

Seasonal abundance of *Coricuma nicoyensis* Watling and Breedy, 1988 (Crustacea: Cumacea) on a tropical intertidal mud flat.

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Resumen: Un estudio de tres años muestra que el cumáceo *Coricuma nicoyensis* Watling y Breedy, 1988, presenta abundancia estacional en una planicie fangosa tropical de la zona de entre-mareas en el Golfo de Nicoya (10°N, 85°W), costa Pacífica de Costa Rica. La abundancia es alta durante la estación seca (diciembre a abril) y baja en la estación lluviosa (mayo a noviembre). Variaciones estacionales de la salinidad pueden ser el factor ambiental más obvio que influye en la abundancia de este crustáceo. Sin embargo, se necesitan estudios fisiológicos y reproductivos que brinden apoyo a esta inferencia. *C. nicoyensis* aparentemente se reproduce durante todo el año en la planicie fangosa, pero con periodos de mayor intensidad durante la estación seca.

Key words: *Coricuma*, abundance, seasonality, Cumacea, Gulf of Nicoya, benthos.

The Cumacea is a group of small crustaceans characterized by their inflated carapace and pereon, followed by a narrow pleon ending in slender elongated uropods. The body surface is often sculptured (Fig. 1). They feed on microorganisms and organic matter from marine sediments. Information on seasonal fluctuations of cumaceans is scarce, and only the life histories of several species are known (Jones 1976). Certain species are important food items in the diet of demersal fish (Rachor *et al.* 1982).

Coricuma nicoyensis is a cumacean described by Watling and Breedy (1988) based on type material collected by the author during a semi-monthly survey (February 1984 - February 1985) of the fauna of a tropical intertidal mud flat (means: 32 % silt + clay, 2 % organic matter) in

the Gulf of Nicoya (10° N, 85° W), Pacific coast of Costa Rica. In this environment, *C. nicoyensis* accounted for 20 % of the total number of individuals collected, with peak abundance during the dry season (December through April) and very low numbers during the rainy season (May through November) (Vargas 1987). These seasonal oscillations were also observed, although with less detail and intensity, during a monthly survey conducted at the site the following year (March 1985 - March 1986). In order to establish more clearly the repetition of the seasonal pattern, a third survey was conducted (July 1987 - July 1988) based on a semi-monthly sampling program. Thus, the objective of this study is to present unpublished data on the abundance of *C. nicoyensis* collected over a period of three years.

A detailed description of the Gulf of Nicoya and the Punta Morales intertidal mud flat is given in Vargas (1987, 1988). Core samples (core area:

