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Supplementary information

Harnessing the diversity of small-scale actors is key to the future of aquatic food systems

In the format provided by the authors and unedited

Harnessing the diversity of small-scale actors is key to the future of aquatic food systems

Supplementary information

Table S1 - List of experts consulted for case profiles and subsequent expert knowledge elicitation

Name	**Submission affiliation & address**
Fiorenza Micheli	Stanford Center for Ocean Solutions, and Hopkins Marine Station, Stanford University, USA
David Little	Institute of Aquaculture, University of Stirling, UK
Stefan Gelcich	Instituto Milenio en Socio-Ecologia Costera, Pontificia Universidad Catolica de Chile, Chile.
Rebecca Short	Stockholm Resilience Centre, Stockholm University, Sweden
Michelle Tigchelaar	Center for Ocean Solutions, Stanford University, USA
Eddie Allison	WorldFish, Malaysia
Xavier Basurto	Duke University, USA
Ben Belton	WorldFish, Malaysia; Department of Agricultural, Food and Resource Economics, Michigan State University, USA
Melba Bondad-Reantas	Fisheries Division, Food and Agriculture Organization of the United Nations (FAO), Italy
Cecile Brugere	Soulfish Research & Consultancy, York, United Kingdom
Simon Bush	Environmental Policy Group, Wageningen University and Research
Ling Cao	School of Oceanography, Shanghai Jiao Tong University
Beatrice Crona	Stockholm Resilience Centre, Stockholm University, Sweden
Pippa Cohen	WorldFish, Malaysia; ARC Centre of Excellence for Coral Reef Studies, James Cook University, Australia
Omar Defeo	Facultad de Ciencias, Montevideo, Uruguay
Peter Edwards	School of Environment, Resources and Development, Asian Institute of Technology, Thailand
Caroline Ferguson	School of Earth, Energy, and Environmental Sciences, Stanford University
Nicole Franz	Fisheries Division, Food and Agriculture Organization of the United Nations (FAO),Italy
Christopher Golden	Dept. of Nutrition, Harvard T.H. Chan School of Public Health, Boston, USA
Ben Halpern	National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara, USA; Bren School of Environmental Science and Management, University of California, USA
Lucie Hazen	Center for Ocean Solutions, Stanford University, USA
Christina Hicks	Lancaster Environment Centre, Lancaster University, UK
Derek Johnson	Department of Anthropology, University of Manitoba, Canada
Alexander Kaminski	Institute of Aquaculture, University of Stirling, UK
Sangeeta Mangubhai	Wildlife Conservation Society, Fiji Country Program,Fiji
Roz Naylor	Department of Earth System Science and Center on Food Security and the Environment, Stanford University, USA

Rashid Sumaila	Institute for the Oceans and Fisheries, University of British Columbia, Canada
Shakuntala Thilsted	WorldFish, Malaysia
Colette Wabnitz	Stanford Center for Ocean Solutions, Stanford, Ca, USA and Institute for the Oceans and Fisheries, University of British Columbia, Canada
Wenbo Zhang	College of Fisheries and Life Science, Shanghai Ocean University

