



The State of World Fisheries and the Environmental Impact of Fishing Compared to Livestock

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World's Fisheries Problem: the Litany

"Most of the world's major fisheries are depleted or rapidly deteriorating. Wherever they operate, commercial fishing fleets are exceeding the oceans' ecological limits."

-- Greenpeace

**West Coast
fishing faces
huge cutbacks**

Overfishing is
blamed for the
proposed limits

Fishing industry

*Plan to ban factory trawlers
addresses issue of overfishing*

ALASKA FISHERMAN'S
JOURNAL

More than just the tip of the news

Vol. 22, No. 11

November 1998

Humans and the sea

*Overfishing is ruining
our once-bountiful oceans*

FISHERMEN OR FELONS?

Waste and overfishing of one of the last, great resources

Disturbance of the Seabed by Mobile Fishing Gear: A Comparison to Forest Clearcutting

LES WATLING* AND ELLIOTT A. NORSE†

*Darling Marine Center, University of Maine, Walpole, ME 04573, U.S.A., email watling@maine.maine.edu

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email enorse@u.washington.edu

1998 The area trawled each year is the same as the total area of the Amazonian Rainforest and the ecosystem consequences are similar

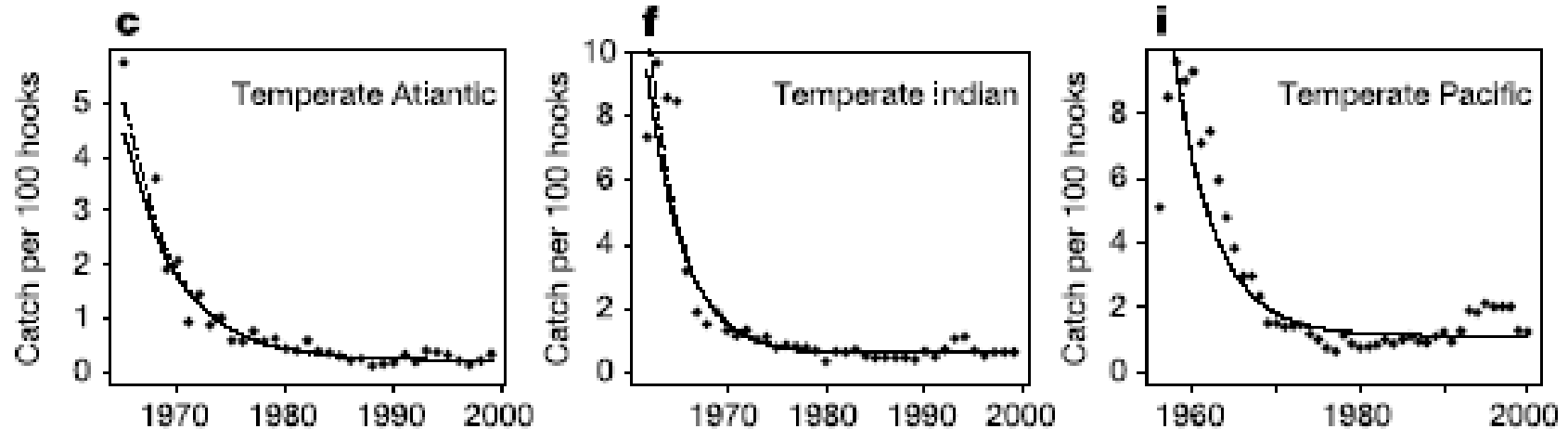
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Rapid worldwide depletion of predatory fish communities

Ransom A. Myers & Boris Worm

*Biology Department, Dalhousie University, Halifax, Nova Scotia, Canada
B3H 4J1*

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2006

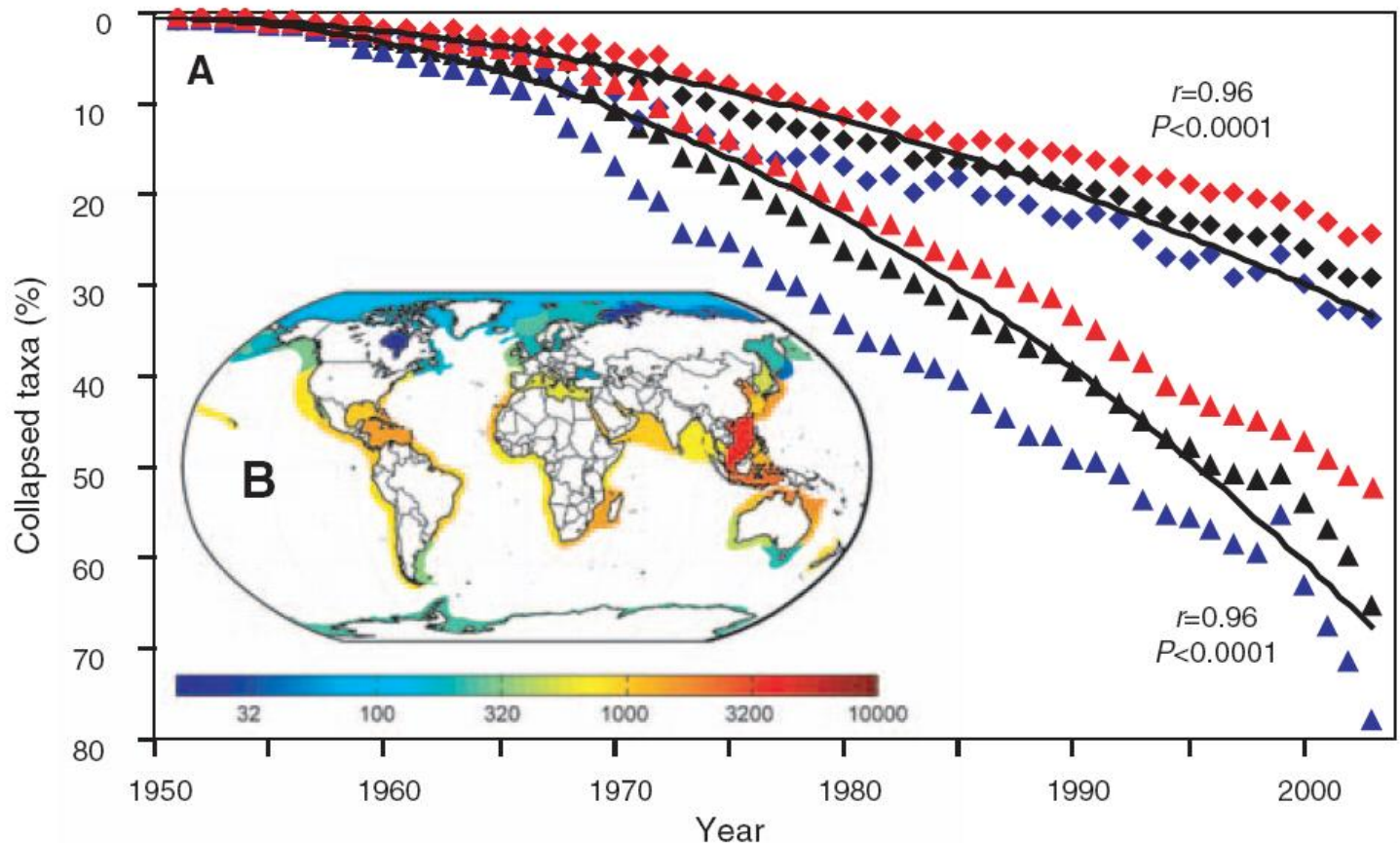
ECOLOGY

Globalization, Roving Bandits, and Marine Resources

Impacts of Biodiversity Loss on Ocean Ecosystem Services

Boris Worm,^{1*} Edward B. Barbier,² Nicola Beaumont,³ J. Emmett Duffy,⁴
Carl Folke,^{5,6} Benjamin S. Halpern,⁷ Jeremy B. C. Jackson,^{8,9} Heike K. Lotze,¹
Fiorenza Micheli,¹⁰ Stephen R. Palumbi,¹⁰ Enric Sala,⁸ Kimberley A. Selkoe,⁷
John J. Stachowicz,¹¹ Reg Watson¹²

All fish gone by 2048



What's Causing the Problem?



