



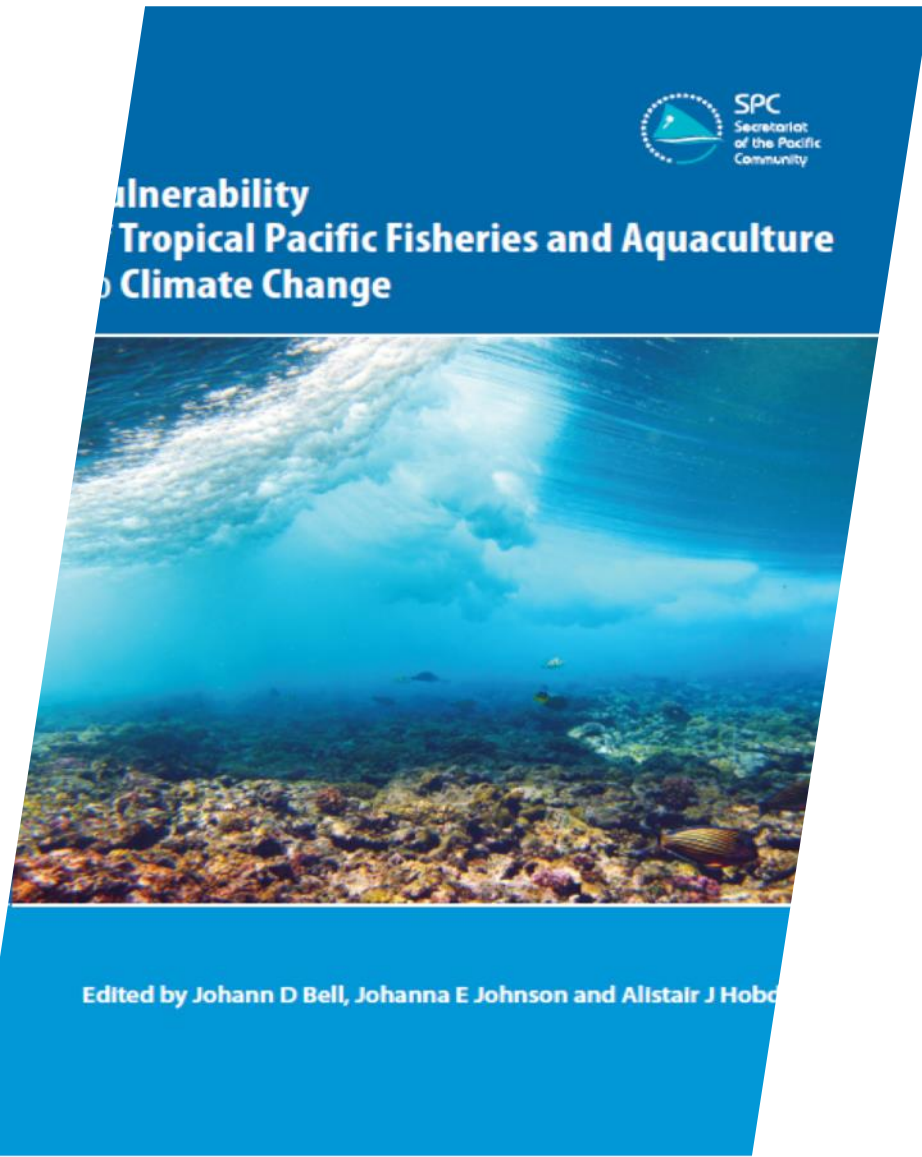
Pacific
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Pacific regional climate change assessment

12-year update

Johanna Johnson & Colette Wabnitz (Editors)

Climate change implications for Pacific fisheries and aquaculture



Update started in 2022 as a direct response to Member requests

Improved data and understanding of climate change impacts, and improved modelling (climate, habitats, and fisheries)

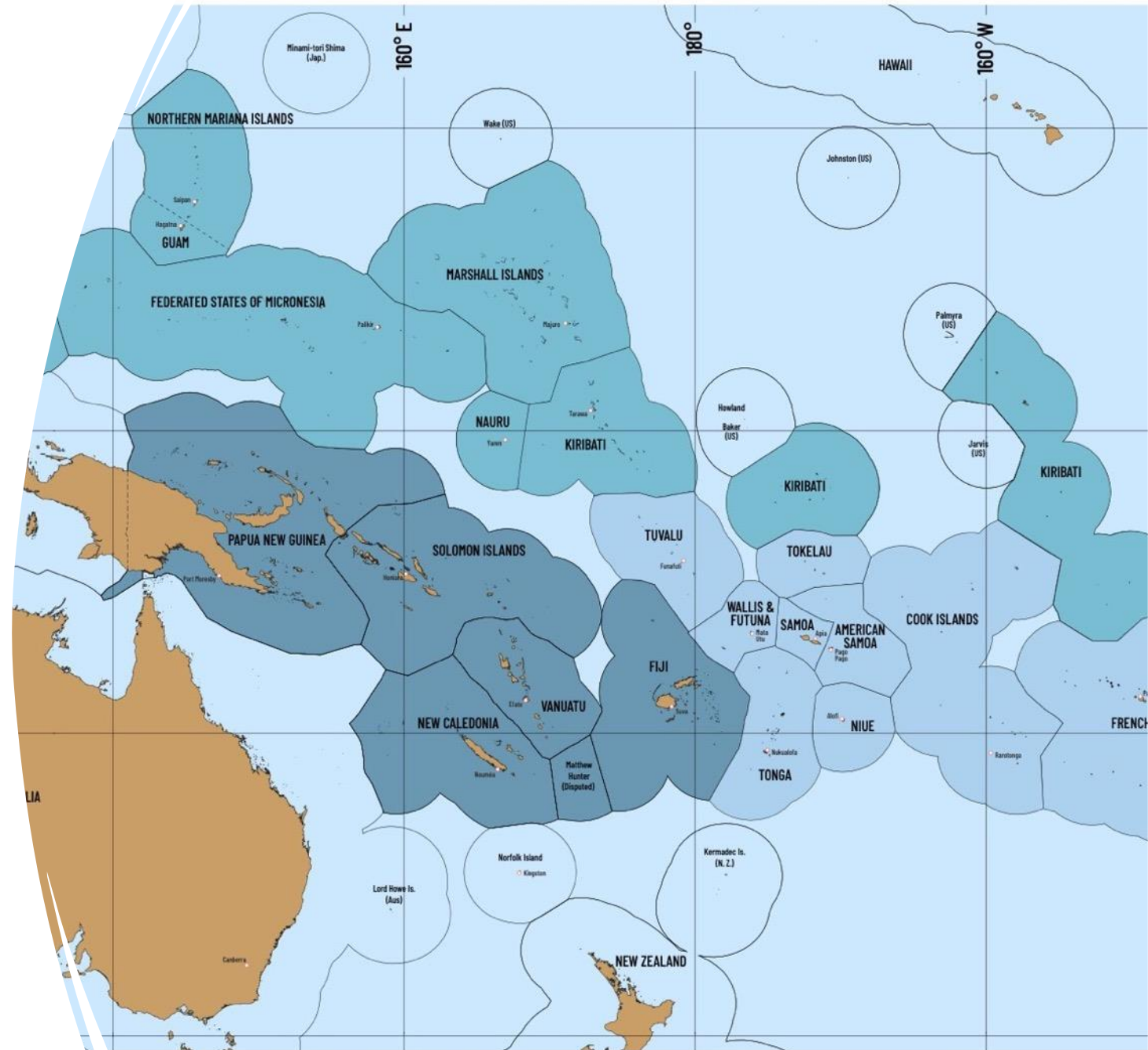
Progress made on adaptations that support food security, livelihoods and economies

Current 2-year project supported by DFAT and MFAT

Over 50 contributors from 30 organisations

Engagement with Heads of Fisheries

- HOF14 (2022) – Input to scope of update:
 - regional aspirations for fisheries and aquaculture
 - key issues climate change poses for managers
 - information needs
- HOF15 (2023) – Input during assessment:
 - progress of technical assessments
 - focus of PICT summaries
- HOF16 (2024) – Input to communicating results:
 - review of adaptations and recommendations
 - types of outputs and products
- Participate in launch (late 2024)



Single volume publication

SECTION 1: Introduction to region & climate projections

SECTION 2: PICT Summaries

SECTION 3: Technical coastal, oceanic, freshwater fisheries and aquaculture assessments