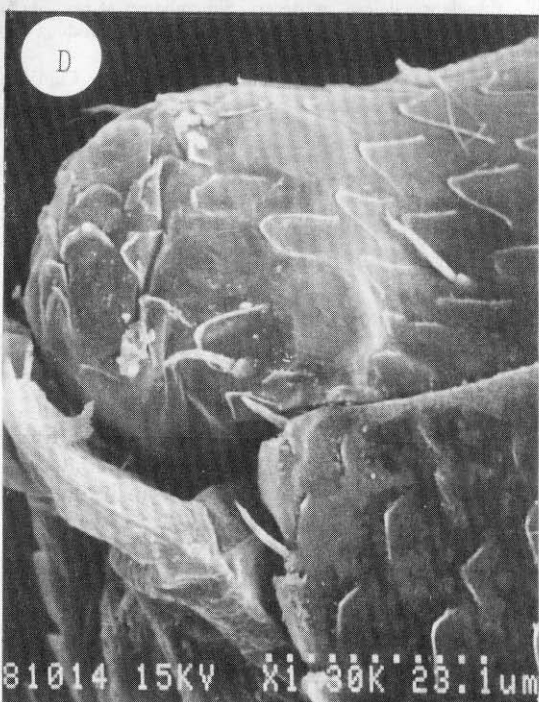
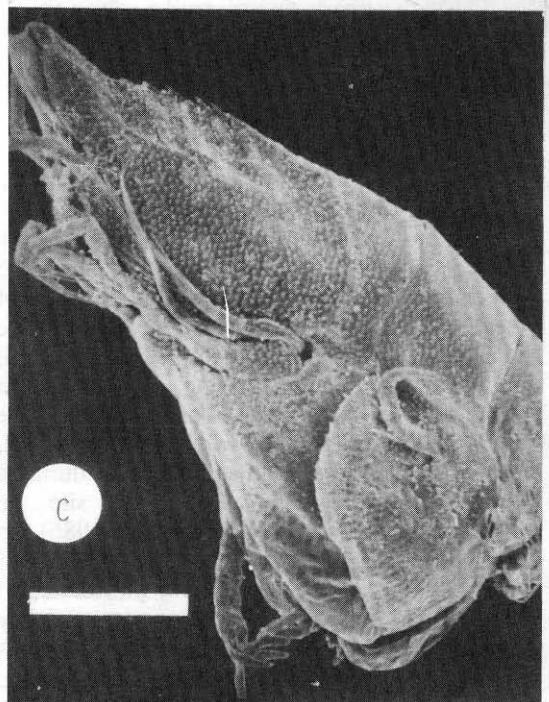
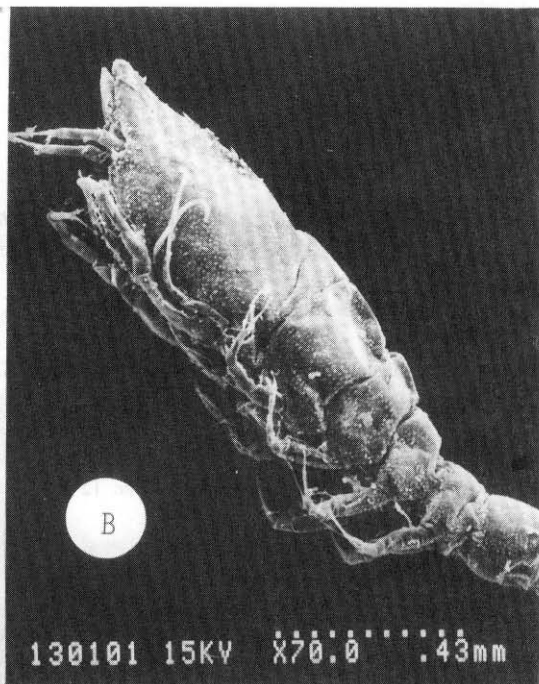
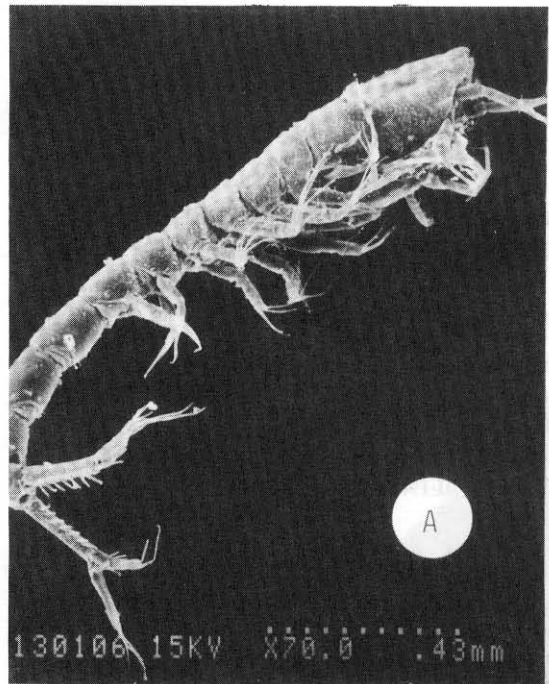


Fig 1. *Coricuma nicoyensis* (Cumacea: Bodotriinae). A. male (smaller than female, with two pair of pleopods). C. female with ventral marsupium carrying larvae. D. Eyelobe region with detail of cuticle sculpture. Dotted line indicates scale in millimeters (A, B), or microns (D). Scale bar (C) is 300 microns long.

