Trends in the sustainability of world fisheries

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Key topics

- Sustainability: what is it?
- Status of stocks
- Environmental impacts of fishing
- Conclusions

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.“

Page 8, *World Commission on Environment and Development. Our Common Future*. (Oxford, Great Britain: Oxford University Press, 1987). (Frequently referred to as the Brundtland report after Gro Harlem Brundtland, Chairman of the Commission)

Some do not believe fishing is sustainable

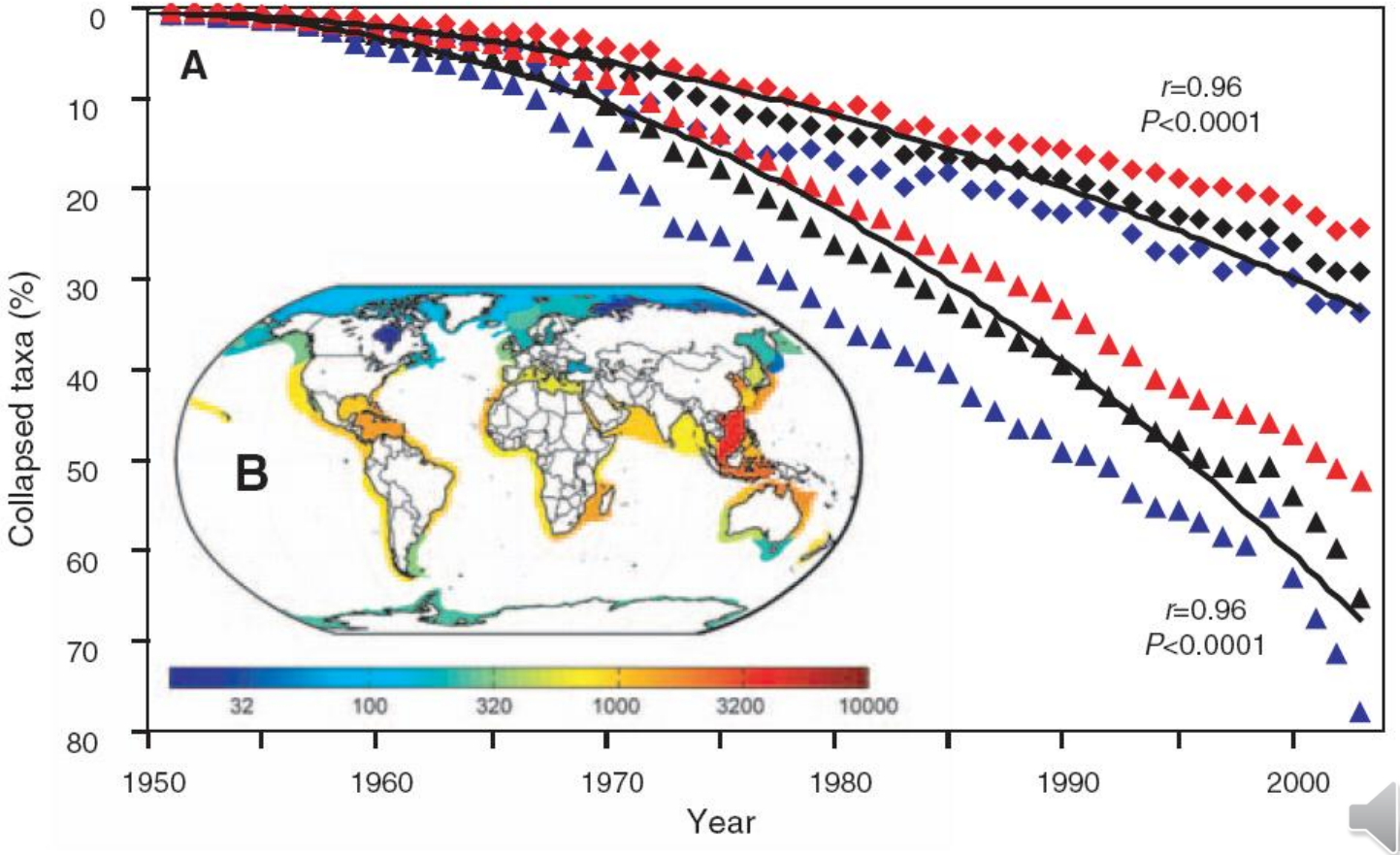
"And, just as a Ponzi scheme will collapse once the pool of potential investors has been drained, so too will the fishing industry collapse as the oceans are drained of life"

"people—even those who profess great environmental consciousness--continue to eat fish as if it were a sustainable practice." Pauly 2009

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 Watson[12]

