

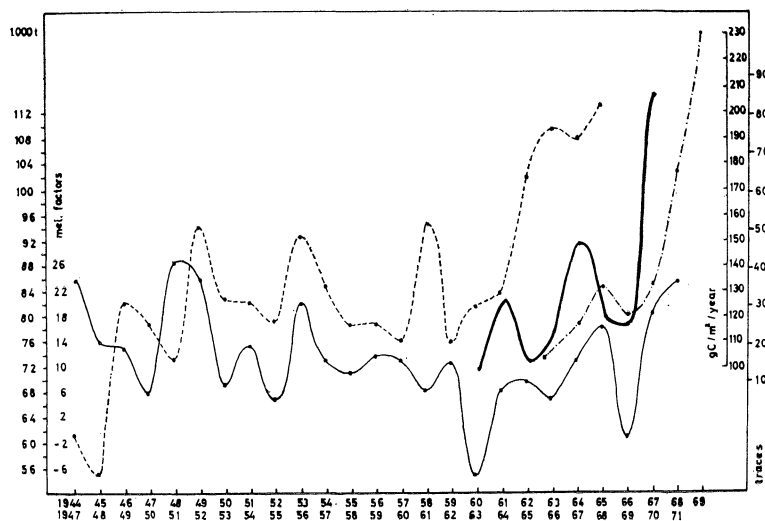
Meteorological conditions and ichthyologic production in the Adriatic

by

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A series of endeavours have been lately undertaken for the Adriatic in order to connect the state of various oceanographic factors with the meteorological conditions as well as to connect the oceanographic conditions of the environment with the living world [GRUBIŠIĆ, 1950, BULJAN, 1968; PUČER-PETKOVIĆ, 1968; ŽUPANOVIĆ, 1968; VUČETIĆ & PUČER-PETKOVIĆ 1969; ZORE-ARMANDA, 1969*a*, 1969*b* and others]. This work will deal with the effect of local and global meteorological factors which influence the production in the Adriatic.

The state of the Adriatic oceanographic properties is mainly dictated by the intensity of water exchange with the neighbouring basin i.e. the Ionian Sea and with the whole Eastern Mediterranean [BULJAN, 1953; ZORE-ARMANDA, 1963]. As the Adriatic itself due to the influence of the North Italian rivers is the source of less saline water, and the Levantine basin is the source region of the most saline water in the Mediterranean, the greater exchange of the water between these two zones in the Adriatic is manifested at the first place in the higher degree of salinity, and then in the higher degree of the nutrient salts which causes intermediately larger production. Therefore, it is of the paramount importance to find out which are the external and which are the internal factors which influence to the intensity of circulation. For the present we shall give our consideration on its year to year changes.



The full thin line indicates superimposed meteorological factors i.e. annual differences of air pressure between Trieste and Athens and the quantity of ice in the Iceland region (according to Zore-Armanda, 1971). The dashed line denotes the total annual catch of pelagic fish in thousand tons (sardine, sprat, anchovy, mackerel and spanish mackerel) of Yugoslavia and Italy together (the data according to FAO Yearbook of Fish. Stat.). Dash dot line shows annual gross primary production in one station in the Middle Adriatic (the Bay of Kaštela), while the full thick line indicates the number of pelagic fish concentrations (mean annual) obtained by echo sounder in the Middle Adriatic (the region of Palagruz). Echo sounding was done preferably seasonally during the day per six hours always on the same route.

Rapp. Comm. int. Mer Médit., 21, 10, pp. 809-811, 1 fig. (1973).

