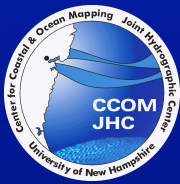# Marine Information Objects: What, Why and How

Dr. Lee Alexander, Univ. of New Hampshire

Michel Huet, IHB

Marine Information Objects (MIOs)

- Chart and navigation-related information that supplement the minimum information required by IMO ECDIS

- Additional, non-mandatory
- Not covered by existing standards (e.g., IHO S-57, IHO S-52, or IEC 61174)
- The "everything else"
- Points, lines, areas, features, objects

Two types of Electronic Charting Systems

ECDIS - Electronic Chart Display and Information System
- IMO Performance Standards
- IHO data and display specifications
- IEC testing/certification reqmnts
- ECDIS has been accepted by IMO as suitable for meeting chart requirements of SOLAS.
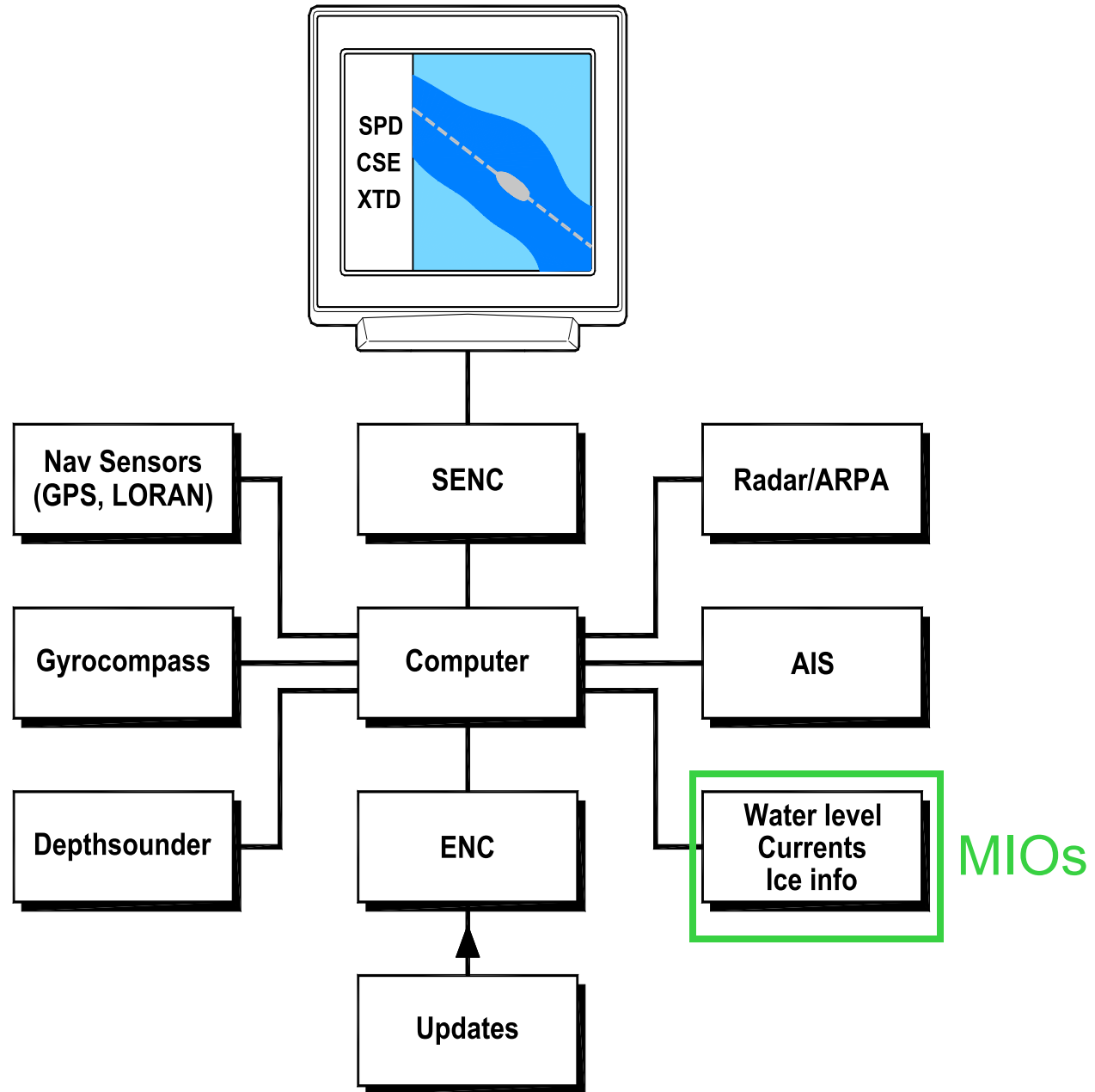
ECS - Electronic Chart System
- Anything other than ECDIS
- RTCM performance & ISO data standards
- Use a wide variety of EC data

