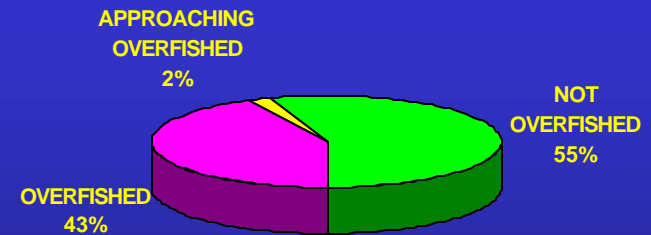
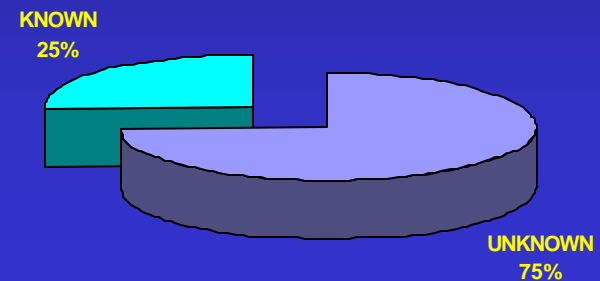


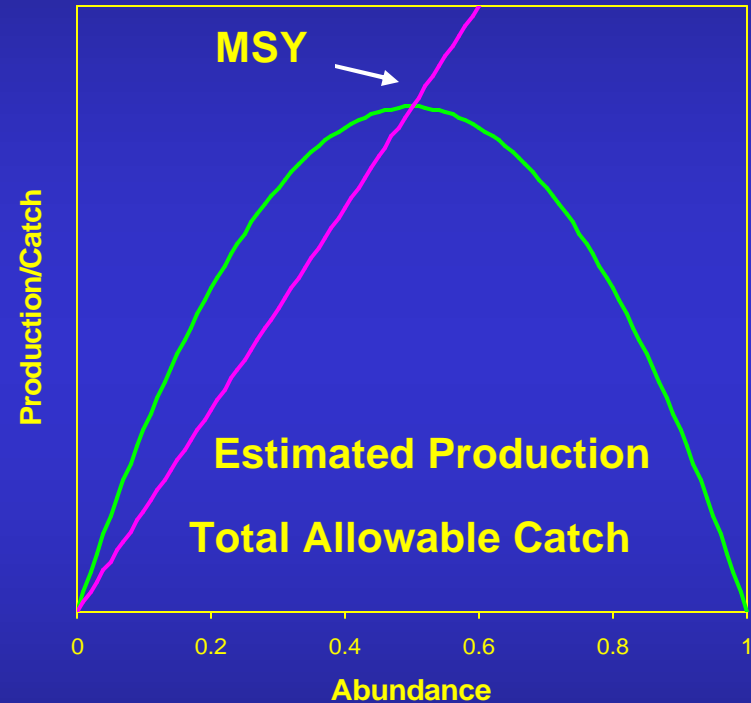
Current Situation in U.S.

- Huge gaps in most basic of information
- Poor management performance, even using weak overfished criteria



Conventional Information Needs

- Conventional management requires knowledge of:
 - the biology / ecology of the stock (production)
 - the abundance of the stock
 - the amount of the stock killed by fishing



- Without good information about all three, we are likely to make management errors

Larval Dispersal

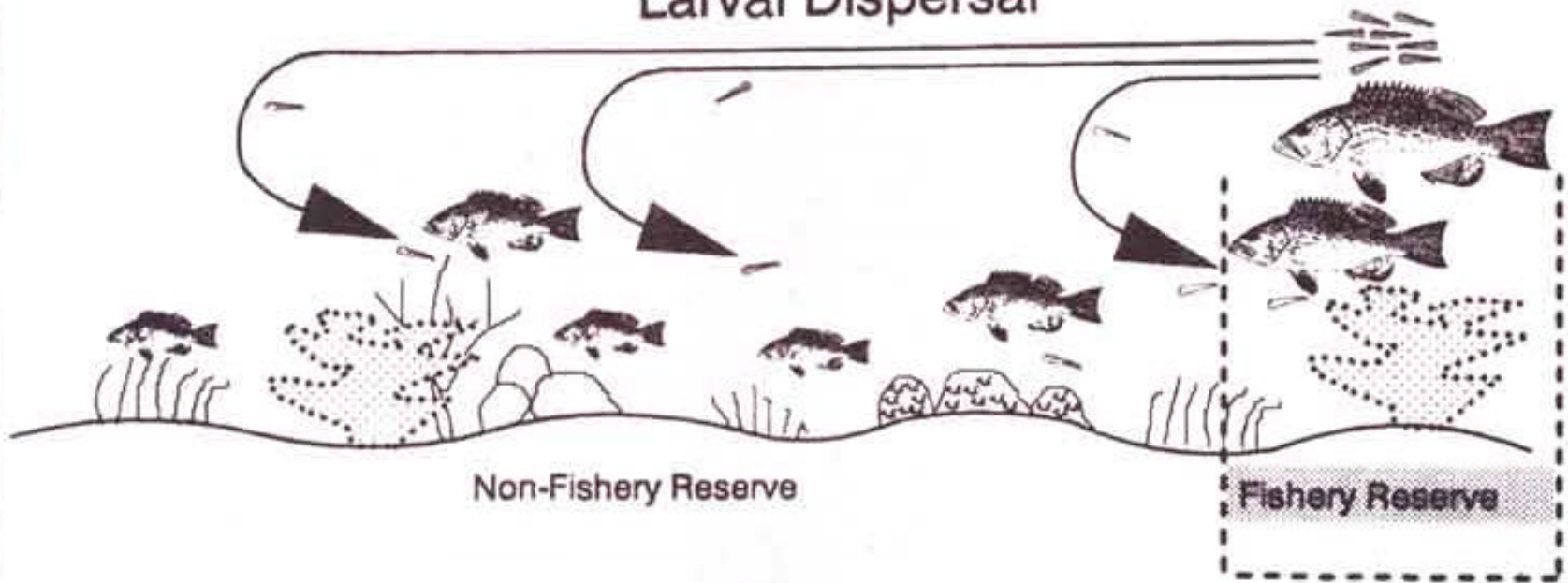
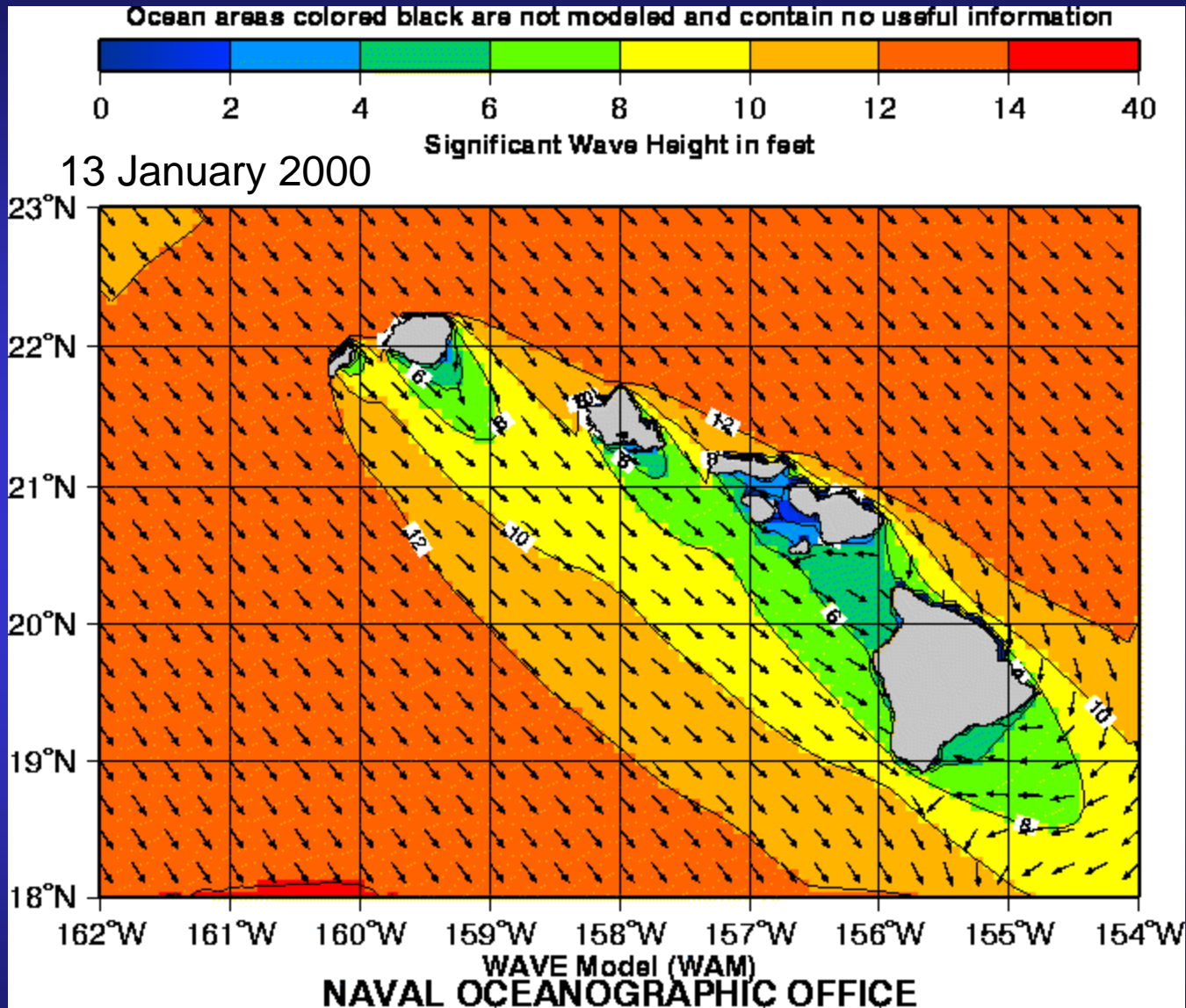


Figure 11. Many larvae generated by adults in marine fishery reserves should disperse and recruit to harvested areas.

