

Vulnerability to CC in Chilean Aquaculture and Fisheries: results and findings

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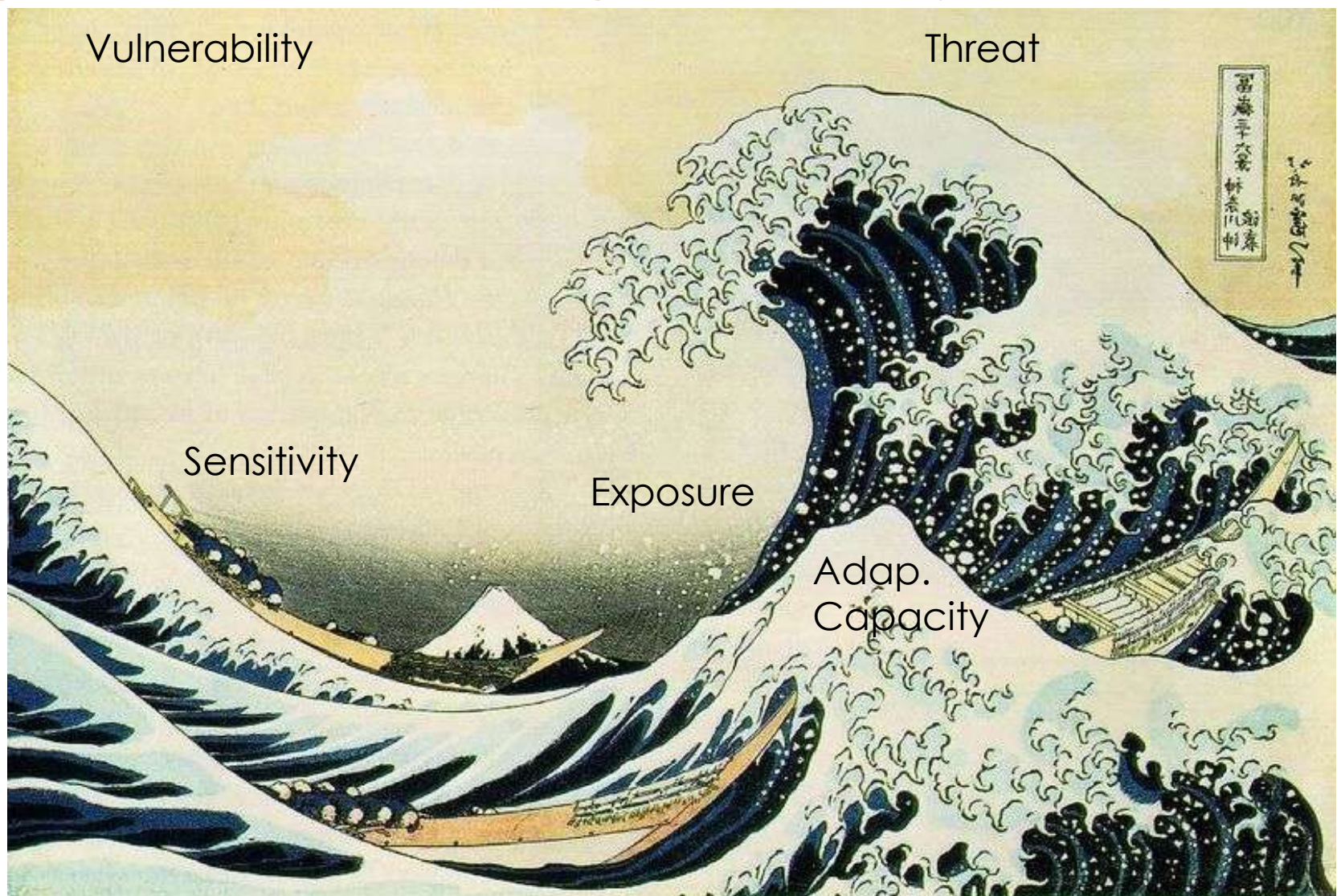


Context and content

- ❑ National strategy on Climate change
 - ❑ Adaptive capacity to CC effects/impacts
 - ❑ To analyze options to mitigate Chile's green house effect emissions
 - ❑ To create and promote adaptive capacities to CC

