



# The Census of Marine Life

Ocean Day  
11 June 2003

# The Census of Marine Life:

- Advancing scientific knowledge of marine diversity
- Building international cooperation and technology
- Responding to research needs for the decade

# The Census of Marine Life

## Why Now?

“*The Known*” is meager:

- 200 commercially important species
- Near-shore, other convenient areas

“*The Unknown*” is immense:

- 1 or 10 million species?
- 95% of oceans unexplored biologically

“*The Unknowable*” is not even pondered:

- Heterogeneity in Space & Time

# The Census of Marine Life

## Why Now - Environmental Obligations

- UN Convention on Biodiversity
  - requires signatories to collect information on living resources
- Marine Protected Areas
- Sustainable Fisheries
- Habitat Loss and Pollution
- Global Climate Change

# Why Now - New Technologies

- Sampling Technologies
  - Optical sensors
  - Active & passive acoustics: “Every fish is a submarine”
  - Tags (animals doing surveys themselves)
  - Vehicles: unmanned, remotely operated
  - Genetics - Barcode of Life
- Data Management & Communication
  - Satellite communications for real-time observations from fixed and floating platforms
- Data Analysis
  - On-line image libraries, recognition
  - Modeling & simulation for population estimates



**Ian  
Poiner  
Australia**



**Fred  
Grassle  
USA**



**Olav Rune  
Godø  
Norway**



**Yoshihisa  
Shirayama  
Japan**



**Carlo  
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Netherlands**

## **CoML Scientific Steering Committee**

**David  
Farmer  
Canada**

**Victor  
Gallardo  
Chile**

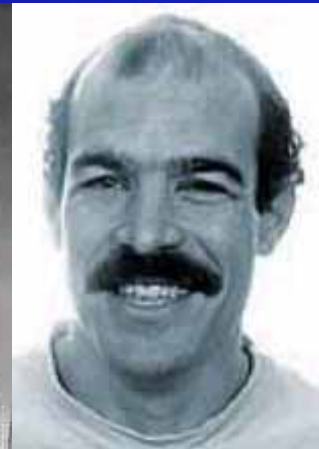
**Patricio  
Bernal  
France**

**Don  
Boesch  
USA**

**Poul  
Holm  
Denmark**

**Andy  
Solow  
USA**

**Vera  
Alexander  
USA**



# CoML Implementation Committees

## National

- |                                      |               |
|--------------------------------------|---------------|
| •coml.ca, February 2002, Nova Scotia | K. Zwanenburg |
| •coml.jp, March 2002, Tokyo          | Y. Shirayama  |
| •coml.au, May 2002, Melbourne        | V. Sakell     |
| •coml.eu, September 2002, Amsterdam  | C. Heip       |
| •coml.cn, October 2002, Qingdao      | S. Sun        |
| •coml.us, December 2002, San Diego   | D. Fautin     |
| •coml.ru, September 2003, Moscow     | ?             |

## Regional

- |   |               |
|---|---------------|
| •Southeast Asia, October 2001, Phuket       | S. Bussarawit |
| •South America, October 2002, Concepción    | R. Escribano  |
| •Southern Africa, September 2003, Cape Town | C. Griffiths  |
| •Indian Ocean, October 2003, Goa?           | M. Wafar      |
| •South Pacific, December 2003, New Zealand  | J. Annala     |
| •Caribbean, Spring 2004, ?                  | E. Klein      |

# *Grand Challenge Questions*

## Components

1) *What did live in the oceans?*

History of Marine Animal Populations (HMAP)

2) *What does live in the oceans?*

New sampling technologies (Field Projects)

3) *What will live in the oceans?*

Future of Marine Animal Populations (FMAP)

4) *How to access & visualize data on living  
marine resources?*

Ocean Biogeographic Information System (OBIS)

# History of Marine Animal Populations

## HMAP

- Interdisciplinary research program using historical and environmental archives to examine the recent history of marine communities
- Goals are to examine:
  - Ecological impacts of large-scale harvesting
  - Long-term changes in stock abundance
  - Role of marine resources in historical development

# Can we picture the oceans before fishing?

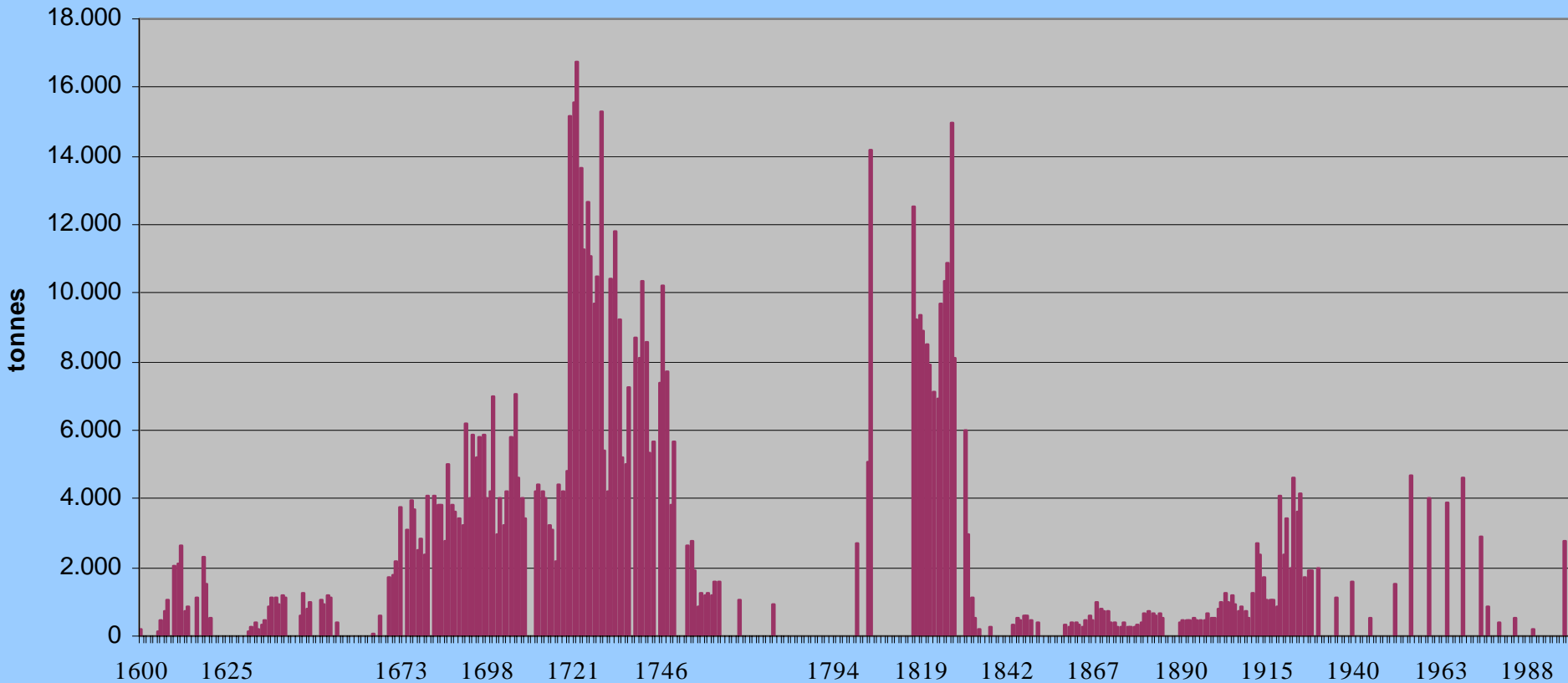
Scripps CMBC KUU Conference, December 2003

## Current HMAP Studies



# 400-year herring catch in Danish Limfjord (Bo Poulsen)

catches of herring, 1600-1999



# Census of Marine Life

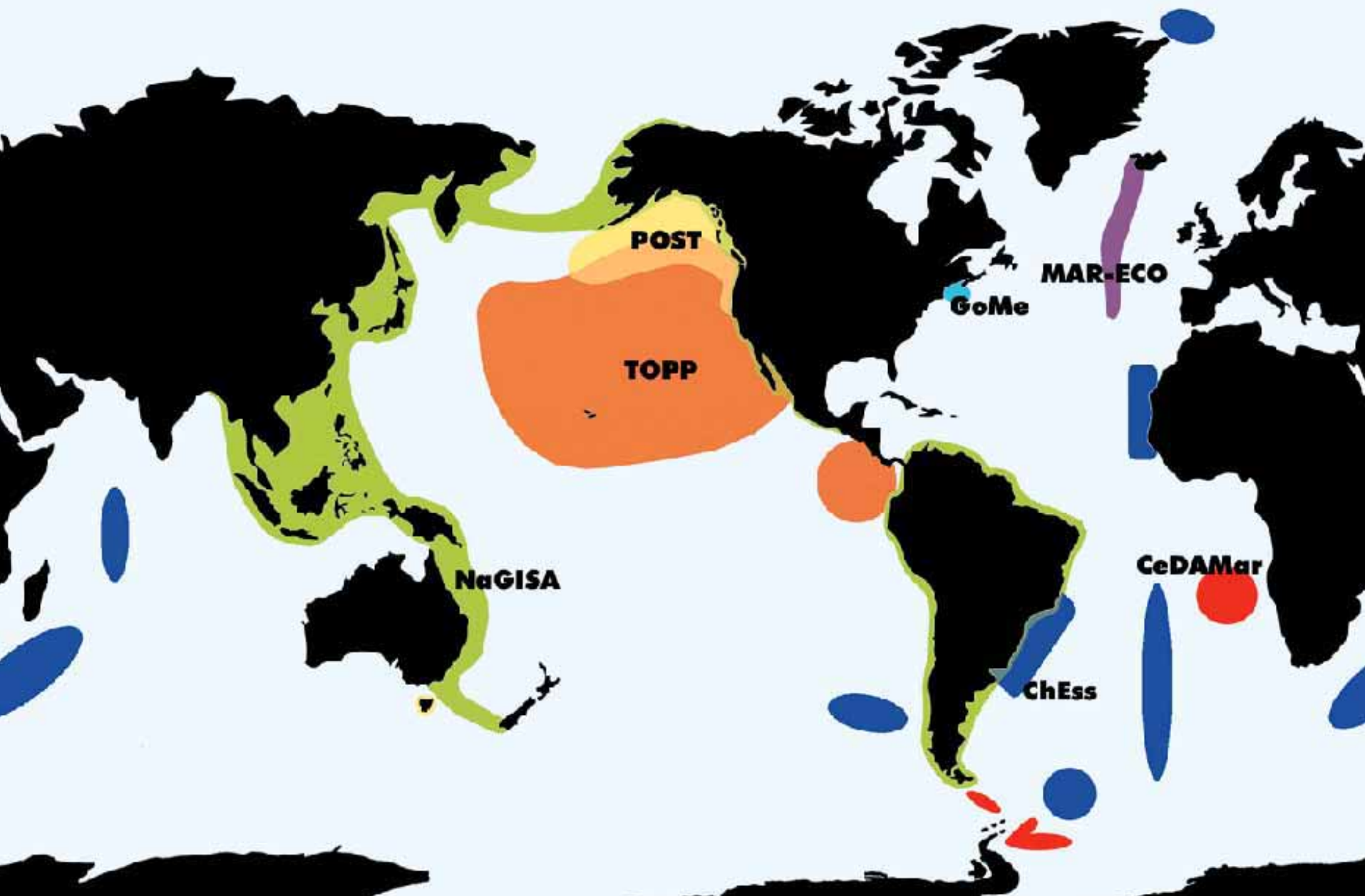
## Field Project Criteria

- Potential to change present perspectives
- Known, unknown, unknowable context
- At least regional in scope
- Novel technologies or applications
- Opportunities for discovery of new taxa
- Focus on species distributions
- Education and capacity building
- Contribute to 2010 report
- Data available through OBIS