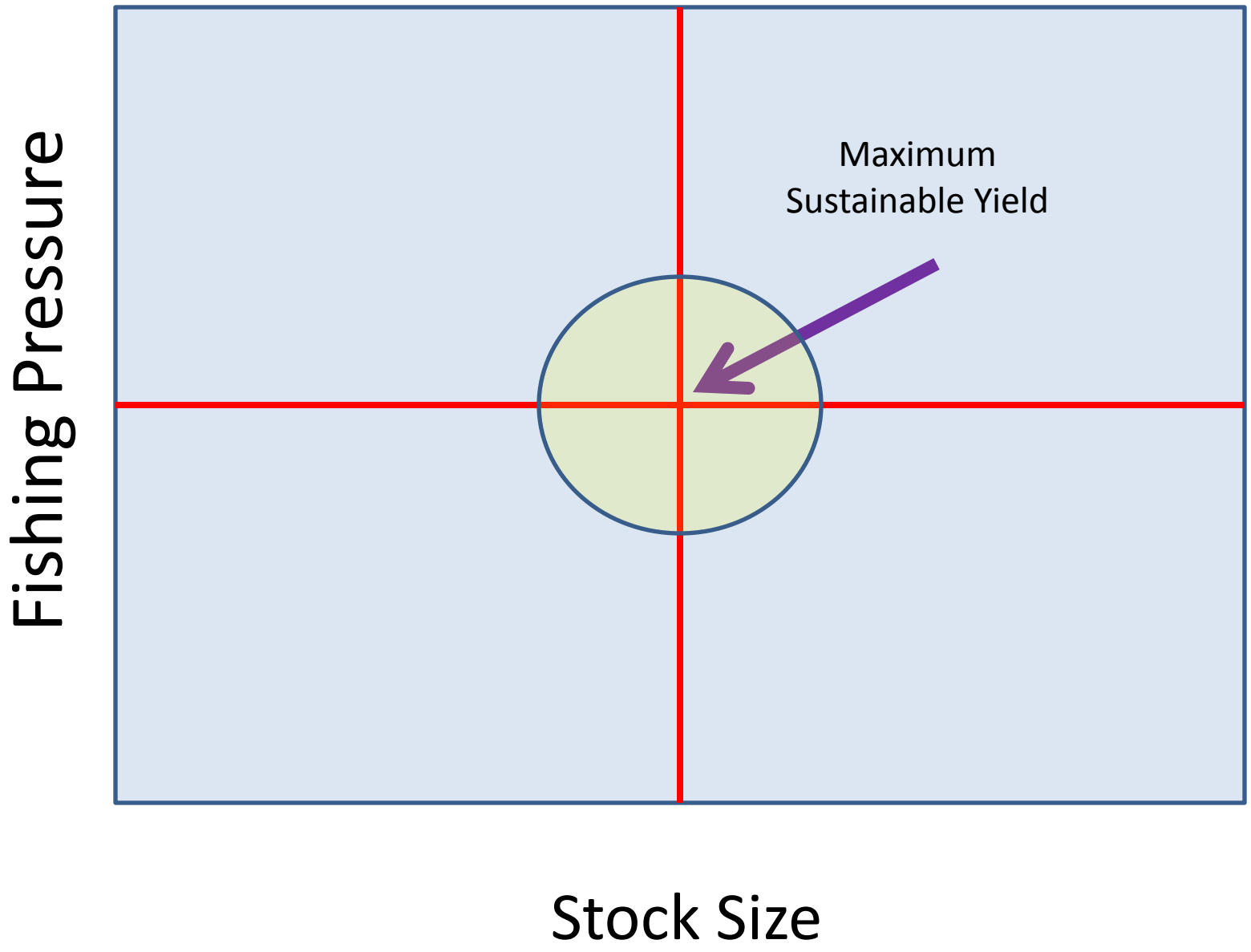
All fish gone by 2048

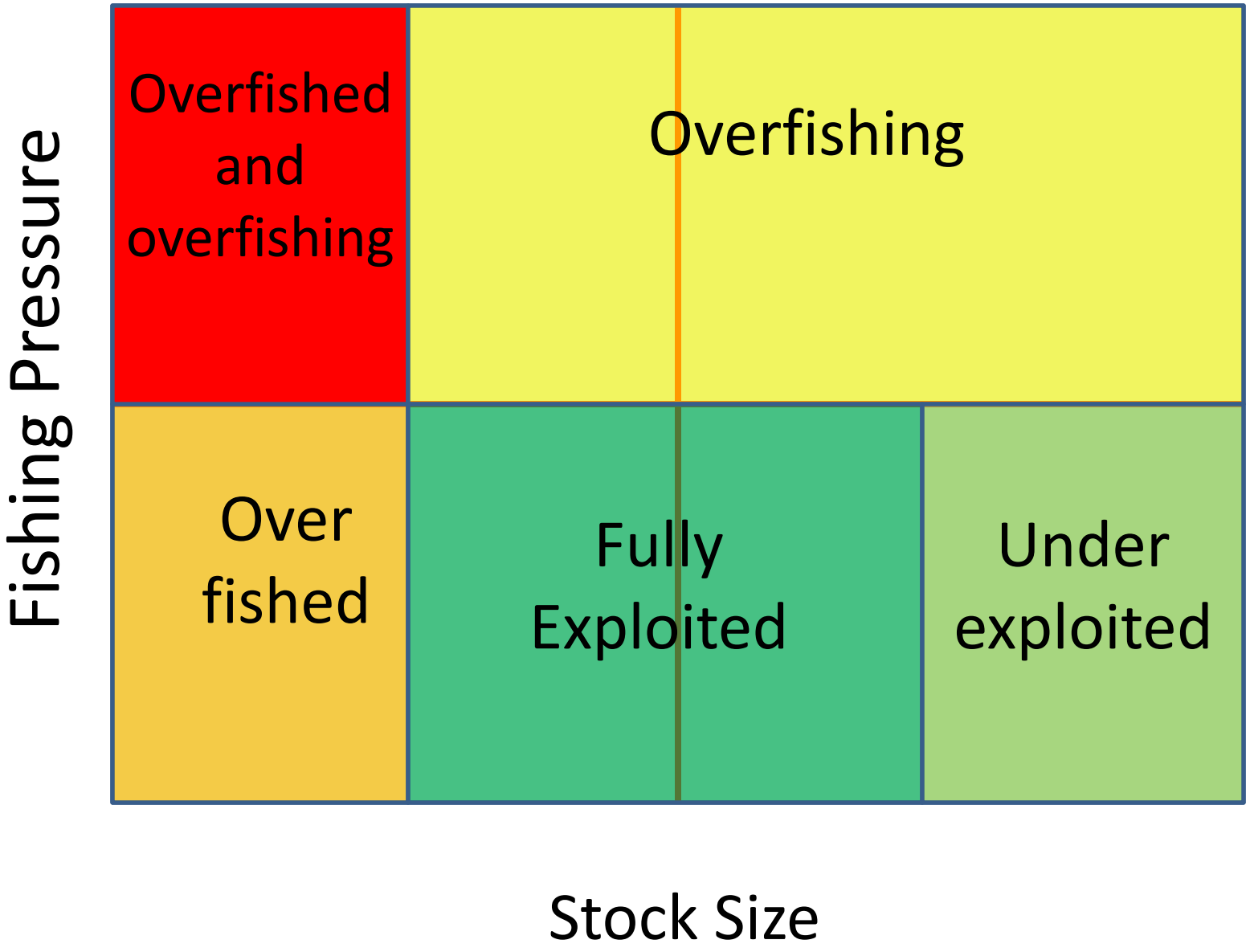


NCEAS working group: Finding common ground in marine conservation and management

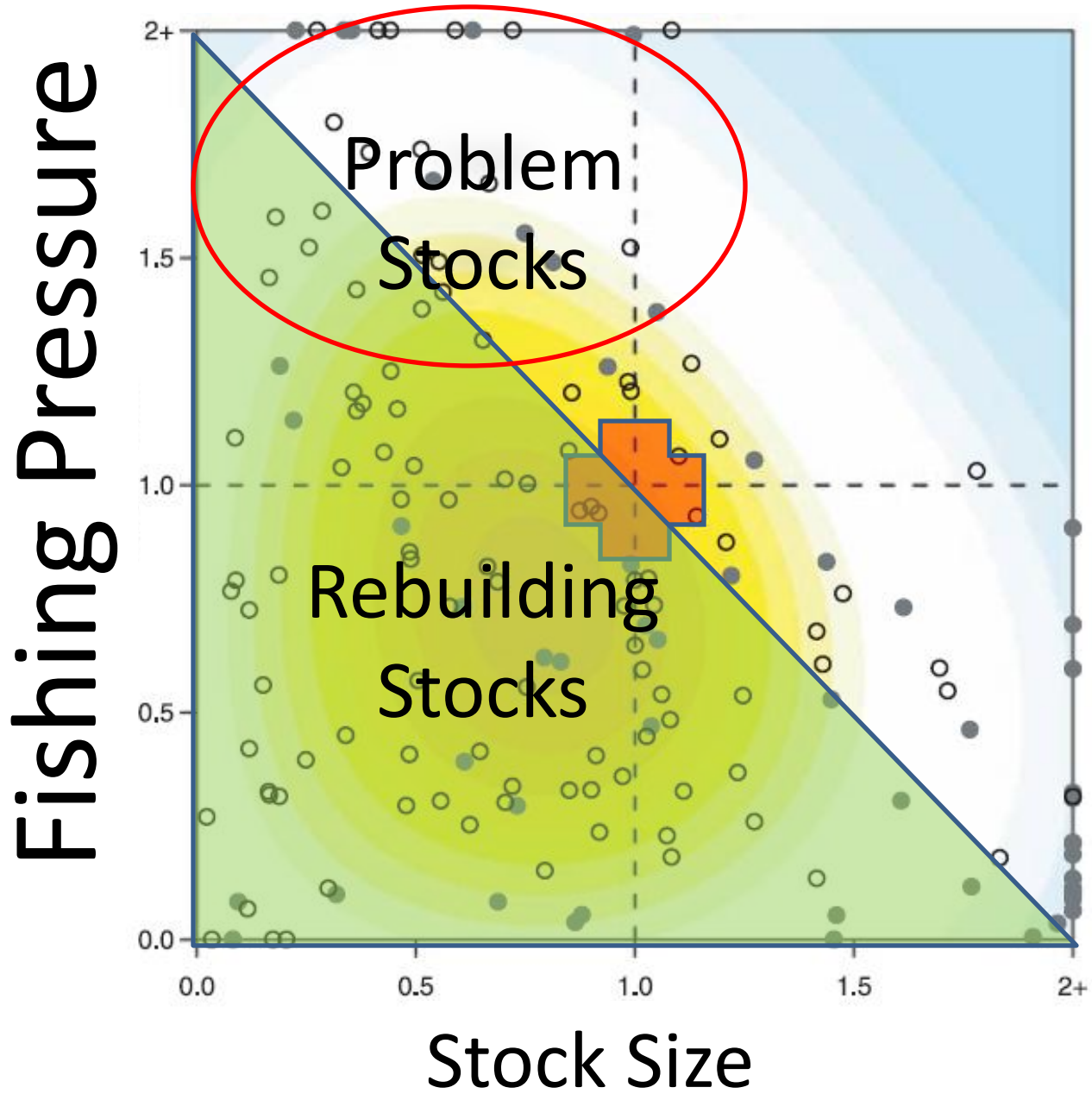
Rebuilding Global Fisheries

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] Cóilín