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DISTRIBUTION OF *ACROPSOPILIO CHILENSIS* SILVESTRI, 1904 IN SOUTHERN SOUTH AMERICA (OPILIONES, PALPATORES, CADDIDAE)

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ABSTRACT.– The biogeography of the *Acropsopilio chilensis* in southern South America is discussed based on new records and published data. In this region this species has been found in four biogeographical units (three widely disjunct regions): a) Subantartic (Southern Chile and Southwestern Argentina); b) Yungas (Northwestern Argentina and Western Bolivia); c) Serra do Mar (coast Brazil) and d) Paranaense (Northeastern Argentina and Southeastern Brazil). This disjunct distribution is a result of vicariance events due to dry conditions during Pliocene and Pleistocene that produced a breakup of the former widespread forest.

KEY–WORDS.– *Acropsopilio*, Biogeography, Opiliones, South America

RESUME.– La biogéographie des *Acropsopilio chilensis* de la région méridionale de l´Amérique du Sud est discutée sur la base de nouveaux registres et de données publiées. Dans cette région ce genre est rencontré dans quatre unités biogéographiques (trois régions largement disjointes): a) Subantarctique (sud–est du Chili et sud–ouest de l´Argentine); b) Yungas (nord–ouest de l´Argentine et ouest de la Bolivie); c) « Serra do Mar » (côte du Brésil) et d) Paranaense (nord–est de l´Argentine et Sud–ouest du Brésil). Cette distribution disjointe est le résultat d'événements vicariants relevant des conditions de sécheresse (aridité) pendant le Pliocène et le Pléistocène ce qui a produit la rupture de la forêt primaire.

MOTS–CLES.– *Acropsopilio*, Biogéographie, Opiliones, Amérique du Sud

INTRODUCTION

The caddids are very small opilionids, length of 1–2 mm, with short legs and conspicuous eyes, they live under logs, moss and leaf litter (SHEAR, 1975; COKENDOLPHER & MAURY 1990). In the Yungas of the NW Argentina the *Acropsopilio chilensis* were found among moss on trees, 2 m above ground (P. Goloboff pers. comun.). In the Estação Biológica de Boracéia they were found under fallen logs and in the leaf litter.

SHEAR (1975) reviewed the family Caddidae, ranked the Acropsopilionidae to the subfamilial level and showed some aspects of the natural history and biogeography of the different taxa. The genus *Acropsopilio* has a large and disjunct distribution: NE of the U.S.A. and SE of the Canada; México (Chiapas); South America (Argentina, Chile and Brazil); Japan (the same species as from U.S.A. and Canada); New Zealand and

Australia (CEKALOVIC, 1974; GRUBER, 1974; SHEAR, 1975; SUZUKI, 1976; SUZUKI *et. al.*, 1977; CANTRELL, 1980; COKENDOLPHER & MAURY, 1990; GONZALEZ-SPONGA, 1992 and KURY, 1994). This distribution was put in doubt by STAREGA (1989), who proposed (without study specimens) that the north american species of *Acropsopilio* belonged to a distinct taxon from those from South America.

In the southern South America three species of *Acropsopilio* were described: *A. chilensis* Silvestri, 1904 (from Chile: Cautín, Pitrufquén, Provincia Subantártica), *A. ogloblini* Canals, 1932 (Argentina: Misiones, Santa Ana, Provincia Paranaense) and *A. normae* Cekalovic, 1974 (Chile: Concepción, Pinares, rio Bío-Bío, Provincia Subantártica). The first two were considered synonymous by SHEAR (1975), who did not studied the latter, but, reading its description seems to be also synonymous.

Large collections were made in South America in the last years and a lot of specimens of *Acropsopilio* were collected (109 from Argentina, Brazil, Bolivia and Chile) in four large regions (Provincia Yungas, Subantártica and Paranaense plus Serra do Mar), according to CABRERA & WILLINK (1980) or, according to AB´SABER (1977b) corresponding to Domínio Monte de Cactáceas e Bolsones Residuais, « Domínio Subantártico, Domínio da Finisterra Úmida Patagônica-Magelânica, Domínio dos Planaltos de Araucária and Domínio Tropical Atlântico ». In despite of the long time isolation of these areas and, the cryptic habits of the caddids, it is impossible to recognized different features which could caracterize more than one species. The characters commonly used to recognized the species of *Acropsopilio* are quite similar and it is necessary to look for new features as those from male genitalia (until now not analysed). However, SHEAR (1975) pointed out for the *Caddo agilis* Banks 1892 that the lack of variability observed in the specimens from Japan and eastern North America is resulted of the parthenogenesis established before the animal reaches its present distribution. We assume that all material examined belongs to a single species, *Acropsopilio chilensis* Silvestri, 1904.

