NUMBER 240 JUNE 6, 1932

OCCASIONAL PAPERS OF THE MUSEUM OF ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN PUBLISHED BY THE UNIVERSITY

DRAGONFLIES COLLECTED IN MISSOURI

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THE localities where collections were made are described below.

August 19–23, 1929, L. A. Cowens, Nathan Linn, E. A. Pence, H. T. Spieth, and I collected in Missouri at the following locations.

1. A 12–15 foot pool, or little pond, back of a filling station about one mile west of St. Clair, Franklin County. Pool shallow, in full sun, with grass and sedges on the banks and in the water. August 19.

2. Rubidoux Creek, near and below Waynesville, Pulaski County, a tributary of the Gasconade River. Rubidoux Creek at this season depended for its flow almost entirely on the large spring just above town. It is a fine rocky creek, the water slightly opalescent, abounding in crayfish. It varies from shallow ripples to slower deeper pools, and deep holes washed out about logs, tree roots, and stones. Since it rained all morning we explored the cave above Dr. Krapf's summer home, spending the too cloudy afternoon on the creek. Rubidoux Creek should be a fine collecting spot for gomphines at the proper season. August 20.

3. Vicinity of the first bridge below Waynesville, Pulaski County, over the Gasconade River on Missouri State Road 17.

Below the bridge is a fine series of ripples with a long, sluggish pool above. The river is wide and the pool was too deep to ford; at the ripples one could wade across the river. The forenoon was largely cloudy with some sunshine, but a dull drizzle set in about 11 o'clock. The rain was of short duration and in the afternoon we went to Location 4. August 21.

4. Pools formed by Rubidoux Creek in past years along hills, above the big spring above Waynesville, on the Williams (or Kerr) farm. Pools very muddy, button-bush almost the only vegetation on the banks. Collected also in low, moist, grass meadow at foot of hills. Bright sun after 2 o'clock. At the big spring which supplies most of the flow of Rubidoux Creek at this season we found only one species, *Argia vivida,* taken nowhere else on this date. About 5 o'clock we returned to Location 3 where, at this hour, we found all the species seen in the morning except *Erpetogomphus designatus.* August 21.

5. En route on State Road 17 to Tuscumbia, about 5 miles north of the Gasconade River bridge, is a small shallow pond along the railroad track on the west side of the road, Pulaski County. Collected here less than an hour in the forenoon. August 22.

6. The Osage River at Tuscumbia, Miller County, is 100–150 yards wide, rocky and rapid. Collected at ripples on the left bank of the river, in vegetation on the same bank, at an adjacent spring, and on the hillside overlooking the town. August 22.

7. Along the Osage River, opposite Tuscumbia, on the right bank of the river. First we went below the bridge to the second gully, a rivulet in steep mud bank, which we followed upstream to where it became rocky with only occasional isolated pools. Adjacent to this upper part of the creek were brushy (persimmon, sassafras, scrub oaks, and blackberry) and open grass flats. We also collected along the river and on adjacent hills to their tops. In the afternoon we followed the path and lane upstream above the bridge at the foot of the bluff, which is here separated from the river by wide corn

and pasture fields. At one point the path crossed a little rocky woodland creek reduced to isolated pools. August 23.

On October 15 and 16, 1929, with my wife and two younger daughters, I drove across Missouri on U. S. Road 40.

8. Pond west of Mineola, Montgomery County, along the west bank of the Loutre River, on the north side of the road. October 15.

9. Artificial pond along U. S. Road 40, east of Kansas City, in Jackson County. October 16.

E. A. Pence and his wife were at Van Buren, Carter County, June 6 to July 30, 1930, and collected in that vicinity at the following locations (10–23), many of which were also visited by others of our party. This work was supported jointly by the Museum of Zoology and myself. When I was collecting about Van Buren in 1930, Mr. Pence frequently joined my party.

10. Along and adjacent to Current River, above Van Buren, Carter County. See also 12 and 22. June 6, 30, July 19.

11. Pike Creek, Carter County, mouth of creek to 2 or 3 miles above. The creek bed is gravel, sand, and mud, with numerous ripples alternating with pools which are often deep; width ten to twenty feet; winding through woods and fields. See also 28. June 7, 8, 14, 16.

12. Current River; river channels in rapids, and adjacent pools, above bridge at Van Buren, Carter County. See also 10 and 22. June 9, 17.

13. Small spring-fed stream, 1–3 feet wide at north edge of Van Buren, Carter County. June 10, 23.

14. Bowen's Bay, a river slough about 1½ miles southeast of Van Buren, Carter County; no current; spatter-dock abundant. June 12, 17.

15. Cavanaugh Bay, a river slough on south (right) bank of Current River, near the Van Buren bridge; about 15 feet wide; gravel and mud. June 13, July 14.

16. Carter Creek about 3 miles east of Van Buren, Carter County. June 18.

17. Wooded, steep-sided gully, near Van Buren, Carter County. June 27.

18. Pool at base of cliff near Richbark Cave, Assembly Grounds, near Van Buren, Carter County. July 2.

19. Vicinity of Spring Cave, on U. S. Road 60, about 2 miles above Van Buren, Carter County. July 8.

20. A large spring creek about one-half mile above Van Buren, Carter County, on left (north) bank of Current River. Creek with extensive miry swamps below near the river, and cliffs and deep pools above. We were told this stream was called Cliff Spring Branch. July 9, 10, 11, 22, 27, August 17.

21. Riley Pond, a muddy, deep, earth-dammed, artificial pond in woods about 3 miles southeast of Fremont, Carter County. Pond about 250 feet long and 100 feet wide; depth reaches 15 feet. Dam embankment and two adjacent sides steep; the upper side, where gully which supplies the pond ends, with gentle slope. No vegetation in water or immediately adjacent banks except dead trees; hillsides above pond, wooded. July 16, 29.

22. Current River, above the bridge at Van Buren, Carter County. See also 10 and 12. July 16, 31.

23. Along the railroad track, above the bridge over Current River at Van Buren, Carter County. The railroad track follows the base of the cliff, with the Current River and river sloughs below. Heavy growths of grasses, weeds, and vines cover the cliffs and extend to the water's edge. Along the track at this season the soil and rocks are dry, but there is evidence of run-off water at the foot of the cliff along the railroad track where specimens were collected. July 17, 19, August 25.

Mr. and Mrs. N. D. Shufelt, my daughter Jane, and I camped at Big Spring State Park, on Current River, about 4½ miles from Van Buren, Carter County, from June 19 to June 26, 1930. Mr. and Mrs. E. A. Pence, as mentioned above, frequently joined our party. Our camp was located at the extreme lower end of the camping site in the park, on the right bank of the river and on the bank of the stream carrying the water from Big Spring. Carter County lies entirely in the Current River drainage. The river here is a fine, large,

clear, cold, rapid, rocky stream, fordable only rarely at the shallowest rapids. It swings in broad curves from one cliff to another through its valley rimmed with high hills at whose bases frequently lie deep, clear pools. Throughout the valley are scattered innumerable sloughs, marking old river channels and cut-offs, usually surrounded by brush or forest, and often deep and treacherous. We collected at the following locations.

24. Sloughs along the steep hills immediately above Big Spring at Big Spring State Park, Carter County. Largely in forest shade; maximum width about 30 feet, and about 1–3 feet deep; water cool to cold; numerous extensive patches of lizard's-tail. At times of high water these sloughs are in a river cut-off. In the hillside, above the sloughs there are a few caves, one with a trickle of water from its mouth. June 19, 22, 23.

25. At rapids in Current River, opposite the mouth of Pike Creek, Carter County. June 20, 21.

26. Rapids in Current River at the railroad bridge above Big Spring State Park, Carter County, and at adjacent sloughs. June 20, July 18.

27. Along Current River in Big Spring State Park, Carter County, and at adjacent hillside spring. June 20, August 10.

28. Pike Creek, Carter County, from lowest ford to about 1½ miles up stream where the railroad crosses a left tributary. Creek is 3–20 feet wide; in woods and fields; frequent ripples and pools; below the railroad bridge several long, deep, bayou-like pools with pond species. See also 11. June 21, July 27, August 2, 27.

29. Jack's Fork River, near Eminence, Shannon County. A fine stream, similar to Current River, with possibly one-fourth the volume. June 21.

30. Chilton Creek at Game Refuge, Big Spring State Park, Carter County. The creek below the game warden's house is a mere thread of water which soon disappears. Above the house there are several very rocky pools, 30–60 feet long and 10–15 feet wide, varying greatly in temperature owing to varying distances from a spring which furnishes the entire water sup-

ply as the creek bed is dry above the spring. Spatter-dock grows in all the pools. June 23, July 24.

31. Ebb and Flow Spring, a mile or two up the valley west of the lower end of the camping site at Big Spring State Park, Carter County. Only a small flow of water which disappears a short distance below the spring. June 23.

32. A small spring, about a mile or less from our camp site at Big Spring State Park, Carter County; located northeast of Ebb and Flow Spring. Collected in the vicinity of the spring and the adjacent valley and hillside in fields and second growth woods. June 24.

33. Shawnee Creek, a tributary of Jack's Fork River about 3 miles below Eminence, Shannon County. Collected from its mouth upstream 2–3 miles. A fine, clear creek, 10–20 feet wide, through fields and woods, banks varying in character; the stream itself a succession of pools and ripples. June 24.

34. Chub Hollow, on the right bank of Current River, the first gully below the Big Spring State Park camping site, Carter County. The level ground at lower end of Chub Hollow, adjacent to the river, is known as Floater's Camp. Chub Hollow Creek is dry in its lower course where the channel winds through sand and mud. Higher up, the course is rocky, and small shallow pools of water occur, separated by long stretches of dry rocky channel. Still higher the pools are larger and are connected by flowing water. The entire hollow lies between high, and often steep, rocky hills and is clothed with brush and second growth forest. As one goes upstream there is an old lumbering camp just above where the first flowing water is encountered. Above this camp the stream breaks up into two or three tributaries, each with its own narrow valley. We went upstream to a saw mill site above the old camp. Lumbering was discontinued in the hollow about 7 years ago. June 25, July 22, August 2, 5.

35. Chub Hollow as described under 34. We followed up the hollow to a second old sawmill site, one-half to three-quarters of a mile above the one mentioned in 34. Near this site, on left bank of hollow, at foot of hill, is a small boggy

spot not more than 200 square feet in area, densely covered with grass. In the miry soil, with here and there a cupful or less of water, *Tachopteryx thoreyi* was found ovipositing, and resting on a small ash tree in the bog. Above this little bog about a quarter of a mile, at the head of the gully coming down from the west to the hollow at this point, on the left bank of the gully, another larger and dissimilar bog was found. This bog extends halfway up the hill above it, and below almost reaches the very small, spring-fed creek in the bottom of the gully. It is roughly circular, about 100–150 feet in diameter, largely covered with low sedges interspersed in which are grasses, taller herbs, a few bushes and briars, and two or three small trees, the whole surrounded by deciduous forest, mostly oaks, with some conifers high on the hills. The soil is black, filled with small stones. The water is warm, in tiny trickles, occasionally pockets with perhaps only a few spoonfuls of water, and, rarely, little pools 2–3 feet wide. In full sun *Argia bipunctulata* flew in great numbers with an occasional *Argia vivida,* the latter visitors from the adjacent spring and its scanty overflow in the bottom of the gully. Down from the adjacent forest frequently came *Tachopteryx thoreyi,* paying brief visits to their birth place, to alight on the small tree trunks or to oviposit in the thimbles of water deep among the sedges and grasses. More rarely *Libellula flavida* visited the bog, the males to rest on the tips of the bushes or the taller herbs and the females to oviposit in the open pools. No other bog like this one was seen by us in Missouri. For purposes of convenience we called it Tachopteryx Bog, and it is so referred to in our notes. To reach the bogs described above it was necessary of course to pass through the habitats described in 34. On our frequent trips to 35, we looked carefully for aeshnines but none was ever seen there. June 26, July 18, 20, 21, 30, 31, August 10, 15, 26.