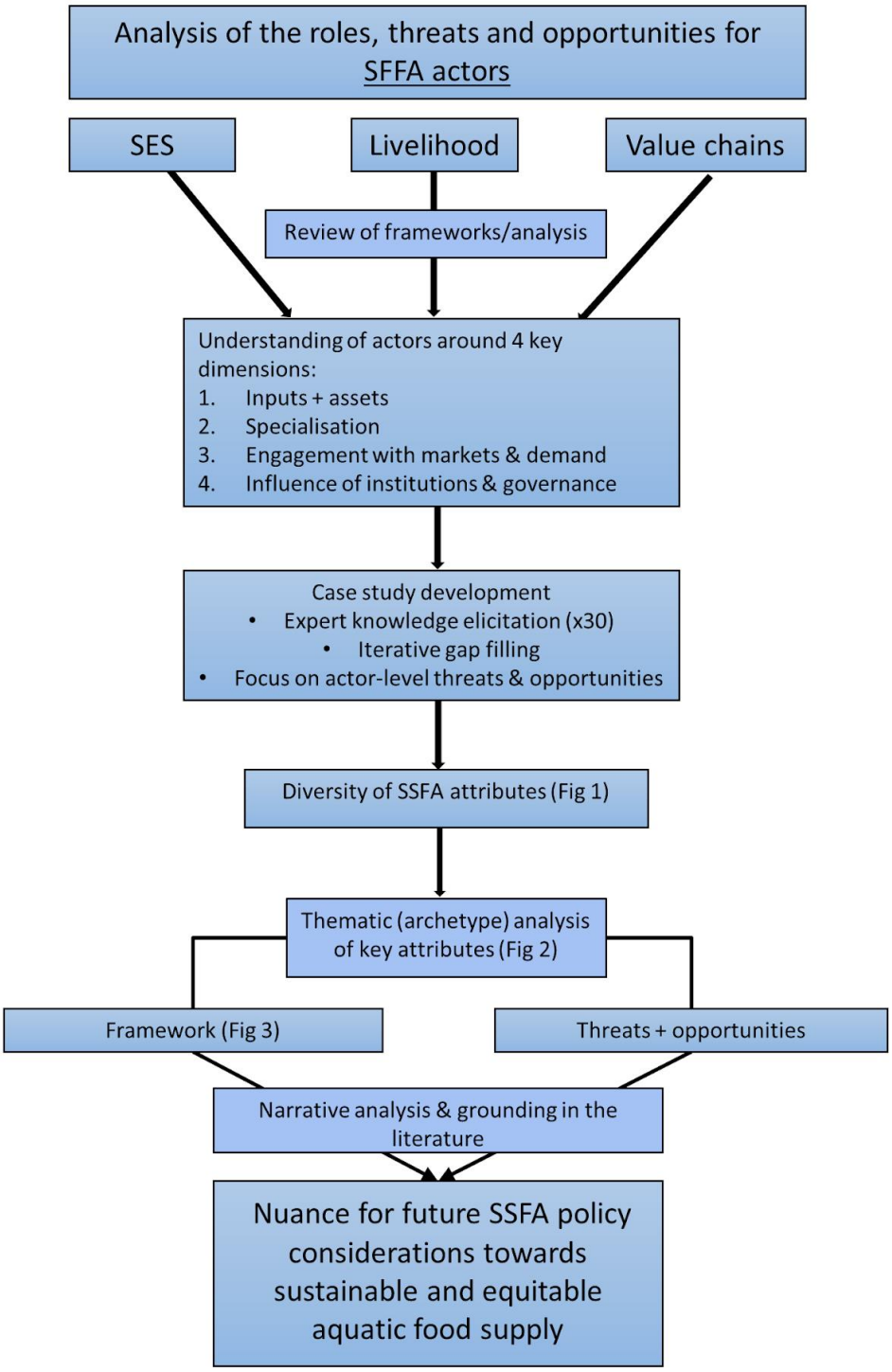

Figure S1 - Process flow diagram

Supplementary text S1:

Expert knowledge elicitation was used to collect small-scale fisheries and aquaculture typical actor profiles from 30 experts (Table S1) across 27 institutions globally in July 2020. Profiles which experts were familiar with were requested across the value chain (production, processing, trading, multiple), with no geographical restrictions and where the expert defined the actor as small-scale as academic definitions vary and no globally comparable metric exists. A template was circulated in order to structure profiles around the four dimensions of: 1) inputs and assets, 2) specialization, 3) engagement with markets and demand, and 4) institutions and governance. Dimensions were decided upon following review of key frameworks e.g. Ostrom's social-ecological framework (Ostrom, 2009) and the sustainable livelihoods framework (Carney, 1998). The lead authors workshopped the dimensions of most relevance at the level of the actor and to the goals of the analysis. In addition, experts were instructed to include current and future threats and opportunities specific to the profiled actor and their engagement with the aquatic food sector. In the first instance, experts were asked to provide two diverging profiles, adding additional profiles of perceived importance thereafter. After initial submissions were received, the lead author team reviewed submissions and made select follow-up requests to attempt to fill key gaps such as geographical representation, value chain nodes, production systems/resource types and gender.

Seventy profiles were analyzed (Table S2), with methods drawn from archetypes analysis, in an inductive process to categorize each of the narrative profile dimensions into a set of attributes representing diversity of actor characteristics along given spectra (Fig S2). These attributes were presented for feedback from the expert team in a set of three workshops in September 2020. These workshops aimed to further reduce the attributes, identify redundancy and explore gaps in representation of diversity across the dimensions. Following these workshops, a framework was developed based on a continued reductive process, identifying key representative attributes (Fig S2 – boxes). In addition, associated threats and opportunities were categorized in a similar process and cross-referenced for association with given attributes. Cross-cutting threats and opportunities were identified for further discussion and to provide focus for the narrative analysis within the paper. The framework, threats and opportunities, and key questions arising were again presented to the expert group in a second set of workshops in November 2020. These second workshops were intended to refine the framework and structure the discussion around use and presentation of this framework. Additionally, following the workshops a validation step was undertaken with each expert independently applying the framework to one of their submitted profiles, further clarifying any issues or gaps in representation.

Experts had input throughout the drafting of the paper's narrative and a collaborative effort was therefore applied to a grounding of the framework, threats and opportunities in the current literature.

Supplementary text S2 - Template for case profile collection as circulated to expert co-authors

Submitted by: [Name]

How would you title this actor? Please provide a photograph if possible for context (these will not be used further without appropriate permissions)	
Please provide short description of this actor 'type'	Relevant aspects may include nationality/region, age, ethnicity, gender, socio-economic profile, education, residency, primary/secondary/other livelihoods etc.
Please provide detail on how this actor may fit with/engage within the domains of SFFAs below:	
1. Inputs/assets	We would like to think beyond production-based inputs or necessary assets and may include: ● Time investment, physical effort, trade-offs/strategies ● Knowledge/skill requirements ● Social capital requirements ● Capital investment inc. strategies e.g. credit agreements ● Spatial requirements ● Biological inputs e.g. feed ● Degree of intensity ● Technological inputs ● Where is product sourced?
2. Position in value chain	Where along the value chain does this actor sit? E.g.: ● Production ● Processing ● Trade ● Marketing ● Consumption ● Multiple (please list)
3. Engagement with markets and influence of demand	● Who and where are their end consumers? ● Where do they source their product? ● Scale (e.g. feeds commercial markets, remains local) ● Degree of specialization/diversity of product ● Product use e.g. human consumption, non-human consumption (feed, fertilizer?), luxury, staple, medicinal, ornamental

4. Degree of regulation/formality of governance	Description of structures relevant to actor e.g.: ● Top down (e.g. quotas) or bottom up (e.g. collectives) ● Access ● Quality control ● Related costs ● Independent/state regulation?

swOT

5. Threats	Please outline any long and short term exogenous threats to the **food security outputs** of these actors. Outputs which may be threatened by external change may include: ● Volume produced/traded/processed ● Nutritional quality of product ● Diversity of product ● Access, affordability, and fair trade particularly where end consumers are vulnerable ● Sustainability/longevity of production ● Relevance to food sovereignty, agency and autonomy ● Known trade-offs e.g. high nutrition, low volume foods sold for low nutrition, high volume staples.
6. Opportunities	Please outline any **opportunities for preserving or enhancing** these food security outputs for this actor, ion the context of both contemporary systems/governance and future transformative policy change.