SECTION 4: Implications for livelihoods, economies & blue food systems



Single volume publication

SECTION 1: Introduction to region & climate projections

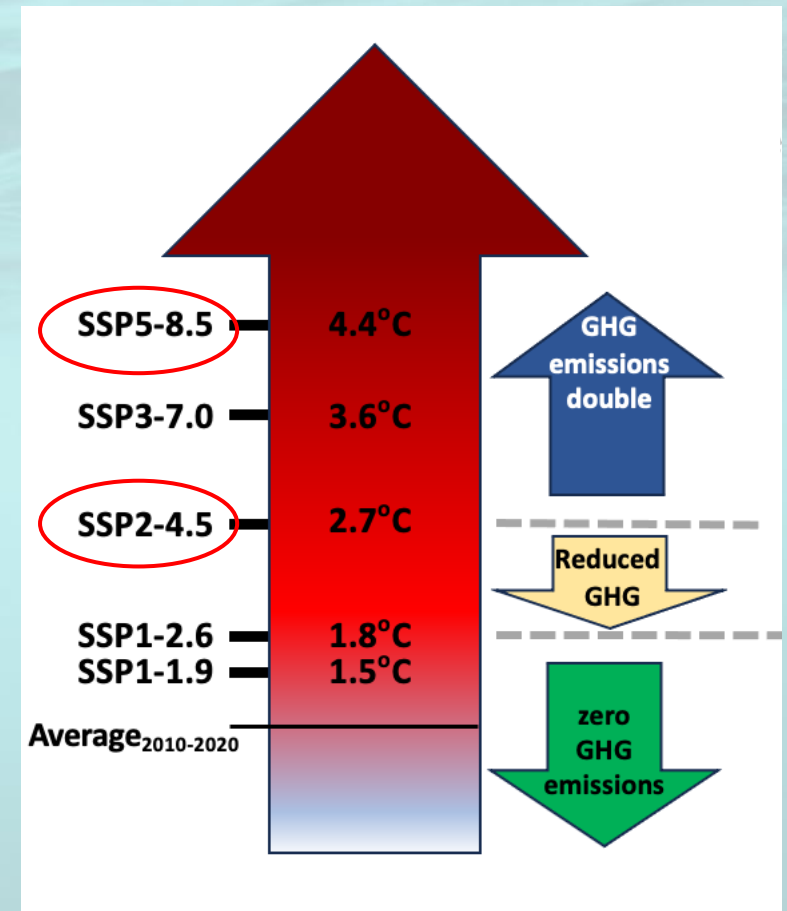
SECTION 2: PICT Summaries

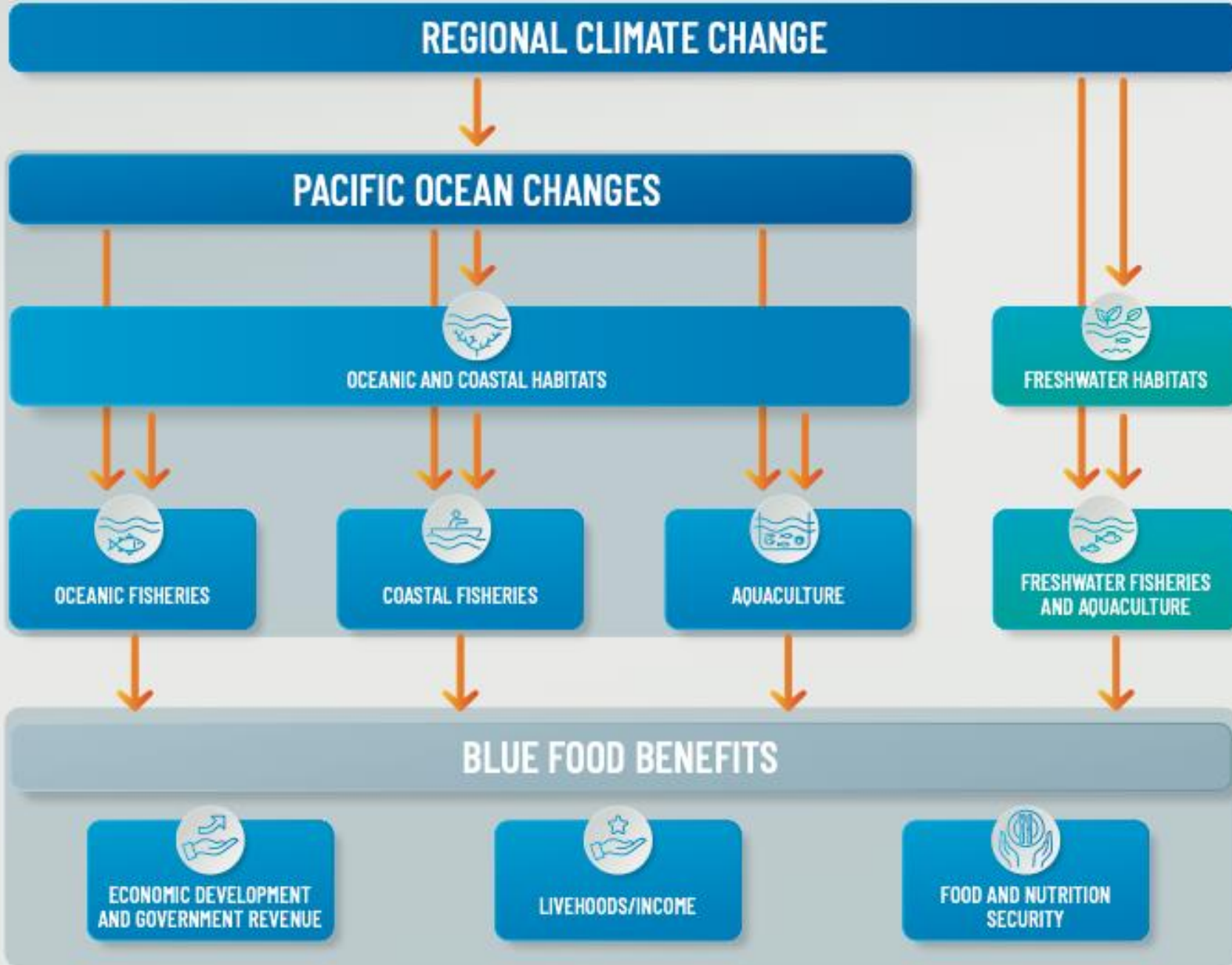
SECTION 3: Technical coastal, oceanic, freshwater fisheries and aquaculture assessments

SECTION 4: Implications for livelihoods, economies & blue food systems

Assessment for:

- 2050 medium greenhouse gas emissions scenario (SSP2-4.5)
- 2050 high greenhouse gas emissions scenario (SSP5-8.5)
- 2090 both scenarios (where possible)

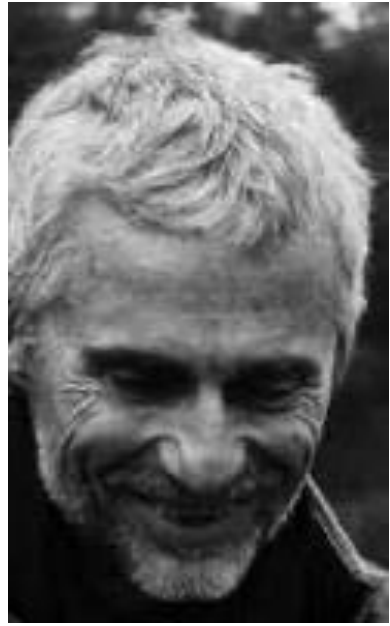




Cascade of Effects



Colette Wabnitz



Aymeric
Desurmont



Ruth Garcia
Gomez



Simon Nicol



Peter Gehrke



David Welch

Speakers & facilitators



Julie-Anne
Kerandel



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Chapter 3: Implications of climate change for coastal fisheries in the tropical Pacific Islands region

David J. Welch, Johanna E. Johnson, Katie Sambrook, Bianca Molinari, Dieter Tracey (C₂O Pacific, Australia)

Elizabeth Fulton (CSIRO, Australia)

Julia L. Blanchard, Denisse Fierro-Arcos (University of Tasmania, Australia)

Bradley R. Moore (NIWA, New Zealand)

Jessica Zamborain-Mason (Harvard University, USA)

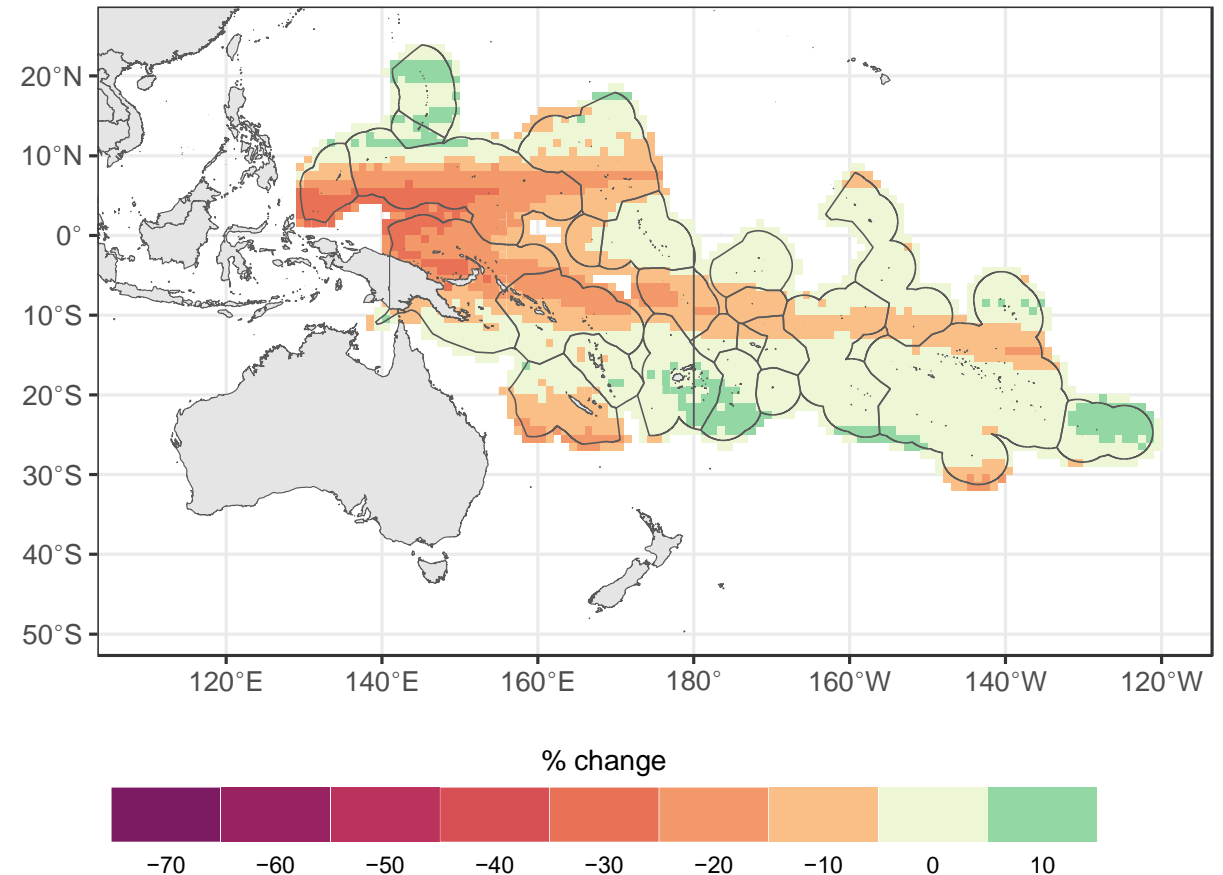
Andrew Halford (SPC, New Caledonia)