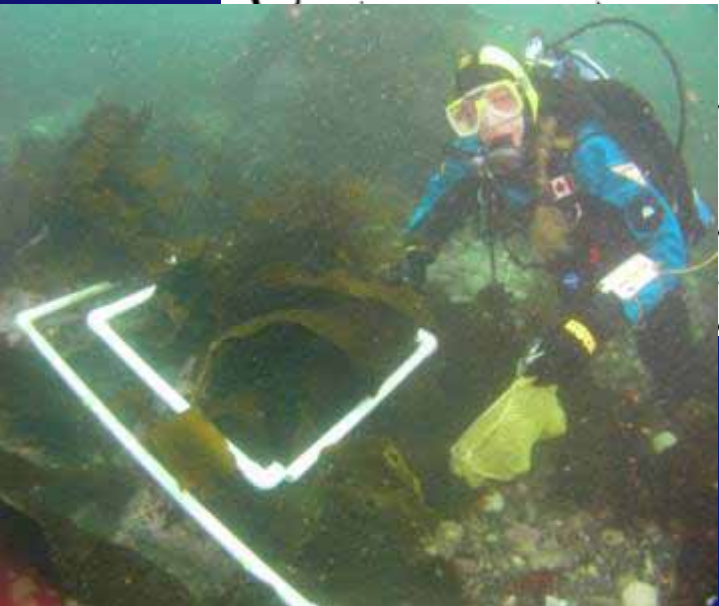
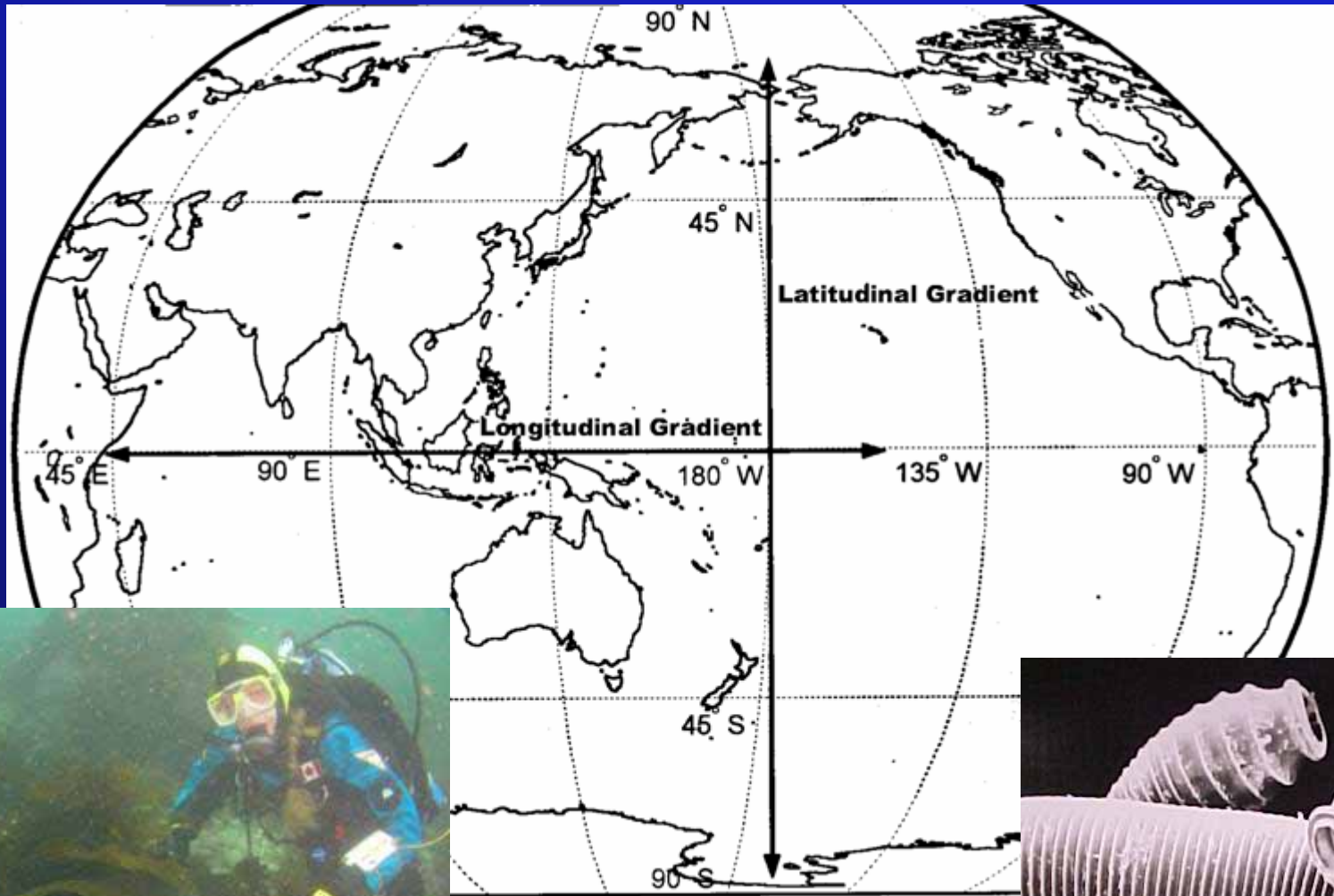
# Initial Zonal Field Projects

- **Nearshore** - Natural Geography In Shore Areas (NaGISA), Japan
- **Coastal** - Gulf of Maine Census (GoMe), USA & Canada
- **Coastal Tracking** - Pacific Ocean Salmon Tracking (POST), Canada
- **Oceanic** - Mid-Atlantic Ridge Ecosystems (MAR-ECO), Norway
- **Oceanic Tracking** - Tagging of Pacific Pelagics (TOPP), USA
- **Margins** - Seamounts & Canyons - developing
- **Depths** - Diversity of Abyssal Marine Life (CeDAMar), Germany
- **Active Geology** - Chemosynthetic Ecosystems (ChEss), UK
- **Ice Cover** - Arctic/Bering - developing

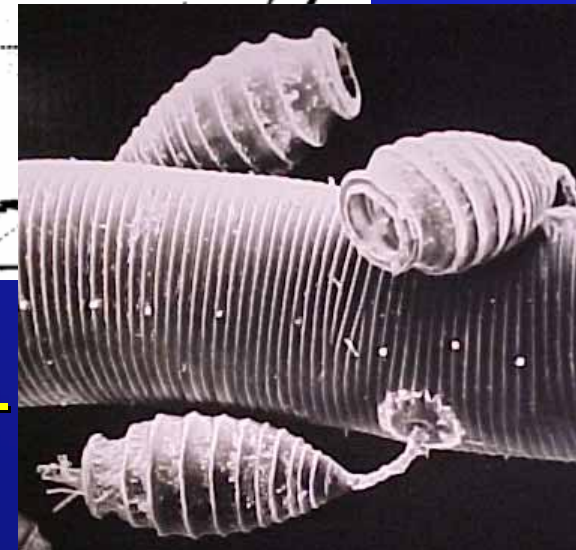
# Initial Field Project Distribution



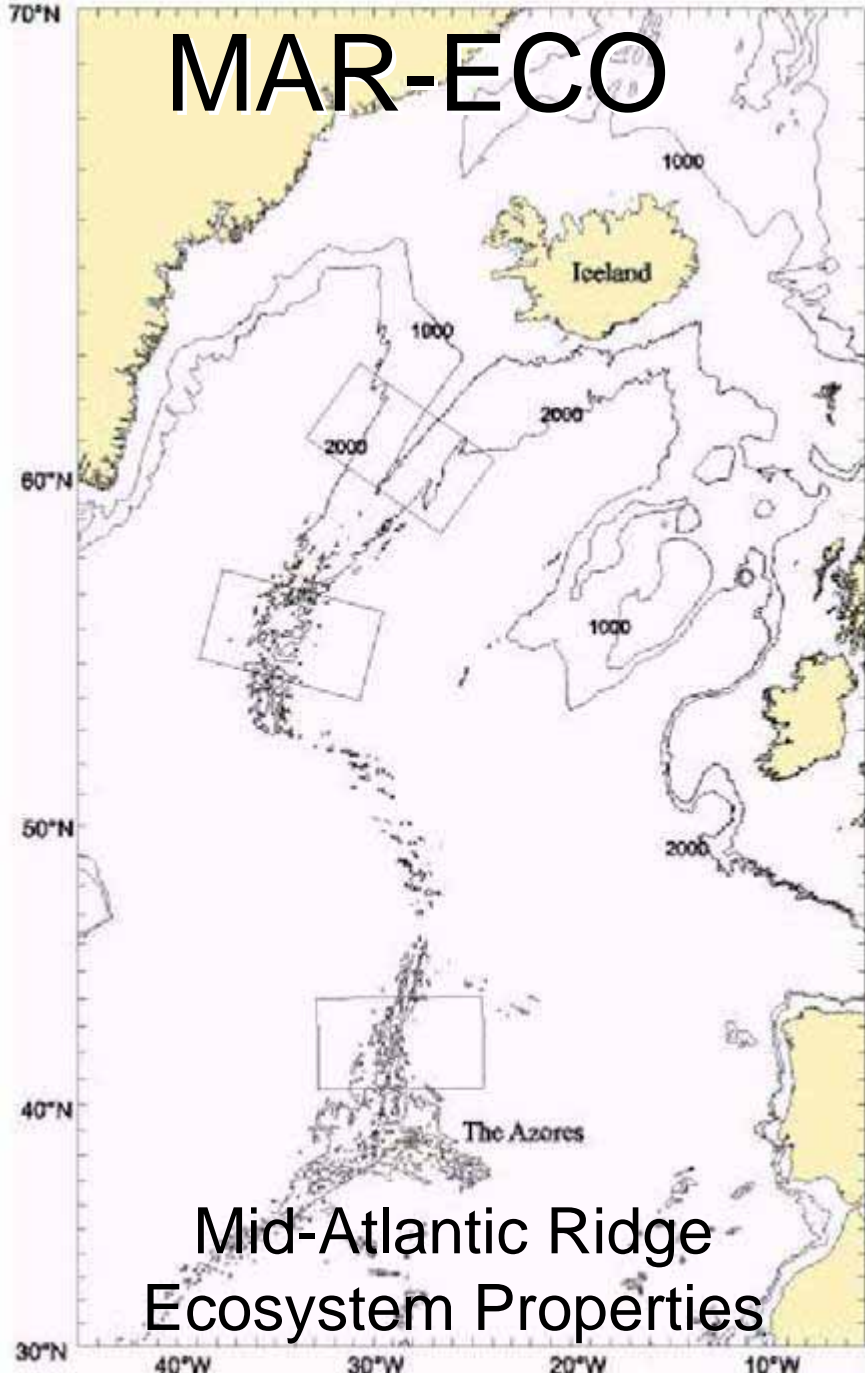
# NaGISA Biodiversity Gradients 15,000 km Long



-scuba to 10m  
new species-  
20+ countries



# MAR-ECO



Mid-Atlantic Ridge  
Ecosystem Properties

*G.O. Sars*

Norway



Vecchione et al. *Science*, 2001



# MIR Submersible & R/V Akademik Mstislav Keldysh

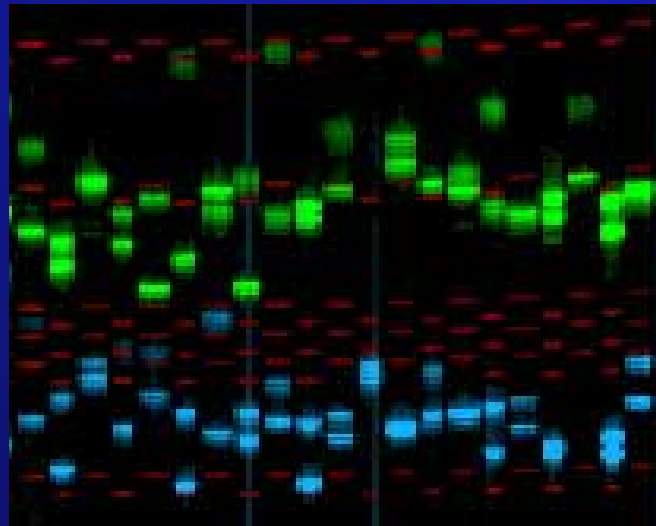
Demonstrated capacity  
for quantitative  
mid-water  
observation is  
key for MAR-ECO

