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PROGRAM AND ABSTRACTS

Departamento de Biologia, Universidade dos Açores
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IMPLEMENTATION OF A NEW FEED PELLETS FOR INCREASING GROWTH AND SURVIVAL IN THE FRESHWATER SHRIMP *MACROBRACHIUM ROSENBERGII*

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An experimental diet (elaborated with fish leftovers, and soya, corn and wheat flour) was fed to postlarvae of *Macrobrachium rosenbergii* (De Man) for three months in the Center of Postlarvae Production "El Real", Catemaco, Ver., Mexico. Growth and survival of the prawns were compared with those of organisms fed with commercial feed pellets. Results show 89 % survival and accumulative growth of 28 mm (181.82%, corresponding to 0.31 mm of week growth rate) for organisms fed the experimental diet. In comparison, organisms fed the commercial feed pellets showed 80 % survival and an accumulative growth of 16.90 mm (106.96%, corresponding to 0.19 mm week growth rate). The experimental feed pellets can be preserved in dry conditions for periods as longer than one year and represent a cheap product for use in any country.

WASTEWATER TREATMENT PLANT OF PONTA DELGADA (SÃO MIGUEL, AZORES), IMPLEMENTATION OF A MANAGEMENT PROGRAM

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Wastewater treatment started in Ponta Delgada in 1998, when the first facility started to treat a small volume of the municipal sewage. A monitoring program was initiated in March 1999 to study the effects of the effluent discharge. The current state of the research, and the main aspects of the program are presented: 1) the establishment of a local laboratory to monitor *in situ* the water quality and environmental data; 2) the methodology under development to assess present and future environmental impact, namely regarding water quality parameters, macrofauna ecological surveys and meiofauna sampling. The objectives and results of a long-term study on these aspects are discussed, as well as future studies and complementary perspectives needed to be incorporated in such a monitoring design.



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INTRODUCTION

Wastewater treatment was initiated in Ponta Delgada in 1998, when the first facility (Fig. 1) started to operate on a small volume of the municipal sewage. Figure 2 represents the schematic diagram of the plant. A monitoring program was started in March 1999 to study the effects of the effluent discharge (Fig. 3). This program is guided by the practical need to ascertain the water quality for recreation purposes, but also by the scientific value of documenting the possible biological effects of increasing the nutrient levels in otherwise oligotrophic oceanic waters.

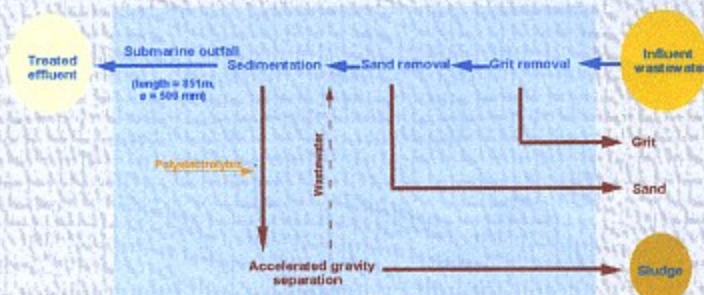


Fig. 2. Process flow diagram of Ponta Delgada Wastewater Plant

WATER QUALITY

Wastewater and receptor water in the vicinity of the outlet need to be characterized in terms of their physical and chemical composition, as well as of their microbiological quality.

The first priority was to establish a laboratory to enable, in a near future, the routine performance of the standard water analysis procedures required by law. Equipment for determining the basic physical parameters, such as colour, transparency, salinity, temperature and conductivity already exists. The colorimetric analysis, and those requiring more elaborate chemical techniques, have proved more difficult to setup with the small budget allocated for this program. Nevertheless, some preliminary measurements have been made and are presented in Table 1. Chemical parameters were determined using colorimetric methods and reagents supplied by LaMotte (water chemical analysis Kit, Fig. 4). Tests for coliforms were carried out using a membrane filter technique which involved samples filtration and incubation in a m-coli-blue hach media for 24h. Chemical and microbiological parameters were determined in samples taken from (i) the sewage at the entrance of the treatment plant, (ii) the effluent before leaving the plant, (iii) underwater, at the outfall discharge (Fig. 5) and at the surface, in the same location. Our results show that, despite the source of microorganisms of fecal origin represented by the outfall discharge, the microbiological water quality at the surface is very good. However, the effect of currents on the effluent plume in the water column has to be taken into account before more firm conclusions can be reached regarding the recreational value of the seawater in the area.