Changes since 2011

- Ecosystem model ensemble forced by climate models to project changes in marine organism biomass (FishMIP)
- Modeling to estimate sustainability-based reference points by PICT
- Recent (2021) catch estimates
- Updated habitat area data

Mean % change in fish biomass from 2010–2020

SSP5–8.5: 2045–2055



Summary results

By 2050 under SSP2-4.5:

- Overall habitat area declines of 0 – 62% (coral reef, seagrass, mangroves)



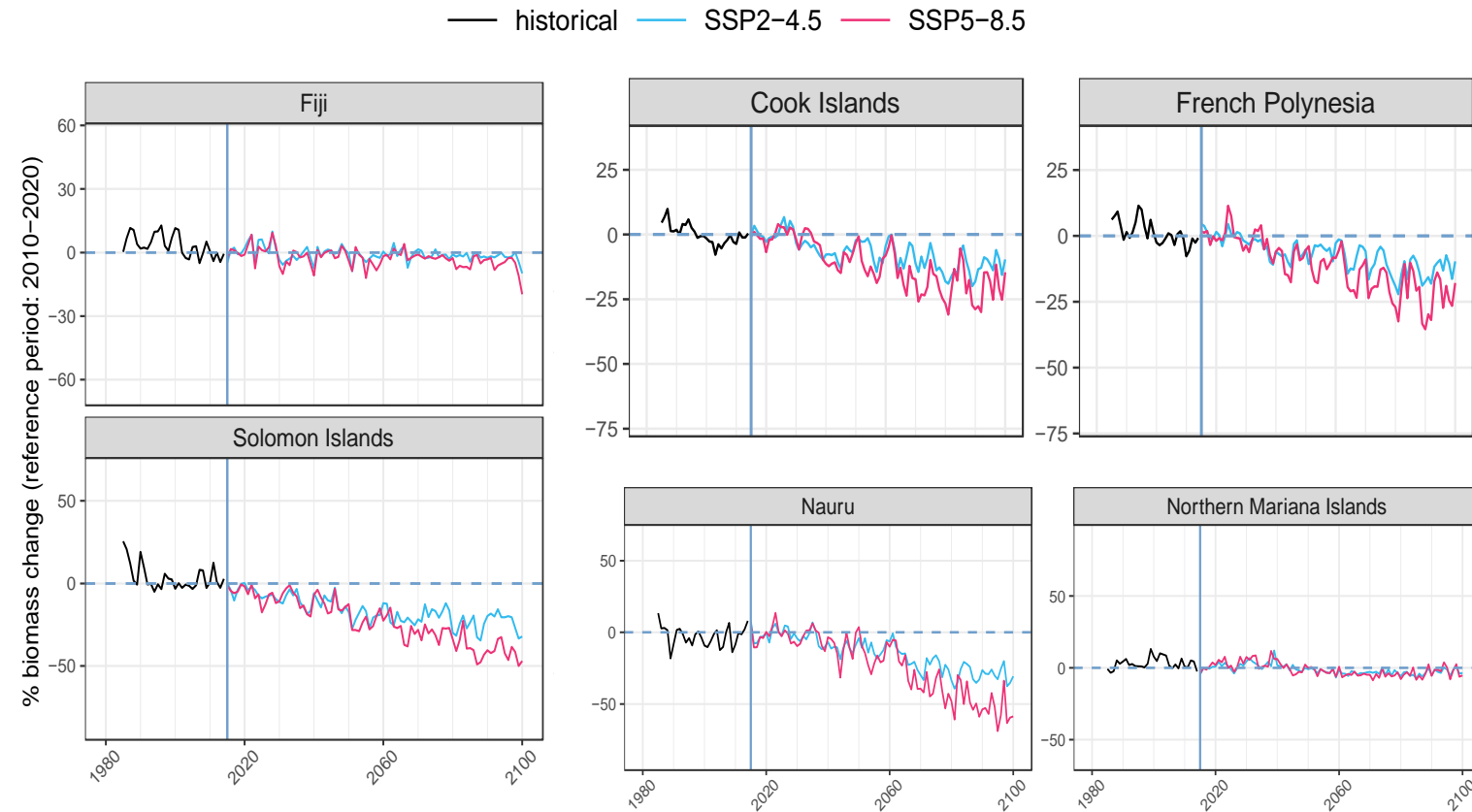
- Fish biomass declines of 1 – 20%



- Fish catch declines of 3 – 65%

Notably:

- Declining trend in coastal fish biomass in most PICT
- Higher than usual inter-annual variability in catches (sometimes significant)



Implications for PICT

- High likelihood of continuing declines in catches
- High inter-annual variability in catches
- Severity of impacts will depend on individual PICT capacity
 - alternative sources of fish, e.g. aquaculture, FADs
 - status of stocks
- Current low resilience of some PICT will likely exacerbate impacts without management intervention
 - for some PICT the situation may be critical (e.g. Guam)



Key recommendations

1. Implement coastal fisheries management systems customised to the local context for each PICT
2. Restore and protect critical coastal habitats
3. Prepare for sudden 'shocks'
 - Nearshore FADs
 - Aquaculture
 - Post-harvest methods that increase shelf life
 - Explore alternative fisheries
4. Increase education and awareness
5. Improve data collection and systems



Further information



Lead author: David Welch, d.welch@c2o.net.au

Fisheries and Marine Ecosystem Model Intercomparison Project (FishMIP):
<https://fishmip.org>





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Chapter 4: Implications of climate change for oceanic fisheries in the tropical Pacific Islands region

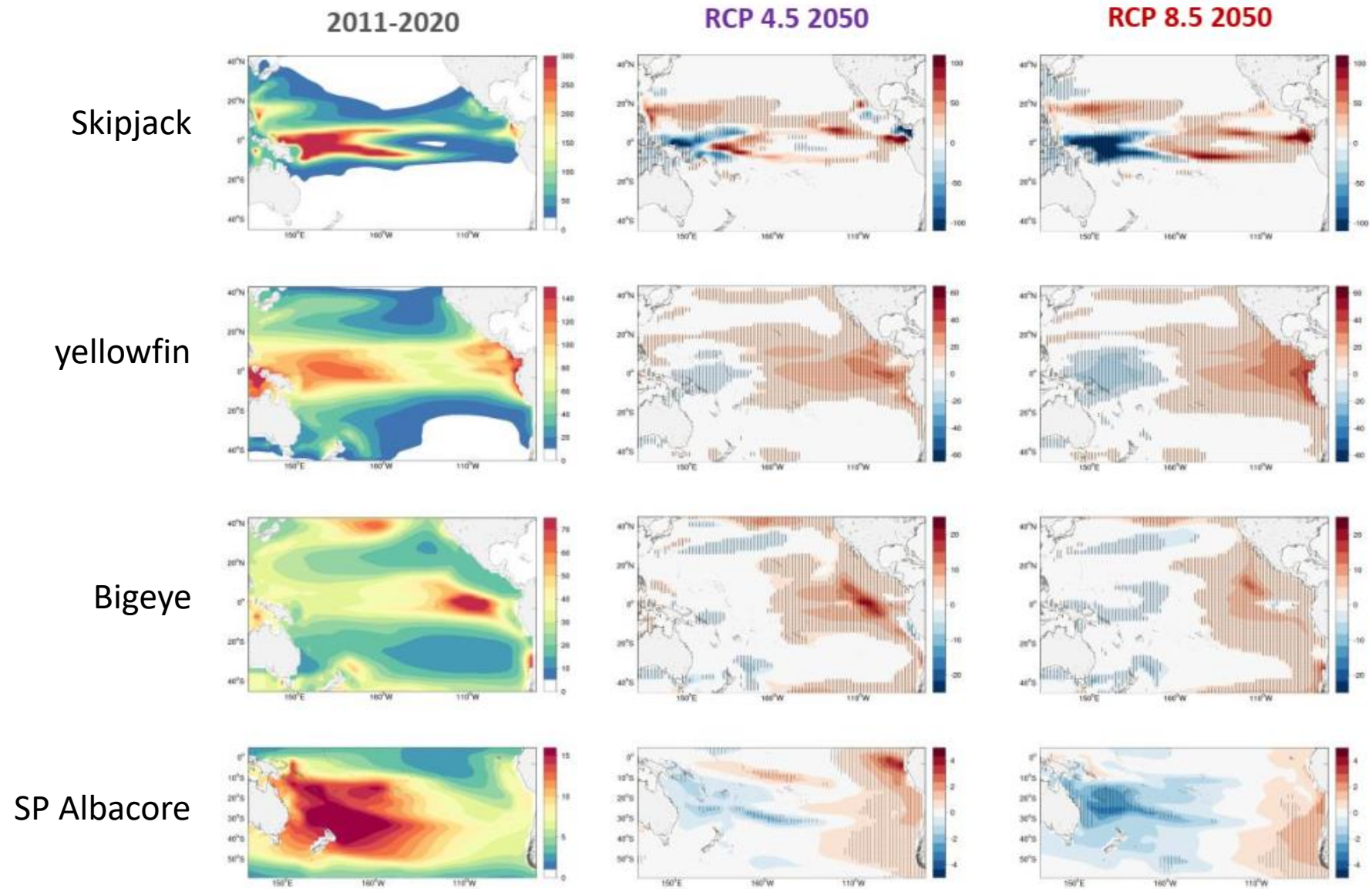
Patrick Lehodey, Inna Senina, Simon Nicol, Johann Bell, Beatriz Calmettes, Romain Forestier, Thomas Gorgues, Christophe Menkes, John Hampton, Matthieu Lengaigne, Alex Sen Gupta, Peter Williams

