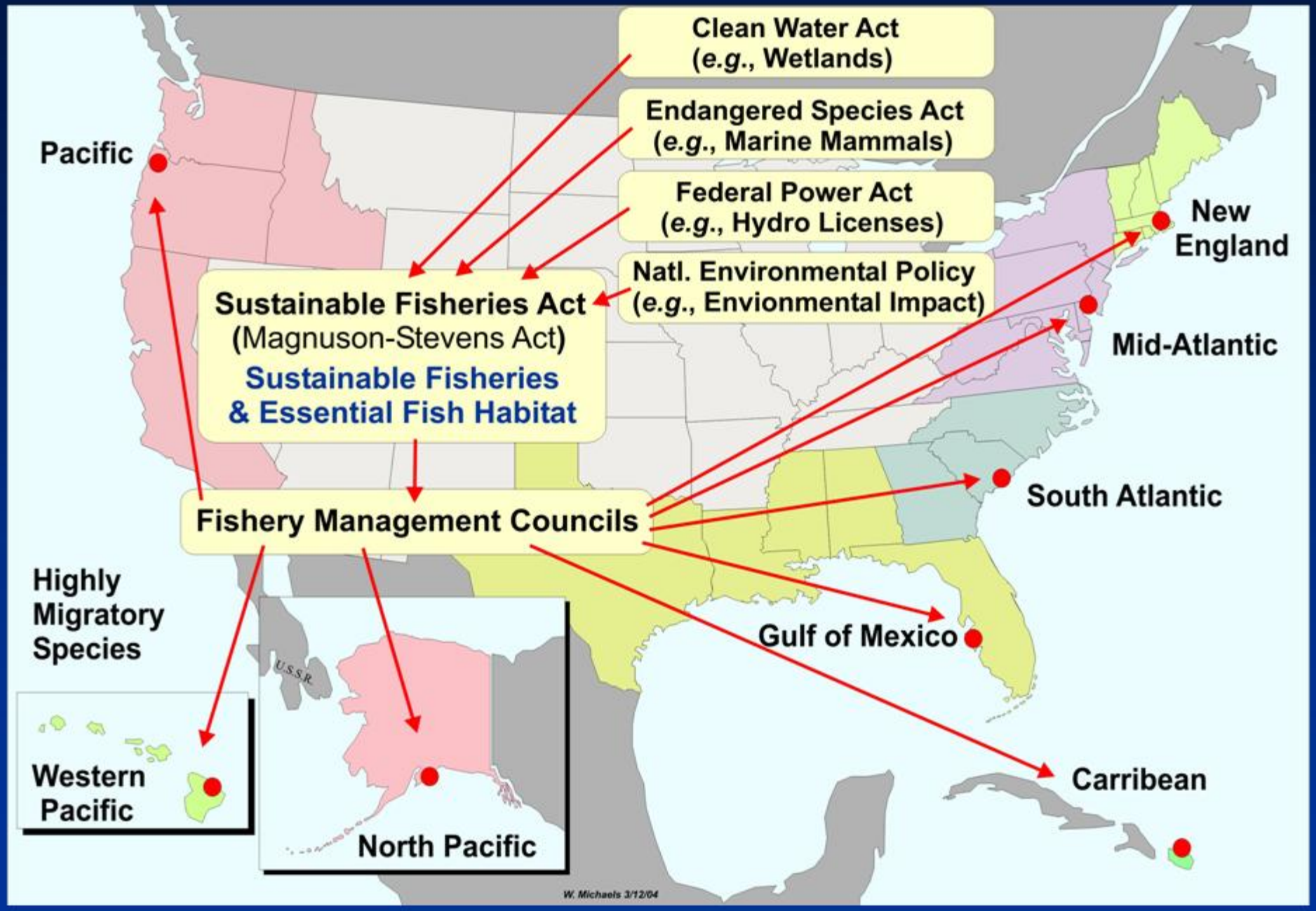
Introductory Overview of

Marine Habitat Mapping & Classification Requirements for Multibeam

3rd Multibeam Workshop (sponsored by NMAO & NOS)
in Boulder, CO during 10-12 March 2004

