

DRIFT PATTERNS IN COSTA RICA STREAMS (a preliminary report)

INTRODUCTION

Tropical streams are not as well characterized as temperate streams. The types of benthic organisms and their abundances may or may not be different from temperate systems (COVICH 1988, FLOWERS 1991). Many more studies will have to be done to understand ecological principals and to answer the question of whether tropical waters are more diverse than temperate ones.

Drift behavior of aquatic invertebrates in tropical streams has achieved little attention in the last few years. Several studies from temperate (e.g. KOHLER & McPEEK 1989, FORRESTER 1992 unpubl.) and also from tropical streams (TURCOTTE & HARPER 1982, FLECKER 1992) show that drift behavior depends on presence or absence of predators and different types of predator communities (e.g. invertebrates, fish).

Objective of this study is to evaluate factors effecting drift densities in low order tropical streams.

STUDY AREA

This study was conducted in three low order streams near Maritza, a biological field station in the Area de Conservacion Guanacaste, Costa Rica, and in two intermittent streams in Murcielago, also Area de Conservacion Guanacaste (Fig. 1). Maritza lies at about 600 m a.s.l. on the slope of Volcan Orosi at the edge of the tropical dry forest, which is the typical vegetation in the northwestern part of Costa Rica. Moving higher this dry forest changes successively from a deciduous to an evergreen rainforest and even to a cloud forest on the ridge of the mountain range towards the northeastern slopes. The Maritza study sites lie in this area of changing vegetation. The three study streams are draining the slopes of Volcan Orosi (Fig. 2), with the continental divide dissecting their watersheds. Rio Tempisquito and Quebrada Marilin are discharging into the Pacific Ocean, Quebrada Pedregal flows through Rio El Hacha into Rio Sapoa and is therefore connected with Lake Nicaragua.

The climate of the Maritza area is tropical but seasonal, with a distinct wet season from June to November and a dry season for the rest of the year. Days of precipitation are more frequent at Maritza than in Santa Rosa National Park. Annual water temperatures lie always between 20 and 23 °C. During the sampling period water temperature showed constantly 22 °C.

The study streams in Murcielago are both intermittent streams, which show continuous flow only in the rainy season. They drain into the Pacific Ocean (Fig. 3). Because of their closeness to the sea and their low elevation, they contain different vertebrate and invertebrate biota.

Rio Tempisquito

At the study site, Rio Tempisquito is a 2nd or 3rd order stream which flows right behind the Maritza Field Station. The sampling site was a few meters upstream from the crossing with the trail leading to Volcan

Río

Cacao. Riparian vegetation is dense and cover is about 70 - 80 %. Medium boulders and cobbles line the stream bed. The stream is about 3 to 5 m wide and the mean depth is approximately 30 - 50 cm. Fish species living in the stream are the cyprinodontid *Rivulus isthmensis* and the pimelodid *Rhamdia guatemalensis*, freshwater crabs ... are also common. *Rivulus isthmensis* is insectivorous and shows the maximal vertical distribution within Costa Rica (from sea level to 1500 m altitude); its body length reaches 65 mm (BUSSING 1987). *Rhamdia guatemalensis* is insectivorous, and also feeds on crustaceans and small fishes; it reaches a length up to 270 mm (BUSSING 1987).

Quebrada Marilin

Quebrada Marilin, a tributary of Rio Tempisque, is a 2nd order stream and smaller than R. Tempisque. The stream discharges from dense primary forest, and its canopy covers about 90 % at the sampling site, which lies 10 to 30 m upstream from the trail crossing. The stream bed is on average 2 m wide. * The current velocity is low, in riffle areas 0.3 - 0.4 m/s; the stream is shallow (during the time of sampling the water depth was on average 10 - 20 cm) and consists of many small pools. The only fish species in the sampling area is *Brachyrhaphis rhabdophora*, an insectivorous (BUSSING 1987) and primarily drift feeding (pers. obs.) poecilid. Freshwater crabs were also observed.