ECDIS COMPONENTS

Color Display

Nav Sensors (GPS, LORAN)	SENC	Radar/ARPA
Gyrocompass	Computer	AIS
Depthsounder	ENC	Water level Currents Ice info
	Updates	

MIOs

IMO-compliant ECDIS

ENC Definition:

"*all the chart information necessary for safe navigation and may contain* supplementary information *in addition to that contained in the paper chart which may be considered necessary for safe navigation.*"
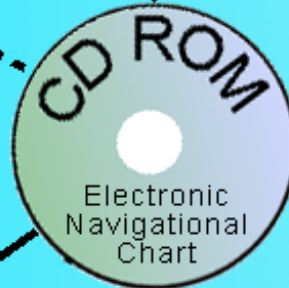
COLLECTION AND USE OF HYDROGRAPHIC DATA

IHO Paper Chart Standard. M-4

DIGITAL HYDRO-GRAPHIC DATA BASE

IHO TRANSFER STANDARD S-57

Paper Navigational Chart

CD ROM

Electronic Navigational Chart

Digital Hydrogra[...]
IHO Standa[...]

OTHER GIS APPLICATIONS

ECDIS

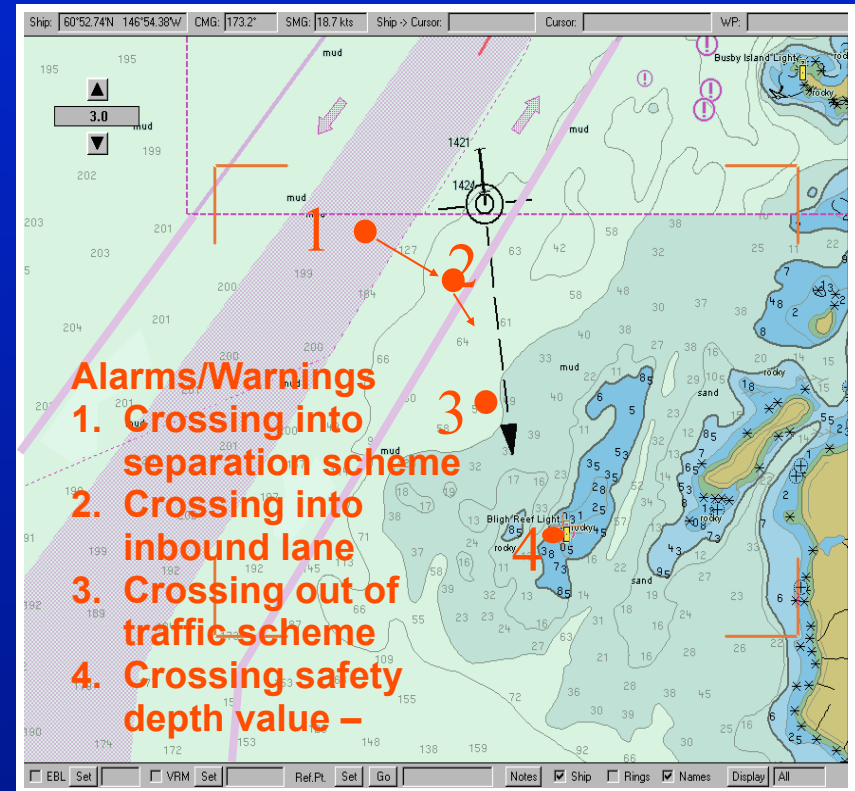| MONITORING HUMAN ACTIVITIES AND DEVELOPMENT	LONG TERM MANAGEMENT (Erosion, Pollution, Water Levels etc) DISASTER-MANAGEMENT (Accidental Pollution)	BIOLOGICAL PHYSICAL	BAT[...] MAP[...]
Coastal Zone Management	Environmental Management	Resource Management	

Electronic Navigational Chart (ENC)

- Database of chart features

- Produced in conformance to IHO S-57 Standards

- Displayed on ECDIS using IHO S-52 colors and symbols

- Software can provide alarms/warnings and use "intelligence" of data

- chart is background for display of other navigation information, e.g.,

       Ownship
       Radar
       AIS
       MIOs

Alarms/Warnings
1. **Crossing into separation scheme**
2. **Crossing into inbound lane**
3. **Crossing out of traffic scheme**
4. **Crossing safety depth value –**

Bligh Reef, Prince William Sound, Alaska

(site of EXXON VALDEZ grounding)

Types of MIOs

Tides / water levels
Ice coverage
Meteorological
Oceanographic
Marine Habitats (e.g., coral reefs)
Environmental Protection (e.g., Marine Protected Areas)
Archeological
Security
Pipelines/cables
Aids-to-navigation

Display Standards/Specifications

IMO Performance Standards for ECDIS:

1. Chart-related

"IHO recommended colours and symbols (IHO S-52) should be used to display SENC information"

2. Navigation-related

"other navigational information may be added to the ECDIS display. However it should not degrade …and be clearly distinguishable from SENC information."