- ❑ Undersecretariat for Fisheries and Aquaculture (USFA) and FAO
 - ❑ Evaluating CC potential impacts and vulnerability of Fisheries and Aquaculture (Quiñones et al. 2011, González et al. 2011)
 - ❑ Proposal for a methodological approach and action plan to cope with impacts of CC on the Chilean fisheries and aquaculture (Cubillos et al., 2012).
 - ❑ The Ministry of the Environment
 - ❑ USFA-FAO, PIF (draft PPG)

Approach to understanding vulnerability



Source: L. Cubillos et al. (2011) based on Hokusai (1830)



Aquaculture vulnerability to CC

Method and Data: Allison et al. 2009

☐ Exposure (-)

☐ Sensitivity (-)

☐ Adaptive Capacity (+)

Potential
Impact
(-)

Vulnerability
 $V = E + S - AC$

☐ Scenarios (IPCC 2000): A2 current trends, B2 optimistic trends

☐ Data:

- ☐ T°, Salinity, wind, Sea water level (U. of Chile)
- ☐ Aquaculture relative importance to national sector economy and exports
- ☐ Worldwide relative importance of national economy
- ☐ Life expectancy, Education, Governance

Results

$$V = \frac{1}{3}E + \frac{1}{3}S + \frac{1}{3}(1 - AC)$$

Escenarios	Factores	Peso	Tipo de Acuicultura				
			Gracilaria	Salmónidos	Chorito	Ostión Norte	Nacional
A2	Exposición	1/3	0.325	0.295	0.299	0.453	0.298
	Sensibilidad	1/3	0.002	0.140	0.006	0.002	0.150
	Capacidad Adaptación	1/3	0.672				
	Vulnerabilidad		0.218	0.254	0.211	0.261	0.258
B2	Exposición	1/3	0.221	0.202	0.202	0.345	0.204
	Sensibilidad	1/3	0.002	0.140	0.006	0.002	0.150
	Capacidad Adaptación	1/3	0.672				
	Vulnerabilidad		0.184	0.223	0.179	0.225	0.227



Fisheries Vulnerability to CC

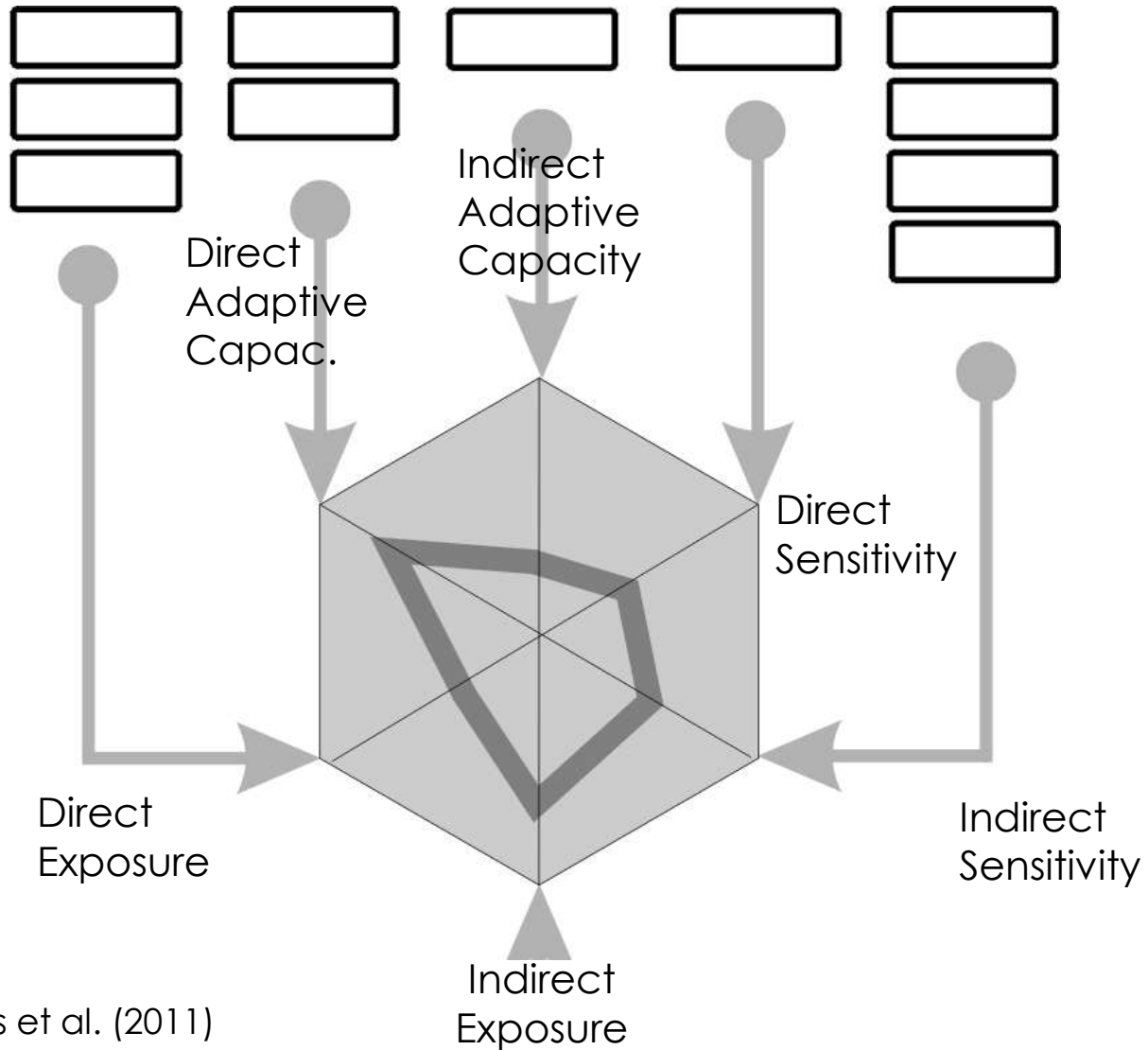
Adaptive capacity Jack Mackerel Fisheries