Directions:

This first development stage will be to ask you all to submit a set of **2-5 examples** of SFFA actor ideal types that you are particularly familiar with or have conducted research involving, using the attached template. The focus here is on **the actors and how they engage with the broader food system**, rather than a focus on the food system itself. These can be actors at any stage of the value chain and may be an individual, group or company/organisation. As a minimum we would really like you to describe **two actors who you view as quite different from one another**, in order to really capture heterogeneity in the system.

As such, we want you to first ask yourself the question 'who is this actor?' and to provide **a photo and short description** you feel encapsulates this person/group, if you have one. These photos will not be used beyond the group without further express permission, however the BFA has an open data sharing agreement across the teams of authors, so your submissions more generally may be made available to other team members in future.

Once the context of the actor is envisioned, we would like you to frame some detail on these ideal types around a set of **4 dimensions**, informed by prior work on ideal types and your feedback so far;

1. Input/assets
2. Position in value chain
3. Engagement with markets and influence of demand
4. Degree of regulation/formality of governance

These dimensions are laid out in more detail in the attached template, and some example ideal types are also attached as prompts. Lastly, we would like you to feed into the start of the swOT analysis by explicitly considering some of the **threats and opportunities** which may apply to the **food security-specific** outputs of a given actor, also detailed in the template.

Whilst we want to be clear on the exercise, and the detail we are looking for, we are also conscious that we do not want to lead you all too rigidly in defining how these ideal types should be shaped. This is deliberate as we believe the greatest strength of this approach is you, the experts, leading on how SFFA actors can be better understood towards effective policy. As such the content of the template and the examples given are not intended to be exhaustive or present an inductive categorisation, but a sufficient prompt to start the thought process off.

However, please do let us know if anything is unclear, or you have any questions.

We would really like to have a first set of submissions **by the end of July** to start stage two. Please also find a rough timeline for the next phases of paper development outlined below this e-mail, and do let us know in advance if any of these timings are likely to be problematic for you.

Hopefully this all makes sense and we will send a couple of reminders out as the month progresses, if you could all send your sets of ideal types to Rebecca in the first instance (rebecca.short@su.se), then we will get back to you to organize some further discussions going forward. This is an exemplary group of authors and we are excited to get to work with you all on what we hope will be a key point of further development for the blue foods narrative.

Table S2 - Case profiles from expert knowledge elicitation

SSFA #	Author	Country	Aquaculture/ Fisheries	Brief Description	Gender	Value Chain Position(s)
1	Franz	Antigua and Barbuda	f	Small-scale fisher, SSF spokesperson	m	Producer
2	Wabnitz	Australia	f	Commercial abalone dive fisher	m	Producer
3	Little	Bangladesh	f	Throw net fisher	m	Producer, Seller, Consumer
4	Johnson	Bangladesh	f	Net repair engineer	m	Supporting role
5	Belton	Bangladesh	a	Commercial catfish farmer	m	Producer
6	Johnson	Bangladesh	a, f	Generational fisher	m	Producer, Seller
7	Wabnitz	Canada	f	Small-scale boat-based fisher	m	Producer, Seller, Processor, Consumer
8	Johnson	Canada	f	Freshwater fisher and retailer	m	Producer, Processor, Seller
9	Wabnitz	Canada	f	Commercial trap sablefish fisher	m	Producer
10	Gelcich	Chile	f	Benthic hookah fisher	f	Producer, Seller, Consumer
11	Gelcich	Chile	a	Small to mid-scale mussel aquaculture	m	Producer
12	Naylor	China	a	Tilapia pond sharecropper	m	Producer, Seller, Consumer
13	W Zhang	China	a	Small-scale carp farmer	f	Producer
14	W Zhang	China	a	Small-scale crucian carp fingerling farmer	m	Producer
15	W Zhang	China	a	Small-scale mitten crab farmer	m	Producer
16	W Zhang	China	f	Small-scale tilapia farmer	m	Producer
17	W Zhang	China	f	Shrimp middleman	m	Middleman/Trader
18	W Zhang	China	f	Small-scale fishmonger	f	Trader/Seller