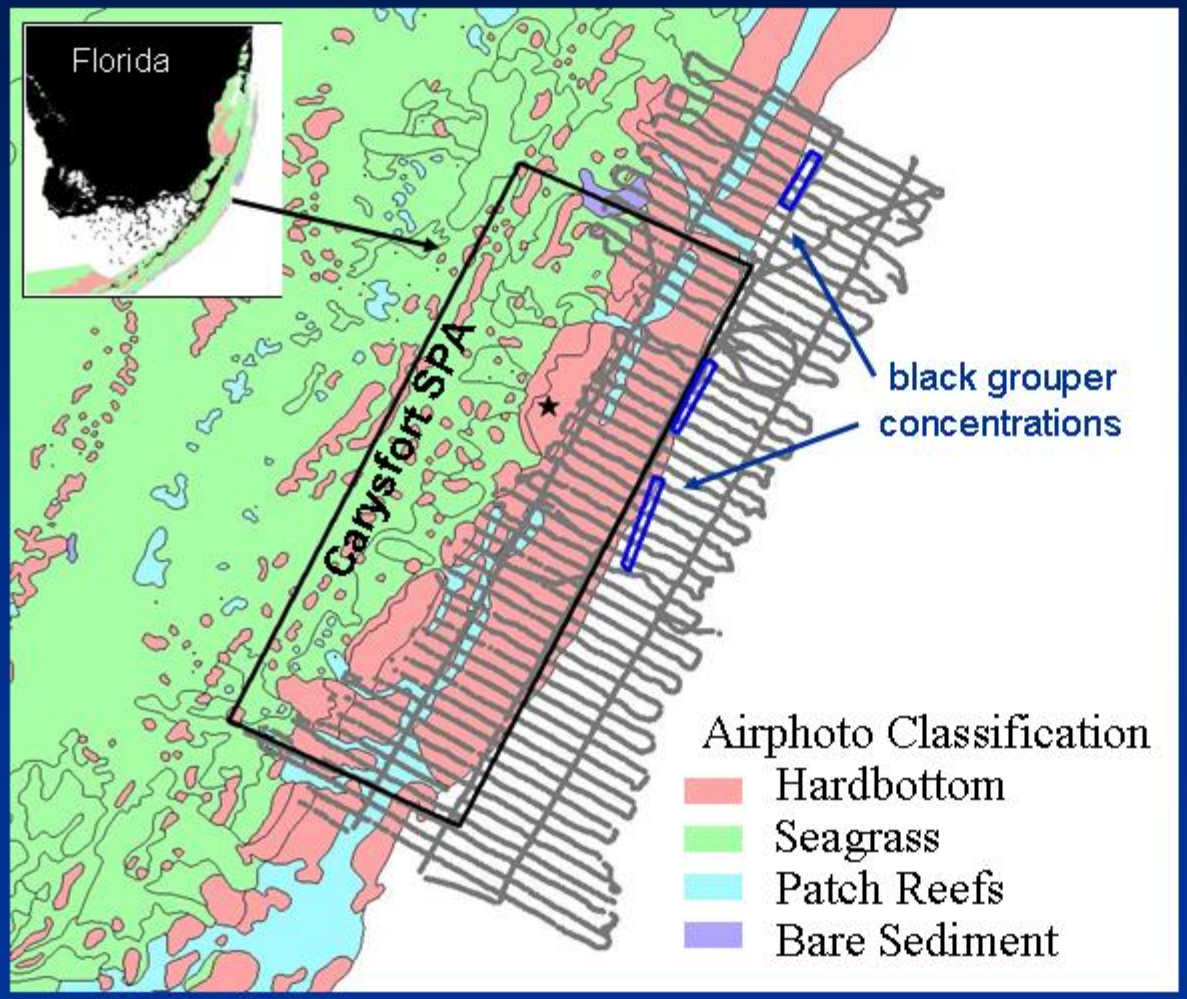
NOAA is Mandated to Identify & Monitor Essential Fish Habitats