Key Features



- All Western and Central Pacific Ocean tuna stocks fished by SPC members are biologically sustainable. They are not overfished or subject to overfishing
- Catches in the last decade have stabilised at around 2.5-3.0 Million metric tonnes which reflects the strong management measures that have been implemented by the Western and Central Pacific Fisheries Commission
- Tuna fisheries contribute around USD1.1 Billion in export revenue for Pacific Island nations and provide between 25,000–30,000 jobs

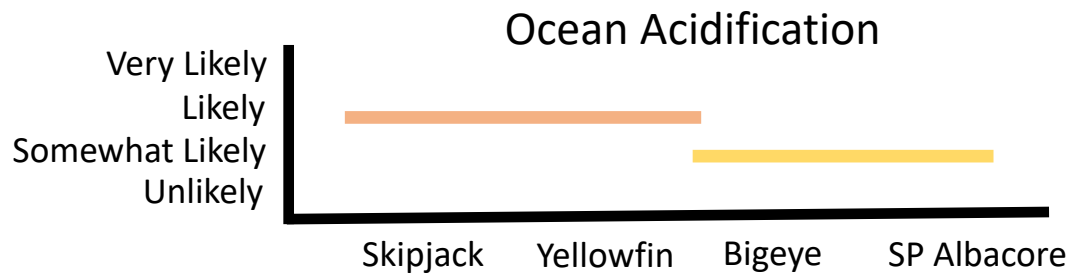
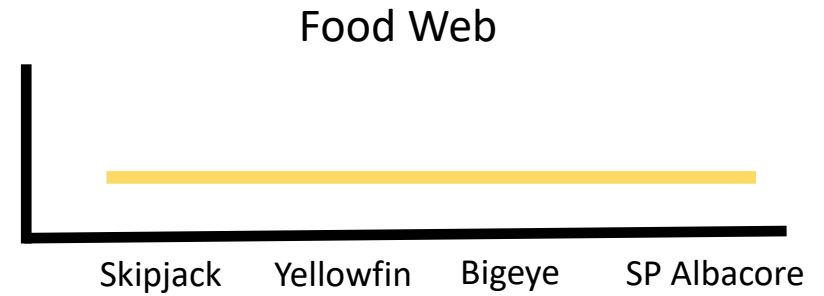
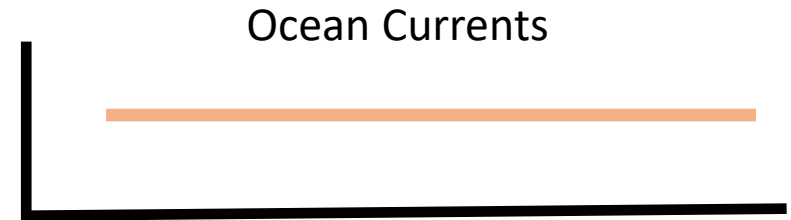
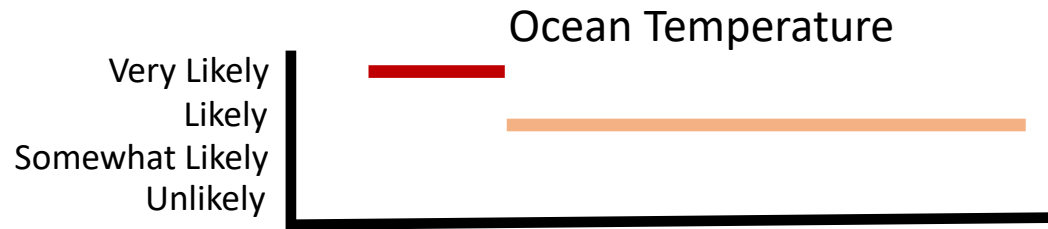
What has changed since 2011



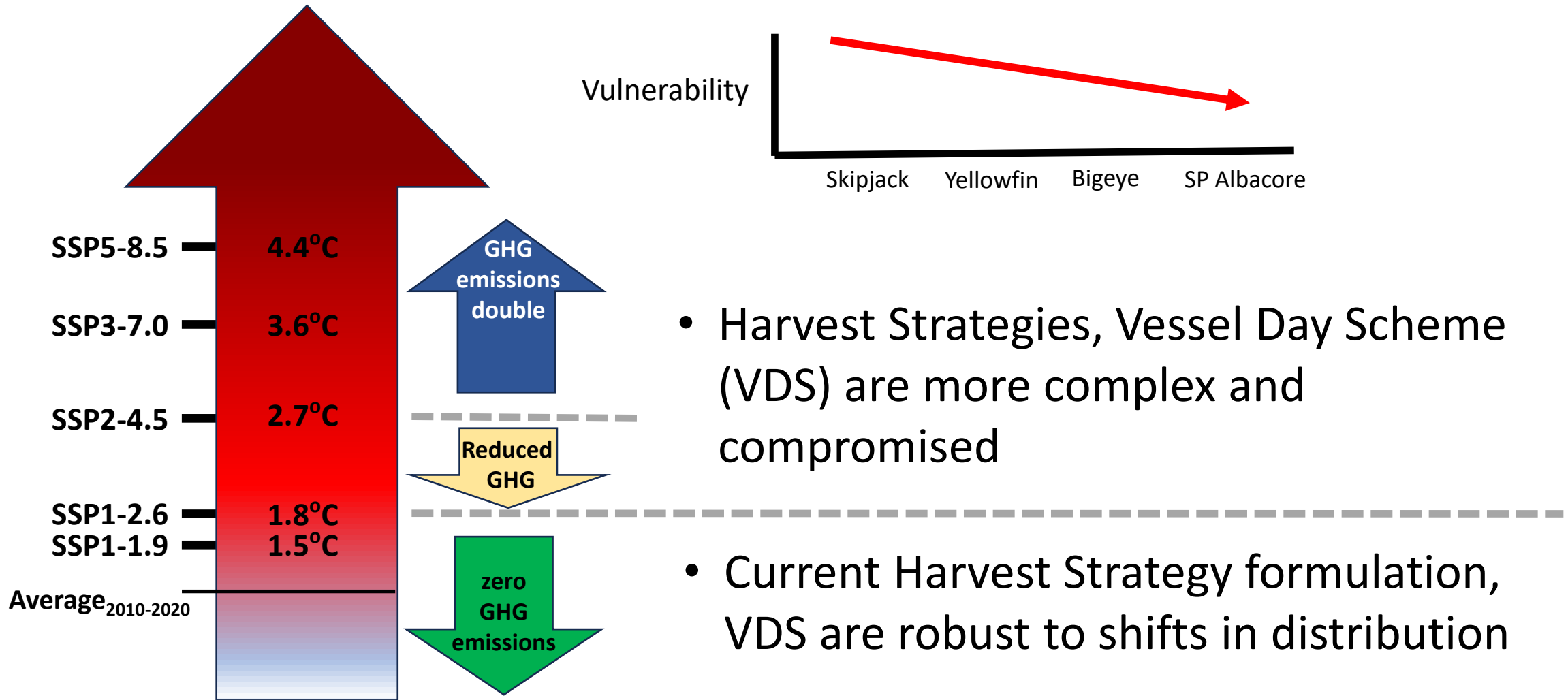
Vulnerability Assessment Results



Vulnerability



Global Warming Impacts (2050-2100)



Adaptations



Regional redistribution (Equatorial Western and Central Pacific Ocean scale)

- Changing participation in the varying sectors of the tuna fishery:
 - Facilitating transshipment & provisioning
 - Enhanced land-based processing
- Dependent upon enhancing our forecasting and short-term projection:
 - Build climate intelligence capacity

Basin redistribution (Pacific Ocean scale)

- Regional redistribution adaptation plus
- Build capacity for increased multi-jurisdictional management
- Loss & damages



Chapter 5: Implications of climate change for freshwater and estuarine fisheries in the Pacific Islands region

Peter Gehrke (Australia)

Lina Pandihau (PNG National Fisheries Authority)

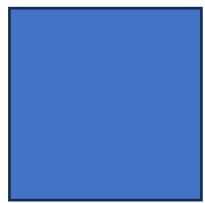
Lekima Copeland (University of the South Pacific, Fiji)

Marcus Sheaves (James Cook University, Australia)

Boga Figa (Papua New Guinea)