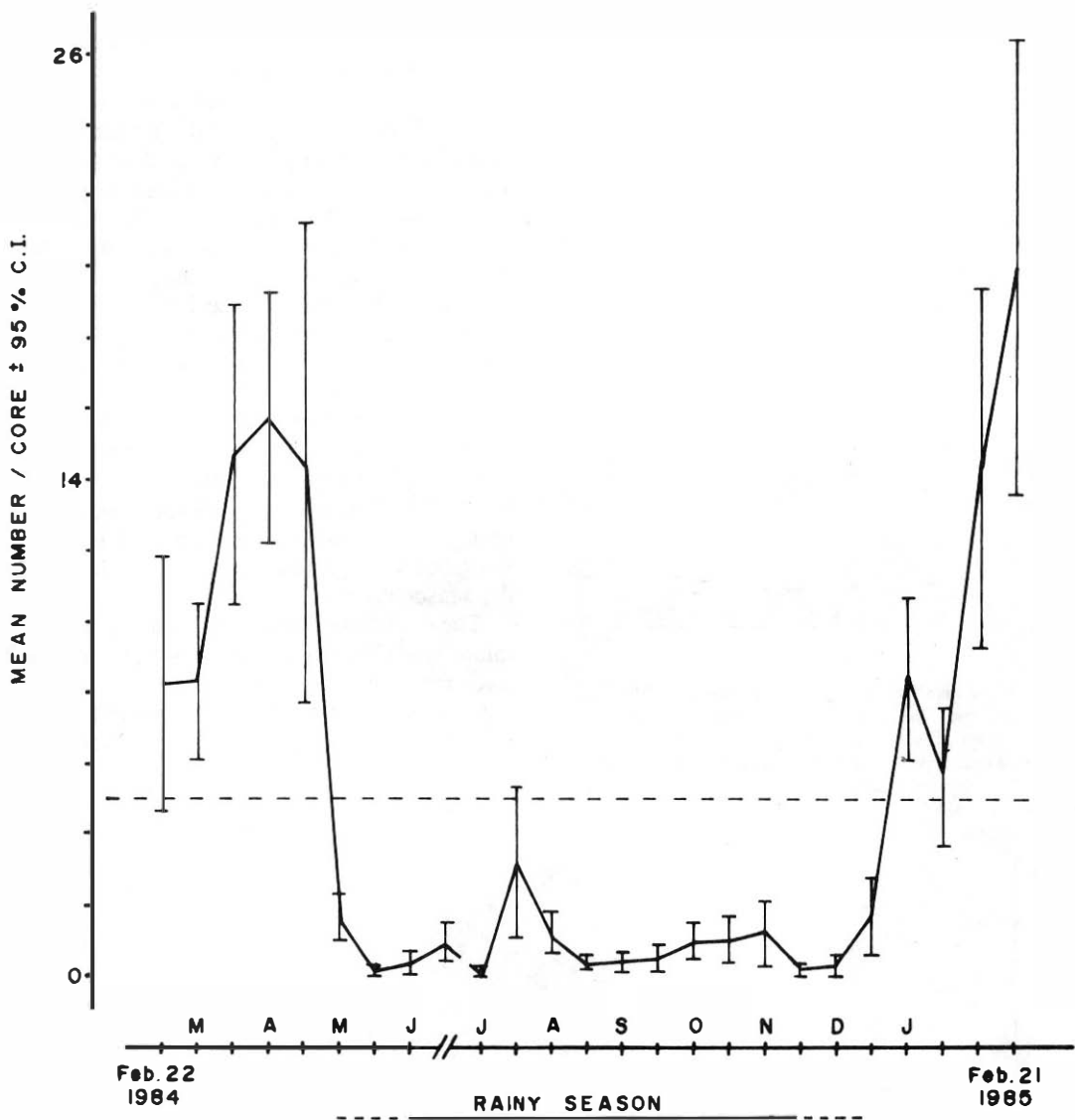


Fig. 2. Mean numbers of individuals per core ($\pm 95\%$ C.I.) for the cumacean *Coricuma nicoyensis* collected at semi-monthly intervals. Dashed line indicates mean number of individuals over the sampling period. Punta Morales intertidal mud flat, Gulf of Nicoya, Costa Rica. (Core area: 17.7 cm^2 , 28 cores per date 1984-1985).

