Topic 3e – Fisheries

The activity of phytoplankton supports the food chain of the entire marine ecosystem, including fish, and in particular, including the fish that we exploit as a food resource. Therefore maps of phytoplankton distribution, indexed as chlorophyll concentration, such as the one in the picture, can be interpreted as maps of the fertility of the sea from the point of view of food resources such as fisheries. Locations of persistently high phytoplankton abundance or persistently high chlorophyll concentration are of a special importance. And they are used, for example, to help to delineate the areas of prospective marine protected areas.

Another thing we can do with the chlorophyll maps is that we can convert them into maps of primary production. Primary production means the rate of generation of new phytoplankton biomass through photosynthesis. This is a very important property of the ecosystem. Primary production is a good index of the potential fisheries' yield in a particular area.

Currently this is a topic of research. And it's used, for example, in the context of global food security of nations who are trying to assign economic value to the resources in their exclusive economic zone. And it's important to say that without the technology of earth observation and remote sensing, we would not be at all able to undertake such analyses in anything like the quality that we are able to do now.

At most places in the sea, there is a strong seasonal cycle in the abundance of phytoplankton, as you can see in the picture. The main peak in this seasonal cycle is referred to as the spring bloom of phytoplankton. And the phase of that cycle will vary between years by as much as six weeks. These variations are of great importance for fisheries.

In the life cycle of fishes, a critical stage is the so-called "post-yolk-sac stage." Here, the fish larvae require access to food of the right kind immediately. If the spring bloom has begun by the time the fish reach this stage, then they will have access to the food they need, and their chances of survival are much better than they would be if the spring bloom were delayed in that particular year.

Because the phase of the spring bloom varies so much between years, the potential effect on larval survival is massive. And fluctuations between years in larval survival lead to corresponding fluctuations in year-class strength. These are of great importance to fisherman and to those whose job is to manage the fishery. Again, it is important to understand that without access to earth observation data and methodology, it would not be possible for us to address such questions in a scientific manner.

A conservation issue in fisheries is to limit the so-called "bycatch." "Bycatch" means the capture and probable damage to species other than the ones being targeted by the fisherman. This is not only wasteful, it's also a threat to biodiversity. An example comes from the Pacific Ocean, as you can see in the picture, where the endangered species the loggerhead turtle can become accidentally parts of the bycatch of fishing operations.

Remote sensing methodology was used to provide a solution to this problem. The habitat of the turtle was monitored using tracking devices on individual animals that reported to satellites as they passed over the area. This allowed the specialist to draw a map of the area favoured by the turtles and therefore the area which it would be preferable for the fisherman to avoid.

The digested information was passed to the fisherman, who were happy to use it and cooperated with the principle. And this is now working very well, to the advantage of the people concerned and also to the turtle. So here we have a nice example of the use of multiple remote sensing methods to provide a solution to a topical issue in conservation.