Eli Captain, Nathan Linn, and I drove from Bluffton, Indiana, to Missouri on July 17, 1930, where we again met the Pences. Captain, Linn, and I re-established our camp at the same site occupied from June 19 to June 26, as described

above. Mr. Captain returned to his home on July 29, and Mr. and Mrs. Pence left on July 30. Mr. E. P. Creaser joined Mr. Linn and me at our camp on July 30. He left on August 30, and Mr. Linn and I left on September 2.

36. A small, clay-bottom, spring-fed stream, 2–8 feet wide, a few miles west of Dexter, Stoddard County, crossed by U. S. Road 60. Stream in brush and scattered trees; banks high and sometimes vertical; a surprising dragonfly fauna. July 17.

37. Lotus beds at a long, low bridge on U. S. Road 60, east of Poplar Bluff, Butler County. July 17.

38. Current River just below Van Buren, Carter County. July 17.

39. About half a mile above Big Spring State Park, Carter County, is a railroad bridge over Current River. Above the bridge, on the left bank of the river, a railroad spur had been built about one mile upstream and paralleling the river to a granite quarry. This abandoned grade is almost entirely in tall bushes and second growth forest; it is about 15 feet above the river, and 30–100 feet distant from it. It forms an ideal opening through the forest for patrolling insects which must cross it in ascending or descending the high hills, bluffs, and gullies which here lie close to the river and face the west. The grade ends at the old quarry, but there is a rough wagon track beyond it which crosses the bed of Carter Creek, now dry, and continues up the Carter Creek Valley to meet U. S. Road 60. A short distance above the crossing of Carter Creek a good path, branching off to the left as one goes upstream, returns to the river and follows closely along it, past the old Carter homestead, to Van Buren. We made many trips over this old quarry grade, sometimes extending our patrol to the Carter homestead. Since it was in the afternoon, and especially in the latter half of the afternoon, that life was most active on the grade, our visits there were usually during that time. July 18, 19, 20, 22, 23, 25, 26, 27, 28, 29, 30, 31, August 1, 4, 5, 9, 11, 13, 17, 27, 29, September 1.

40. From camp in Big Spring State Park, Carter County, along the large stream flowing from Big Spring to its mouth

in Current River. All collections under this number from after sunset until nearly or quite dark. July 20, 22, 23, 26, 27, August 9.

41. On the right bank of Current River, a few miles below Big Spring State Park, Carter County, is a long lagoon, opening into the river, known as Long Bay. It is a long, muddy slough, strewn with large rocks, largely in forest, with frequent growths of spatter-dock. At its upper end there is a nice little creek and some dry gullies. These latter at their heads, have springs, small pools, and trickles of water. July 21, August 1.

42. Above the quarry grade (32) is a rough road leading up Carter Creek, dry on this date for a mile or more above its mouth. Above this dry stretch is a nice stream in woods 6–15 feet wide, and about half a mile long, originating from a large spring at its head. July 22, August 11.

43. Went to the Game Refuge (30) and down the Chilton Creek Valley to Watered Hollow. The lower course of Watered Hollow for about a mile is dry; then there is a stretch for about half a mile of a small creek, 1–6 feet wide, with some fine pools, all well shaded, ending at its upper end in springs emerging from a rock pile. At one place the creek seeps through a small, black-soiled bog, about 30 by 100 feet in size, with grass and bushes, including some button-bush. Collected in the forenoon. July 24.

44. After collecting at 43, returned to the game warden's house and went from there to Frank Mack Hollow, and up the dry hollow about three-quarters of a mile to water—a stretch of about half a mile. This creek is similar to Watered Hollow, but is slightly larger, with more rocks, and higher timber along its course, and there is no bog on it. Collected in the afternoon. July 24.

45. On the road from Winona to Eminence, Shannon County, 2–4 miles south of Eminence, at the left (west) side of the road, between a cliff and the road is a miry, black-soiled bog of varied character; small trees, brushy stretches, grass and sedge expanses, and open water; on hot days an almost suffocating environment. July 25, 28.

46. Across the road, directly opposite the bog described in 45, is a woods through which Shawnee Creek, here a stream 4–10 feet wide, flows for perhaps half a mile, passing from warm sunny fields above into similar fields below. At its lower end in the woods there are two rocky ripples; above, the bed is less rocky and the flow more sluggish. July 25, 28.

47. Ripples, narrow channels, and islands in Current River, opposite the old quarry (39) at the end of the railroad grade. The channels along some of the islands are long and creek-like, and, because of the ease with which they may be waded, are a welcome relief to the collector from the deep, rushing, and often overwhelming waters of the main stream. July 26, August 4, 9, 11, 13, 29.

48. A muddy pond on a hillside at Winona, Shannon County, on south side of the railroad and the north side of U. S. Road 60; south end of pond with a lotus bed, half in the water and half on the bank. August 3, 28.

49. On the right side of the road, R. F. D. 1, a few miles from Winona, Shannon County, is a spring with a black bog 10–20 feet wide and 100 feet long. In the bog are some pools with sedges, grasses, and some smartweed. August 3.

50. A few miles farther from Winona than the spring described in 49, the road crosses Big Rocky Creek, Shannon County, which here is reduced to a few isolated pools. August 3.

51. Rocky Falls, Shannon County. Big Rocky Creek leaves its comparatively quiet course in woods, alder, and witch-hazel, to drop about 40–50 feet, in an abrupt descent, over a granite ledge into a large and deep circular pool. Surrounded by woods and rocks this presents one of the loveliest pictures we saw in Missouri. We reached the falls about 4 o'clock and collected for an hour or less just above the falls, along alder-enclosed and more or less connected small pools, and about the large pool below the falls. August 3.

52. Big Rocky Creek, from Rocky Falls upstream 2–3 miles. Stayed at the home of James M. Bruce, R. F. D. 1, Winona, Shannon County. Mr. Bruce owns 160 acres of land and Big

Rocky Creek flows through his farm. Collecting began above his farm and extended to Rocky Falls. The creek is in woods and fields, in the latter instance the banks usually brush grown. Its maximum width is possibly 20 feet, and more often it is hardly half that wide. There are places where the water disappears to appear again below. At rare intervals there are long, quiet dark pools 2–3 feet deep and 12–15 feet wide, completely inclosed on the sides and above with alders. Most of its course is in mixed sun and shade and only rarely is it fully exposed to the sun. In general the bed is mud, sand, and gravel with some rocks. The flow is gentle, and ripples are short and low, not conspicuous. At one place there is a long stretch of creek bed filled from bank to bank with piled up, rounded boulders of varying sizes where walking is much slower and more difficult than elsewhere on the creek. On these boulder stretches, witch-hazel borders the stream, replacing the alders which grow where there is more soil. The forest is deciduous except that on one of the few low cliffs along the creek there are some red cedars. Bordering the creek are alder, witch-hazel, hazel, hydrangea, willow, elm, ash, and redbud. At places there is some water-willow in the creek. All brook-side vegetation is green except the flowering dogwood, which is drying up everywhere. August 6, 7, 8.

53. Big Rocky Creek (see 52) from Rocky Falls down stream to an old mill site. Rocky, rough going, and unproductive. August 7.

54. Small, wet weather pools, with some grasses and sedges about them, in the Carter Creek Valley east of Van Buren, Carter County. August 16.

55. A wet weather pond just east of Willow Springs, Howell County, on north side of U. S. Road 60. August 18.

56. At Mountain Grove, Wright County, is a so-called lake with many sedges and some patches of cat-tails; area possibly 4–5 acres. It lies on the west side of town on the south side of the railroad tracks. August 18.

57. Near Hahatonka, Camden County, on the Snyder estate is a fine, clear, cold lake about 90 acres in area, formed by

damming a spring stream. The lake contains an abundance of aquatic vegetation. Large numbers of crayfish (*Cambarus nais*) are caught in the lake and shipped alive to the St. Louis market for food. August 19.

58. James River above and below the bridge on U. S. Road 65, about a mile south of Galloway, Greene County. The stream is of very varied character, the bed mud, gravel, and rocks, low ripples alternating with long, sluggish pools; very different from Current River and probably better for macromias and Styluri than that river. August 22.

59. A small, muddy pond on the right bank of Current River, just below the railroad station at Van Buren, Carter County, August 25.

60. Indian Cave, Carter County. The cave is near the railroad a short distance north of Midway, the latter a store or two on U. S. Road 60 about 6 miles west of Van Buren. The stream issuing from the cave is the source of all the water in Pike Creek at this point and at this season. Below the cave the stream is of varied and pleasing character and should well repay collecting at favorable seasons. August 26, 27.

61. Rymer's Ranch (or Resort) on Jack's Fork River, Shannon County. There are beautiful cliffs and gorges adjoining the river which is a succession of ripples, pools, and deep holes—a location which would probably well repay an entire season's collecting.

List of Species

1. *Argia bipunctulata* (Hagen)

Loc. 30, Chilton Cr., Carter Co. (2 ♂, June 23). Loc. 35, Chub Hollow, Carter Co. (79 ♂ 17 ♀, June 26; 75 ♂ 1 ♀, July 18; 55 ♂ 7 ♀, July 21; 17 ♂ 5 ♀, July 30; 11 ♂ 4 ♀, July 31; 16 ♂ 4 ♀, August 10; 11 ♂ 8 ♀, August 15; 1 ♂ 1 ♀, August 26). Loc. 43, Watered Hollow, Carter Co. (6 ♂, July 24). Loc. 45, bog, Shannon Co. (19 ♂ 1 ♀, July 25; 2 ♂, July 28).

This is an unusual *Argia* in being an exclusively sedge bog or shallow marsh species. The two specimens taken at 30 were probably strays from some adjacent boggy spot. The other three localities were spring seepage bogs. I have seen

it in a similar location in Georgia. On June 26 at 35 it seemed the height of the season, and many pairs and ovipositing females were observed. On August 26 the season was practically over at 35. On July 31, we visited this location about 5 o'clock, when the entire bog was in shadow cast by the hills and forest, but *bipunctulata* was numerous and active.

