

# Current fishery status of *Ucides cordatus* (Linnaeus, 1763) (Brachyura, Ocypodidae) in the Parnaíba delta region, Brazil

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## Abstract

In the northeastern Brazilian coast, the crab *Ucides cordatus* is considered as an important fishery resource, generating job and income for thousand of families. The Parnaíba Delta Region, located between states of Piauí and Maranhão (02°44'S; 41°59'W), exhibits the highest concentration of communities that depend on the crab fishery for their living. The aim of this work is to describe the current information about *U. cordatus* fishery, providing an improved basis for the development of effective management plans in this region. Data were collected from several research studies and from technical and regional meetings held between 2002 and 2004. Results showed that approximately 4500 fishermen capture 21 millions crabs per year, and that about 40 to 60% of total catches are discarded without utilization. The wastefulness is caused by inadequate techniques of capture, handling, storage and transportation. Overfishing evidences, such as the reduction of mean individual sizes and the increase of capture effort, are related to the absence of appropriate exploitation policies associated with the high demand from market consumption in the last years.

**Key words:** *Ucides cordatus*, CPUE, fishery management, Parnaíba delta region.

## Introduction

Crustaceans among from mangrove benthic fauna, *Ucides cordatus* (Linnaeus, 1763) (Figure 1) is the most explored crab in Brazil. The species occurs from Amapá to Santa Catarina State, representing an important fishery resource, with elevated socioeconomic value, generating job and income for thousand of families who inhabit littoral zones (Jones, 1984; Nordi, 1994; Ivo and Gesteira, 1999; Santos and Coelho, 2000).

Although its great social and economic importance, the *U. cordatus* capture was reduced in seven of the nine states located in northeast Brazilian Region. The capture decrease has been the first indication of its collapse as a resource. In the states of Piauí and Maranhão, where the capture has been kept constant, overfishing indications can be found, with reduction in the weight and the average size of captured specimens and increase of the fishing effort without capture increase (Legat *et al.* 2003). Between these states, it is located the Parnaíba Delta River, where approximately 4500 crab catchers have dependence on *U. cordatus* fishing for survival. The capture is carried out manually, with insertion of arm or metal hook inside of the burrows where the crab inhabits, removing one individual per time.

Fish stock collapse is common where an adequate resource management is absent. In general, exploration levels exceed maximum sustainable capacity, being common the lack of knowledge about biological aspects of the resources and human actions that modify its habitat. Thus, exploration of supplies becomes unsustainable and impracticable from an ecological and economic point of view. Within this context, the determination of the fishing effort is a basic step to evaluate the pressure to which the fish supplies are submitted, allowing to establish quotas of capture, and to assist in management plans for these resources.

The present study aims to determine the Capture Per Unit Effort (CPUE) of *U. cordatus* in the Parnaíba Delta River, and to provide information about the species fisheries in order to supply subsidies to manage crab exploitation in a more orderly and sustainable way.



Figure 1: *Ucides cordatus* (Linnaeus, 1763)

## Materials and Methods

The present work was carried out in the Parnaíba Delta River, Northeast Region of Brazil (Figure 2). Captures were carried out by traditional crab catchers between the latitudes 2°40' and 2°45' N and the longitudes 41°51' and 42°05' W. Data registry was done on a monthly basis by IBAMA from 1999 to 2002, obtained at the moment of landing (place of capture, number of crabs captured/catcher and number worked days). CPUE was calculated as the number of crabs captured by each fisherman in one day. Statistical analysis were performed according to Campbell (1989) and to Sokal and Rohlf (1969), the influence of the variables "capture area", "total time of capture" and "fisherman" on the total captured fisheries was determined through analysis of variance (ANOVA), and t-test to the level of significance of 1%.

Average work time for each catcher and the total monthly capture of crabs was estimated, considering the average between every year of collection and the total number of 4500 operating catchers in the study area.