19	Cao	China	f	Unspecialized fisherwomen	f	Producers, Processors, Consumers
20	Cao	China	f	New migrant fishers	m	Producers
21	Little	Egypt	f	Fish market vendor	f	Trader/Seller
22	Mangubhai	Fiji	f	Small-scale fishers	m	Producer, Seller
23	Mangubhai	Fiji	f	Small-scale fisherwomen	f	Producer, Seller
24	Mangubhai	Fiji	f	Indigenous freshwater fisherwomen	f	Producer
25	Brugere	France	a	Small-scale oyster farmers	f, m	Producer, Processor, Seller/Trader
26	Wabnitz	French Polynesia	f	Small-scale spear and boat-based fisher	m	Producer, Seller, Processor, Consumer
27	Wabnitz	French Polynesia	f	Small-scale giant clam fisher	m	Producer, Processor, Seller, Consumer
28	Johnson	India	f	Manager of household fishing operation	f	Producer, Processor, Seller
29	Brugere	India	a	Small-scale carp farmers	m	Producer
30	Naylor	Kenya	a	Small-scale tilapia producer	f	Producer, Seller, Consumer
31	Naylor	Kenya	a, f	Fish market vendor	f	Seller/Trader
32	Naylor	Kenya	a	Aquaculture feed producer	m	Producer, Processor, Seller
33	Naylor	Kenya	a, f	Fish processing employee	f	Processor
34	Crona	Kenya	f	Large-scale trader	m, f	Trader/Middleman
35	Crona	Kenya	f	Small-scale trader	m	Trader/Middleman
36	Hicks	Kenya	f	Small-scale fish trader	f	Processor, Trader
37	Little	Kenya	a	Tilapia cook and trader	f	Processor, Trader
38	Golden	Madagascar	f	Motorized net fisher	m	Producer, Seller, Consumer
39	Golden	Madagascar	f	Informal fish trader	f	Trader/Seller

40	Golden	Madagascar	f	Commercial eel byproduct trader	m	Trader/Seller
41	Golden	Madagascar	f	Net fisher	m	Producer, Seller
42	Golden	Madagascar	f	Child mosquito net fishers	f, m	Producers, Traders, Consumers
43	Golden	Madagascar	f	Child gleaners	f, m	Producers, Consumers
44	Short	Madagascar	f	Shark Jarifa net fisher	m	Producer, Processor
45	Micheli	Mexico	f	Processing plant worker	f	Processor
46	Micheli	Mexico	f	Benthic hookah fisher	m	Producer
47	Basurto	Mexico	f	Lobster, shark and finfish fisher	m	Producer
48	Basurto	Mexico	f	Pen shell diver	m	Producer, Processor, Trader, Consumer
49	Basurto	Mexico	f	Small-scale trader	m	Trader/Middleman
50	Short	Mozambique	f	Mosquito net fishers	f	Producer, Consumer
51	Short	Mozambique	f	Mosquito net fishers	m	Producer, Processor, Consumer
52	Belton	Myanmar	f	Dried fish trader	m	Trader
53	Edwards	Myanmar	a	Small-scale tilapia farmer	f	Producer, Seller
54	Ferguson	Palau	f	Commercial sea cucumber gleaner	m	Producer, Processor, Seller, Consumer
55	Ferguson	Palau	f	Recreational gleaner	f	Producer, Processor, Consumer
56	Ferguson	Palau	f	Sea cucumber trader	f	Trader/Seller
57	Ferguson	Palau	f	Sea cucumber gleaner	f	Producer, Processor, Seller, Consumer
58	Hicks	Seychelles	f	Traditional trap fisher	m	Producer, Seller
59	Brugere	Tanzania	a	Tubular net seaweed farmers	f	Producers
60	Defeo	Uruguay	f	Shellfish processing plant owners	f, m	Processor, Trader

61	Defeo	Uruguay	f	Shellfish harvesters	f, m	Producer, Seller
62	Defeo	Uruguay	a	Sturgeon aquaculture business	m	Producer, Processor, Seller
63	Defeo	Uruguay	f	Freshwater cooperative fishers	m	Producers
64	Halpern	USA	f	Community Supported Fisheries (CSF) fishers	m	Producers
65	Bush	Vietnam	a	Small-scale mangrove integrated shrimp farmer	m	Producer
66	Bush	Vietnam	a	Small-scale shrimp farmer	m	Producer, Seller
67	Kaminski	Zambia	a	Small-scale tilapia fish farmer	m	Producer, Seller
68	Kaminski	Zambia	a	Small-scale tilapia farmer	m	Producer
69	Kaminski	Zambia	f	Fish processor and trader	f	Processor, Trader
70	Kaminski	Zambia	f	Fish trader	f	Trader

