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A FOSSIL STALK-WINGED DAMSELFLY, *DICERATOBASIS WORKI* SPEC. NOV., FROM DOMINICAN AMBER, WITH POSSIBLE OVIPOSITIONAL BEHAVIOR IN TANK BROMELIADS (ZYGOPTERA: COENAGRIONIDAE)

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This is the first description of a zygopteran from Dominican Amber and of a coenagrionid from any amber source. Holotype ♀: Dominican Republic, Cordillera Septentrional, "La Toca" mine; age Upper Eocene/Lower Oligocene; deposited in private coll. of J. Work (Ashland, OR, USA). On the basis of the elongate thin abdomen, as well as the known habits of the 2 extant congeners, it can be surmised that the larvae lived in tank bromeliads. The find provides supporting evidence that the genus *Diceratobasis* is endemic to the Greater Antilles.

INTRODUCTION

The order Odonata is known from the Permian and was represented by a number of now-extinct families back in the Mesozoic. Descriptions of fossil representatives of the damselfly family Coenagrionidae are limited to three genera from the Eocene Florissant beds in Colorado (CARPENTER, 1992). There are also several coenagrionids in Baltic and Dominican Amber in public and private collections, however none have been formally described (BECHLY, 1993). The only described amber damselflies are three species of *Platycnemis* (Platycnemididae) in Baltic Amber (PFAU, 1975).

Through the courtesy of Jim Work, I was able to study a nearly complete damselfly in Dominican Amber. Sufficient characters were visible to place this specimen in the extant genus *Diceratobasis*. The present paper describes this specimen and on the basis of morphological characters and the habits of extant species, concludes that the fossil specimen probably oviposited in tank bromeliads.

MATERIAL AND METHODS

The piece of amber containing the fossil was oval in outline, measuring 80 mm in length, 55 mm in width and 14 mm in thickness (tapered at the edges) and weighed 35.7 grams. The specimen was examined with a Nikon Stereomicroscope and a Nikon Optiphot microscope. Drawings and measurements were made with the aid of a camera lucida mounted on both instruments.

The amber piece originated from the "La Toca" mine in the Cordillera Septentrional mountain range in the northern portion of the Dominican Republic. An analysis of amber from seven Dominican mines by nuclear magnetic resonance spectroscopy indicated that the amber from La Toca is approximately 30 to 40 million years old (LAMBERT et al., 1985), which would correspond to Upper Eocene to Lower Oligocene. This age is within the range of 30-45 million years reported by Cepek in SCHLEE (1990).

RESULTS AND DESCRIPTION

The fossil specimen belonged to the group of neotropical coenagrionids which lack postocular spots. The size of the specimen, the presence of a supplementary tooth on the tarsal claws, the configuration of the wing venation and the angulate frons place it in the genus *Diceratobasis* (Selys) as defined by GARRISON (1986). A description follows:

DICERATOBASIS WORKI SP. NOV.

Figures 1-4

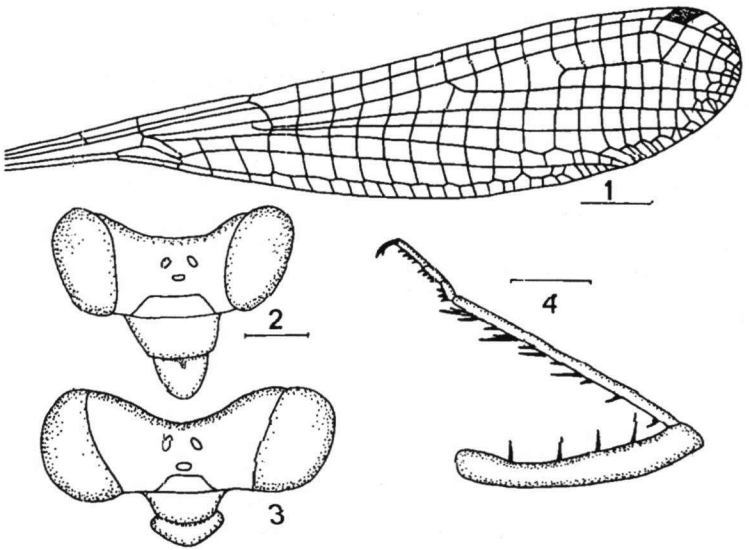
M a t e r i a l. – **Holotype** ♀: A nearly complete specimen; only the terminal four segments are missing. Preserved in a piece of amber: Dominican Republic, Cordillera Septentrional, "La Toca" mine (Upper Eocene/Lower Oligocene). Deposited in the private collection of Jim Work (Ashland, Oregon, USA).

E t y m o l o g y. – Named after Mr Jim W o r k for generously allowing the study of this specimen.

FEMALE (**holotype**). – Based on the proportions of the abdomen of the female paratype of *D. melanogaster*, the approximate length of the abdomen was calculated. This value is given in parenthesis in the following measurements (in mm): total length 50(60), length of abdomen 40(50), length of hind wings 34-35, length of forewings 34-34, length of antennal scape 0.4, length of flagellum 2, length of prothorax 1.3, length of synthorax 6.6, width of abdomen 0.7.

H e a d. – Labrum, clypeus, labium, frons, and vertex entirely matte black; scape of antennae light brown but darkening at distal tip, flagellum black, ocelli and a pair of tear-shaped areas lateral of the ocelli group pale in color. Labrum as long as or longer than broad. Frons angulate.