Overfishing

76% of global fish stocks are at capacity or already depleted.



Bycatch

7.3 million tons of unwanted fish and animals are caught and thrown overboard every year.



Trawling

The area of seafloor trawled each year is 150 times that of all forests clear-cut worldwide.



From Greenpeace

Bottom trawling is the most destructive fishing method used.

Enormous bottom trawl nets are dragged along the sea floor, catching all marine life and killing all habitats - they swallow and destroy everything in their path.

Greenpeace wants to protect ocean habitats, sealife and fish stocks from this indiscriminate fishing method.

What the public believes

- Most fisheries are unsustainably managed
- Stocks worldwide are declining
- The act of fishing destroys the environment

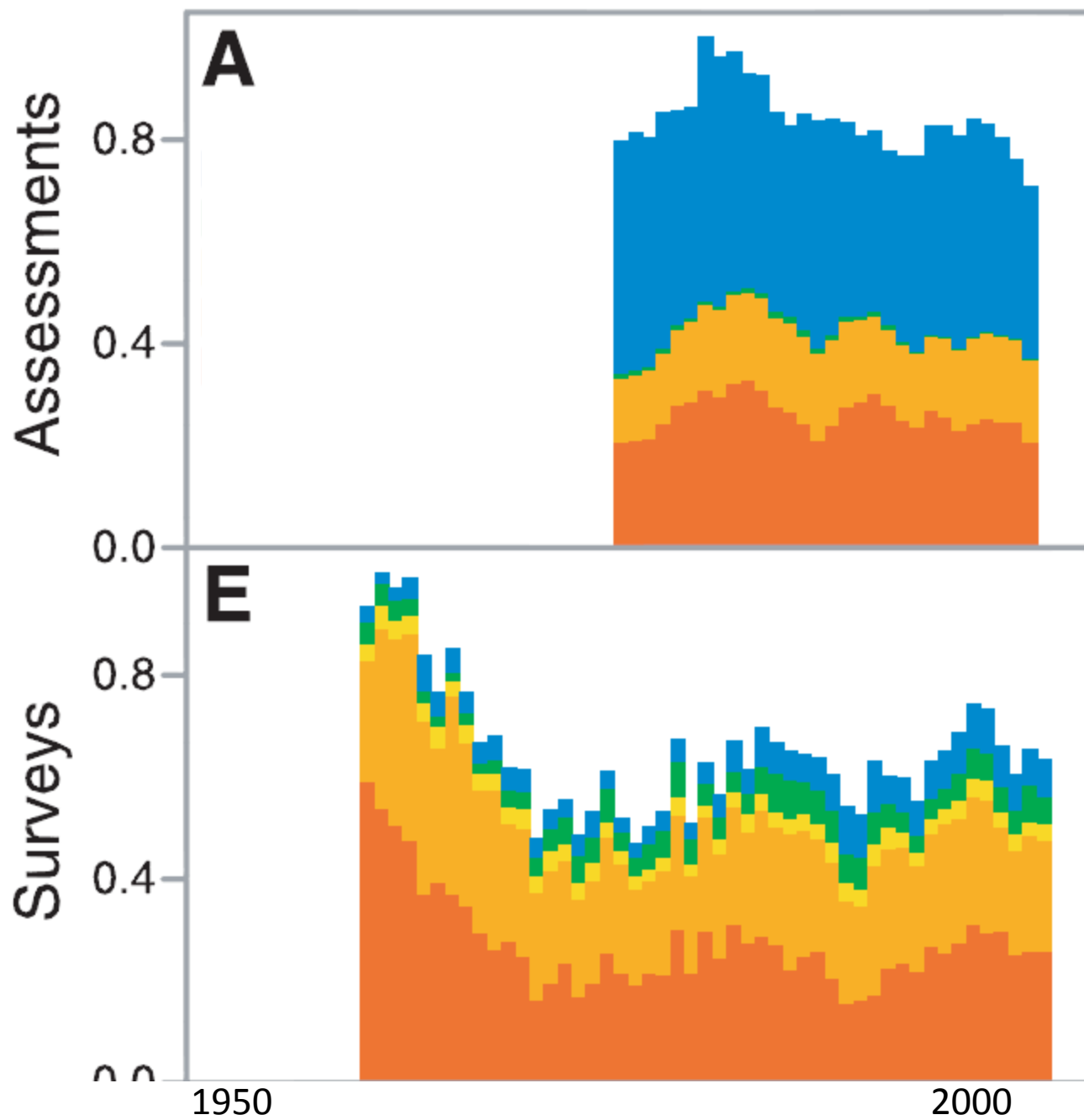
NCEAS working group: Finding common ground in marine conservation and management