- Based on the 1997-2002 Chilean Jack Mackerel fisheries crisis:
 - Assessment of socio-economic characteristics of workers in the processing sector (fishmeal and fishfood), large scale fleet crews and crews from the artisanal anchovy and common sardine fishing fleet
 - Assessment of adaptive social responses to the crisis from: government and parliament, industry owners, processing plant workers, large scale fishing fleet crew and artisanal fishing fleet crew.
- There is a relevant adaptive capacity to changes in biomass levels in the pelagic central-south fishery of Chile.
- Adaptive capacity to CC is directly related to fisheries sustainable management efforts, normally in those with clear signs of overexploitation.

Proposal on Methods estimate fisheries vulnerability to CC

- ❑ Based on a Socio-Ecological-Economic System (SEES)
- ❑ Considers the component elements of Vulnerability through:
direct and indirect effects
- ❑ Considers vulnerability has effects on five dimensions of the SEES:
ecological, socio-economic, technological, institutional and ethical
- ❑ Considers a quali-quantitative and discrete scale of impacts:
Null (0), Low (1), Medium (2) and High (3)

Proposal continued..



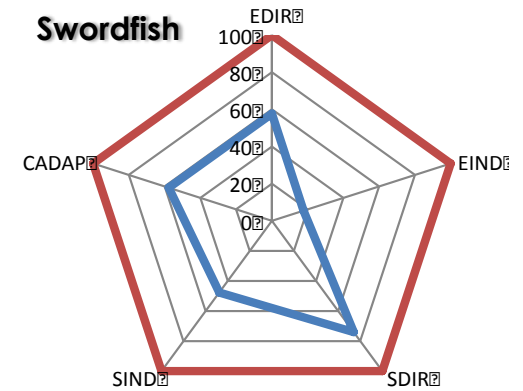
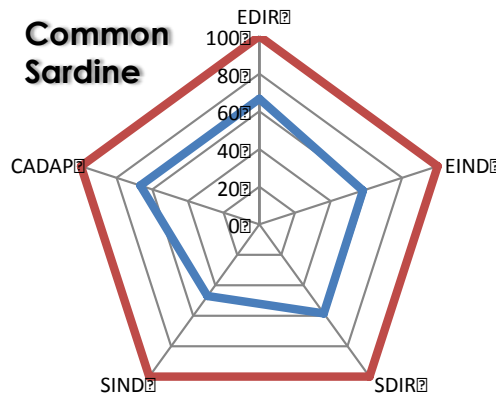
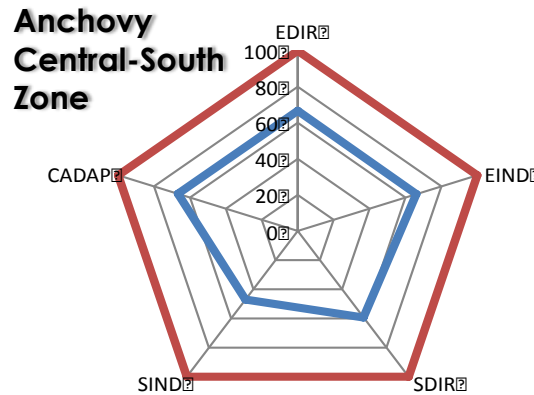
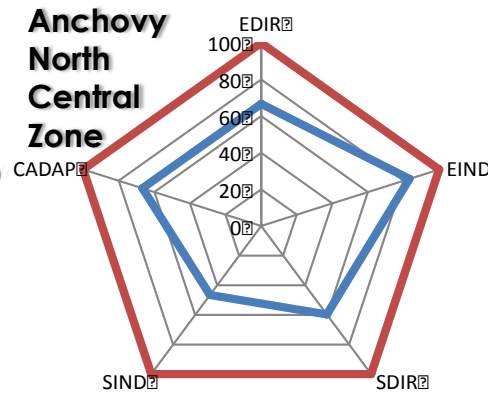
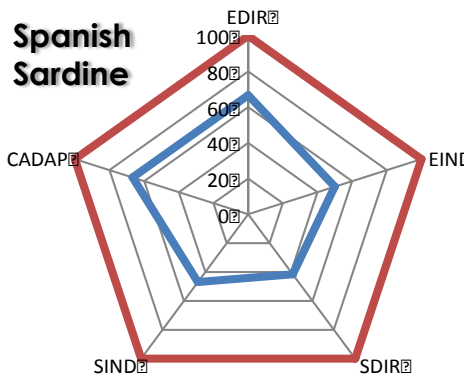
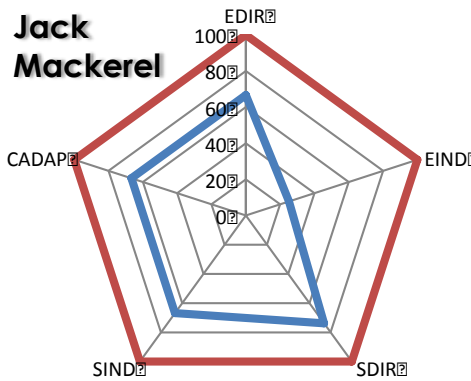
Source: L. Cubillos et al. (2011)

Proposal continued...

Components	Dimensions	Attributes	Jack Macherel	Spanish Sardine	Anchovy Northern Zone	Anchovy North-Central Zone	Anchovy South-Central Zone	Common Sardine	Swordfish	High	Low