Quebrada Pedregal

Q. Pedregal is a tributary of Rio El Hacha and Rio Sapoa which drain into Lake Nicaragua. Quebrada Pedregal is a 2nd or 3rd order stream, the stream bed is made up of big boulders which form shallow and deeper pools, and also gravel and stones. Rock surfaces are densely covered with periphyton (...). This stream is an excellent habitat for Cichlidae, like *Cichlasoma nigrofasciatum*; which along with the poecilid *Brachyrhaphis rhabdophora* and the pimelodid *Rhamdia guatemalensis* make up the fish fauna of Q. Pedregal. BUSSING (1987) describes *C. nigrofasciatum* as omnivorous, feeding on aquatic insects, seeds, leaves and detritus. Stomach contents showed insect larvae and algae. As in all the other streams, nocturnal freshwater crabs are very common.

Q. Esbavelar (?)

This intermittent stream is a tributary of Q. Pedregal (different from the above described Q. Pedregal), and is in size, depth and velocity comparable to Q. Marilin. The stream bed consists of cobbles and stones and most of it dries out during the dry season, with only a few pools insuring the survival of the biota. Q. Esbavelar has a dense shrimp population. Every small pool had several individuals of ... The dominant fish in this stream is the characid ... The sampling site was about 20 m above the trail crossing which leads to Playa Blanca (approximately 2.5 km from the station). Drift was measured in two narrow riffle habitats, about 10 m apart from each other.

