REMOTE SENSING in FISHERIES

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Fisheries Applications

- Although direct detection of fish stocks would appear to be the most obvious goal for remote sensing, it is in fact the most difficult to achieve. Visual fish spotting from aircraft is used successfully for locating a number of pelagic species such as anchovy, swordfish, menhaden and tuna. In this case, a trained observer is the "sensor" and direct radio communication is maintained with vessels in the area. If a camera is also carried onboard the aircraft, photographs can be taken for subsequent stock assessment. Different species can be distinguished on the basis of their colour, behaviour and schooling patterns. Table 1.1 lists a number of species which are directly observable from low-level aircraft. Fish spotting is limited by the range of the aircraft and is only feasible when the probability of fish detection is reasonably high and the economic return derived fromthecatch justifies the expense of aerial surveillance.

- A modified type of fish spotting makes use of the phenomenon of **bioluminescence** which is the emission of light by certain types of plankton when they are disturbed by the movement of fish. This phenomenon has been recognized by fishermen for centuries and is regularly used to locate fish when bioluminescent organisms are abundant. Sensitive low- light level television (LLLTV) systems equipped with image intensifier tubes can be used to amplify the relatively small amount of biologically produced light. Information derived from aircraft-mounted LLLTV systems can be used to direct vessels towards schools of fish. Attempts also have been made to image bioluminescence from an orbiting satellite while scanning the night side of the earth.

- While the direct detection of fish is not always feasible, their indirect detection may be possible by observation of sea surface phenomena associated with species distribution. This may simply involve mapping the distribution of fishing activities within a given area. Changes in ocean colour from blue to green may also serve as an indicator of increasing plankton abundance. The green colour is associated with the presence of chlorophyll, the light retaining pigment of phytoplankton. While ocean colour has long been used locally by fishermen to locate fish species, aircraft and satellite imagery can record colour variations over a much wider area in a more precise manner. Techniques have been developed to quantity biological productivity on the basis of chlorophyll distribution and abundance.

REPRESENTATIVE FISH TYPES OBSERVABLE FROM LOW-LEVEL AIRCRAFT (After W.H. Stevenson and E.J. Pastula, 1971)

ATLANTIC OCEAN AND MEDITERRANEAN SEA

Eastern

Fish:
Spanish sardine
(*Sardinella aurita*)
herring
(*Sardinella eba*)

Spanish mackerel
(*Scomberomorus*)
maculatus)
yellowfin tuna
(*Thunnus albacares*)
skipjack tuna
(*Katsuwonus pelanis*)
pilchard
(*Sardinops trachurus*)

Northern

Fish:
thread herring
(*Opisthonema oglinum*)
Spanish mackerel
(*Scomberomorus*)
maculatus)
bluefish
(*Pomatomus saltarix*)
gulf menhaden
(*Brevoortia patronus*)

Northern (Continued)

Fish:
ladyfish
(*Elops saurus*)
blue runner
(*Caranx crysos*)

tarpon
(*Megalops atlantica*)

herring
(*Clupea harengus*)
Atlantic mackerel
(*Scomber scombrus*)
butterfish
(*Poronotus triacanthus*)
Atlantic menhaden
(*brevoortia tyrannus*)

Mediterranean Sea

Fish:
Spanish sardine
(*Sardinella aurita*)

Atlantic mackerel
(*Scomber scombrus*)

PACIFIC OCEAN AND INDIAN OCEAN

Eastern

Fish:
basking shark
(*Cetorhinus maximus*)
white shark
(*Carcharodon*)
carcharias)
northern anchovy
(*Engraulis mordax*)

Pacific sardine
(*Sardinops sagax*)
Pacific bonito
(*Sarda chiliensis)*)
jack mackerel
(*Trachurus symmetricus*)
Pacific mackerel
(*Scomber japonicus*)

Pacific barracuda
(*Sphyraena argentea*)
yellowtail
(*Seriola dorsalis*)
white seabass
(*Cynoscion nobilis*)

bluefin tuna
(*Thunnus thynnus*)
albacore tuna
(*Thunnus alalunga*)
yellowfin tuna
(*Thunnus albacares*)
skipjack tuna
(*Katsuwonus pelamis*)
jacksmelt
(*Atherinopsis*)
(*californiensis*)

Eastern (Continued)

Fish:
ocean sunfish
(*Mola mola*)
striped bass
(*Morone saxatilis*)

Pacific saury
(*Cololabis saira*)

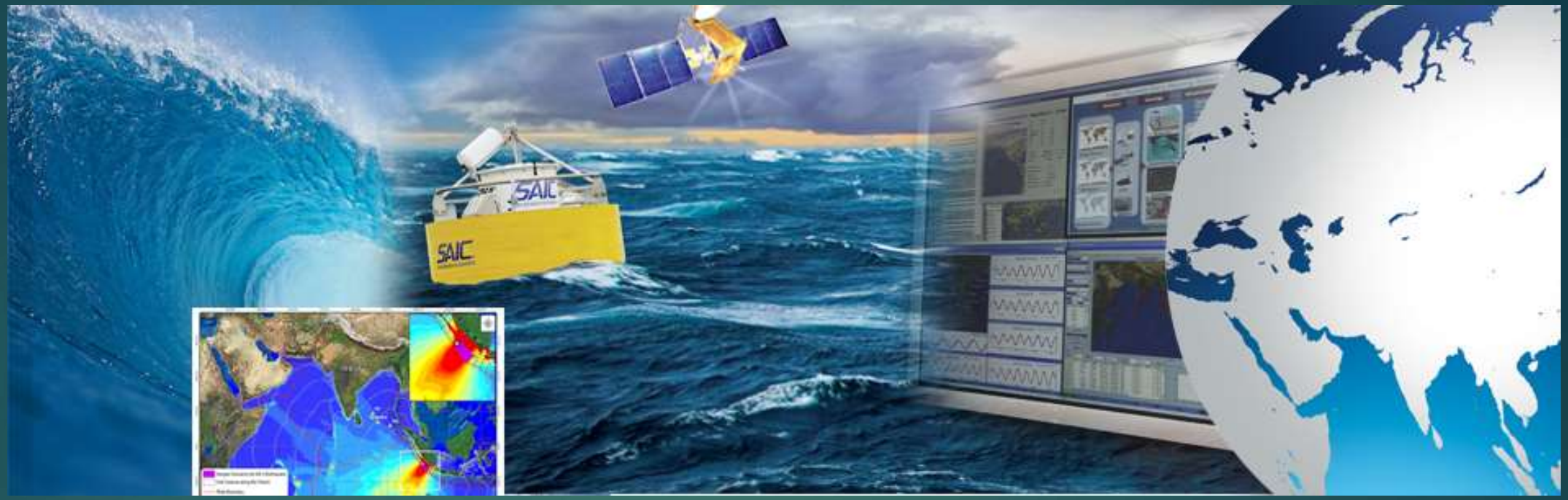
swordfish
(*Xiphias gladius*)
striped marlin
(*Tetrapturus audax*)

Mammals:
gray whale
pilot whale
Blackfish (killer whale)
Porpoise and dolphin
Seals and sea lions

Invertebrates:
Squid
Jellyfish

Western and Indian Oceans

Fish:
pilchard
(*Sardinops pilchardus*)
sardine
(*Sardinella fimbriata*)
mackerel
(*Rastrelliger kanagurta*)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