2. *Argia violacea* (Hagen)

Loc. 11, Pike Creek, Carter Co. (1♂ 1♀, June 7). Loc. 12, Current River, Carter Co. (1♀, June 9). Loc. 14, Bowen's Bay, Carter Co. (2♂, June 12). Loc. 25, Current River, Carter Co. (2♂ 3♀, June 20). Loc. 28, Pike Creek, Carter Co. (6♂, June 21; 7♂ 3♀, August 2). Loc. 30, Chilton Creek, Carter Co. (3♂, June 23). Loc. 36, stream, Stoddard Co. (5♂, July 17). Loc. 39, old railroad grade, Carter Co. (6♂ 2♀, July 27). Loc. 50, Big Rocky Creek, Shannon Co. (13♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1♂ 1♀, August 6; 1♂, August 8). Loc. 60, Pike Creek, Carter Co. (1♂, August 26).

No effort was made to collect numbers of this common, widely distributed species which can be identified on the wing.

3. *Argia tibialis* (Rambur)

Loc. 2, Rubidoux Creek, Pulaski Co. (1♂, August 20). Loc. 11, Pike Creek, Carter Co. (2♂ 1♀, June 7; 1♂, June 8; 1♂, June 14). Loc. 14, Bowen's Bay, Carter Co. (3♂, June 17). Loc. 24, near Big Spring, Carter Co. (4♂, June 19). Loc. 26, Current River, Carter Co. (4♂ 6♀, June 20). Loc. 28, Pike Creek, Carter Co. (3♂ 1♀, June 21; 2♂ 1♀, August 2). Loc. 33, Shawnee Creek, Shannon Co. (1♂ 2♀, June 24). Loc. 47, Current River, Carter Co. (3♂, July 26).

4. *Argia apicalis* (Say)

Loc. 3, Gasconade River, Pulaski Co. (1♂, August 21). Loc. 6, Osage River, Miller Co. (1♀, August 22). Loc. 7, Osage River, Miller Co. (2♂ 2♀, August 23). Loc. 23, cliff near Current River, Carter Co. (2♂, July 19). Loc. 39, old railroad grade, Carter Co. (2♂, July 23; 3♂ 1♀, July 26; 4♂, August 1; 1♂, August 4; 1♂, August 17; 1♂, August 29).

Noted as follows, at 39 on September 1 (none collected): "As usual *Argia apicalis* was in numbers along the grade, 2 or 3 in each bright sunny spot resting on low twigs, rocks,

fallen leaves, and the ground. It is more frequently seen in sunny spots in the woods than any other *Argia.*"

5. *Argia moesta* (Hagen)

Loc. 2, Rubidoux Creek, Pulaski Co. (8♂ 1♀, August 20). Loc. 3, Gasconade River, Pulaski Co. (12♂ 11♀, August 21). Loc. 6, Osage River, Miller Co. (2♂, August 22). Loc. 7, Osage River, Miller Co. (17♂ 10♀, August 23). Loc. 24, near Big Spring, Carter Co. (1♂, June 19). Loc. 27, Current River, Carter Co. (9♂ 7♀, June 20). Loc. 29, Jack's Fork River, Shannon Co. (5♂, June 21). Loc. 33, Shawnee Creek, Shannon Co. (1♂, June 24). Loc. 34, Chub Hollow, Carter Co. (2♂, June 25). Loc. 26, Current River, Carter Co. (19♂ 6♀, July 18). Loc. 23, cliff near Current River, Carter Co. (1♂ 1♀, July 19). Loc. 39, old railroad grade, Carter Co. (1♀, July 23; 7♂ 2♀, July 26; 1♂ 1♀, July 30; 1♂, July 31; 6♂ 2♀, August 1). Loc. 48, pond, Shannon Co. (1♀, July 26). Loc. 47, Current River, Carter Co. (1♀, August 4; 4♂ 3♀, August 9). Loc. 52, Big Rocky Creek, Shannon Co. (1♂, August 6; 1♂, August 7). Loc. 61, Rymer's Ranch, Shannon Co. (3♂, August 28).

Like *apicalis, moesta* is a river species with an inclination to wander far. On August 9 I noted: "*Argia moesta* flies ripples, alights on rocks, and behaves like and is warier than many an anisopteron. Females, usually in couple, may oviposit in algae on rocks in ripples but prefer débris about brush heaps lodged in swift water. The couple often descend beneath the surface, where they may be tossed about on some waving twig in apparent peril for their lives."

6. *Argia translata* Hagen

Loc. 2, Rubidoux Creek, Pulaski Co. (4♂, August 20). Loc. 3, Gasconade River, Pulaski Co. (21♂ 5♀, August 21). Loc. 26, Current River, Carter Co. (4♂ 1♀, July 18). Loc. 23, cliff near Current River, Carter Co. (1♂ 1♀, July 19). Loc. 39, old railroad grade, Carter Co. (2♀, July 23; 5♂, July 30; 2♂ 1♀, August 1). Loc. 46, Shawnee Creek, Shannon Co. (1♂, July 25). Loc. 47, Current River, Carter Co. (1♂ 1♀, July 26; 5♂, August 9; 6♂, August 29). Loc. 28, Pike Creek, Carter Co. (2♂, July 27). Loc. 50, Big Rocky Creek, Shannon Co. (1♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (2♂, August 6; 1♂ 1♀, August 8). Loc. 27, Current River, Carter Co. (2♂ 2♀, August 10). Loc. 58, James River, Greene Co. (1♂, August 22). Loc. 61, Rymer's Ranch, Shannon Co. (1♂, August 28).

7. *Argia sedula* (Hagen)

Loc. 2, Rubidoux Creek, Pulaski Co. (3 ♂, August 20). Loc. 3, Gasconade River, Pulaski Co. (4 ♂ 1 ♀, August 21). Loc. 12, Current River, Carter Co. (1 ♂, June 9). Loc. 11, Pike Creek, Carter Co. (1 ♂ 1 ♀, June 16). Loc. 27, Current River, Carter Co. (3 ♂ 1 ♀, June 20). Loc. 34, Chub Hollow, Carter Co. (1 ♂, June 25). Loc. 23, cliff near Current River, Carter Co. (6 ♂ 1 ♀, July 19). Loc. 47, Current River, Carter Co. (10 ♂ 1 ♀, July 26; 1 ♂, August 9; 4 ♂, August 29). Loc. 39, old railroad grade, Carter Co. (1 ♀, August 1). Loc. 28, Pike Creek, Carter Co. (3 ♂, August 2). Loc. 57, lake, Camden Co. (1 ♂, August 19). Loc. 58, James River, Greene Co. (4 ♂ 3 ♀, August 22). Loc. 61, Rymer's Ranch, Shannon Co. (4 ♂ 2 ♀, August 28).

8. *Argia vivida* Hagen

Loc. 2, Rubidoux Creek, Pulaski Co. (6 ♂, August 20). Loc. 4, near Waynesville, Pulaski Co. (3 ♂ 1 ♀, August 21). Loc. 6, Osage River, Miller Co. (10 ♂ 3 ♀, August 22). Loc. 7, Osage River, Miller Co. (21 ♂ 6 ♀, August 23). Loc. 10, Current River, Carter Co. (1 ♀, June 6). Loc. 11, Pike Creek, Carter Co. (5 ♂ 1 ♀, June 7). Loc. 13, near Van Buren, Carter Co. (4 ♂, June 10). Loc. 27, Current River, Carter Co. (10 ♂ 5 ♀, June 20). Loc. 28, Pike Creek, Carter Co. (8 ♂, June 21; 9 ♂ 3 ♀, July 27; 3 ♂, August 2). Loc. 30, Chilton Creek, Carter Co. (37 ♂ 10 ♀, June 23). Loc. 30, Chilton Creek, Loc. 43, Watered Hollow, and Loc. 44, Frank Mack Hollow, all in Carter Co. (14 ♂ 8 ♀, July 24). Loc. 31, Ebb and Flow Spring, Carter Co. (24 ♂ 5 ♀, June 23). Loc. 32, spring near Big Spring, Carter Co. (1 ♂ 1 ♀, June 24). Loc. 33, Shawnee Creek, Shannon Co. (3 ♂ 2 ♀, June 24). Loc. 34, Chub Hollow, Carter Co. (67 ♂ 32 ♀, June 25; 3 ♂, July 22). Loc. 35, Chub Hollow, Carter Co. (9 ♂ 5 ♀, June 26; 14 ♂ 2 ♀, July 18; 9 ♂ 3 ♀, July 21; 6 ♂ 1 ♀, July 30; 1 ♂, August 10; 3 ♂ 1 ♀, August 26). Loc. 36, stream, Stoddard Co. (1 ♂ 1 ♀, July 17). Loc. 46, Shawnee Creek, Shannon Co. (2 ♂, July 25). Loc. 39, old railroad grade, Carter Co. (1 ♂, August 1). Loc. 49, spring, Shannon Co. (3 ♂, August 3). Loc. 50, Big Rocky Creek, Shannon Co. (1 ♂ 1 ♀, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (3 ♂ 1 ♀, August 6; 1 ♂, August 7; 4 ♂ 1 ♀, August 8). Loc. 60, Pike Creek, Carter Co. (1 ♂ 1 ♀, August 26).

In Missouri, as far as we observed, *vivida* is a spring or small spring brook species, preferring sunny spots near the water of hard bottomed pools or streams in shaded areas. It reaches the highest points on spring-fed streams attained by any species. High in the forest at the head of a dry gully one may find a minute pool of clear, cold water. If the sun

reaches the pool or its adjacent banks, almost certainly this lovely large species, well deserving its name, will be found, its color flashing with almost metallic brilliance. So dependent is it on springs that its presence anywhere may be taken as positive proof of adjacent spring water. This dependence is responsible I feel sure for its failure to cross the Mississippi Valley. In eastern Missouri, along the border of this valley barrier, *vivida* is very abundant, occupying apparently every one of the habitats it requires, no matter how small or isolated. It is as though there were pressure from the west which piles the species up along its eastern border like migrating settlers congregated at a swollen ford.

9. *Enallagma basidens* Calvert

Loc. 14, Bowen's Bay, Carter Co. (1 ♂, June 17). Loc. 28, Pike Creek, Carter Co. (1 ♂, August 2).

The single male taken August 2 was near the mouth of the left tributary of Pike Creek, just above the railroad bridge. It was first seen over a patch of lizard's-tail on the bank near a bed of spatter-dock. It flew higher up the bank and alighted on a tall weed. Diligent search in the vicinity for an hour, both on the tributary stream and on Pike Creek, failed to disclose more specimens of this unexpected species.

10. *Enallagma geminatum* Kellicott

Loc. 30, Chilton Creek, Carter Co. (10 ♂ 1 ♀, June 23). Loc. 39, old railroad grade, Carter Co. (3 ♂, July 27). Loc. 41, Long Bay, Carter Co. (1 ♂, August 1). Loc. 48, pond, Shannon Co. (1 ♂, August 3). Loc. 49, spring, Shannon Co. (2 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂, August 6).

At 30, *geminatum* was not in the coldest pool where the only *Enallagma* was *divagans*. In the warmer pools as in the coldest pool, *divagans* was the most abundant dragonfly, but associated with it in the warmer pools were *E. geminatum* and *aspersum*. At 48, the same three species were associated, and another species, not taken but probably *civile*, was also there. In no instance in Missouri was *geminatum* as abundant as it usually is in its habitats east of the Mississippi River.

