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New distribution records and moss associations for the lace bugs *Acalypta duryi* drake and *A. lillianis* Torre-Bueno (Hemiptera: Tingidae)

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NEW DISTRIBUTION RECORDS AND MOSS ASSOCIATIONS FOR THE
LACE BUGS *ACALYPTA DURYI* DRAKE AND *A. LILLIANIS* TORRE-BUENO
(HEMIPTERA: TINGIDAE)

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Abstract.—North American tingids of the mostly Holarctic, moss-inhabiting genus *Acalypta* are seldom collected, and records from specific mosses are scant. Our collections of a nymph and an adult of *A. duryi* Drake from *Dicranum scoparium* in North Carolina, nymphs and an adult from *Hylocomiastrum umbratum* in Tennessee, and adults from *Anomodon rostratus* in Tennessee are the first specific mosses associated with this lace bug. Records of nymphs and adults of *A. lillianis* Torre-Bueno from *Polytrichum commune* and *P. juniperinum* in the southeastern United States corroborate the association with hair-cap mosses, *Polytrichum* spp. New state records for *A. lillianis* are Alabama and South Carolina.

Key Words: *Acalypta*, Tingidae, insect distribution, new records, bryophagy, *Anomodon*, *Dicranum*, *Hylocomiastrum*, *Polytrichum*

Acalypta Fieber is a primarily Holarctic genus of lace bugs comprising about 40 species (Froeschner 1991, Péricart and Golub 1996). In the New World, *Acalypta* is found from Alaska and Newfoundland to Guatemala (Drake and Lattin 1963; Froeschner 1976, 1988, 1996; Scudder 1997). The Canadian and U.S. fauna includes eight (Allen et al. 1988, Froeschner 1988) or nine Nearctic species (Lattin and Moldenke 1990), in addition to the trans-Beringian *A. cooleyi* Drake and perhaps the Palearctic *A. parvula* Fallén (Golub 1973, Froeschner 1976). Uncertainty about the number of Nearctic species involves the taxonomic status of *A. mera* Drake, described from British Columbia and Oregon (Drake 1941), and synonymized by Drake and Lattin (1963) with *A. barberi* Drake, which was described from New York (Drake 1934). Golub (1973) synonymized *A. barberi* with *A. parvula*, suggesting that

this European tingid has been accidentally introduced to the east and west coasts of North America. Froeschner (1976) followed Golub's (1973) biogeographic interpretation but omitted reference to *A. mera*, as he also did in cataloguing the North American Tingidae (Froeschner 1988). Lattin and Moldenke (1990), without taxonomic explanation, reinstated *A. mera* as a valid species, a decision apparently based on its association with mature, old-growth forests of the Pacific Northwest (see Lattin 1997). In the current catalog of Palearctic Tingidae, both *A. barberi* and *A. mera* are retained as synonyms of *A. parvula* (Péricart and Golub 1996). Examination of European and North American type material is needed to determine the taxonomic status of *A. mera* and the identity of the moss tingid in northeastern North America that has been referred to as *A. barberi* or *A. parvula*.

Brachyptery is common in *Acalypta*, and

some species are known only from a short-winged form (Drake and Lattin 1963). As moss inhabitants, these lace bugs are seldom collected except when collecting devices such as Berlese or Tullgren funnels are used; mosses and other nonvascular plants generally receive little attention from entomologists (e.g., Beshear et al. 1976, Wheeler 2003). In referring to *Acalypta* species, Froeschner (1996) pointed out that their "cryptic moss-frequenting habit . . . undoubtedly shields them from being collected frequently." Ranges of even the best-known North American species of *Acalypta* are inadequately known (Froeschner 1976). Moreover, specific moss associations have rarely been recorded for the Nearctic species.

On the basis of fieldwork in southeastern states, we provide new distribution records and moss associations for *A. duryi* Drake and *A. lillianis* Torre-Bueno. Specimens of *A. duryi* were obtained by placing moss samples in a Berlese funnel and recovering adults and nymphs from the extracted material. A Berlese funnel also was used to collect *A. lillianis*, but adults and nymphs were obtained mainly by placing an enamel pan in mats of *Polytrichum* mosses, tapping the overlying stems over the pan, and collecting any dislodged nymphs and adults. Voucher specimens have been deposited in the Clemson University Arthropod Collection, Clemson, SC; the Great Smoky Mountains National Park Museum, Gatlinburg, TN; and National Museum of Natural History, Smithsonian Institution, Washington, DC. Parenthetical numbers in the following list of material examined refer to the number of adults (number only) and nymphs (number + roman numeral indicating instar) collected or observed.

Acalypta duryi Drake

Acalypta duryi was described as *Fenestrella ovata* from Cincinnati, Ohio, by Osborn and Drake (1916), placed in *Acalypta* by Drake (1928), and renamed *A. duryi* by Drake (1930) because the name *ovata* was

preoccupied in *Acalypta*. Reported since the original description only from Georgia, North Carolina, and Tennessee (Froeschner 1988), *A. duryi* has been collected from unidentified mosses (Drake and Lattin 1963, Beshear et al. 1976).

Material examined.—NORTH CAROLINA: Swain Co., Quiet Walkway nr Cherokee, Great Smoky Mountains National Park, 25 Aug. 1999, ex *Dicranum scoparium* Hedw., W.K. Reeves (1 V, 1 adult). TENNESSEE: Monroe Co., Tellico River nr Tellico Plains, 6 Feb. 1999, ex *Anomodon rostratus* (Hedw.) Schimp., W.K.R. (7); Sevier Co., Rt. 441 (35°36'N, 83°25'W), Great Smoky Mountains National Park, 2 Sept. 1999, ex *Hylocomiastrum umbratum* (Hedw.) Fleisch. in Broth., W.K.R. (1 II, 1 III, 11 IV, 2 V, 1 adult).

