

TOWARDS DEVELOPMENT OF OPTIMAL STRATEGY FOR SUSTAINABLE FISHERY IN THE BARENTS AND NORWEGIAN SEAS

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It was decided at the UN World Summit on Sustainable Development in Johannesburg in 2002 that the international community should start transition to sustainable fishing after 2005. The global nature of this transition does not exclude regional peculiarities of optimal strategy for sustainable exploitation of living resources.

We see the optimal strategy for development of sustainable fishery as adaptation of the fish stock exploitation to highly variable natural environment and fishing opportunities.

Ecosystem productivity and emergence of abundant or poor year-classes of cod, haddock, and other fish species in the Barents and Norwegian seas are determined by highly variable seasonal and interannual variability in hydrophysical and atmospheric processes in this Arctic region, which could be either favorable or unfavorable to the fish reproduction.

This essential factor should lay the base for the optimal strategy for long-term sustainable and rational exploitation of marine living resources.

Joint Russian-Norwegian Fisheries Committee (JRNFC) had already adopted "Provisions on main principles and criteria of long-term sustainable management of marine living resources in the Barents and Norwegian seas" in 2001.

We consider this document the first step in development of the optimal strategy for sustainable fishery of Norway and Russia in the Barents and Norwegian seas. Thus, the Provisions highlighted that principles and criteria were to be drafted with due consideration of development of national fisheries and potential fishing opportunities aiming at full and rational exploitation of fish stocks.

Experience of the JRNFC application of this essential document shows that we have approached the stage of rational exploitation of fish stocks in the Barents and Norwegian seas. However, in case of the rapidly growing cod stocks "Rules of the cod fishery regulation" set within the framework of the Provisions are aimed not at full and rational exploiting, but at significant underexploiting of cod stocks.

For one thing, the cause of the cod stock underexploitation is to be sought in faulty scientific data and advice provided by ICES. This scientific organization continues to assess cod fish stocks with the XSA model. Drs. Vasil'ev and Bulgakova show a fundamental difference between the cod stock assessment with the XSA model (ICES) and that obtained with the TISVPA model (separable model) applied by VNIRO (2007 г.). Their analysis which is based on the ICES AFWG input data and allows to consider specifics of various cod generations in calculations of the cod fish stock yielded considerably higher values of the spawning stock for recent years.

Thus, the TISVPA model outcome on 2006 was that the cod spawning stock totaled 878,000 t (compared to 535,000 t provided by the ICES AFWG). Likewise, the TISVPA model assessment of the total stock (2,072,000 t) was quite different from the XSA model outcome of 1,298,000 t. The 1.6-time difference between the two models indicates the magnitude of errors in the fish stock assessment with non-separable models. Moreover, this difference make us carry sampling and collection of the input data more meticulously.

For the past two years VNIRO in collaboration with RC *Morskaya informatika* and *Natsrybresursy*, has been developing two new approaches to sampling and analysis of the fishery biological data.

Real-time assessment of the fish stock biomass is made during the satellite monitoring of fishing operations in the principal fishing grounds. With due account of the seasonal maximums and minimums this technique allows for as-

assessment of the fish stock lowest level. Moreover, this information could help improve interpretation of data collected during the biomass surveys.

Another approach is use of daily reports in the fish stock assessment with the GIS method of processing data from the *FISHERY* database. Thus, the cod stock biomass in the Barents Sea in 2007 was assessed with the GIS method at 2.9 mln t (Bulatov et al., 2007). This is twice as much as the value provided by the XSA model. According to the GIS method, the cod TAC value for 2008 should total 629,000 t.

These techniques have been developed since the mid- 1990s and now we should not only increase the research range and introduce them into fishery studies in Russian seas, but also to implement them for assessment of shared fish stocks and fish stocks in the convention areas in the framework of bilateral and international cooperation.

We believe that the quality of the fishing vessel reports will improve significantly as a result of implementation of the RF President order of 22.09.2007 "On establishment of industrial head center of the satellite monitoring of aquatic living resources, surveillance and control over activities of fishing vessels, and use of the monitoring data as evidence in prosecution of administrative and criminal offences concerning fisheries". With the increased accuracy of reports, the satellite monitoring data will be used to calculate not only the minimum levels of fish stocks, but also the optimal ones. The increased accuracy of reports is also ensured by the fact that the set of the presidential orders includes *inter alia* a charge to amend the law with a provision on the vessel forfeiture for illegal fishing for aquatic living resources.

To sum up, for the fish stocks assessment as well as for determination of the fishery impact on living resources we should use data from daily reports of the fishing vessels as a supplementary source of information.

Analysis of long-term variations in the age composition and growth rates of the Northeast Atlantic cod allowed Drs. Kuznetsova and Bondarenko (2007) to

find out that the cod weight growth in 2002-2006 exactly coincided with that in 1949-1966, i.e. the period of a high biomass of the cod stock and catches at the level of 800,000 t. It is interesting that growth rates of cod elder than seven slowed down considerably in 2002-2006. Fishermen also noticed a sharp increase in number of large-sized cod in catches in 2002-2006.

The optimal strategy should also consider economic and social consequences of the established principles and criteria, therefore, it is very important that such principles and criteria are developed with close involvement of the fishermen. In this context it would be interesting to learn a cod stock assessment technique and ideas about the cod fishery proposed by Mr. Minasyan, a Murman fisherman.

Considering a sharp increase in the cod stock abundance, decline in the IUU fishing, decrease in the cod size in catches and the cod market overheating, he proposed to increase catch quotas for the coming years.

We hope that these materials will help the coming session of JRNFC in Saint-Petersburg to make a well-considered decision on the cod TAC for 2008.

Nevertheless, to improve our knowledge about stocks of cod species as well as ecosystems of the Barents and Norwegian seas necessary for development of the optimal strategy for sustainable fishery, we should intensify our efforts on the following issues both at the national, and bilateral levels:

- development of joint Russian-Norwegian model for the cod stock assessment based on the TISVPA approach;
- development of the agreed model for the fish stock assessment of spring spawning herring and other fish stocks in convention areas;
- improvement of techniques and methods of assessment and calculation of the Northeast Atlantic cod abundance, including satellite monitoring of both Russian and Norwegian fishing vessels;
 - determination of the yearly percentage of cod missing spawning;
 - tagging of cod and haddock;

- determination of climate-induced variations in marine ecosystems and their impact on the fish reproduction and growth rates;
- complex genetic analysis of cod and other commercial species.