11. *Enallagma aspersum* (Hagen)

Loc. 1, small pond, Franklin Co. (14 ♂, August 19). Loc. 30, Chilton Creek, Carter Co. (3 ♂, June 23). Loc. 21, Riley Pond, Carter Co. (2 ♀, July 29). Loc. 48, pond, Shannon Co. (1 ♀, August 3). Loc. 49, spring, Shannon Co. (7 ♂, August 3). Loc. 59, pond, Carter Co. (14 ♂, August 25).

See under *E. geminatum*. The small series taken of this species was due to our inability to see and catch any more. For example, at Riley Pond the only Zygoptera we were able to find after careful search were the two females of *aspersum*.

12. *Enallagma civile* (Hagen)

Loc. 1, small pond, Franklin Co. (14 ♂ 4 ♀, August 19). Loc. 9, pond, Jackson Co. (1 ♂, October 16). Loc. 23, cliff near Current River, Carter Co. (1 ♂, July 19). Loc. 55, pond, Howell Co. (5 ♂, August 18). Loc. 59, pond, Carter Co. (7 ♂ 2 ♀, August 25).

E. civile is one of the commonest, if not the commonest, North American species of *Enallagma*. It was surprisingly rare where we collected in Missouri.

13. *Enallagma carunculatum* Morse

Loc. 57, lake, Camden Co. (8 ♂ 2 ♀, August 19).

14. *Enallagma exsulans* (Hagen)

Loc. 3, Gasconade River, Pulaski Co. (5 ♂, August 21). Loc. 11, Pike Creek, Carter Co. (3 ♂, June 7; 3 ♂, June 8). Loc. 12, Current River, Carter Co. (1 ♂ 3 ♀, June 9). Loc. 15, Cavanaugh Bay, Carter Co. (2 ♂, June 13). Loc. 24, near Big Spring, Carter Co. (19 ♂ 3 ♀, June 19). Loc. 36, stream, Stoddard Co. (1 ♂, July 17). Loc. 20, Cliff Spring Branch, Carter Co. (2 ♂, July 27). Loc. 39, old railroad grade, Carter Co. (1 ♂, July 30). Loc. 41, Long Bay, Carter Co. (2 ♂ 1 ♀, August 1). Loc. 28, Pike Creek, Carter Co. (6 ♂, August 2). Loc. 50, Big Rocky Creek, Shannon Co (3 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂ 2 ♀, August 6; 1 ♂, August 7). Loc. 58, James River, Greene Co. (1 ♂, August 22).

See under *divagans*.

15. *Enallagma divagans* Selys

Loc. 11, Pike Creek, Carter Co. (3 ♂, June 8). Loc. 12, Current River, Carter Co. (5 ♂, June 9). Loc. 24, near Big Spring, Carter Co. (29 ♂ 19 ♀, June 19). Loc. 28, Pike Creek, Carter Co. (2 ♂, June 21). Loc. 30, Chilton Creek, Carter Co. (37 ♂ 9 ♀, June 23). Loc. 20, Cliff Spring Branch, Carter Co. (2 ♂, July 27).

At 30 *divagans* occurred in all the pools (see under *geminatum*) but had other enallagmas as associates only in the warmer pools. *E. exsulans* was not found at 30, but in all other localities where *divagans* was taken, *exsulans* also occurred. At 24 the two species were about equal in numbers. Typically *exsulans* is a larger stream and warmer water species than *divagans; divagans* is frequently found on glacial lakes where *exsulans* is very rare or wanting, and it occurs far from larger streams on pools in spring-fed brooks, such as at 30, which *exsulans* fails to reach. *E. divagans* seems to have some preference for lizard's-tail while I have never detected any particular plant preference on the part of *exsulans*. They are found together where the preferential habitats of the two are more or less merged, as at the sloughs at 24.

I found the females of *divagans* and *exsulans* unidentifiable with the existing literature. They were studied carefully by Mrs. H. K. Gloyd, who is responsible for their determination.

16. *Enallagma signatum* (Hagen)

Loc. 4, near Waynesdale, Pulaski Co. (6♂ 1♀, August 21). Loc. 20, Cliff Spring Branch, Carter Co. (2♂ 2♀, July 27). Loc. 48, pond, Shannon Co. (6♂ 2♀, August 3). Loc. 59, pond, Carter Co. (1♀, August 25).

At 48 *signatum* was associated with *E. aspersum, geminatum,* and another species, probably *civile,* not captured. At 30 *signatum* was absent and *aspersum* and *geminatum* were associated with *divagans.* This may indicate a greater adaptability on the part of *geminatum* and *aspersum* as compared with *signatum* and *divagans.*

17. *Ischnura posita* (Hagen)

Loc. 11, Pike Creek, Carter Co. (1♀, June 8). Loc. 12, Current River, Carter Co. (3♂, June 9). Loc. 28, Pike Creek, Carter Co. (3♂, June 21; 1♂, August 2). Loc. 30, Chilton Creek, Carter Co. (2♂ 2♀, June 23). Loc. 36, stream, Stoddard Co. (1♂, July 17). Loc. 23, cliff near Current River, Carter Co. (1♂, July 19). Loc. 43, Watered Hollow, Carter Co. (1♀, July 24). Loc. 45, bog, Shannon Co. (1♂, July 25; 1♂, July 28). Loc. 20, Cliff Spring Branch, Carter Co. (3♂ 1♀, July 27). Loc. 41, Long Bay, Carter Co. (4♂, August 1). Loc. 52, Big Rocky Creek, Shannon Co. (1♂, August 7). Loc. 57, lake, Camden Co.

(1 ♀, August 19). Loc. 59, pond, Carter Co. (3 ♂ 1 ♀, August 25). Loc. 60, Pike Creek, Carter Co. (12 ♂ 7 ♀, August 26).

This species was seen also at 48 on August 3 and 28. At 41 on August 1, it was the commonest agrionine. It is such a common species that no effort was made to collect large series.

18. *Ischnura verticalis* (Say)

Loc. 1, small pond, Franklin Co. (2 ♀, August 19). Loc. 2, Rubidoux Creek, Pulaski Co. (2 ♂, August 20). Loc. 4, near Waynesville, Pulaski Co. (2 ♂, August 21). Loc. 30, Chilton Creek, Carter Co. (1 ♀, June 23). Loc. 45, bog, Shannon Co. (5 ♂, July 25). Loc. 20, Cliff Spring Branch, Carter Co. (2 ♂ 1 ♀, July 27). Loc. 48, pond, Shannon Co. (4 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂ 1 ♀, August 7). Loc. 57, lake, Camden Co. (2 ♂ 1 ♀, August 19). Loc. 60, Pike Creek, Carter Co. (3 ♂, August 27). Seen also at 55, 56, and 59.

19. *Anomalagrion hastatum* (Say)

Loc. 4, near Waynesville, Pulaski Co. (1 ♂ 1 ♀, August 21). Loc. 9, pond, Jackson Co. (1 ♂, October 16). Loc. 45, bog, Shannon Co. (4 ♂, July 25; 1 ♀, July 28). Loc. 28, Pike Creek, Carter Co. (1 ♂, August 2). Loc. 48, pond, Shannon Co. (2 ♂, August 3). Loc. 49, spring, Shannon Co. (1 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (12 ♂ 2 ♀, August 7). Loc. 60, Pike Creek, Carter Co. (1 ♂, August 26).

Seen also at 54 where I noted: "Several *A. hastatum* seen—it occurs everywhere where there are thick growths of sedges or grasses in warm water or where water frequently stands." See also under *Lestes unguiculatus.*

20. *Nehalennia gracilis* Morse

Loc. 45, bog, Shannon Co. (3 ♂, July 25; 3 ♂, July 28).

"At bog I found *Nehalennia* but two hours careful search in a boiling sun yielded only 3 males"—July 25. "Diligent search gave only 3 male nehalennias and no females"—July 28.

21. *Chromagrion conditum* (Hagen)

Loc. 30, Chilton Creek, Carter Co. (1 ♂, June 23).

Taken in the coldest pool where *divagans* was the only *Enallagma;* only the single male seen.

22. *Lestes congener* Hagen

Loc. 8, pond, Montgomery Co. (1 ♂, October 15).

23. *Lestes forcipatus* Rambur

Loc. 49, spring, Shannon Co. (1 ♀, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂, August 8).

The single male was on dead brush twigs at the foot of a cliff just back from the creek. Here is a small, isolated pool, 10–15 feet long and 4–6 feet wide, deep and full of leaves and twigs. Careful search in the neighborhood yielded only the one specimen.

24. *Lestes unguiculatus* Hagen

Loc. 1, small pond, Franklin Co. (1 ♂, August 19). Loc. 52, Big Rocky Creek, Shannon Co. (2 ♂, August 7).

At 52 in Mr. Bruce's cornfield is a narrow swampy meadow, now dry, which joins the creek bed at its lower end. It was in this meadow that *Anomalagrion hastatum* and *L. unguiculatus* were taken.

25. *Archilestes grandis* (Rambur)

Loc. 23, cliff near Current River, Carter Co. (7 ♂ 1 ♀, July 17; 4 ♂ 3 ♀, July 19).

This habitat was visited a third time, on August 25, when no trace of the species was found. Credit for the discovery of this little colony of *A. grandis* is due Mr. Pence who first collected specimens there. Two days later we visited it together. The number of individuals indicated an established colony but where the larval life was passed was something of a mystery. Among the piled up rocks it is altogether probable that crevices led down to permanent water. The run-off waters of fall rains might carry the eggs or newly hatched naiads down among the rocks. Having found this colony the greater mystery is that we could not find another. I spent hours in rocky gullies, watered and dry, in sun and in shade, without finding an *Archilestes*.

26. *Hetaerina americana* (Fabricius)

Loc. 3, Gasconade River, Pulaski Co. (5 ♂ 1 ♀, August 21). Loc. 12, Current River, Carter Co. (2 ♂ 3 ♀, June 9; 3 ♂ 5 ♀, June 17). Loc. 15, Cavanaugh Bay, Carter Co. (4 ♂ 1 ♀, June 13). Loc. 26, Current River, Carter Co. (2 ♂, June 20). Loc. 29, Jack's Fork River, Shannon Co. (1 ♂, June 21). Loc. 23, cliff near Current River, Carter Co. (3 ♂,

July 19). Loc. 47, Current River, Carter Co. (1♂ 2♀, July 26; 1♂, August 4; 1♂ 2♀, August 29). Loc. 27, Current River, Carter Co. (4♂, August 10).

Seen also rarely at 33. At 27 on August 10, "*H. americana* abundant on small willows, dead and alive, along swift water in full sun—a location *H. titia* would avoid."

27. *Hetaerina titia* (Drury)

Loc. 3, Gasconade River, Pulaski Co. (8♂, August 21). Loc. 7, Osage River, Miller Co. (3♂, August 23). Loc. 39, old railroad grade, Carter Co. (1♂, July 23). Loc. 47, Current River, Carter Co. (1♂ 1♀, July 26; 4♂ 2♀, August 4; 7♂ 4♀, August 9; 40♂ 7♀, August 29). Loc. 35, along cliff trail just above mouth of Chub Hollow, Carter Co. (1♂, July 30). Loc. 22, Current River, Carter Co. (1♂, July 31).