It has been proved that the air pressure gradient over the Eastern Mediterranean has a strong influence on the exchange of water between its basins [ZORE-ARMANDA, 1969*a*, 1969*b*]. Since this could not completely explain the fluctuation of the intensity of the water circulation, a global factor of general dynamics of air masses of the Northern Atlantic and Europe has been taken into consideration. The quantity of the ice in the Nord Atlantic has shown to be a good indicator for the state of meteorological circumstances over this vast area [ZORE-ARMANDA, 1971]. If both these factors i.e. the local Mediterranean (air pressure gradient) and the indicator of the global air circulation (the quantity of ice in the Nord Atlantic) are superimposed, and then compared with the salinity of the Adriatic water, it can be seen an excellent correspondence, what means that these factors really cause in the greatest measure the intensity of water exchange between the Adriatic and the neighbouring basins [ZORE-ARMANDA, 1971].

Now it would be interesting to see how certain dynamic conditions manifest themselves on production. In the enclosed figure are shown annual values of superimposed meteorological factors and the production of phytoplankton in the Middle Adriatic [PUCHER-PETKOVIĆ, 1970] and a good relation of curves can be seen. It means, that meteorological factors of the larger region in the greatest measure influence upon the mean annual production in the Adriatic. Precisely, it means that when a great air pressure gradient above Eastern Mediterranean appears during the year and when, as indicator of certain dynamic conditions over Atlantic and Europe, the North Atlantic is more covered by ice, the Adriatic exchanges water more intensively with the neighbouring basins and in it is larger the primary production.

Let us suppose now that in one year the conditions were satisfactory, and they were favourable for spawning and for survival of fish larvae (of course with the series of reserves due to possible presence of the local wind influence etc.). Further let us confine ourselves only to the pelagic fish (sardine, anchovy, sprat, mackerel and spanish mackerel), which in the Adriatic is at the same time the part important of the final production.

Further more let us presume that pelagic fish require about three years to grow up to the commercial size. Namely, the analyses of the several catches of the sardine from the various regions in the Middle Adriatic shows that in catches could prevail sardine ageing from 3, 4 and more years [MUŽINIĆ, 1954]. GRUBIŠIĆ [1947] assumed that the strong winds and calms data taken for the period of 4 to 5 years before the catch of sardine could be a good indicator for its prediction. Therefore let us analyse the pelagic fish catch three years later. If all mentioned conceptions are at least partially real, and probably they are if one examines global circumstances in the waster region not taking into consideration the very local influences, one could expect a good catch in the fourth year. On the enclosed figure are shown meteorological conditions covering 22 years and the catch of pelagic fish (sardine, sprat, anchovy, mackerel and spanish mackerel) of Yugoslavia and Italy together, always three years later [ZORE-ARMANDA, 1970]. Although the relation of the curves is not ideal, it can be clearly seen there exists a dependence in the quantity of the catch with the described meteorological factors. It must be stressed that the catch includes the fish caught by the Italians outside the Adriatic as well, where from it is possible to find a reason for some deviations. On the other hand, it can be understood that aforesaid meteorological conditions influence equally on the whole Mediterranean. It can be seen that in the post war years the most favourable conditions up to now have been 1948/49 and 1968. First gave a good catch in 1952 and one can expect favourable catch in 1971. A continuous increase of catch can be seen from 1947 onwards, but it is presumably the result of continuous endeavours in improving the catching technic (or of some other factors independent on climatic conditions), and need not be taken into consideration for the moment.

In order to support also by direct measurement that certain meteorological factors influence on the final production, the same enclosed figure shows the number of the concentrations of the pelagic fish which were obtained by echo sounding in the Middle Adriatic also considered for three years in the phase after certain meteorological conditions and the primary production. The curves show a very good relation and it gives a chance for a good catch forecasting. It is a very favourable circumstance that it is important the interval of three years from the corresponding meteorological and oceanographic conditions to their effect in the final production i.e. the quantity of fish because it simplifies the problem of forecasting. Of course, it is certain, that the oceanographic conditions of the whole interval required for the development of the grown fish play a part in the final production. But it seems that they are most important during spawning. According to the state of meteorological and oceanographic factors in 1968 we could expect favourable catch of pelagic fish in 1971.

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