"the colours and symbols used to describe navigational elements and parameters …are published in IEC 61174"

Relationship of MIOs to Navigation-related Information
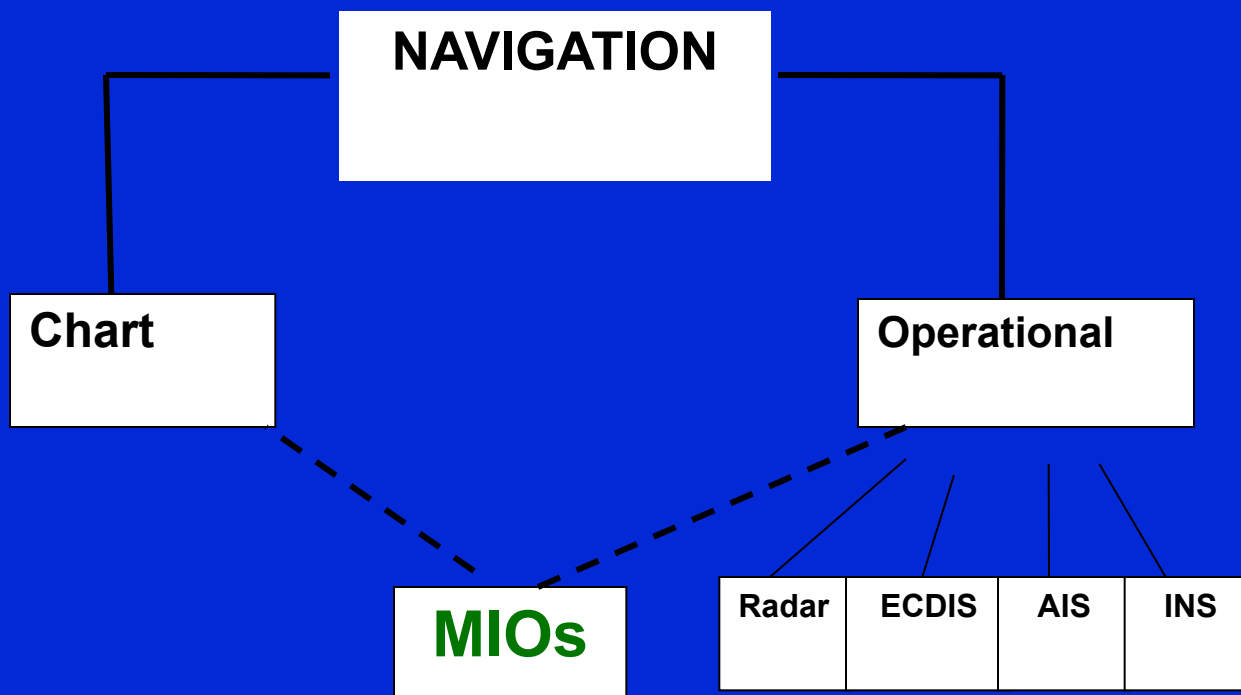
IHO – IEC HGMIO

- Harmonization Group on Marine Information Objects
- Subsidiary of Two Committees:

  IHO CHRIS

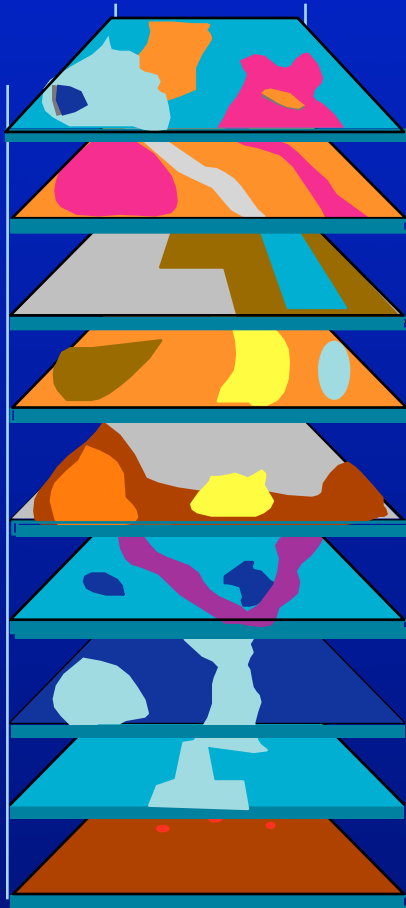 TSMAD (S-57 objects/attributes, ENC Prod Spec)