Minto,[1] Stephen R. Palumbi,[12] Ana M. Parma,[13] Daniel Ricard,[1] Andrew A. Rosenberg,[14] Reg Watson,[15] Dirk Zeller[15]


Fishing Pressure
Maximum
Sustainable Yield
Stock Size

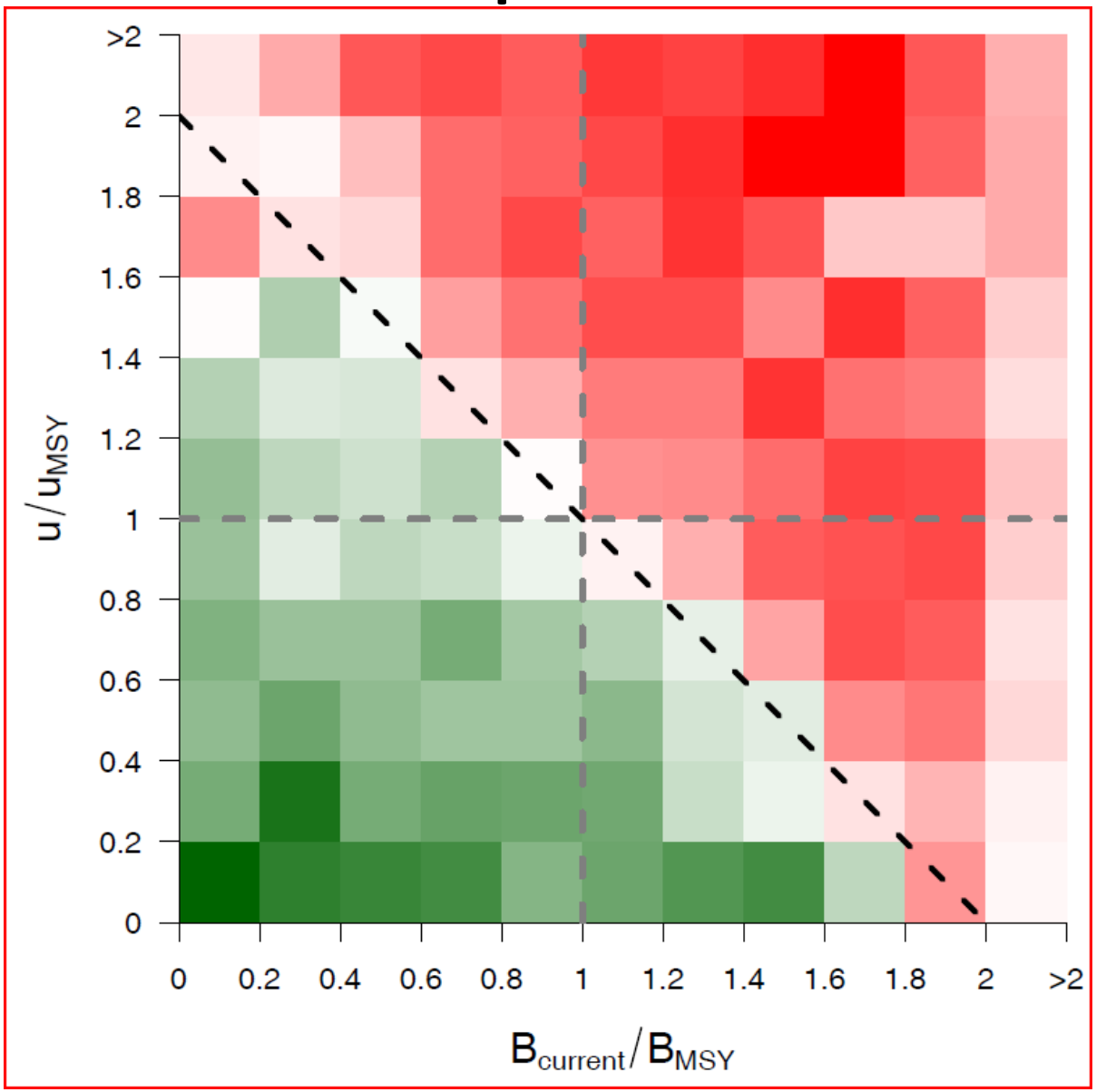

Fishing Pressure
Overfished and overfishing
Overfishing
Over fished
Fully Exploited
Under exploited
Stock Size