Deployment on Mid-Atlantic Ridge, June 2003

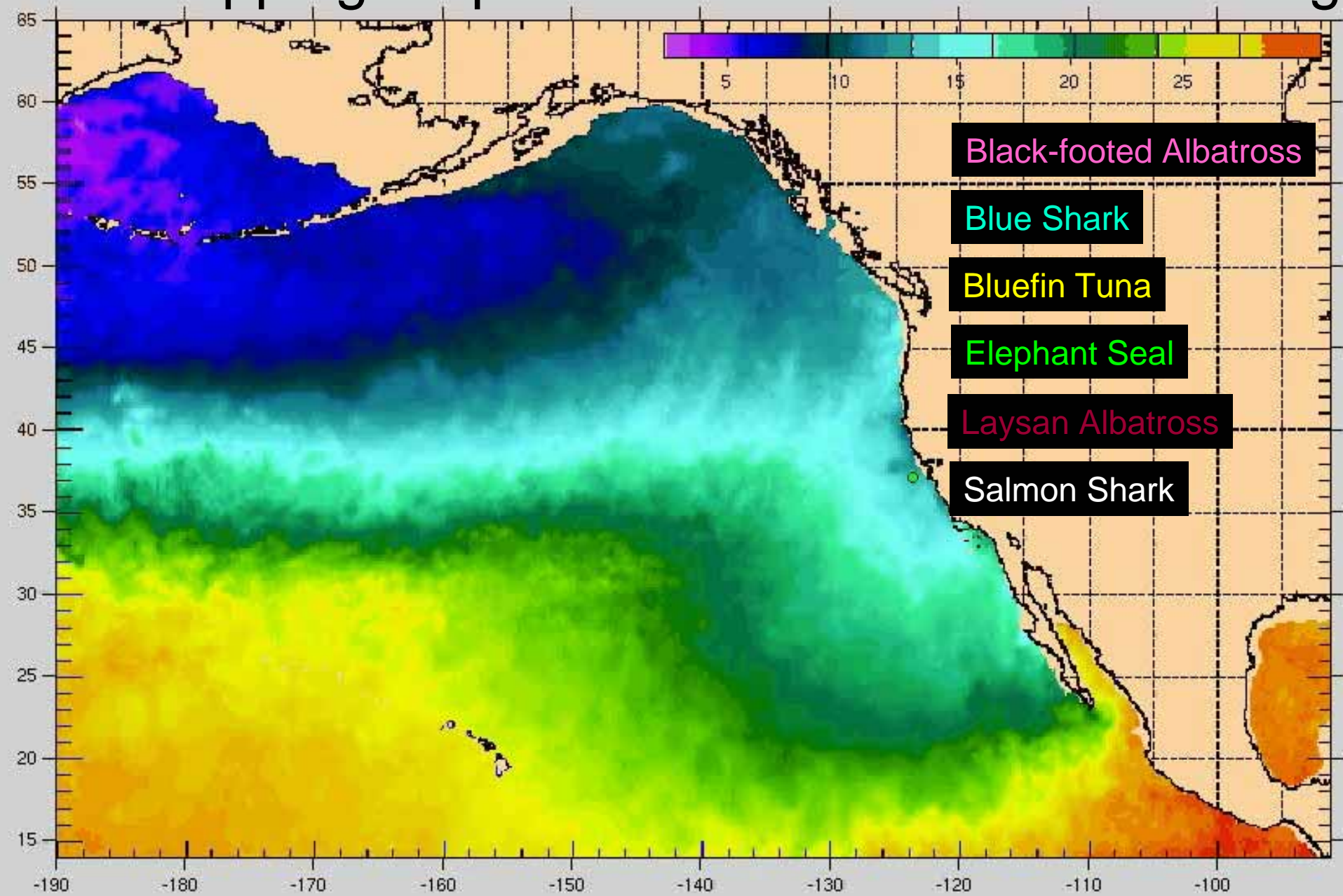


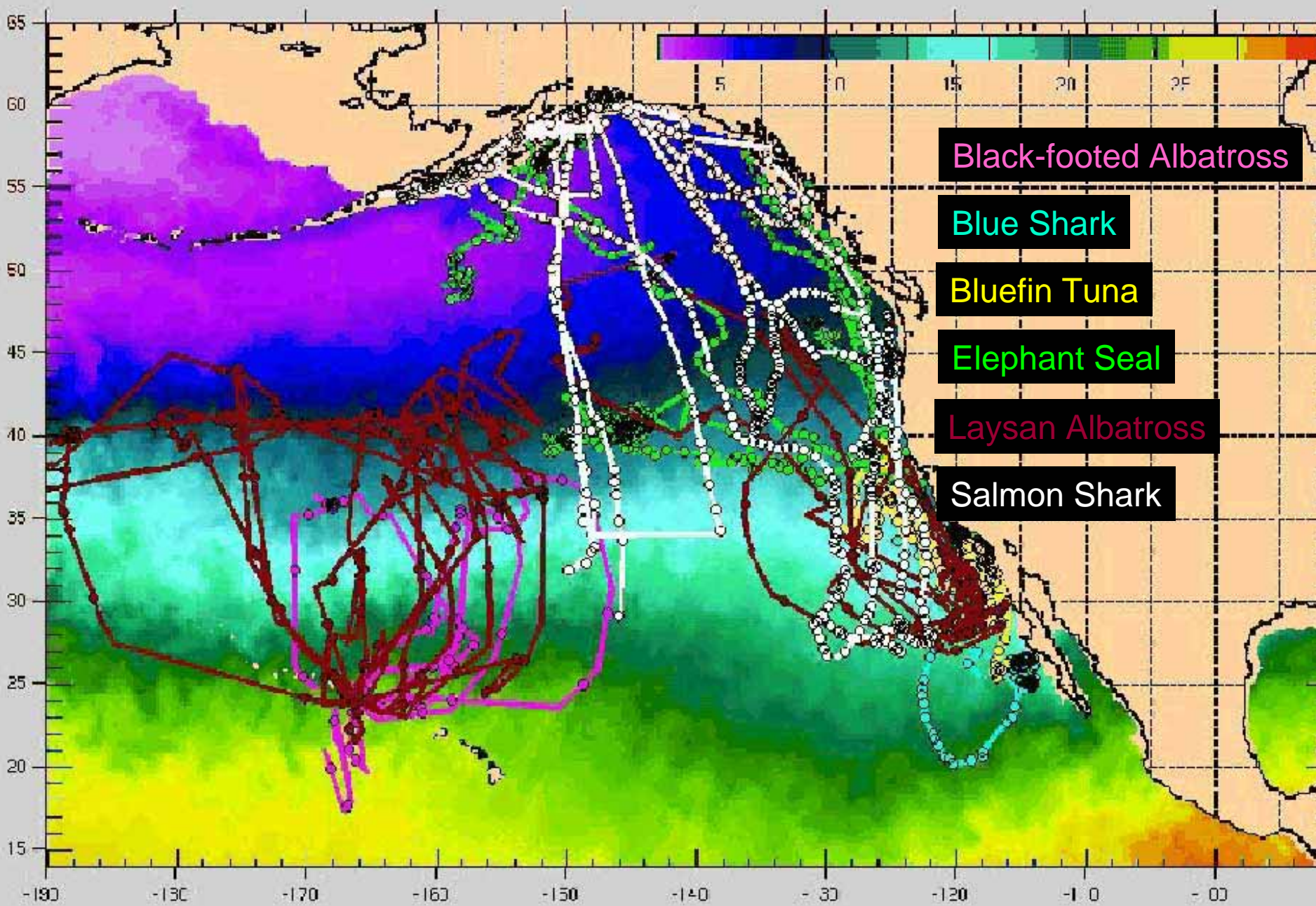
# TOPP Project: Infers what lives in the ocean from behavior of wide-ranging species

- Tag about 10 species
- Total of 5000 animals
- Follow for 1-2 years
- North Pacific prototype



# Overlapping Bioprobes for TOPP-down modeling





Black-footed Albatross

Blue Shark

Bluefin Tuna

Elephant Seal

Laysan Albatross

Salmon Shark

# Ocean Biogeographic Information System

- Vision: Click on maps of the ocean & bring up data on what has been reported to live there
- Goal: Next generation information infrastructure for marine biology & living marine resource management

[About OBIS](#)[Data & Mapping](#)[Educational Resources](#)[Technical Resources](#)[Image Library](#)[FAQ  
Frequently Asked Questions](#)[Contributors, Partners & Links](#)[Publications](#)[What's New](#)[Home](#)

Funded By

Alfred P. Sloan  
Foundation

The Ocean Biogeographic Information System (OBIS) is a web-based provider of global geo-referenced information on accurately identified marine species. We contain expert species level and habitat level databases and provide a variety of spatial query tools for visualizing relationships among species and their environment. OBIS strives to assess and integrate biological, physical, and chemical oceanographic data from multiple sources. Users of OBIS, including researchers, students, and environmental managers, will gain a dynamic view of the multi-dimensional oceanic world.

### Quick Links to Our Contributors

- ▶ BATS Zooplankton
- ▶ Biogeoinformatics of Hexacorals
- ▶ Biotic Databast of Indo-Pacific Marine Mollusks
- ▶ CSIRO Marine Research
- ▶ CephBase
- ▶ FAO Catch and Aquaculture Production
- ▶ FishBase
- ▶ Fishnet
- ▶ Gulf of Maine Biogeographic Information System
- ▶ History of Marine Animal Populations
- ▶ The Huntsman Marine Science Centre
- ▶ Integrated Taxonomic Information System
- ▶ Maritimes Region Homepage (Canada)
- ▶ National Ocean Data Center (NODC)
- ▶ OBIS-SEAMAP
- ▶ SeamountsOnline
- ▶ SOC Atlantic Bathypelagic Biota
- ▶ Species 2000
- ▶ ZooGene

May Marine Life of the Month



Clown Anemonefish, *Amphiprion ocellaris*, Indonesia. Provided by FishBase © Dr John E. Randall



Male *Sepia* (cuttlefish) from CephBase © James Wood



*Actinodendron plumosum*. From Biogeoinformatics of Hexacorals. © Adorian Ardelean

