SOME ASPECTS OF THE BIOLOGY OF THREE FISH SPECIES FROM THE SEAGRASS BEDS AT INHACA ISLAND, MOZAMBIQUE

by

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ABSTRACT. - Aspects of the biology of three fish species, *Apogon nigripinnis*, *Leptoscarus vaigiensis* and *Siganus sutor*, associated with seagrass beds (*Thalassodendron ciliatum / Cymodocea serrulata* and *Thalassia hemprichii / Halodule wrightii*) were studied at Inhaca Island (Mozambique). Stomach contents analysis showed that both *L. vaigiensis* and *S. sutor* are herbivorous and *A. nigripinnis* is carnivorous. *A. nigripinnis* spawns between October and March, and *S. sutor* between September and February. In the case of *L. vaigiensis*, mature individuals were found during almost all times of the year. Monthly occurrences from day and night sampling are described for these species in the *T. ciliatum / C. serrulata* seagrass association.

RÉSUMÉ. - Quelques aspects de la biologie de trois espèces de poissons des herbiers de l'île d'Inhaca (Mozambique).

Trois espèces associées aux peuplements de phanérogames marines *Thalassodendron ciliatum / Cymodocea serrulata* et *Thalassia hemprichi / Halodule wrightii* de l'Île de Inhaca (Mozambique) ont été étudiées: *Apogon nigripinnis*, *Leptoscarus vaigiensis* et *Siganus sutor*. L'analyse des contenus stomacaux indique que *L. vaigiensis* et *S. sutor* sont herbivores et que *A. nigripinnis* est carnivore. *A. nigripinnis* est mature entre octobre et mars et *S. sutor* entre septembre et février. Pour *L. vaigiensis*, les individus sont matures pendant presque toute l'année. Les prélèvements ont été effectués de jour et de nuit sur le site de *T. ciliatum / C. serrulata*.

Key-words. - Apogonidae, *Apogon nigripinnis*, Scaridae *Leptoscarus vaigiensis*, Siganidae, *Siganus sutor*, ISW, Mozambique, Diet, Spawning, Seagrass habitat.

Seagrass beds at Inhaca Island, Mozambique, play a major role in the well-being of the local human population, sustaining local fisheries, particularly as nurseries for molluscs, crustaceans and commercial fish species. Fisheries are an important economic activity in this country, where resources are scarce and where every source of animal protein is welcome. The distribution of seagrass beds around Inhaca Island was first stated by MacNae and Kalk (1962). More recently, Bandeira (1991) published a detailed distribution map of the *Thalassodendron ciliatum / Cymodocea serrulata* seagrass association. Early studies on the Inhaca Island fish fauna carried out by MacNae and Kalk (1962), who listed 43 species in the seagrass beds, and by Smith (1969) who, in a general study, mentioned 10 species inhabiting *Cymodocea* associations from a total 573 identified species in the area. More recently, 66 seagrass bed fish species were described by Almeida *et al.* (1999, in press).

In this study, *Apogon nigripinnis* Cuvier, 1828, *Leptoscarus vaigiensis* (Quoy & Gaimard, 1825) and *Siganus sutor* (Valenciennes, 1835) comprised 30% of the total catch,

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and were present in the seagrass beds all year round (Almeida *et al.*, 1999). These three fish species are locally of great value either as a commercial product or as a subsistence dietary item to the human population. As there where no previous data available on the biology of these species in this area, they were chosen as target species for this study.

STUDY AREA

The Island of Inhaca is about 32 km off Maputo (Mozambique), on the south-eastern coast of Africa, at approximately 26°S, 33°E (Fig. 1). Sampling was undertaken at two stations, both located in areas presenting high densities of two seagrass associations: *Thalassodendron ciliatum / Cymodocea serrulata* (station I) and *Thalassia hemprichii / Halodule wrightii* (station II). These sites are both subject to exploitation by the native human populations.