On August 8 a teneral male flew into our Big Spring Park camp and was captured by Mr. Linn. All specimens taken in July, 1930, were teneral. On August 9 more mature than teneral individuals were seen; and on August 29, when a good series was taken, all were matured. August 2, "*H. titia* emerging in numbers and going back into brush." August 9, "in shaded, overhung nooks, near and facing the river, *H. titia* very abundant." *H. titia* is generally more of a shade-dweller than *H. americana.* On large streams where *americana* flies about and rests in full sun on vegetation in or near ripples, *titia* may often be found resting on lower dead twigs of trees in the deep shadows cast by the trees. The imagoes of *americana* enjoy a much longer season than those of *titia,* owing to the earlier emergence of *americana.*

28. *Calopteryx maculata* (Beauvois)

Loc. 2, Rubidoux Creek, Pulaski Co. (5♂ 1♀, August 20). Loc. 3, Gasconade River, Pulaski Co. (2♂, August 21). Loc. 10, Current River, Carter Co. (4♂ 5♀, June 6). Loc. 11, Pike Creek, Carter Co. (7♂ 3♀, June 7; 1♂ 2♀, June 8). Loc. 12, Current River, Carter Co. (3♂ 1♀, June 9). Loc. 13, near Van Buren, Carter Co. (1♀, June 10). Loc. 15, Cavanaugh Bay, Carter Co. (6♂ 4♀, June 13). Loc. 16, Carter Creek, Carter Co. (4♂ 1♀, June 18). Loc. 27, Current River, Carter Co. (1♂, June 20). Loc. 29, Jack's Fork River, Shannon Co. (5♂ 4♀, June 21). Loc. 34, Chub Hollow, Carter Co. (2♂ 2♀, June 25). Loc. 36, stream, Stoddard Co. (6♂ 2♀, July 17). Loc. 26, Current River,

Carter Co. (1♂, July 18). Locs. 43 and 44, Watered and Frank Mack Hollows, Carter Co. (3♂ 2♀, July 24). Loc. 47, Current River, Carter Co. (1♂ 1♀, August 4). Loc. 52, Big Rocky Creek, Shannon Co. (1♂, August 6). Loc. 58, James River, Greene Co. (2♂ 3♀, August 22). Loc. 60, Pike Creek, Carter Co. (1♂ 1♀, August 26).

Seen also at 33 and 42 on August 11. At 34 on June 25, *C. maculata* and *Argia vivida* in large numbers made up the obvious odonate fauna, the Anisoptera being elusive things that moved obscurely to and from the creek, less bound to the stream itself by a strong locality instinct. The lovely play antics of the males of the species of our two calopterygine genera, *Hetaerina* and *Calopteryx,* should some day be described by a poet-scientist.

29. *Hagenius brevistylus* Selys

Loc. 3, Gasconade River, Pulaski Co. (4♂, August 21). Loc. 11, Pike Creek, Carter Co. (1♂ 1♀, both very teneral, June 7). Loc. 25, Current River, Carter Co. (1♂, June 20). Loc. 34, Chub Hollow, Carter Co. (1♀, June 25; 1♀, August 5). Loc. 35, Chub Hollow, Carter Co. (1♂, June 26; 1♀, July 21). Loc. 26, Current River, Carter Co. (1♂, July 18). Loc. 10, Current River, Carter Co. (1♂, July 19). Loc. 41, Long Bay, Carter Co. (2♂ 2♀, July 21). Loc. 42, Carter Creek, Carter Co. (1♂, July 22). Loc. 39, old railroad grade, Carter Co. (3♂, July 23; 1♀, July 28). Loc. 47, Current River, Carter Co. (3♂ 1♀, July 26; 1♂ 1♀, August 4; 5♂ 1♀, August 29). Loc. 28, Pike Creek, Carter Co. (3♂ 4♀, July 27). Loc. 52, Big Rocky Creek, Shannon Co. (2♂, August 6; 1♂, August 8). Loc. 61, Rymer's Ranch, Shannon Co. (2♂, August 28).

Mr. Creaser and I, seining for fish and crayfish, took many naiads of *H. brevistylus.* Throughout its adult life it is a wide ranger, wandering far and wide, always in a dignified and independent, if not arrogant, manner. It probably eats all insects, excepting the harder and nauseous species, but Lepidoptera and Odonata are the only ones I have seen it capture.

On August 27 by a path along Current River, scattered over a small area, I found about a dozen or more wings of teneral boyerias. Immediately above the wings was a perch which would have served admirably for a *Hagenius. Boyeria* naiads congregate in great numbers on partially submerged

brush heaps in swift water. Literally dozens of exuviae may sometimes be gathered from the twigs of such a brush heap. There was such a brush heap in the river near where the severed wings lay. The wings were cut cleanly at the base and were little injured,—certainly not the work of a bird. Macromias hang up in bushes or trees (rarely in rank herbs), apparently eat only smaller insects, and certainly do not, as *Hagenius* does, select a perch to which they return again and again like a flycatching bird. I believe the severed wings were the discarded fragments, probably over a period of several days, from a *Hagenius* lunch-counter.

One day I saw a *Hetaerina titia* sitting on one tip of a branched twig above the water in a ripple in Current River. The *Hetaerina* made a short flight to return again to the twig which showed some nervousness as the dragonfly alighted. Approaching, I found the branch of the twig was the extended abdomen of a *Hagenius,* and a sweep of the net captured both specimens.

One of the males taken at 47 on August 29 has segments 8 and 9 with the yellow much more extensive than I have seen it in any other specimen; dorsum and sides of 8 are yellow from base to apex, the two lateral areas narrowly joined on either side near the base of the segment; the sides below of 9 are yellow from base to apex, the two areas joined by a yellow basal ring.

30. *Progomphus obscurus* (Rambur)

Loc. 28, Pike Creek, Carter Co. (2♂, June 21; 1♂, July 27). Loc. 36, stream, Stoddard Co. (24♂ 4♀, July 17).

These specimens have been loaned to Dr. C. F. Byers, who is studying the genus. At 36, "*Progomphus* sat on twigs, weed stems, and, preferably, flat on sand bars."

31. *Erpetogomphus designatus* Hagen

Loc. 3, Gasconade River, Pulaski Co. (1♂, August 21). Loc. 6, Osage River, Miller Co. (14♂ 8♀, August 22). Loc. 7, Osage River, Miller Co. (1♂ 1♀, August 23).

This species may cut back and forth near the surface over ripples without alighting, and under such circumstances its

capture is very difficult. Sometimes specimens alight on rocks in or near ripples; and along the shore they may rest or pair on vegetation where they are easily caught. Most of those taken at 6 were on a hillside above town, in the full sun of a blazing hot afternoon, where they rested conspicuously 1–8 feet high on bushes or herbs. Tips of mullein heads were favorite spots, and one specimen defied the collector by perching on a telephone wire.

32. *Dromogomphus spinosus* Selys

Loc. 3, Gasconade River, Pulaski Co. (1 ♂, August 21). Loc. 28, Pike Creek, Carter Co. (1 ♂, June 21). Loc. 32, spring, near Big Spring, Carter Co. (1 ♀, June 24). Big Spring Park, Carter Co., Pence (1 ♀, July 14). Loc. 36, stream, Stoddard Co. (1 ♂, July 17). Loc. 23, cliff near Current River, Carter Co. (1 ♂, July 19). Loc. 39, old railroad grade, Carter Co. (1 ♂, July 19; 2 ♂, July 23; 1 ♂, July 28; 2 ♂ 1 ♀, July 30; 1 ♀, August 11; 1 ♀, August 13; 1 ♀, August 29). Loc. 10, Current River, Carter Co. (3 ♂, July 19). Loc. 35, Chub Hollow, Carter Co. (3 ♂ 2 ♀, July 20). Loc. 30, Chilton Creek, Carter Co. (1 ♂, July 24). Loc. 47, Current River, Carter Co. (1 ♀, July 26). Loc. 41, Long Bay, Carter Co. (2 ♂, August 1). Loc. 61, Rymer's Ranch, Shannon Co. (1 ♀, August 28).

Seen also at 58. At 41 on August 1, *spinosus* was emerging; adult specimens had been taken 40 days earlier. Records of this wandering species mean very little, as it follows its own sweet will over the whole countryside after the manner of *Hagenius.*

33. *Lanthus albistylus* (Hagen)

Loc. 12, Current River, Carter Co. (a teneral ♀, June 9). On July 23, 44 days later than the first female was taken, a still more teneral female flew into our camp at Big Spring State Park. Loc. 52, Big Rocky Creek, Shannon Co. (2 ♂, August 6; 1 ♂, August 8).

August 6, "*Lanthus* taken resting on boulders in a small ripple in full sun. Wary and nervous, their flight almost impossible to follow; sometimes seen to fly from boulders into witch-hazel, alighting on the upper side of leaves at such a height that they could not be seen."

34. *Gomphus lividus* Selys

Loc. 11, Pike Creek, Carter Co. (1 ♀, June 7).

Apparently this species, but a larger series, including both sexes, is desirable.

35. *Gomphus graslinellus* Walsh

Loc. 28, Pike Creek, Carter Co. (1 ♂, June 21).

The only one seen; their season was probably past.

36. *Gomphus vastus* Walsh

Loc. 26, Current River, Carter Co. (1 ♂, June 20; 2 ♂, July 18). Loc. 25, Current River, Carter Co. (3 ♂, June 21). Loc. 38, Current River, Carter Co. (1 ♀, July 17). Loc. 10, Current River, Carter Co. (1 ♀, July 19).

If this species occurs in any numbers along Current River in Carter County, specimens of it certainly were not on the river, and we failed to locate them in fields or woods. To locate specimens in any considerable number which have left the river is generally an almost impossible feat in a country as forested and gullied as the valley of Current River.

37. *Stylurus plagiatus* (Selys)

Loc. 6, Osage River, Miller Co. (4 ♂ 5 ♀, August 22). Loc. 7, Osage River, Miller Co. (3 ♂ 1 ♀, August 23).

At 6 it was very noticeable that copulating pairs of this species, leaving the river where the sexes had met, flew farther back from the river and into higher vegetation (trees) than did pairs of *Erpetogomphus designatus*. At a ripple in Red River, near Walthersville, Powell County, Kentucky, on August 1 and 2, 1929, 15 males and 2 females of this species were taken. All these Kentucky specimens, all the Missouri females (6 in number), and 1 Missouri male have the pale dorsal thoracic stripes isolated; the remaining 6 Missouri males have these pale stripes broadly joined to the pale mesothoracic half collar.

About sunset August 2, a female *plagiatus* was hovering near the head of the ripple in Red River when she was seized by another dragonfly. As they started to leave the river in couple they were netted; the male proved to be *Dromogomphus spinosus*. About 4 P. M. October 3, 1931, at a ripple on Brier Creek just below the railroad bridge at Keysville, Georgia,

Mr. W. H. Ditzler caught a pair of dragonflies which had flown in couple back and forth over the ripple three times. The male was *Stylurus plagiatus* and the female *Dromogomphus armatus.*

38. *Stylurus spiniceps* (Walsh)

Loc. 3, Gasconade River, Pulaski Co. (1♂, August 21). Loc. 10, Current River, Carter Co. (1♂, July 19). Loc. 39, old railroad grade, Carter Co. (1♂ 1♀, July 28).