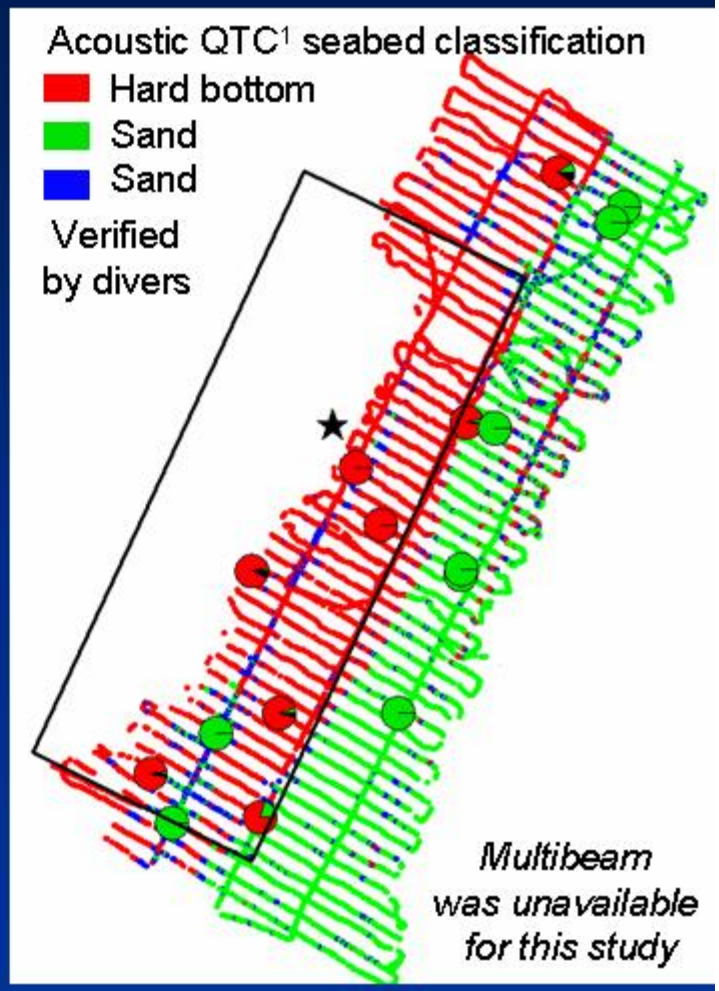


Example of Marine Habitat Mapping

Multibeam seafloor & watercolumn backscatter would improve research for Marine Protected Areas (MPA) & Essential Fish Habitat (EFH)

Biological, geophysical & environmental parameters are required for marine habitat mapping to delineate & monitor EFH & MPA





[1] *Does not imply endorsement of vendor's product*

Contacts: Art Gleason, Pamela Reid (Univ. Miami)
Anne-Marie Eklund, Veronique Koch (SEFSC)

Marine Habitat Mapping & Classification

Background

National standards for marine habitat classification & mapping have presently not been established in the USA

Several countries (*e.g.*, Australia, Britain, Ireland) have established national habitat classification standards providing framework

Literature (*e.g.*, Greene *et al.* 1999, Allee *et al.* 2000, Madley 2002,) reports marine habitat classifications within local regions providing additional framework for developing national (& international) standards

Multibeam provides watercolumn & seafloor products for habitat mapping

Multibeam is required to test & validate standards before establishing national (and international) marine habitat classification guidelines.

Marine Habitat Classification

Identify & monitor abiotic & biotic parameters describing "ecotypes", including anthropogenic & environmental effects on community structure.

"Ecotypes" include community assemblages & their habitat

EUNIS Habitat classification

Version 2.3 - 28/02/2002

Full list of habitats for "Marine habitats (A)" :

Note that habitat types at levels 1-3 (shaded yellow) have been validated by the EUNIS habitat classification, and habitat types at lower levels (coded with /) have been attached from other classifications.