  C&SMWG (S-52 Colours and Symbols)

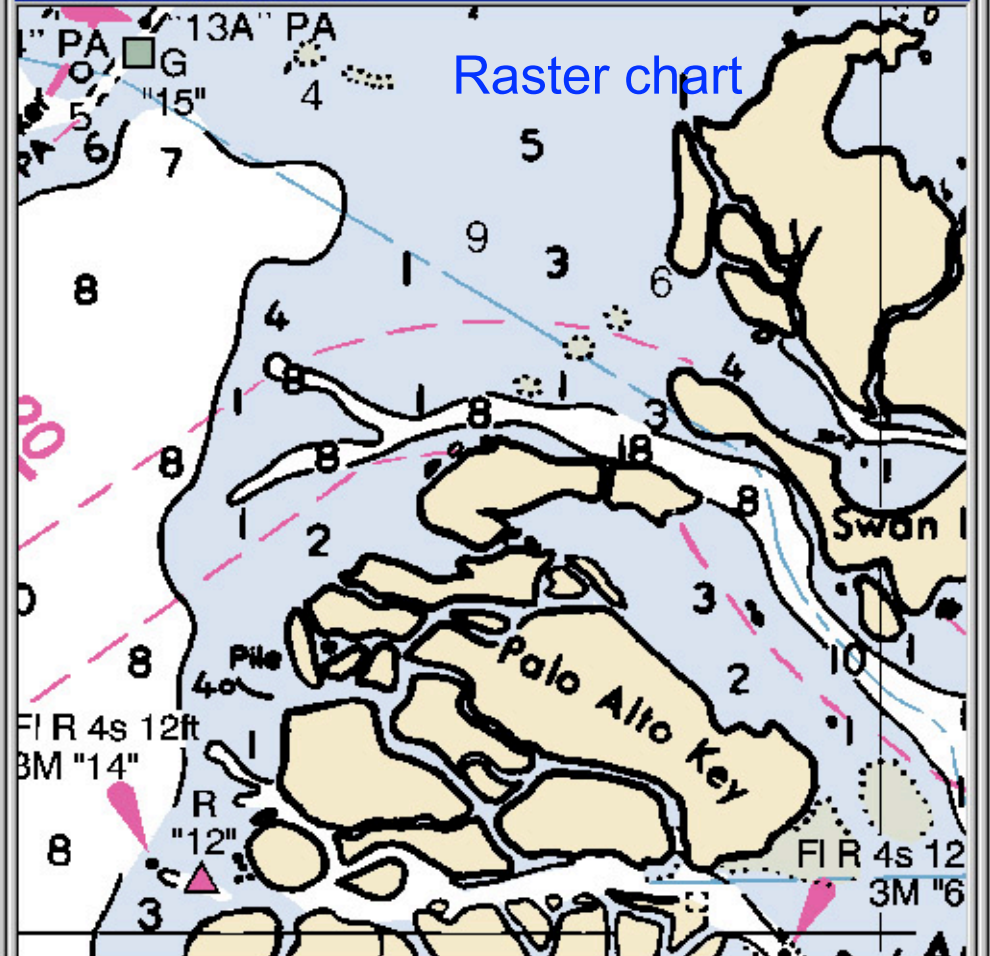 IEC TC80

  WG7 (ECDIS)

  WG13 (Navigation Display)