The single female was teneral. At 3 the male was taken by Mr. Spieth after sundown. It was flying a beat and attacking boyerias. These attacks by males of this and other species are probably really efforts to locate females of their own species, though libelluline males will sometimes drive ovipositing females of other libelluline species from a certain area as though protecting the area for females of their own species. The male taken at 10 on July 19 was caught in the forenoon by Mr. Captain. Prolonged search in the vicinity at the time and a later search at the same place about sundown by Mr. Pence failed to show any more. A good series of *S. spiniceps* has never been taken.

39. *Ophiogomphus rupinsulensis* (Walsh)

Loc. 25, Current River, Carter Co. (2♂, June 21). Loc. 34, Chub Hollow, Carter Co. (1♂, June 25). Loc. 26, Current River, Carter Co. (1♂, July 18).

We were never able to find *Ophiogomphus* at rest on the banks of the river. They flew the ripples with swift, erratic flight, and their capture was a matter of sheer good luck depending entirely on the dragonfly coming within reach of the collector, rather than the collector going to the dragonfly.

40. *Tachopteryx thoreyi* (Hagen)

About 8 A. M. on June 25, a female flew into our camp in Big Spring State Park, Carter Co., and alighted about 15 feet high on a tree trunk, where I shot her. Loc. 35, Chub Hollow, Carter Co. (10♂ 5♀, June 26; 2♂ 1♀, July 18; 1♀, July 20; 1♂ 2♀, July 21).

On July 18 we found no *Tachopteryx* on Tachopteryx Bog. Those captured were on the creek just above the old sawmill

camp site. The female was ovipositing in the creek, the only instance of this kind we observed. On July 30 and 31 careful search failed to discover a *Tachopteryx*—the season which began about the middle of June was over.

On August 10 at 35, Tachopteryx Bog, I dug out a spot containing possibly a cup of water, encountering a small, nearly vertical burrow which I thought was that of a small crayfish. In digging I lost this burrow. Among the soil and small stones dug out was a large naiad of *Tachopteryx*. No crayfish was found and it is possible or probable that the burrow belonged to *Tachopteryx*. Later at Tachopteryx Bog on August 15, Mr. Creaser and I carried on protracted excavations in the bog without unearthing any crustaceans or any more *Tachopteryx* naiads.

The naiad taken August 10 was brown in color without any distinct markings. The hairy tufts on either side of the median line of the abdomen stood up conspicuously. It walked on the ends of the tibiae or the first joints of the tarsi with the tarsi turned back almost parallel to the tibiae. When disturbed it threw its abdomen around in stinging motions. It was injected with 10% formalin and preserved in a solution of 1 part formalin, 3 parts alcohol, and 6 parts water. In the preserving fluid it lay flat, while *Cordulegaster* naiads, similarly preserved, had the apex of the abdomen turned dorsad at about a right angle to the long axis of the body.

41. *Boyeria vinosa* (Say)

Loc. 2, Rubidoux Creek, Pulaski Co. (2 ♂ 2 ♀, August 20). Loc. 3, Gasconade River, Pulaski Co. (1 ♂, August 21). Loc. 24, near Big Spring, Carter Co. (2 ♂, June 22; 2 ♂, June 23). Loc. 33, Shawnee Creek, Shannon Co. (1 ♂ 1 ♀, June 24). Loc. 34, Chub Hollow, Carter Co. (1 ♀, June 25). Loc. 17, near Van Buren, Carter Co. (1 ♂, June 27). Loc. 10, Current River, Carter Co. (1 ♂, June 30). Loc. 20, Cliff Spring Branch, Carter Co. (1 ♂, July 10; 1 ♀, July 11; 6 ♂ 1 ♀, July 27). Loc. 23, cliff near Current River, Carter Co. (2 ♂, July 17; 2 ♂ 1 ♀, July 19). Loc. 35, Chub Hollow, Carter Co. (1 ♂ 2 ♀, July 18; 7 ♂, July 20; 1 ♀, July 21; 4 ♂ 2 ♀, July 30; 1 ♂, August 10). Loc. 40, Big Spring, Carter Co. (3 ♂, July 20; 1 ♂ 1 ♀, July 22; 1 ♂, August 17). Loc. 41, Long Bay, Carter Co. (5 ♂ 3 ♀, July 21). Loc. 39, old rail-

road grade, Carter Co. (1♂, July 23; 3♂ 1♀, July 26; 1♂ 1♀, July 29; 1♂ 1♀, July 30; 1♀, August 1). Loc. 46, Shawnee Creek, Shannon Co. (3♂ 3♀, July 28). Loc. 28, Pike Creek, Carter Co. (3♂ 1♀, August 2). Loc. 47, Current River, Carter Co. (2♂ 1♀, August 4; 1♂, August 9). Loc. 52, Big Rocky Creek, Shannon Co. (3♂, August 6; 1♂ 1♀, August 7; 2♂ 2♀, August 8).

Seen also at 30 on June 23, at 39 on July 22 and 25, and at 42 on July 22. *Boyeria vinosa* is by all odds the most abundant and most widely distributed of the lotic Anisoptera east of the Great Plains. It frequents some of the smallest streams of diverse characters as well as large and equally diverse rivers, shade being its most obvious requirement. Over its range it joins many different dragonfly associations, flying, for example, with *Calopteryx maculata* and two species of *Somatochlora* on a small woodland creek, while a mile away it spends its life with a richer river fauna of agrionines, gomphines, and cordulines. Its food so far as observed consists of minute and usually aquatic insects which it captures with a bobbing-in-and-out flight about logs, trash, and overhanging nooks, usually along the course of a stream. It discriminates in its food, rejecting some insects after approaching very near to or seizing them. Instances of this were not infrequent but the distance always prevented determining certainty whether the rejected insect was seized or not.

It may wander far from streams into swampy woods and brushy fields, along shaded cliffs, or into a town. One evening, long after sunset, one flew back and forth in the spray from a garden hose in our yard at Bluffton, Indiana. It is not sensitive to slight changes in sunlight or temperature, and spends more time on the wing than most species, in hot weather becoming more active at about sunset and often flying until increasing darkness renders it invisible. I have seen males capture their mates so late in the evening that I could barely see them on the stream where they flew. At rest they hang up in almost any shaded location—in tall herbs, bushes, or trees, in piles of large rocks, the mouths of caves, under bridges, or in culverts or buildings. Along Current River, during their resting periods, they were most often found in

the vegetation and rocks of the precipitous cliffs facing the river.

Just after coming to rest, they often start a swinging or swaying motion of the body which may be continued for possibly a quarter of a minute. In copulation they usually rest in bushes or trees. July 31, "For some reason no boyerias flying tonight along the water's edge below our camp, where they usually compete with the bats, beating back and forth at a slightly lower level and with a flight scarcely less erratic." July 28, "Why is it one collects many teneral boyerias but never a teneral *Macromia*?" The first male we caught on June 22 and the last male taken August 17, and probably half of all those collected, were tenerals. See also under *Hagenius brevistylus*.

42. *Aeshna umbrosa* Walker

Loc. 35, Chub Hollow, Carter Co. (1 ♀, July 20). Loc. 20, Cliff Spring Branch, Carter Co. (1 ♀, July 22). Loc. 39, old railroad grade, Carter Co. (1 ♂, August 5). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂ 1 ♀, August 6; 3 ♂ 1 ♀, August 7; 1 ♂, August 8).

43. *Anax junius* (Drury)

Loc. 4, near Waynesville, Pulaski Co. (1 ♂ 1 ♀, August 21). Loc. 23, Pike Creek, Carter Co. (1 ♀, July 27). Loc. 20, Cliff Spring Branch, Carter Co. (1 ♀, July 27). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♀, August 6).

44. *Macromia illinoiensis* Walsh

Loc. 3, Gasconade River, Pulaski Co. (5 ♂, August 21). Loc. 6, Osage River, Miller Co. (7 ♂, August 22). Loc. 7, Osage River, Miller Co. (9 ♂, August 23). Loc. 25, Current River, Carter Co. (1 ♂, June 20). Loc. 26, Current River, Carter Co. (1 ♂, June 20). Loc. 27, Current River, Carter Co. (1 ♂, June 20). Loc. 10, Current River, Carter Co. (1 ♀, June 30). Loc. 39, old railroad grade, Carter Co. (8 ♂ 1 ♀, July 18; 22 ♂ 7 ♀, July 19; 8 ♂ 3 ♀, July 20; 25 ♂ 9 ♀, July 26; 34 ♂ 14 ♀, July 27; 27 ♂ 9 ♀, July 28; 1 ♂, July 29; 2 ♂ on adjacent river, July 30; 3 ♂ 2 ♀, in adjacent field, August 5). Loc. 42, Carter Creek, Carter Co. (1 ♂, July 22). Loc. 30, Chilton Creek, Carter Co. (1 ♂, July 24). Loc. 41, Long Bay, Carter Co. (1 ♂ 1 ♀, August 1). Loc. 20, Cliff Spring Branch, Carter Co. (6 ♂, July 27). Loc. 47, Current River, Carter Co. (1 ♂ 1 ♀, August 4; 4 ♂ 5 ♀, August 9). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂, August 6). Loc. 27, Current River, Carter Co. (1 ♀, August 10).

This fine series of specimens has been retained intact pending a thorough study. If only one species is represented, there is greater individual variation than has ever been detected or suspected in any North American species of *Macromia*. If two or more species are included, their detection and definition will require some high powers of discrimination. If the series represents a hybrid population, analysis will be difficult and may be impossible.

Macromias were first taken in Carter County on June 20 and last on August 10 (last seen August 29). We collected on the quarry grade (39) first on July 18 and last on September 1; saw the first *Macromia* there July 18 and the last one August 27 (last captured was on July 29). We visited the grade 6 forenoons and 21 afternoons on 25 different days. No specimens were collected in forenoons, only one was seen then; in the afternoons of 7 days about 168 specimens were collected of possibly 250 seen. On 14 afternoons no macromias were seen. Had our first few visits to the grade been made in forenoons or on days when no macromias were flying there, we should have discontinued our visits, and this large series of specimens would never have been collected.

Macromias came on the grade at its upper end where it intercepts the winding dry basin of Carter Creek not far from the river. The grade could thus receive macromias from the river and from the extensive fields, pastures, and woods of the Carter Creek Valley. Their patrols on the grade rarely took them to the lower end, and it is possible the very few seen there had dropped in through some adjacent opening in the forest.

They did not spend the night on the grade, unless rarely. They gradually disappeared as darkness came on and there were none there in the morning. The forenoons are probably passed in widely scattered habitats, with more time spent at rest than on the wing, as it is in late afternoon that the greatest number of macromias are seen. What brings them to the grade about noon on certain days depends on some factor for the determination of which my sketchy field notes fail miser-

ably to supply adequate data; nevertheless, some guesses may be made. More complete observations may correct statements which follow.