Eunis code including code in attached classification	EUNIS code	Habitat name
A	A	Marine habitats
A1	A1	Littoral rock and other hard substrata
A1.1	A1.1	Littoral rock very exposed to wave action
A1.1/B-ELR.MB	A1.11	Mussels and/or barnacles on very exposed littoral rock
A1.1/B-ELR.MB.MytB	A1.111	[Mytilus edulis] and barnacles on very exposed eulittoral rock
A1.1/B-ELR.MB.Bpat	A1.112	Barnacles and [Patella] spp. on exposed or moderately exposed, or vertical sheltered, eulittoral rock
A1.1/B-ELR.MB.BPat.Cht	A1.1121	[Chthamalus] spp. on exposed upper eulittoral rock
A1.1/B-ELR.MB.BPat.Lic	A1.1122	Barnacles and [Lichina pygmaea] on steep exposed eulittoral rock
A1.1/B-ELR.MB.BPat.Cat	A1.1123	[Catenella caespitosa] on overhanging, or shaded vertical, upper eulittoral rock
A1.1/B-ELR.MB.BPat.Fvesl	A1.1124	Barnacles, [Patella] and [Fucus vesiculosus] f. [linearis] on exposed eulittoral rock
A1.1/B-ELR.MB.BPat.Sem	A1.1125	[Semibalanus balanoides] on exposed or moderately exposed, or vertical sheltered, eulittoral rock
A1.1/B-ELR.FR	A1.12	Robust fucoids or red seaweeds on very exposed littoral rock
A1.1/B-ELR.FR.Fdis	A1.121	[Fucus distichus] subsp. [anceps] and [Fucus spiralis] f. [nana] on extremely exposed upper eulittoral rock

Marine habitat classifications reported with local focus, providing framework for establishing national standards

Deep-Water Marine Benthic Habitat Classification Scheme

Key to Habitat Classification Code for Mapping and use with GIS programs

(modified after Greene et al., 1999)

Interpreted from remote sensing imagery for mapping purposes

Megahabitat – Use capital letters (based on depth and general physiographic boundaries; depth ranges approximate and specific to study area).

A = Aprons, continental rise, deep fans and bajadas (3000-5000 m)
B = Basin floors, Borderland types (floors at 1000-2500 m)
F = Flanks, continental slope, basin/island-atoll flanks (200-3000 m)
I = Inland seas, fiords (0-200 m)
P = Plains, abyssal (>5000 m)
R = Ridges, banks and seamounts (crests at 200-2500 m)
S = Shelf, continental and island shelves (0-200 m)

Seafloor Induration - Use lower-case letters (based on substrate hardness).

h = hard substrate, rock outcrop, relic beach rock or sediment pavement
m = mixed (hard & soft substrate)
s = soft substrate, sediment covered

Sediment types (for above indurations) - Use parentheses.

(b) = boulder
(c) = cobble
(g) = gravel
(h) = halimeda sediment, carbonate
(m) = mud, silt, clay
(p) = pebble
(s) = sand

Determined from video, still photos, or direct observation.

Macro/Microhabitat – Preceeded by an asterik. Use parentheses for geologic attributes, brackets for biologic attributes. Based on observed small-scale seafloor features.

Geologic attributes (note percent grain sizes when possible)