Rebuilding Global Fisheries

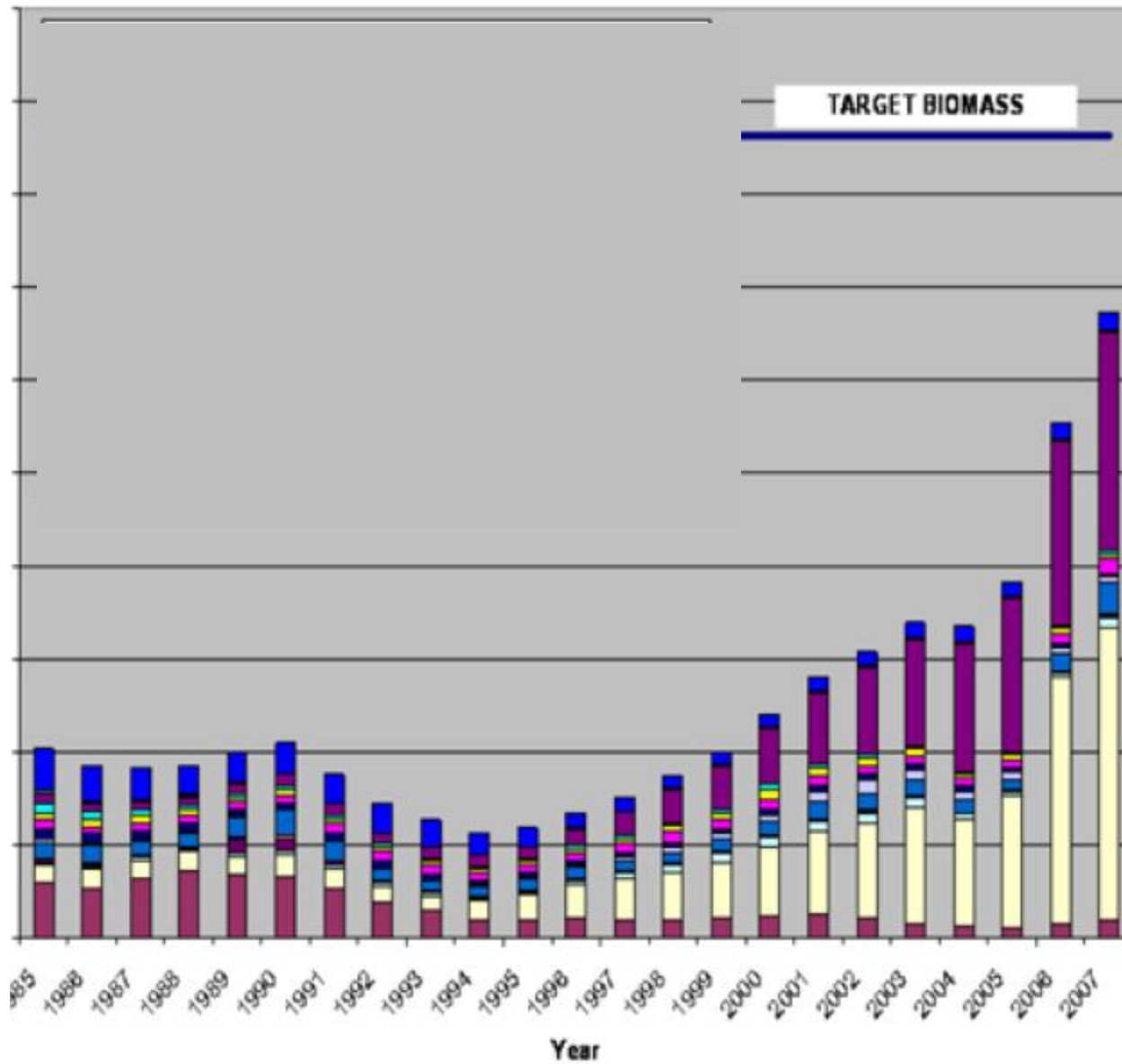
Boris Worm,^{1*} Ray Hilborn,^{2*} Julia K. Baum,³ Trevor A. Branch,² Jeremy S. Collie,⁴ Christopher Costello,⁵ Michael J. Fogarty,⁶ Elizabeth A. Fulton,⁷ Jeffrey A. Hutchings,¹ Simon Jennings,^{8,9} Olaf P. Jensen,² Heike K. Lotze,¹ Pamela M. Mace,¹⁰ Tim R. McClanahan,¹¹ C  il  n Minto,¹ Stephen R. Palumbi,¹² Ana M. Parma,¹³ Daniel Ricard,¹ Andrew A. Rosenberg,¹⁴ Reg Watson,¹⁵ Dirk Zeller¹⁵