The grade, at the foot of hills and cliffs facing west, is in shade much of the forenoon. In the earlier part of the afternoon it is still distinctly cooler than the neighboring river and fields. Macromias do not visit the grade in the afternoon following a night or morning rain, apparently because such days are not relatively warm ones. They come to the grade in the afternoon of days which are relatively or absolutely very warm when the wind is in the west or southwest. As they come to the grade they become inactive (hang up) so the inference that the grade is a retreat, offering an escape from some undesirable factor (heat) is not too far fetched. Later in the afternoon as the temperature and humidity on the grade approaches those of adjoining environments, and as the hour for feeding arrives, as shown by flights over fields and roads, they drop from their perches above the grade, and, flying the first opening they encounter (the opening made through the forest by the grade) they begin their patrols there. These patrols continue until the hour when the fields and roads are deserted for the night's rest, wherever that may be, at which time the grade is deserted too, and they scatter, probably, to the same sites as those to which the individuals from roads and fields go. The next day, when the time for the noon-day "hang-up" arrives, another lot of individuals is sorted out from the mass of population by the contours of river, creek, and forest and field boundaries, to find itself on the grade. (This is indicated by the fact that the collecting in one day of many specimens, virtually cleaning the grade for that day, results in no diminution in numbers the succeeding day.) July 26, "At 8 o'clock Captain and I ran the grade; nothing there; day bright sunshine and very warm with a brisk west wind; about noon macromias began coming in and hanging up." July 19, "Macromias hung up until the sun was low when they began patrolling the grade." July 29, "During the day a strong easterly wind; day bright and warm but not as warm

as yesterday; at the grade and in the Carter Creek woods only one *Macromia* seen where there were dozens yesterday."

45. *Somatochlora tenebrosa* (Say)

Loc. 6, Osage River, Miller Co. (1♂, August 22). Loc. 7, Osage River, Miller Co. (1♂ 1♀, August 23). Loc. 35, Chub Hollow, Carter Co. (2♂ 1♀, July 18; 1♀, July 20; 2♀, July 21; 2♂, July 30). Loc. 39, old railroad grade, Carter Co. (1♀, July 19; 1♂, July 28; 1♂, July 29). Loc. 41, Long Bay, Carter Co. (2♀, July 21). Loc. 42, Carter Creek, Carter Co. (2♀, July 22). Locs. 43 and 44, Watered and Frank Mack Hollows, Carter Co. (13♂ 1♀, July 24). Loc. 46, Shawnee Creek, Shannon Co. (5♂ 2♀, July 28). Loc. 51, Rocky Falls, Shannon Co. (4♂, August 3). Loc. 34, Chub Hollow, Carter Co. (4♀, August 5). Loc. 52, Big Rocky Creek, Shannon Co. (5♂ 7♀, August 6; 6♂ 7♀, August 7; 10♂ 9♀, August 8).

At 39 on July 19, "Somatochloras seen several times, always darting wildly, most active when the sun was low and the grade in gloom (never saw them act this way on creeks where they were more abundant than on the grade)." At 39 on July 27, "It rests low in brush and weeds." At 46 on July 28, "All the tenebrosas seen were taken on two rocky ripples at the extreme lower end of the creek in the woods; *linearis* occurred always above the ripples where *tenebrosa* was never observed. We confirmed today our observation of July 25 that *linearis* patrols the creek; *tenebrosa* hovers more and leaves the creek more frequently. *S. tenebrosa* (as compared with *linearis*), seems generally to hang up at higher elevations and at greater distances from the creek, but this is no invariable rule; in the woods it sometimes alights almost at the ground." At 43 and 44, "*Tenebrosa* hovered generally over pools in the shade." At 42, "Two females ovipositing in decayed leaves and mud, half covered with water, were caught by Captain." At 34 on August 5, "One female ovipositing in damp moss on top of a rock in the stream." At 52 on August 7, "*Tenebrosa* in dying in the cyanide jar often curls up the abdomen just as ischnuras and ceraturas often do." See also under *S. linearis*.

46. *Somatochlora linearis* (Hagen)

Loc. 24, near Big Spring, Carter Co. (1♀, June 22). Loc. 35, Chub Hollow, Carter Co. (1♂ 1♀, July 18; 1♀, July 21). Loc. 46, Shawnee

Creek, Shannon Co. (7 ♂, July 25; 18 ♂ 1 ♀, July 28). Loc. 51, Rocky Falls, Shannon Co. (1 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (16 ♂ 1 ♀, August 6; 16 ♂ 9 ♀, August 7; 8 ♂ 8 ♀, August 8).

At 46, "Very different from *tenebrosa,* patrolling creek over long stretches, and hanging up at lower elevations, 1–10 feet high." At 52 on August 7, "About 7 A. M. a few somatochloras were flying over a bit of swamp meadow in Mr. Bruce's cornfield. None were caught, but those seen close at hand were *linearis.*" At 24 on June 23, "Alighting on dead twigs behind or below green bushes on the hill side." At 46 on July 28, "*Linearis* did lots of hanging up along the creek on low twigs, rootlets, etc., after the earlier flight of the morning." At 52, "From 5 : 30–6 : 30 P. M., about half a mile below Mr. Bruce's, at a farm house yard and garden, *linearis* and *tenebrosa,* were flying with typical aeshnine flight; probably 30 to 50 individuals, but looked like hundreds; *linearis* seemed the more abundant. Some flew pretty regularly, others wildly up to 30 feet high and as low as 2 feet or maybe less."

We collected every *Somatochlora* we could catch, taking 87 specimens of *linearis* and 91 of *tenebrosa,* nearly equal numbers of each; but *linearis* were taken in only 5 habitats, in all of which, but one, *tenebrosa* was taken, while *tenebrosa* was taken in 12 habitats, at 8 of which *linearis* was not found. Since the total number collected of each is practically the same, it follows that in its habitats as observed by us, *linearis* is a more abundant species than is *tenebrosa* in its habitats. (*Linearis* habitats contained more and warmer water and less dried up creek bed. Compare 43 and 44, a *tenebrosa* habitat, with 46, a *linearis* habitat). Of *linearis* the ratio of females to males is 1 : 3; of *tenebrosa,* 4 : 5. See also under *S. tenebrosa.*

47. *Somatochlora filosa* (Hagen)

Loc. 39, old railroad grade, Carter Co. (1 ♀, July 29; 1 ♂, August 5). Loc. 51, Rocky Falls, Shannon Co. (1 ♀, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (4 ♀, August 7).

At 39 on August 5, "In the afternoon caught a male *filosa* resting 4–5 feet high in a small red-bud bush on the grade."

At 39 on July 29, "The female *filosa* on the grade flew higher (than *tenebrosa*), like a *Macromia,* and hung up 6–8 feet high on a bush; only one seen." At 52 on August 8, "I was unable to find *filosa* today, though I spent the entire day on that particular part of the creek where I took 4 females yesterday. I spent much time looking over higher and lower locations in trees and bushes than I had examined the two preceding days. The woods along the creek here were so extensive that to leave the creek and search the woods seemed a hopeless task." In no instance was I able to distinguish specifically the females of the three species of *Somatochlora* before they were in the net. The males, unless the light was very poor, could be distinguished before capture.

48. *Neurocordulia yamaskanensis* (Provancher)

Loc. 39, old railroad grade, Carter Co. (1 ♀, July 30).

The only *Neurocordulia* seen in Missouri was hanging up about 10 feet high on the land side of a small tree about 20 feet from the river and between the river and the old quarry. It was partially concealed by leafy vines. I worked the region several times before sunrise and until dark in the evenings without any success. The surprising thing is that it is identical with typical *yamaskanensis* except that the immediate region of the ante- and postnodals is tinged with light brown.

49. *Epicordulia princeps* (Hagen)

Loc. 41, Long Bay, Carter Co. (3 ♂, July 21).

50. *Libellula pulchella* Drury

Loc. 4, near Waynesville, Pulaski Co. (3 ♂, August 21). Loc. 5, pond, Pulaski Co. (3 ♂, August 22). Loc. 7, Osage River, Miller Co. (1 ♂, August 23). Loc. 28, Pike Creek, Carter Co. (1 ♂, July 27).

Seen also at 36, at 21 on July 29, at 41 on August 1, at 48 on August 3, and at 54, 55, and 56. Occurs over practically every warm water pond in Missouri. We did not have the time to spare to catch many of this alert and wily species.

51. *Libellula luctuosa* Burmeister

Loc. 5, pond, Pulaski Co. (1 ♀, August 22). Loc. 11, Pike Creek, Carter Co. (2 ♂, June 8; 2 ♂, June 16). Loc. 14, Bowen's Bay, Carter

Co. (1 ♂, June 12; 1 ♂, June 17). Loc. 28, Pike Creek, Carter Co. (1 ♀, June 21; 1 ♀, July 27; 1 ♀, August 2). Loc. 21, Riley Pond, Carter Co. (2 ♂, July 29). Loc. 48, pond, Shannon Co. (1 ♂, August 3). Loc. 56, lake, Wright Co. (1 ♀, August 18).

Seen also at 41 on August 1. Not as common as *L. pulchella,* but many more specimens might have been taken.

52. *Libellula incesta* Hagen

Loc. 21, Riley Pond, Carter Co. (1 ♂ 1 ♀, July 16; 4 ♂ 1 ♀, July 29). Loc. 37, pond, Butler Co. (4 ♂, July 17). Loc. 39, old railroad grade, Carter Co. (1 ♀, July 19; 1 ♀, July 30).

53. *Libellula cyanea* Fabricius

Loc. 10, Current River, Carter Co. (6 ♂, June 6). Loc. 11, Pike Creek, Carter Co. (1 ♂, June 7). Loc. 12, Current River, Carter Co. (1 ♂, June 9). Loc. 26, Current River, Carter Co. (2 ♂, June 20). Loc. 28, Pike Creek, Carter Co. (6 ♂, June 21; 10 ♂ 3 ♀, July 27). Loc. 30, Chilton Creek, Carter Co. (1 ♂ 1 ♀, June 23). Loc. 33, Shawnee Creek, Shannon Co. (1 ♂ 1 ♀, June 24). Loc. 20, Cliff Spring Branch, Carter Co. (1 ♀, July 11). Loc. 45, bog, Shannon Co. (1 ♂, July 25). Loc. 21, Riley Pond, Carter Co. (1 ♂ 1 ♀, July 29). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂, August 6).

Seen also at 36. At 30 on June 23, *cyanea* was at the warmer pools and not at the coldest one.

54. *Libellula flavida* Rambur

Loc. 35, Chub Hollow, Carter Co. (1 ♂ 3 ♀, June 26; 2 ♂ 1 ♀, July 18). Loc. 36, stream, Stoddard Co. (2 ♂ 1 ♀, July 17). Loc. 43, Watered Hollow, Carter Co. (8 ♂ 1 ♀, July 24). Loc. 45, bog, Shannon Co. (2 ♂, July 25).

A rare species; we took every specimen we could; after July 18 it is noted several times in my field book. "No flavidas on Tachopteryx Bog today."

