

# *MACROBRACHIUM*: ITS PRESENCE IN ESTUARIES OF THE NORTHERN VENEZUELAN COAST (*DECAPODA, PALAEMONIDAE*)

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## ABSTRACT

The altitudinal distributions of four shrimp species belonging to the genus *Macrobrachium* were studied in different rivers of the Northern Venezuelan coast. *Macrobrachium acanthurus* was always less than 20 m. above sea level with oviferous females and postlarvae in water with salinity values up to 36%. *M. olfersi* was captured up to 140 m. above sea level. While postlarvae were occasionally found in estuarine areas possessing high salinity values (36%), oviferous females were never captured in brackish waters. Post larvae of *M. carcinus* and *M. heterochirius* were not found. Adults of both species usually hid behind large rocks in the riffle area with *M. heterochirius* normally at higher altitudes.

## INTRODUCTION

ACCORDING to Holthuis' (1952) there seem to exist two groups of *Macrobrachium* with different fresh water adaptations. The first includes species like *M. amazonicum* and *M. jelskii* whose life cycles are independent of marine habitat. Species in the second group, *M. acanthurus*, *M. olfersi*, *M. carcinus*, require an estuarine period in their life cycles. Evidence for this requirement comes from laboratory studies on *M. acanthurus* (Choudhury, 1970) and *M. olfersi* (Dugger and Dobkin, 1975) for which it has been shown that the larval development needs 21% salinity. Larvae of *M. carcinus* fail to develop in salinities lower than 14-16% (Choudhury, 1971). However, in these studies the salinities of the natural estuarine habitats have never been determined.

The altitudinal distribution of some *Macrobrachium* species (*M. acanthurus*, *M. faustum*, *M. carcinus*) have been studied in Dominica (Chace and Hobbs, 1969). Other studies have described the distribution of several *Macrobrachium* species in Peruvian rivers (Guerra and Guerra, 1976) and in the Guadalupe and

San Marcos Rivers of Central Texas (Home and Beisser, 1977), but no data are provided about the lower limits of these distributions.

In this paper the altitudinal species distributions of post-larvae, juveniles and adult shrimp of *M. acanthurus*, *M. olfersi*, *M. carcinus* and *M. heterochirius* are reported in the estuarine and lower portions of different rivers of the northern Venezuelan coast.

## METHODS

During the 1976-1977 dry season (January-May), samples were collected at different river stations as shown in figs. 1, 2 and 3. Adults were captured using dip nets, and hook and line in inaccessible areas; post-larvae and juveniles (< 10 mm total length) were captured using 1 mm-screen mesh. Post-larvae of *M. acanthurus* and *M. carcinus* were identified by comparison with known standard drawings (Choudhury, 1970; 1971). The post-larvae of *M. olfersi* could be identified after a short growing period in laboratory conditions.

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## RESULTS

*Species distribution*

Post-larvae, juveniles and adults of *Macrobrachium acanthurus* were always found a few meters from the sea in those rivers with transparent waters and stony stream beds (station 1, figs. 1 and 2). However, in the Guapo River, which has the least aptitudinal gradient, turbid waters, and a muddy stream bed, juveniles were found up to 11 km from the mouth (station 3, fig. 3), and adults as far as 30 km from the mouth (station 5, fig. 3). At the time of collection, maximum salinity in most of the rivers at the lowest station (1) was 0,1%, but in the Tacarigua lagoon of the Guapo River and La Sabana River post-larvae and juveniles were captured from waters varying between 20% and 36% in salinity (Table 1). Post-larvae and juveniles of *Macrobrachium olfersi* had a distribution similar to that of *M. acanthurus* in the Guapo river, some adults being captured as far as 35 kms away from the sea (figs. 3 and 4).

Oviferous females of *M. acanthurus* and *M. olfersi* were found at station 1 at all rivers with the exception of the La Sabana and Guapo rivers where oviferous females of *M. olfersi* were never captured at the mouth.

Juveniles of *Macrobrachium carcinus* were found from 6 km up to 35 km in the Guapo River (stations 2-6, fig. 3), and adults of *Macrobrachium heterochirus* from 10 km up to 16 km in the Ocumare River (stations 3-5, fig. 1); in neither case were we able to find post-larvae during the collections.

*Aptitudinal distribution of adults*

Adults of *Macrobrachium acanthurus* were never found at altitudes higher than 20 m above sea level in all rivers studied. Adults of both *M. olfersi* and *M. carcinus* were captured as high as 140 m (fig. 4, and Table 2) but in different habitats. Adult *M. olfersi* live in stony stream beds hidden behind the shoreline plants, whereas adult *M. carcinus* prefer to hide between the rocks of the riffle areas.