Foundation Data Layers for Marine GIS

- Shoreline
- Bathymetry
- Cadastral (boundary)
- Environmental Sensitivity Index
- Habitat and species location
- Benthic mapping (seagrass, corals, ...)
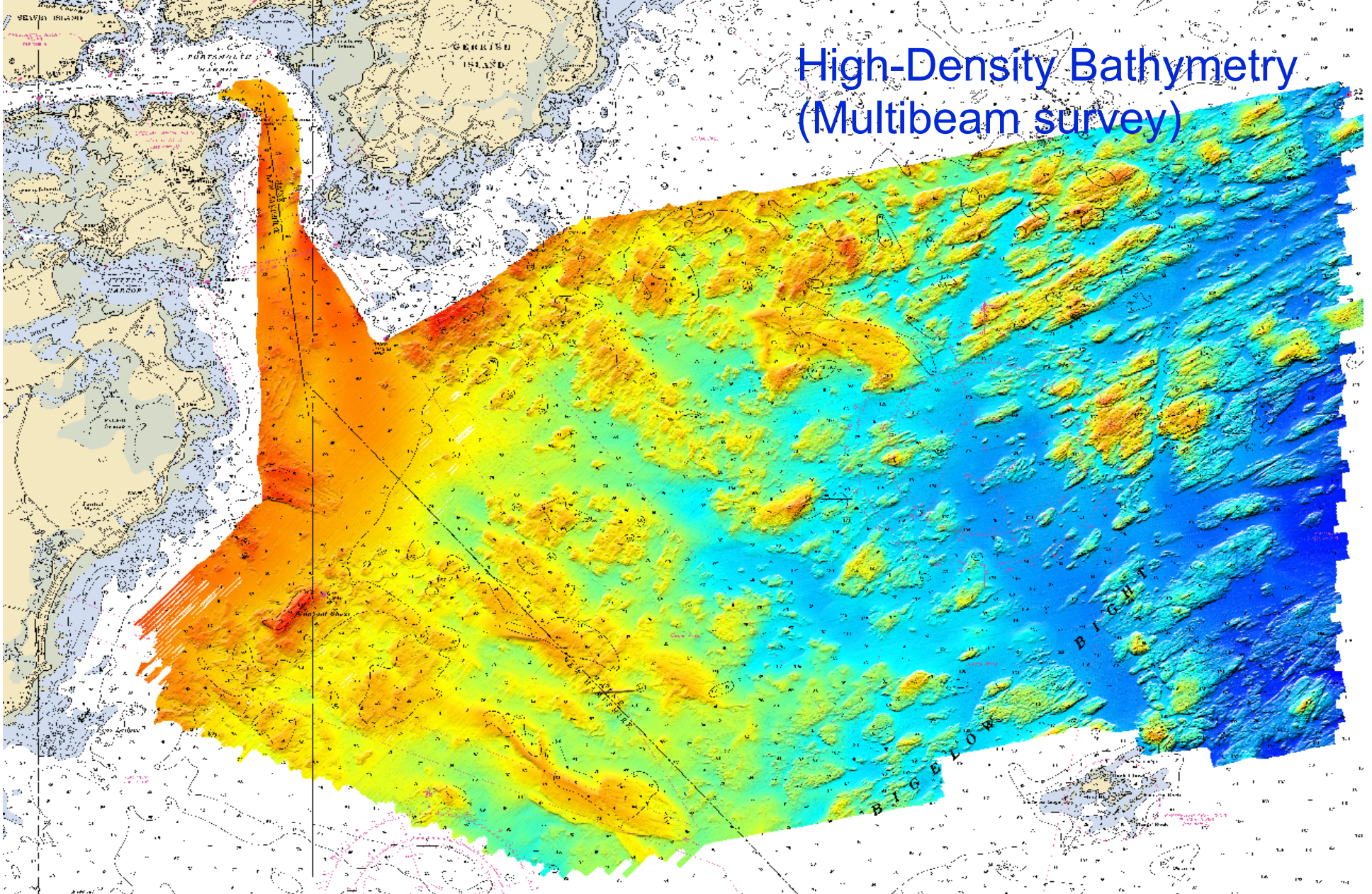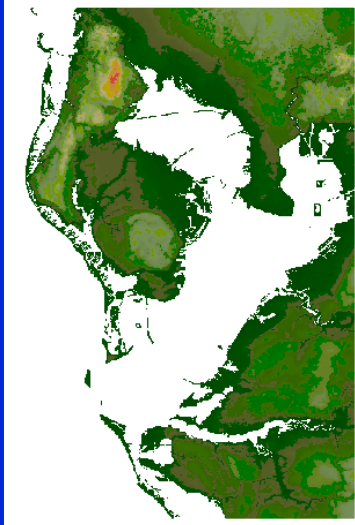- Ports and vessel traffic
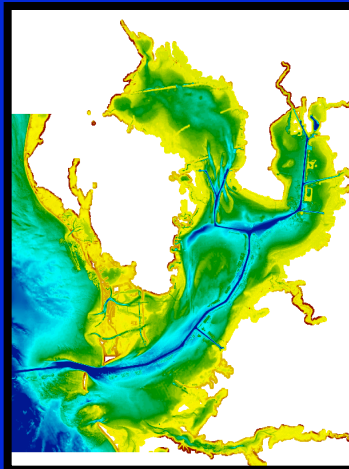- Geo-regulations