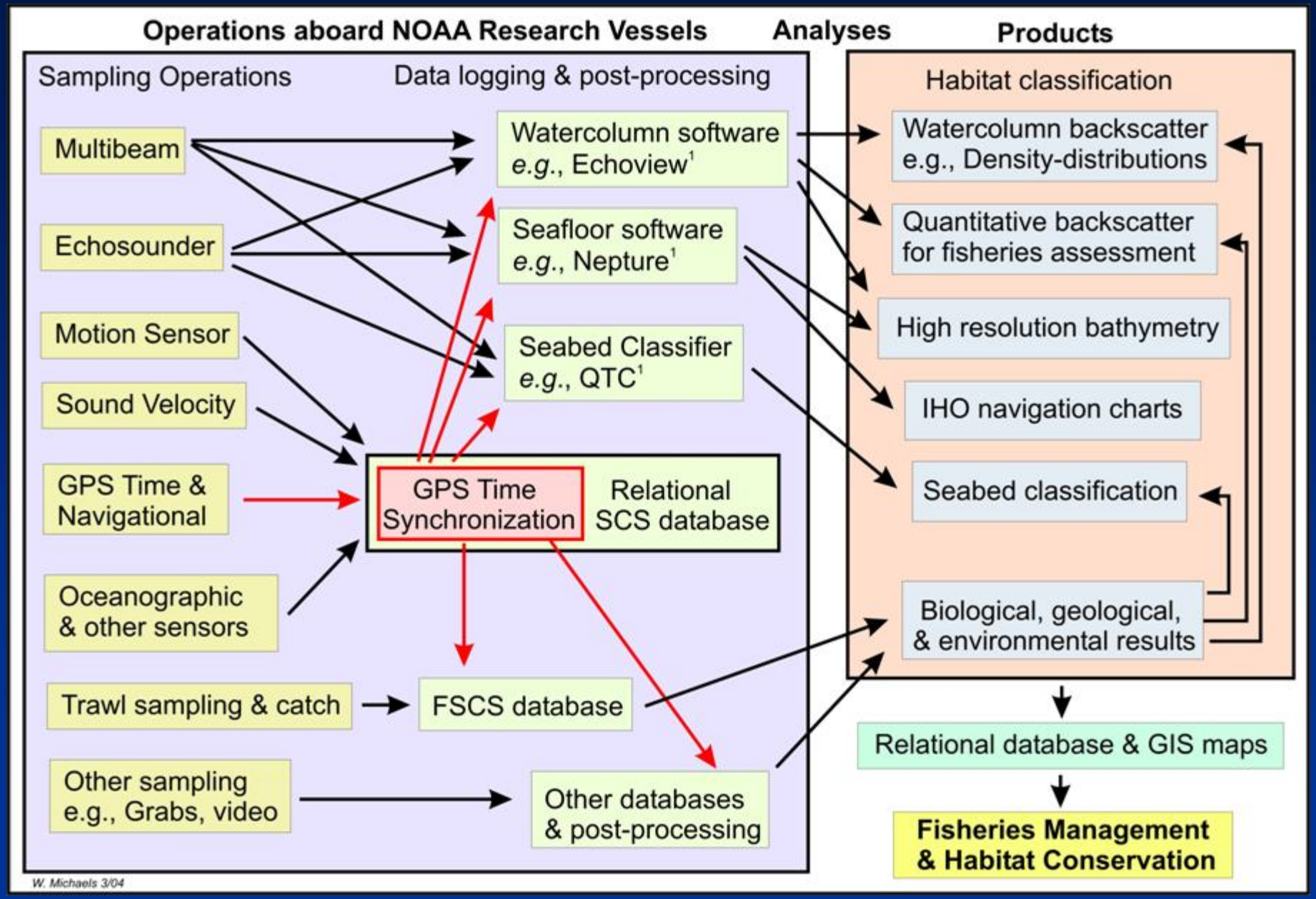
(b) = boulder
(c) = cobble
(d) = deformed, faulted, or folded
(e) = exposure, bedrock (sedimentary, igneous, or metamorphic)
(f) = fans
(g) = gravel
(h) = halimeda sediment, carbonate slates or mounds
(i) = interface
(j) = joints, cracks, and crevices
(m) = mud, silt, or clay
(p) = pebble
(q) = coquina (shell hash)
(r) = rubble
(s) = sand
(t) = terrace-like seafloor including sedimentary pavements
(w) = wall, scarp, or cliff