17.7 cm^2) were collected at low tide (mean tide range: 2.3 m) to a depth of 15 cm into the sediment, and preserved in 10% buffered formalin in sea water stained with Rose Bengal. A total of 28 cores per date (25 dates) was collected by Vargas (1987), and 14 cores per date (12 and 26 dates, respectively) during the second and third surveys. A 500 micron mesh sieve was used to separate the organisms from the sediments, and

all cumaceans were stored in glass vials filled with 70% ethanol.

Salinity at low tide ranged from 27 ‰ (September, 1984) to 34 ‰ (April, 1984) and 28 ‰ (October, 1985) to 36 ‰ (March, 1985) (Vargas 1987, 1988). During the 1987-1988 survey it varied from 22 ‰ (October, 1987) to 33 ‰ (February and March, 1988). Water temperatures at low tide oscillated between 27°C and

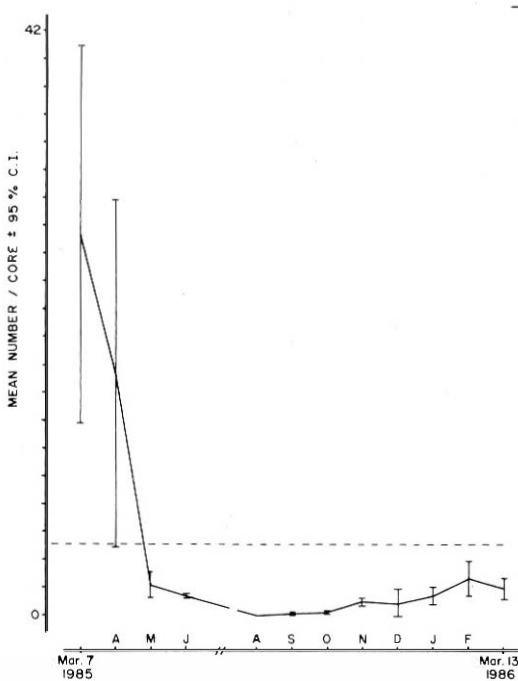


Fig. 3. Mean numbers of individuals per core (\pm 95% C.I.) for the cumacean *Coricuma nicoyensis* collected at monthly intervals. Dashed line indicates mean number of individuals over the sampling period. Punta Morales intertidal mud flat, Gulf of Nicoya, Costa Rica. (Core area: 17.7 cm², 14 cores per date 1985-1986).

40° C over the three years, and depended more on local atmospheric conditions during a particular date, than on seasonal trends.

Mean abundances of *C. nicoyensis* were 2822 and 1445 individuals per m² during the first and second semi-monthly surveys, respectively. The mean number of cumaceans collected per core during 1984 - 1986 surveys are included in Figs. 2 y 3. Abundance was high during the dry seasons and low during the rainy seasons. A similar pattern was found during the 1987 - 1988 study, with no cumaceans collected from August 1 through September 25, 1987; densities increased to a maximum by March 1988 (dry season), and decreased afterwards (Fig. 4). Thus, a repeatable dry season peak of abundance characterizes *C. nicoyensis* at the study site. Females outnumbered males (2.5 : 1 ratio, Fig. 4.) Females with developing larvae were observed throughout the surveys, but were particularly common during the dry season months.

The temperate regions are seasonal in temperature while the tropics are seasonal in rainfall. The cumacean, *Diastylis rathkei* (Kröyer) has a mean annual density close to 500 individuals per m², and shows conspicuous annual cycles with

