USEFULNESS OF THE MARSALA LAGOON FOR AQUACULTURE. I. NUTRIENTS AND PRIMARY PRODUCTION

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The results of a seasonal cycle of physico-chemical observations and of estimations of primary production in a brackish Sicilian lagoon are reported. These results indicate the opportunity of an experimental beginning for aquaculture in these waters.

On reporte les résultats d'un cycle saisonnier d'obsérvations physico-chimiques et de mesures de production organique primaire dans une lagune saumâtre sicilienne. Ces résultats indiquent l'opportunité d'un travail expérimental d'aquiculture dans ces eaux.

The "Stagnone" of Marsala is the largest brackish lagoon of Sicily. It is 2000 Ha wide with a perimeter of 25 Km. Its mean depth is 1 m with extreme values of 0,2 - 2,5 m. It is characterized by a poor exchange with the sea through two inlets of medium width. In the last years the opportunity of its exploitation for aquaculture has been considered. However the information on its biology and hydrology (Cavaliere, 1961; Arena, 1961; Genovese, 1969) is scarce and fragmentary. In the summer of 1975 a series of seasonal observations was undertaken and 5 stations inside the lagoon and one near shore, were set up to measure the main hydrological parameters, nutrients, primary production (C_{14} in situ), plankton, benthos and the level of pollution. In this first note we report the seasonal cycle of nutrients and primary production.

The results of the measurements are listed at Tab. 1. The values represent the monthly average of the 5 stations in the lagoon; the values of each depth (0; 0,5; 1; 1,5) were integrated and reported as weighted means. Such treatment is justified by the T° and S distribution in that, in summertime at least, even if an inner zone and two transitional areas at different T° and S can be distinguished, it is generally impossible to observe any quantitative difference of the physico-chemical and biological parameters between these stations even at the various measured depths. The seasonal cycle of nutrients is characterized by large variations of nitrogen salts. In fact, in the period summer-autumn whereas a high concentration of ammonia was observed, nitrite and nitrates were scarce. In winter and spring a sharp decrease of ammonia corresponded to a marked increase of nitrates. Such a distribution might be related to the intense bacterial activity in the Stagnone. This assumption is supported by the results of Genovese (1969) who measured an intense activity of ammonifiers, denitrifiers and proteolitic bacteria capable of affecting nitrogen salts concentrations. During the warmest months the bacterial activity in the sediments, favoured by the high temperature, generates large amounts of ammonia which are transferred to the water column. In winter, with a decrease in temperature, the ammonia production is reduced but the nitric nitrogen is not removed as a result of phytoplankton activity. The cycle of P is simpler while soluble phosphate was always scarce, no matter what the season and the total P was much more abundant in summer and autumn as a consequence of its incorporation into the phytoplankton.

Photosynthetic activity in the lagoon waters was highest than that measured for the waters at the shore station and for those of the Sicilian coast (Magazzù, Andreoli and Munaò, 1975). The maximum production was registered in summertime and the minimum in January. Owing to the optimal transparence of the water column (the bottom was always clearly visible from the surface) and the availability of nutrients during the whole year, one of the factors which regulated the primary production was the total incident radiation closely related to the phytoplankton production. In conclusion with the results of this first annual cycle of observations a lot of data indicating the possibilities for an experimental beginning of aquaculture in the Marsala Stagnone are available.

References

ARENA (P.), 1961 - Aperçu préliminaire sur la lagune de Marsala et ses possibilités d'exploitation pour la pêche. Brief account of the lagoon of Marsala and its possibilities for fisheries development. Proc. gen. Fish. Coun. Medit., 6, 50, pp. 329-333.

CAVALIERE (A.), 1961 - Osservazioni nello stagnone di Marsala. Delpinoa (N.S.), 3, pp. 183-204.

GENOVESE (S.), 1969 - Données écologiques sur le "Stagnone" de Marsala (Sicile occidentale). Rapp. Comm. int. Mer Médit., 19, pp. 823-826.

MAGAZZU' (G.), ANDREOLI (C.), MUNAO' (F.), 1975 - Ciclo annuale del fitoplancton e della produzione primaria del basso Tirreno (1969-1970). Mem. Biol. Mar. Ocean., 5, (2), pp. 25-48.

TAB. 1

Month	t°	S‰	O_2 ml/l	s%	µg-a/l $N\text{-}NH_4^+$	$N\text{-}NO_2^-$	$N\text{-}NO_3^-$	$P\text{-}PO_4^{\equiv}$	P tot.	$mgC/m^3/h$	$mgC/m^2/d$	$Cal/cm^2/d$
July	27,47	41,12	5,17	120,5	3,41	0,09	0,08	0,25	0,71	2,00	26,7	752
October	21,69	40,52	4,91	99,7	2,32	0,10	0,30	0,08	0,49	1,80	9,7	432
January	9,48	37,68	7,14	113,4	0,53	0,14	1,26	0,06	0,62	0,70	3,7	293
May	21,29	39,23	6,17	125,0	0,89	0,11	0,62	0,20	0,33	1,44	14,9	621