FLYING FISHERIES

Aerial Survey Monitoring Tools for Environmental Impact Assessment

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Overview

• **Introduction**
  - Data Sources for Fisheries Management in the UK
  - Reporting Requirements
  - Custom development concept

• **Overflights Surveys**
  - Data format
  - Standardized mapping requirements
  - Custom tool development and demonstration

• **Vessel Monitoring System**
  - Data format
  - Custom tool development and demonstration

• **Next Steps – Future Development Plans**
Introduction

- **Fisheries Management in the UK**
  - Marine Management Organization (MMO) conducts Marine Control and Surveillance (MCS) to monitor commercial fishing activity

  - Conduct 2 primary types of vessel surveillance in addition to monitoring landings data:
    - **Overflights Surveys** – Spotter planes over fishing areas recording fishing vessels, types, activities
    - **Vessel Monitoring System (VMS)** – GPS system providing 2 hourly point data for vessel locations

  - ERM use this data to assess potential impacts from offshore developments (offshore wind, ports, aggregate dredging) and consult with the MMO and CEFAS to review findings.
Introduction

• Reporting Requirements
  - No statutory requirement to review monitoring data but expectation from MMO and CEFAS that it will be assessed.
  - No specific guidelines on best practice for assessing data – large volume of data provides many options for analysis and map production:
    » Vessel Type
    » Nationality
    » Time period – sum by date, month, year, season

• Custom development concept
  - Historically basic summary of all vessels engaged in fishing. Single set of summary maps by season.
  - GIS analyst not the best person for the job – require a tool to enable fisheries specialist to query, analyze and map data
OVERFLIGHT SURVEYS

Mapping Tool Development

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OVERFLIGTS: Methodology Overview

• Data Collection
  ✷ Spotter planes fly over fishing grounds and record any fishing vessel >10m in length:
    » Date
    » Vessel ID Number
    » Vessel Type – gear type
    » Current Activity – Steaming, Fishing, Stationary
    » ICES grid sub-rectangle (0.5° E-W, 0.25° N-S = 20 x 20 miles)

• Source Data
  ✷ Provided as separate text files:
    » Observations
    » Number of flights over each rectangle
  ✷ Data requires standardization to account for variations in flight frequency
OVERFLIGHTS: Standardization Method

- **Standardizing observations**
  - Method recommended by CEFAS
  - No. of Observations / No. of Flights
  - Can be applied to any combination of vessel types, time periods
  - Large number of calculations and multiple map outputs possible
  - Custom tool developed in VBA

- **Reference**
OVERFLIGHTS: Tool Workflow

- Process Raw Data
  - Data loaded to template geodatabase with standard schema for tables
  - Rectangles for Study Area extracted from master grid
  - Data loaded to mxd containing VBA code for fisheries specialist to analyze

![Layer and data selection interface](image)
OVERFLIGHTS: Tool Workflow

- Select Query Parameters
  - Nationality
  - Vessel Type
  - Activity Type
  - Time Summary

- All options enable multi-selection of criteria

- Tool generates a copy of the polygon grid with standardized obs for selected parameters
OVERFLIGHTS: Tool Workflow

- Mapping Tool
  - User applies standard symbology to analysis output. User adds additional base data as needed.
  - User selects layer and runs tool producing individual PDF for each time period, updates layer and title for each map.
VEESSEL MONITORING SYSTEM

Mapping Tool Development

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VMS: Methodology Overview

• Data Collection
  ✷ GPS devices fitted to vessels >15m in length and record positions every 2 hours
    » Vessel ID Number
    » Vessel Type – gear type
    » Position (Lat/Long)
    » Speed (inconsistently recorded)
  ✷ UK VMS data does not record vessel activity

• Source Data
  ✷ Provided as text files – format changed over time. Requires pre-processing using custom scripts before loading to geodatabase
**VMS: Methodology Overview**

- **Analysis Methodology**
  - Adapted by ERM from existing UK wide analysis
  - Uses speed information in data to estimate vessel activity
  - Speeds calculated from locations where speeds not available
  - Activity reported on subdivisions of ICES sub-rectangles – greater data volume enables greater granularity

- **Reference**
  
VMS: Tool Workflow

- Process Raw Data
  - Data pre-processed and loaded to template geodatabase with standard schema for tables
  - Rectangles for Study Area extracted from master grid
  - Data loaded to mxd containing VBA code for fisheries specialist to analyze
VMS: Tool Workflow

- **Analysis and Mapping has four stages**
  1. Process Tables – Converts table to points, re-projects to selected local coordinate system and calculates tool specific fields (Run Once)
  2. Process Speed – Calculates speed between points for individual vessel voyages (Run Once)
  3. Query Data – Select query parameters (Run multiple)
  4. Plot Data – Generate map series from query (Run multiple)
**VMS: Tool Workflow**

- **Select Query Parameters**
  - Nationality
  - Vessel Type
  - Speed range
  - Time Summary
- **All options enable multi-selection of criteria**
- **Tool generates a copy of the polygon grid with standardized obs for selected parameters**
**VMS: Tool Workflow**

- **Mapping Tool**
  - User applies standard symbology to analysis output. User adds additional base data as needed.
  - User selects layer and runs tool producing individual PDF for each time period, updates layer and title for each map.
DELIVERING SUSTAINABLE SOLUTIONS IN A MORE COMPETITIVE WORLD

CONCLUSIONS

Future Developments
Conclusions

• Benefits of Custom Tool Approach
  - The specialist is in control of the assessment with minimal GIS training
  - Tools enable rapid assessment of multiple user-defined input parameters
  - Multiple series of maps can be generated for different time periods
  - Potential user error in bulk data processing is removed
Future Developments

- Conversion of tools to .NET to provide more robust development platform
- Enhanced mapping functions to enable greater user interaction with automated mapping
- Development of web-based version of tools to remove need for desktop software and increase access to users