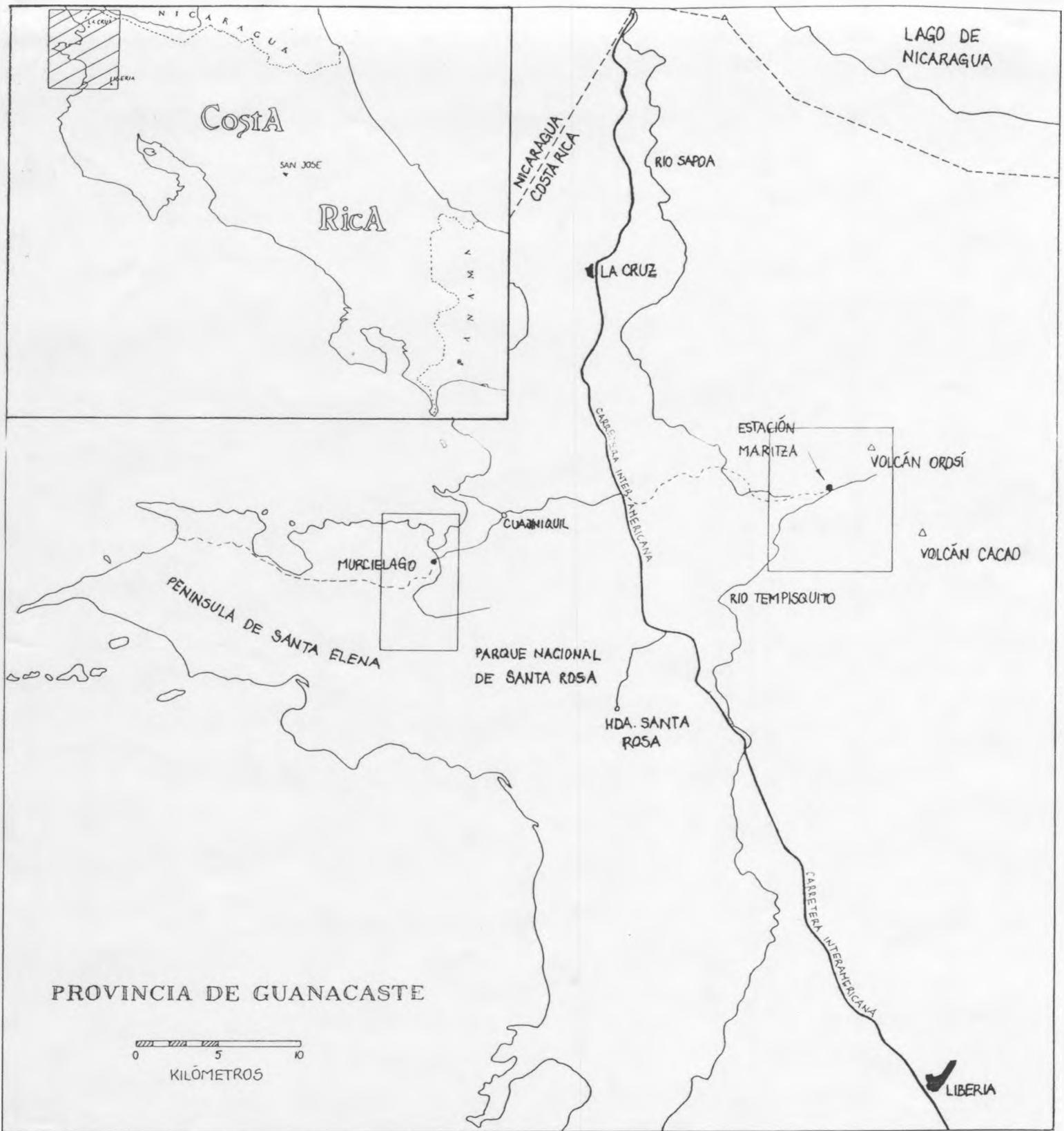


Fig 1: Guanacaste, Costa Rica, showing the two study areas.