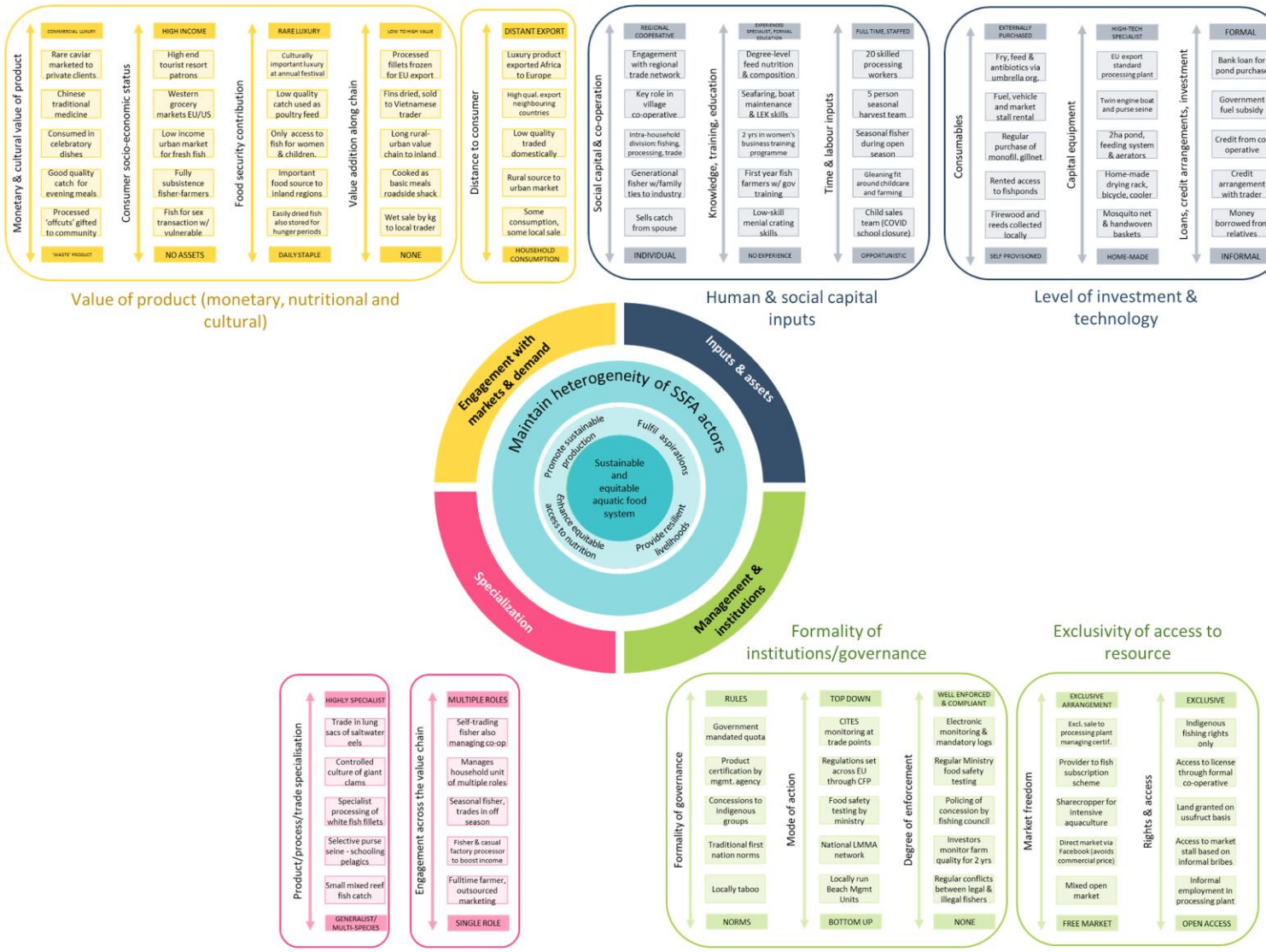

Figure S2 - All SSFA attributes associated with each of the four dimensions and groupings representing reductive analysis.

Table S3 - Categorized threats and opportunities drawn from case profiles and select examples from individual actors.

Threats		**Examples from case studies**			
Climate change	*Severe weather events*	Cyclones in Fiji reduce fishers abilities to target grouper aggregations			
	Warming	Tatakoto and Reao, two atolls in the Tuamotu archipelago, French Polynesia were hit by severe bleaching mortality during the 2015-2016 El-Nino event, which also harmed small-scale clam aquaculture and also lead to a ban on clam exports to protect wild populations.	Declining seagrass beds due to ocean warming have reduced sea cucumber catches in Palau leading to a ban on exports and severe price drops for gleaners		
	Sea level rise	The ongoing viability of small Vietnamese farming systems in Ca Mau province are threatened by sea level rise as a low-lying and vulnerable coastal region.			
	Altered water flows	Large amounts of low-lying Twantay District, Myanmar are now populated by small-scale tilapia ponds which are prone to frequent flooding with associated loss of stock.	There is continuing and increasing degradation of watersheds in Fiji due to poor land-use practices, and this is likely to impact many species targeted by women.		
Overexploitation of resources	*Overfishing*	Marketisation and commodification of sea cucumbers in Palau in 2011 led to rapid overexploitation for export and a ban by 2012, leaving small-scale gleaners serving local markets (important for food sovereignty) with a reduced resource.			

Habitat degradation	*Pollution*	Harmful algal blooms and prolonged hypoxia in Mexico mean less seasonal work for abalone processing workers and declines in personal catch for households.			
	Invasive species	Increased introduction of non-native species by farmers in the south of Zambia struggling to make their farms viable may mean an increased tendency for successful northern farms to follow, posing a threat to sensitive ecosystems in this region.			
	Benthic damage/alteration	Illegal infilling of urban water bodies for development in Dhaka, Bangladesh means loss of fishing grounds for throw net fishers			
	Land degradation and poor pond management/abandonment	Loss of mangroves in Fiji impacts women fishers who sell mud crabs to the tourism market			
Disease	*Die-offs and reduced efficiency*	Artificial pond production of carp in Hubei province is heavily impacted by disease. Government restrictions on wastewater may help slow the spread, but require significant investment in new technology which may force out small-scale farmers.	French small-scale oyster farms dependent on a single species are prone to disease. Alongside seasonality of demand this can often mean that women, 'assisting spouses', may be forced to find alternative incomes whilst their husbands continue to farm.		
	Reduced community bonds	Chilean salmon farmers have distanced themselves from the community by increasingly hiring contract divers from other regions/countries as farms increase in size/become more mechanized			