# CephBase



*Find the Octopus vulgaris?*

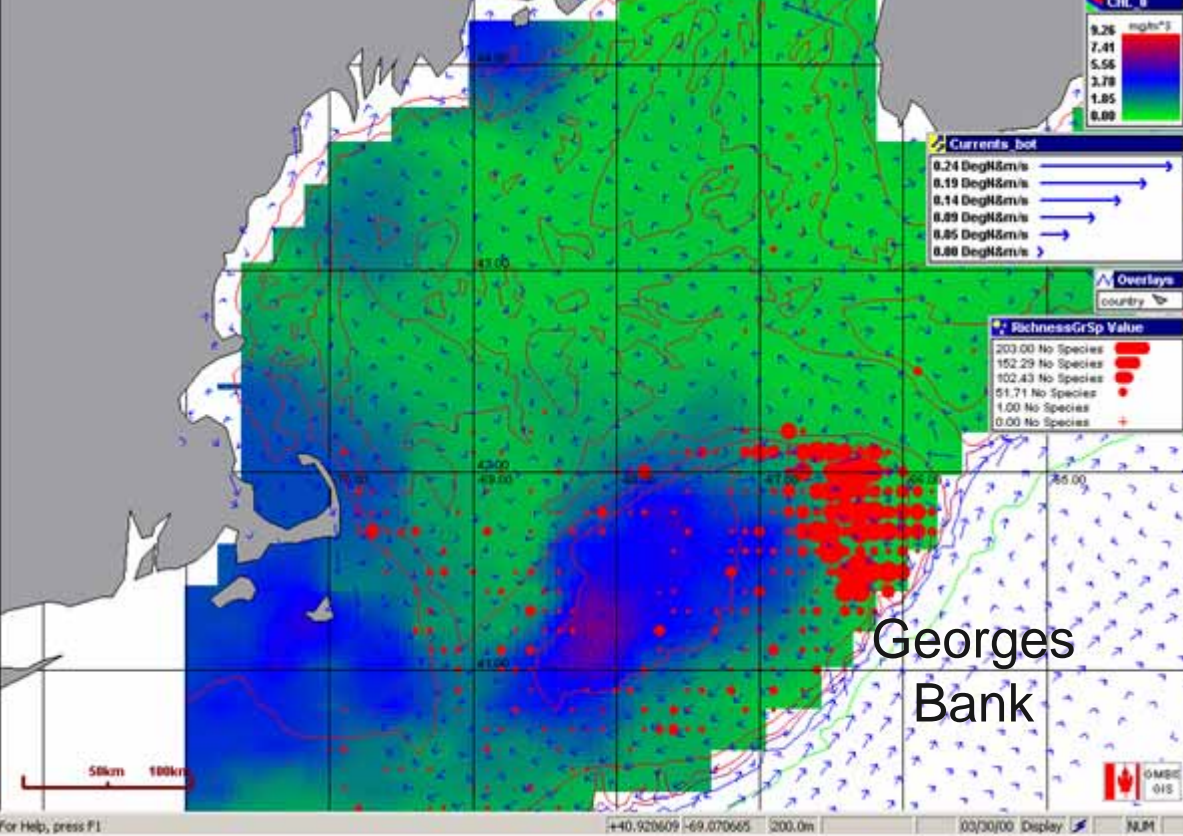
Photographer: John Forsythe

Biogeography  
Beaks  
Species & Taxonomy  
Image Database  
Video Database  
Literature Reference  
Researcher Database  
Predators & Prey

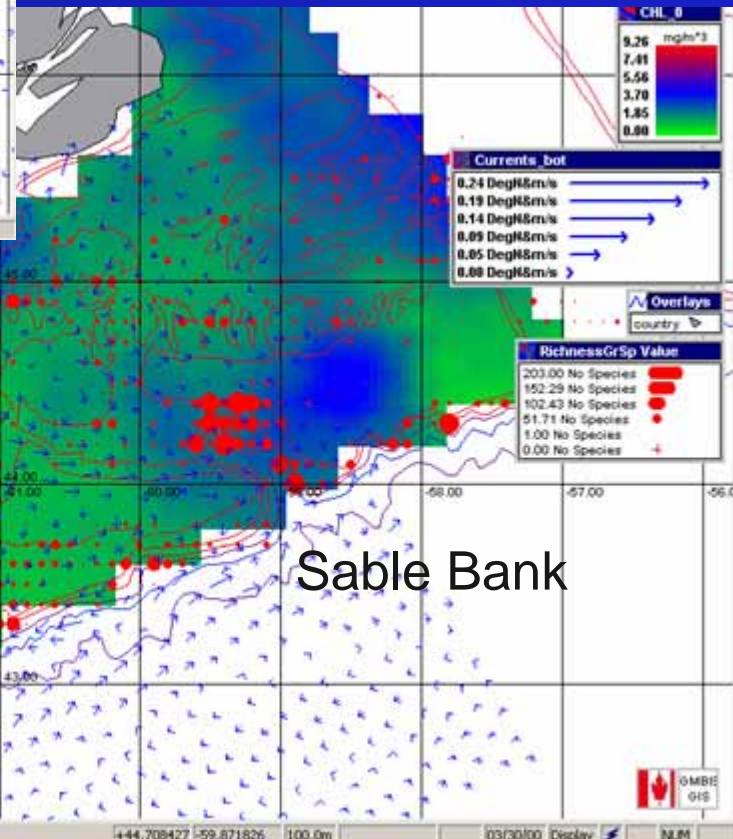


# GMBIS

## Diversity Hotspots in Winter



Georges Bank



Sable Bank

Chlorophyll  
Concentration  
Overlay

Bottom  
Current  
Vectors

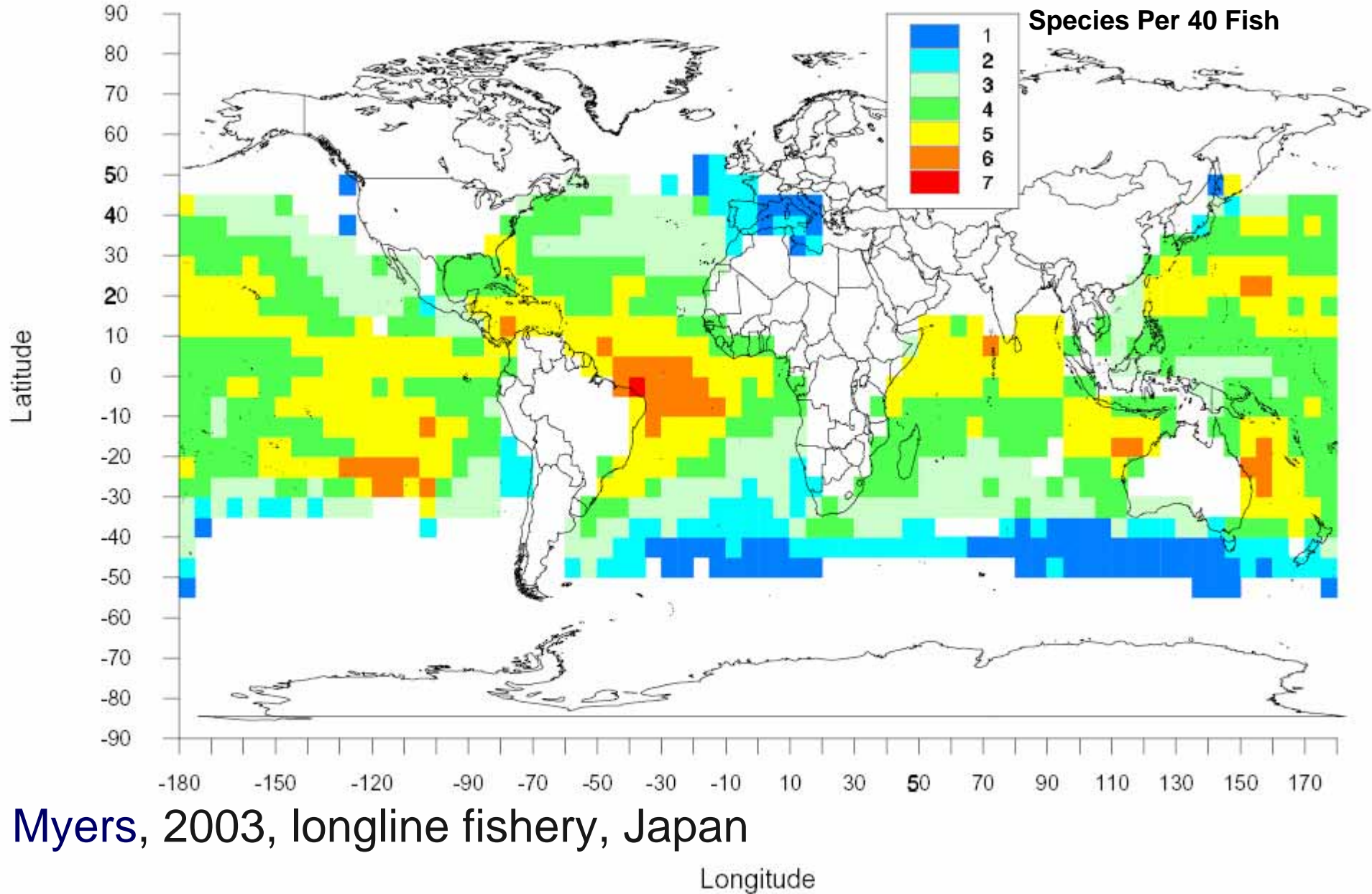
# Future of Marine Animal Populations

## FMAP

Data, Models and Prediction Workshop, Halifax, June 2002  
H. Matsuda, R. Myers, G. Stefansson, network leaders