Direct Exposure	Ecological	Wind	2	1	3	3	3	3	3	3	0
	Ecological	SWL	0	1	1	1	1	1	0	3	0
	Ecological	T°	1	0	2	2	2	1	3	3	0
	Ecological	Acidification	0	1	1	1	1	1	0	3	0
	Ecological	UV light	0	0	1	1	1	1	0	3	0
Indirect Exposure	Ecological	ENSO	2	2	3	3	2	2	3	3	0
	Ecological	Upwelling	0	1	3	3	2	2	1	3	0
	Ecological	Prim. Product.	1	2	3	4	5	6	1	3	0
	Ecological	O ₂ min	0	1	3	2	1	1	0	3	0
	Ecological	Zooplankton	2	2	2	2	2	1	0	3	0
Direct Sensitivity	Ecological	Status	3	3	2	1	1	0	2	3	0
	Ecological	Potential Catch	2	2	2	2	1	1	3	3	0
	Socio-economic	Employment	3	2	2	2	2	2	1	3	0
	Socio-economic	Access	2	1	2	2	2	2	3	3	0
	Socio-economic	Catch Value	2	1	1	1	1	1	1	3	0
	Socio-economic	Revenues	2	0	2	2	3	3	3	3	0
Indirect Sensitivity	Socio-economic	CamDistribution	0	2	1	1	2	2	3	3	0
	Socio-economic	Market	1	1	1	1	1	1	2	3	0
	Socio-economic	Processing Infrast.	2	1	2	2	2	2	0	3	0
	Ecological	Pesca Inc	3	1	2	1	1	1	3	3	0
	Socio-economic	Capture Costs	2	2	2	2	2	2	1	3	0
	Socio-economic	Processing Costs	2	2	1	1	1	1	1	3	0
Adaptive Capacity	Socio-economic	Management Quality	2	2	2	2	2	2	1	3	0
	Socio-economic	Crew education	1	1	1	1	1	1	1	3	0
	Socio-economic	Quality of Life	2	2	2	2	2	2	2	3	0
	Technological	Infrastructure	3	3	3	3	3	3	2	3	0
	Technological	Connectivity	3	3	3	3	3	3	2	3	0
	Ethical	Illegal harvest	1	0	2	1	1	1	1	3	0
	Institutional	Enforcement	2	2	2	2	2	2	2	3	0
	Institutional	Monitoring	2	2	2	2	2	2	1	3	0
	Institutional	Certification	2	2	2	2	2	2	1	3	0
	Institutional	Industrial Fleet	3	2	2	2	2	2	1	3	0
	Technological	Selectivity	2	1	1	1	1	1	2	3	0