MATERIALS AND METHODS

Fishes were collected during twelve monthly sampling operations carried out between July 1993 and July 1994 by local technicians, at two stations located in *Thalassodendron ciliatum / Cymodocea serrulata* and *Thalassia hemprichii / Halodule wrightii* seagrass bed associations respectively (Fig. 1). Trawling was carried out during daylight using a beam trawl net with a rectangular mouth of dimensions 150x50 cm, and a 1 cm mesh cod end, towed for 10 min. at a speed of 1.5 knot. At station I (Estação de Biologia Marinha) sampling was also carried out during the night. Sampling took place at high tide during the first quarter phase of the moon, with a total of thirty six samples being taken. Individuals of *Apogon nigripinnis* (Apogonidae), *Leptoscarus vaigiensis* (Scaridae) and *Siganus sutor* (Siganidae) were measured to the nearest millimetre (total length), and weighed to the nearest milligram (total weight). Stomach contents were also weighed and preserved in 10% formalin for further analysis. Gonadal maturity status was determined by macroscopic analysis (Nikolsky, 1976).

The existing lack of data (namely some specimen weights) for some monthly samples was due to labelling problems.

RESULTS AND DISCUSSION

The 36 trawls supplied 5,922 individuals, representing 66 species from 30 fish families (Almeida *et al.*, 1996b). From these, we used 486 *Apogon nigripinnis*, 83 *Leptoscarus vaigiensis* and 1,232 *Siganus sutor* in our study.

Apogon nigripinnis Cuvier, 1828

Presence and abundance. - At station II (Banco da Sangala - *Thalassia hemprichii / Halodule wrightii*), *Apogon nigripinnis* was present in March, April and June, which corresponds to the hatching period.

At station I (*Thalassodendron ciliatum / Cymodocea serrulata* association), this species was more abundant in the seagrass environment during the night than during the day (Fig. 2). The overall abundance of *A. nigripinnis* was more or less constant, with a