Assessed stocks in industrial and developed countries



From Worm et al. 2009

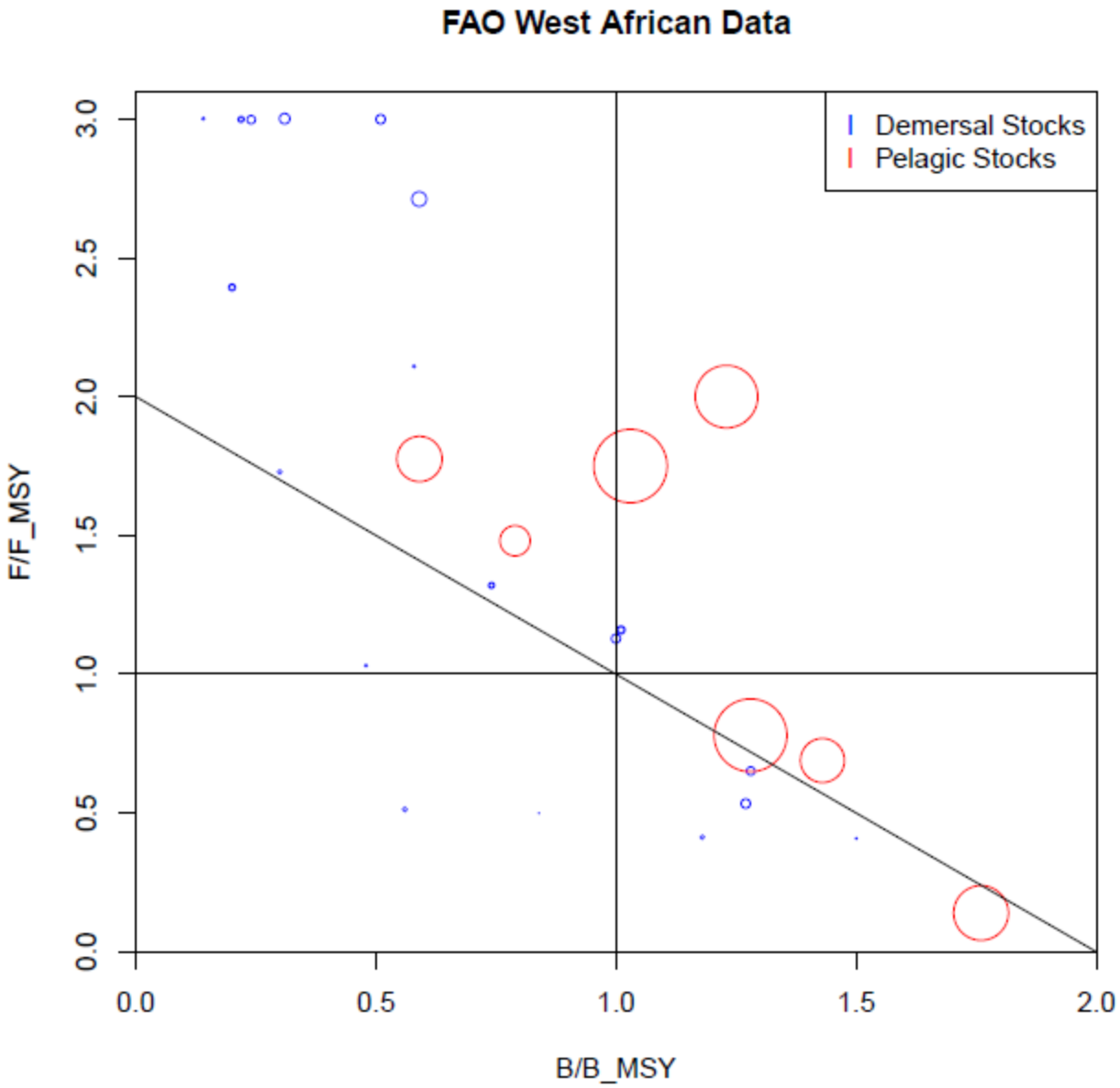
Do overexploited stocks rebuild?



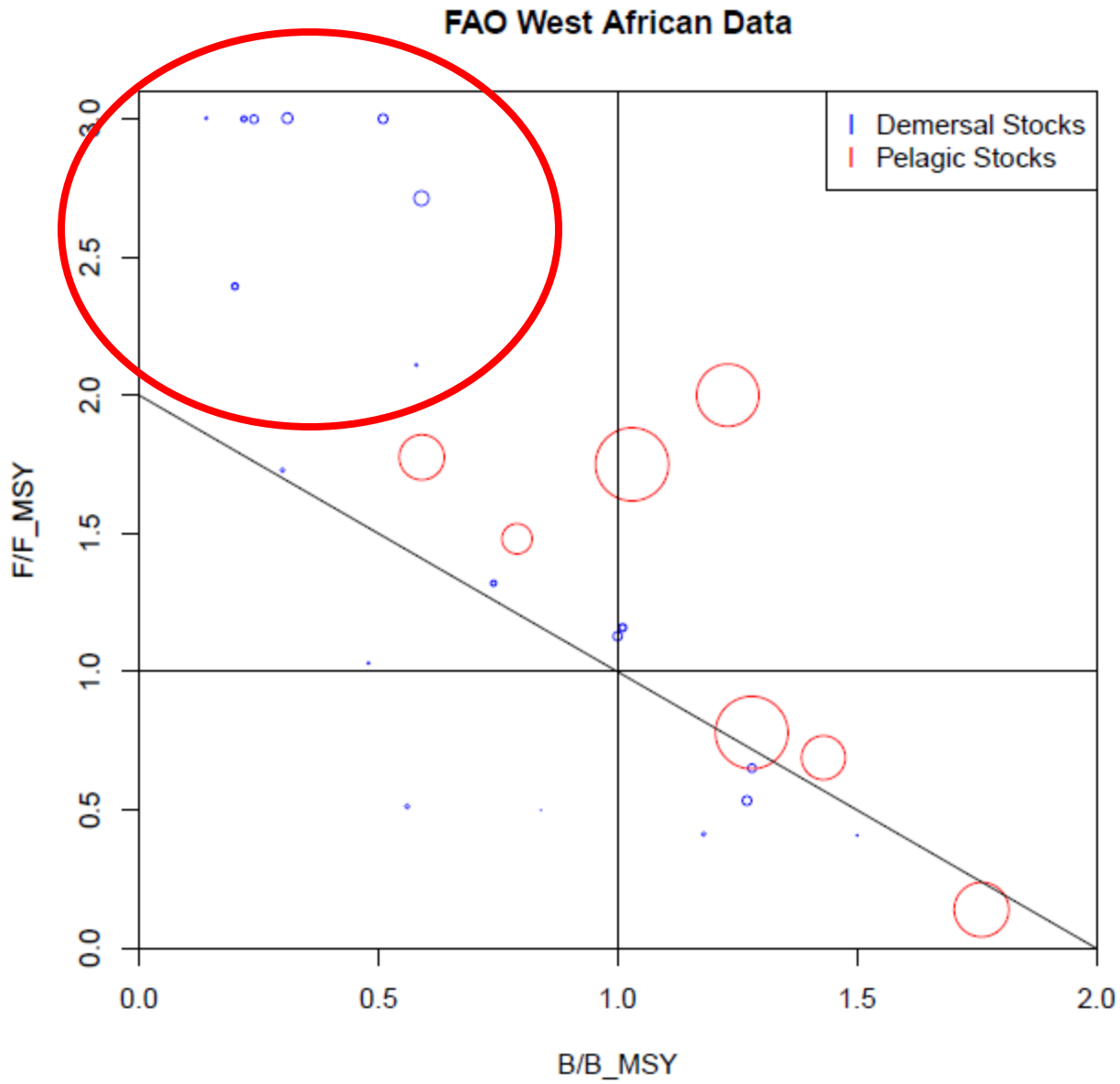
Status of stocks

- The situation is very different in different places: from low fishing pressure and rebuilding to general non-sustainable exploitation rates