T h o r a x. – Prothorax and synthorax entirely matte black; coxae, trochanters, femora, tibiae, tarsi and claws light brown; armature, tips of claws and supplemental claws black; venation black; pterostigma light brown. Wings petiolated half way between antenodes 1 and 2; arculus slightly distal to 2nd antenodal in all



Figs 1-4. Structural features of *Diceratobasis worki* sp.n. (holotype) [Figs 1-2, 4] and *D. melanogaster* Garrison (paratype) [Fig. 3]: (1) venation of hind wing; bar=3.8 mm; – (2-3) head, anterior view; note angular frons in Fig. 2; bar=1.0 mm; – (4) foreleg; note supplementary tooth on tarsal claw; bar=1.0 mm.

wings; postnodals 15/14, 14/14; R3 arising just before 7th and 6th postnodal in forewings; just before the 6th postnodal in hind wings. Origin of IR2 recessed to the 4th (hindwing) or 5th (forewing) crossvein of the second series, just proximal to the pterostigma. R3 arising at junction of the 6th postnodal in the hindwing (not visible in the forewings). Three crossveins in the hindwing and two crossveins in the forewing separate the origin of R3 from the origin of IR2.

A b d o m e n. – Flattened dorso-ventrally (an artifact of preservation) with only the first six segments present. They are uniformly dark brown. No tubercles present.

AFFINITIES. – The genus *Diceratobasis* presently contains two extant species, *D. macrogaster* (Selys) and *D. melanogaster* (Garrison). The present species can be separated from the two extant species by wing venation. In *D. macrogaster*, the origin of IR2 is recessed to the first or second postnodal crossveins of the second series proximal to the pterostigma. In *D. worki* sp.n., the origin is recessed to the 4th crossvein. In *D. melanogaster*, there are four crossveins between the node and origin of R3 in both fore and hindwings, whereas in *D. worki* sp.n., there are five. Also vein CU1 extends 73% or the entire wing length in *D. melanogaster*, but 83% in *D. worki* sp.n.

The length of the abdomen of *D. melanogaster* is 37 mm, however it is probably closer to 50 mm in *D. worki* sp.n. The sides of the prothorax and synthorax of *D. melanogaster* have white areas whereas all of these structures are black in *D. worki*

sp.n. The labrum appears wider than long in *D. melanogaster* whereas it is as long as or longer than wide in *D. worki* sp.n.

The following key separates the known species of *Diceratobasis*

1 Origin of IR2 recessed to the first or second postnodal crossvein of the second series proximal to the pterostigma. (Jamaica) ..... ***macrogaster***

1' Origin of IR2 recessed to the third or fourth postnodal crossvein of the second series proximal to the pterostigma 2

2 Four crossveins between node and origin of R3: CU1 extends 73% of entire wing length. Length of abdomen 37 mm. White areas on side of thorax. (Dominican Republic) ..... ***melanogaster***

2' Five crossveins between node and origin of R3: CU1 extends 83% of entire wing length. Length of abdomen 40-50 mm. Thorax completely black. (Fossil in Dominican Amber) ..... ***worki***

DISCUSSION

Some inference to the oviposition habits of *D. worki* sp.n. can be surmised from its long abdomen, which is characteristic of species which oviposit in deep sites with restricted access such as tank bromeliads. Also, the larvae of *D. macrogaster* occur in the tank bromeliads (WESTFALL, 1976; LAESSLE, 1961) and although the larvae of *D. melanogaster* are unknown, the adults of this species have been observed around bromeliads (R.W. Garrison, pers. comm.). Tank bromeliads are epiphytic bromeliads that possess thick, troughlike concentric leaves that converge at their bases. Rainwater collects in these bases and can remain in these "tanks" for long periods of time, even over dry periods. Up to several liters of water can be stored by a single plant, although the amount is normally less than that. These tanks form "microcosms" which harbor a range of both invertebrate and vertebrate forms, including damselfly larvae (PICADO, 1913).

Having tank bromeliads as ovipositional sites would also explain how *D. worki* sp.n. became entrapped in amber. It may have been attempting to oviposit in a tank bromeliad growing on the amber tree, *Hymenaea protera* POINAR (1991), when it accidently flew up against some sticky resin.

Tank bromeliads are just one type of phytotelmata (small bodies of water occurring in or upon plants) that serve as hosts for aquatic insect communities. CORBET (1983) discusses three categories regarding site specificity for Odonata recorded from phytotelmata. There are dendrolimnetobionts (species living only in specific types of phytotelmata), dendrolimnetophiles (species that often live in phytotelmata but mainly live elsewhere) and dendrolimnetoxenes (species which occasionally live in phytotelmata but normally live elsewhere). The site specificity category for extent members of *Diceratobasis* is not definitely known, although Corbet suggests that *D. macrogaster* might belong to the latter category based on LAESSLE's report (1961) of finding eight larvae of this species coexisting in a single leaf axil of a bromeliad. However, additional collections of larval *D. macrogaster* from tank bromeliads (WESTFALL, 1976) suggest that this species may be a true dendrolimnetobiont.

Food for Odonata larvae in phytotelmata comprise predominantly dipterous larvae such as mosquitoes (Culicidae), midges (Chironomidae), biting midges (Ceratopogonidae), moth flies (Psychodidae), hover flies (Syrphidae) and crane flies (Tipulidae) (CORBET, 1983). Representatives of all of these families have been reported from Dominican Amber (POINAR, 1992).

On the basis of this find, it is now evident that *Diceratobasis* is an endemic genus that has been in the West Indies for a considerable period of time. In his work on the Odonata of Mesoamerica, PAULSON (1982) comments on the degree of endemism found in West Indian Odonata. Of 101 odonates reported from the West Indies, 27% are endemic to the Archipelago and 9% are restricted to single Greater Antillean islands (including three on Hispaniola). *Diceratobasis* is at present restricted to the two island combination of Hispaniola and Jamaica but further collecting may show that it extends throughout the Greater Antilles.

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