Abundance trends of assessed stocks

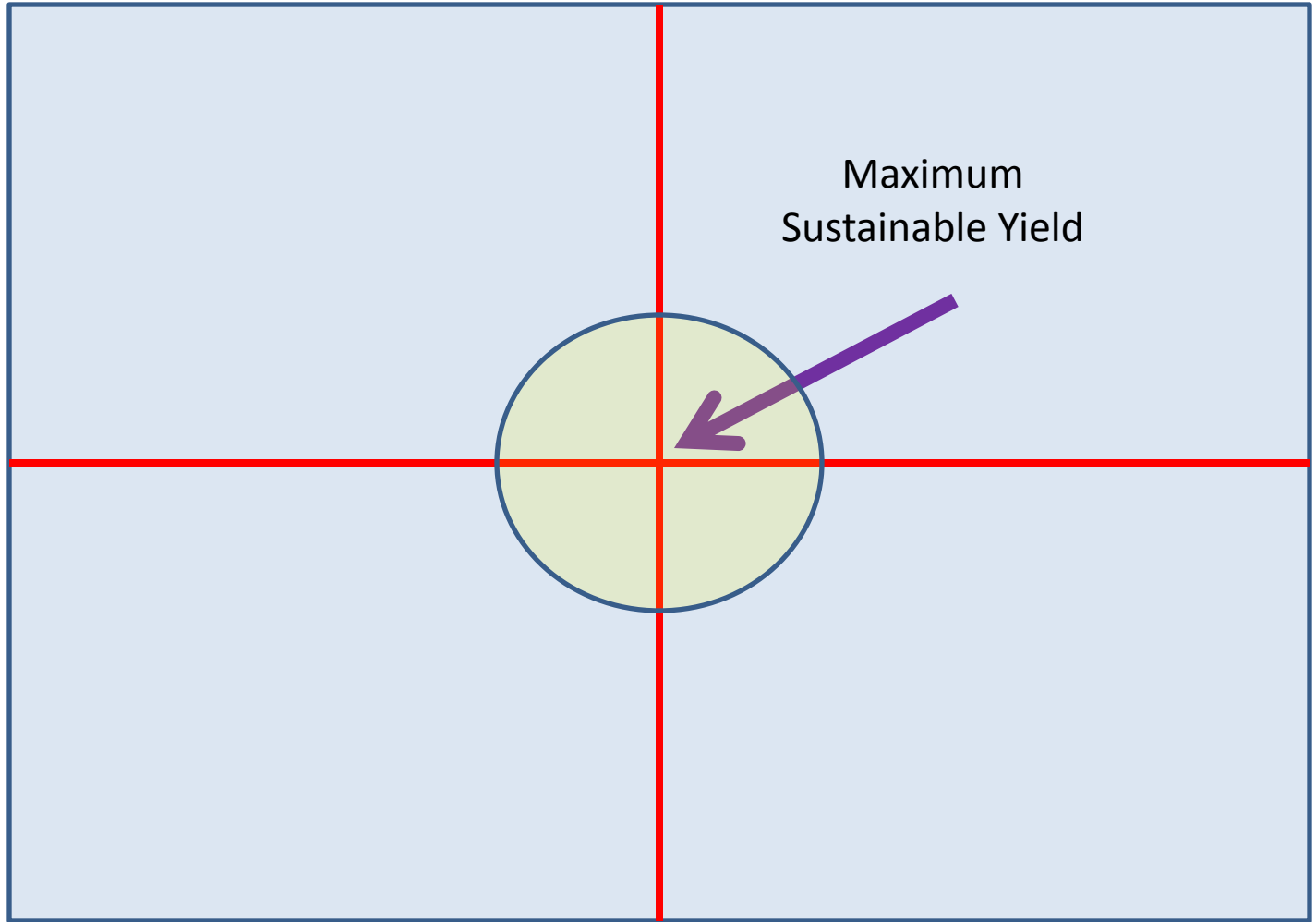


New England Groundfish 1985-2007

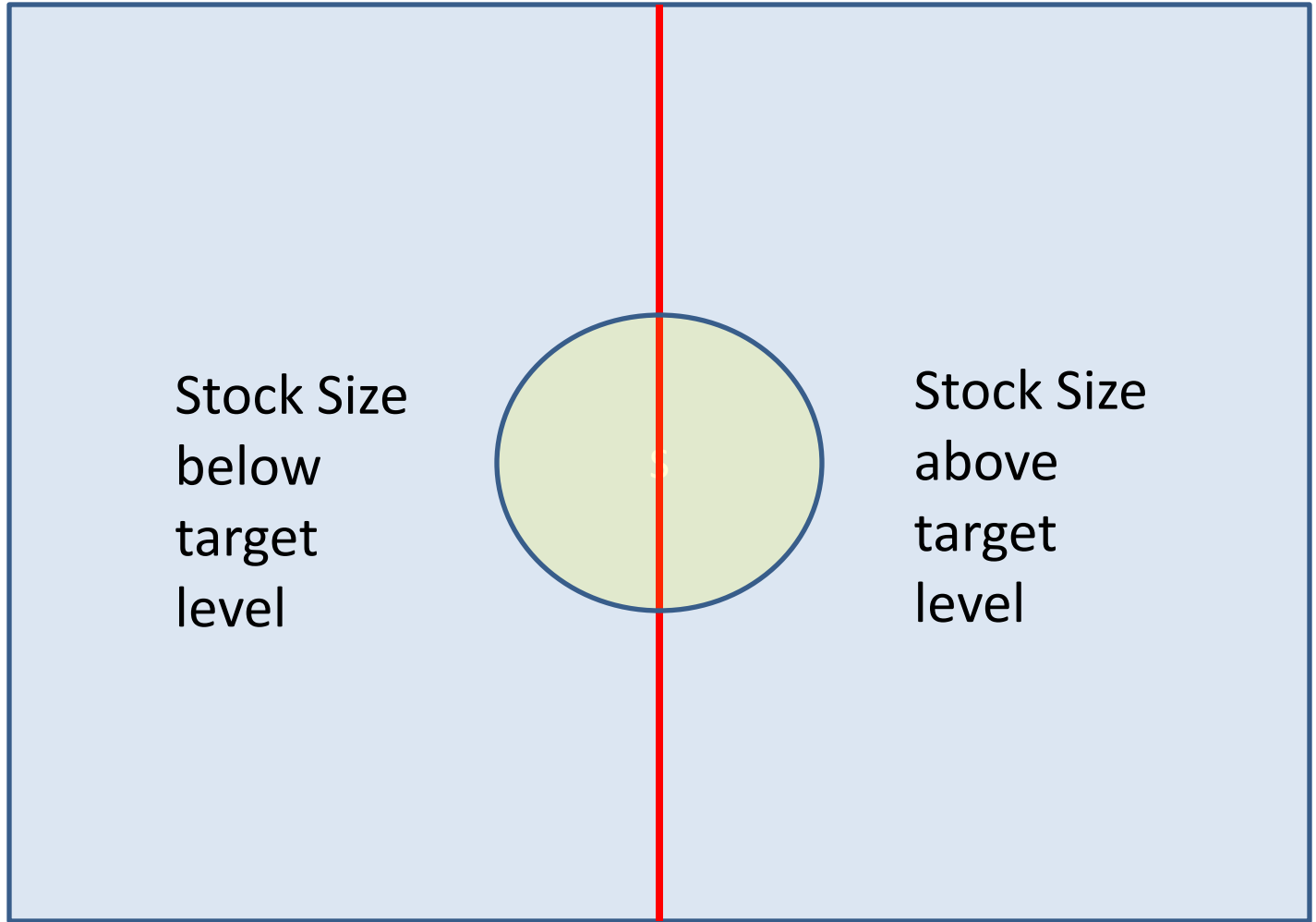
Total abundance



Fishing Pressure



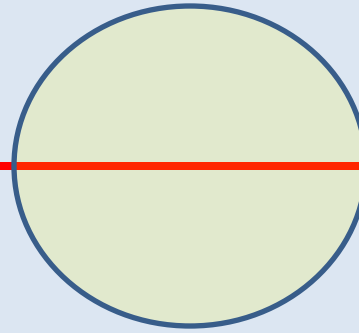
Stock Size



Stock Size

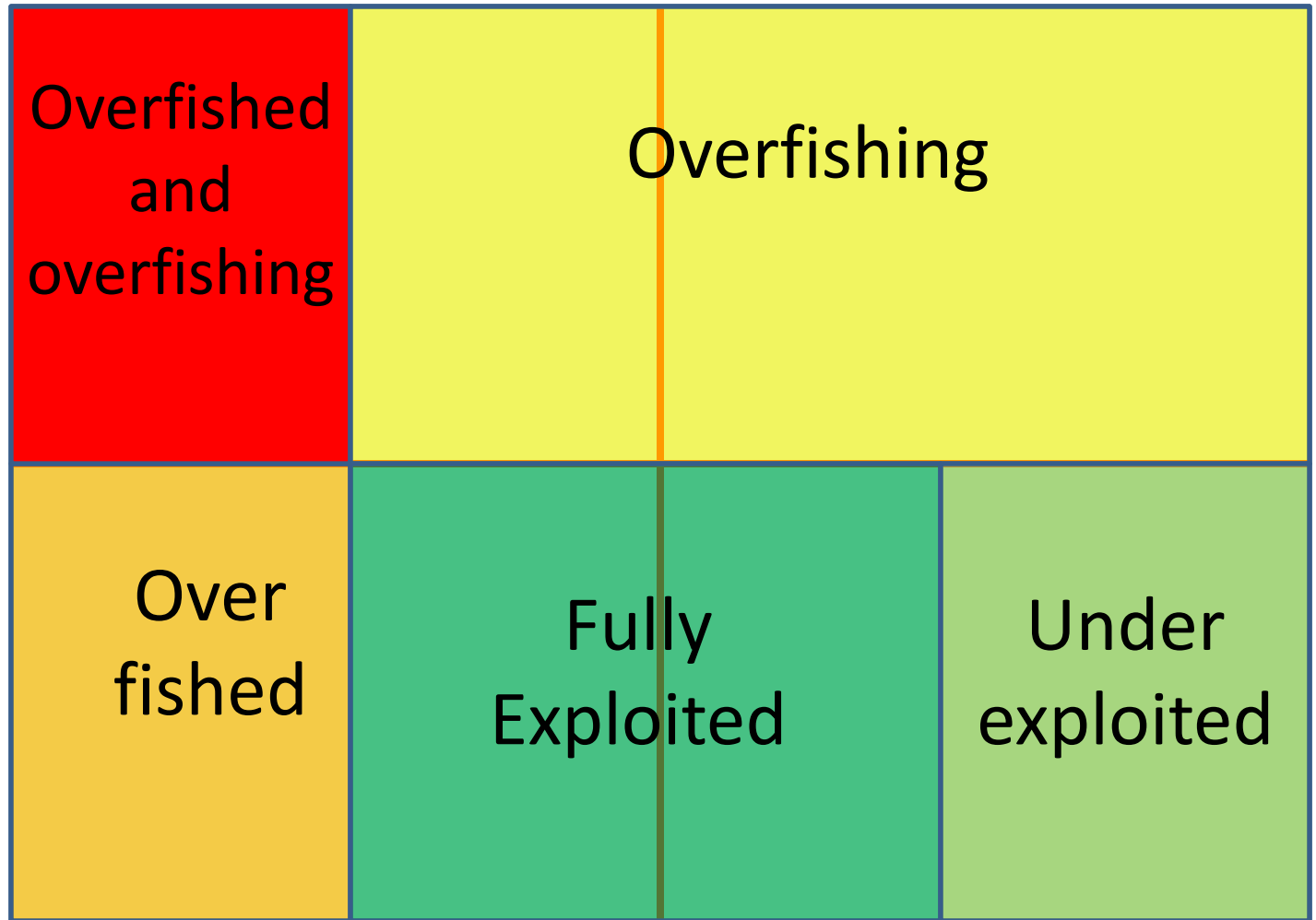
Fishing Pressure

