

Climate change and natural distributions of endangered and commercial ocean species

Fishing, pollution and other human activities are reducing natural ocean stocks, but climate change is also altering the distributions of migratory animals. The only certain way to distinguish between declining numbers and changing distributions is to follow the animals. Fixed coastal arrays and satellite telemetry can monitor natural migrations to improve management, understand life histories and characterize preferred conditions of different species for various activities. As the first frame shows, wild tuna move seasonally to find the ocean conditions that suit them best. The second frame shows the structure of the ocean that they move through using sensors that record their depths, temperatures and salinities along their path. Such 'bioprobes' not only report their own preferences, but also map ocean conditions in three dimensions as they dive to feed on deep water food chains. Bioprobes provide *in situ* records to calibrate satellite surface temperatures and relate them to the structure and animals in the ocean beneath. These large animal 'oceanographers' are very efficient at monitoring the changing ecosystems they depend on throughout the oceans. Large animals start small and juvenile stages are often the most sensitive. Coastal arrays for monitoring ocean physics and chemistry can also monitor changing distributions of animals as small as 10 grams, by listening to the coded sounds of tiny tags. This approach can track young salmon leaving their rivers or hatchling turtles leaving their beaches.

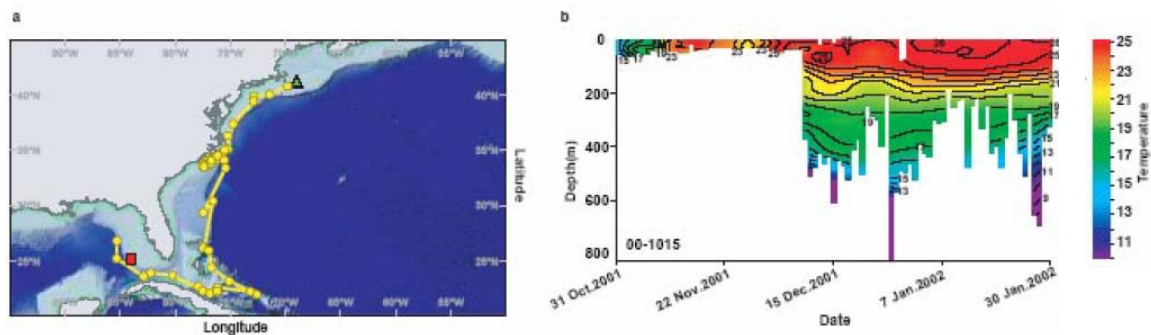


Figure 1. A seasonally migrating tuna maps the temperature-depth profiles on its route from feeding (triangle) to breeding (square). (Can. J. Fish. Aquat. Sci., in press)