ODONATA FROM THE PARIA PENINSULA, IN THE EASTERN COASTAL CORDILLERA OF VENEZUELA

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Abstract — 32 spp. are reported from the eastern Paria Peninsula in the region of Macuro, Estado Sucre, NE Venezuela. The area studied includes part of the ten-year old Paria National Park. Two of the spp. captured (including one previously undescribed) are endemic to the eastern Coastal Cordillera, and may be under threat. Behavioural notes are given for a number of spp.

Introduction

Despite Venezuela having one of the richest odonate faunas in the world, with over 500 described species, detailed distributional data are largely lacking, particularly for the rarely visited north-east regions. The records described below result from the activities of the "Cambridge Columbus Zoological Expedition to Venezuela, 1988", which spent seven weeks on the eastern Paria Peninsula during July and August 1988. The Expedition's primary aims were to identify bird and insect species rare or endemic to the Paria National Park, and thus provide important data for use in Park planning and management.

Sites visited

All the sites visited were at the eastern end of the Paria Peninsula, within 10 km of the village of Macuro. Sampling was concentrated around a number of small streams or rivers either in the immediate vicinity of Macuro village, or within the boundaries of the National Park. In addition, a number of casual visits were made to streams entering Aricagua bay (E of Macuro); some sampling was carried out on overland trips from Macuro to Uquire on the north side of the Peninsula, and Don Pedro (E of Uquire) to Aricagua. One visit was made to Patao, some way W of Macuro. Work within the National Park was based at Rancho Los Chorros, a hut at approximately 500 m altitude on the Macuro-Uquire cross-peninsula path. Individual site descriptions are given below.

(A) Pool behind beach, Macuro. This consisted of an open area ca. 10x10 m, adjoining a large reed bed and a further open area overhung by trees and bushes. The main open area has a sandy bottom, maximum depth of 45 cm, with some patches of floating algal mats. Being only 15 m from the sea, it was probably brackish, at

least periodically. The reed bed contained a number of small open patches (< 1 m^{-2}), and had a water depth of approximately 60 cm. The more shaded open water contained larger areas of algal mats. — This pool forms the "mouth" of the Rio Macuro. However, it has no inflow or outflow except after heavy rain, as the river normally sinks into the sandy soil of Macuro before this point, and leaches through to the sea. After rain, the pool may rapidly rise 9-12 cm. The pool is in the middle of a patch of wasteland containing Macuro's rubbish dump, and is polluted by refuse and some domestic water run-off.

(B) Small stream, Macuro. A small overflow runnel from the Rio Macuro, forming a series of shallow pools at the start of the path north out of Macuro. The pools were less than 9 cm deep, and connected by sluggish channels. These may dry out during drier periods, although the pools are more permanent. The site receives direct sunshine from 0930-1400 h.

(C) Streams in secondary forest, Macuro. Two streams crossed on the path to Rancho Los Chorros, between 50 and 100 m altitude. Both in quite disturbed but lush secondary growth. Both are partly shaded, receiving dappled sunshine until approximately 1400 h.

(D) Stream 1, Rancho Los Chorros. Small mountain stream at 500 m altitude, about 100 m E of the hut, in mature secondary growth near the junction with primary forest. Consisted of a series of 0.5-1.5 m waterfalls, rapids and small pools (< 15 cm deep). Plant material in the stream was fibrous tree/shrub roots and dead, decaying leaf material. No green aquatic plants. The stream was heavily shaded, receiving dappled sunlight at best, and no direct insolation, between 0715 and 1530. The stream banks were formed by damp earth, vegetation and rocks.

(E) Stream 2, Rancho Los Chorros. Small stream, very similar to D (above), except with a smaller area visible and exposed to direct sun as a result of a treefall. It was 500 m E of the hut at 500 m altitude.

(F.) Casual observations:

- rain puddles in Macuro streets
- Aricagua track
- two streams entering Aricagua bay
- stream at ca. 100 m in secondary growth on Aricagua-Don Pedro path
- around hut (500 m). Several species were seen hawking in the clearing by the hut
- on a transect line from the hut to the summit of Cerro El Olvido used for bird studies
- disused banana plantation to E of site E
- path descending to Uquire from Rancho Los Chorros.

Species encountered

Under each species are notes on the sites where it occurred, and some behavioural observations. It is hoped that this information may prove relevant to behavioural studies of odonates or other insects.

Calopterygidae

Hetaerina caia (Drury) — Two males caught at a stream in open cultivated land, Patao, July 17. These were transitional to ssp. *dominula* Hagen.

