

CONSEQUENCES OF ICES PRESENT DURING THE WINTER OF 1972,
ON THE CYSTOSEIRA POPULATIONS ALONG THE ROMANIAN
SHORE OF THE BLACK SEA

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ABSTRACT

The extremely strong freezing on the Romanian shore during the period of January - March 1972 had a marked negative effect as it destroyed in a proportion of 80 % the Cystoseira populations. The long lasting ice also delayed the advent of the reproduction period of the surviving stock and consequently the gametes emission took place two months later. The efficiency of this reproduction period was nonetheless high, the density of young plantula over the artificial substratum sunk into the sea reaching up to 890 individuals/m² within a time period of 60 days.

It is a well known fact that during the winter months, the North-Western side of the Black Sea is, under the continuous influence of continental air masses and even under the influence of arctic air masses which frequently enough enter this zone (LEONOV 1961). A direct consequence of these meteorological conditions is ice packs build-up within these areas. On the Romanian shore, ice packs appear for various periods of time - mainly during the particularly severe winter months. (BACESCU 1954., SERPOIANU 1961).

Ice origins are different. On one hand, huge ice packs from the Danube mouths or from other continental sources originating on the soviet shore are carried away by dominant sea winds and currents from the North towards the romanian shore. They float and agglomerate within the bays of the extreme southern coast (Mamaia, Constantza, Agigea,

Vama Veche), thus bringing about a further drop in the temperature of waters in contact with the upper levels of the benthos. On the other hand, in winters when air temperatures are very low and last for a longer period of time, contact water temperatures drop to the limit of ice build-up. However, there are fairly frequent cases - as in the winter of 1972 - when on the shore "ice bridges" build-up could be recorded out of the above mentioned packs and those produced by local freezing.

Owing to the hydrometeorological peculiarities prevailing on the Romanian shore, ice packs become agglomerated and superimpose one over another thus forming compact ice surfaces covering distances of several miles off-shore, and reaching thicknesses up to 2-4 m (BACESCU 1954).

The favourable, but particularly the unfavourable consequences of these ice packs, as well as those of the water masses cooling down, on the biology of the sea organisms were outlined by several authors (BACESCU 1954 ; BACESCU et al. 1967), and 1971; BORCEA 1931) but no reference was made to the changes incurred by the perennial vegetation of macrophyte

As for the thermal aspect, in the late 1971, the sea water frequently dropped to a temperature of 5 - 7°C (VASILIU et al 1973), which favoured a normal photosynthetic activity of the brown alga from the rocky infralittoral, this activity being continued in the early 1972.

During the second decade of January, subsequent to a sudden drop in the air temperature, sea temperature was alternating between 0 and 10°C. In such conditions ice crystals began to grow. At the same time, the winds and sea streams coming from North and North-East conveyed to the shore a great amount of ice packs. As a result, beginning with January the 16, the ice built within the shore area (Mamaia, Constantza, Agigea etc.) a belt having some hundreds of meters off-shore. Ice pack agglomerations towards the shore, together with other ice packs formed and conveyed here, continued with a much greater intensity during the subsequent days. At the same time, ice layer thickness increased up to 1-2 m.

Followed a 7-day period (January the 21-th to January the 27-th) of ice melting, with a partial clearance of the shore, ice packs being conveyed in other directions under the winds. The following days, air temperature dropped again drastically, the dominant winds taking a steady, North and North-East direction. As a result of storms, before the sea was frozen again, large amounts of seaweeds (pulled out or sectioned), of mussels, of fish were brought to the shore.

From January the 28-th till February the 23-th, a second period of ice pack building up, conveyed and blocking, both on the shore and off-shore took place. As a consequence, the ice blocked all the shore from Midia to Vama Veche. Ice was present until the day of March the 5-th in the southern shore (Vama Veche) and till March the 6-th in the North (Mamaia, Agigea, etc.) The last ice clear off and melting was followed by strong storms which threw on the shore enormous amounts of mussels (a rough evaluation made by us showed some 20-25,000 tons) and thus completed the process of Cystoseira population destruction.

Taking as a start point the situation described above, the purpose of the authors was to assess the immediate and long term consequences imposed by ice packs and by the extremely low water temperature, on the Cystoseira populations of the romanian shore.

During the summer of 1971 we conducted - through direct dings - a wide action aiming a putting into light the major Cystoseira agglomerations and evaluating their stocks. Among the zones sureveyed where some more important seaweeds agglomerations were identified - i.e. with more than 10% coverage - were also those from Agigea and Vama Veche. These profiles were resurveyed again in the summer of 1972. Some of the results of these surveys are reported in the tables (Table 1 and 2).