	Conflicts at the local level	Social tensions in Kenya between tilapia farmers and communities have been caused by local preference shift to cheaper, imported tilapia from China	Pond waste from Chinese tilapia farms flowing into Hainan's public waterways is threatening the tourism industry and creating conflicts		
Inequity	*Gender inequality*	Gujarati families who may collectively provide different 'parts of the plate' towards a meal may not equally benefit from this, with girls eating last and often denied fish or other nutritionally rich foods by the time they eat.	Women mosquito net fishers, who fish closer to shore than men and therefore are more visible, are more likely to be fined or have their nets confiscated by fishing councils or government officials.	Efforts to encourage small-scale seaweed farming amongst women in Tanzania are threatened by the increasing profitability of this activity, meaning men are moving into farming spaces more and forcing women out.	
	Cultural marginalization	Indo-Fijians are not recognized as having access to Fijian fishing grounds and are required to gain written permission for a license, despite being the second largest ethnic group. Their contributions remain unrecognized and unquantified with no access to government support.			
	Lack of access to education and training	Lack of access to basic vocational training in small-scale Zambian farms means pond management skills are severely lacking and investment risks are extremely high.			
	Elite capture	Public 'Blue growth' investments are being used to increase marine space allocation to large scale aquaculture, tourism and foreign fisheries across Africa	The urban market where women traders sell their fish in Shanghai will soon be luxury flats. A new, improved market is to be built but stall rents are already too high and these will only go to the wealthiest traders.	Although the fisheries policy of Bangladesh states that inland fisheries resources will only be leased to fishers, government-owned fisheries water bodies are leased by the local elite and influential people of the ruling political party.	

	Lack of access to financial resources/infrastructure	Loss of government subsidies for tilapia farmers in Kenya would decrease viability and enable Chinese products to flood the market, in turn there is the threat of a Chinese processing plant which would outcompete existing Kenyan plants	A concentration of government and donor support in the north of Zambia has meant inconsistent access to feed and fry for those in the south, leading to the abandonment of production systems as they do not prove viable.	A lack of ice and cold storage infrastructure for fisher in Rio Negro, Uruguay precludes commercialization of products with high-added value, and intermediaries take advantage of limitations in local cooperative infrastructure.	The Californian tourism sector over the years has taken over various infrastructure facilities (dry boat storage space and harbor slips), which has narrowed availability for fishing community needs.
	Loss/underperformance of collective action mechanism	Vietnamese shrimp farming families in an organized co-op are wholly dependent on the organic shrimp market for a living, meaning whilst safer from disease they have few alternatives for marketing their shrimp in times of volatility and are unable to take advantage of changes in market price.			
	Poor/unsafe working conditions	As the Myanmar raft fishery expands and catches decrease, viability of the fishery is maintained through exploitative labor practices, with mistreatment causing injury and death of many workers on rafts each year.			
	Illness and lack of access to healthcare	The fish-for-sex phenomenon is thought to be a contributing factor to the high prevalence of HIV/Aids in fishing communities and fish trading networks in Zambia.			
	Disease and illness	COVID19 shocks have reduced demand for Pangasius in Bangladesh as households switch to hardship expenditure (rice and staples) which is leading to delayed harvesting, restocking and even temporary withdrawals of farms with associated compromises to nutritional capabilities	Covid-19 exposed the vulnerability of a Community Supported Fishery in Canada that did not provide door-to-door services, with their customers unable to collect their product.	Covid-19 illustrated the vulnerability to external markets for walleye and whitefish in Canada with export markets for walleye in the US slowly closed down meaning small-scale fishers on Lake Winnipeg could not go out to fish.	

Markets and competition	*Access to resource (capacity, space)*	Women in Mozambique have been gleaning and mosquito net fishing in shallow water sand and seagrass beds for many years, but recent co-management efforts to expand closed zones and shallow oyster mariculture have failed to successfully integrate these women, meaning they are forced out of their traditional fishing grounds.	Kenyan Mama karangas often buy undersized species which are considered trash fish that they are able to repurpose as nutritious and available food for the community, but which are caught using illegal gears. If and when regulations are tightened up they will lose access to this catch, their livelihoods and this nutritional contribution.	Local aquaculture projects in British Columbia supported by the Canadian government are considered a threat to sablefish as the facilities are located in inlets providing important habitat for young sablefish and may undermine the economic viability of the wild capture fishery.	
	Competition from commercial/industrial actors	Small-scale lobster fishers in Mexico are being out-competed by industrial shrimp boats which are able to harvest multiple species at a time.	Small-scale Zambian tilapia farmers struggle to compete with commercial companies, three of whom dominate the market, set the price and largely govern the value chain.	The Seychellois inshore trap fishery is fairly diverse and resilient, however the offshore semi-industrial fisheries are open access with recent large increases in efforts to boost incomes but declines in catches. These fishers may move inshore threatening the trap fishing grounds.	
	Competition from alternative/cheaper products	Mass mortality of yellow clams in Uruguay due to ocean warming with limited recovery has meant severe loss of income for processing plant owners, leaving unmet demand in local markets which is rapidly being filled by cheaper imported clams.	All Zambian tilapia production is threatened by the introduction of cheaper Asian tilapia, however this product provides affordable fish for some experiencing food insecurity.	Production of seaweed by women in Zanzibar is threatened by competition from cheaper products from Indonesia	
	Volatility and changing demand	Traders from Angola, Namibia and DRC are beginning to come to Zambia as domestic demand can no longer be met, as value increases may be higher in these markets, alongside unfavorable exchange rates, these traders have more buying power than the women's network traditionally controlling local distribution.	Middlemen in Kenya can operate on hugely differing scales. Smaller-scale middlemen with much of their capital tied up in credit arrangements may be quickly forced out during periods of volatile pricing by larger, more stable middlemen financing their own boats.		
Food security and nutrition	*Reduced local availability/affordability*	Small dried fish from West Africa are an important, affordable source of essential nutrients for local communities but increasingly being bought up at higher prices for fish meal production in industrial-scale			