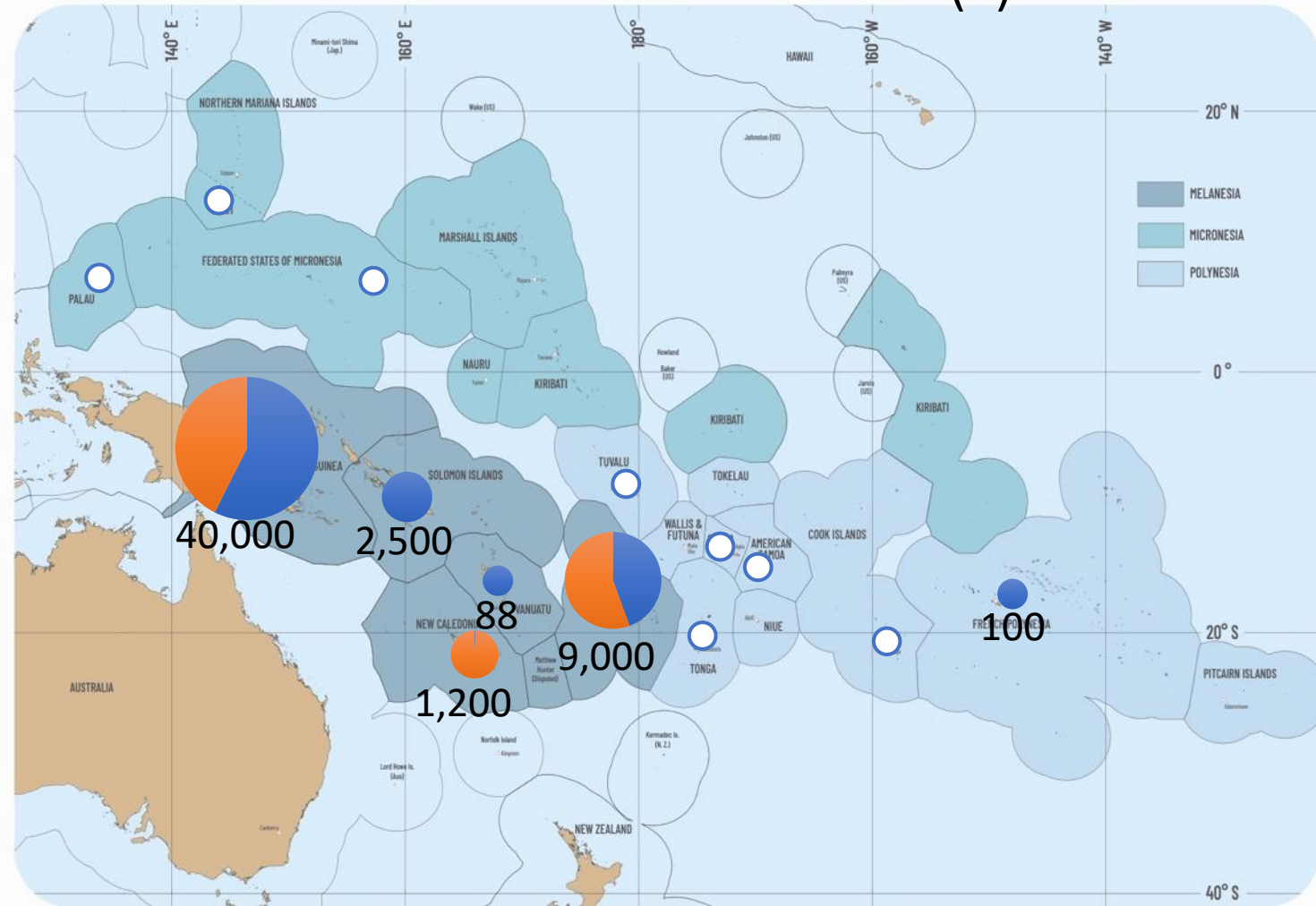
Freshwater and Estuarine Fisheries – Total catch 2021 (t)



- Reported catch < 30,000 tonnes
- Value < USD 45 million
(Gillett & Fong 2023)



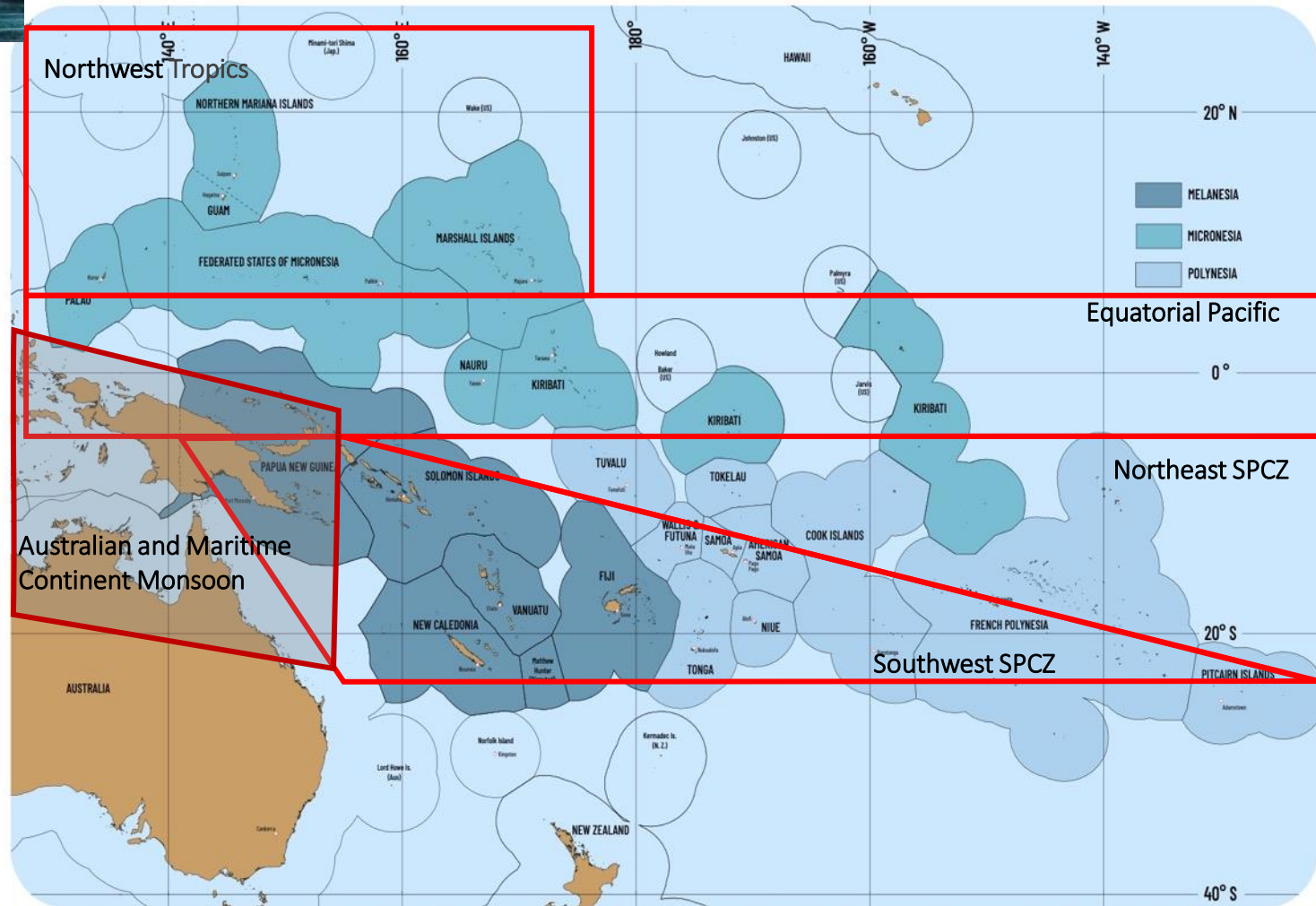
- New data:
- Estimated catch ~ 57,000 tonnes
 - Value ~ USD 86 million





New Information (since 2011)

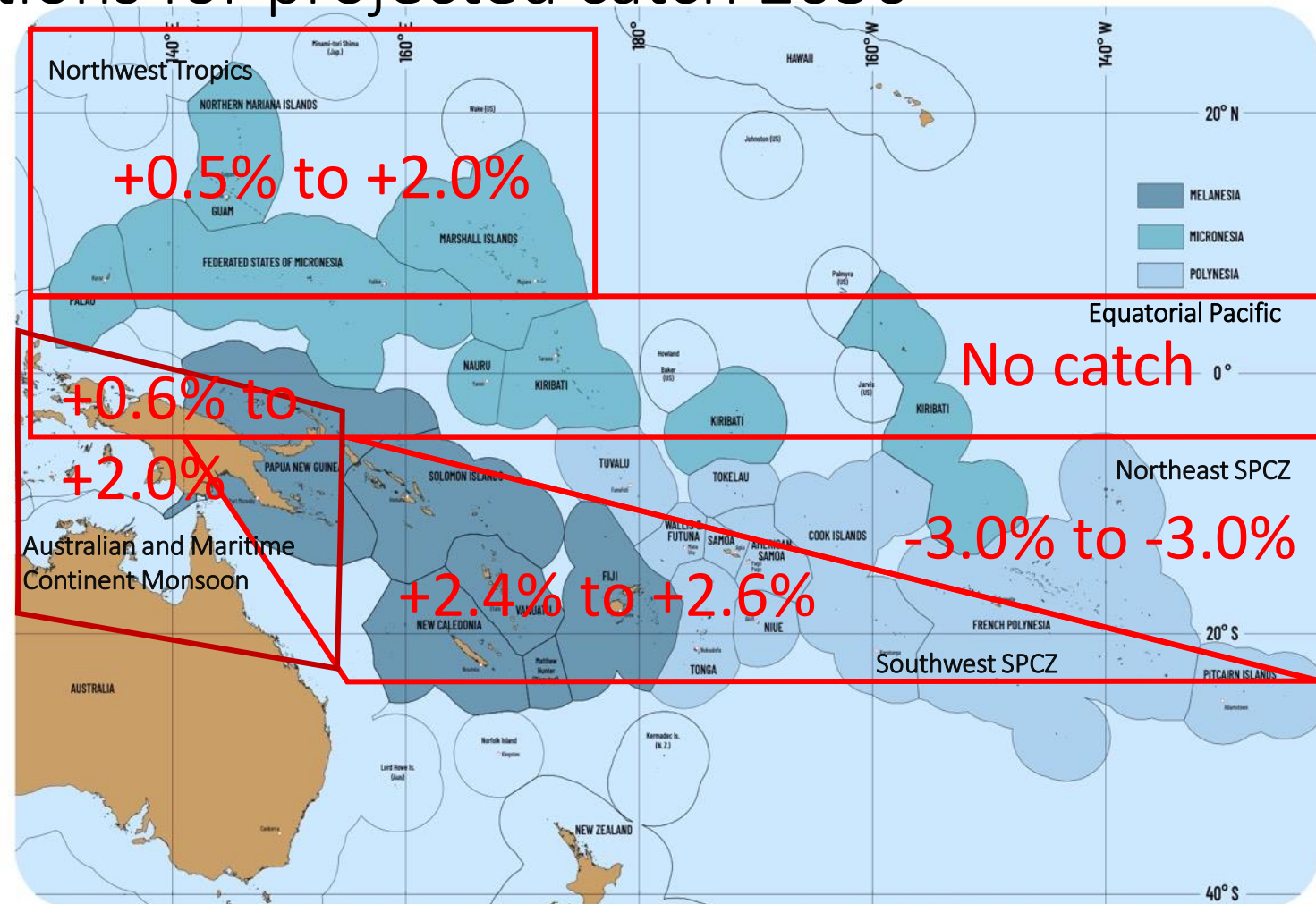
- Identified undocumented fisheries and new data: PNG, Solomon Is., Vanuatu, New Caledonia, Fiji, + Samoa?
- Improved spatial resolution for 5 climatic zones
- Improved discrimination of climate over land v ocean
- Improved resolution of rainfall patterns (river flows and fish habitat)
- Improved understanding of effects of rainfall on water temperature (habitat suitability)