Biologic attributes

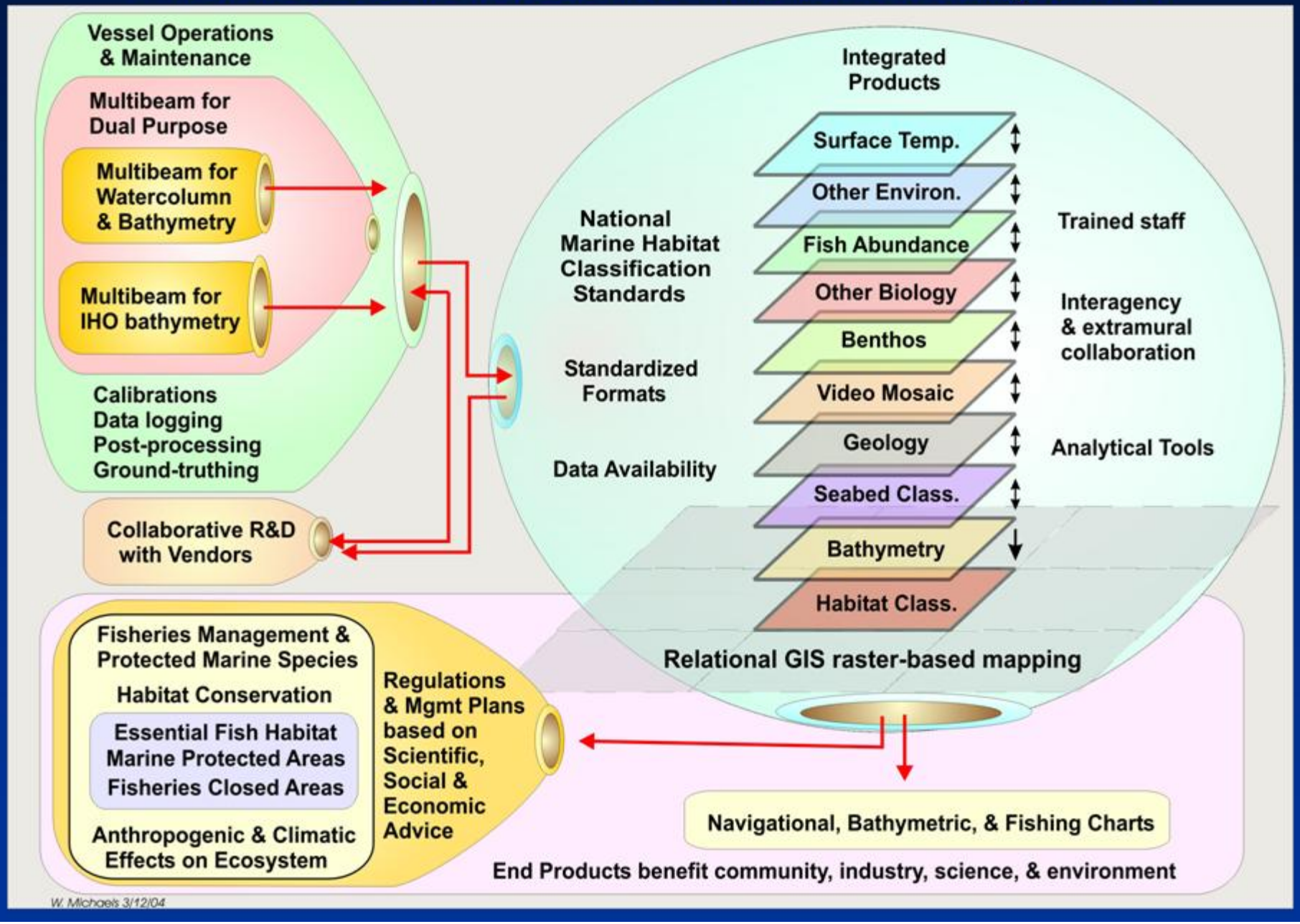
[a] = algae
[b] = bryozoans
[c] = corals
[d] = detritus, drift algae
[g] = gorgonians
[n] = anemones
[o] = other sessile organisms
[s] = sponges
[t] = tracks, trails, or trace fossils
[u] = unusual organisms, or chemosynthetic communities

Marine habitat research requires multibeam backscatter from seafloor (e.g., geophysical, benthos, eelgrass) & watercolumn (e.g., biological assemblages)

Multibeam Systems Provide Watercolumn & Seafloor Products for Marine Habitat Protection & Conservation