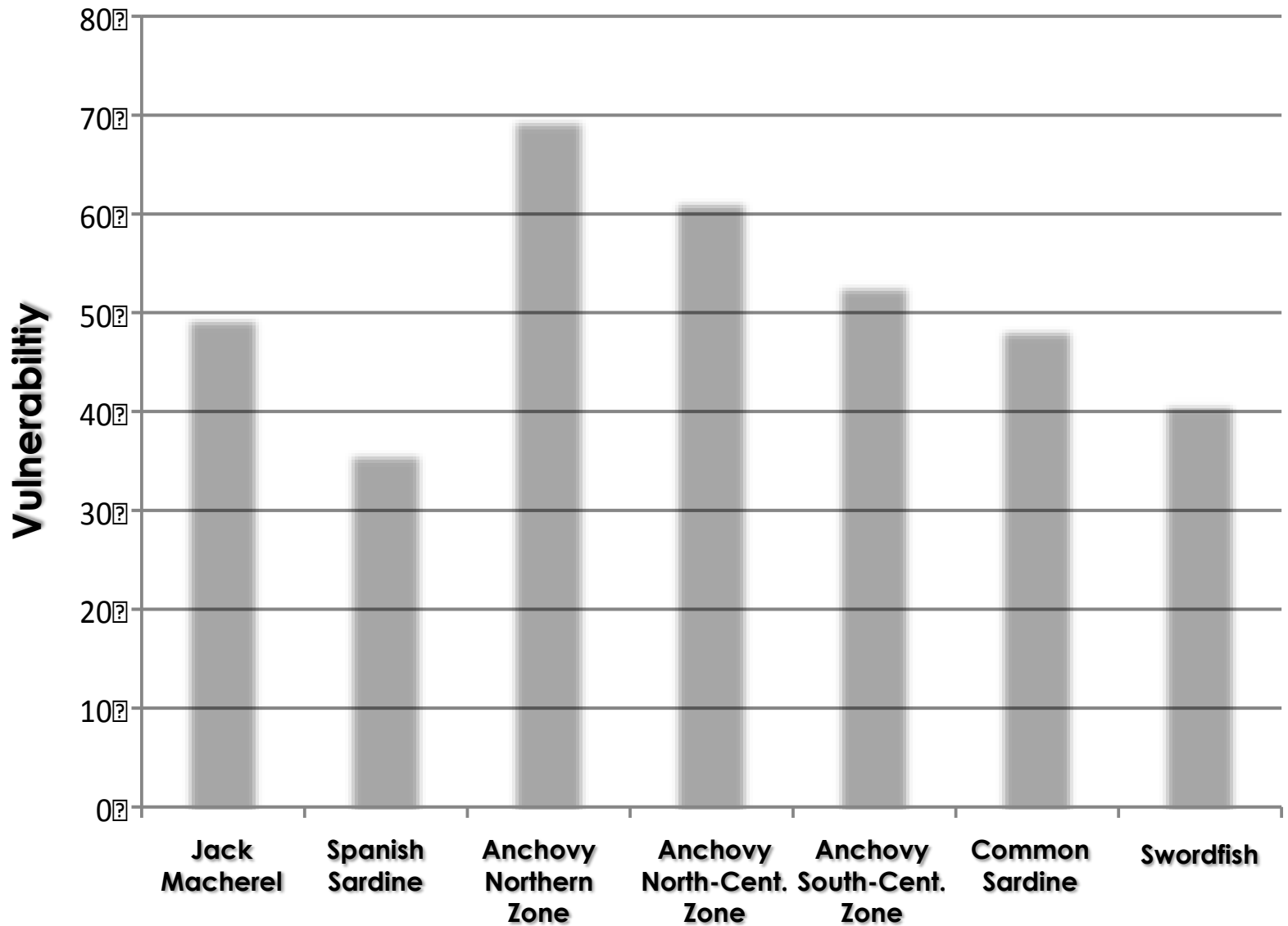
Source: L. Cubillos et al. (2011)

Proposal continued....