Ortho photo

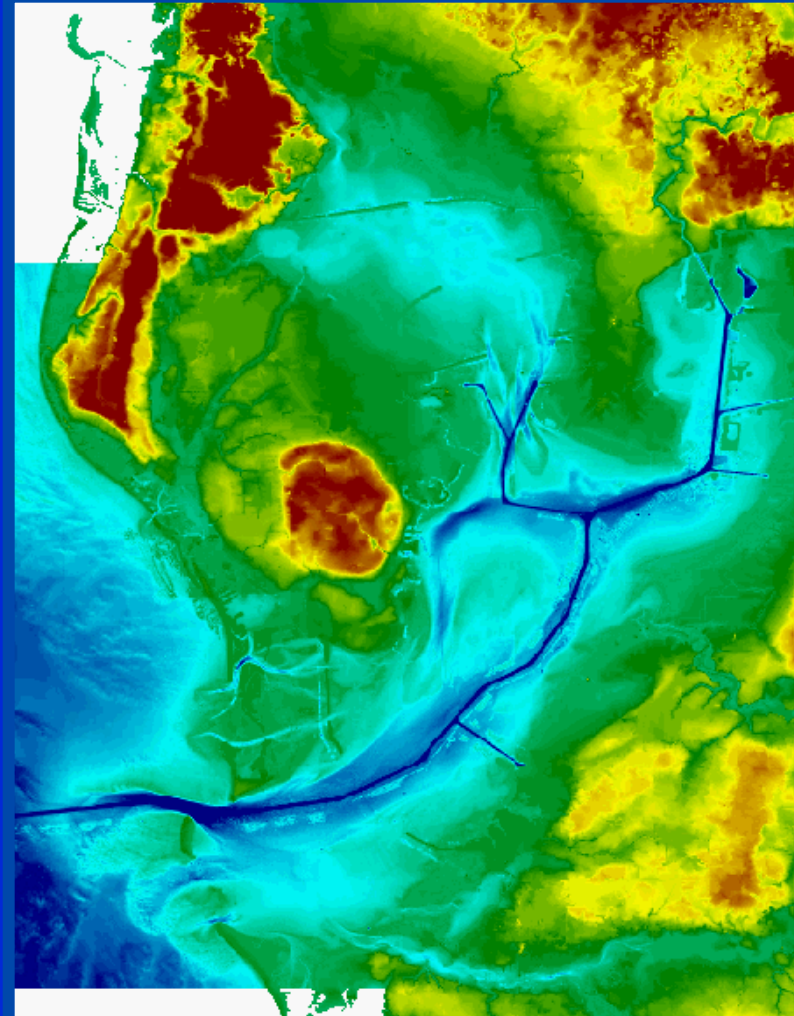Raster chart

High-Density Bathymetry
(Multibeam survey)
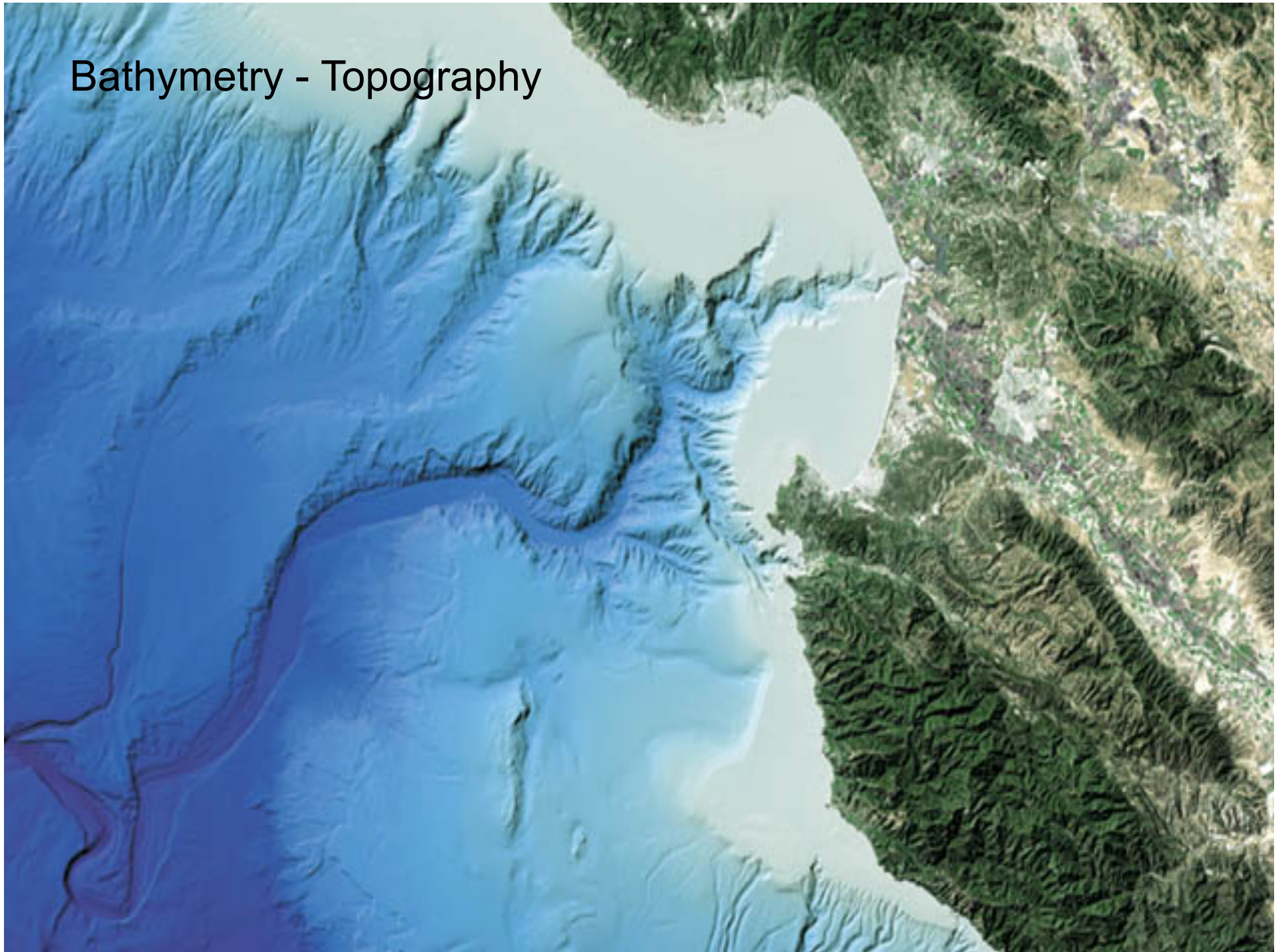
Integrated Topo-Bathy Database