Table 1. Water analysis: preliminary results. Chemical values in ppm, coliform counts in colonies per 100 ml.

	Treatment plant inlet		Effluent discharge 30 m depth		Surface	
	Aug. 20	Aug. 29	May. 18	Jun. 24	Aug. 28	Aug. 29
MICROBIOLOGY						
E. coli	227	273	22	0	18	0
Total coliforms	26	702	29	0	18	0
CHEMISTRY						
Ammonia	61	4	-	7.7	7.7	0.3
Copper	40	0	-	-	-	-
Chlorine	0	0	-	-	-	-
Iron	60	0	-	-	-	-
Nitrate	-	-	0.8	0.8	0.8	0.9
Nitrite	704	88	7.5	6.1	6.1	6.1
Phosphate	19	3.4	0	-	4.1	0

Meiofauna

Meiofaunal communities have been widely used in programs monitoring pollution effects (e.g. Warwick *et al.*, 1990; Somerfield *et al.*, 1994), including those derived from organic enrichment appraised by wastewater sewage outfalls (Botton, 1978; Austen *et al.*, 1989; Coull & Chandler, 1992).

Meiofauna was sampled in the vicinity of the outfall using 6 cm diameter cores to a depth of 30 cm, handled by a SCUBA diver (Fig. 6). The core samples were sieved and the fraction between 1 µm and 60 µm was preserved in 5% neutralized formalin. Organisms were removed from the 60 µm sieve to a container by rinsing with a solution of 5% MgCl₂ solution with sea water. The solution with the extracted sample was stirred and left to stay for a period of 15 min, after what the supernatant was removed and stored in a new container with 5% neutralized formalin. These procedures followed the methodology advised by Hulings & Gray (1971). Major taxa were identified under a compound microscope.

The dominant taxa so far seem to be Ostracoda. Other present taxa include Copepoda, Nematoda and Polychaeta (Fig. 7). Identification of the samples is still in progress and more detailed results are expected in a near future.

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Fig. 1. General view of the Wastewater Treatment Plant



Fig. 3. Discharge of treated effluent at 30m depth



Fig. 4. Laboratory analysis of water samples.



Fig. 5. Water sampling at 30m depth.

BIOLOGICAL EFFECTS

The biological effects of marine pollution can be detected and monitored analyzing changes in benthic community structure. To this effect, several analytic techniques are being developed and tested, most of them involving multivariate methods (see Warwick & Clarke, 1994, and papers therein). All of them require, obviously, an input of species-abundance data. These data, in turn, must be collected from a minimum of two areas: the one presumably affected and a local control. It is at the stage of deciding the sampling method and strategy to be used to obtain the species-abundance data that our efforts are directed at this moment.



Fig. 6. Meiofauna sampling at 30m depth

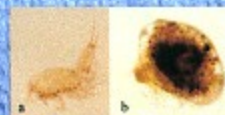


Fig. 7. Meiofauna in the field: a) Copepoda; b) Ostracode

Macrofauna

The substrate in the area is a coarse sand, which makes it impossible to use the conventional grabs, designed for more soft substrates. The operation of larger, heavier, grabs is not in the reach of the available boat facilities. It was therefore decided to use a SCUBA-operated underwater suction device, which functions with compressed air delivered from the surface. This device is fitted with a retaining net, the mesh of which had to be decided. After several preliminary experiments, and given the large mean diameter of the sand grains, it was decided to use a mesh size of 5 mm. This assures that no sand is included in the sample, therefore significantly speeding up the sorting process. On the other hand, a significant portion of the macrofauna is lost. Work is in progress to verify if a pollution effect can be detected using the data thus gathered, and if it can be used to monitor longer-term changes. If it turns out that a smaller mesh size has to be used, the whole sorting process will be much longer and, eventually, the use of the macrofauna for this purpose will have to be reconsidered.