PROJECT Nº 96/051: GENETIC EROSION AND PARASITIC INFECTIONS: NEW TOOLS FOR THE EVALUATION OF THE STATE OF BLUEFIN TUNA AND SWORDFISH STOCKS IN THE MEDITERRANEAN SEA

KEY WORDS

Bluefin tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*), stock assessment, Mediterranean Sea, genetic diversity, parasite burden.

AUTHORS

Prof. G. Nascetti (Co-ordinator) (1).

L. Paggi (2).

Dr. S. Cerasi (3).

PARTICIPATING INSTITUTIONS

(1) Department of Environmental Sciences, Tuscia University, Italy.

(2) Institute of Parasitology, University of Rome La Sapienza, Italy.

(3) Soc. Coop. Maja a.r.l., Italy

OBJECTIVES

The objective of the project was to study the genetic diversity and parasite burden levels of bluefin tuna (*Thunnus thynnus*) and swordfish (*Xiphias gladius*) to assess the state of these important resources in the Mediterranean Sea.

APPROACH AND METHODOLOGY

A total of 227 specimens of bluefin tuna and 284 swordfish specimens were collected from various locations including the Tyrrhenian Sea, Ionian Sea, Adriatic, south-east and northern Atlantic Ocean. Laboratory analysis was undertaken to determine the genetic characteristics of these fishes. At the same time, the external and internal parasites carried by each fish were identified and recorded.

MAIN FINDINGS AND CONCLUSIONS

The results indicated that Mediterranean bluefin tuna and swordfish have low genetic diversity. Significant differences in genetic variability were also found when comparing swordfish samples from the Mediterranean Sea and Atlantic Ocean. While Mediterranean samples were characterised by a low level of genetic variability, the Atlantic samples were found to have much higher values of genetic variability. Moreover the Mediterranean swordfish population was been found to be strongly isolated from the others.

A possible scenario explaining the low genetic variability observed in swordfish and bluefin tuna was that the gene pool of the Mediterranean populations has been depleted, probably by over-exploitation. Moreover, in the case of swordfish, the strong isolation of the Mediterranean stock has prevented its restoration through gene exchange (i.e. interbreeding) with Atlantic populations. Since swordfish have been exploited for a long time, it is considered impossible to prove depletion of swordfish genetic variability by overfishing today. It is however possible to find indirect evidence supporting the notion of reduced genetic variability due to overfishing. Other studies carried out during 1996-1998 on a number of large pelagic fishes in the Mediterranean

Sea indicated that all exhibit comparable levels of genetic variation except swordfish and bluefin tuna. Tuna species such as albacore (*Thunnus alalunga*) have much higher values of genetic variability. This could be related to the different life histories characterising the studied species, but could also be due to the higher fishing pressure that has been applied to bluefin tuna and swordfish in recent decades. In particular, the higher level of genetic variability shown by the south-African swordfish, less exploited than that from Mediterranean Sea and Azores Islands, strongly supports this hypothesis.

The studies on parasites carried by fish and infection levels caused by parasites showed a high prevalence and intensity in the Mediterranean swordfish population. This was caused by the internal tapeworm parasite *Fistulicola plicatus*, by roundworm parasites such as *Hysterothylacium* spp., external parasites such as flukes (*Tristoma* spp.) and by the copepod parasite *Pennella* spp. This further supports the hypothesis that a loss of genetic variability could cause fish species to be more prone to parasitic infections. The authors suggested that parasitological examination of the still genetically-variable Atlantic swordfish populations would confirm this hypothesis.