

OBSERVATIONS ON MERCURY UPTAKE IN *Posidonia oceanica* (L.) DELILE

Biancaelena MASERTI and Romano FERRARA

C.N.R., Istituto di Biofisica, Via S. Lorenzo 26, Pisa (Italia)

RESUME - Dans l'étude du cycle biogéochimique du mercure, il apparaît important d'étudier l'interaction entre Benthos et sédiments. Dans ce but, une étude pour déterminer l'assimilation du mercure de part de la phanérogam marine *Posidonia oceanica* en deux zones échantillons, est en cours. La distribution du métal a été déterminée dans les rhizomes et dans les feuilles.

The state of the art on the Biogeochemical cycle of mercury in the Mediterranean Basin requires, in our opinion, the investigation of the interaction between Benthos and sediment, in order to assess the role of these organisms in making the metal bioavailable in the marine environment (Ferrara and Maserti, 1986).

It must be pointed out, in fact, that in large areas of Mediterranean Basin sediments are rich in mercury because of the presence of notable geochemical anomalies. As *Posidonia oceanica* prairies represent one of the most important ecosystems in the Mediterranean (Boudouresque et Meinesz, 1982), a study of the mercury uptake in this marine phanerogam is in progress.

Posidonia oceanica was collected in two areas, together with the related sediment and seawater: the investigation area, in front of a chlor-alkali plant (R. Solvay - Italy), presents a high level of mercury in the sediment (0.57 µg/g), while the control area (Isle of Corsica) shows a lower content (0.02 µg/g).

The plant was mineralized by a mixture of HNO₃ and H₂SO₄ (1:1) at 120°C for 1 hour under reflux and analysed by Atomic Absorption Spectroscopy.

The sediment was mineralized by HNO₃ at 120°C for 1 hour under reflux and analysed by Atomic Absorption Spectroscopy.

The seawater was filtered and photo-oxidized for 15 min. at pH 1 and the mercury content was determined after a preconcentration step on gold trap by Atomic Fluorescence Spectroscopy (Seritti et al., 1980).

An examination of the results of the measurements in these marine phanerogams, reported in table 1, allows us to draw the following conclusions:

- A mercury distribution exists in *Posidonia oceanica* collected in the studied areas. Higher levels were observed in the rhizomes (without roots and scales) and in the middle part of the leaves where photosynthetic activity is more intense. The lowest values were measured in the basal part.
- *Posidonia oceanica* grown in the sediment rich in mercury shows a higher content of the metal (0.19 µg/g) with respect to that from the control area (0.03 µg/g).
- The concentration of the dissolved form of mercury in seawater ranges from 7 - 9 ng/l for the two examined areas.

	R. SOLVAY chlor-alkali plant		ISLE of CORSICA		
	n.	Hg	n.	Hg	
SEA WATER	20	8.1 ng/l	10	7.5 ng/l	
SEDIMENT	10	0.57 µg/g	5	0.02 µg/g	
RHIZOME	20	0.17 "	7	0.02 "	
BASAL PART	20	0.05 "	7	0.003 "	
MIDDLE PART	20	0.19 "	7	0.03 "	
TOP PART	20	0.13 "	7	0.02 "	

Tab.1 - Mercury concentration in *Posidonia oceanica* and in the related sediment and seawater.
n. = number of samples.

- The high difference of mercury content in sediments appears correlated to that measured in the rhizomes.

These observations indicate that the mercury uptake in *Posidonia oceanica* could occur mainly through the root system. This is probably the primary pathway of mercury in this plant, but it is not possible to exclude that the metal can also be taken up from the water at a lower rate by the leaves.

To substantiate these hypothesis laboratory experiments are at present in progress. Cultures vessels, divided in two parts by a diaphragm, have been realized to allow the growth of leaves and rhizomes in cultures media with different mercury concentrations.

The uptake of this metal by *Posidonia oceanica*, observed also by Augier et al. (1984), suggests a possible use of the plant as bioindicator for mercury pollution.

REFERENCES

- AUGIER H., GILLES G. & L. RAMANDA, 1984. The First International Workshop on *Posidonia oceanica* Beds, Porquerolles/ France: 399-406.
- BOUDOURESQUE Ch-F. & A. MEINESZ, 1982. Découverte de l'herbier de Posidonie. Parc National de Port-Cros, *Cahier n.4*.
- FERRARA R. & B.E. MASERTI, (in press). *Mar. Poll. Bull.*
- SERITTI A., PETROSINO A., FERRARA R. & C. BARGHIGIANI, 1980. *Environ. Technol. Letters*, 1: 50-57.