Exploitation Rate Higher Than Target Level



Exploitation Rate Below TargetLevel

Fishing Pressure



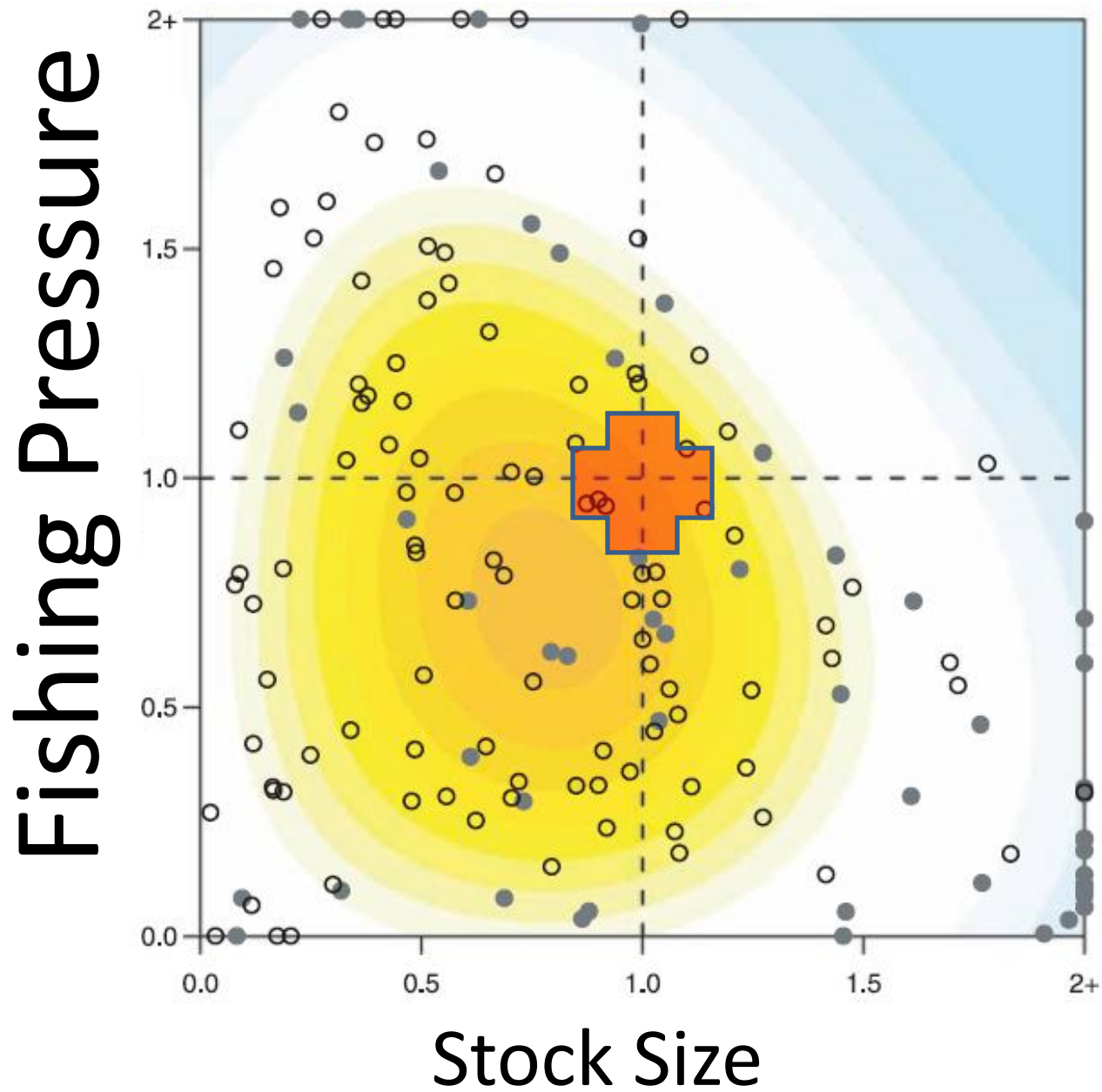
Stock Size

Fishing Pressure

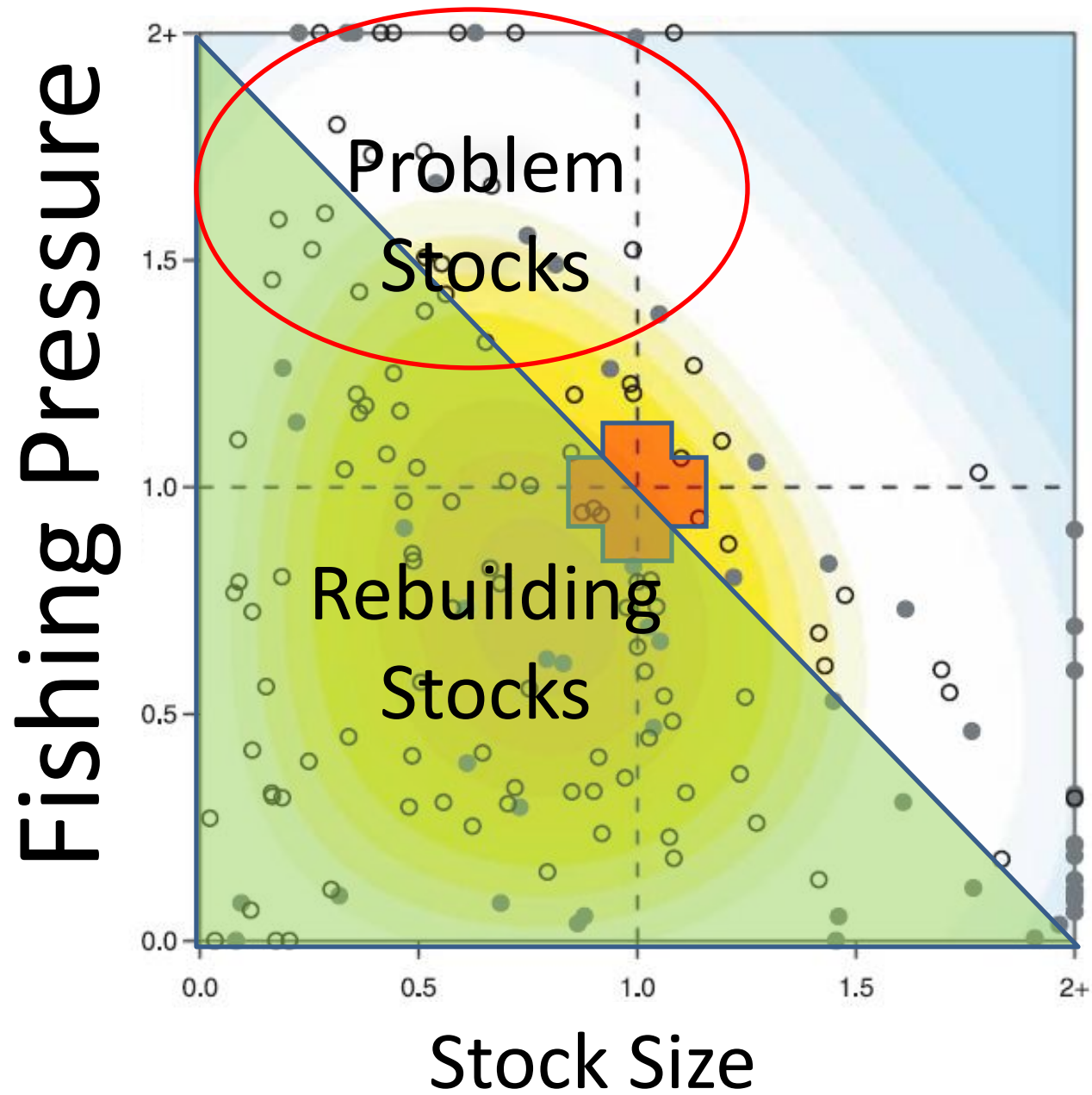
Current and Future Problem	Possible Future Problem		
Current Problem – Better Future	Okay	Okay	Okay