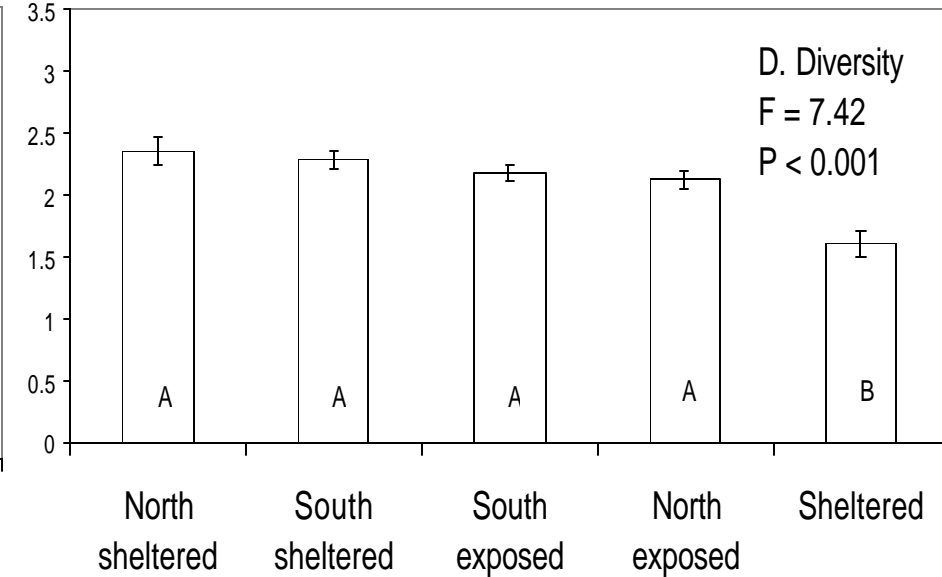
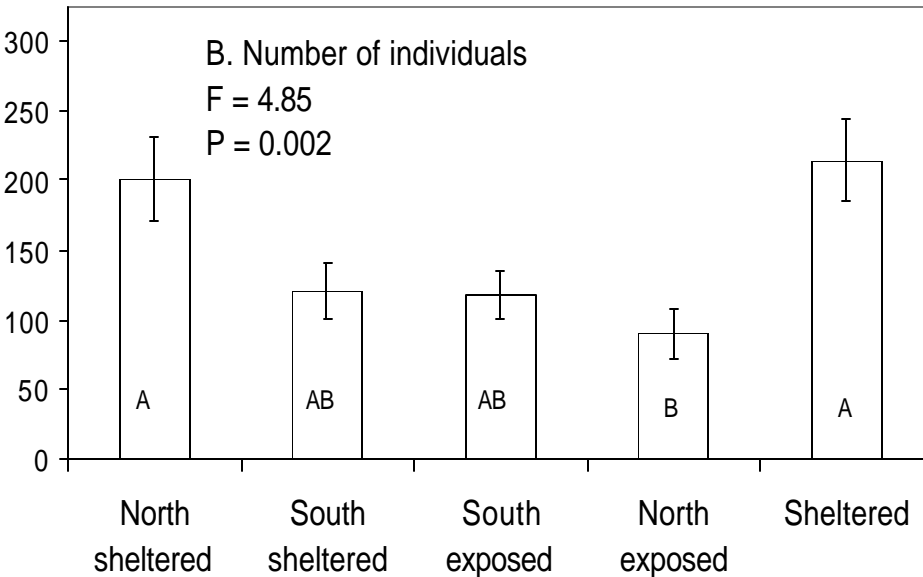
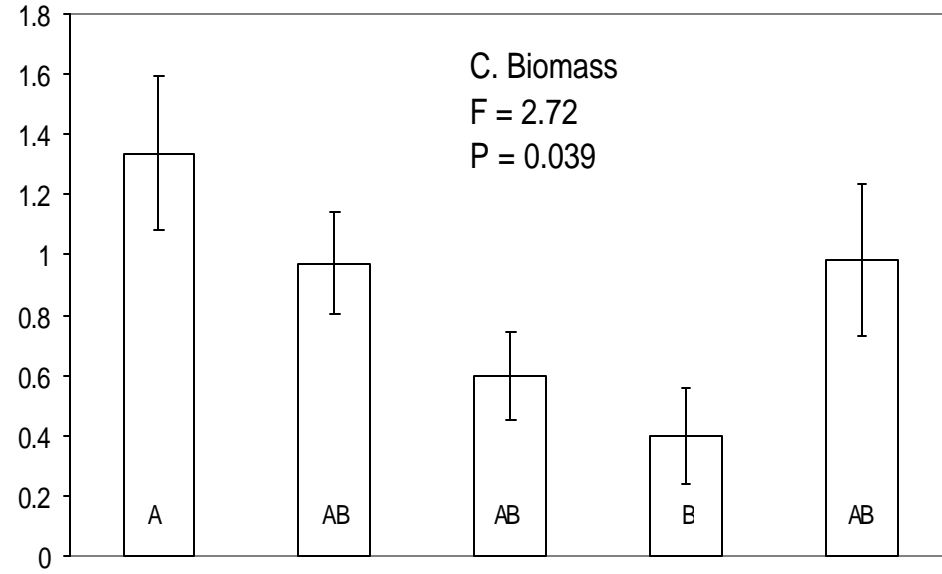
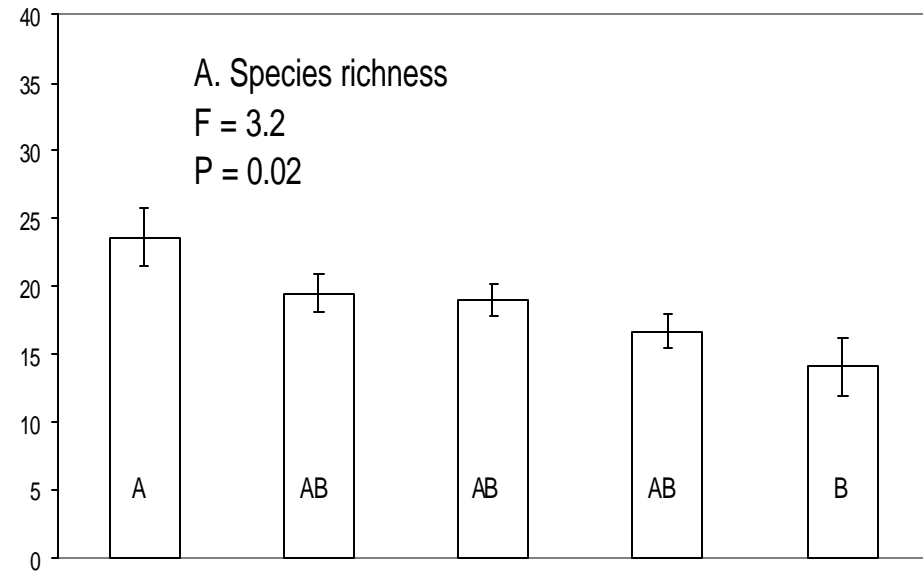
Design for Fisheries

- Intermediate size, but larger reserves required when fishing pressure outside of reserve is higher
- Individual reserves should keep adults in, allow larvae to disperse to provide yield enhancements
- Individual reserves should contain key species and fragile habitats
- Simple borders and public support can enhance enforceability