Adult *Macrobrachium heterochirus* were found as high as 470 m altitude (fig. 4 and Table 2) in the same habitat as *M. carcinus*.

## DISCUSSION

From these results it is evident that the lower limit of the *Macrobrachium* species studied in the northern Venezuelan coast is a few meters from the sea. It is interesting that post-larvae and juveniles of *Macrobrachium acanthurus* and *Macrobrachium olfersi* were found in natural estuarine habitat at salinity values up to 36%. This finding indicates that these two species have a higher salinity tolerance than was suggested by earlier laboratory studies (Choudhury, 1970; Dugger and Dobkin, 1975).

Oviferous females of *M. acanthurus* have been found in brackish waters, whereas oviferous females of *M. olfersi* have never been captured in these waters. In laboratory current chambers, gravid females of *M. acanthurus* swim exclusively in a downstream direction; however, the rheotaxis is inverted upon release of larvae (Hughes and Richard, 1973). This behaviour might explain the presence of oviferous females of *M. acanthurus* in brackish waters (station 1 in La Sabana river and Tacarigua lagoon). Adults of *M. acanthurus* were found up to 30 kms. away from the mouth of the Guapo river. This river is characterized by low slope, turbid waters and a muddy stream bed, and it seems that this species may colonize habitats with these characteristics.

Post-larvae of *Macrobrachium carcinus* and *Macrobrachium heterochirus* were not found during these studies. All collections were carried out in the dry season (January-May). Perhaps we missed the oviposition period as there were no oviferous females in the samples. In Mexico, the oviposition period of *M. carcinus* is limited from June to October (Chavez and Chavez, 1976), and it is possible that in Venezuela this species behaves similarly.

This study of the aptitudinal distribution of shrimp indicates that *M. heterochirus* is able to colonize zones up to 470 m above sea level. In Dominica, Chace and Hobbs (1969) have found that this species may occur up to 750 m above sea level. *Macrobrachium faustinum* and *M. olfersi* are probably phylogenetically related species (Villalobos, 1967), and it appears that their ecologies are similar. In Venezuela, *M. olfersi* was found from 0 to 140 m above sea level, very much in agreement with what has been found for *M. faustinum* (0 to 120 m) in

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Dominica (Chace and Hobbs, 1969).

These studies may contribute to a better understanding about the biology and behaviour of literal shrimp species in their natural habitat.

### ACKNOWLEDGEMENTS

I thank my supervisor Dr. Gilberto Rodríguez for his help and constructive criticism throughout the course of this study, which was done at the Ecology Center of IVIC. I am particularly grateful to Dr. M. Robinson and Dr. I. Cesari for critically reading the manuscript of this paper.

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TABLE 1.— Maximum salinities in the river mouths during the days of collection (station 1)

Rivers	Salinity
Ocumare	0,1
Cata	0,1
Chichiriviche	0,11
Los Caracas	0,1
La Sabana	35,0
Guapo	36,0

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TABLE 2.—Position of the species of genus *Macrobrachium* in rivers of the northern Venezuelan coast.

River	Species	Stations	Distance from mouth (kms)	Altitude
Chichiriviche	<i>M. acanthurus</i>	1	0-0,5	0-10
	<i>M. olfersi</i>	1,2,3	0-4	0-140
	<i>M. carcinus</i>	2,3	2-4	60-140
	<i>M. heterochirus</i>	2,3,4	2-9	60-470
Cata	<i>M. acanthurus</i>	1	0-0,5	0-5
	<i>M. olfersi</i>	1,2,3,4	0-9	0-140
	<i>M. carcinus</i>	2,3	3-6	10-40
	<i>M. heterochirus</i>	2,3	3-6	10-40
Ocumare	<i>M. acanthurus</i>	1	0-0,5	0-5
	<i>M. olfersis</i>	1,2,3,4	0-13	0-80
	<i>M. carcinus</i>	3,4,5	10-15	60-100
	<i>M. heterochirus</i>	3,4,5	10-15	60-100
Los Caracas	<i>M. acanthurus</i>	1	0-0,5	0
	<i>M. olfersi</i>	1,2,3	0-4	0-60
	<i>M. carcinus</i>	2,3	3-4	40-60
	<i>M. heterochirus</i>	2,3	3-4	40-60
Guapo	<i>M. acanthurus</i>	1,2,3,4,5	0-30	0-20
	<i>M. olfersi</i>	1,2,3,4,5,6	0-35	0-60
	<i>M. carcinus</i>	3,4,5,6	5-35	10-60
La Sabana	<i>M. acanthurus</i>	1	0-0,5	0
	<i>M. olfersi</i>	1	0-0,5	0

(FIGURES 1 to 4 appear on pages 135-136)