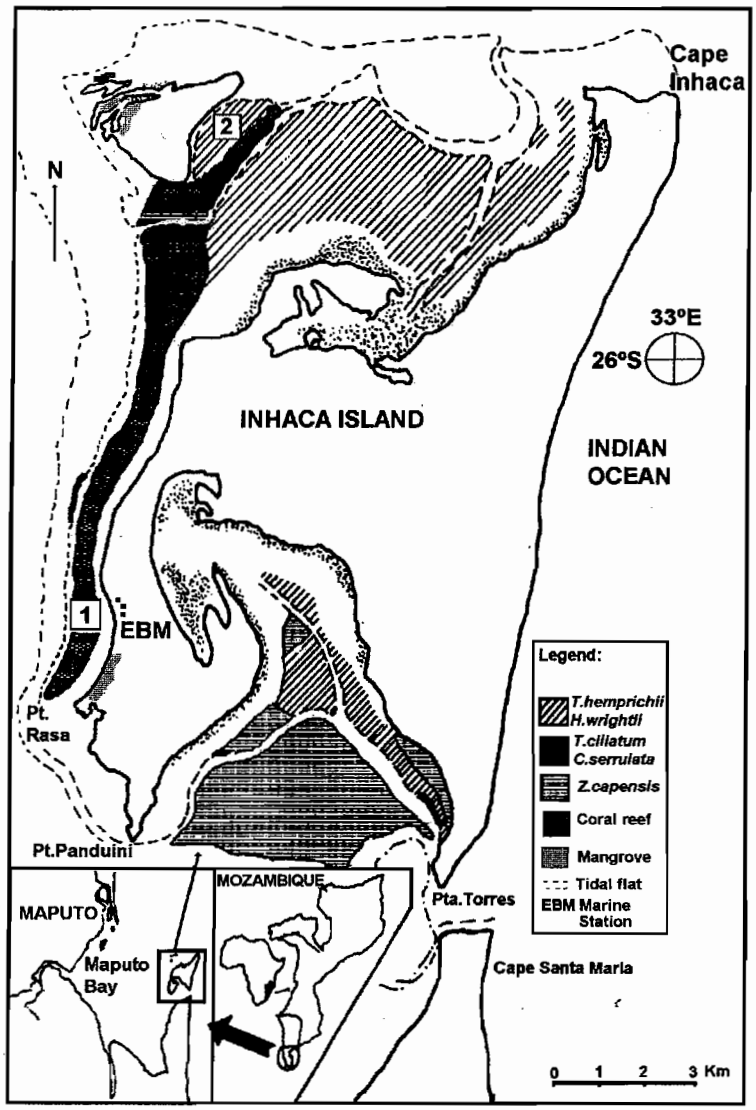

Fig. 1. - Sampling areas: **1**: Estação de Biologia Marinha - station I; **2**: Banco da Sangala - station II.

small peak in March 1994 resulting from recruitment (which explains the relatively low total catch weight) (Fig. 3). In September 1993, the higher total catch weight was due to the presence of larger individuals. The number of *Apogon nigripinnis* in the seagrass beds was lowest in July each year (Fig. 3).

Stomach contents. - *Apogon nigripinnis* has a carnivorous diet (feeding mostly on crustaceans), and seems to be more active at night. The stomach vacuity index was about 55% at night and 71.2% by day. Smaller individuals preferred small crustaceans

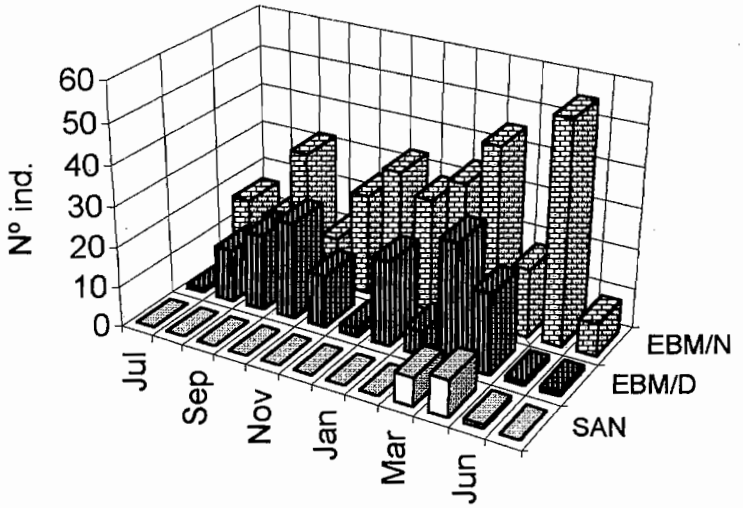

Fig. 2. - Occurrence of *Apogon nigripinnis* during the 12 month study period (1993/1994). SAN: Banco da Sangala; EBM/D: Estação de Biologia Marinha/daylight samples; EBM/N: Estação de Biologia Marinha/night samples.

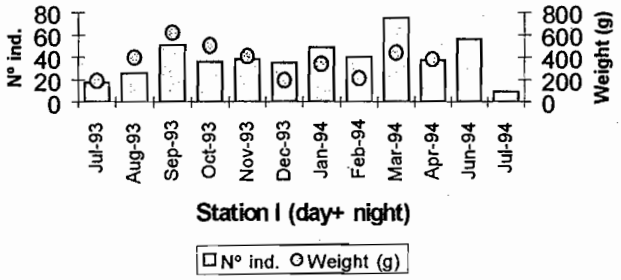

Fig. 3. - Occurrence of *Apogon nigripinnis* and its total catch weight (g) over the 12 month study period. No weight data are available for Jun/94 and Jul/94.

(Mysidacea, Isopoda, Tanaidacea) and zooplankton (Decapoda zoea, Copepoda, Cumacea) (Fig. 4).