Commercial aspects of *U. cordatus* fishery in Parnaíba Delta River from capture to consumer market were observed between August 2002 to June 2004. The problems related to this fishery were presented and discussed at periodical meetings, with the participation of fishermen, transporters, technicals, researchers, township, state and federal organizations, civil society and others private and public institutions.



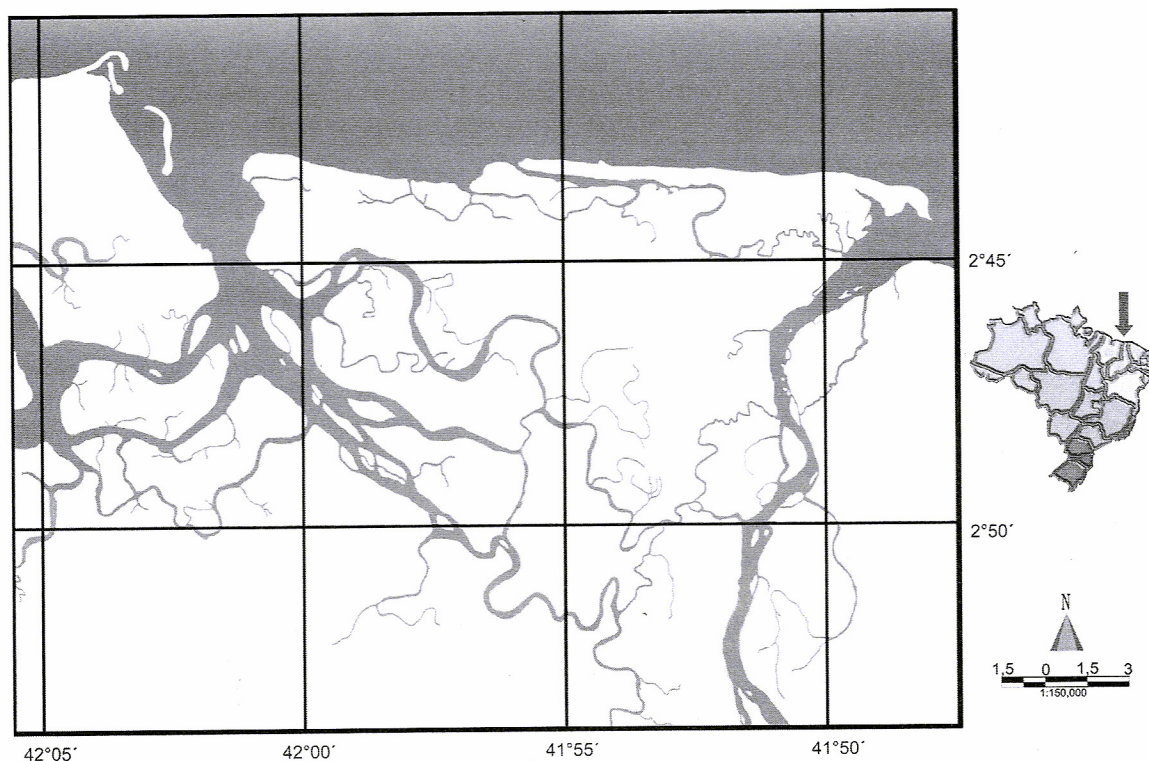


Figure 2: Parnaíba Delta River, located between Piauí and Maranhão States, northeast Brazilian region.

## Results

The average CPUE varied from 14.6 to 22.6 crabs captured by fisherman in the period of one day (Table I), with reduction observed between May and June. The values of CPUE gradually increased from July to October, having a fall in November. From December on, the capture increased until reaching the maximum value in March. No significant differences were observed between the variables tested (capture area, total time of capture and fisherman) on the values of CPUE ( $p < 0.01$ ). The time of work of each fisherman was in average 5 days per week. Considering the number of 4500 crab fishermen in the Parnaíba Delta, the number of crabs captured show a variation between 1 314 000 to 2 034 000 individuals according the CPUE values obtained during the period (Table I).