Hetaerina occisa Hagen *in* Selys — Sites C, D, E, stream in Aricagua bay, and in secondary forest on the Aricagua-Don Pedro path. Common at all sites, with males perching in or near patches of dappled sunlight, and behaving aggressively to other males. Interactions involved extended spiralling chases. Individually marked males remained at sites D and E for over four weeks, utilising several perches around the same pools.

Coenagrionidae

Argia cupraurea Calvert — Sites C, D, E. Similar habits to *A. orichalcea*. A forest species often abundant around streams in areas of dappled sun. Although some aggressive interactions were seen between males, it was more usual to see several perched on the same leaf. Oviposition occurred in tandem, in slower moving water at the edge of streams, with the female injecting eggs into underwater vegetation or algae.

A. oculata Selys — Sites B, C, E. Abundant at all the lower altitude sites, its presence at site E may indicate invasion from the lower secondary vegetation in the area of Macuro.

A. orichalcea Selys — Site C, stream in Aricagua bay, Patao. Common at each of these sites, possibly preferring sites with more direct sunlight than *A. cupraurea*. No territorial activity seen; oviposition in tandem, the female perching on small rocks or branches in the fas-

ter-flowing parts of streams, and injecting eggs into submerged algae.

A. pulla Selys — Sites B, C, E, stream on Aricagua-Don Pedro path. Abundant at all the lower altitude sites, its presence at site E may indicate invasion from the lower secondary vegetation in the area of Macuro.

Megapodagrionidae

Megapodagrion lepidum Racenis — Sites D and E. A species endemic to the eastern Coastal Cordillera (DE MARMELS, 1989). Males are highly alert and aggressive to all other species of damselfly present. They perch on leaves in areas of dappled sun with wings spread as in the Anisoptera. Egg-laying occurs in tandem, one pair in which the female had previously been paint-marked ovipositing for at least 75 minutes. Copulation lasts at least six minutes. Although apparently common around the two forest study streams, DE MARMELS (1989) suggests that the species may be under threat due to severe deforestation, forest fires and construction of water reservoirs in the eastern Coastal Cordillera.

Platystictidae

Palaemnema orientalis De Marmels — DE MARMELS (1989) describes this new species from material provided by the Expedition. An important forest species observed at sites C and D. Only one female was seen or caught, hovering under an overhanging rock about 2 m from the stream edge at site C. Males space out along the streams, and may participate in long hovering displays reminiscent of the Calopterygidae. These involve long periods of hovering "face-to-face" separated by < 1 cm, during which each male will suddenly rise 10-20 cm and drop back to the original level. The males usually alternate in this behaviour. Two such displays seen lasted 4 and 5 minutes, and ended by the males separating and perching approximately 1-2 m apart. No cue for ending the display was obvious. Mating or oviposition was not observed. Males were seen to pounce aggressively on other males of the species. Endemic to the eastern Coastal Cordillera, and possibly endangered as described for the previous species (DE MARMELS, 1989).

Polythoridae

Cora cyane Selys — Sites, C, D, E, plus a site similar to C on the Aricagua-Don Pedro path. Common at all streams examined above 50-100 m altitude. Unusual features include oviposition into mossy or damp branches several metres above flowing water, extreme site tenacity of some males (over two weeks at one perch), parasitism of male guarding behaviour by up to five females, and the maintenance of normal activity levels in extremely overcast and even wet conditions.

Protoneuridae

Protoneura amatoria Calvert — Tandem pair caught perched above small stream in a cacao plantation, Aricagua bay, July 18.

Pseudostigmatidae

Mecistogaster ornata Rambur — One female specimen seen in the disused banana plantation to the east of the rancho. Members of this family have extremely long abdomens, reputedly for oviposition into treeholes or tank bromeliads (see FINCKE, 1984). One species has been observed "throwing" eggs into three holes by flicking its abdomen (MACHADO & MARTINEZ, 1982). This species would be expected to be limited to mature rain forest.

Aeshnidae

Anax amazili (Burmeister) — Frequently seen hawking in and around Macuro, over streets, waste ground and site A. Oviposition by injection into reeds also observed at site A.

Coryphaeschna luteipennis (Burmeister) (probable) — One specimen seen flying low on transect path at 800 m on an overcast day.

Gomphidae

Progomphus dorsopallidus Byers — Site A, July 15.

Libellulidae

Brechmorhoga nubecula (Rambur) — Female caught at site E, July 22, flying low over water surface and under overhanging vegetation in search of egg-laying sites.

Brechmorhoga p. praecox (Hagen) — One caught at pool at the start of the Los Chorros path (used as a swimming pool by local residents), in rough plantations N of Macuro, July 15.

Dythemis m. multipunctata Kirby — Site C, July 17. Lone males seen actively patrolling the more sunlit pools along the stream; females not seen.

