

OBSERVATIONS ON THE REPRODUCTIVE BEHAVIOR OF *ENALLAGMA TRAVIATUM* SELYS (ZYGOPTERA: COENAGRIONIDAE)

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Abstract — This is one of the 15 North American members of the genus about which no information concerning reproductive behavior has so far been available. The sp. could be classified as a long copulator, and a detailed scenario is produced of the reproductive activity observed in the field.

Introduction

Reproductive behavior of *E. traviatum* was observed at a Tarrant County, Texas pond. The site is 0.33 hectares in area, surrounded by the following vegetation *Eclipta alba*, *Juncus diffusissimus*, *Ambrosia trifida*, *Paspalum* sp., *Eleocharis* sp. and scattered *Salix* sp. The dominant emergent vegetation is *Typha* sp. and *Ludwigia peploides*. *E. traviatum* was temporally quite localized in its use of this rendezvous site; it was recorded between May

26 and June 6 and was observed active diurnally between 1005 and 1225 hours. Despite the study site being under observation daily between May 18 and June 21 the brevity of this species appearance coupled with the long duration of its reproductive behavior resulted in quantitative data being obtained for only 5 pairs. The actual capture of a female by a male was never observed nor was the separation of the pair following oviposition.

Observations

The following scenario from my field notes is reasonably representative of the reproductive activity observed,

10:31:00 A pair is observed in copula on *Juncus diffusissimus* stem

10:34:15 The wheel position is broken and the pair moves in tandem to a *Salix* stem

and remain quiescent still in tandem

10:35:10 The male walks backwards down the stem toward the female arching his abdomen; this results in the resumption of copulation; the male pumps his abdomen

10:42:20 The female releases her grip on the stem, copulation continues

10:45:00 The male wipes his eyes with his front legs

10:51:15 The wheel position is broken, the pair moves in tandem to a new perch on a *Salix* stem. The stem is grasped by the male who supports the female with his abdominal appendages

10:53:30 The male begins arching his abdomen performing pumping bends

10:54:05 Copulation is resumed; the male has his wings spread and abdomen raised up between the V formed by his wings, the female has her wings pressed together with her legs folded under her thorax. The male pumps his abdomen but the pumps are infrequent and not vigorous. The wheel form is characterized by the pronounced curvature of the anterior segments of the male's abdomen, the posterior half of his abdomen being straight. The female is bent so that her thorax is pressed against the ventral surface of her anterior abdominal segments. Her anterior abdominal segments are relatively straightened

11:05:30 The male closes his wings together and begins more vigorous pumping. The form of the wheel position now predominating is for the anterior portion of the male's abdomen (approximately three quarters of its length) to be roughly straight while the posterior segments are deeply curved. Concurrently the female's thorax is no longer pressed against her abdomen and her abdomen takes the form of an inverted question mark.

11:10:30 Strong winds cause adjacent stems to brush the pair. They break the wheel position in response and fly off in tandem to another perch. Both individuals grasp the new perch with their legs.

11:15:05 The male wipes his eyes with his forelegs.

11:17:30 The male wipes his eyes with his forelegs.

11:21:00 They fly in tandem to a new perch; only the male grasps the perch, the female being entirely supported by his abdominal appendages.

11:23:15 The male spreads his wings and arches his abdomen while performing pumping movements. After approximately five pumps the female swings her abdomen forward and the wheel position is formed again. The form is similar to the description for 10:54:05 except that more space is visible between the female's thorax and abdominal segments; she grasps her abdomen with her legs.

11:35:00 The female begins moving her legs. The pair abruptly break the wheel position and fly off in tandem to the oviposition site. They land on the top leaf of a *Ludwigia peploides* plant which the female grasps with her legs. The male is supported entirely by the female and remains rigid and motionless with his wings pressed together.

The oviposition site was approximately 1 meter from shore in a moderately dense patch of *L. peploides* receiving partial shade from a willow tree. It was approximately 5 meters from the site of copulation and generally populated between 10:30 and 12:30 hours by solitary males of *E. traviatum*.

The arrival of the ovipositing pair activated inspection by a set of solitary males several of which approached within 10 cm and then retreated. Two of these males stationed themselves within 20 cm of the ovipositing pair.

11:45:00 The pair fly in tandem to another *L. peploides* uppermost leaf. The female begins inserting eggs into the *Ludwigia* stem at the water surface and gradually descends the stem apparently inserting eggs as she moves. The pair maintain their tandem association.

11:49:05 Female is totally submerged

11:49:20 The female surfaces suddenly and the pair rotate approximately 120° on the same stem.

11:50:10 The male assumes the rigid position described in 11:35:00. The form of this position is characterized by both the male and the female maintaining straight body pos-

- tures at an angle of approximately 120° .
- 11:50:50 The male curves his posterior segments so that his body is approximately parallel to the female's body. With the exception of the rear most portions of his abdomen (which is curved to maintain tandem) the male maintains a straight body form.
- 11:52:00 A solitary male approaches. Each member of the pair responds by vigorously beating its wings. The female lifts her abdomen. The solitary male retreats to a nearby leaf.
- 11:54:00 Pair fly in tandem to a nearby *Ludwigia* plant displacing a solitary male who was perched there. The male grasps the top leaf and the female deposits eggs in the stem, beginning at the water surface and progressively descending the stem.
- 11:58:00 The female is totally submerged.
- 12:04:35 The female suddenly emerges from the water and the pair move in tandem to another *Ludwigia* stem where an analogous ovipositioning sequence occurs.
- 12:11:00 The female suddenly emerges from the water. This apparently stimulates a solitary male to attack the paired male. The attack involves the unpaired male making solid contact with the dorsal surface of the paired male's thorax. It appeared, but was unconfirmable, that the lone male bit the paired male. This behavior was unsuccessful in interrupting the tandem connection and the solitary male flew away. Immediately after his retreat another solitary male attacked in an identical fashion; he was also unsuccessful.
- 12:13:00 The pair settle on a new plant with the rigid male supported entirely by the female with an angle of 120° between their body axes.
- 12:16:55 The pair fly to a different plant and resume the same position.
- 12:18:30 Female begins inserting eggs at the water surface. The male is attacked by a solitary male as described above.
- 12:19:00 The female arches her abdomen and rotates approximately 90° on the stem. The male is attacked again and the pair moves to a different plant, assuming the position described in 11:35:00.
- 12:21:00 The pair move in tandem and I lost sight of them.

Discussion

E. traviatum is one of the 15 North American *Enallagma* species about which no published information concerning reproductive behavior exists (BICK & BICK, 1980). The duration of copulation suggests that *E. traviatum* is best classified as a long copulator (CORBET, 1962). Usually oviposition was performed while the female was grasped by the male; the depth that she submerged perhaps being regulated by this tandem connection because the male rarely got more than the tip of his abdomen wet. Once, a male was observed to desert a female in the midst of the oviposition sequence for no apparent reason. The female continued ovipositing apparently unaffected by the male's departure. Despite there being solitary males nearby none made any advances toward this lone female. Oviposition was entirely limited to the stems of *Ludwigia peploides* in this habitat. It also appeared to always be preceded by the support of the rigid male entirely by the female at approximately a 120° angle.

References BICK, G.H. & J.C. BICK, 1980, *Odonatologica* 9: 5-18; — CORBET, P.S., 1963, *A biology of dragonflies*, Quadrangle Books, Chicago.

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