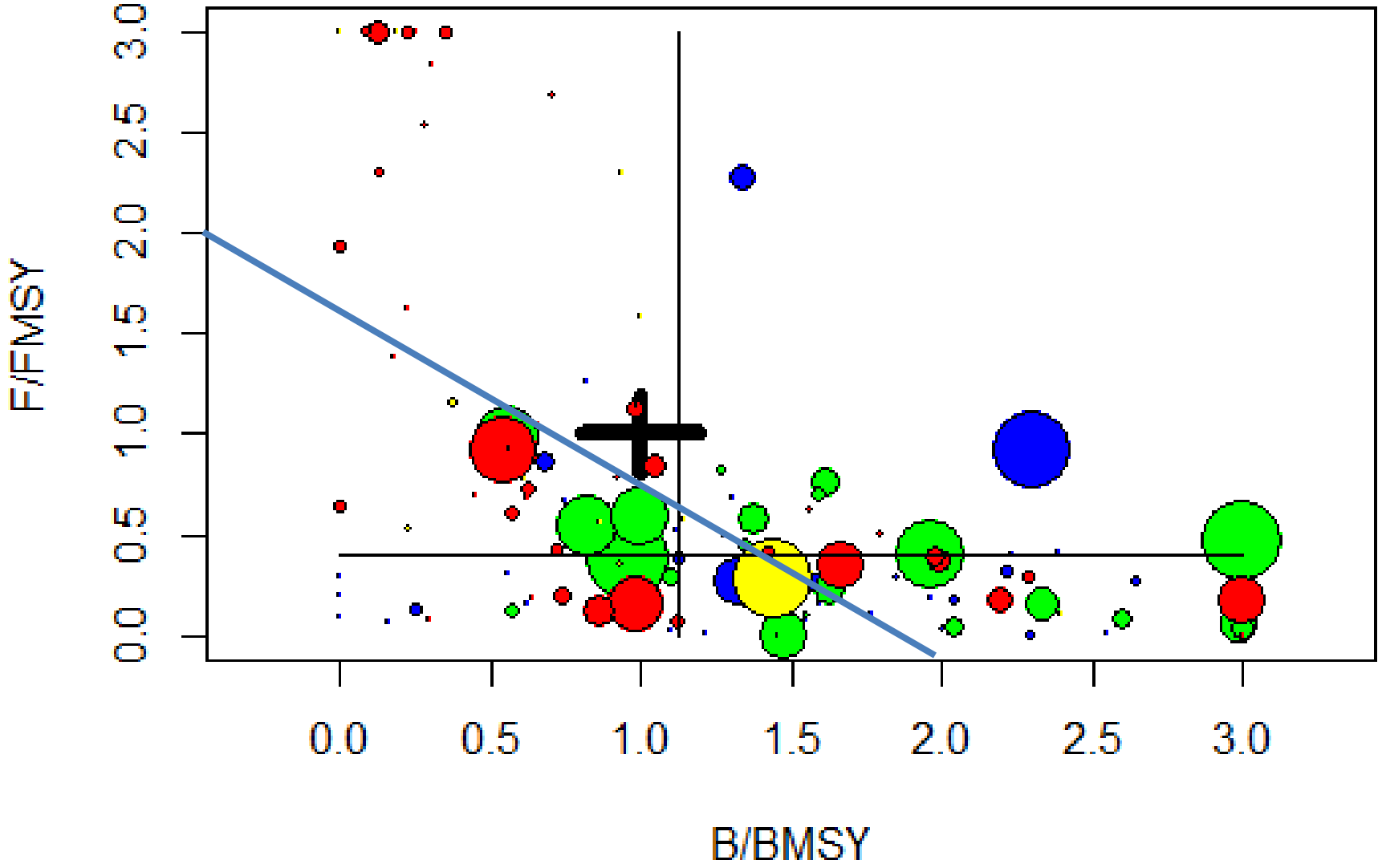
The worst place for data we have



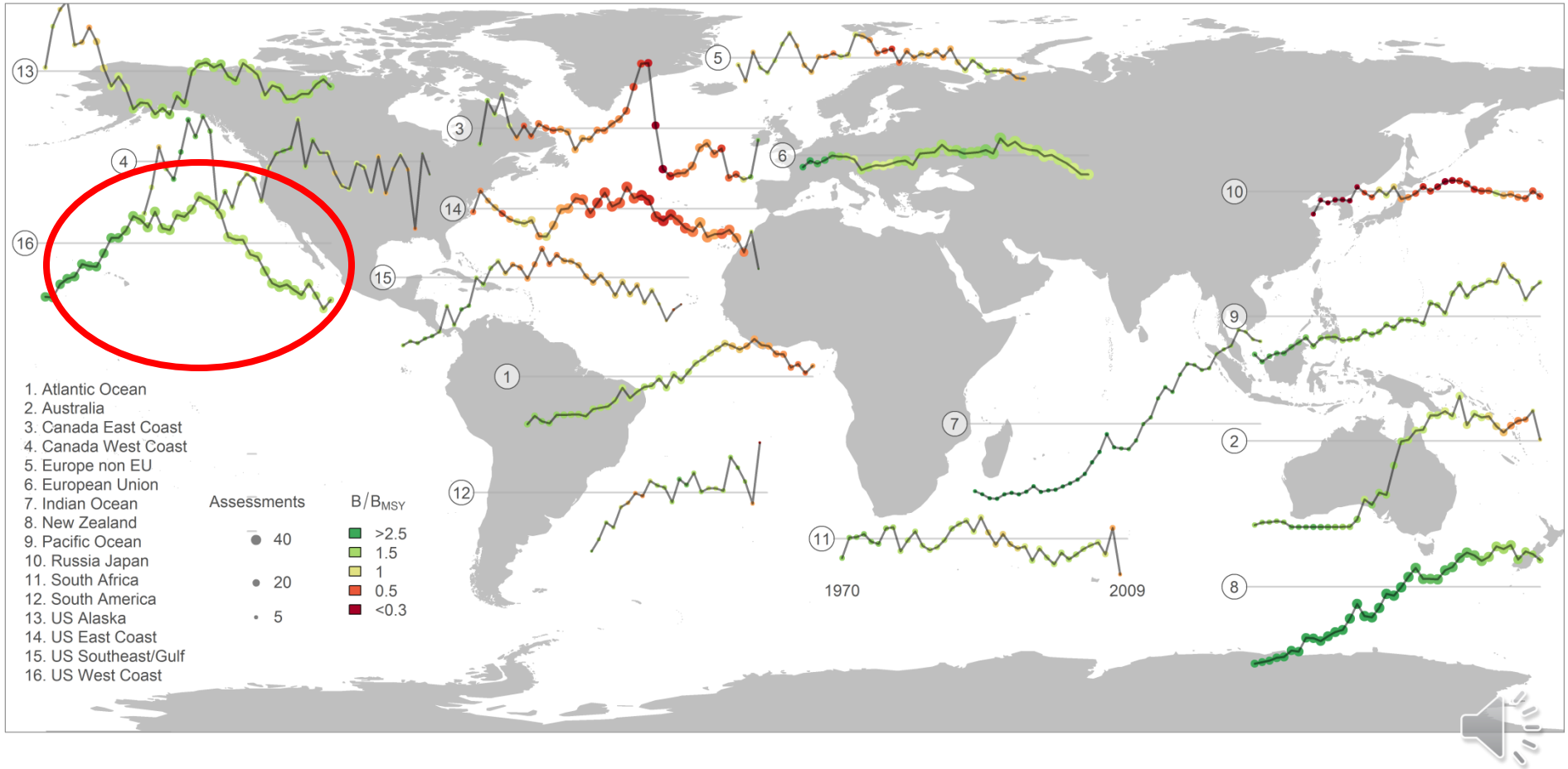
The worst place we have documented



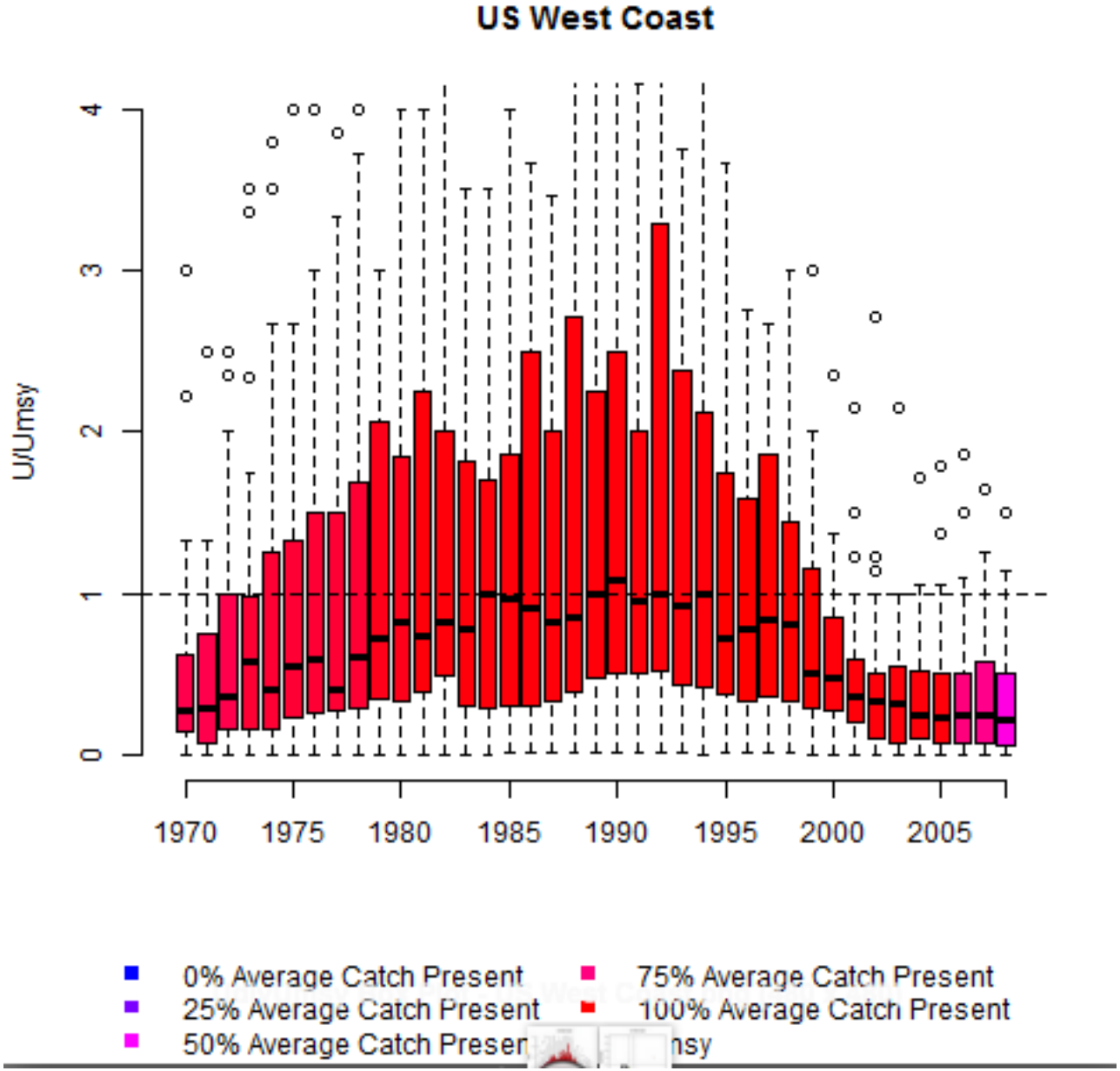
U.S. Fisheries



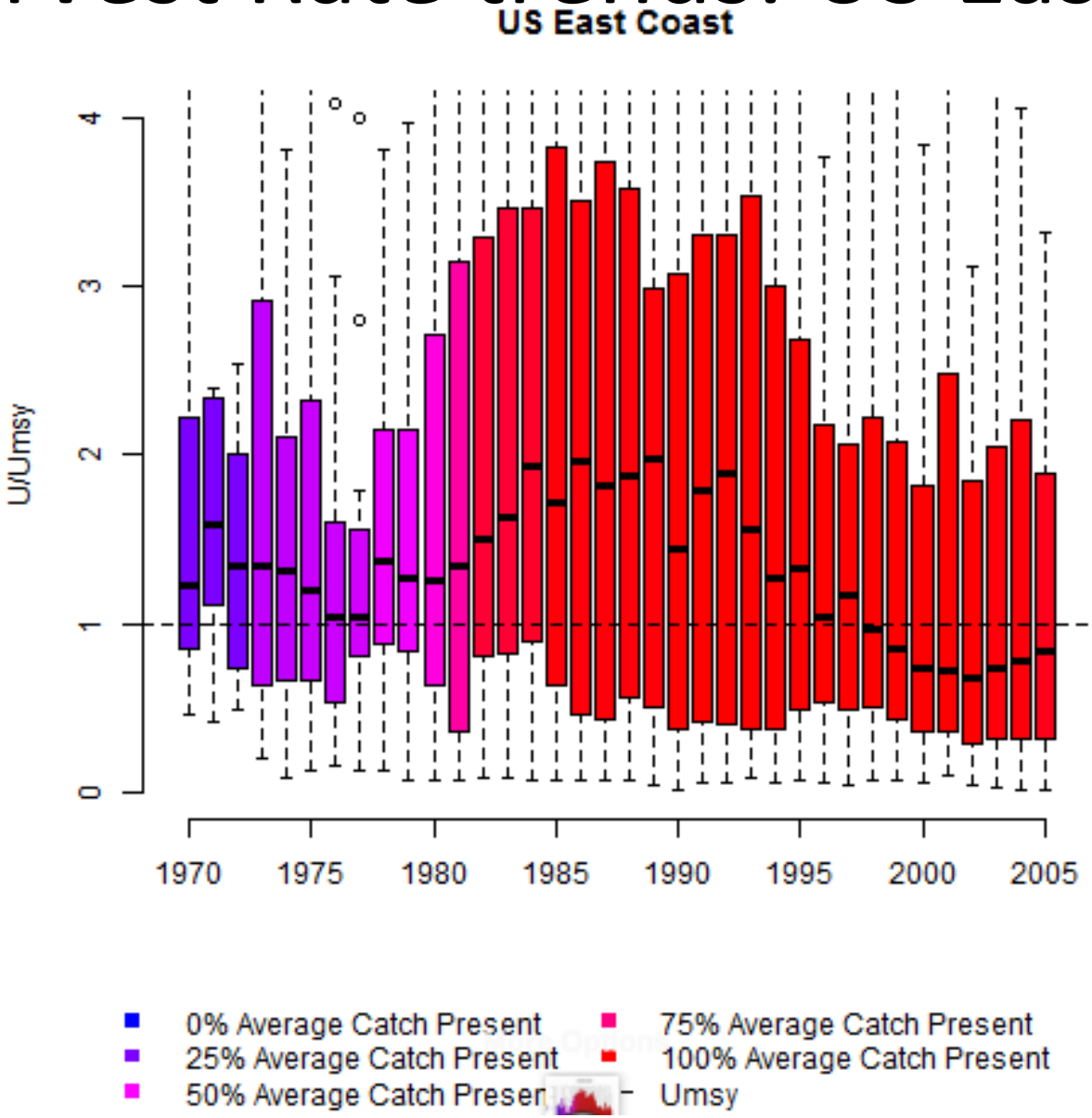
Harvest Rate trends



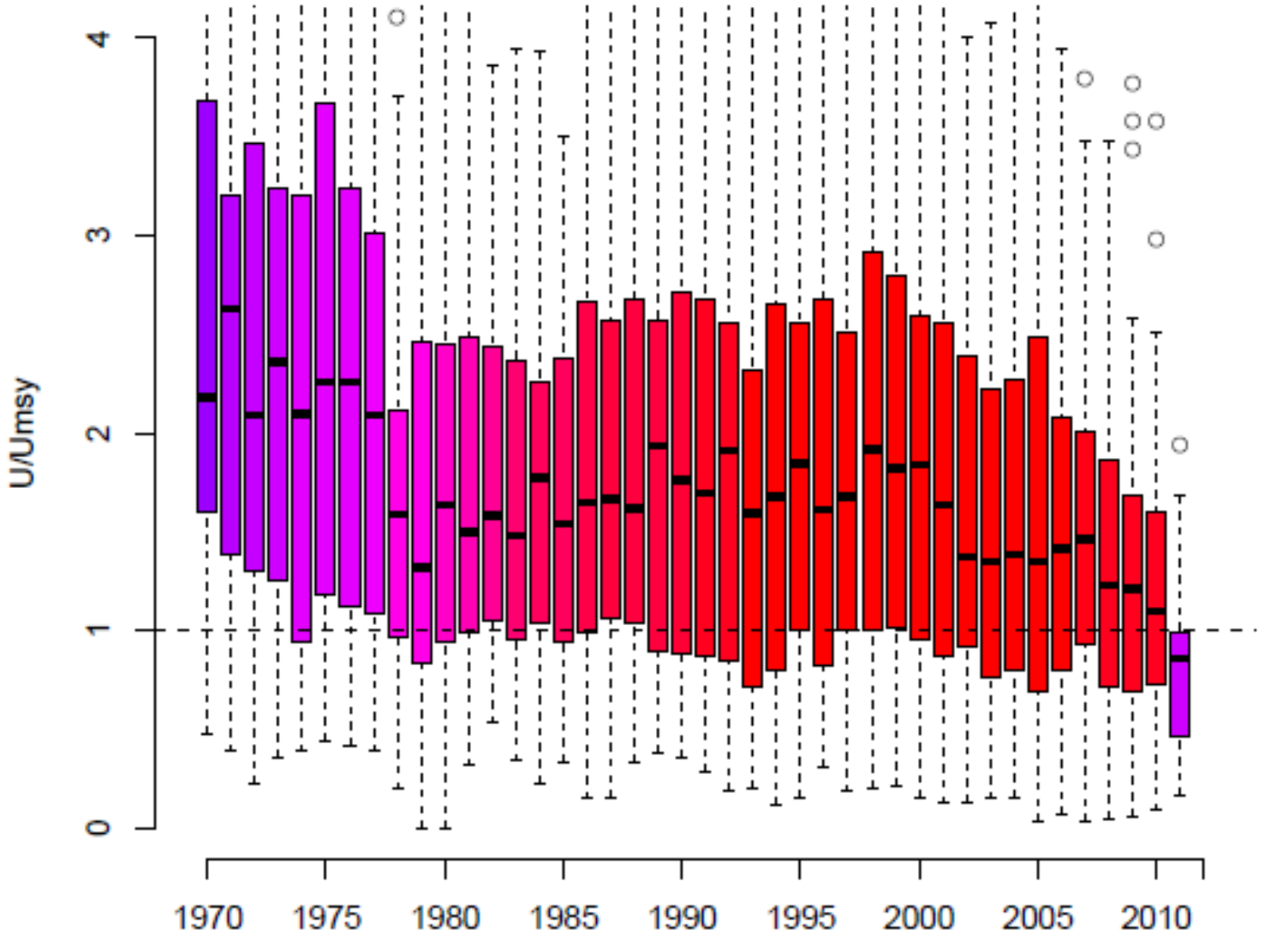
Harvest rate trends US West Coast



Harvest Rate trends: US East Coast



Harvest Rate trends: EU

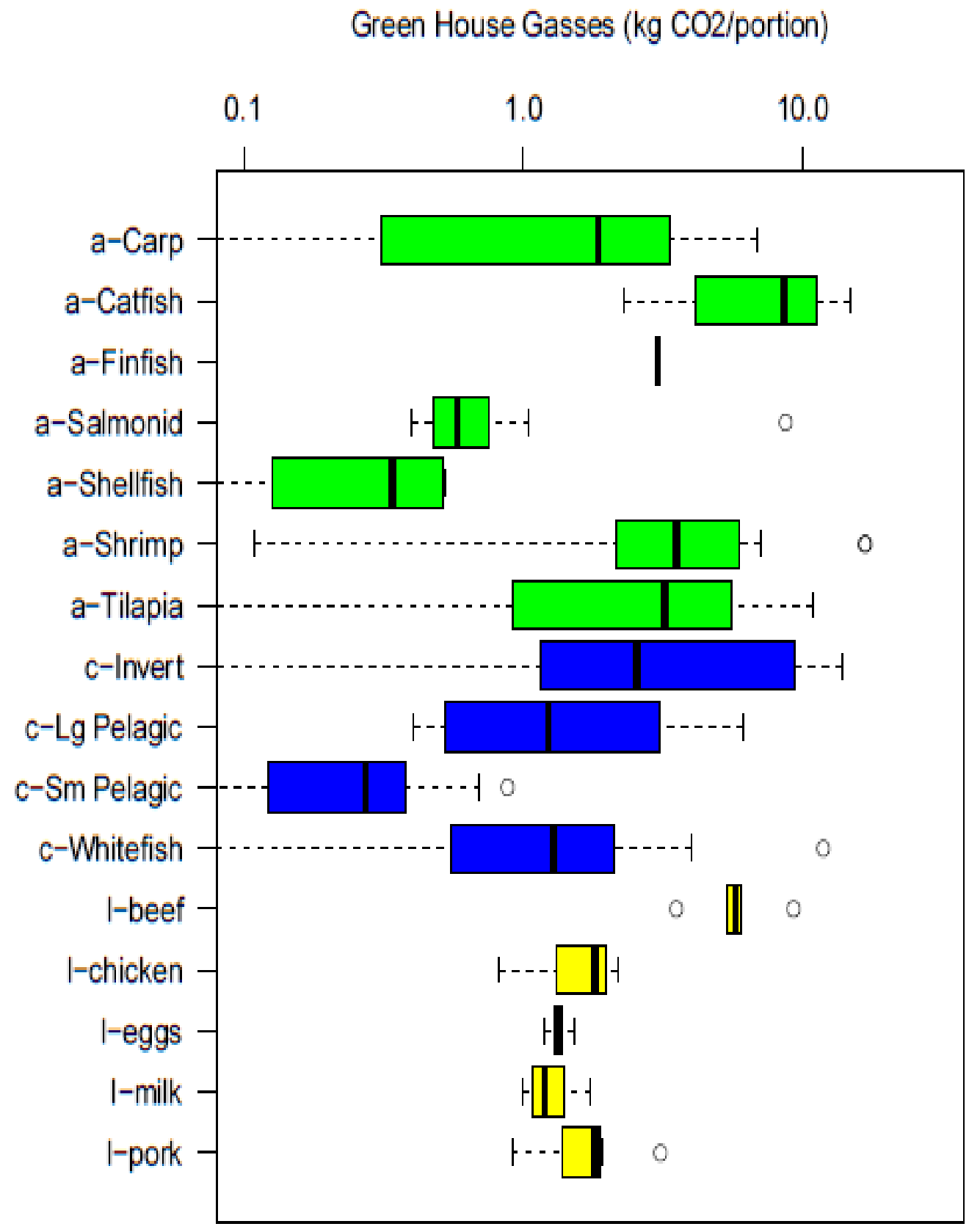


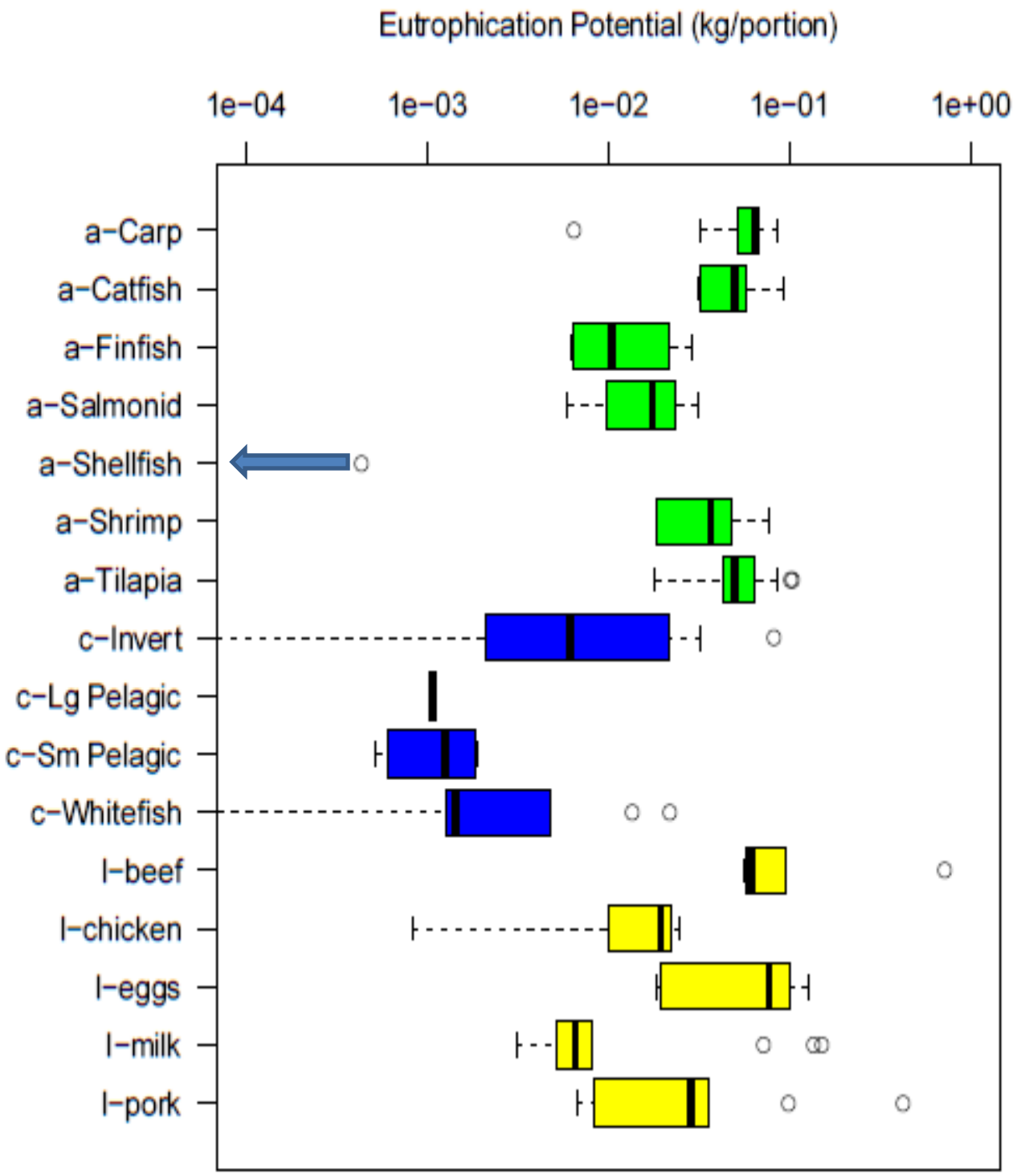
Is fisheries management failing?

- Not where it is applied
  - A combination of policies to support sustainability, science to support the policies, and the ability to enforce policies and regulations has been shown to work wherever it is applied
- What gets measured gets managed
- Fisheries appear to be in decline where fisheries are not being managed