RECENT ADVANCES IN KNOWLEDGE OF *ARISTEUS ANTENNATUS* BIOLOGY

F. SARDA

Instituto de Ciencias del Mar, Paseo Nacional s/n, Barcelona (Espana)

RESUME: Pendant l'année 1986 on a accompli les suivants aspects de la biologie de *Aristeus antennatus* Risso, 1816:

- 1) On a réussi à la maintien en captivité pendant 26 jours.
- 2) Pendant ce temps on a observé 3 mues d'un total de 35 exemplaires.
- 3) Quelques larves, zoeas II et III, on été capturée.
- 4) Le recrutement a lieu pendant l'automne.
- 5) Pendant les mois d'avril et mai on a observé une réduction du rostre des males.
- 6) On a analysé le contenu en calcium à divers tissus, en relation avec le cycle de mue.

Biology of *Aristeus antennatus* Risso, 1816 (Decapoda: Penaeidae), has been recently studied by RELINI-ORSI (1979,1980) and SARDA & DEMESTRE (1984,1985) and currently, these studies are being continued. During 1986, further investigations took place about new aspects summarised in the following points:

- 1) It was possible to maintain these prawns in captivity, (caught by trawl from 700 m depth). Open and closed water circuits were used. Temperature was maintained between 13 and 14°C, salinity was near 36.15, pH = 7.65 and total darkness. However, in these conditions, the mortality rate was high, but some individuals survived several weeks. During this period, these specimens remained on the bottom of the tank and rarely ate. All specimens are females.
- 2) During the captivity period (April-May, 1986), three moults were observed. The observations were made in individuals dying during ecdysis process. No external signs were observed prior to ecdysis. One can suppose that the ecdysis occurs in a few minutes. The spermatophore was lost attached to the old carapace in these cases, this implied that the males must couple with the females continuously during the maturity period, because all females (near 100%) transport spermatophore between May and August (Sardà & Demestre, 1985).
- 3) Larvae of this species have been collected. They were found on the surface with 300 µ mesh (zooplankton net), between July and September from a depth of 500 m. The larval stages, identified by Fusté * and Tunesi (Ist. Anat. Comp. Univ. di Genova), were: 2 zoeas I, 5 zoeas II and 3 zoeas III. The larvae correspond those described by Heldt (1955), however, other verification methods are necessary (genetic or proteinic methods).
- 4) Recruitment presents the highest values in autumn on the Catalan coast (NE of Spain). The highest proportion of young *Aristeus antennatus*, appear from September until January. The high proportion of young, between February and April, is due to recruitment of both, first and second year males, were not separated. Due to different growth patterns present in males and females, recruitments have been studied separately. We considered recruits females upto 25 mm Lc and males upto 22 mm Lc.
- 5) Rostrum males decrease in length during April and May. Correlation between males growth and shortage rostrum is observed. There is a period where the frequency of reduction rostrum is maximum. This period appears between April and May coinciding with couple period during the first year of life of the males.
- 6) Observations of calcium variance and amount in different tissues were made. Calcium percentages are nearly half the amount as observed on very calcified species (Sardà, 1984). One can observe correlation between the amount of calcium in different tissues (Haemolymph, hepatopancreas, carapace, stomach and gastric mill).

NOTE.- The above points are still being studied and the results are provisional and may be modified.

LITERATURE

- RELINI-ORSI, L & G. RELINI, 1979.- Pesca e riproduzione del Gambero Rosso *Aristeus antennatus* (Decapoda, Penaeidae) nel mar Ligure. *Quad. Civ. Staz. Idrobiol. Milano* 7, 39-62
- RELINI, L. 1980.- Aspetti riproduttivi in *Aristeus antennatus* (Risso, 1816) (Decapoda, Penaeidae). *Mem. Biol. Marina e Oceanogr.*, suppl. X:285-289.
- SARDA, F & L. CROS, 1984.- El metabolismo del calcio y del magnesio en la cigala *Nephrops norvegicus* (L.), durante las etapas del ciclo de intermuda. *Inv. Pesq.*, 48(3): 377-397.
- SARDA, F & M. DEMESTRE, 1984.- Determination of the intermolt stages in *Aristeus antennatus* Risso 1816, by setal development. *Rapp. Com. int. Mer. Medit.*, 29(5): 305-307.
- SARDA, F & M. DEMESTRE, 1985.- Estudio bioecológico de la gamba *Aristeus antennatus* Risso 1816, en el mar catalán. III COLLOQUIUM: CRUSTACEA DECAPODA MEDITERRANEA. (Marzo, 1985). *Inv. Pesq.* (in press).