Sexual maturation. - When the gonads where examined macroscopically, males and females of *Apogon nigripinnis* were found to be mature between October and March.

Leptoscarus vaigiensis (Quoy & Gaimard, 1825)

Presence and abundance. - This species was always present in the daylight samples at both stations, although relatively few individuals were present in each catch (Figs 5, 7). *Leptoscarus vaigiensis* was not found during February at both stations. Night catches were irregular, in that *L. vaigiensis* did not occur constantly at night all year round, but when present, mainly occurred in higher numbers compared with the daylight trawls (Fig. 6).

Stomach contents. - *Leptoscarus vaigiensis* has a primarily herbivorous diet and feeds more actively during daylight, with a vacuity index of 40% by day, compared with

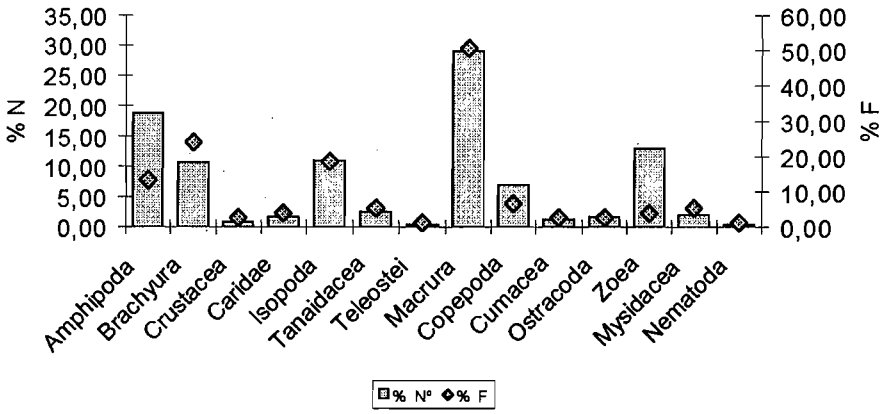

Fig. 4. - Diet of *Apogon nigripinnis*.

82.3% at night. Our feeding data confirm the previous results for this species from Madagascar (Vivien, 1973). The diet of *L. vaigiensis* is mainly seagrass. Other items found, including Algae, Hydrozoa and Porifera, which are seagrass epibionts, are possibly consumed unintentionally along with the seagrass.

Sexual maturation. - When their gonads where examined macroscopically, individuals of *Leptoscarus vaigiensis* were found to be mature during most months of the year.

***Siganus sutor* (Valenciennes, 1835)**

Presence and abundance. - Sousa (1988) stated that the fishery for *Siganus sutor* was one of the most important in Kenyan waters. Large individuals of this species, which can reach 45 cm (Fischer *et al.*, 1990), are also an important component of fisheries at Maputo Bay. In seagrass beds, the largest specimen caught had a total length of 175 mm, and the smallest 10 mm. Individuals smaller than 60 mm were only present between December and June. In this biotope, *S. sutor* is the most important species in terms of numbers and biomass (Figs 8, 9, 10).

Stomach contents. - *Siganus sutor* is primarily herbivorous. Its diet is based mainly on the seagrasses *Cymodocea*, *Thalassia* and *Syringodium*. Some seagrass epibionts (including bryozoans, hydrozoans and sponges) were also identified in the stomach contents. At night most stomachs were empty (vacuity index 93.4%), but the intestine was full. This fact suggests that this species feeds mainly during daylight (vacuity index 14.0%).

Sexual maturation. - When its gonads were examined macroscopically, *Siganus sutor* has shown to be sexually mature in the study area between September and February. De Souza (1988) found two major spawning seasons on the Kenyan coast, one from October to January and the other from April to May. Also for the Kenyan coast, Ntiba and Jaccarini (1990) claimed that were two spawning seasons, one from January to February and one from May to June.