Climate change implications for projected catch 2050

- Projected increase in fisheries production capacity (up to 2.4% in PNG and SW SPCZ; -3.0% in NE SPCZ, large annual variability)
- Caveat – Poor land use management, water resource development, will cancel out potential gains in fisheries production



Opportunities for PICT

- Climate-driven growth in freshwater fisheries may partially offset losses in other fisheries
- Undocumented catches provide opportunity to capture greater value via added-value chains; specialty bi-products
- Increase habitat protection to prevent habitat degradation from blocking small increases in production from climate change





Recommended adaptation pathways

1. Within fisheries jurisdiction:

- Improve catch data to understand climate change opportunities, risks, and value
- Manage threats to fisheries benefits from climate change:
 - Overfishing and illegal fishing
 - Introduced species interactions
 - Decreased fishing safety during floods

2. Beyond fisheries jurisdiction:

- Leadership in ecosystem-based management and collaboration with other agencies
 - Land-use change
 - Water resource development
- Training in climate change, ecosystem-based management and environmental planning
- Climate change monitoring networks: e.g. hydrology, water quality and land use change



Three Key Messages

1. Freshwater and estuarine fisheries are much larger, and more valuable economically, culturally and socially than documented sources suggest
2. Small increases in fisheries production are expected, driven by increased rainfall
3. Habitat degradation caused by poor land and water management poses a greater threat to freshwater and estuarine fisheries than climate change



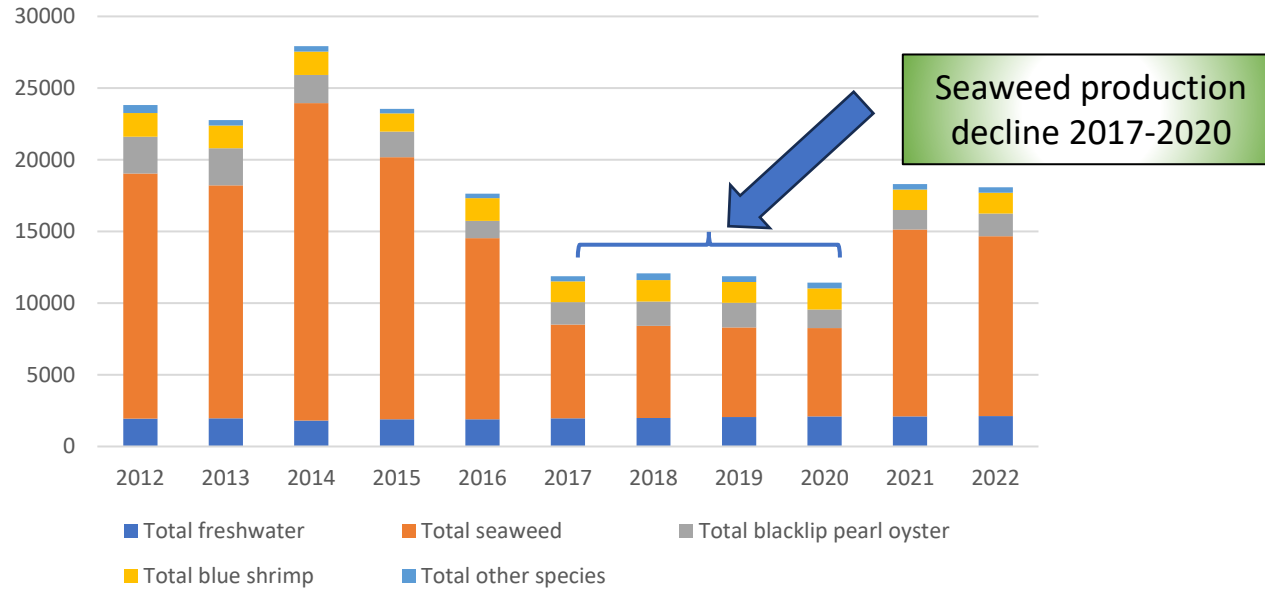


Chapter 6: Implications of climate change for aquaculture in the Pacific Islands region

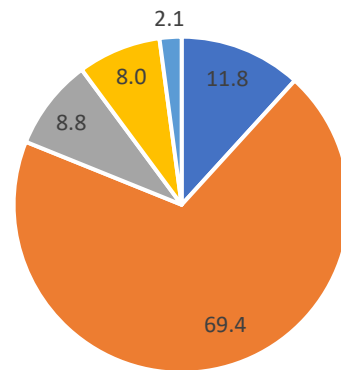
Ruth Garcia Gomez, Chinthaka Hewavitharane,
Cathy Hair, Jeffrey Kinch, Jamie Whitford, and
Antoine Teitelbaum

Aquaculture in PICT

PICT Aquaculture Production 2012-2022



Percentage of farmed species groups in PICT (2022)



- Freshwater species
- Seaweed species
- Blacklip pearl oyster
- Marine shrimp species
- Others

Key changes 2010-2023

Aquaculture diversification



Biosecurity



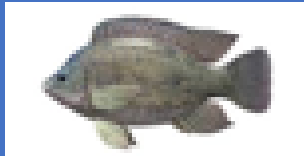

Governance







Marketing



EFFECTS of climate variability and change on aquaculture

|  OPPORTUNITIES Freshwater species  | |
|---|--|
| Increase Inland Water Temperature Increased growth, reproductive rates | Increase Rainfall Production site availability |

|   NEGATIVE EFFECTS   | | | | | |
|---|--|---|--|--|---|
| Sea surface temperature increase Marine | Ocean acidification Marine | Sea level raise Marine | Extreme weather events (freshwater/ marine) | Habitat alteration (freshwater/ marine) | Biosecurity risks (freshwater/ marine) |
| Reduced growth, reproduction, survival | Production skeleton, exoskeleton, shell Seaweed quality | Production sites availability Pond management Drainage | Loss stock, infrastructure Inputs Markets | Invasives Predators Epiphytes Feed availability | Pathogenicity Prevalence Host stress |

Management
implications and
recommendations

1. **GOVERNANCE:** science-based, strategic and integrated
2. **DIVERSIFICATION:** aquaculture strategies and livelihoods
3. **SITE SELECTION:** carrying capacity assessment and aquaculture zoning
4. **SELECTIVE BREEDING:** towards resilient farmed types (strains and varieties)
5. **ARTIFICIAL BREEDING:** addressing capture-based aquaculture (wild juveniles/seeds)
6. **LOCAL KNOWLEDGE:** valorisation of field-based indigenous knowledge
7. **INSURANCE:** climate change insurance schemes
8. **CLIMATE-SMART AQUACULTURE:** integration, rotational, biofloc, RAS
9. **DATA:** social, economic, production, market

Many thanks for your attention!