According to informations registred during meetings and observed from commercial fishery of *U. cordatus*, there is an increasing in the fishermen number and inadequate techniques of capture, handling, storage and transportation, promoting an increase of market consumption demand and a lack of appropriate exploitation policies. The following actions were suggested in these events: 1) Personal register and documentation for catchers; 2) Settlement of a closed season for *Ucides cordatus* in Piauí and Maranhão States; 3) Developing transportation facilities and management techniques to reduce crab mortality; 4) Researching market, processing and value adding on crabs products; 5) Evaluating the present fishing effort and the species exploration potential; 6) Stimulating the community organization using courses and cooperative association; 7) Promoting periodic meetings and forums; 8) Developing alternative jobs and training courses in catchers communities; 9) Increasing inspection in all stages of the crab production chain; 10) Diagnosing the social-economic characteristics from productive chain.

**Table I:** Capture Per Unit Effort (CPUE) results and estimated number of captured crabs monthly in the Region of the Parnaíba Delta River between 1999 to 2002.

Month	CPUE (1 day)	Estimated number of crabs captured by month
January	19.6	1 765 800
February	18.2	1 630 800
March	22.6	2 034 000
April	20.3	1 827 900
May	16.5	1 486 800
June	14.6	1 314 000
July	18.5	1 661 400
August	19.4	1 743 300
September	19.4	1 749 600
October	22.0	1 980 900
November	17.5	1 575 900
December	21.6	1 944 900
Total		20 715 300

## Discussion

The CPUE range observed in this research characterize the *Ucides cordatus* biology and market tendency at the Northeast Brazilian Region. The capture of crabs in Parnaíba Delta supplies, mainly, the consumers of Ceará and secondarily, the states of Piauí and Maranhão. The highest crab consumption occurs when the tourist flow is intense (December to March). In this period, the values of CPUE have been always above of 18 crabs/catcher/day. From the end of March until June, time of low season in the Northeast Region, the reduction of crab consumption leads to a consequent reduction of the CPUE. The tourist number in Brazilian Northeast Region is high in July, as the same for consumer market demand.

Although the market demand in August to November is similar to the demand in April and June, the increase in CPUE values coincides with the time of ecdysis of *U. cordatus* (Ivo *et al.*, 1999). At this time, the crabs present a soft shell and little resistance to capture methods, causing an addition in the mortality rates that can arrive to 60% of the captured total. Crabs under ecdysis process was not adequate for consumption (Fiscarelli and Pinheiro, 2002), whatever, they are sold by fishermen who are paid for individual captured.

The slow growth of *U. cordatus* suggests a high vulnerability to overfishing (Diele, 2000). In the Parnaíba Delta River region was related a reduction in number and size of captured crab caused by fishing effort, increasing together with the fishermen number and the lack of a capture prohibition period for this species (Legat *et al.* 2003). The great catcher number is a consequence at the market increase demand and the little working options in coastal areas.

Due to consumer market requirement for only alive crabs, every individuals death from catching to final delivery are discarded. According to catchers and distributors, the crab mortality rate range from 40 to 60%, depending on year season, but mainly during the ecdysis period. This suggests that capture can be decreased without affects negatively the production chain, once the product is consumed 40% less than it is fishing. The great crabs losses are associated to inadequate capture, management and storage by catchers; distributors and dealer uncorrected handling; facilities problems on the road and pluvial transportation; laws and inspection absence for transportation.



Related to transportation, the crabs are tied one to another in number of forty individuals. They are transported in boats to an open truck, in big piles without refrigeration (Figure 3). In this commercialization stage, the mortality occurs due to gills parching by the wind and to carapace crushing by heavy great crabs piles.

A preliminary study with 78 crabs suggests that mortality rate of crabs captured by traditional method is higher when it is compared to those using trap and bait methods (Legat *et al.*, 2004). However, the trap use it is not allowed by Federal Government inspection, and more researchs will be conducted to better enlightening of this preliminary study.