Direct Exposure (EDIR), Indirect Exposure (EIND), Direct Sensitivity (SDIR), Indirect Sensitivity (SIND), Adaptive Capacity (CADAP)

Proposal continued.....



Source: L. Cubillos et al. (2011)



Strengthening Adaptive Capacity F&A

Steps towards AC

2011-2012

PIF
USFA & FAO
i.c.w. ME

2013

PPG

2014-2016

GEF
Improve Chile's
Adaptive Capacity to
CC effects on Fisheries
and Aquaculture

Steps towards AC (future)

Project Components

Expected Outcomes

Expected Outputs

Strengthening public and private capacity building for climate change adaptation at national and local level

Capacity building of public and private institutions to implement/enhance CC adaptation in the fisheries and aquaculture sector strengthened at national and local level

A Task Force within the USFAT and the Climate Change Office of the ME to coordinate and support all activities related to adaptation to climate change effects in the F&A Sector.

At least 200 key stakeholders/leaders from private and public institutions aware and knowledgeable on the effects of CC on F&A and how to integrate the sector in national adaptation actions and, a total of 100 key stakeholders trained on adaptation approaches/strategies to climate change in fisheries and aquaculture.

A Dissemination package implemented throughout the three year project, including: a 12 issues newsletter, 6 articles in national-regional newspapers and magazines and monthly interviews in cultural radio and open TV programs.

A total of 450 persons from local fisheries and aquaculture associations, community organizations, municipalities and other local government institutions and local NGOs, aware and knowledgeable on the effects of climate change on F&A and trained and prepared on adaptive measures to negative effects from climate change in this sector

Building local adaptive capacity to CC effects on fisheries and aquaculture through the implementation of Local Pilot projects considering those identified during the NAP-F&A preparation research.

Adaptive capacity system established at local level.

Local Adaptation Plans (LAP) established through pilot adaptation projects in seven fishing/aquaculture communities along the coastal zone of Chile.

Local Task Forces established in seven F&A communities along the coastal zone of Chile.

A LAP monitoring and performance evaluation system in place and running in seven fishing/aquaculture communities along the coastal zone of Chile.

A Medium to Long term LAP Portfolio synthesizing and articulating all knowledge, experiences and conclusions drawn from the seven pilot projects will be prepared and shared with the Ministry of the Environment as a contribution to the NAP-FAS

Local coastal communities aware, knowledgeable and prepared to cope with climate change effects on fisheries and aquaculture.

A total of 350 local community people (youth and adults) attended a total of 21 seminars/workshops on climate change effects and practical adaptive measures on F&A conducted on seven local communities along the coastal zone of Chile.

Seven Local Dissemination Packages implemented in seven fisheries/aquaculture communities along Chile, including: local radio broadcasting programs, youth oriented theater groups and local newspaper/newsletter (Quarterly).

Full GEF



Lessons learnt

- Problem perception / threats:
 - Scarce knowledge on the CC process among F&A stakeholders in Chile.
 - Stakeholder prioritize on short-term concrete events (i.e. Contingency)
 - Difficult to establish the urgency/importance of AC to CC
- Even though there is an CC Office in the ME, there are insufficient capacities to “install” the CC issue among the most vulnerable sectors.

Lessons learnt *continued...*

- In spite of recent efforts to incorporate and integrate the CC variable in F&A Management, it is essential to strengthen the public institutions capable to implement Adaptation Plans, specially at local level.
 - Ad hoc formal institution required: identifiable, permanent, visible, sufficient human and financial resources
 - To integrate CC variable in sectoral policies, regulations, research and monitoring.

Lessons learnt *continued...*

- Importance of time, spacial and social scales
- Recognize the relevancy and value of past stakeholder experience in adaptation processes:
 - National: Jack mackerel and common hake fisheries, ISA virus
 - local: migration/relocation of main resources, overexploitation Chilean Abalone (loco) and soft clam (macha).
- A good approach to induce more knowledge and comprehension on CC and its effects is to rescue traditional and historic community knowledge, analyze it, sistematize it and present it back at the community from a CC perspective.
- The relevance and value to effectively and efficiently transfer scientific/academic knowledge and information to the local communities.

Lessons learnt *continued...*

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 - Scarse knowledge on the CC process among F&A stakeholders in Chile.
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Gracias.....