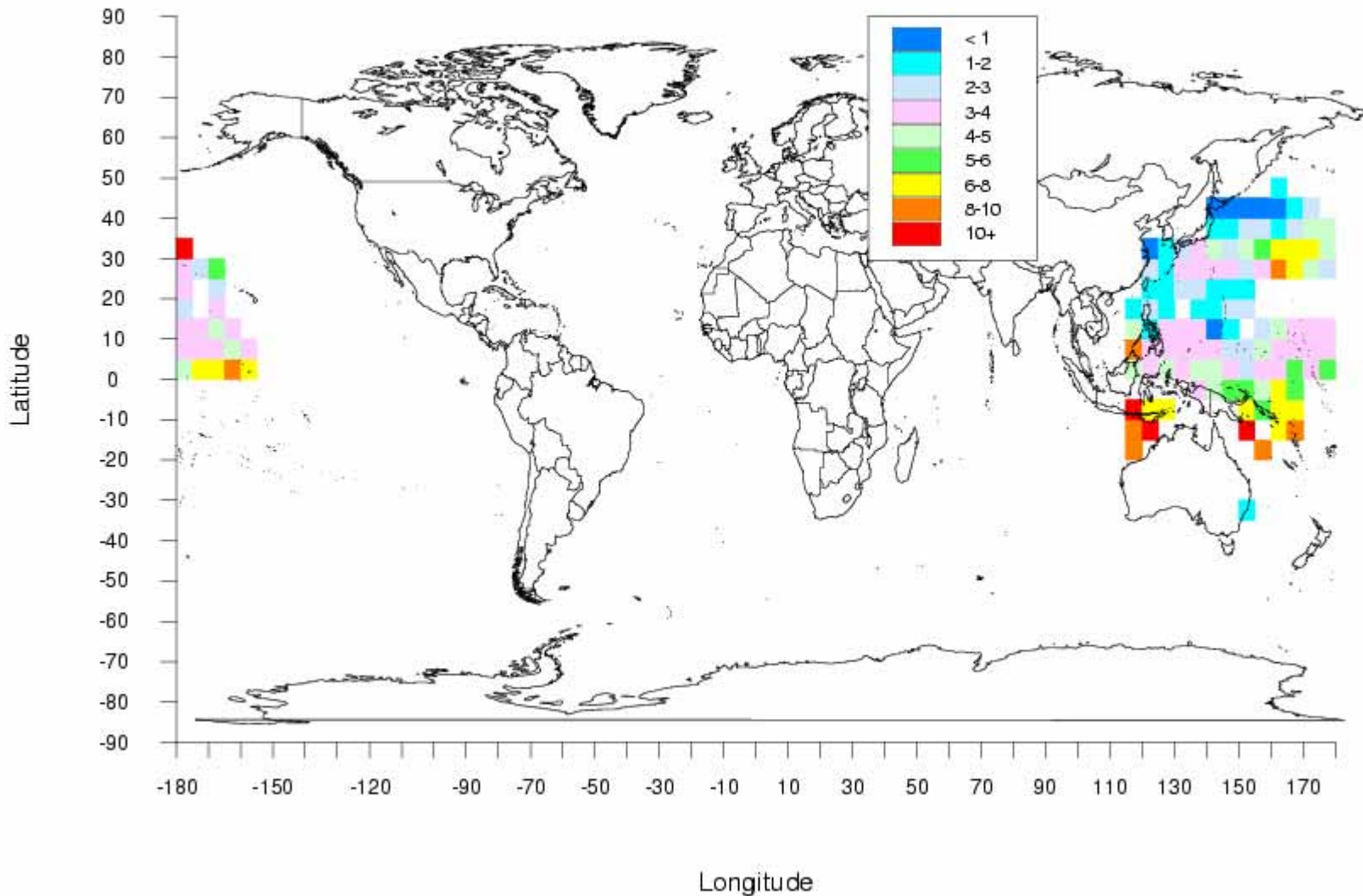
# Global Pattern of Pelagic Diversity



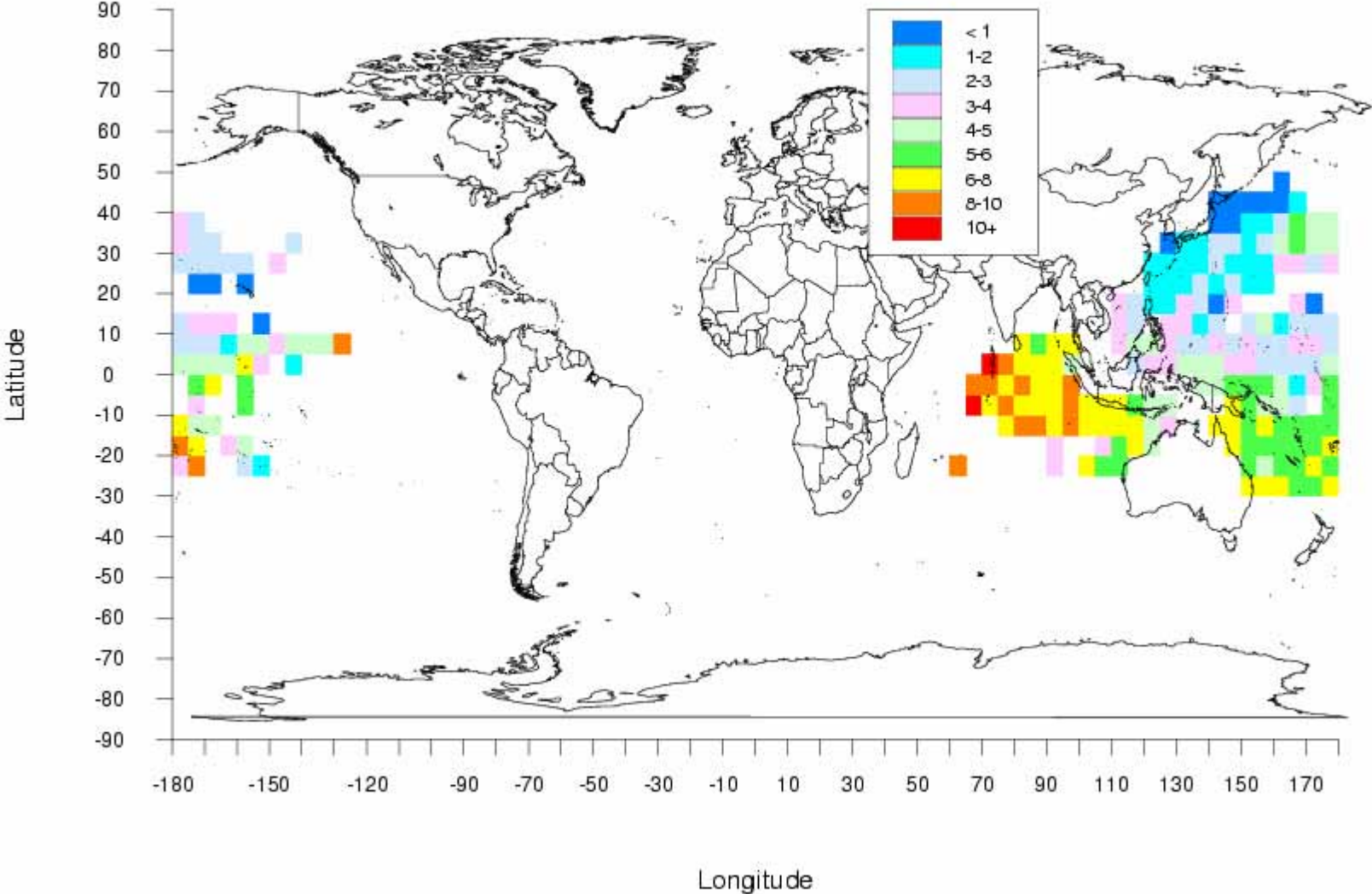
Myers, 2003, longline fishery, Japan

# Japanese Far Seas Tuna Fleet

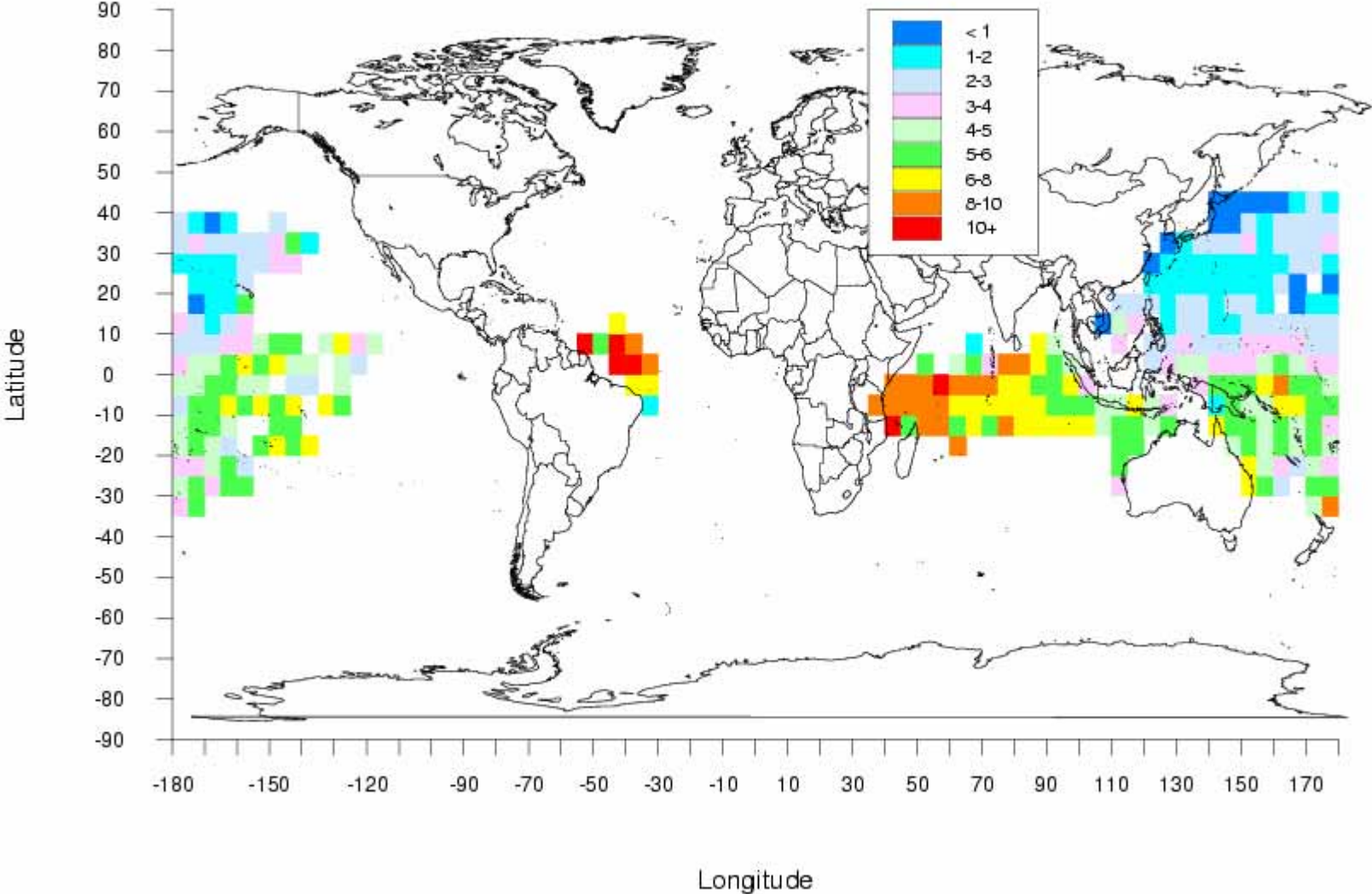
Catch Per Hundred Hooks, Year = 1952



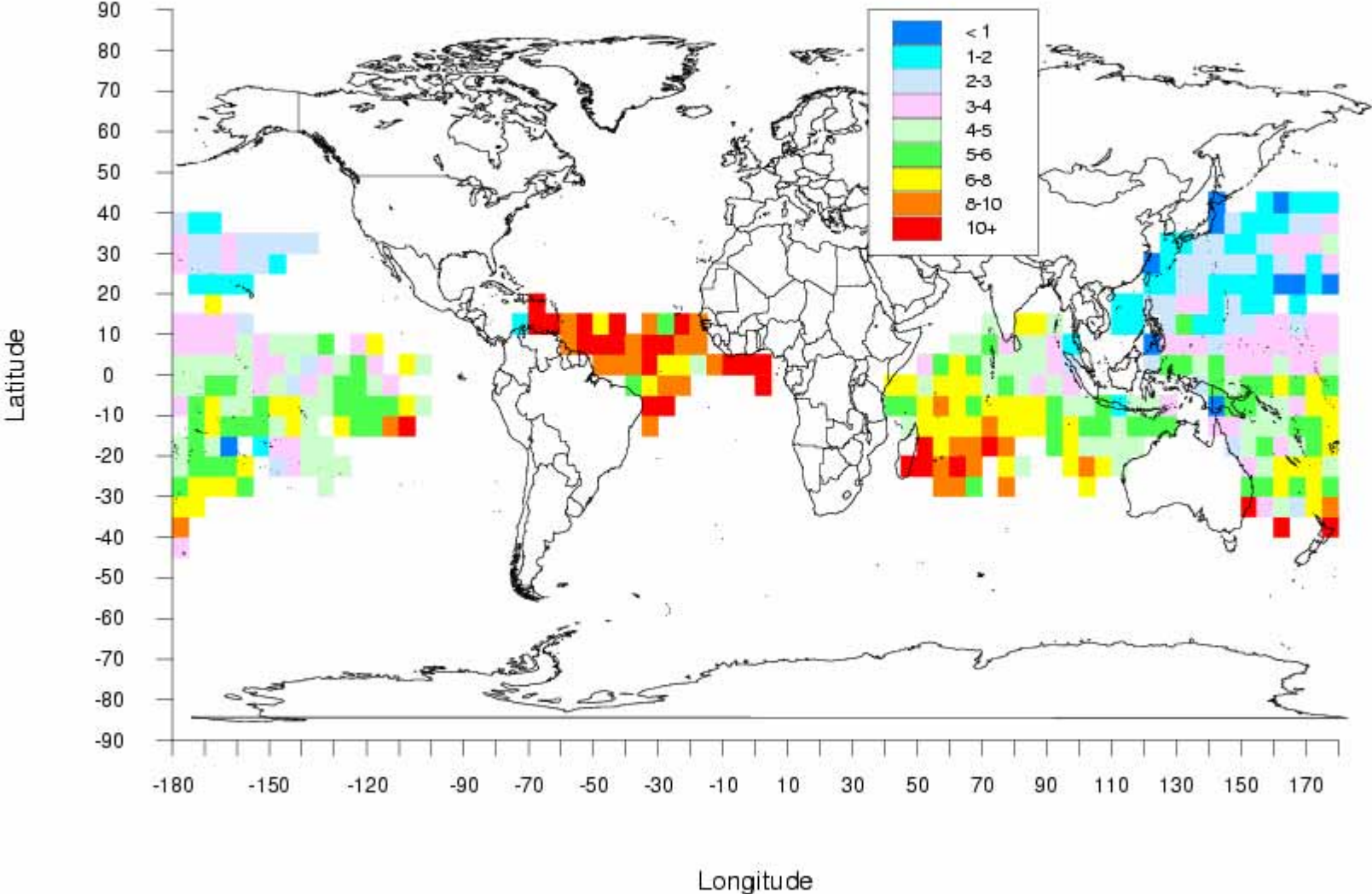
### Catch Per Hundred Hooks, Year = 1954



