed, there would probably be few if any riffle beetles present since the streams would dry up almost every year. Both streams become torrents after a heavy rain. The regions of the streams where

riffle beetles were found are bordered by many overhanging trees and shrubs (2) shading considerable portions of the streams, but the influence of this shade on riffle beetle populations is uncertain.

Honey Creek and Pennington Creek differ considerably in some respects. The former, in the regions harboring riffle beetles, is largely lined with travertine, a porous calcareous rock which is built up or deposited by the action of certain blue-green algae. Exposed tree roots, dead twigs, and even leaves lodged so that they are not swept downstream by the current soon acquire this calcareous crust and become incorporated in the stone. Such a substrate is liberally supplied with crevices and tiny crannies in which riffle beetles seem to thrive, both as larvae and as adults. Aside from the travertine in the stream bed, the rocky canyon in which the creek lies contains sandy limestone and limestone boulder conglomerate (3). In contrast, the portions of Pennington Creek in which riffle beetles were found overlie and partially cut through Tishomingo granite. The Devil's Den area is a scenic attraction, largely because of the great granite boulders along the stream, often producing grotesque forms. Here the riffle beetles are largely confined to the sides and undersides of stones submerged in the water, in company with caddisworms, mayfly naiads, hellgrammites, etc.

Lutrochus adults are something of an exception to the rule among the riffle beetles of these streams. We may infer from the heavy incrustations covering the body that many *Lutrochus* adults remain upon submerged objects for extended periods, at depths ranging up to at least one foot. These individuals might be said to exhibit characteristic "riffle beetle behavior." However, other individuals with clean, unencrusted pubescence enclosed by a conspicuous air bubble occur upon substrates just beneath the water surface (especially on the uppermost parts of stones which do not quite protrude from the water), while still other clean ones are commonly found at or slightly above the water's edge. The unencrusted individuals, if disturbed when outside the water, readily take flight. They typically fly downward to the water surface, then skim speedily along the surface until they encounter some projecting object upon which to alight. Then they quickly crawl into the water. In contrast, the elmids are very sluggish, and are almost invariably found beneath the water surface. If removed from the water, they do not fly, but remain motionless or creep slowly over the substrate or into a crevice. Adults and larvae of *Dubiraphia* occur on submerged vegetation, but all adults and larvae of the remaining elmid genera collected by Brown were on non-living substrates—mostly stones, but also wood and travertine-encrusted leaves.

At a point on Pennington Creek a few miles upstream from the Reagan collecting site, no riffle beetles were found, although the general appearance of the stream seemed quite propitious. The stream was fast, shallow, clear, and cool, with abundant *Helicopsyche* larvae (caddisworms) attached to the rocks. Here the bedrock is sedimentary, and of more recent geological origin than the precambrian granite so conspicuous a few miles downstream. This was the only difference noted between the portions of the stream containing riffle beetles and that which lacked them.

The larva of *Hesacyloopus ferrugineus* Horn

Twenty-four genera of Elmidae have been recorded from the United States by Sanderson (5) and Chandler (1). In these two reports the larval stages of 22 genera are described; the genera whose larvae have remained unknown are *Hesacyloopus* Hinton, occurring in Mexico, Texas, and Oklahoma, and *Atractelmis* Chandler in California. The larvae of *Hesacyloopus ferrugineus* Horn, a species occurring only in Texas and Oklahoma, is described herein.

Because of the suspected close relationship of the adults of *Hesacyloopus* to *Microcyloopus* Hinton, indicated by comparative adult morphology, Sanderson (5) suggested that the larva of *Hesacyloopus*, when discovered,

probably would be found to have a posterior prothoracic sternum, that the mesopleuron and metapleuron of the thorax each would consist of 2 parts, and that the first 7 abdominal sternites each would have a lateral pleuron. The larva of *Heacylloepus*, upon examination, was found to differ from these predicted features only in having 3 instead of 2 mesopleural and metapleural parts. However, as pointed out by Sanderson (5), small larvae of *Microcyllloepus* may have 2 mesopleural and metapleural parts.

Description of larva of *Heacylloepus*

Body of full grown larva when fully extended about 4 mm. in length; color buffy brown. Dorsum nearly evenly convex, without large elevations. Head (fig. 2) not produced at antero-lateral angles, but anterior margin of epistoma bearing a row of about 9 or 10 teeth; each mandible with 4 teeth; third antennal segment and sensorial appendage each narrow and very short, about one-third length of second segment; surface of head covered with flat tubercles, those on front slightly emarginate at apex, those in posterior region subtruncate. Posterior sternum present and separated from postpleurite by distinct suture; prepleurite and postpleurite of prosternum each consisting of a single part (5, fig. 34); mesopleuron and metapleuron each of 3 parts (5, fig. 48); 7 complete abdominal pleura, the pleuron of the 7th abdominal segment narrowed to a point; posterior angles of abdominal segments not produced; last abdominal segment triangular in cross section; apex of last tergite narrowly truncate, not produced at each outer angle; mesonotum, metanotum, and first 8 abdominal tergites each with a slightly diagonal row of low tubercles on each side of median ecdysial line (fig. 1), laterad of this row of tubercles an irregular group of about 8 to 12 low tubercles, remaining tubercles apparently irregularly dispersed.

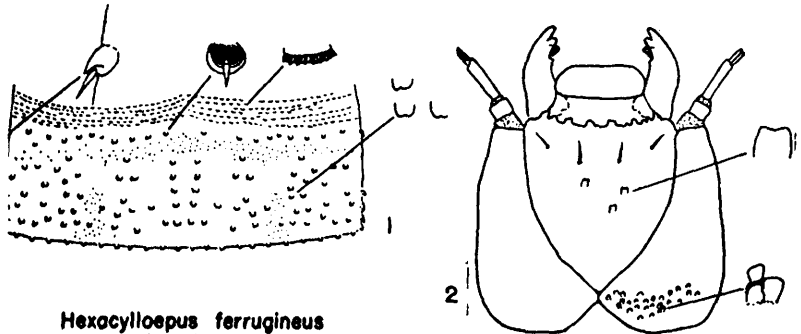
The difference between larvae of *Heacylloepus* and *Microcyllloepus* are not great. The Oklahoma representatives can be distinguished by the following key:

Each of the first 8 tergites (fig. 1) with a median double row of convergent tubercles, laterad of each row a group of 8 to 12 tubercles, then many irregularly distributed tubercles between this group and lateral margin of tergite *Heacylloepus* Hinton.

Each of first 8 tergites (5, fig. 50) with 4 irregular rows of tubercles with intermixed tubercles of same size scattered especially between 3rd and 4th rows *Microcyllloepus* Hinton.

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Hexacylloepus ferrugineus

Explanation of figures

- FIG. 1. *Hexacylloepus ferrugineus* Horn. Fourth abdominal tergite of larva.
 FIG. 2. *Hexacylloepus ferrugineus* Horn. Head of larva.