		plants.			
	Increased availability of nutritionally poor imports	Intergenerational knowledge loss and changing food preferences for convenient and cheap high-calorie foods have led to declining herring consumption and increasing health problems amongst Comox First Nation fishing communities in Canada.			
	IUU	Illegal itinerant divers may take oysters and lobsters from traditional concessions in Punta Lobos, Mexico, reducing the catch of local fishers			
	Banned gear/methods	Mosquito net fishing is viewed as a growing threat to coral reef fishers of Mozambique, but is an important source of food and income for marginalized people unable to access the fishery with formal gears.			
Opportunities		**Examples from case studies**			
Investments/technologies	*Better shared resources and infrastructure*	The commercial sector and infrastructure for tilapia farming in Zambia have vastly improved in the last 10 years, the benefits of which should be better shared with small-scale farmers by building relations so that they can be inclusively integrated into the value chain.	Agreements between Californian community supported fisheries and other port and coastal users could be fostered to better enable shared infrastructure needs (space is very limited). For example, new partnerships are being explored for fishers to work with other sectors that could be complementary such as aquaculture and the ocean energy industry.		

	Access to credit and business expansion	Greater access to loans and credit for small-scale carp farmers in India would facilitate expansion within already highly suitable environments by enabling investment in high quality feeds and achieving economies of scale.	Replacing informal loan shark arrangements with formal co-operative bank loans to start revolving funds cuts interest rates and permits more borrowing over time has enabled expansion for small-scale carp farmers in Myanmar.	Village savings and loans associations (VSLAs) provide community-supported access to credit for women mosquito net fishers in Northern Mozambique, meaning the income from this illegal but informally tolerated activity can be invested in alternative small-businesses and lifestyle improvements such as education and housing.	
	Access to technology and equipment (increased efficiency, quality)	Opportunity to increase productivity of the tilapia aquaculture in Kenya through high-quality, locally produced feeds that are affordable to a growing number of producers, additionally bolstering small-scale agriculture.	Tubular nets for seaweed farming in Tanzania offer opportunities to mitigate impacts of climate change and empower women to be more competitive through higher-value products.	While the majority of members own fishing equipment, the number of equipment items per person is very low. This indicates that there may be scope for more investment and the opportunity to enhance the overall productivity of members, particularly in the inland fishery.	
	Increased storage & transport capacity	Improved availability of cool storage boxes, ice, and credit support for things like transport costs have increased the purchase and selling power of female fish traders in Kafr el Sheik, Egypt.			
Markets	*Increasing demand for product*	In Kisumu, Kenya there is an opportunity to meet growing demand for animal protein (fish) and micronutrients in the province and in the country through targeting school lunches, additionally providing better nutrition for children's physical and cognitive development.			
	Diversification (new resources and demand)	Diversifying Madagascar's relatively well-equipped shark fishers away from this boom and bust fishery to more productive species serving domestic markets, through efforts like gear exchanges for smaller gillnets, may provide a more stable	A range of species exist in Zambia which could diversify aquaculture production and lessen the temptation to illegally stock invasive species.		

		income and contribute more to domestic food supply.			
	Access to e-commerce	Mitten crab is very suitable as a fresh food e-commerce product for farmers in Jiangsu Province, China, as crab can survive several days long distance transport using simple ice boxes. The online sales of mitten crab have increased rapidly as market demand has diversified.			
	Value addition	Opportunity for small-scale Chinese tilapia farmers to expand to simple processing as tastes change and demand for fillets in urban areas increases, but control of processing activities by large parent companies over sharecroppers needs addressing.			
	Improved market access/connectivity	Uruguayan clam processing plants may be certified by DINARA, which provides strict inspections of the product stored at the processing plant (testing concentration of toxins and organoleptic quality) to authorize its sale to wider markets.	Enabling Mozambican mosquito net fishers to dry fish with basic equipment would improve access to sporadic rural traders who will pay a premium for dried fish for more distant domestic markets and boost incomes even in the rainy season.		
Improved rights, access and equity	*Gender mainstreaming & inclusion*	Efforts have been made in Mexico to enhance the role of female processing plant workers, via fishing cooperatives, into new roles in administration, technical staff positions, and production, primarily in aquaculture and mariculture which is consequently expanding.	Legal recognition of the status of 'assisting spouse' is considered a significant step for women in fisheries and aquaculture in France, giving women the right to represent the company, participate in related representative organizations, and access to vocational training.	There is a unique opportunity to work with rural freshwater fisherwomen in Fiji to improve handling and hygiene standards, and the product that gets to market, connect them better to markets and provide education to better understand how changing land-use practices are impacting their resources.	