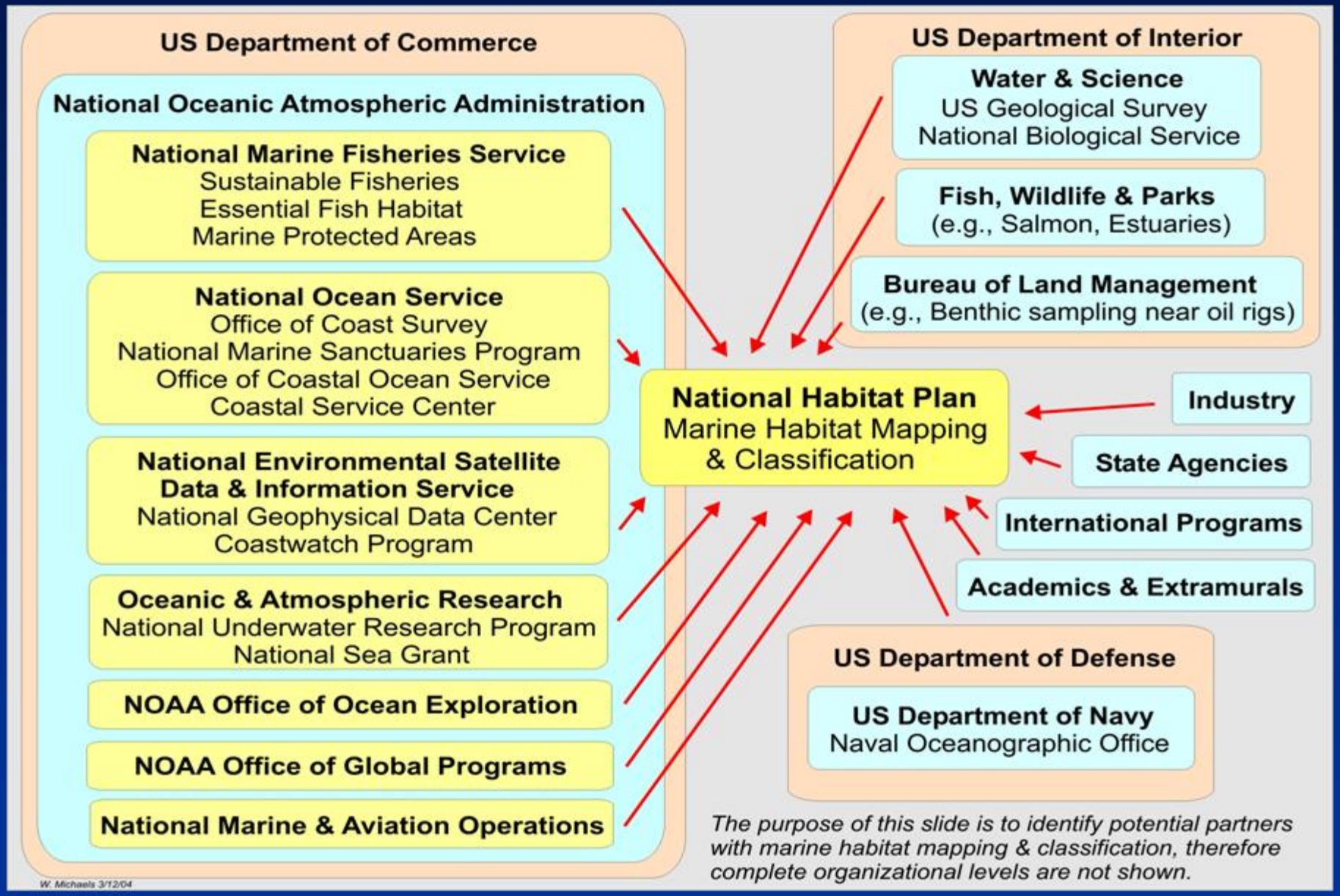


Some "Bottlenecks" Exists for Marine Habitat Mapping & End Products for Fisheries & Habitat Management



Potential Partnerships for Marine Habitat Mapping & Classification

Synoptic watercolumn & seafloor multibeam mapping is required to test & evaluate national standards for marine habitat classification



Marine Habitat Mapping & Classification

Summary & Recommendations

NOAA is mandated to identify & monitor Essential Fish Habitat (& MPAs)

Marine habitat classification requires biotic (e.g., fish, benthos, eelgrass) & abiotic (e.g., bathymetric, geophysical, environmental) parameters

Synoptic watercolumn & seafloor multibeam mapping is required to improve research & national guidelines for identifying Essential Fish Habitat (& MPAs)

Multibeam can be used operationally for most watercolumn (biological backscatter) & seafloor (bathymetry, seabed classification) products, while research & development is required for other multibeam products (quantitative population estimates).

Routine multibeam survey operations are required to monitor biological, environmental, & geophysical (including gear effects) fluctuations in marine habitats.

Cooperative efforts from intra-agency, inter-agency, academic, & industry is required for integrating multibeam products in support of fisheries & habitat conversation.