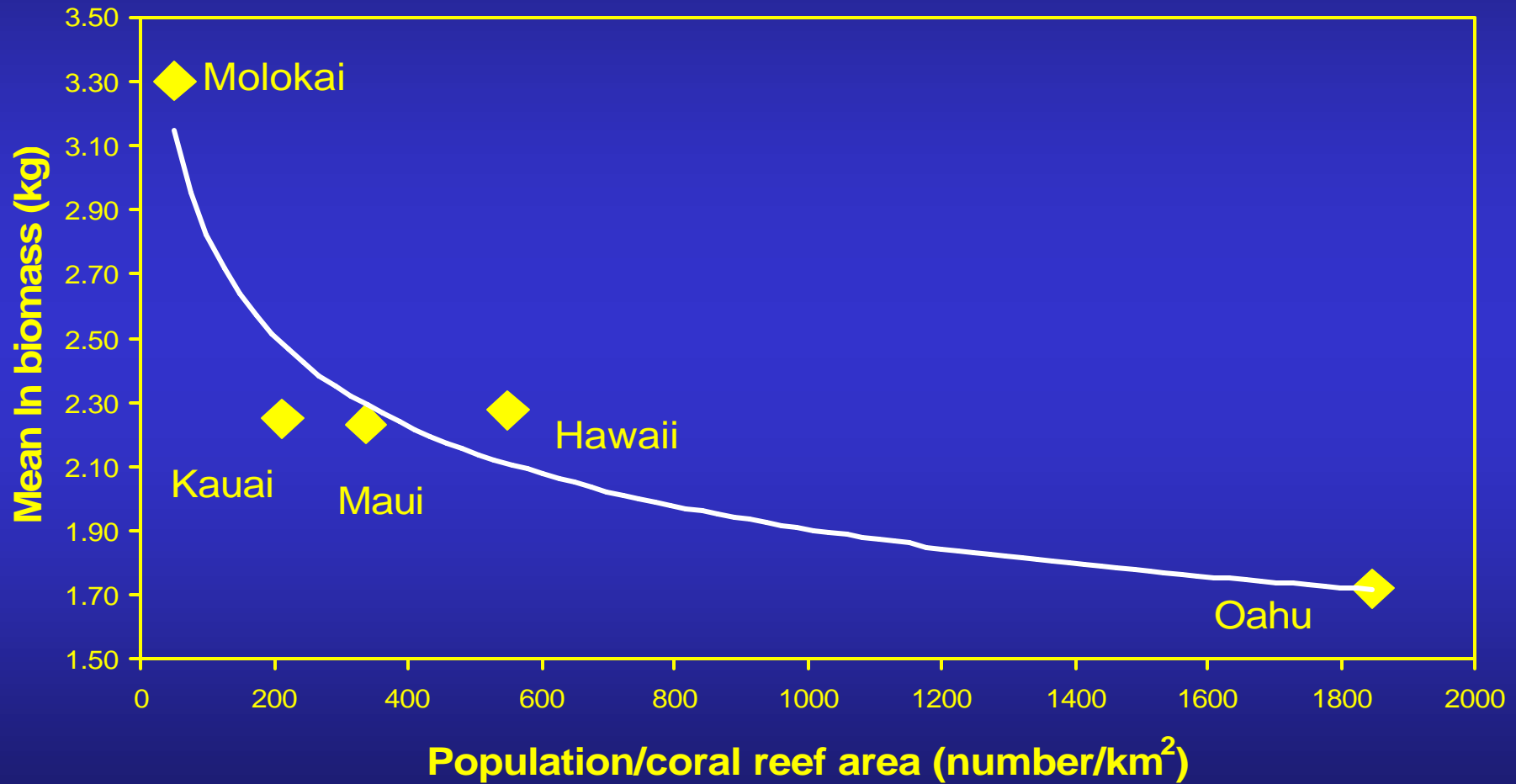
Forcing function (natural): wave energy



Fish assemblage characteristics by degree of wave exposure



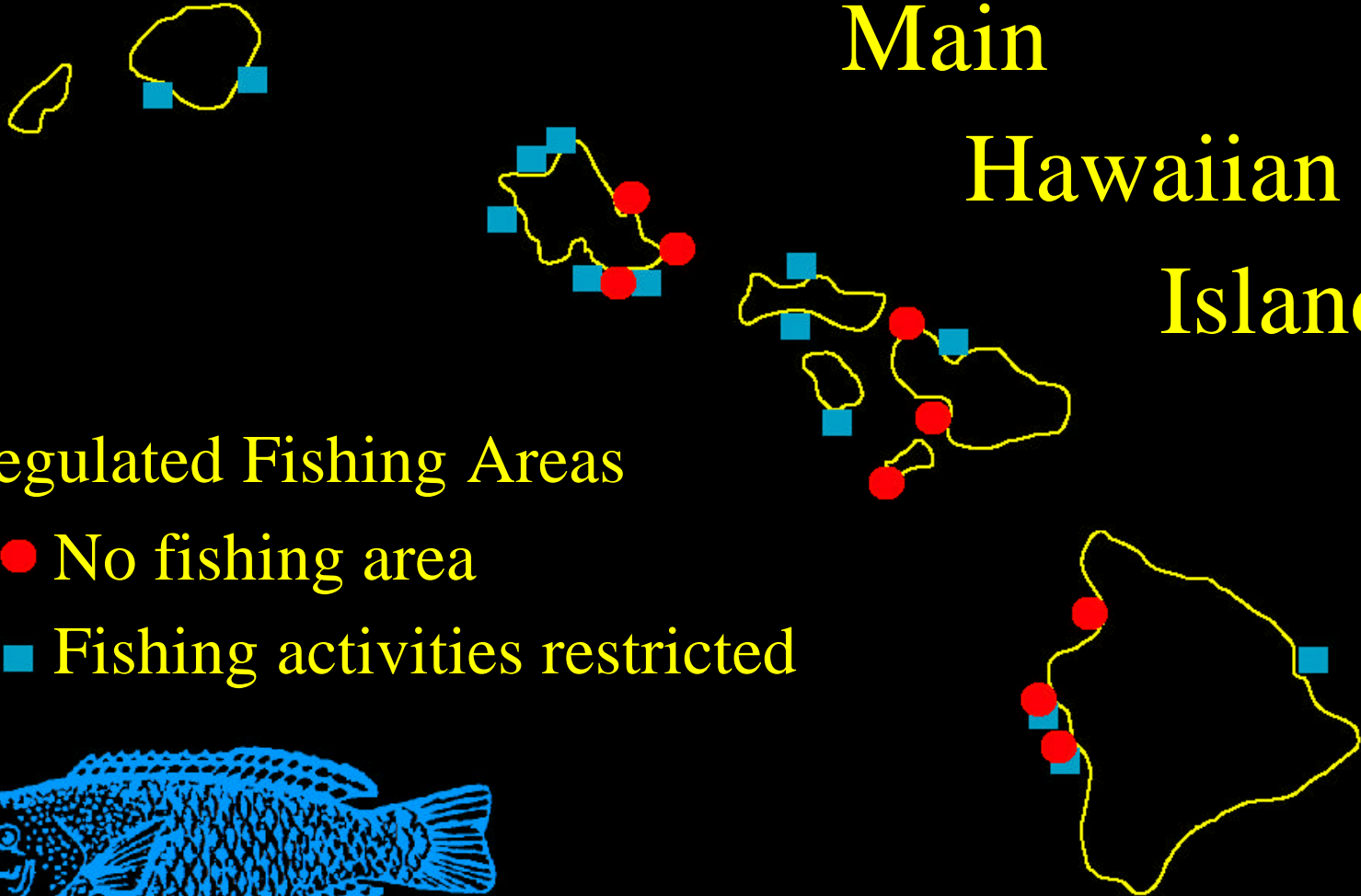
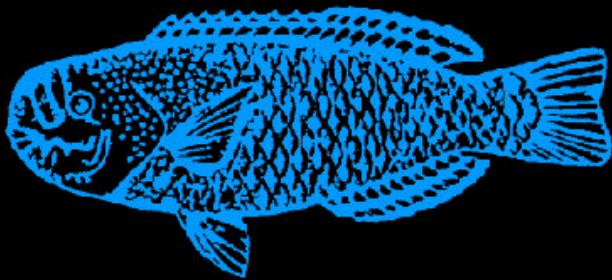
Fish biomass vs. human population density in the MHI