What about the environmental impacts of fishing?

- All food production has an environmental impact
- We need to judge fisheries in relation to other methods of producing comparable food: that is animal protein


Green House Gasses (kg CO2/portion)
0.1
1.0
10.0
a-Carp
a-Catfish
a-Finfish
a-Salmonid
a-Shellfish
a-Shrimp
a-Tilapia
c-Invert
c-Lg Pelagic
c-Sm Pelagic
c-Whitefish
l-beef
l-chicken
l-eggs
l-milk
l-pork


Eutrophication Potential (kg/portion)
1e−04
1e−03
1e−02
1e−01
1e+00
a−Carp
a−Catfish
a−Finfish
a−Salmonid
a−Shellfish
a−Shrimp
a−Tilapia
c−Invert
c−Lg Pelagic
c−Sm Pelagic
c−Whitefish
l−beef
l−chicken
l−eggs
l−milk
l−pork

Group	Average Rank	Energy	GHG	Acid	Eutrop	Area used	Water	Pesticides	Antibiotics	Soil
a-Shellfish	1.7	6	2	1	1	1	1	1	1	1
c-Sm Pelagic	2.9	3	1	2	3	13	1	1	1	1
c-Lg Pelagic	4.2	8	5	5	2	14	1	1	1	1
c-Whitefish	4.8	11	6	4	4	14	1	1	1	1