Table 1

Results of surveys carried out in the summer of 1971

Profils	Stations	Biomass g/m ² wet stage	Number of individuals/m ²	Length
Agigea 1 - 4 m	1	2800	254	20
	2	2200	196	19
	3	1800	84	17
Vama Veche 1 - 4 m	1	5200	28	31
	2	4600	64	39
	3	8240	100	43

Table 2

Results of the surveys carried out during the summer of 1972

Profils	Stations	Biomass g/m ² wet stage	Number of individuals/m ²	Length
Agigea 1 - 4 m	1	310	36	20
	2	100	17	14
	3	1060	114	16
Vama Veche 1 - 4 m	1	340	31	21
	2	1270	135	17
	3	1460	286	15

The analysis of these results shows that in general the destruction proportions of Cystoseira populations were close to one another, i.e.

78.4 % for Agigea and 83.1 for Vama Veche. The somewhat higher proportion at Vama Veche is explained by the fact that here, Cystoseira populations are fixed on a smoother calcareous platform and the average length of the plants exceeds in some stations that of the 40 cm. As it could be noted from the analysis of algal samples left on the shore, the most affected were the aged individuals, hence those with a more elongated thallus. On the 6-th of March, we went at the above mentioned place and carried out measurements on algal deposits left on the shore. These deposits had the form of elongated agglomerations, 3 to 5 m in length, 1 to 1,5 m in width and 0,5 to 1,0 m in height. The dominant vegetal mass of these deposits was made up of fragments of Cystoseira, most of them under 10 cm in length.

Data obtained subsequent to the 1971 survey permitted the evaluation, at the level of Agigea and Vama Veche of stocks as huge as 8.1 tons and 936.0 tons respectively. For the whole zone surveyed from Cap Midia to Vama Veche covering an area of some 7.2 Km² with a rocky substratum, the total stock of Cystoseira was of 4.6 tons (all values are in moist substance). When referring all these values to the destructions evaluated at the level of the two places, we could see that at Vama Veche only some 160 tons of alga were left, while at Agigea, only negligible amounts. Assuming for the whole shore area populated with Cystoseira a destruction proportion of 80% of the total amount of populations, it results that the surviving biomass is slightly exceeding the value of 900 tons.

In addition to the destruction proportions affecting the initial stock of Cystoseira, the abnormal conditions of the winter were the cause for important perturbations in their energetic processes.

At the beginning of the winter, the assimilation branches developed normally but during the period of ice persistence, that is from January the 17-th to March the 6-th, their photosynthetic activity was blocked owing to the lack of light and to the temperature fall under 0°C.

When thermally favourable conditions prevail in winter, as for instance in 1970 and 1971 (VASILIU 1973), the formation, maturation and emission of sexuate elements of Cystoseira proceeds continuously, starting from the late January and lasting up to March-April, when the processes reach a maximum of intensity. During the winter and the spring of 1972, this reproduction dynamics was perturbed, that is it was restricted over the time interval; end of March - middle of May.

Searching the reproduction intensity, beginning with the month of January, we launched into the sea cement blocks of a known surface area which then were checked at 2-3 weeks intervals to determine the moment of Cystoseira young individuals apparition. At the same time, by diving, direct investigations were conducted on the neighbouring hard substratum. Subsequent to these investigations we could establish that the first young individuals of the 1972 generation appeared during the last decade of the month of March, the reproduction process being particularly intensified during the month of April. Over the concrete surfaces immersed in the early April, the density of the young individuals attached was of 890/m², that is the highest recorded for the three months (March-May).

An other effect of the mechanical action consisting in ice packs tearing out and breaking the bottom vegetation was, (as it can be seen tables 1 and 2) the considerable rejuvenation of the Cystoseira fields. Our intention is not to discuss again the tabulated figures but merely to remind the fact that in our surveys from the summer of 1972, both at Agigea and Vama Veche, algal samples did not exceed 52 cm in length. These are extremely small lengths, especially when referred to those found no more than a year before, but also during other previous years (MULLER et al 1969).

In conclusion, the joint action, of the two factors - that is the ice packs and the extremely low temperature of the sea prevailing in the winter of 1972 had a damaging effect on Cystoseira populations the stock of which was reduced by some 80%. Moreover, it can be assumed that the same factors had strong negative consequences on the associated fauna and flora from the Cystoseira - Mytilus subcoenosis.

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