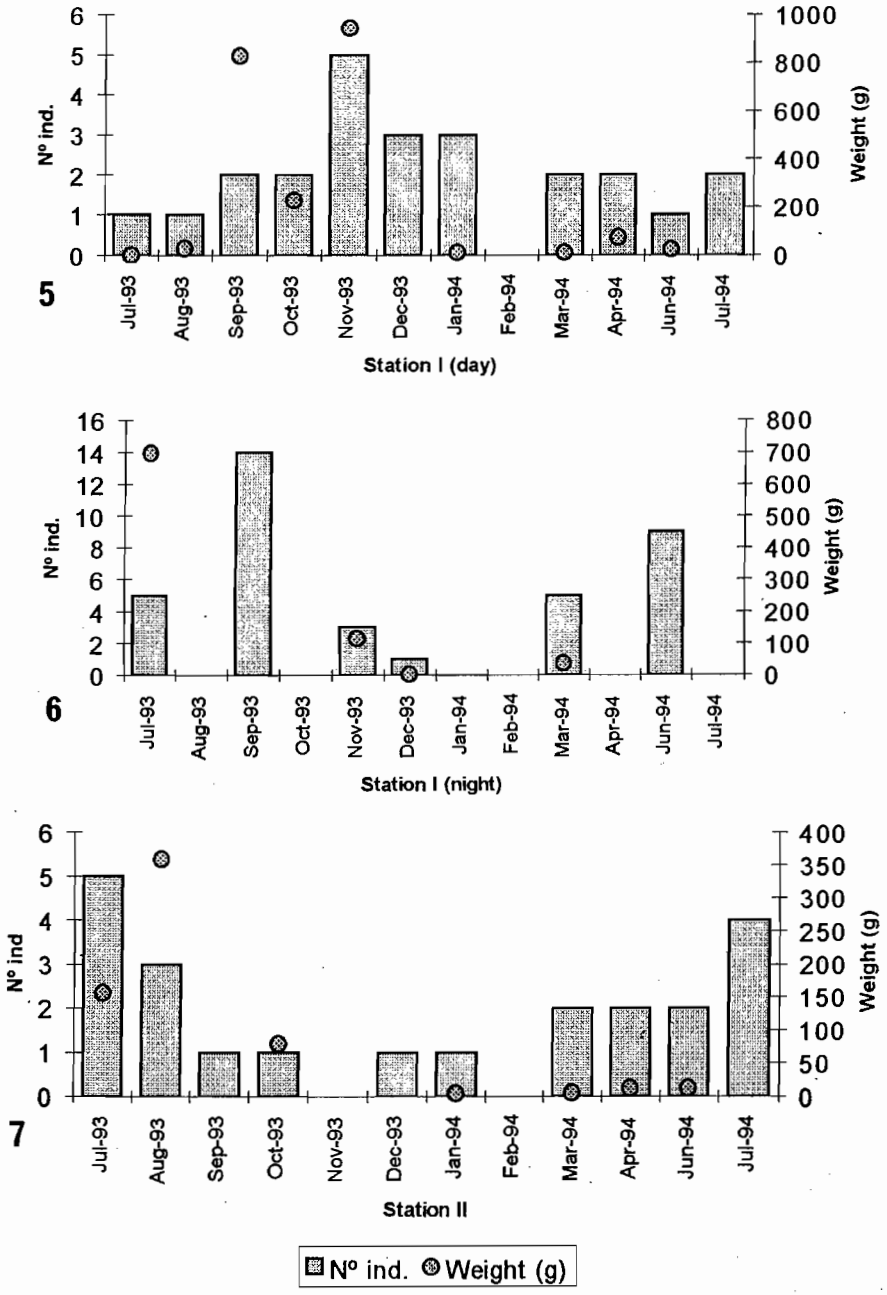

Fig. 5. - Occurrence of *Leptoscarus vaigiensis* and its total catch weight (g) over the 12 month study period at station I (daylight samples). No available data for Dec/93 and Jul/94.