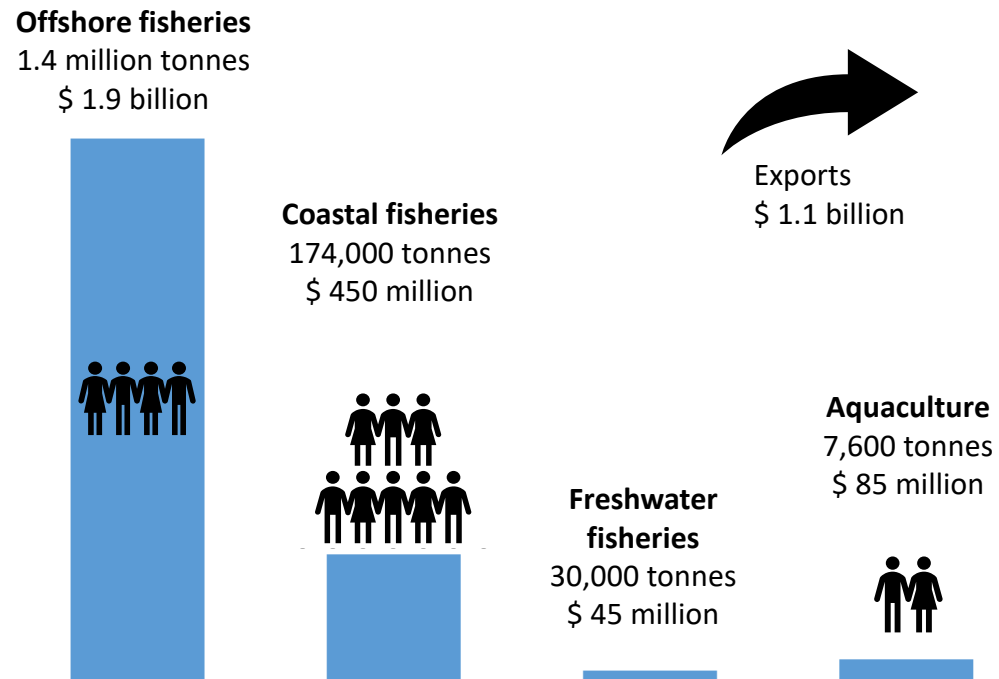
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Chapter 7:

Implications of climate change for livelihoods and economies based on fisheries and aquaculture in the Pacific Islands region

Julie-Anne Kerandel, Marina Abas, Rodney Beard,
Ruth Garcia Gomez, Peter Gehrke

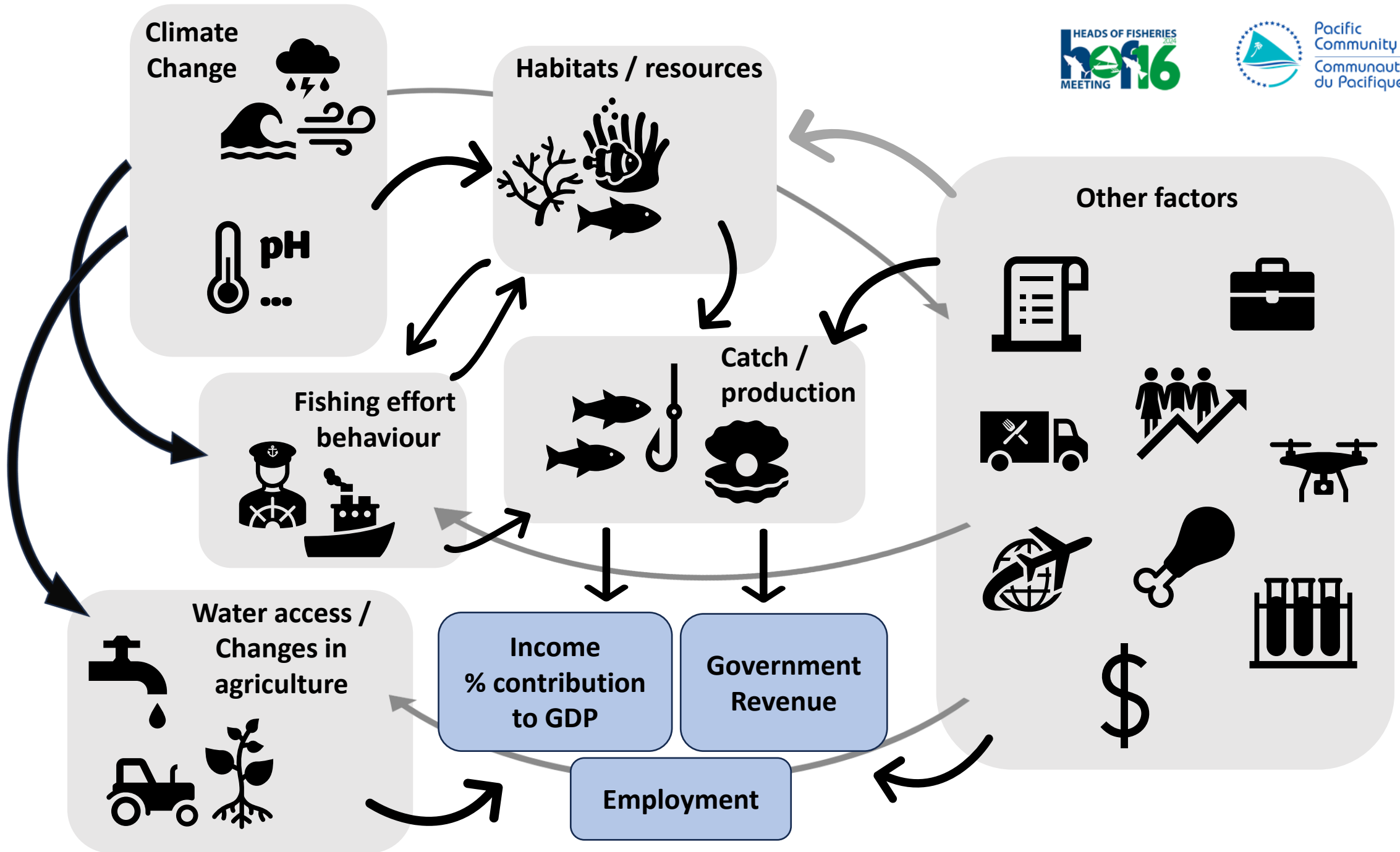
Key messages of the chapter



Source Gillett and Fong 2023

Fisheries and aquaculture economics

- Availability / accuracy of data
- Scale of impact
- Challenging to predict impact on economies
- Large role of adaptative capacity of PICTs to find resilience



What has changed since 2011

- No quantitative predictions and assessment
- Updated data on GDP, income and employment
- Trends according to PICTs' characteristics and analysis of time series
- Adaptation opportunities to increase economic contribution



Implications of climate change for fisheries and aquaculture economies and livelihoods

- More challenging to earn income from fisheries and aquaculture
- Impact not only on production but on the entire value chain
- More costly for governments
- Population growth may increase demand, impacting prices



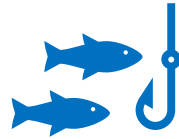
What do these results mean for PICT economies



Offshore fisheries

Impact on
government revenue
from licence fees

Changes in regional
management



Coastal fisheries

Impact on income

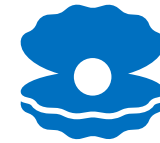
Vulnerability highly
depends on capacity of
people to adapt



Freshwater fisheries

Low vulnerability

Opportunities



Aquaculture

Challenges to maintain
volumes

Opportunities

Recommended adaptations and management measures



- Diversify livelihoods
- Improve infrastructure, relocate equipment
- Adapt fishing methods, labour standards, trade practices
- Improve value adding and post-harvest products
- Develop farming of non-fed species / high temperature tolerant species
- Optimise processes

Management measures

Collaboration

Support small-scale activities

Integrated and flexible approach

Risk management

Thank you
Merci

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peter.gehrke60@gmail.com



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Chapter 8: Implications of climate change for blue food system outcomes in the Pacific Islands region

Michelle Tigchelaar, Colette Wabnitz,
Patrick Lehodey, Inna Senina, Johanna Johnson,
David Welch, Julia Zamborain Mason, Beth Fulton,
William Cheung, Neil Andrew, and Gianluigi Nico



Modelling framework

Climate variables impacting components of blue food supply chains

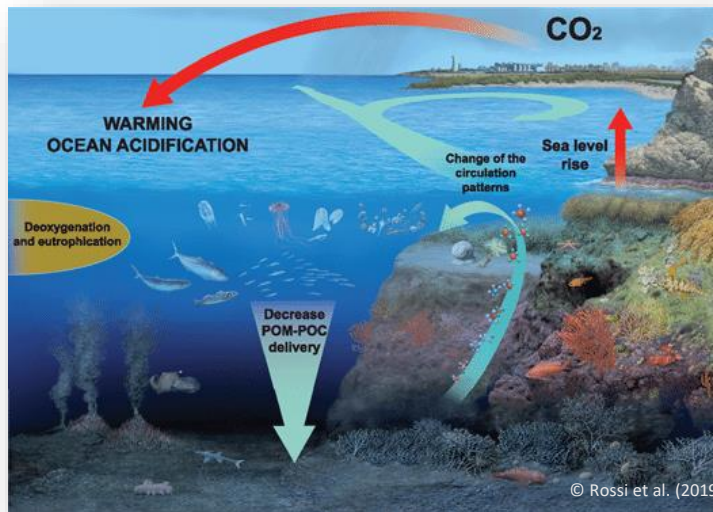


National-level contributions of blue foods to nutrition & health, economic, and social outcomes



National-level measures of general and nutrition & health, economic, and social outcome-specific vulnerability