Stock Size

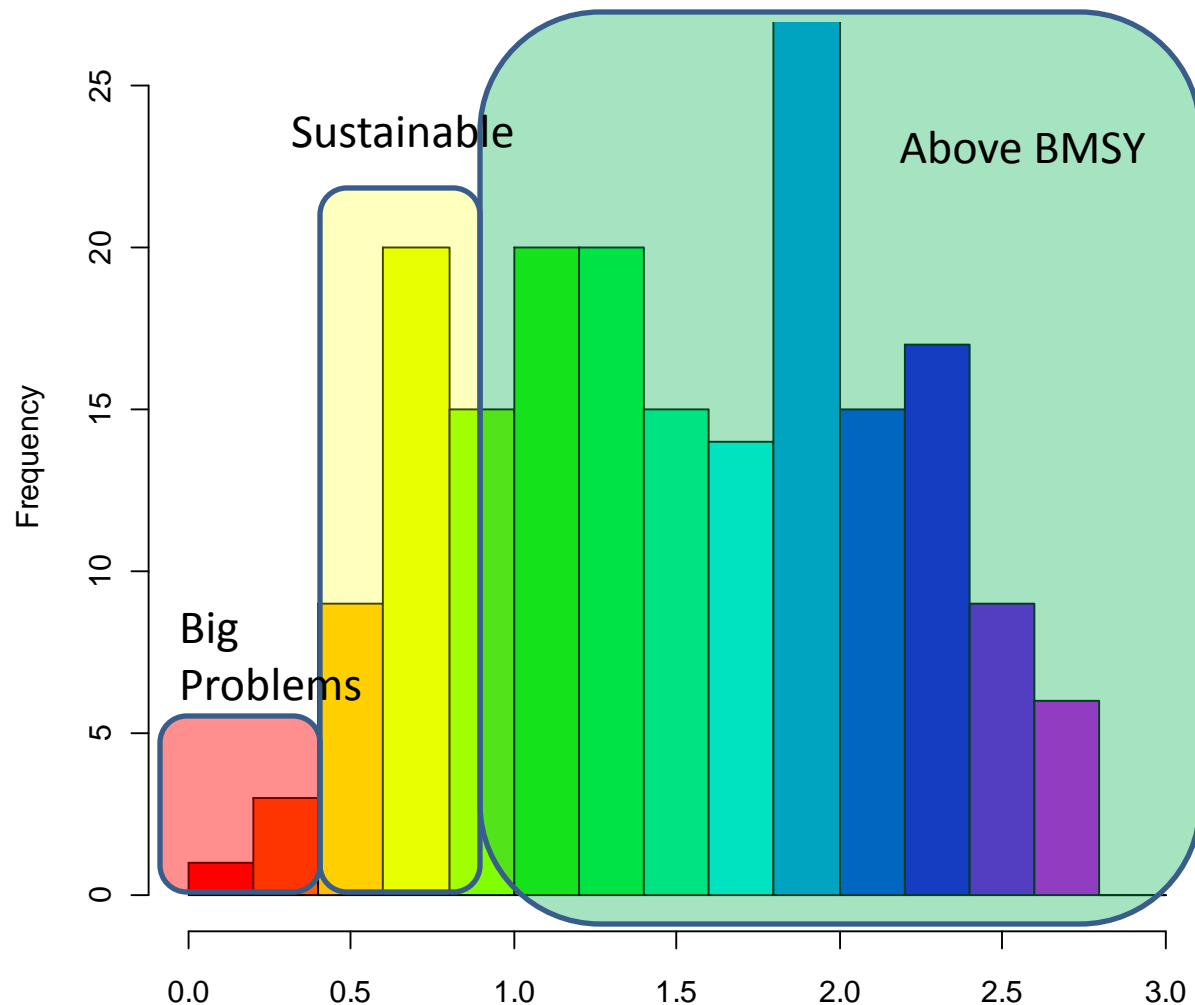
Assessed stocks in industrial and developed countries