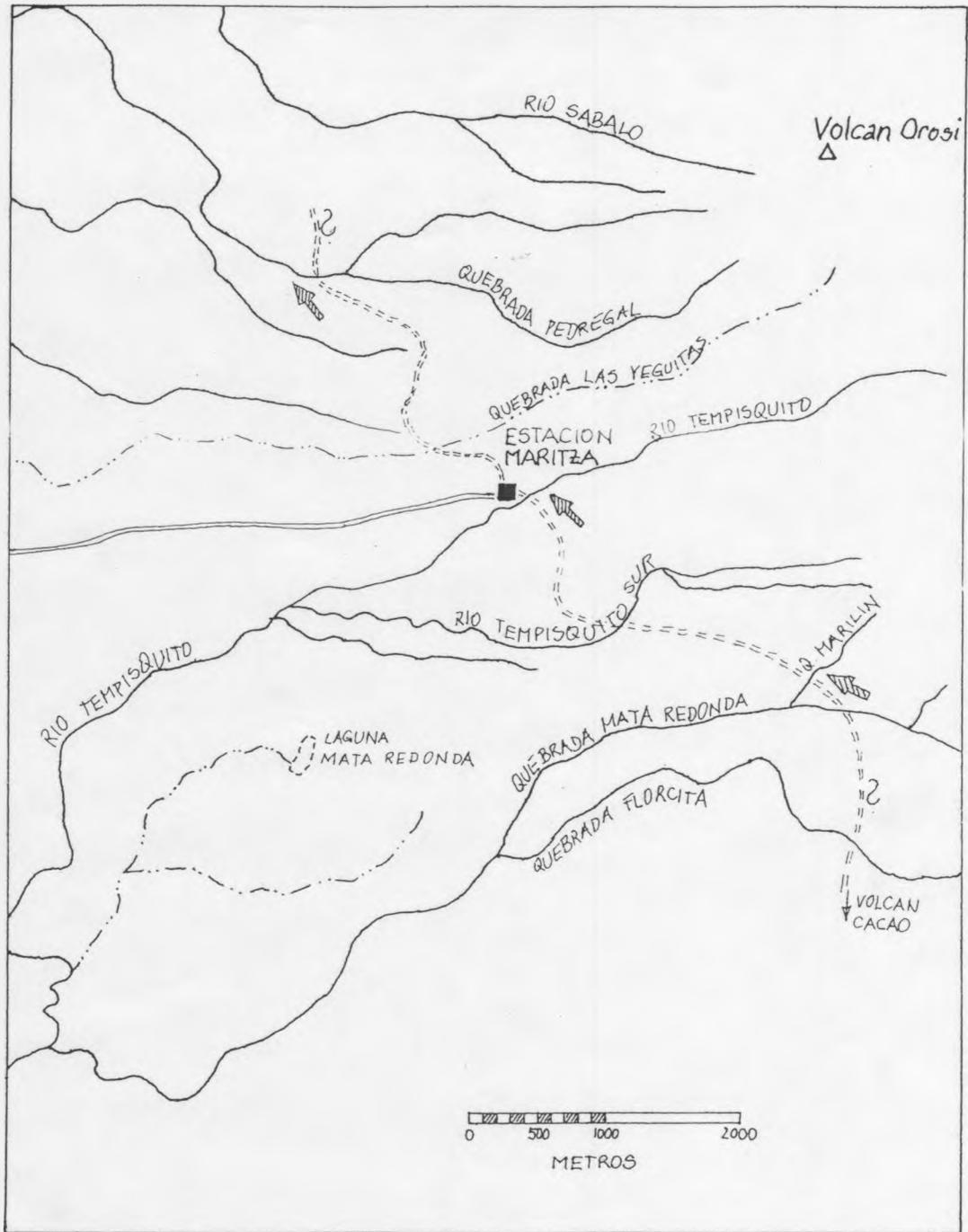


Fig. 2: Study streams draining Volcan Orosi (← sampling sites).