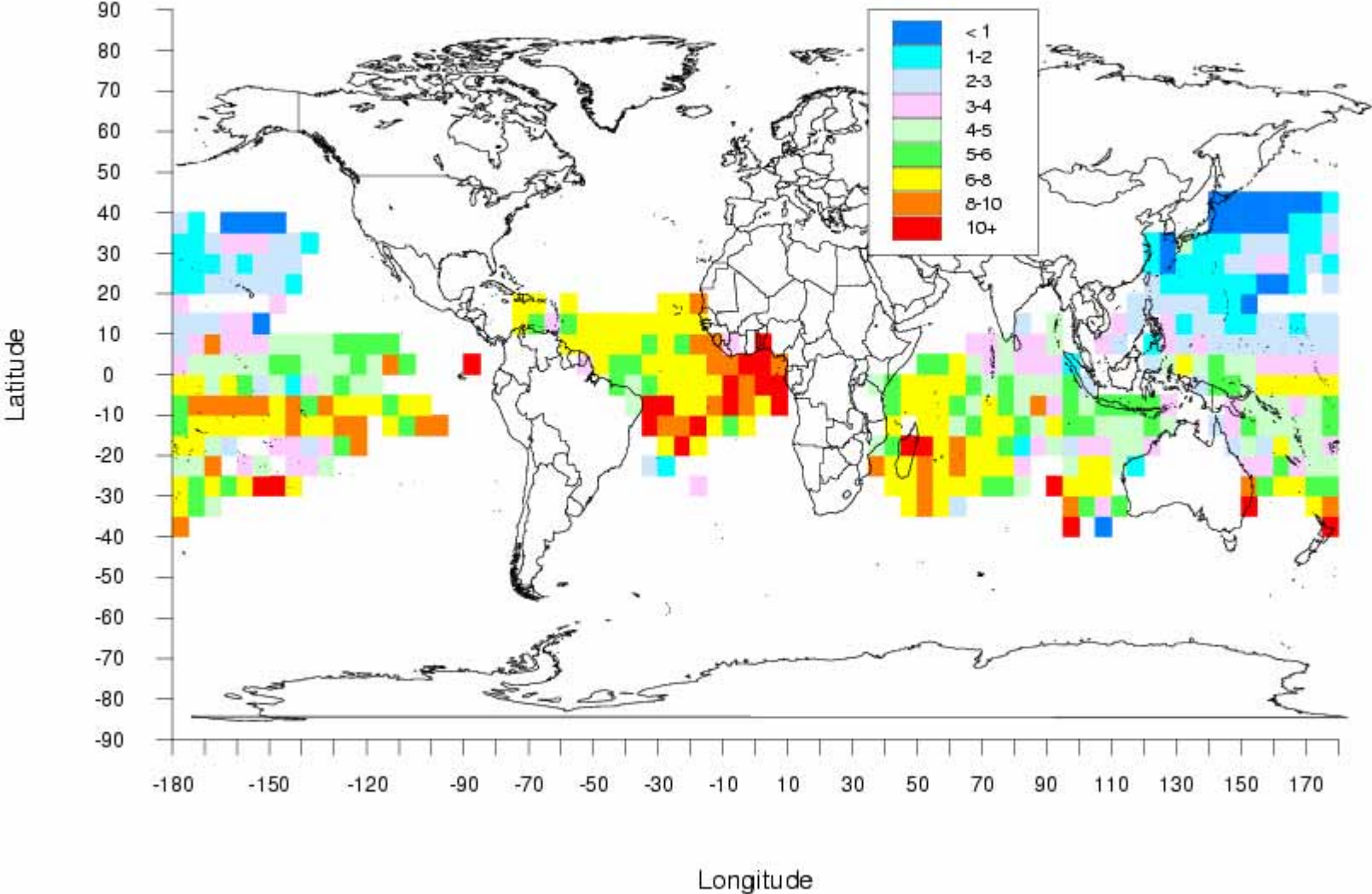
### Catch Per Hundred Hooks, Year = 1956