Assessed stocks in industrial and developed countries

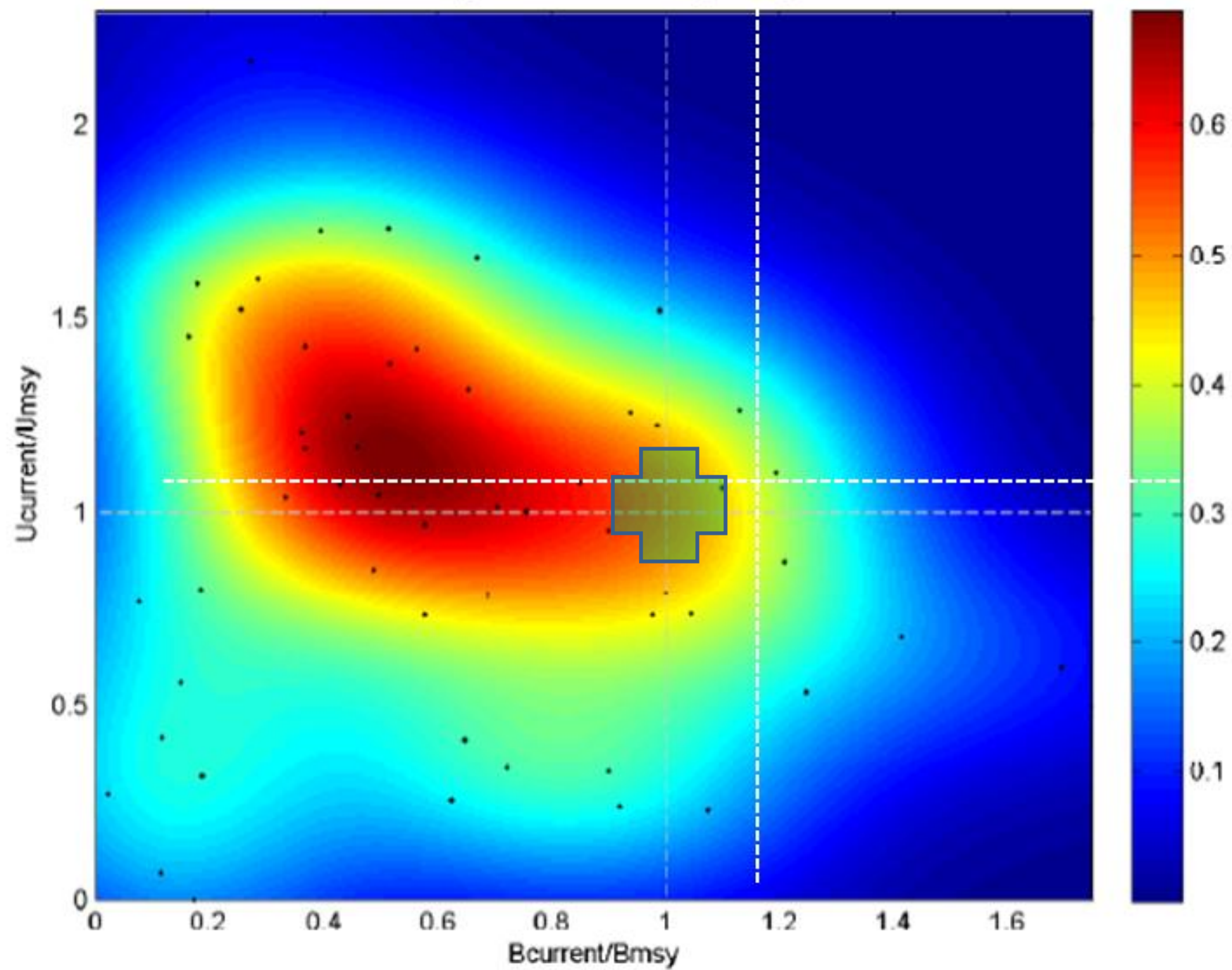


Where “business as usual” takes us

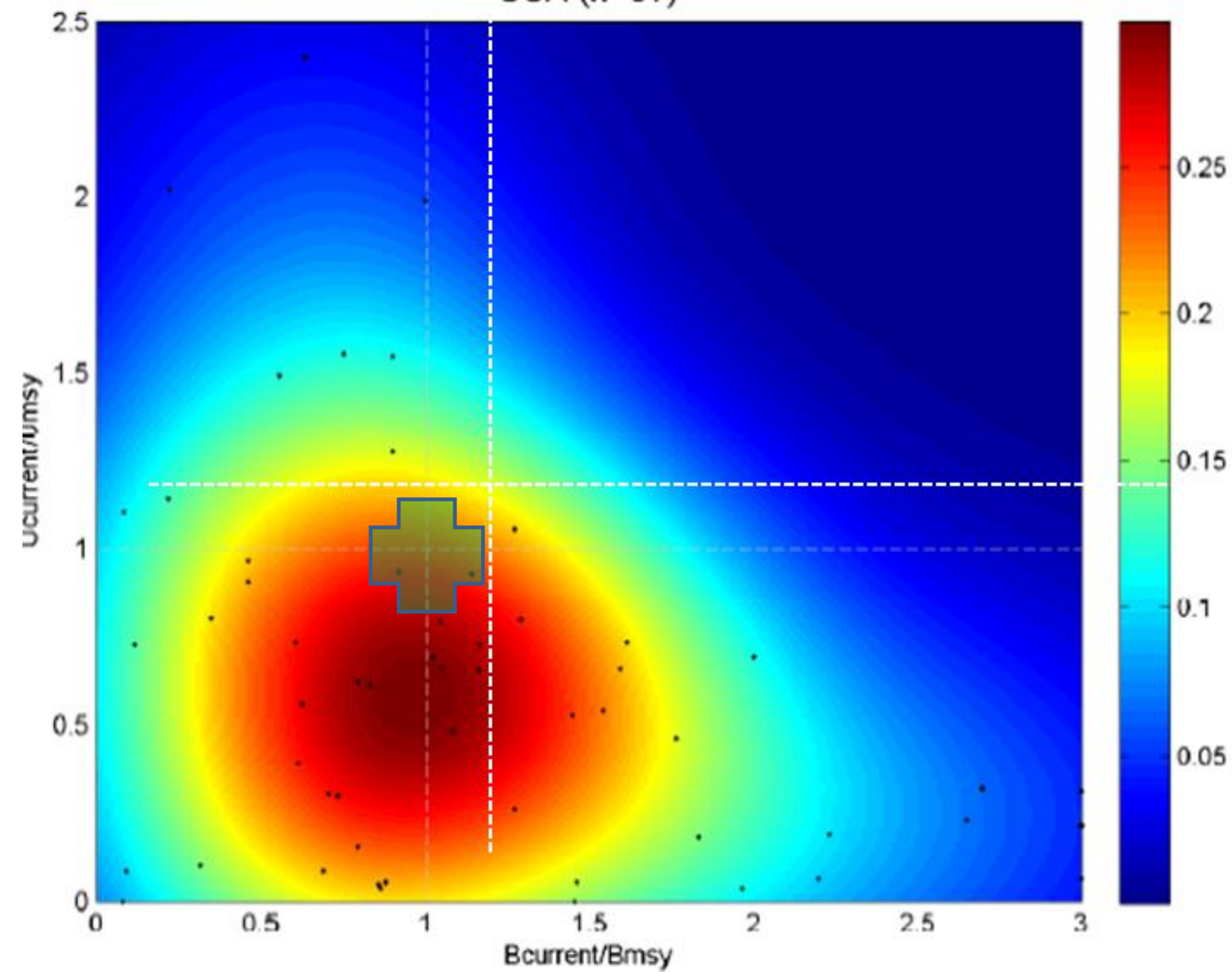


Equilibrium biomass relative to BMSY

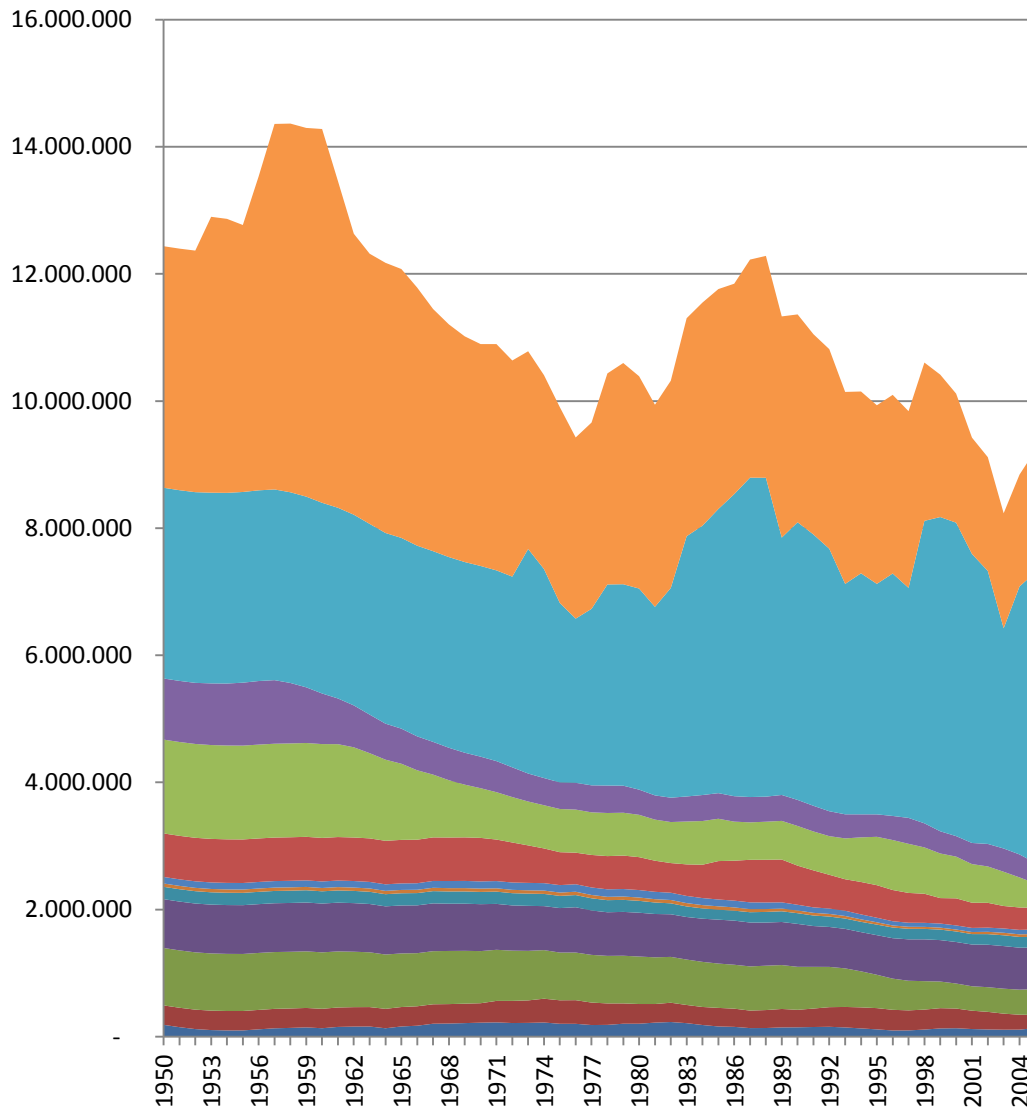
European fisheries (n=54)



