

Remote Whale Detection:
A Hyperspectral View

Michael Dichner
Senior Thesis
Spring, Fall, 2001

OCN 499
Under the auspices of:
Jane Tribble, Ph.D.
And the direction of:
Michael DeWeert, Ph.D.,
Senior Scientist
Science and Technology International®

Proprietary Notice

The information enclosed is the property of Science and Technology International® and shall not be duplicated, used or disclosed in whole or in part with out the expressed written authorization by an Officer of Science and Technology International®.

1.0 Abstract

This paper presents the necessary background knowledge needed to develop a remote hyperspectral imaging sensor. It also describes the algorithmic process of detecting whales in digital data using sophisticated software. A hyperspectral imaging system which is comprised of a stabilizer, lens assembly and transmission grating, CCD, and computer software was used in March 2001 by Science and Technology International® (STI) in order to gather and process hyperspectral data for the purpose of whale counting. The presence of submerged humpback whales in the data was confirmed and their hyperspectral information was analyzed.

2.0 Introduction

The field of Environmental Science encompasses many different areas of expertise. In order to study the environment a base knowledge of chemistry, physics, biology, oceanography, and geology is needed. One of the main modes of environmental research and environmental monitoring is broadly described as remote sensing. Remote sensing to the environmental scientist essentially means that certain indicators of any given environmental situation are measured from a distance in order to gather data that can be used to draw a final conclusion. Determination of what indicators to measure, how to measure them remotely, and what those measurements mean, involves abstract theorizing, careful engineering, and meticulous, ongoing calibration.

Remote sensing systems and their applications are growing because they have many advantages over *in situ* and laboratory testing. Whenever *in situ* observations or measurements are made, the environment that is being studied is inevitably disturbed by those observations and measurements. Using remote sensing techniques can allow