REMOTE SENSING IN FISHERIES

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BASIC TERMS AND CONCEPTS

- **Remote sensing** may be defined as the acquisition of information about an object or event on the basis of measurements taken at some distance from it. In practice the term is normally used to describe the collection and analysis of data made by instruments carried in or above the earth's atmosphere.
- A **sensor** is a device which detects and measures a physical parameter, such as radiation, and converts it into a form which can be stored or transmitted. In other words, it is the device which "sees" the objects or terrain towards which it is pointed. While devices which sense gravity, magnetic fields or sound waves can properly be classified as remote sensors, many authors restrict their use of the term remote sensing to describe measurements of electromagnetic radiation. That convention will be followed in this manual although a brief section is included on underwater acoustic devices such as sonars and echo sounders because of their importance to the fishing industry.

BASIC TERMS AND CONCEPTS

- **Electromagnetic radiation** (EMR) is a type of energy which appears in such forms as X-rays, visible light, microwaves and radio waves. While these forms of EMR may initially seem to be separate phenomena, they are in fact part of a continuous spectrum. This can be understood best by considering how a prism separates white light into different colours; each colour represents a different wavelength of light. Visible light is the only segment of EMR which human vision can detect.

BASIC TERMS AND CONCEPTS

- A given sensor can detect EMR only over a limited range of wavelengths: this range is referred to as a **spectral band**. The width of the spectral band, i.e. the extent of the limited range of wavelengths detected, is referred to as **spectral resolution**. Some sensors are comprised of a number of detectors, each of which is sensitive to a different spectral band. These are called **multispectral** or **multiband** sensors. By our looking at the earth in two or more bands simultaneously, it is possible to discriminate a wider range of features. The combination of typical responses coming from a specific target seen by a sensor in various spectral bands is called the **spectral signature** of that target.

BASIC TERMS AND CONCEPTS

- Sensors may be classified according to a number of different criteria. For example, there are **imaging** and **non-imaging** sensors. As their name implies, imaging sensors produce a two-dimensional "picture" while non- imaging sensors produce point measurements or profiles. Sensors are also described as being either **active** or **passive.** Active sensors transmit radiation to "illuminate" the surface and to receive and measure the amount of radiation which is reflected back. Passive sensors, in contrast, measure naturally produced radiation which is either reflected solar energy or emitted terrestrial energy.

BASIC TERMS AND CONCEPTS

- In order to provide a view of the earth's surface a sensor must be mounted on a **platform** which is simply the device or vehicle from which the sensor operates. Although stationary platforms, either attached or tethered to the ground, are sometimes used for specialized applications, aircraft and satellites are the most commonly used platforms for remote sensing. A general rule is that the higher the altitude of the platform, the larger the area that can be“seen” by the sensor; however, the ability to discriminate small objects will be reduced.

BASIC TERMS AND CONCEPTS

- The level of spatial detail which can be observed or recorded by a sensor is referred to as its **spatial resolution.** For a given sensor/platform system, spatial resolution is usually described in terms of the smallest unit area which can be distinguished from its neighbours. In an imaging sensor system, the individual elements which make up the image are called **pixels,** a term derived from “picture elements”. The area on the earth's surface represented by a pixel normally corresponds to the spatial resolution of the sensor, i.e. the ground resolution cell size.

BASIC TERMS AND CONCEPTS

- Data from sensors may be stored in **analog** or **digital** formats. In an analog system variations in the strength of the original input signal (e.g., the brightness variation in an image) are represented by continuous variations in some other medium such as voltage or film density. A digital representation, in contrast, divides the original signal into discrete ranges, each of which is assigned a numerical value. The range of the original signal as represented by a single numerical value is termed the **radiometric resolution** of the sensor system. Digitally recorded data, unlike analog data, can be processed easily by computers and can be copied repeatedly without negatively affecting the original or copied data. For human interpretation, however, an analog display such as a photograph or television picture is more useful. With appropriate equipment, it is possible to convert data from one format to the other.