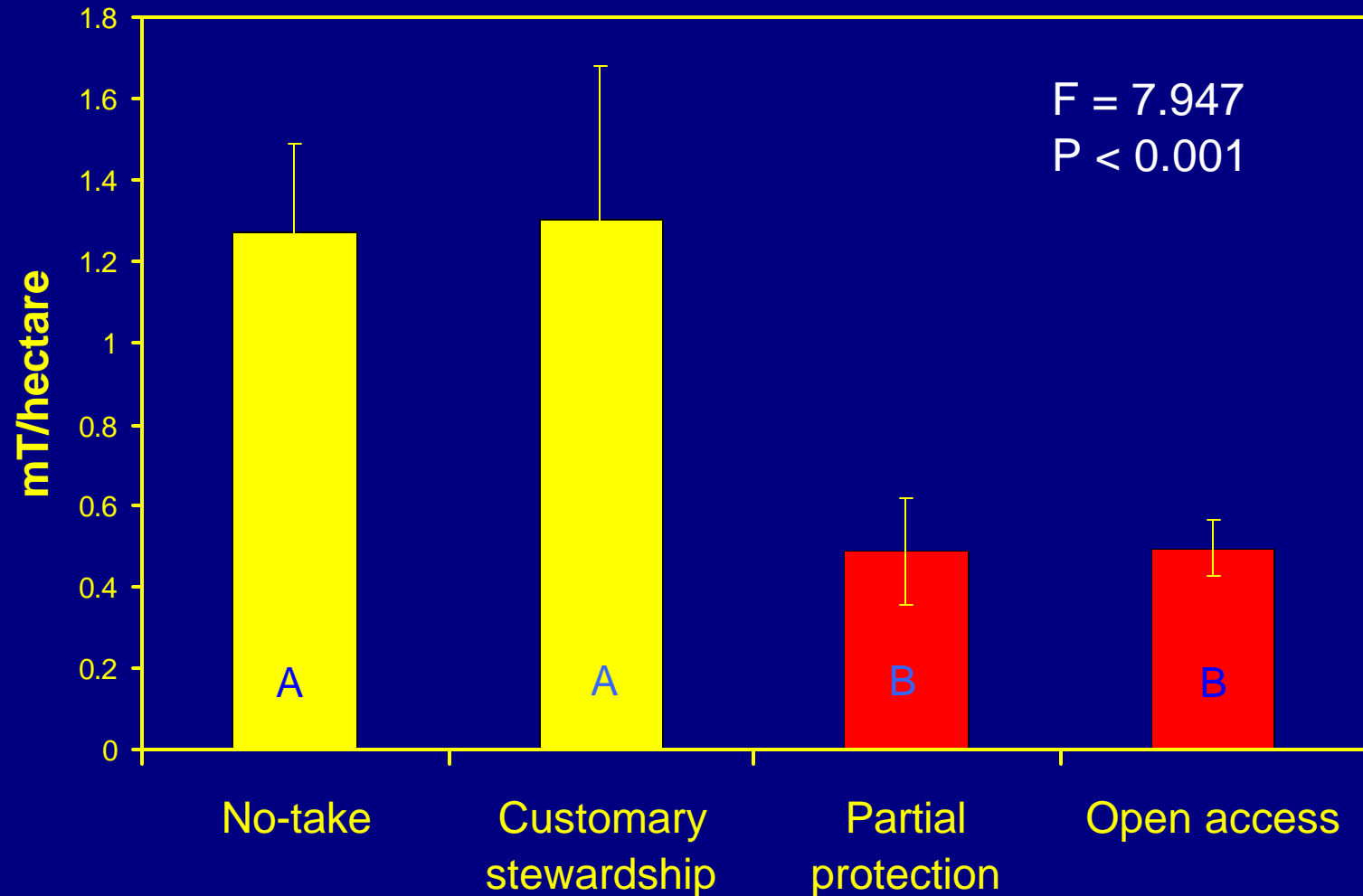
Main Hawaiian Islands

Regulated Fishing Areas

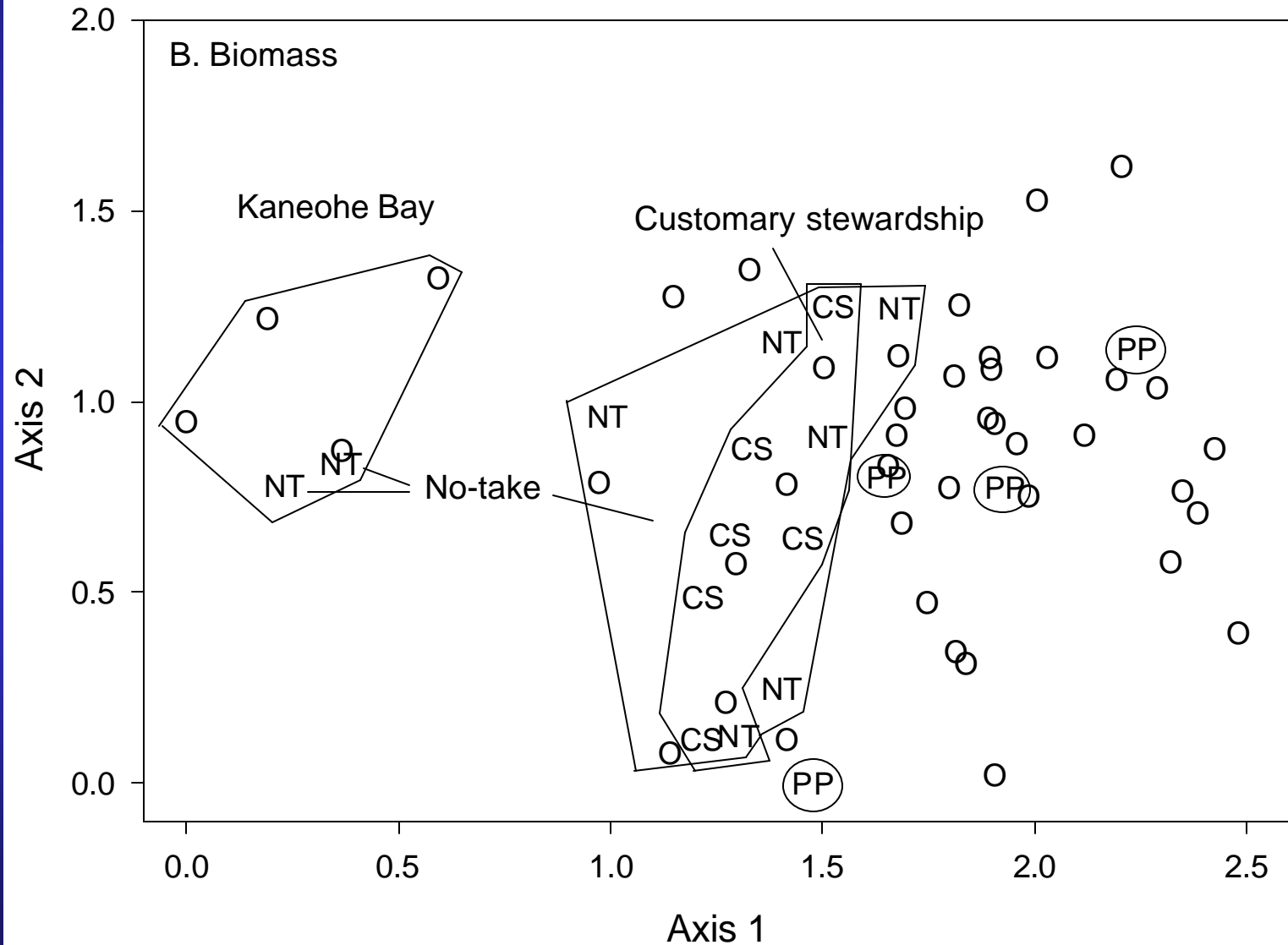
- No fishing area
- Fishing activities restricted



Fish standing stock by level of protection from fishing



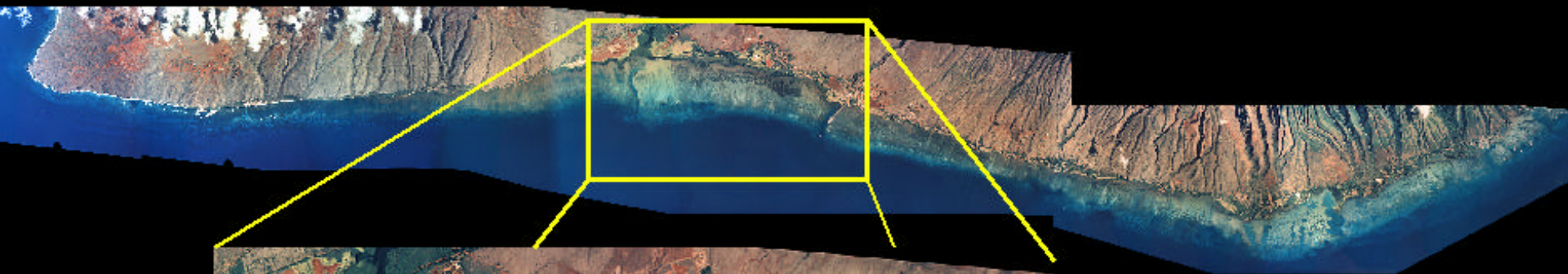
DCA fish biomass by level of protection from fishing



Influence of environmental parameters and management regimes on fish assemblages characteristics (general linear models)

Parameters	Species	Number	Biomass	Diversity
Depth	0.929	0.028	0.454	0.281
Rugosity	0.011	0.021	0.042	0.077
Exposed (N & S)	0.029	0.11	0.873	<0.001
Sheltered (N & S)	0.575	0.136	0.753	0.009
Embayment	0.037	0.026	0.929	<0.001
Protected Status	0.001	0.427	0.01	0.008
Coral cover-plate	0.124	0.224	0.224	0.979
Coral cover-branch	0.14	0.05	0.093	0.225
Coral cover - lobate	0.02	0.086	0.076	0.29