Several papers that cited males of *Acropsopilio* in South America are misidentificated like SILVESTRI (1904) who presented a drawing of ovipositor and at the legend called it penis, CANALS (1932) and RINGUELET (1959, 1962).

MATERIAL

The collections studied were the following: AMNH (American Museum of Natural History, New York); CBF (Colección Boliviana de Fauna, La Paz); MACN (Museo Argentino de Ciencias Naturales, Buenos Aires); IML (Instituto Miguel Lillo, Tucumán); MNRJ (Museo Nacional, Universidade Federal do Rio de Janeiro); MZSP (Museu de Zoologia, Universidade de São Paulo). The number of the localities below are showed in the figure 1.

Material examined: BRASIL. São Paulo: Salesópolis (Estação Biológica de Boracéia, 45°50´W - 23°35´S, # 01), R.Pinto-da-Rocha leg., 30.X.1991, 1 ex. (MZSP-14868); idem, 28.X.1995, 1 ex. (MZSP-14869). Rio Grande do Sul: Cambará do Sul (30°50´W - 49°30´S, 900-1100 m, # 02), A.Bonaldo & L.Moura leg., 11-13.IV.1994, 1 ex. (MCN-1207). BOLIVIA. Tarija: Reserva de Tariquia (Palo Marcado, # 03), P. Goloboff *leg.*, 1 ex. (CBF). ARGENTINA. Salta: Finca Jakulica, 25 km NW of Aguas Blancas (# 04), M. Ramírez & P. Goloboff *leg.*, 15-19.XI.1994, 1 ex. (MACN/IML). Tucumán: camino a Cochuna (ruta provincial 330 km 37, # 05), P. Goloboff leg., 5.I.1995, 1 ex. (MACN/IML); camino a Tafí del Valle (5 km W of El Indio, # 05), M. Ramírez & P. Goloboff leg., 24.XI.1994, 1 ex. (MACN). Neuquén: Hua Hum (# 06), E. Maury leg., 23-25.IX.1987, 1 ex. (MACN); Laguna Piré (19 km W of Villa La Angostura, # 07), E. Maury leg., 30.I.1991, 4 ex. (MACN). Santa Cruz: Extremo NW Lago Rico (15 Km S of Punta Bandera, # 08), E. Maury leg., 26.I.1978, 3 ex. (MACN);

Arroyo Las Monjas (15 KM E of Glaciar Perito Moreno, # 08), E. Maury leg., 23.I.1988, 1 ex. (MACN). Tierra del Fuego: Bahía Buen Suceso (# 09), E. Maury leg., 16–31.I.1986, 30 ex. (MACN); Bahía Aguirre (# 09), S. Nuñez leg., 4.II.1949, 2 ex. (MACN). CHILE. Malleco: Monumento Natural Contulmo (# 10), E. Maury leg., 13.I.1987, 1 ex. (MACN); Fundo María Ester (15 km W of Victoria, # 11), E. Maury leg., 8–9.I.1987, 1 ex. (MACN). Cautín: Parque Cerro Nielol (# 12), Temuco (# 12), E. Maury leg., 15.I.1989, 15 ex. (MACN). Valdivia: S of Lago Pirehueico (#13), E. Maury & A. Toth leg., 18.I.1985, 3 ex. (MACN). Osorno: Aguas Calientes, Parque Nacional Puyehue (# 14), N. Platnick & R. Schuh leg., 28.I.1986, 1 ex. (AMNH); camping Nomeolvides (7 km E of Entrelagos, # 14), E. Maury leg., 30.I.1991, 22 ex. (MACN); Los Derrumbes (5 km S of Termas de Puyehue, #14), E. Maury leg., 9.I.1988, 1 ex. (MACN); Anticura, Parque Nacional Puyehue (# 14), E. Maury leg., 9.I.1988, 2 ex. (MACN). Palena: 25–27 km N of Chaitén (# 15), N. Platnick, P. Goloboff & R. Schuh leg., 17.I.1986, 2 ex. (AMNH); Termas del Rio Amarillo (SE of Chaitén, # 15), E. Maury leg., 4.I.1986, 1 ex. (MACN); 20 km N of Chaitén (# 15), E. Maury leg., 15.I.1988, 1 ex. (MACN); Rio Yelco Chico (S of Puerto Cárdenas, # 16), E. Maury leg., 15.I.1988, 1 ex. (MACN). Aisén: 85–89 km S of Puerto Puyuguapi (# 17), N. Platnick, P. Goloboff & R. Schuh leg., 19.I.1986, 1 ex. (AMNH); 102 km S of Puerto Puyuguapi (# 17), N. Platnick, P. Goloboff & R. Schuh leg., 19.I.1986, 2 ex. (AMNH); Reserva Nacional Rio Simpson (37 km W of Coihaique, # 18), N. Platnick, P. Goloboff & R. Schuh leg., 20.I.1986, 6 ex. (AMNH).