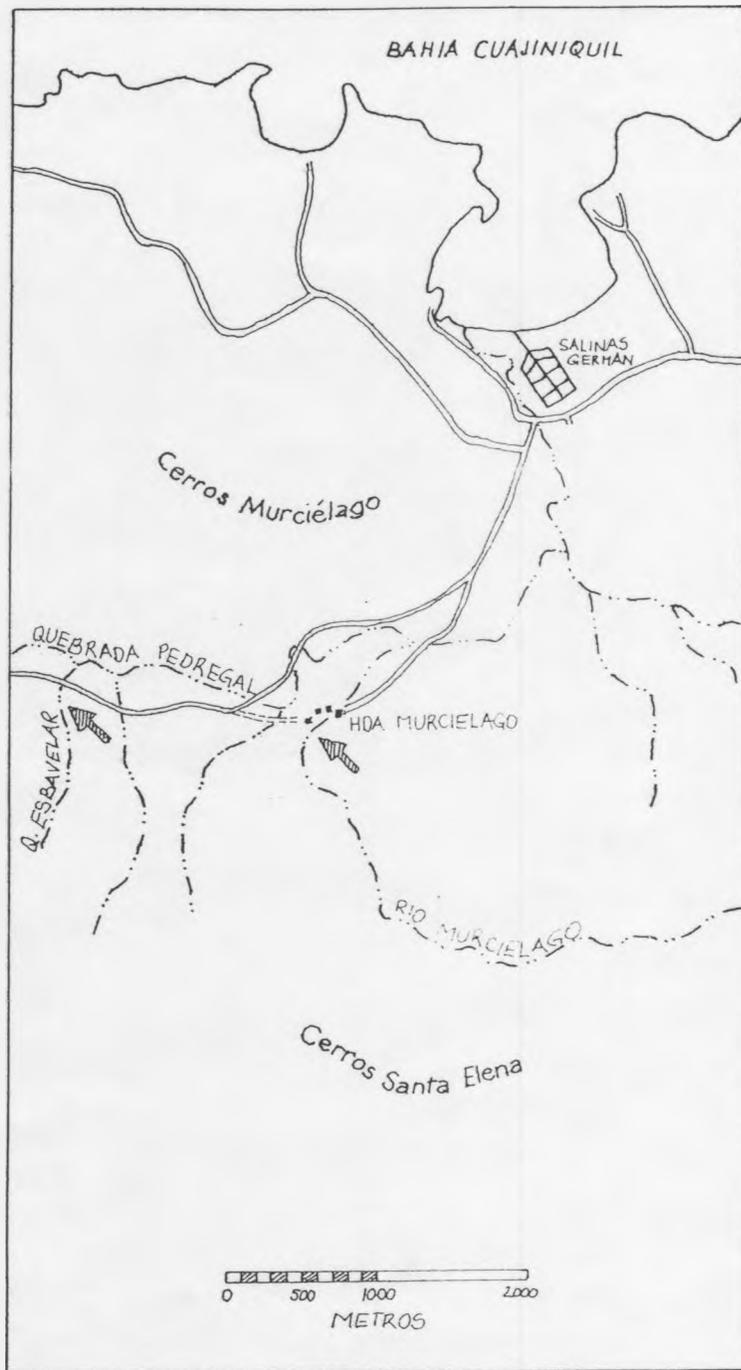


Fig. 3: Study streams in Murciélago, Peninsula Santa Elena (hatched symbols sampling sites).

R. Murcielago

R. Murcielago is an intermittent stream about 3 times bigger than Q. Esbavelar. Deeper pools hold water during the dry season. Boulders and stones build the stream bed, the flooded channel is about 6 - 7 m wide. Sampling site was next to the campground, near the entrance to the park.

METHODS

To describe the drift patterns of these tropical streams, diel drift was measured by taking samples every two hours over a 24 hour period. Fluctuations in those patterns were detected by comparing undisturbed drift samples with samples taken at times of rain and increased water flow. To discover any difference in the drift density of invertebrates after riffle habitats or after pools, a diel sampling was undertaken in Q. Marlin, where three drift nets were placed after riffle regions and one after a pool. Drift samples from intermittent streams were compared to streams with continuous flow to investigate the importance of drift in intermittent streams for the dispersal of invertebrates and their recolonization of newly discharged stream regions.

Drift nets (mesh size 150 μm) with a rectangular opening (...) were used. Every measurement consisted of at least two parallel samples, the nets exposed either next to each other or, in small streams like Q. Marlin, in a distance of about 7 - 10 m. To avoid clogging, sampling time was usually 20 minutes to an hour, depending on the current. After sampling, the drift nets were emptied into jars and the samples immediately preserved with 80 % alcohol. At the laboratory organisms were separated, identified to the lowest determinable taxonomic level and counted.

A propeller current meter was used to determine water velocity in the opening of the nets. To quantify the drift, the data will be presented as drift density (numbers of drifting invertebrates per 100 m^3 water) and where stream discharge is available also as drift rate. For R. Tempisquito and Q. Marlin the correlation between the benthic standing crop (data from B. Sweeney ?) and the drift density will be calculated.

RESULTS

Since not all of the samples are sorted yet, only a list of those samples which are important for this study is reported here.

Rio Tempisquito

20-VI-1992	16.00	18.00	18.30		
21-VI-1992	05.00	06.00			
23/24-VI-92	DIEL				
18-VII-1992	18.00	20.00			
22-VII-1992	04.30	06.00	08.00	18.00	20.00

23-VII-1992	06.00	08.00	18.00	20.00
24-VII-1992	06.00	08.00	18.00	20.00
25-VII-1992	06.00	08.00	18.00	20.00
26-VII-1992	06.00	08.00		
Quebrada Marilin				
21-VI-1992	16.00	18.00		
23/24-VI-92	DIEL			
3/4-VII-1992	DIEL			
Quebrada Pedregal				
29-VI-1992	16.00	18.00	20.00	
29/30-VII-92	DIEL			
Quebrada Esbavelar				
2-VIII-1992	17.00	18.00	19.00	
3-VIII-1992	06.00			
Rio Murcielago				
3-VIII-1992	16.00	18.00	20.00	
4-VIII-1992	06.00			

LITERATURE CITED

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