55. *Plathemis lydia* (Drury)

Loc. 4, near Waynesville, Pulaski Co. (2 ♂, August 21). Loc. 5, pond, Pulaski Co. (1 ♂, August 22). Loc. 7, Osage River, Miller Co. (1 ♂, August 23). Loc. 11, Pike Creek, Carter Co. (3 ♂, June 7; 6 ♂ 1 ♀, June 14). Loc. 12, Current River, Carter Co. (3 ♂, June 9). Loc. 13, near Van Buren, Carter Co. (3 ♂, June 10). Loc. 15, Cavanaugh Bay, Carter Co. (3 ♂, June 13). Loc. 14, Bowen's Bay, Carter Co. (1 ♀, June 17). Loc. 16, Carter Creek, Carter Co. (1 ♂, June 18). Loc. 28,

Pike Creek, Carter Co. (2♂, June 21). Loc. 22, Current River, Carter Co. (1♂, July 16). Loc. 36, stream, Stoddard Co. (3♂, July 17). Loc. 39, old railroad grade, Carter Co. (1♀, July 19; 1♀, July 20). Loc. 43, Watered Hollow, Carter Co. (2♂ 1♀, July 24). Loc. 21, Riley Pond, Carter Co. (1♂, July 29).

Seen also at 41 on August 1, and at 54, 55, and 59. At 21 on July 29, "*Lydia* the commonest species on the pond." At 54, "*Lydia* wanders less widely than *L. pulchella.*"

56. *Perithemis tenera* (Say)

Loc. 4, near Waynesville, Pulaski Co. (13♂, August 21). Loc. 12, Current River, Carter Co. (7♂, June 9). Loc. 14, Bowen's Bay, Carter Co. (2♂ 2♀, June 12; 2♂, June 17). Loc. 15, Cavanaugh Bay, Carter Co. (10♂, June 13). Loc. 28, Pike Creek, Carter Co. (1♂, June 21). Loc. 20, Cliff Spring Branch, Carter Co. (1♂, July 9). Loc. 21, Riley Pond, Carter Co. (1♂, July 16; 3♂ 2♀, July 29). Loc. 41, Long Bay, Carter Co. (2♂, July 21; 1♂, August 1). Loc. 48, pond, Shannon Co. (8♂ 17♀, August 3; 1♀, August 28). Loc. 55, pond, Howell Co. (2♀, August 18). Loc. 59, pond, Carter Co. (4♂ 1♀, August 25).

At 21 on July 29, "Possibly 40–50 individuals on the pond." Among the beautiful series of females taken at 48 is one which was recognized in flight as distinctly different from all the others. It has the wing markings dark and sharply defined; the hind wing is 14.5 mm. long and the abdomen 12 mm., as compared with other individuals which have these parts respectively about 18.5 mm. and 13 mm. It remains for some sympathetic observer to record the sexual antics of *P. tenera,* the act of oviposition, and the behavior of the egg cluster when it is brushed into the water.

57. *Pachydiplax longipennis* (Burmeister)

Loc. 2, Rubidoux Creek, Pulaski Co. (1♂, August 20). Loc. 11, Pike Creek, Carter Co. (1♀, June 7; 1♂, June 8). Loc. 12, Current River, Carter Co. (7♂, June 9). Loc. 14, Bowen's Bay, Carter Co. (17♂ 1♀, June 12; 14♂ 3♀, June 17). Loc. 15, Cavanaugh Bay, Carter Co. (5♂, June 13). Loc. 16, Carter Creek, Carter Co. (1♂, June 18). Loc. 28, Pike Creek, Carter Co. (1♂ 1♀, June 21; 1♂, July 27). Loc. 34, Chub Hollow, Carter Co. (2♂, June 25). Loc. 21, Riley Pond, Carter Co. (1♀, July 16). Loc. 36, stream, Stoddard Co. (1♂, July 17). Loc. 39, old railroad grade, Carter Co. (1♂, July 23). Loc. 43, Watered Hollow, Carter Co. (2♂, July 24). Loc. 45, bog, Shannon Co. (1♂,

July 25). Loc. 48, pond, Shannon Co. (2 ♂, August 3). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♂, August 6).

Seen also at 21 on July 29, at 41 on August 1, and at 59.

58. *Erythemis simplicicollis* (Say)

Loc. 2, Rubidoux Creek, Pulaski Co. (1 ♀, August 20). Loc. 11, Pike Creek, Carter Co. (7 ♂, June 8; 1 ♂, June 16). Loc. 14, Bowen's Bay, Carter Co. (3 ♂, June 12; 1 ♂, June 17). Loc. 15, Cavanaugh Bay, Carter Co. (1 ♂, June 13). Loc. 25, Current River, Carter Co. (1 ♂, June 20; 1 ♂, June 21). Loc. 34, Chub Hollow, Carter Co. (1 ♂, June 25). Loc. 18, Richbark Cave, Carter Co. (1 ♂ 2 ♀, July 2). Loc. 21, Riley Pond, Carter Co. (1 ♂, July 16). Loc. 10, Current River, Carter Co. (2 ♂, July 19). Loc. 35, Chub Hollow, Carter Co. (1 ♀, July 20). Loc. 43, Watered Hollow, Carter Co. (2 ♂, July 24). Loc. 45, bog, Shannon Co. (1 ♀, July 25). Loc. 28, Pike Creek, Carter Co. (2 ♂, July 27; 1 ♀, August 2). Loc. 59, pond, Carter Co. (1 ♂, August 25).

Seen also at 36, at 41 on August 1, at 48 on August 3, and at 56. The male taken at 59 was carrying the abdomen and enough of the thorax to hold together the 4 wings of a male *Enallagma civile*. *Erythemis* does not seem to clip off the wings of its prey as I think *Tachopteryx* and *Hagenius* do.

59. *Sympetrum corruptum* (Hagen)

Loc. 28, Pike Creek, Carter Co. (1 ♀, July 27). Loc. 41, Long Bay, Carter Co. (1 ♂, August 1). Loc. 48, pond, Shannon Co. (2 ♂, August 3). Seen also at 5 and 55.

60. *Sympetrum costiferum* (Hagen)

Loc. 8, pond, Montgomery Co. (5 ♂, October 15).

Acts much like *rubicundulum;* alights lower than *vicinum* and often alights flat on the ground. The thorax is dark reddish plum, almost black; frons blackish.

61. *Sympetrum vicinum* (Hagen)

Loc. 8, pond, Montgomery Co. (4 ♂, October 15). Loc. 9, pond, Jackson Co. (2 ♂, October 16). Loc. 16, Carter Creek, Carter Co. (1 ♂, June 18). Loc. 18, Richbark Cave, Carter Co. (2 ♀, July 2). Loc. 19, Spring Cave, Carter Co. (1 ♀, July 8). Loc. 10, Current River, Carter Co. (1 ♂, July 19). Loc. 45, bog, Shannon Co. (1 ♂, July 25). Loc. 39, old railroad grade, Carter Co. (1 ♂, August 4). Loc. 52, Big Rocky Creek, Shannon Co. (1 ♀, August 6; 4 ♂, August 7; 1 ♂, August 8).

62. *Sympetrum ambiguum* (Rambur)

Loc. 4, near Waynesville, Pulaski Co. (1 ♂, August 21). Loc. 23, cliff near Current River, Carter Co. (1 ♂, July 19). Loc. 35, Chub Hollow, Carter Co. (2 ♂ 1 ♀, July 25). Loc. 42, Long Bay, Carter Co. (1 ♂, July 21; 1 ♂, August 1). Loc. 39, old railroad grade, Carter Co. (1 ♀, July 22; 1 ♀, July 26; 1 ♂ 1 ♀, July 27; 2 ♂ 5 ♀, July 28; 1 ♂, July 29; 1 ♂, July 30; 2 ♂, August 4; 1 ♀, August 29). Loc. 52, Big Rocky Creek, Shannon Co. (5 ♂ 5 ♀, August 6; 10 ♂ 4 ♀, August 7; 4 ♂ 2 ♀, August 8).

Vicinum and *ambiguum* seem to be both pond and stream dwellers.

63. *Celithemis elisa* (Hagen)

Loc. 5, pond, Pulaski Co. (1 ♂ 1 ♀, August 22). Loc. 21, Riley Pond, Carter Co. (2 ♂ 1 ♀, July 16; 1 ♂, July 29). Loc. 48, pond, Shannon Co. (1 ♂, August 3). Loc. 56, lake, Wright Co. (1 ♂, August 18).

64. *Celithemis monomelaena* Williamson

Loc. 21, Riley Pond, Carter Co. (5 ♂, July 29).

65. *Tramea lacerata* Hagen

Loc. 5, pond, Pulaski Co. (2 ♂, August 22).

On August 3 and 6 this species was positively identified flying the pool below Rocky Falls. I did not wish to sacrifice the time necessary for its capture.

66. *Tramea carolina* (Linné)

Loc. 52, Big Rocky Creek, Shannon Co. (1 ♀, August 7).

67. *Pantala flavescens* (Fabricius)

Loc. 53, Big Rocky Creek, Shannon Co. (1 ♀, August 7). Loc. 54, ponds, Carter Co. (1 ♂, August 16).

68. *Pantala hymenaea* (Say)

Loc. 22, Current River, Carter Co. (1 ♂, July 16). Loc. 54, ponds, Carter Co. (1 ♂, August 16).

The two species of *Pantala* were frequently seen about warm ponds and over roads and fields. Few were taken because of the time required for their capture.

A brief general discussion of the 1930 collecting season in Missouri may conclude this paper. Although collecting was

started by Mr. Pence on June 6, we obviously missed whatever early summer Gomphi the locality may have. For example, some of the *pallidus* group will certainly be found in Carter County. Likewise inevitably we missed the still earlier things such as *Cordulegaster,* of which genus at least one species lives in little spring brooks. Several naiads were taken in Chub Hollow, and their sizes indicated that larval life lasted at least three years, but the number taken was too small to warrant very definite conclusions.

The year 1930 was one of a severe if not unprecedented drought in the region in which we collected. This means the extermination of some habitats, and at least the reduction in numbers of certain species over the area. As early as June 24, I noted, "Country drying up, corn rolled, and weeds wilting." The severity of the drought increased as the season progressed so that early in August many supposedly dependable springs at country homes had gone dry. Frequent showers in August did little or nothing toward relieving the situation. The visible effects in forests varied with soil and drainage, and the species affected. Everywhere the flowering dogwood seemed the worst sufferer.

On August 11, I noted, "Dry weather has apparently rendered certain species inert, as the wood roads are not patrolled by cordulines, and there are no gomphines on the river." On August 28, "The drought which now covers the ground with fallen leaves must exert some influence on insects for whom desiccation is a real menace to a normal life span; and it is possible the *Stylurus* season has thus been abruptly shortened." Emerging gomphines generally leave the place of their birth to spend the teneral span of their life in fields or woods, often far from water, returning when sexually mature. It seems not improbable that temperature and humidity conditions sufficient to change a corn field in one day from the promise of a harvest to dead and barren stalks, might operate so unfavorably on teneral dragonflies as to prevent them ever attaining maturity and returning to the water where the collector would be looking for them.

September 1, "About 2 o'clock patrolled the quarry grade to the spring (a short distance above the quarry) and rested there until about 4 o'clock before returning. On both trips saw no signs of gomphines, aeshnines, or cordulines. No dragonflies collected today—the season for some reason has quite played out—boyerias are rare or entirely wanting below camp in the evenings—on the river in sunshine or back under the overhanging vegetation of under-cut banks are only argias and hetaerinas—a few rather belated *Hagenius* still fly along the river from dead branch to dead branch. We break camp at dawn tomorrow."