NOAA Molokai Test Area



Draw Boundary

Delineate Habitats

Generate Random
Points

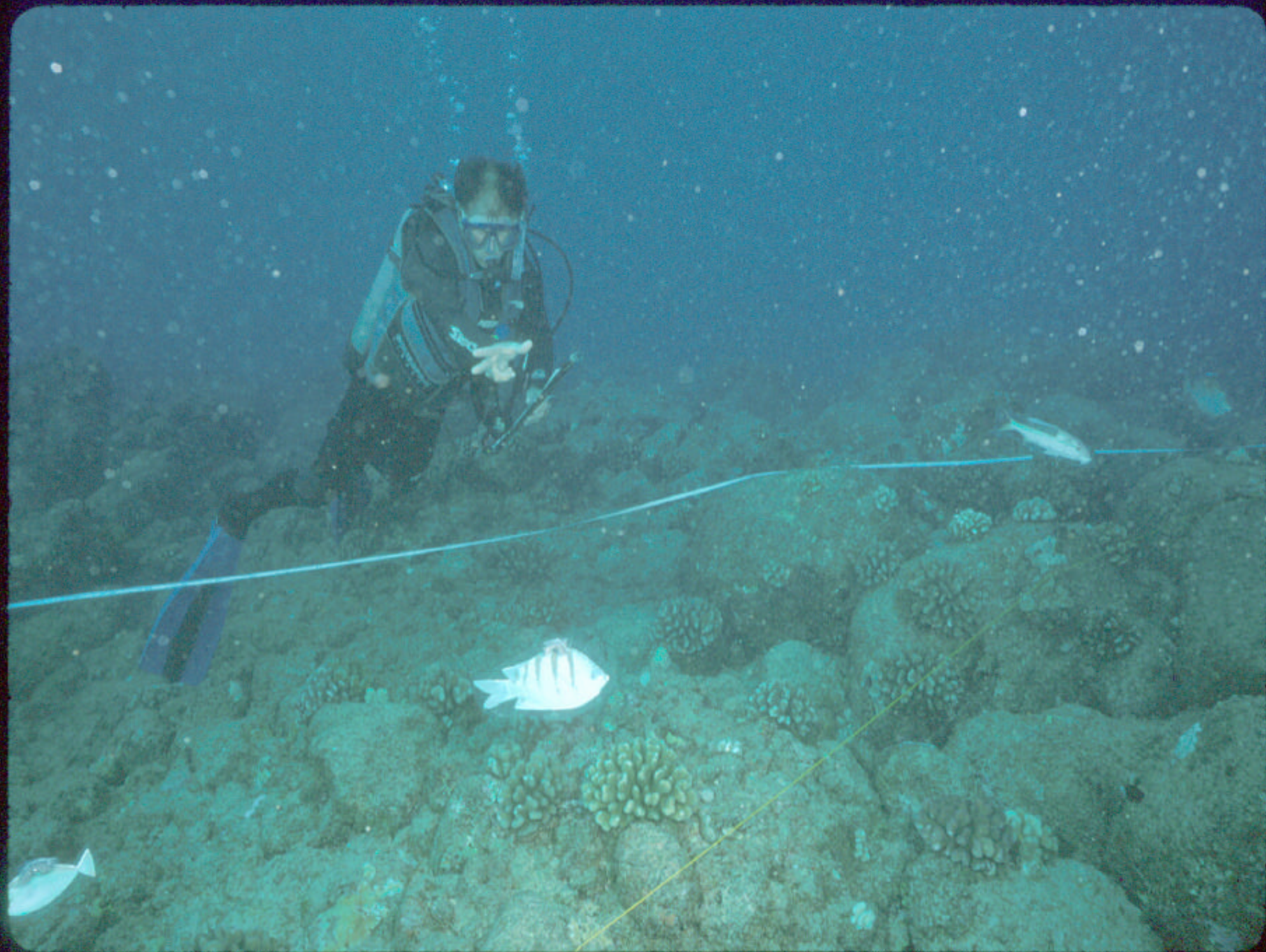
Map Accuracy Analysis

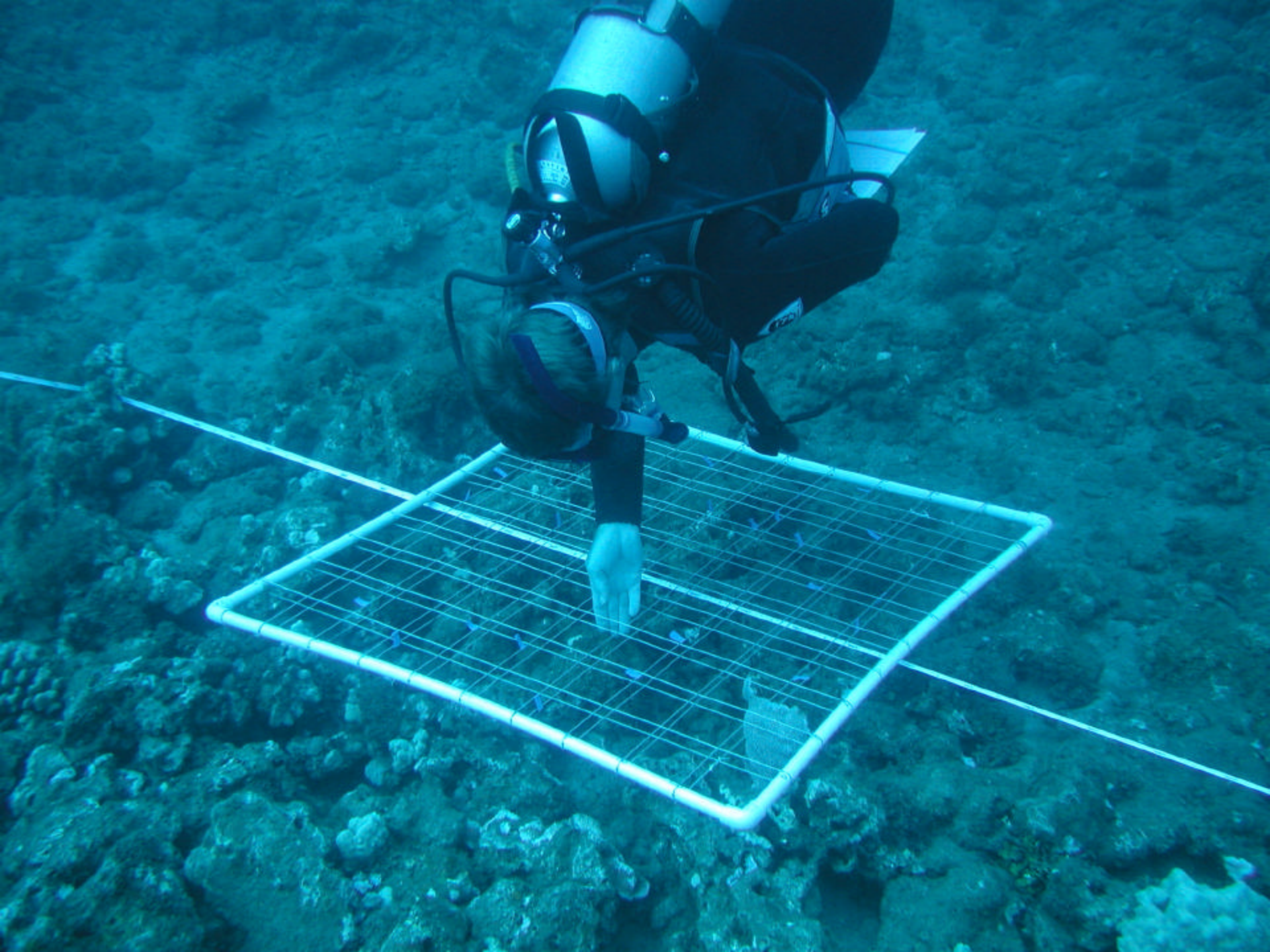
Rapid Assessment Transects- Fish/benthic Community