a-Salmonid	6.3	9	3	3	8	2	8	8	8	8
c-Invert	6.3	12	11	11	5	14	1	1	1	1
a-Finfish	7.6	2	12	7	7	8	8	8	8	8
l-milk	7.8	1	4	8	6	3	12	12	12	12
a-Carp	9.7	14	10	6	15	10	8	8	8	8
a-Tilapia	9.8	15	13	9	13	6	8	8	8	8
a-Shrimp	10.1	13	14	12	11	9	8	8	8	8
l-eggs	10.3	4	7	10	16	4	13	13	13	13
l-pork	11.0	5	8	15	10	5	14	14	14	14
a-Catfish	11.2	16	16	13	12	12	8	8	8	8
l-chicken	11.3	7	9	14	9	7	14	14	14	14
l-beef	13.6	10	15	16	14	11	14	14	14	14

The biodiversity impacts of fishing

- Subject of enormous amount of concern and publicity
- Including certification and major pressure by eNGOs

Recent WWF Canada video
We don’t farm like this

My son modifying biodiversity


Organic vegetable field my wife farmed

My wife and part of her organic vegetable business

Fisheries may have less biodiversity cost than organic agriculture

Costa Rica

Costa Rica

Corn Field








Conclusions

- Sustainability is not about fish abundance
- It is a function of the management system and the key is keeping the exploitation rates within a range that the populations can support
- This requires estimating abundance and stock productivity
- There is no silver bullet to achieving sustainability: you simply must have three elements
  - Science to measure status of the stock
  - Science estimate sustainable exploitation rates
  - A process that regulates exploitation rates based on science advice
- BUT there are a wide range of sustainable fishing policies and science cannot tell you which one to choose, so a political process must determine what the harvest strategy should be

OVERFISHING

WHAT EVERYONE NEEDS TO KNOW

RAY HILBORN, WITH ULRIKE HILBORN

Thanks to

- NCEAS working group team – Especially Dan Ricard, Julia Baum, Coilin Minto, Olaf Jensen Trevor Branch and Boris Worm