Published data not studied by the authors: CHILE. Cautín: Pitrufquén, # 12 (SILVESTRI, 1904). Concepción: Florida (#19), Pinares (# 21) (CEKALOVIC, 1974); Penco (# 19), Cerro Caracol (camino a Ramuntcho, #20), Estero Nonguén (# 20) (CEKALOVIC, 1985).BRAZIL. Rio de Janeiro: Itatiaia (Parque Nacional do Itatiaia, 44°43´W – 22°20´S, 1,600 m, # 22) (KURY, 1994). Santa Catarina: Seara (Nova Teutônia, 52°30´W – 27°11´S, 300–500 m, # 23) (GRUBER, 1974). Rio Grande do Sul: Sinimbú (52°30´W – 29°30´S, 200 m, #24) (GRUBER, 1974); near 50°07´W – 29°40´S (# 25) (GRUBER, 1974). ARGENTINA. Misiones: Santa Ana (# 26) (CANALS, 1932). Buenos Aires: Punta Lara (# 27) (RINGUELET, 1962). Rio Negro: Lago Frías (# 28) (RINGUELET, 1959).

DISCUSSION

Only immatures and females were collected, males were not found. It is difficult to know if the males live in a different place from females/immatures; if *A. chilensis* has a short span adult life or; if it is parthenogenetic. In the literature the parthenogenetic hypothesis is presented as the most plausible possibility (SHEAR, 1975). However, it is interesting to note that the small part of the material examined (Argentina and Chile) are adult females. An exception to this report is the record of the male of *Acropsopilio venezuelensis* from El Junquito–Carayaca road, Distrito federal, Venezuela (GONZALEZ–SPONGA, 1992). The lack of males in our samples make the study of the male genitalia impossible. The penis has been proved to be a very useful organ in the systematic of the order Opiliones (MARTENS, 1986). A similar case were found by COKENDOLPHER & MAURY (1990) which made a remarkable record of an undetermined species of *Austropsopilio* Forster.

The *Acropsopilio chilensis* occurs in widely disjunct areas in southern Chile, Argentina, and southern Brazil (Fig. 1). When its distribution is analysed it results that this species is basically associated to the forested areas, and largely absent from the so–called « diagonal of open formations » (VANZOLINI, 1974; VANIN, 1986) or « savanna corridor » (SCHMIDT & INGER, 1951), which extends from northeastern Brazil to the Chacoan dominion and the Patagonian biogeographic Province in Argentina. The Chaco Region was subjected to very severe ecological conditions (dry and cool climate with

aeolian sand and loss deposition, establishment of a dry sea–level changes, etc.) during the Quaternary, after its subsidence (see references in SILVA, 1995). The only record that appears to be outside these forested areas is Punta Lara (Provincia de Buenos Aires, Argentina), and it could be explained by dispersal of tropical forest elements along the Paraná–La Plata system (RINGUELET, 1961), or by the existence of an ancient population in a relictual subtropical forest (RINGUELET, 1962).