Acalypta lillianis Torre-Bueno

The distribution of *A. lillianis*, the most widespread Nearctic species of the genus, is hypothesized to have been shaped by the Pleistocene glaciations. Populations in the four areas of its range—central Alaska, northwestern United States, north-central and northeastern states plus Ontario and Quebec, and Newfoundland—correspond to some glacial refugia (Froeschner 1976). The previously reported eastern U.S. distribution extends from Maine to Georgia and west to Iowa, Minnesota, and Arkansas (Allen et al. 1988, Froeschner 1988), with Georgia (Beshear et al. 1976) and Arkansas (Allen et al. 1988) having been added since Froeschner's (1976) zoogeographic analysis. *Acalypta lillianis* is one of the few North American members of the genus whose associated mosses have been identified to genus or species. Nymphs and adults are known from *Polytrichum* sp. in Massachusetts (Bailey 1951) and *P. juniperinum* Willd. in North Carolina (Horn et al. 1979).

Material examined.—ALABAMA: Chambers Co., granite outcrop, Rt. 77, ca. 3.2 km NNW of Penton, 9 Apr. 1997, ex *Polytrichum commune* Hedw., A.G. Wheeler (1);

Cherokee Co., Rt. 35, SE of Fort Payne, 6 Apr. 2002, ex *P. commune*, A.G.W. (1); Jackson Co., sandstone outcrop, Rt. 117, 0.3 km NW of jet. Rt. 71, Flat Rock, 10 Apr. 1997, ex *P. commune*, A.G.W. ("adults"); 3 May 2000, ex *P. juniperinum*, A.G.W. (2); 6 Apr. 2002, ex *P. commune*, A.G.W. (10); 18 May 2002, ex *P. commune*, A.G.W. (2); 30 Mar. 2003, ex *P. commune*, A.G.W. (1 V). GEORGIA: Towns Co., Rt. 76, 15 km E of Hiawassee, 18 May 2002, ex *P. commune*, A.G.W. (1). NORTH CAROLINA: Transylvania Co., Big Rock Trail, DuPont State Forest, 14 May 2001, ex *P. juniperinum*, W.K.R. (1). SOUTH CAROLINA: Pickens Co., Boggs' Rock, Rt. 178, 2.1 km N of Liberty, 9 Apr. 1999, ex *P. commune* and *Aulacomnium palustre* (Hedw.) Schwaegr., P.H. Adler (1); 25 Apr. 1997, ex *P. commune*, A.G.W. (1 IV, 1 V, 1 adult); 14 Sept. 1997, ex *P. commune*, A.G.W. ("nymphs"); 28 Feb. & 15 Mar. 1998, ex *P. commune*, A.G.W. ("late instars"); 24 Apr. 1998, *P. commune*, A.G.W. (1); 27 Apr. 2003, ex *P. commune*, A.G.W. (1); granite outcrop, Glassy Mountain Heritage Preserve, 4.2 km NE of Pickens, 16 June 1996, ex *P. commune*, A.G.W. (1); 13 Apr. 1997, ex *P. commune*, A.G.W. (2); 15 May 1998, ex *P. commune*, A.G.W. (1); 23 Mar. 2003, ex *P. commune*, A.G.W. (1 V); York Co., granite outcrop, Clover, 15 Mar. 2002, ex *P. commune*, A.G.W. (2 V).

DISCUSSION

The mosses *Anomodon rostratus*, *Dicranum scoparium*, and *Hylocomiastrum umbratum* represent the first mosses specifically associated with *A. duryi*. The collection of a nymph and an adult from *D. scoparium* and multiple nymphs and an adult from *H. umbratum* suggests that these mosses serve as hosts of this lace bug.

Our observations on *A. lillianis* support previously recorded associations with *Polytrichum* species (Bailey 1951, Horn et al. 1979). We found late instars in mats of *P. commune* in February, March, April, and September and adults mainly in April but

also in May and June. One adult was extracted from a mixture of the mosses *P. commune* and *A. palustre*. Bailey (1951) reported that adults were collected most often in late spring (late May through June) in the northeastern states and that he generally was unable to collect this tingid later in the season from *Polytrichum* colonies that had yielded numerous individuals during spring. He suggested that *A. lillianis* is nocturnal or by day retires under stones and remarked that some of its habits are as yet unexplained (Bailey 1951). Bailey's (1951) inability to collect the lace bug during summer might have involved the desiccation of moss colonies. Field and laboratory studies are needed to determine the seasonality of this lace bug and other aspects of its bionomics.

Species of *Acalypta* are considered muscicolous (e.g., Drake and Lattin 1963), and several North American species have been observed to feed on mosses (e.g., Bailey 1951, Allen et al. 1988). At least one species, *A. parvula*, inserts its eggs into moss stems under laboratory conditions (Leston 1953). A consistent association with mosses in the Old and New World (Drake and Lattin 1963, Péricart 1983, Stehlík 2002) suggests that many *Acalypta* species develop on these bryophytes. Mosses probably do serve as hosts of *A. duryi* and *A. lillianis*. Even though we found nymphs of both tingids on certain mosses, we refer to an association with mosses, rather than a host relationship, until the plants have been demonstrated to support the bugs' growth and development.

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