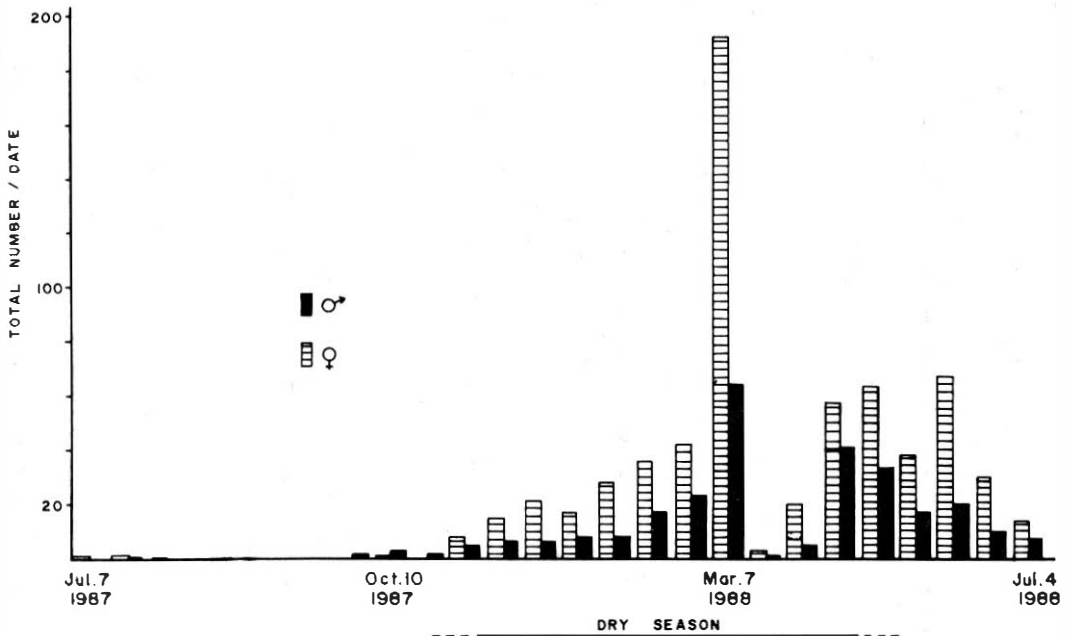


Fig. 4. Total number of males (solid bars) and females of the cumacean, *Coricuma nicoyensis* collected at semimonthly intervals at the Punta Morales intertidal mud flat, Gulf of Nicoya, Costa Rica. (Core area: 17.7 cm², 14 cores per date 1987-1988).

lowest densities during late winter and highest from May to August at 54° N. It appears that hatching and growth of juveniles are retarded after severe winters, and mating individuals are smaller than in normal years (Rachor *et al.* 1982). In the Gulf of Nicoya salinities vary seasonally influenced by precipitation (De Vries *et al.* 1983). Therefore, seasonal changes in salinity seem the most obvious environmental factor influencing the abundance of *C. nicoyensis* at the study site. This inference, however, must be tested by physiological and reproductive studies under laboratory conditions.

Rachor *et al.* (1982) indicate that remarkable low densities of *D. rathkei* are related with high species numbers of the associated fauna, stressing the importance of biological (predation-competition) interactions. Macrofaunal and meiofaunal densities in Punta Morales are relatively high: 13,827 and 2.17x10⁶ individuals per m², respectively (Vargas 1987, De la Cruz and Vargas 1987). Thus, changes in population structure induced by animal activities (feeding, construction of tubes and burrows, sediment reworking and stabilization, fecal pellet accumulation, traces, etc.) are possible, but difficult to quantify. Predation by macropredators (birds, crab, fish), however, appears unimportant at the site. Moreover, *C. nicoyensis* was found more abundant outside predator exclusion cages (5mm mesh) than inside (Vargas 1988).

Temperature varies little in tropical coastal regions, and continuous reproduction has been observed in many tropical species (De Vries *et al.* 1983). The eggs of cumaceans are released directly into the ventral marsupium, formed by oostegites (Fig. 1c), where the larvae develop to a manca state closely resembling the adult (Corey 1969). Vargas (1987) collected juveniles of *C. nicoyensis* from February to May of 1984. De la Cruz and Vargas (1987) found recently released cumaceans (retained on a 63 micron sieve) in samples collected from February to September of the same year, with a peak in February. Data gathered during the 1987 - 1988 survey indicate that *C. nicoyensis* appears to breed the year around in Punta Morales, but with peaks of reproductive activity being more frequent during the dry season. A detailed examination of marsupia may bring further support to this observation. This reproductive pattern also characterized the portunid crab, *Callinectes arcuatus* Ordway, whose spawning activity occurs throughout the

year in the Gulf of Nicoya, but with a marked peak during the five-month dry season (DeVries *et al.* 1983). Continuous reproduction, however, is not exclusive of tropical crustaceans. For instance, the cumacean *Pseudocuma longicornis* (Bate), a temperate (55° N) species, also breeds more or less continuously during the year (Corey 1969).

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