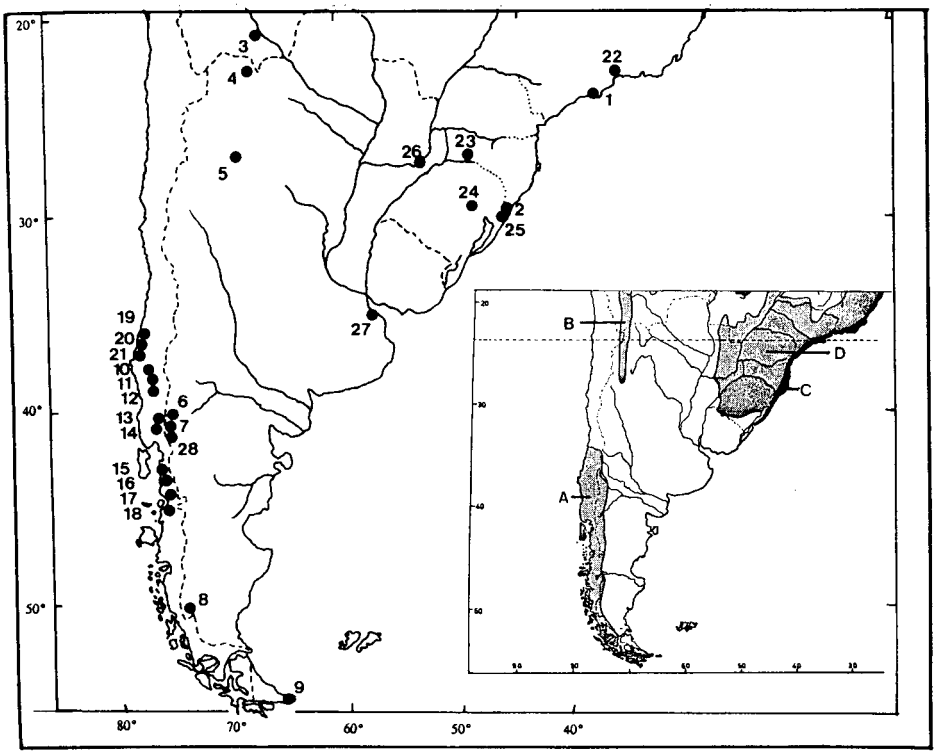

Fig. 1. Records of the distribution of the *Acropsopilio chilensis* in Southern South America. See the item material examined and published data for the name of the localities. The map of the present vegetation of southern South America on the right side was modified from HUECK (1972) and shows the four regions on which *A. chilensis* occurs: A) Subantartic; B) Yungas; C) Serra do Mar; and D) Paranaense.

A recent analysis of the Neotropical Peiratinae (Heteroptera: Reduviidae) by MORRONE & COSCARON (in press) showed that the gradual development of this open vegetated diagonal separated a former widespread forest. It has been hypothesized that the development of this forest occurred after the breakup of Gondwanaland into South America and Africa (Upper Jurassic–Lower Cretaceous). From Cretaceous to Eocene, southern South America had a subtropical climate and this forest was widespread throughout most of the area, stretching to the northern part of the Antartic peninsula (PATTERSON & PASCUAL, 1972; PASCUAL & ORTIZ JAUREGUIZAR, 1990). The major tectonic event that shaped the continent was the gradual uplift of the Andes, which began in the late Oligocene and underwent its major uplift until the Pliocene. By cutting off the Pacific wind drift, this uplift induced the aridity of vast areas of southern South America. With some regional range fluctuations, tropical to subtropical environments were well represented as far as the southern tip of the continent until early Miocene. In the middle

Miocene these environments were shifted to the North, and extensive open–country environments ranging from wetter subtropical savannas to cold–temperate steppes developed (PASCUAL & ORTIZ JAUREGUIZAR, 1990). During Pliocene and Pleistocene, geological changes drastically altered the climate and vegetation, and a major dry–cool climatic period occurred (AB´SABER, 1977a; 1982). Semiarid vegetation extended into the continent, and once continuous plant and animal populations became isolated in forested regions, where moist habitats provided refuge from the expansion of arid habitats.

The discontinuous pattern of *A. chilensis* as well other plant and animal taxa, is what one would expect under a vicariance event due to dry conditions, instead of long–distance dispersal. A pre–Quaternary age for most Amazonian distributional patterns was postulated by CRACRAFT & PRUM (1988) and BUSH (1994), with speciation processes taking place over at least the last 25 million years. The basic disjunction analyzed herein seems to be rather ancient and due to the vicariance caused by the Andean orogeny and the formation of great rivers.

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