USA (n=57)



World abundance of tuna and billfish



Go to animation of whitefish

How has the success been achieved

- A wide suite of “traditional” tools
 - Catch limitation especially hard TACs
 - Fleet reduction
 - Area closures
 - Gear restrictions
- There is no silver bullet
 - Neither catch shares or MPAs have proved to be a necessary or sufficient condition

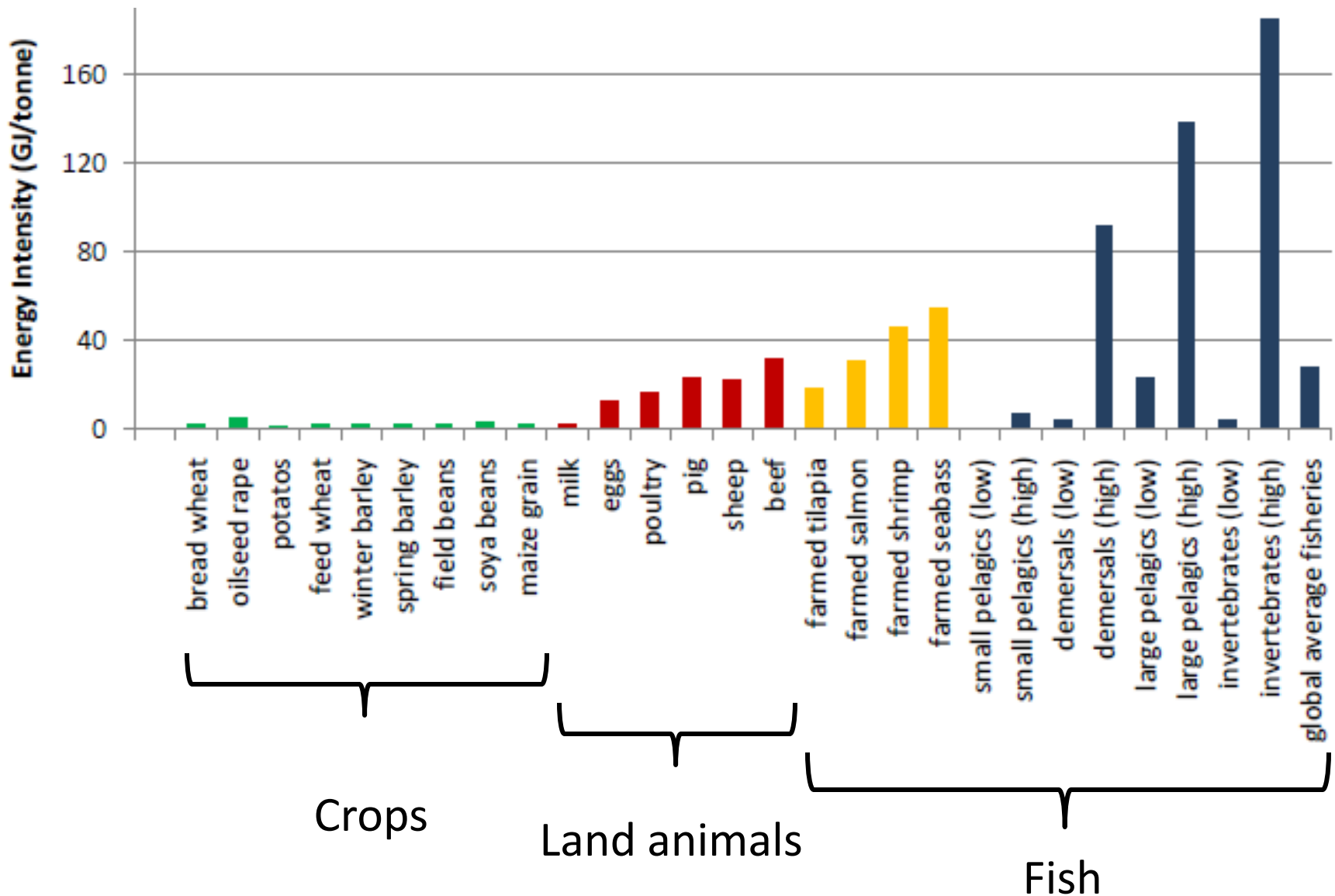
Lessons Learned

- Good data on abundance triumphs over poor data and belief
- Scientists from all perspectives can find common ground on the status of fisheries
- Changing the public perception will take longer

The major industrial fisheries of
the developed world are
sustainably managed...

but at what environmental cost?

Energy intensity of food production



Environmental costs per 40g protein

	Water (L)	Fertilizer (g)	Pesticides (mg)	Antibiotics (mg)	Soil Loss (kg)
Beef	2200	50	494	21	16
Chicken	1331	18	163	55	3
Pork	1331	46	422	53	8
Dairy	1178	34	299	50	7
Capture fisheries	low	0	30	0	0

Environmental costs per 40 g protein

	Land Required (m ²)	CO ₂ (land use) (kg)	CO ₂ (no land use) (kg)
Beef	354	16.7	11.5
Chicken	1.4	2.5	1.4
Pork	3.7	3.8	1.6
Dairy	3.0	2.7	1.6
Capture fisheries	20-100	0.3-2.0	

**Fisheries may have less biodiversity cost
than organic agriculture**





Environmental Trade-offs

- Would need 22 times the world rainforests to replace fish production by grazing

Other interesting numbers

- If we were to stop all trawl fishing we would need 5 times the worlds rainforest area to make up the protein by grazing

Good citizens at work



Rapers and Pillagers of the Ocean



How have fisheries been villified

- Foundations and NGOs have spent over 100 million per year on marine issues
- Many of these foundations and NGOs are specifically opposed to industrial fishing
- BUT
- The data have begun to convince many NGOs and Foundations that well managed fisheries are part of the solution to world food production

An aerial photograph showing a long, winding line of red combine harvesters in a vast, flat, brownish field. The harvesters are arranged in a single file, stretching from the top left towards the bottom right of the frame. The background is a uniform, textured expanse of dry earth or stubble.

**The
Economist**

The 9 billion-people question

A special report on feeding the world | February 26th 2011

Moving forward

- Changing the agenda from “marine conservation” to sustainable food production
- There is an environmental cost to fishing, but it is less than many alternative forms of food production
- Making sure there is a good scientific basis for understanding the sustainability and environmental impact of fishing