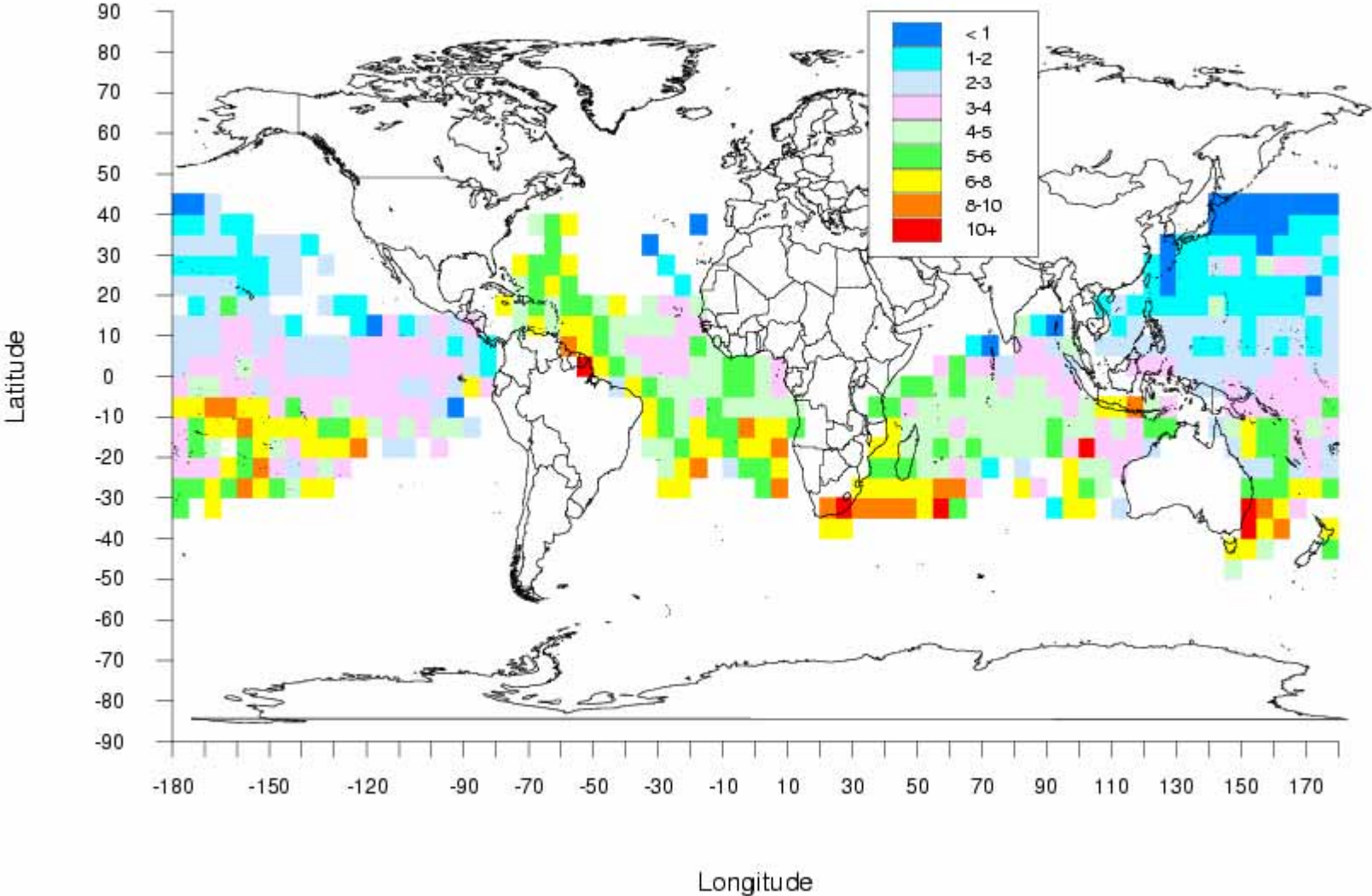
Catch Per Hundred Hooks, Year = 1958



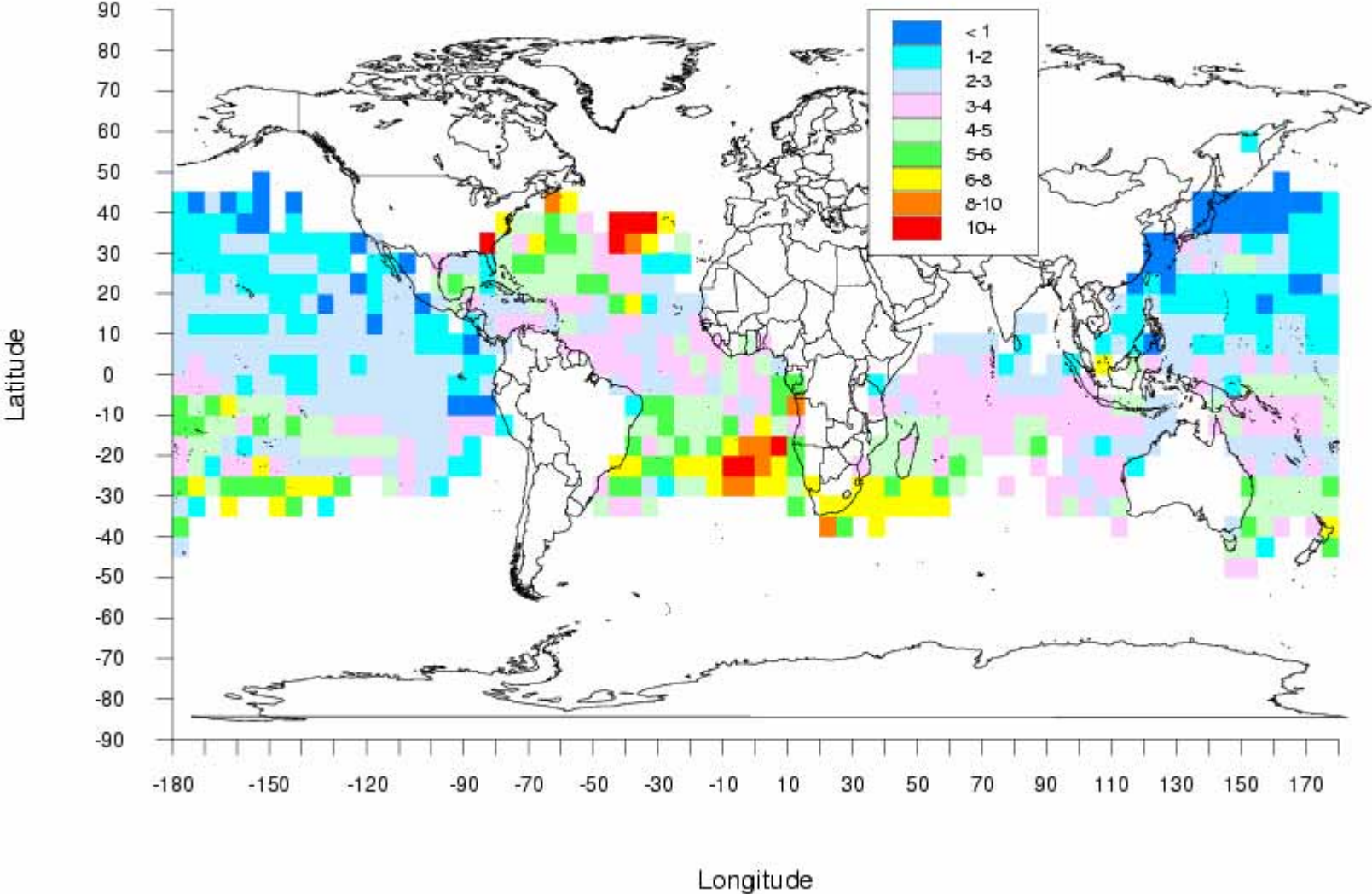
Catch Per Hundred Hooks, Year = 1960



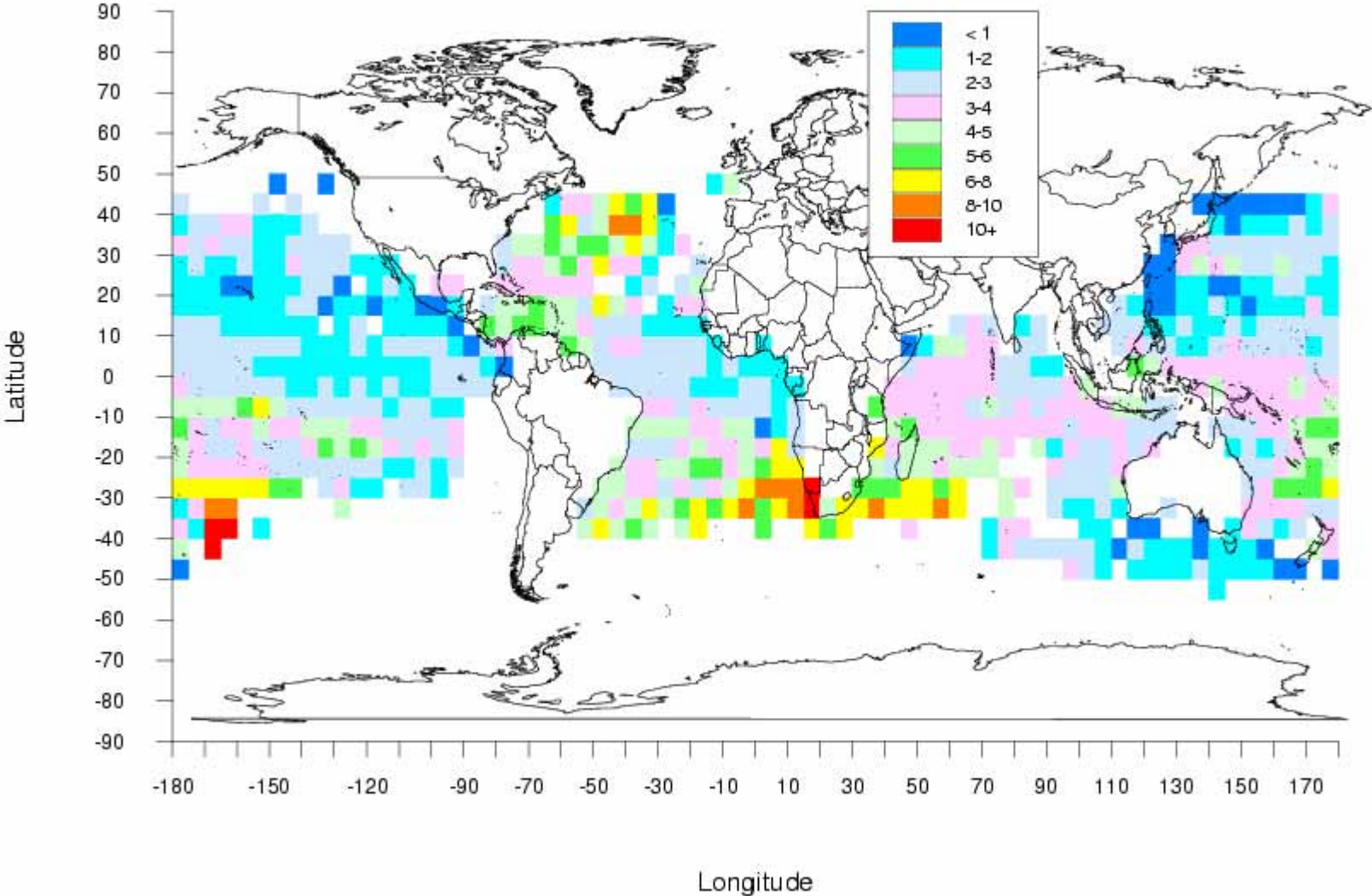
Catch Per Hundred Hooks, Year = 1962



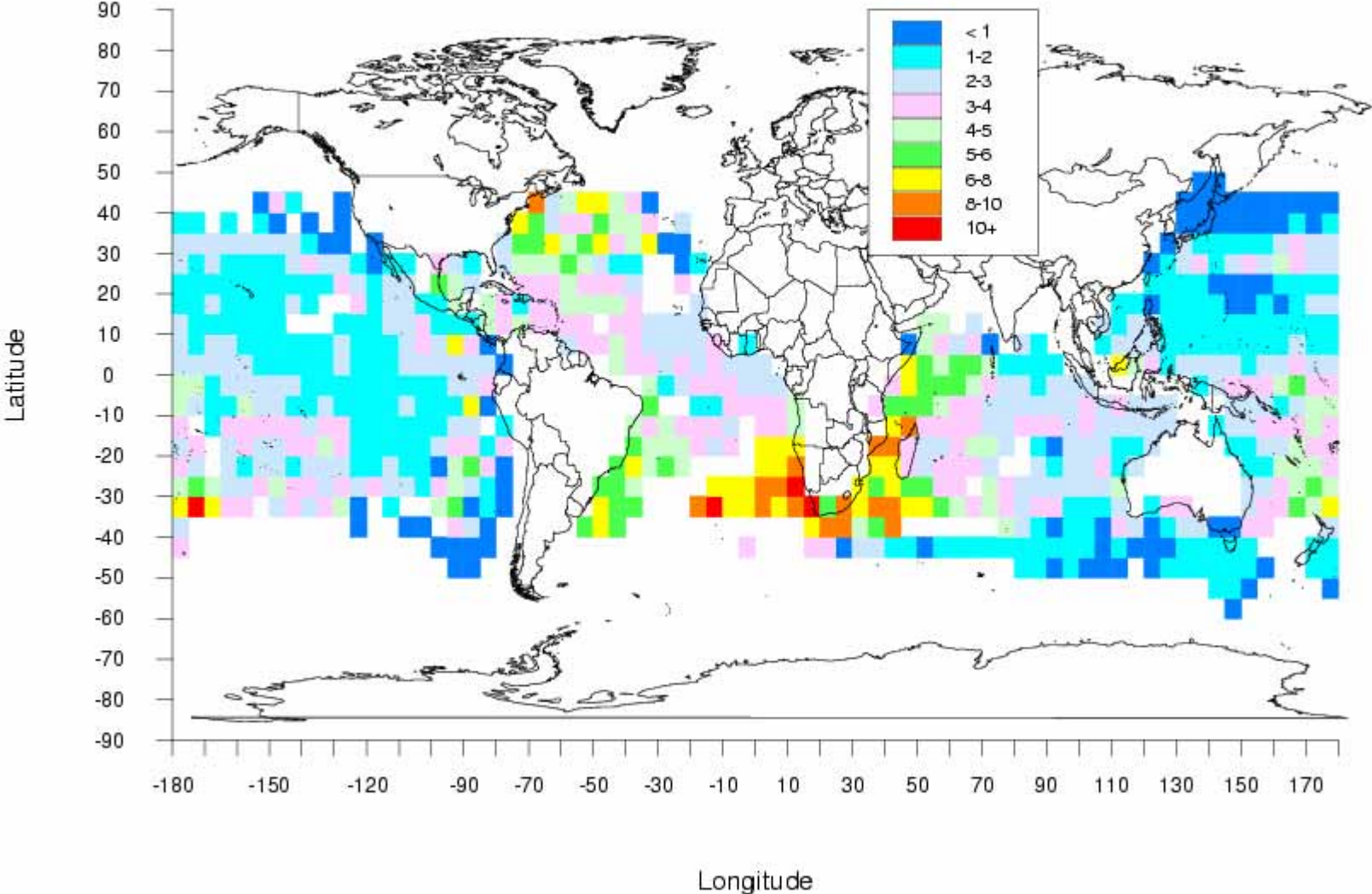
### Catch Per Hundred Hooks, Year = 1964