Examples of variables



World Governance Indicators



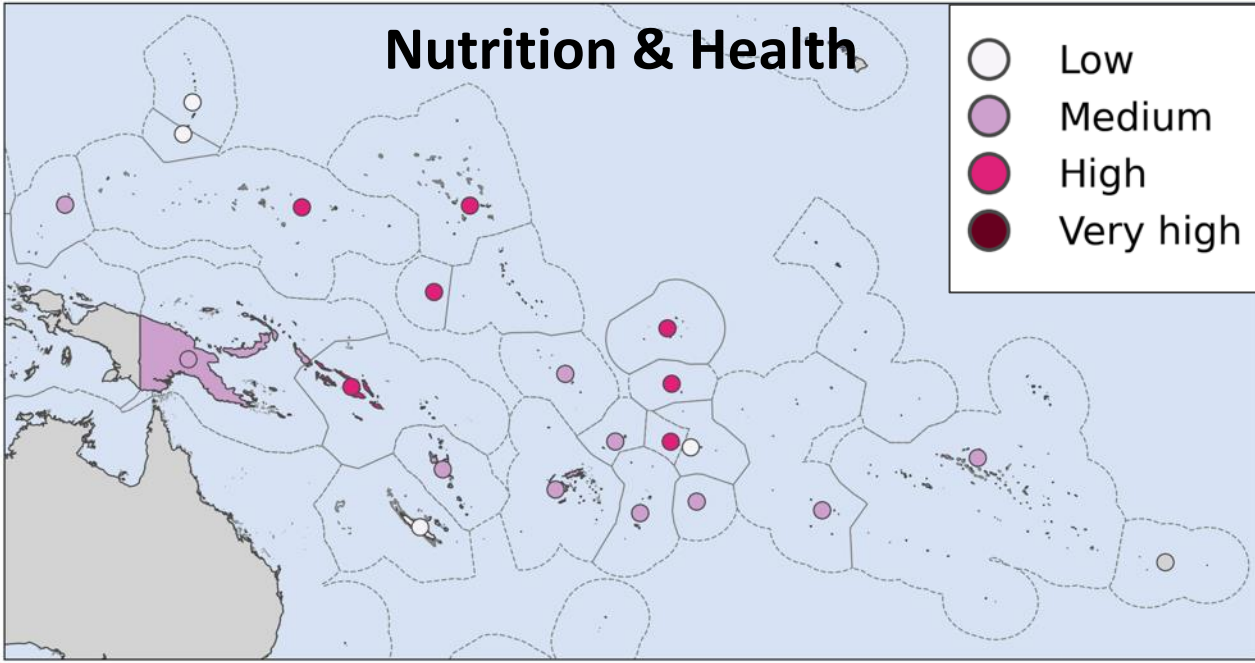
THE WORLD BANK

IBRD • IDA | WORLD BANK GROUP



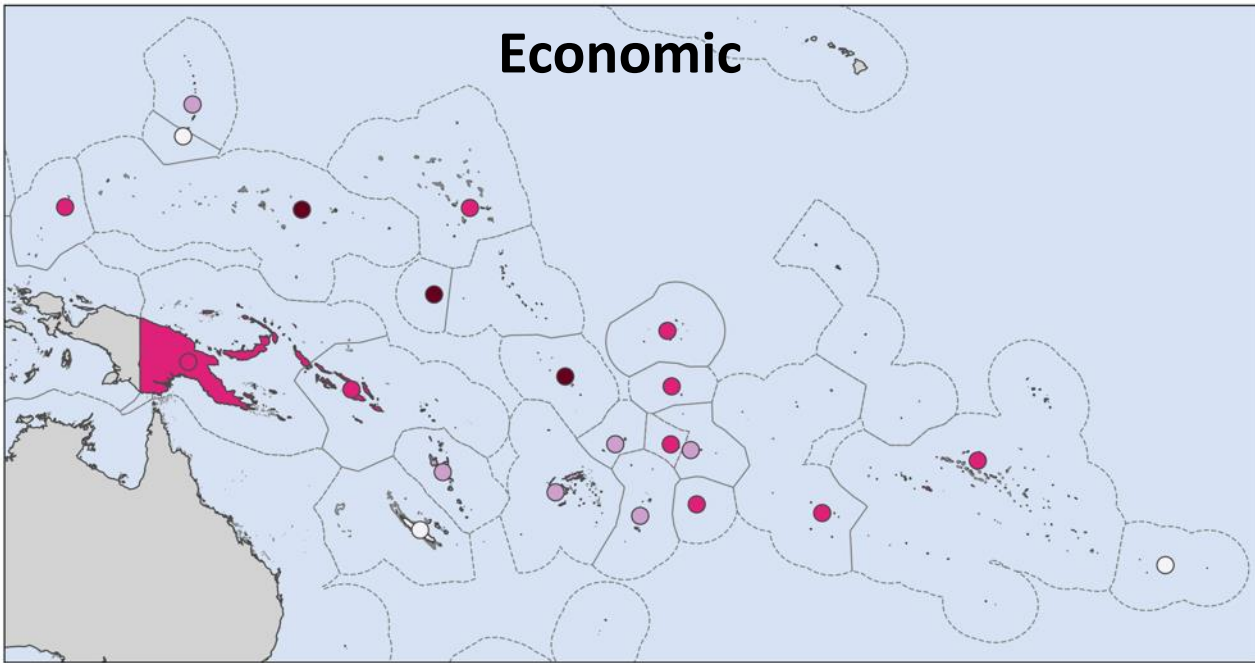
Nutrition & Health

- Low
- Medium
- High
- Very high

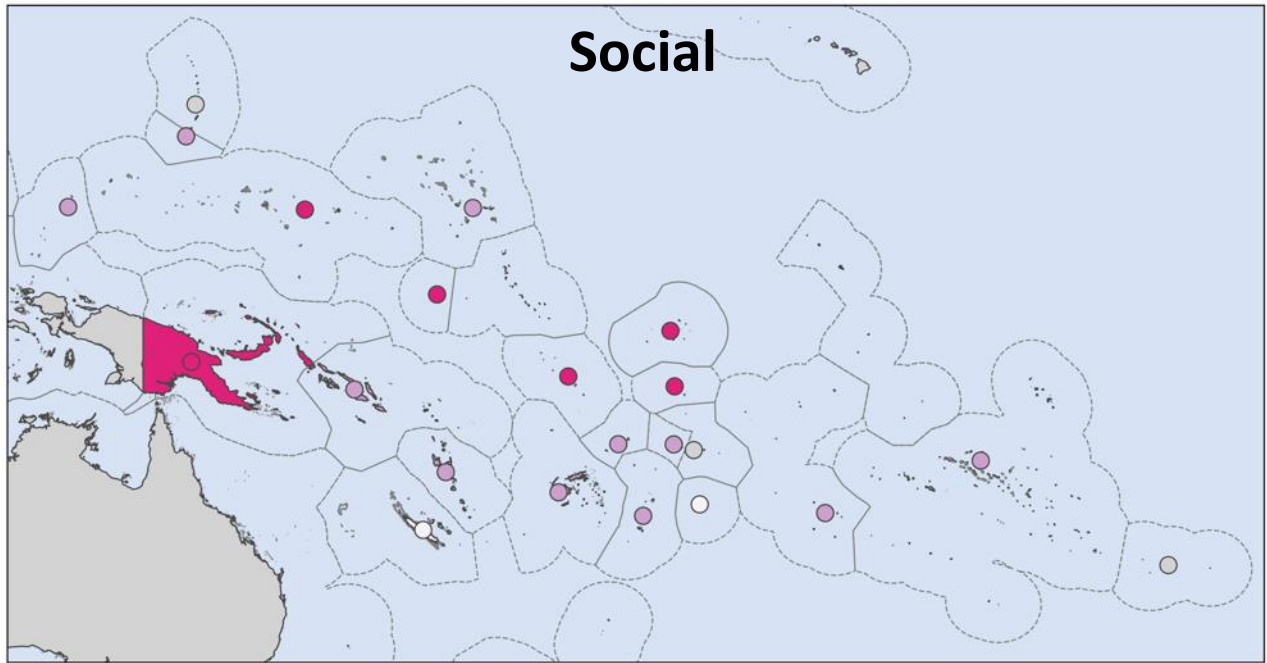


Projected climate risk in 2050 under high emission scenario

Economic



Social





© Shyama Caver



© Ronald Toito'ona

Thank you!
Merci!

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Michelle Tigchelaar
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Breakout Groups

Breakout Groups

Adaptations and recommendations (45 mins):

1. What current actions (including policy and plans) are being implemented in your PICT?
2. What new/future actions are needed to minimise climate impacts in your PICT?
3. What are the major barriers or challenges to implementing adaptation actions?

Communicating PICT summaries (25 mins):

1. Is the content clear?
2. Is the style appropriate and accessible?
3. Does the information (as available) have the focus and detail needed for decision-making?



HOF16 Breakout Groups



| ID | Venue | Members | Observers | Facilitator | Support | Note Taker |
|--------|-----------------------|--|--------------------------|---------------------|-------------------|-------------------|
| Red | Small conference room | American Samoa Guam Northern Marianas Pitcairn Islands Tonga France | PIF; World Bank | Julie-Anne Kerandel | Johanna Johnson | Johanna Johnson |
| Green | Main conference room | Cook Islands Fiji French Polynesia New Caledonia PNG USA | AFD; Our Fish Our Future | Peter Gehrke | Ruth Garcia Gomez | Ruth Garcia Gomez |
| Blue | Main conference room | FSM Kiribati Marshall Islands Nauru Solomon Islands Tuvalu New Zealand | UoW; FFA; OES/OMC | Simon Nicol | Colette Wabnitz | Colette Wabnitz |
| Yellow | Library | Niue Palau Samoa Tokelau Vanuatu Wallis & Futuna Australia | JCU; NIWA | David Welch | Aymeric Desurmont | Aymeric Desurmont |



Pacific Photo CONTEST



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TOPIC:

"Impact, resilience and solutions related to climate change within the context of the Pacific Ocean and habitats, fisheries and/or aquaculture"

USD 500

worth of photo
equipment per
category

CATEGORIES:

YOUTH : 16- 24 years old

AMATEUR: 25 years old and above

PROFESSIONAL: Anyone who sold one
or more photos



**Entry Deadline: April 7, 2024 - midnight
(Fiji time)**

CRITERIA OF PHOTO SUBMISSION:

- Capture authentic moments, events or scene showing connection between nature and communities
- Living in the 22 Pacific Islands, countries and territories, Australia and New Zealand
- High-resolution images, in digital format (jpeg, jpg, tiff or png)

SEND YOUR PHOTO TO:
CFPinfo@spc.int

FEEDBACK



<https://app.sli.do/event/qXW6RgAVQ5UhUgnzzKNB1H>