Identify Essential Fish Habitat

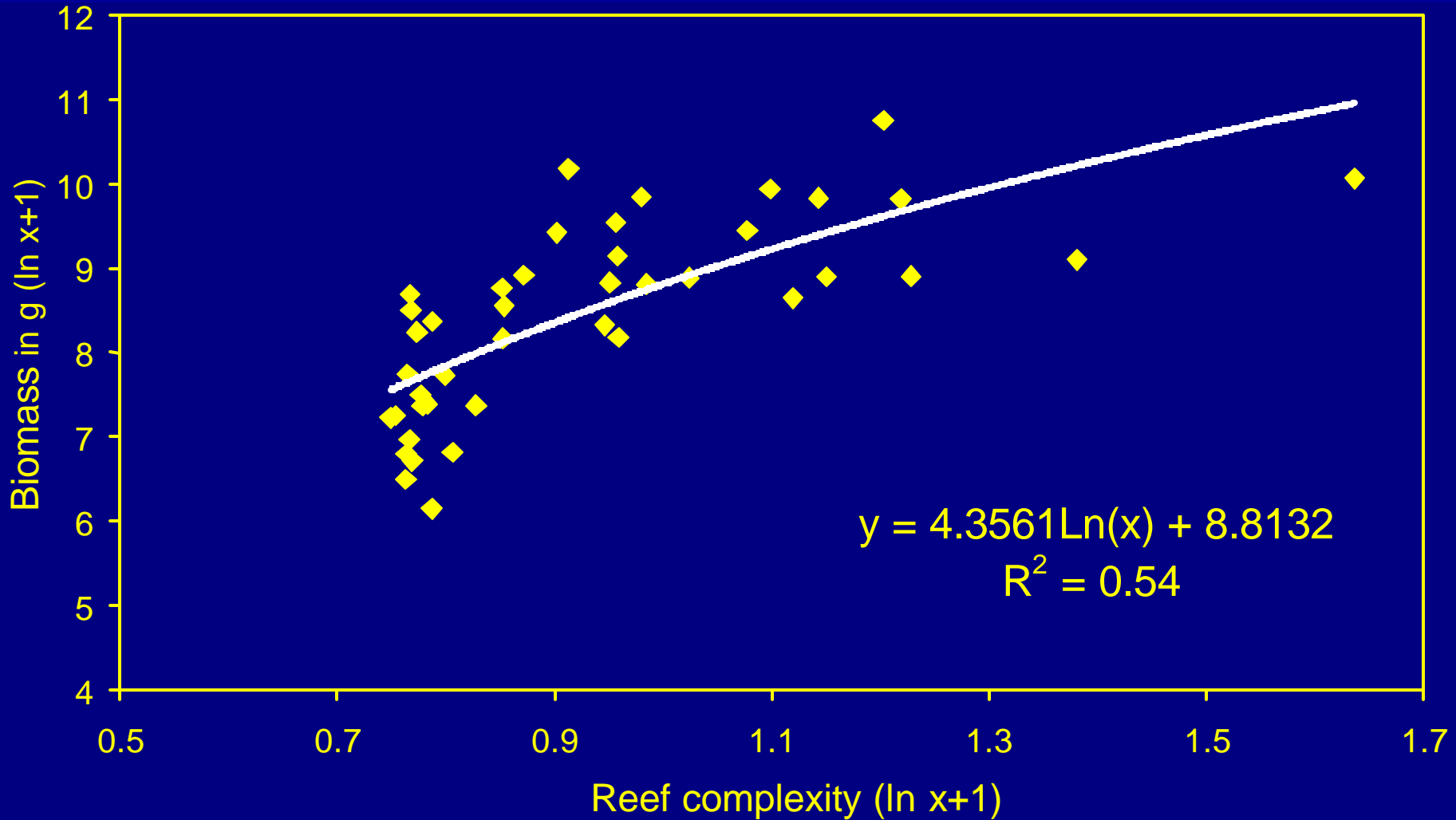
Evaluation of Marine Protected Areas



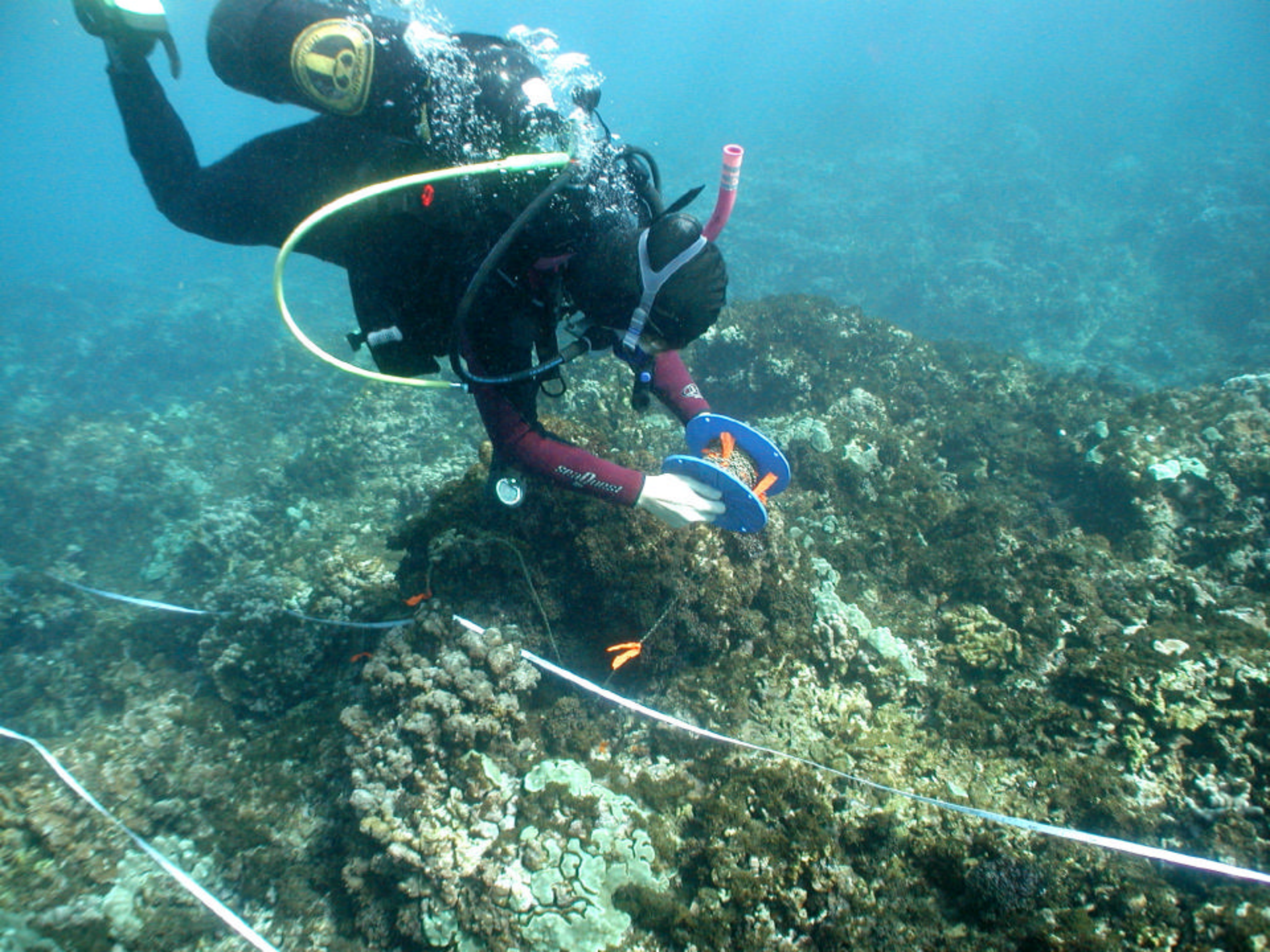




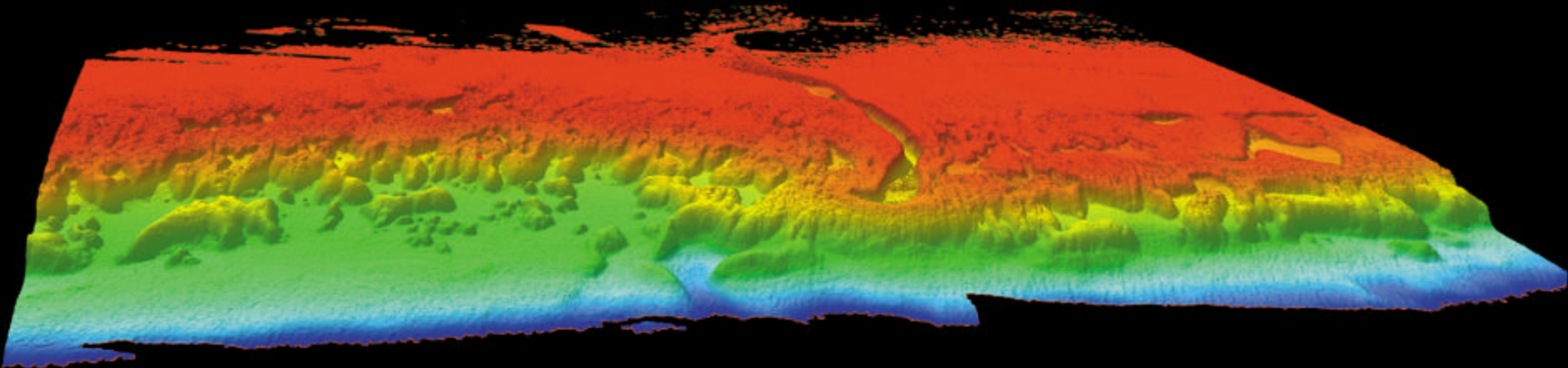
Effects of reef complexity on fish biomass in Hanalei Bay, Kauai



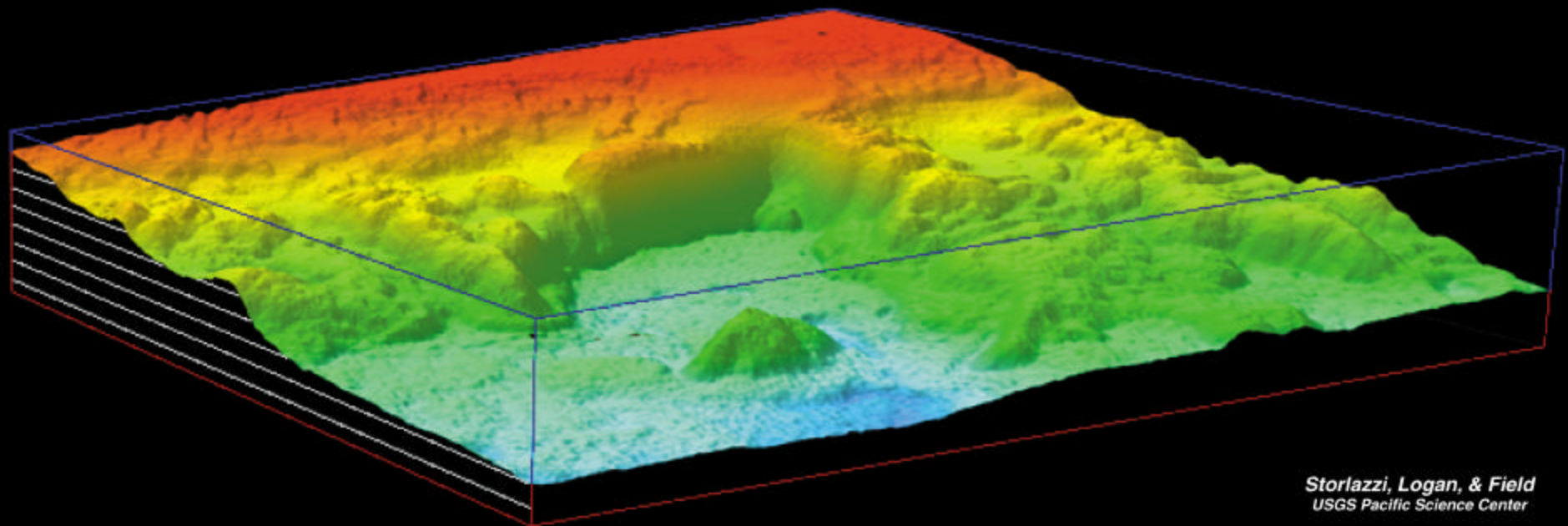
Source: Friedlander and Parrish 1998



Pala'au



Kawela

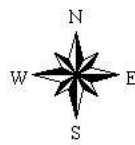
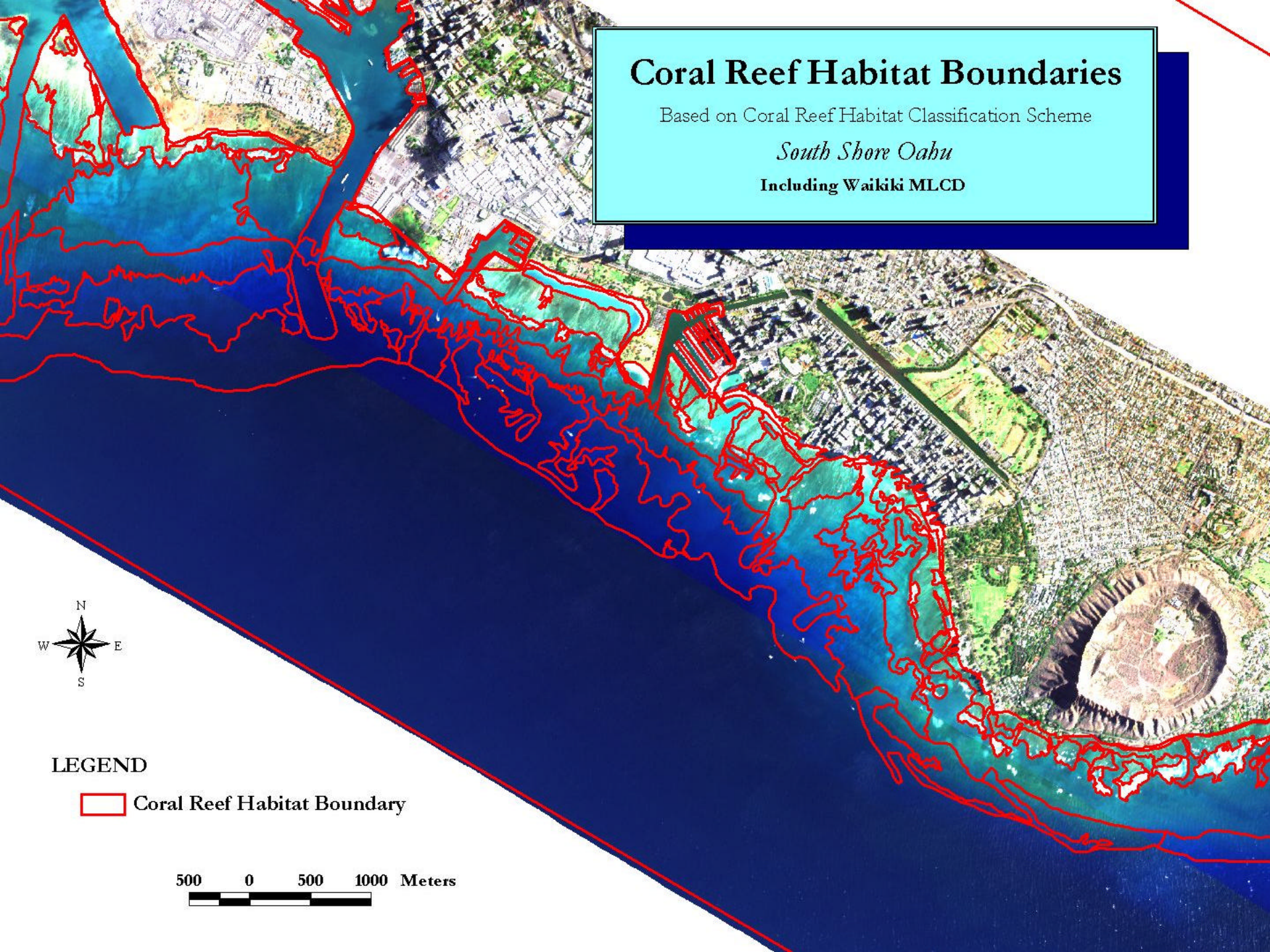