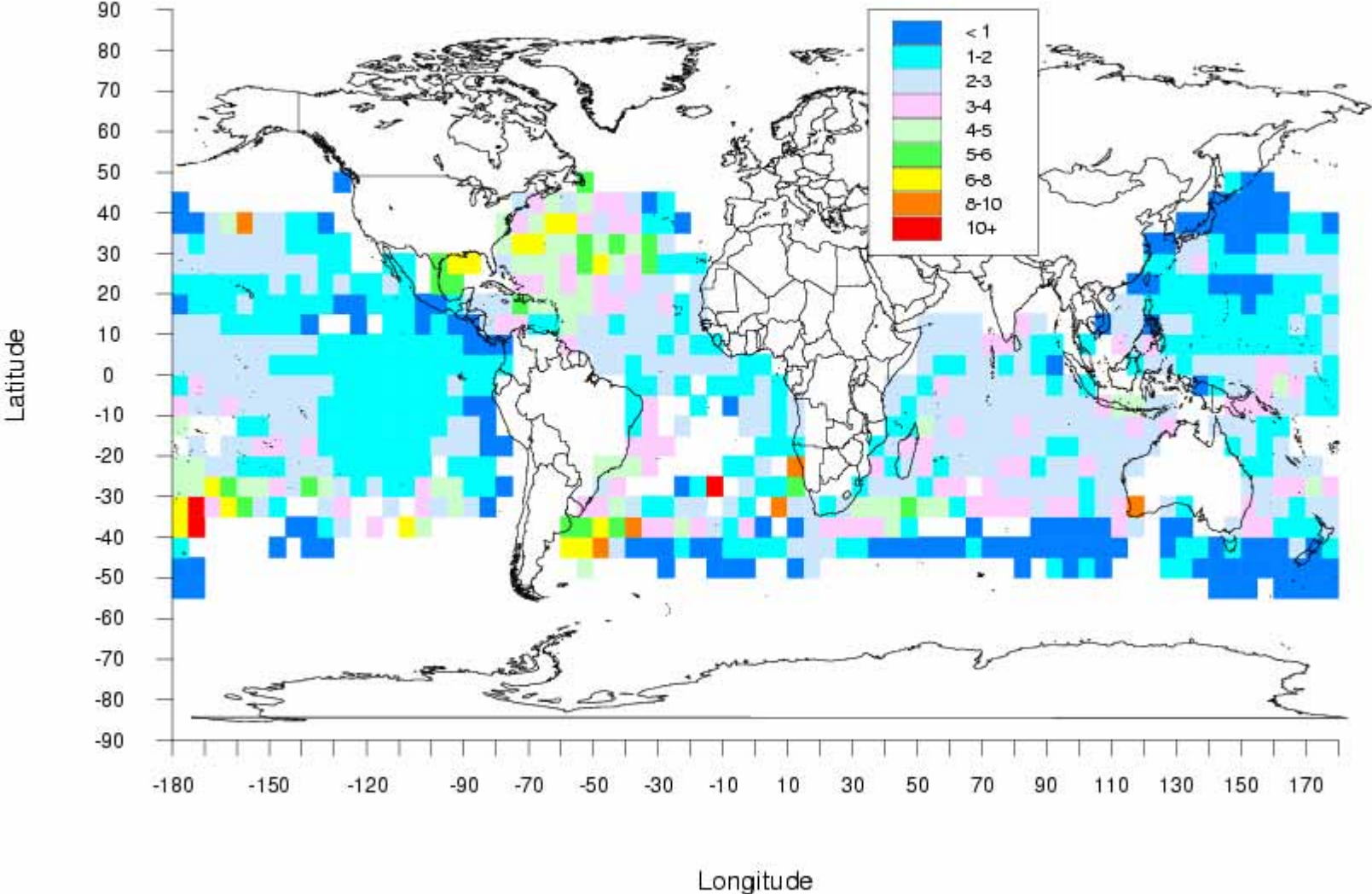
Catch Per Hundred Hooks, Year = 1966



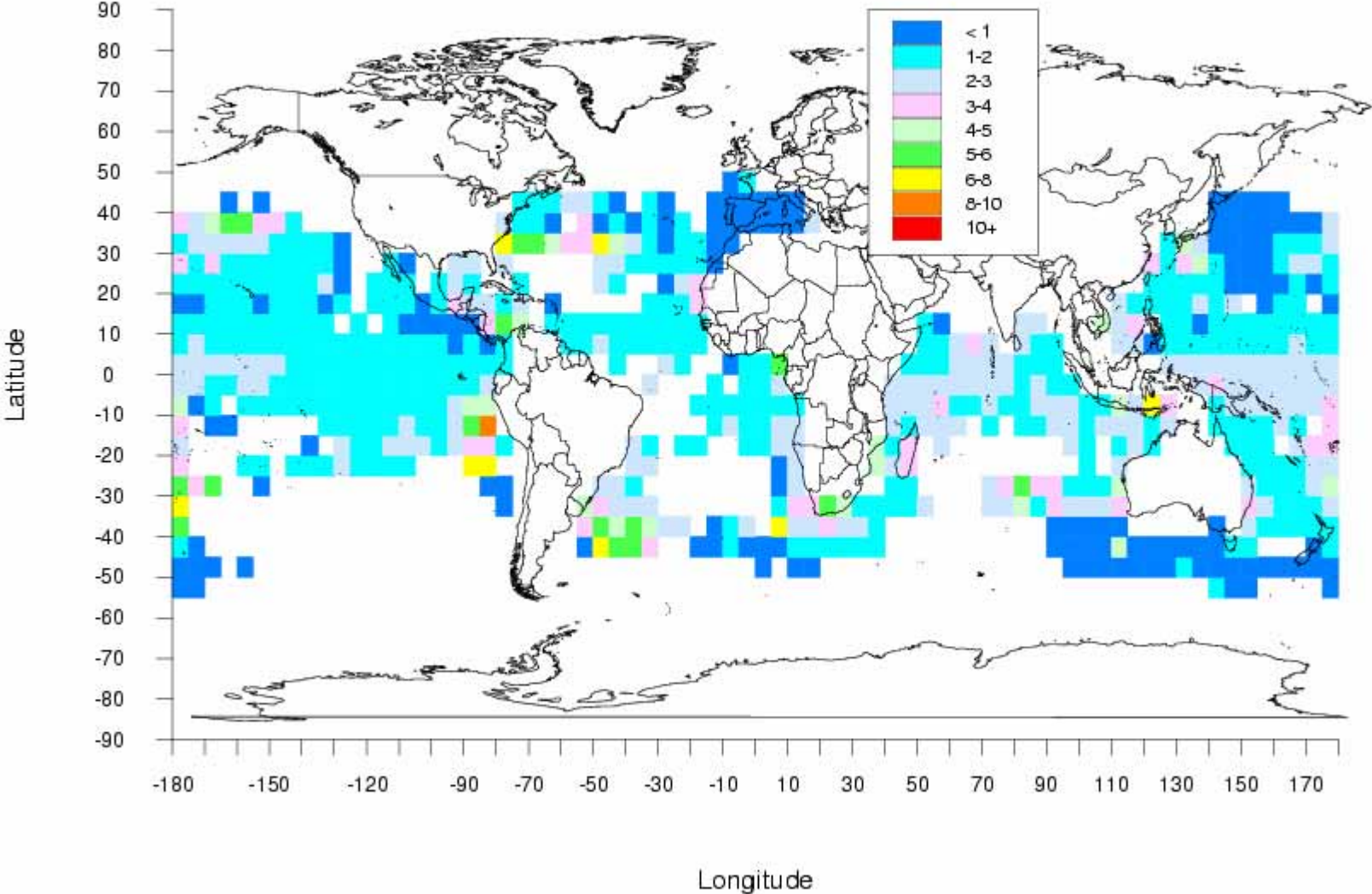
Catch Per Hundred Hooks, Year = 1968



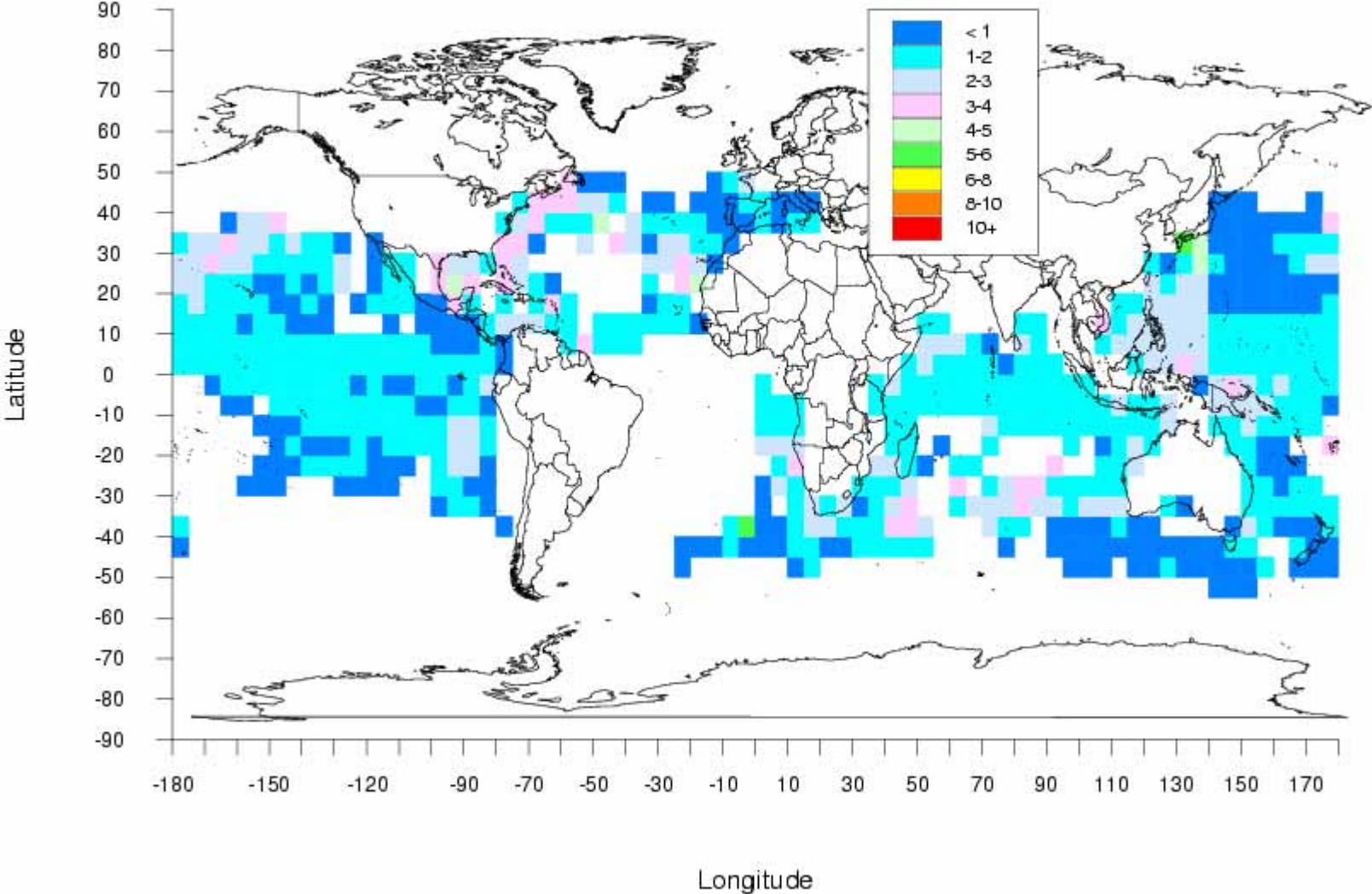
Catch Per Hundred Hooks, Year = 1970



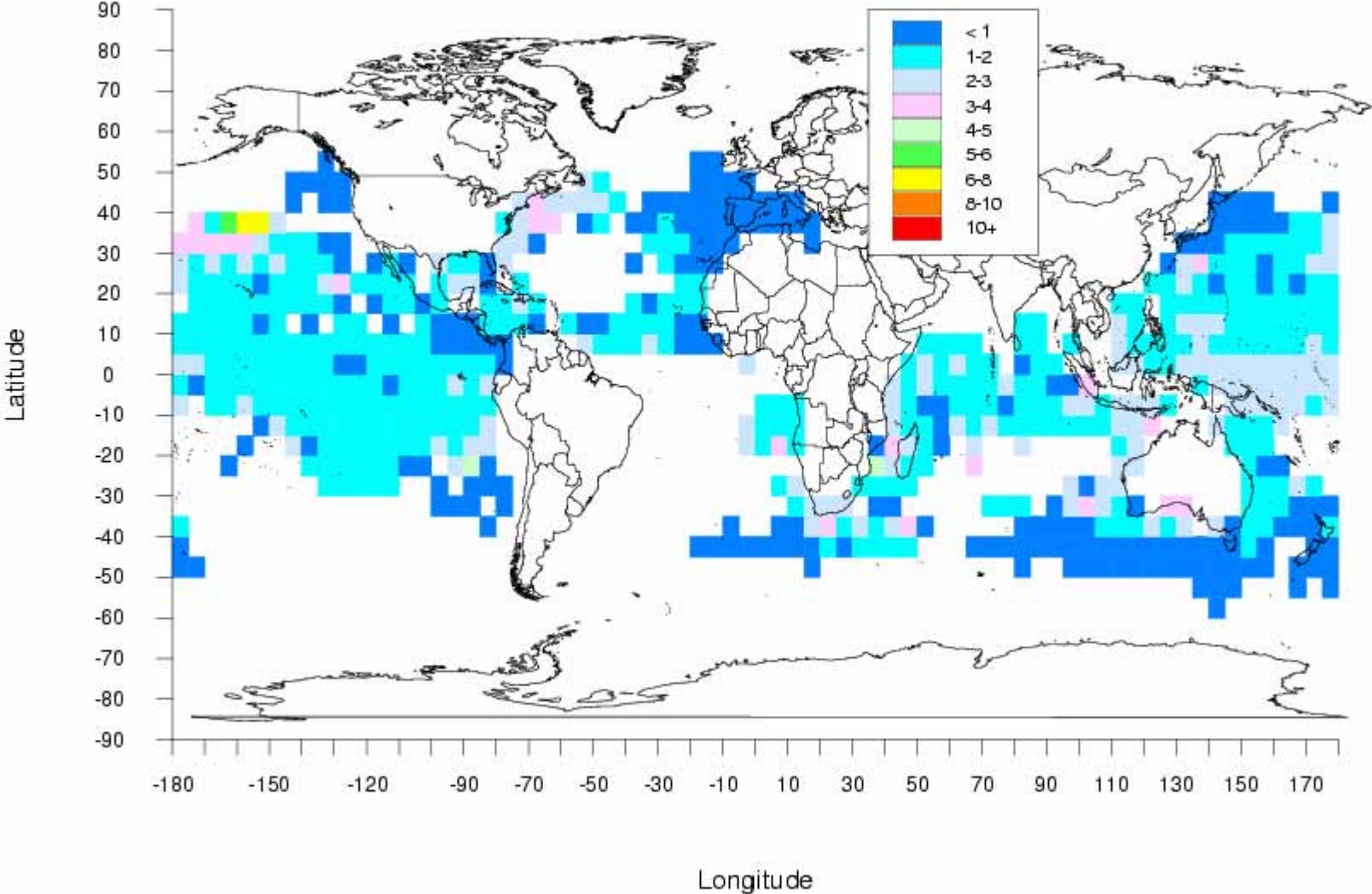
Catch Per Hundred Hooks, Year = 1972



### Catch Per Hundred Hooks, Year = 1974



Catch Per Hundred Hooks, Year = 1976



# Census of Marine Life

What's known

What's unknown

What's unknowable

*An ancient dream, a real possibility*

*A here-and-now test of  
partnerships & mechanisms  
for sustainable development*

A MEANS AND AN END

# CoML Contact Information

- Website:
  - Census of Marine Life: [www.coml.org](http://www.coml.org)
- Contacts:
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  - Ron O'Dor, Senior Scientist  
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