Fig. 6. - Occurrence of *Leptoscarus vaigiensis* and its total catch weight (g) over the 12 month study period at station I (night samples). No available data for Sep/93 and Jun/94.

Fig. 7. - Occurrence of *Leptoscarus vaigiensis* and its total catch weight (g) over the 12 month study period at station II. No available data for Aug/93, Sep/93, Dec/93 and Jul/94.

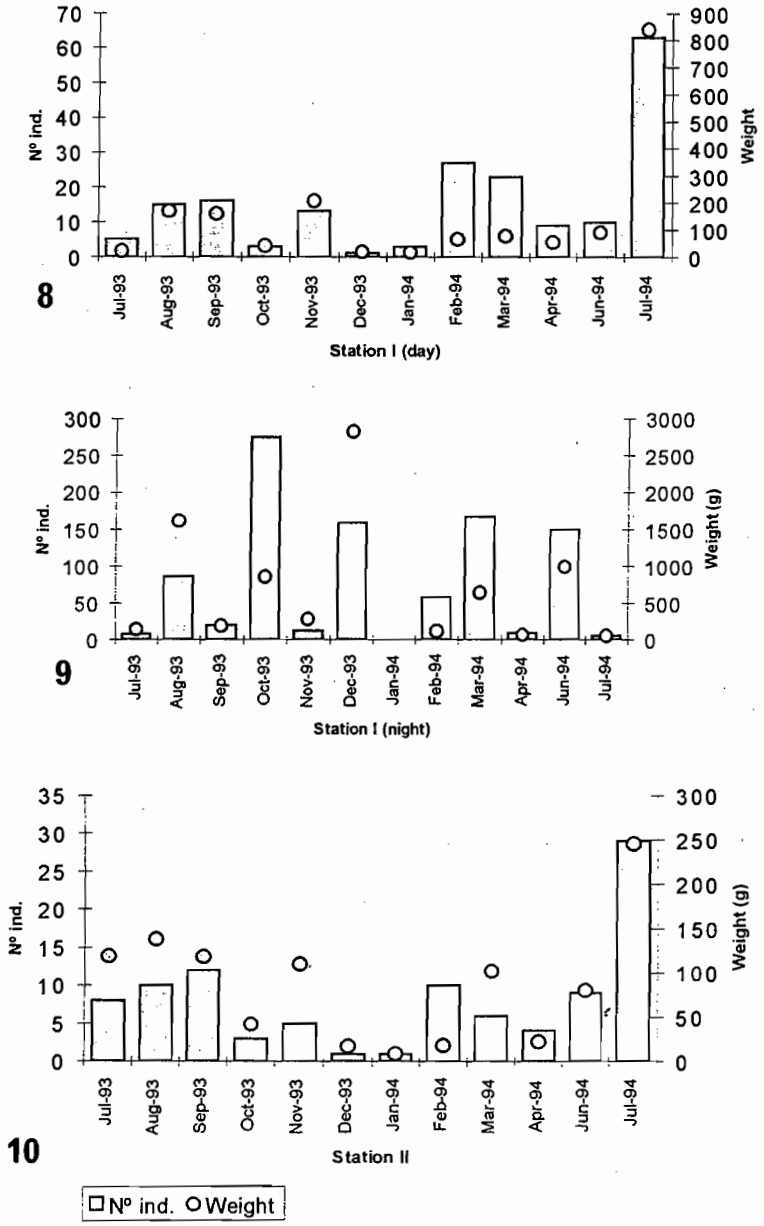

Fig. 8. - Occurrence of *Siganus sutor* and its total catch weight (g) over the 12 month study period at station I (daylight samples).

Fig. 9. - Occurrence of *Siganus sutor* and its total catch weight (g) over the 12 month study period station I (night samples).

Fig. 10. - Occurrence of *Siganus sutor* and its total catch weight (g) over the 12 month study period at station II (daylight samples).

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