Coral Reef Habitat Boundaries

Based on Coral Reef Habitat Classification Scheme

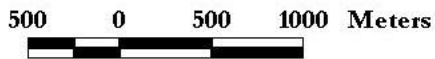
South Shore Oahu

Including Waikiki MLC



LEGEND

 Coral Reef Habitat Boundary



Detailed Habitat Classes

Generated by Photointerpretation of Hyperspectral Imagery
















South Shore Oahu

Including Waikiki MLCD

500 0 500 1000 Meters



LEGEND

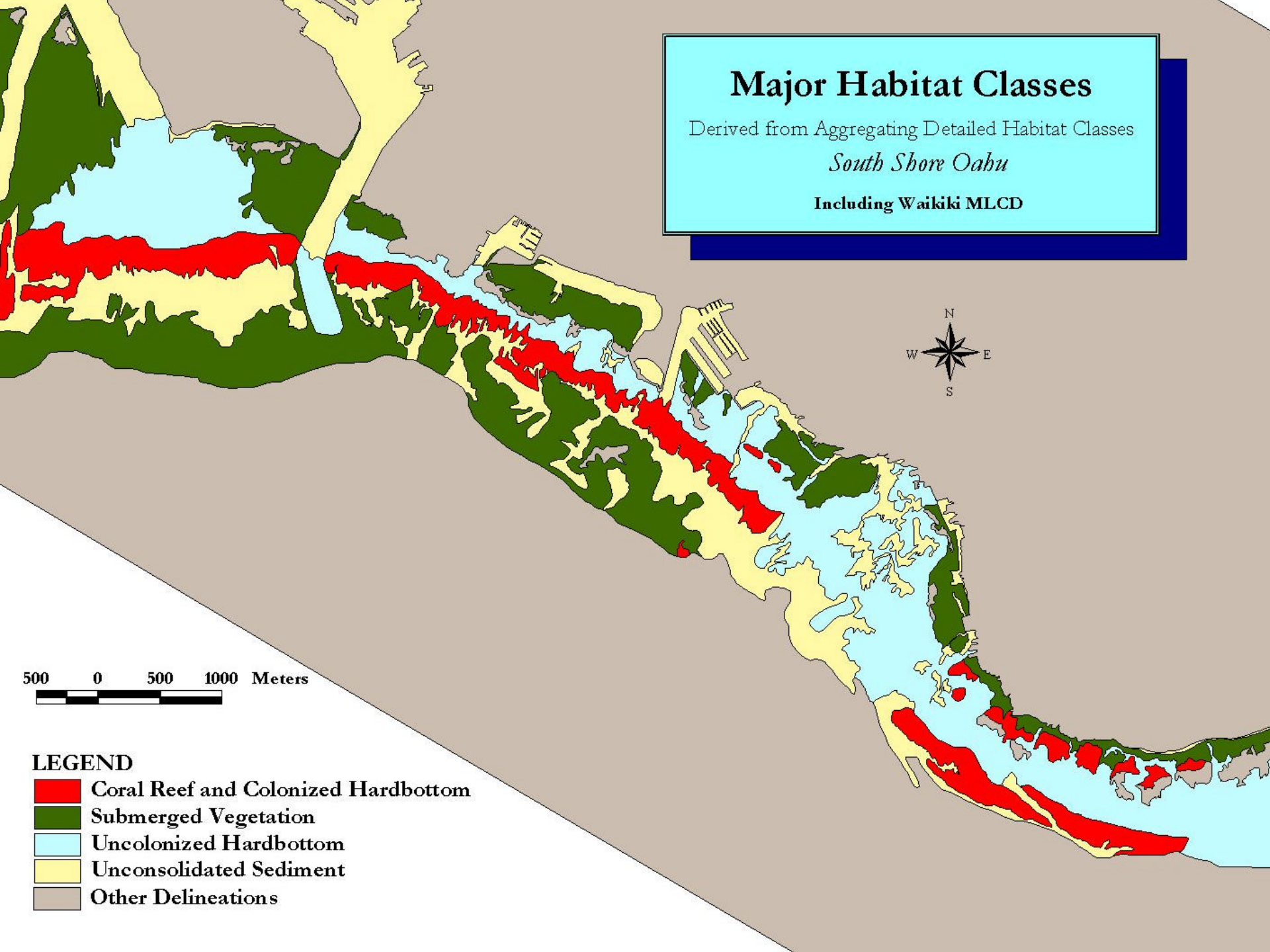
-  Sand
-  Mud
-  Macroalgae/10%-50%
-  Macroalgae/50%-90%
-  Encrusting Coralline Algae(10%-50%)
-  Spur and Groove Reef
-  Patch Reef (Individual)
-  Colonized Pavement
-  Colonized pavement with Sand/Surge Channels
-  Uncolonized Pavement
-  Reef Rubble
-  Land
-  Hardened Shoreline
-  Other Man Made Structures
-  Unknown

Major Habitat Classes

Derived from Aggregating Detailed Habitat Classes






South Shore Oahu

Including Waikiki MLCD



500 0 500 1000 Meters

LEGEND

-  Coral Reef and Colonized Hardbottom
-  Submerged Vegetation
-  Uncolonized Hardbottom
-  Unconsolidated Sediment
-  Other Delineations





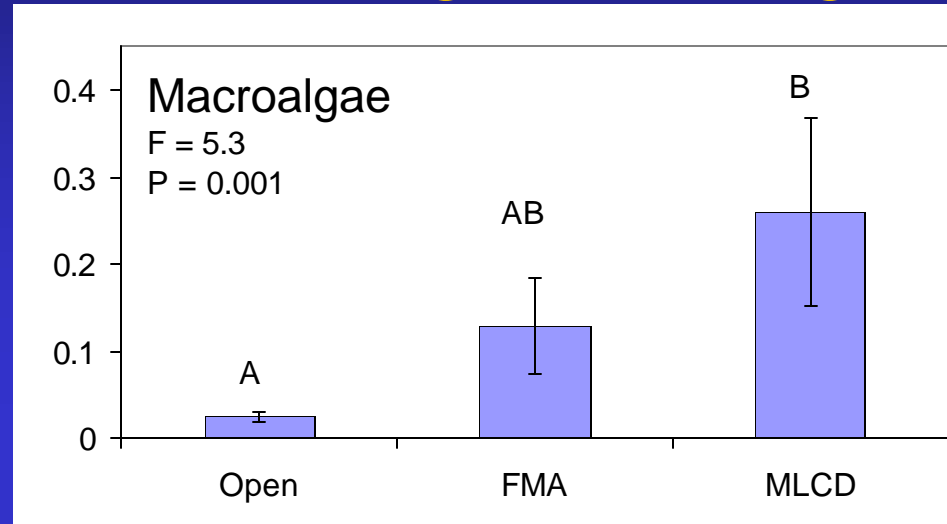
Study Site

Waikiki Marine Life Conservation District

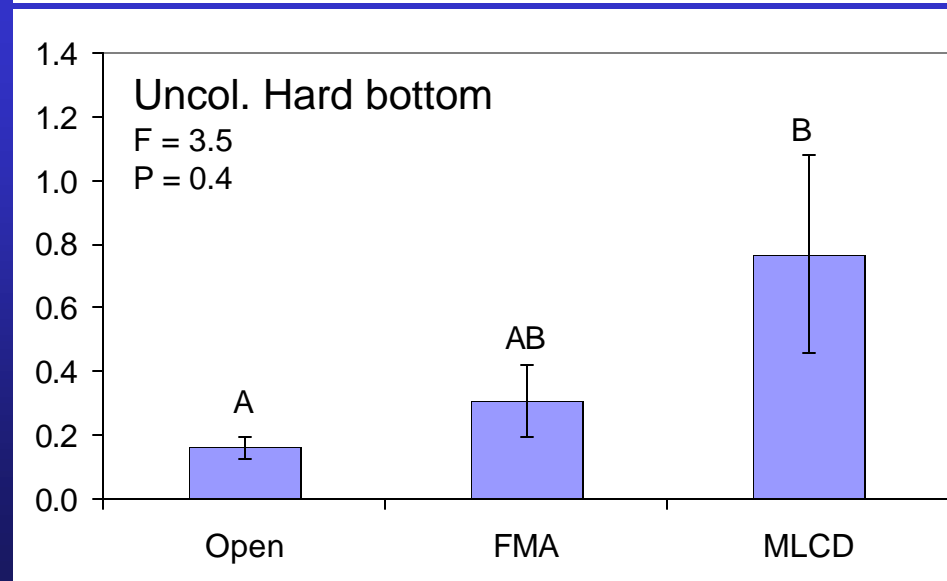
- Waikiki MLCD
 - ‘No Fishing’ area since 1988
 - Covers 700 m stretch of shoreline
 - Seaward boundary 450 m from HW
 - Encloses 0.32 km² of reef habitat
 - High energy fringing reef
 - 4 habitat zones