## Conclusion

The annual capture of approximately 21 million crabs in the Parnaíba Delta River, associated with indications of over fishing, brings to the conclusion that the collapse of the activity is a question of time. Appropriate measures can be taken to organize the productive chain and to establish an adequate resource management. The increase of *U. cordatus* capture rates, the collapse of this resource in other regions of Brazil, and the socio-economic and environmental importance of *U. cordatus* can indicate a necessity of developing actions to modify this picture. To provide these issues, EMBRAPA, IBAMA and other partner institutions, start a fishery management plan since 2004 involving the catcher communities. The development of this plan aims to reach the sustainable capture of *U. cordatus* in the States of Piauí and Maranhão.

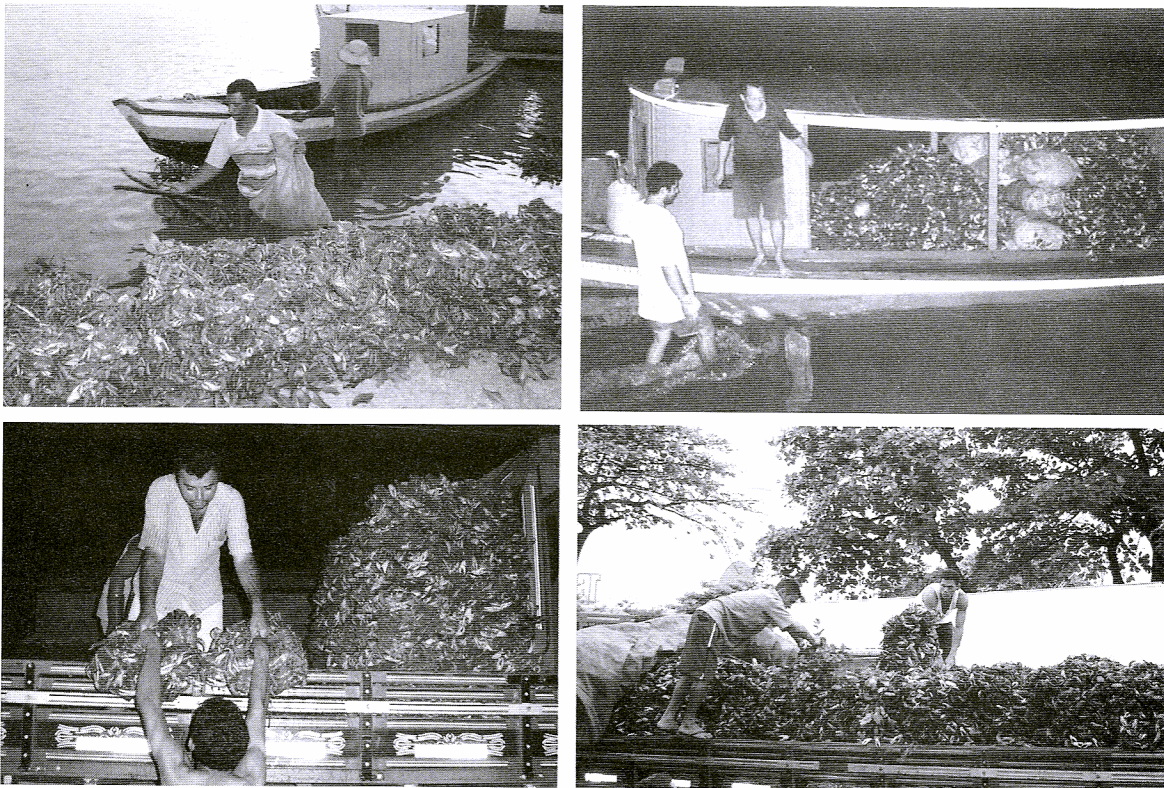


Figure 3: *Uides cordatus* tied one to another in number of forty individuals transported in boats and open trucks.

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