USGS Topography

NOAA Bathymetry

Integrated Topo-Bathy Model

Bathymetry - Topography

Seafloor Classification
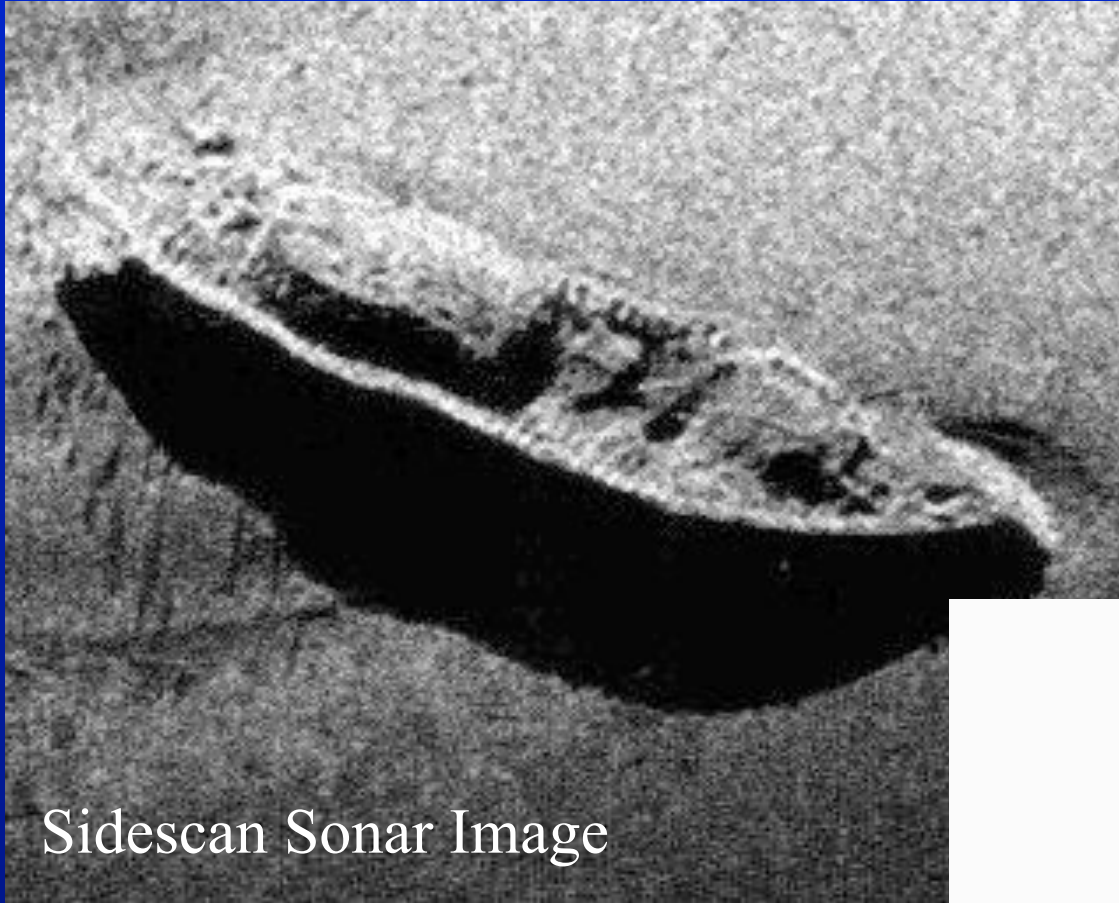
Benthic Mapping

Florida Bay Benthic Habitats
- Dense Seagrass
- Dense Seagrass on a Bank
- Sparse Continuous Seagrass
- Continuous Dense Seagrass in a Matrix of Sparse Seagrass
- Discontinuous Moderate to Dense Seagrass
- Discontinuous Moderate to Dense Seagrass on a Bank
- Predominatly Sand/Mud with Small, Scattered Seagrass Patches
- Predominantly Sand/Mud with Small, Scattered Seagrass Patches on a Bank
- Bare Carbonate Mud
- Tidal Creek
- Land
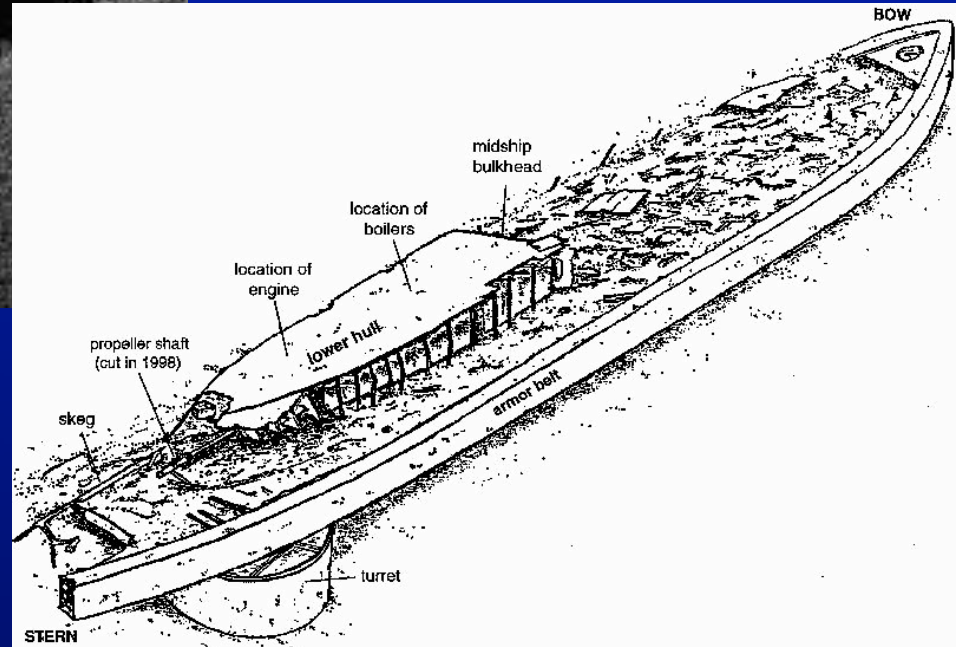
www.csc.noaa.gov/crs/bhm/

USS MONITOR

Sidescan Sonar Image

Two basic types of MIOs

Static
Bathymetric (e.g., gridded data)
Geophysical data (seismic, gravity, magnetic)
Seafloor classification/physiography
Archeological (wrecks, heritage sites)
Critical Habitats (e.g., coral reefs, nesting sites)

Dynamic
Tides (predicted, real-time, forecast)
Current flow (speed, direction, time of occurrence)
Meteorological (wind speed/direction)
Oceanographic (wave height/direction, salinity, temp)
Ice Coverage

Goal for MIOs

- Supplemental information for "decision support"
  - Right information for task-at-hand
  - Voyage planning & route monitoring
- How displayed less important than data format and content
  - Accurate, timely, and useable