Fish biomass in Waikiki study area under various management regimes



Biomass (t/ha)



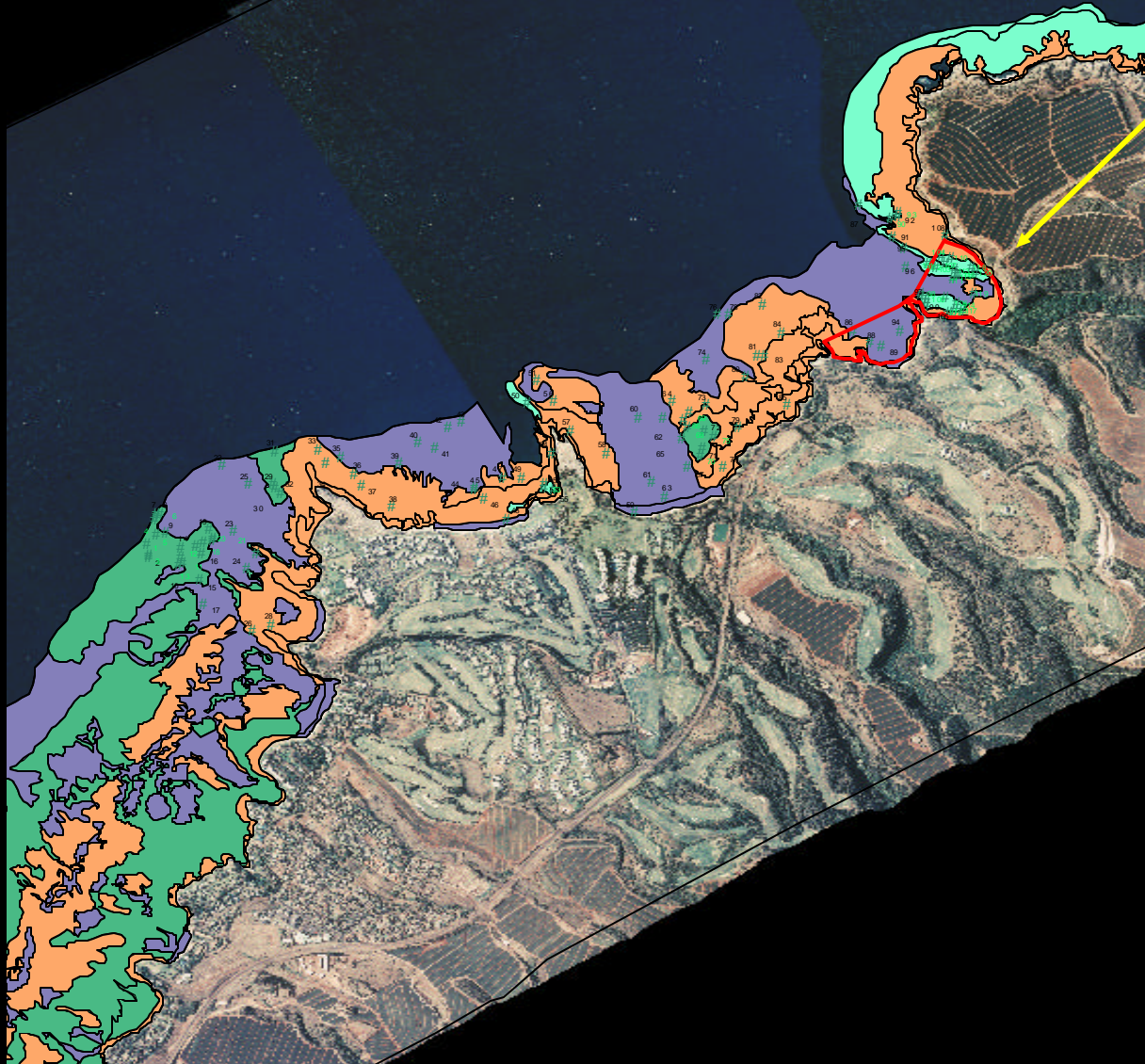
West Maui study area

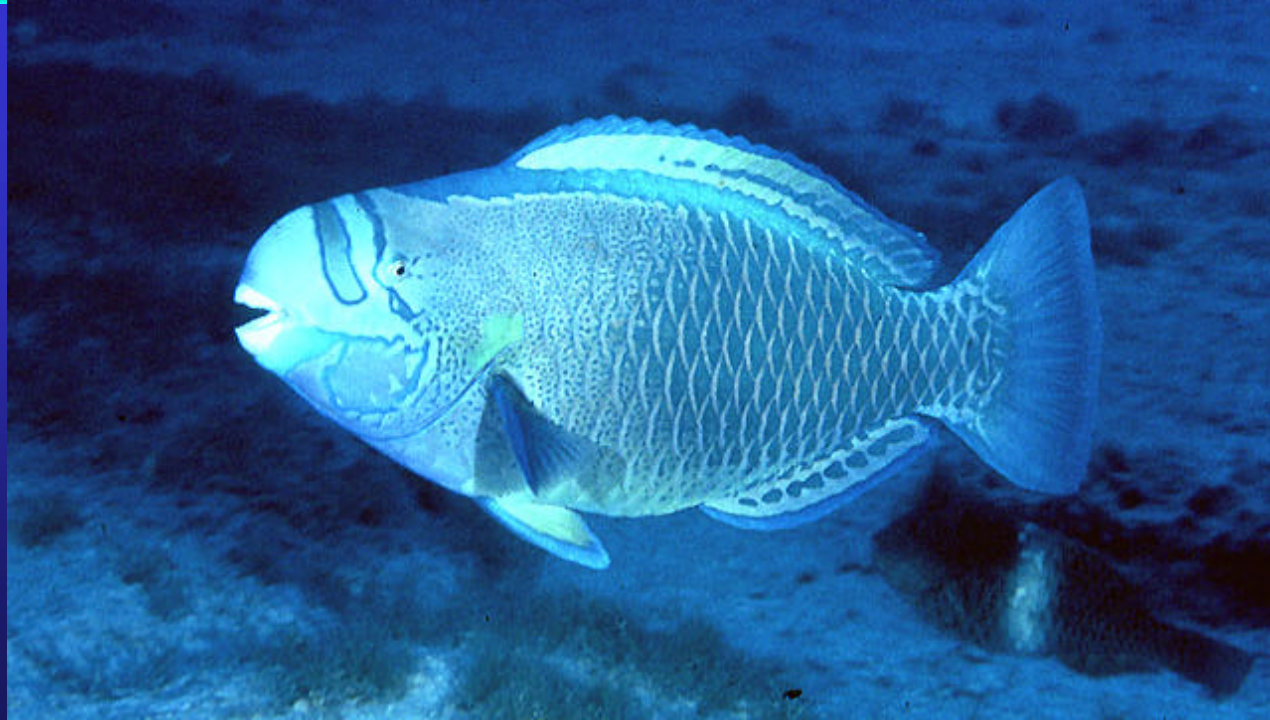
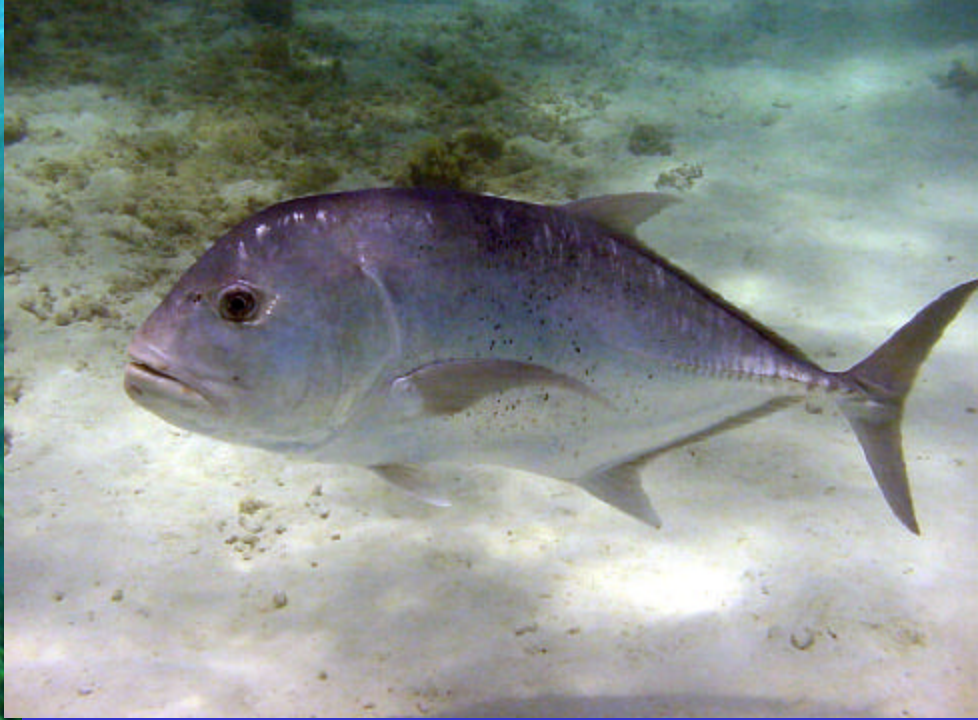


Honolua/Mokulei MLCD

West Maui study area

Honolua/Mokulei
MLCD





Fish habitat utilization

- Identify major habitat types
- Stratify fish/benthic sampling by habitat
- Define fish habitat utilization patterns
- Identify essential fish habitat
- Examine efficacy of existing MPAs
- Develop ecological criteria for future MPAs