D. sterilis Hagen — Sites A and B. Perching on vegetation in sunlight near small patches of

open water.

Erythrodiplax b. basalis (Kirby) — Site A, B, abundant, also in Macuro itself. Copulation while perched, 1-2 min. Oviposition into floating algal mats, male non-contact guards. Females often approached and sometimes grabbed in tandem by male *E. fusca;* may explain the existence of inter-species territoriality between males of the two species.

E. fervida (Erichson) — Site A, July 16 and 25. Copulation in flight, 2-3 s, male non-contact guards during oviposition (bouts lasting ca. 1 min). A male was once seen to mate with a second female while already guarding, and then to guard both.

E. fusca (Rambur) — Sites A and B, Abundant. Copulation in flight, 5-10 s oviposition into floating algal mats with male non-contact guarding.

E. umbrata (L.) — Several seen in and around Macuro and on the Aricagua path. A number were seen feeding over dry scrub and a large area of landslip debris, at 100-250 m altitude, above Uquire on the north side of the peninsula.

Lepthemis vesiculosa (Fabr.) — Both sexes of this large aggressive libellulid were seen at site A, and individuals were occasionally noted at site B. Copulation was not seen. Females were seen to fly low among the reeds as though searching for oviposition sites (see MICHALSKI, 1988); one female was captured having become entwined on the surface of an algal mat.

Libellula herculea Karsch — Male seen regularly for short periods at site D. He was only seen after a treefall had opened up an area adjacent to the stream to direct sunlight. He had a rapid, strong flight, interspersed with short periods of perching on exposed branches in the sun. No intraspecific encounters seen.

Macrothemis pseudimitans Calvert — Site B, common.

Micrathyria aequalis (Hagen) — Site A, July 25. Similar oviposition habits to *Lepthemis vesiculosa* (above).

Orthemis concolor Ris — Specimens of both sexes were seen along the Aricagua path in late July. A male was captured over a rainpool on the path; he was probably guarding it as a potential oviposition site, as was a male *"O. ferruginea".*

O. discolor (Burmeister) — See notes on next species.

O. schmidti Buchholz — This species of large red libellulid normally appears as *O. ferruginea* (Fabr.) in the literature. This has recently been separated into *O. schmidti* and *O. discolor.* For males, the difference lies in the present species having a cinnabar-red abdomen, with pinkish pruinescence only on the thorax, whilst *O. discolor* has pinkish pruinescence on both thorax and abdomen (De Marmels, 1988). I did not separate the two species on the peninsula, but the aggregate *"O. ferruginea"* was common over pools and open ground in the vicinity of Macuro and Aricagua bay.

Pantala flavescens (Fabr.) — A truly pan-tropical species. Abundant in and around Macuro over waste ground and any water (even very short-lived rain pools). Oviposition observed at site A and in rain pools, sometimes guarded by a male. Little or no male territorial behaviour or intra-sexual aggression observed. Large swarms frequently seen feeding in early morning, and less often late afternoon, in the clearing by the hut at 500 m; apparently a long way from the nearest suitable breeding site.

Perithemis domitia (Drury) — Site A, July 25, territorial males perched at edge of shaded area of open water; highly aggressive.

Conclusions

Endemic species

Only two of the 31 species observed proved to be endemic (one previously undescribed), both to the eastern Coastal Cordillera (J. De Marmels, pers. comm.). It should be noted, however, that many of the odonate species recorded were found in disturbed ground, well away from primary forest, and are thus unlikely to be limited to the Paria Peninsula. The level of endemicity is higher when only the species seen within the primary and mature secondary forest are considered (two out of 14).

With respect to the two endemic species, subjective observations suggest that they are both common over suitable partly shaded stream habitat above 50 m altitude. Their distribution is probably limited by the paucity of streams rather than type of forest (primary vs secondary) overhanging them. I would expect them

both to be more generally distributed in the wetter western part of the Paria Peninsula. Neither species was noted in brief visits to streams above Uquire and Don Pedro on the north side of the peninsula.

Habitat quality

The dragonfly species recorded during this study are probably not suitable indicators of habitat quality for the National Park. The low diversity (31 species out of the national fauna of 500+), probably due to the isolation and relative dryness of the extreme eastern end of the peninsula, is one contributing factor. However, perhaps a more important factor is the level of maturity of much of the secondary forest, buffering the higher montane forest from invasion by more opportunistic species from cultivated areas on the coast. The montane stream species seem to be able to occupy successfully streams in reasonably mature secondary forest. However, the species found near the coast breed largely in stagnant or slow-moving water and thus occupy a different habitat type. Any reduction in numbers, or loss, of the stream dwelling species, particularly the endemics, would obviously provide serious cause for concern. There appears to be little danger of this at present.

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