	Increased inclusion in governance (see below)	Immigrant fishers are rarely if ever included in management decision-making in Palau. There are opportunities to include a more diverse set of stakeholders in discussions about the sea cucumber fishery's recovery, and new funds for aquaculture could be expanded to include immigrants and women.			
	Access to collective action groups	Collective action among Egyptian female fish traders has aimed to improve their bargaining power and market access through support from international projects and advocacy.	The Caribbean Network of Fisherfolk Organizations is part of an enabling regional framework and mechanism that can facilitate support to small-scale production systems. The challenge is – as in many cases, the insufficient application and operationalization.	Under institutionalized co-governance in Uruguay, fishers and intermediaries of Rio Negro put back into operation the icemaker and cold storage room for fish. Moreover, illegal fishing was mitigated with 10,000 m of illegal nets replaced after agreements with fishers.	
	Social development (healthcare, sanitation, water, literacy)	To date, the Machhiyara communities of Gujarat, India, have been completely ignored in governance regimes. A basic income supplement, provision of basic but reliable health care, sanitation, and drinking water, and literacy training are some of the many interventions that are needed to ensure their fishing activities remain viable.			
	Economic development (increasing incomes)	Moaming is a major tilapia producing area of China, but as farms for other species such as crucian carp and pangasius enter the region there is increasing demand for semi-skilled workers whose wages have increased rapidly, doubling in 10 years.			

Improved governance	*Enabling governance structures*	There are increased efforts in Fiji and the Pacific region to better consider gender and social inclusion in small-scale/coastal fisheries. Advocacy by NGOs has helped support draft national management plans for key fisheries and influence national level policy for better enabling governance for marginalized fishers.	Institutionalized co-governance and clear access rights in Uruguay improved the transparency, accountability and legitimacy of fisheries management, and has empowered the local community of Barra del Chuy, whose members are proud to be clam gatherers ("almejeros").	The political will to establish aquaculture in Zambia is much higher than in neighboring countries and Zambia has tremendous potential for small-scale producers.	CSFs provide a viable model that, although limited, might provide inspiration and opportunities for adaptation for the industry, government, regulations and further interest from consumers in other geographies, socio-economic realities.
	Improved management capacity	MSC certification, fisheries improvement projects (finfish), voluntary marine reserves and ecological restoration projects have resulted in increased government support through infrastructure (roads, electricity) and awards, as well as philanthropic support for improvement projects in Baja, Mexico.	The Tasmania abalone fishery is one of the most valuable fisheries in the world and as such is well regulated. Amendments in Total Allowable Commercial Catch have led to improvements in some areas and such precautionary measures are likely to support the fishery into the future.		
	Improved environmental management	Exclusive access rights, local infrastructure and social capital has enabled Chilean hookah fishers to maintain stocks and quality of resources. Ideas for voluntary marine reserves and restoration projects are now underway to maintain and enhance this success.	Increased understanding of flood protection value of urban water bodies by city planners in Dhaka, Bangladesh may better protect urban fishing grounds for local throw net fishers.	Efforts are now underway to monitor, manage, and farm sea cucumbers in Palau. "Transplanting" sea cucumbers from abundant areas to over harvested areas has been practiced in Palau for decades, possibly centuries.	
	Improved socio-economic management	Popular and well-tested local management tools in Palau include 'bul', or temporary restrictions on harvest - especially area-based restrictions, and the prohibition on marketing/selling.			
Alternative livelihoods	*Capacity building, education, training*	Opportunities for training and education in shellfish farming exist in France, particularly of interest for women who currently have the status of 'assisting spouse', enabling them to manage their own farms or take on management roles.			

	Support for new businesses	Female co-operative efforts to pool resources from mosquito net fisheries in Mozambique have been successful in becoming competitive, access to additional credit or savings schemes would provide next steps to development of small businesses outside the fishery, reducing this illegal activity.			
	Knowledge exchange	There may be opportunities to create greater connections between gleaners marginalized for gender or ethnicity reasons and those who have knowledge of traditional practices for sustainable harvesting (mainly older Palauan women).	Enhanced peer-to-peer knowledge sharing about fish farming practices (rather than top down from the Fisheries Department) would provide Indian carp farmers in Kerala with more consistent support and ability to expand.		
	Increasing local job provision/diversification	The K'ómoks in Canada have been resourceful and entrepreneurial, diversifying their income sources. A number increasingly cater to tourism by hosting individuals and running trips, providing an opportunity to learn about the rich history of the community.	Development of “pesca-tourism” as a diversification opportunity related to shellfish farming in France has presented alternative livelihoods for 'assisting spouses' of oyster farmers; welcoming groups to the farm, presenting their product for tasting and hosting tours.		
	Maintain social identity of actors	The Barotse floodplain is a lifeline for thousands of Zambian people. The entire Lozi culture, history and traditions is associated with the floodplain and preservation of this fishery and the associated livelihoods is critical and there is great potential for effective buy-in to co-management which focuses on this.			

	Better recognise food & nutrition security contributions (alongside rents)	An effort to transition perceptions of Yellow clams away from “bait” towards “high-quality seafood product” for human consumption improved the economic situation of the local community in Uruguay, evidenced in the marked increase of unit price and the societal valuation of the product.	Dried fish traders play an important intermediary role, aggregating dried fish and ensuring its distribution throughout the country, often overlooked in assessments of food security contributions. As Myanmar’s food system modernizes further, enabling these traders to adapt to demand for improvements in quality, food safety, packaging and traceability will be a key opportunity.	Very small-scale women traders of the Giriama in Kenya who sell cheap, small fish to local people, often the most poor, provide an irreplaceable service for food security. Such actors who are extremely vulnerable to shocks and who may buy only from illegal gears (what they can access culturally) need support and inclusion to make sure this service is not lost	
	Re-focus on supporting adaptive capacity (social & environmental stressors)	Pre-existing experience in adaptation to environmental stressors in Chilean mussel mariculture is now being supported by a willingness to invest in early warning systems for harmful algal blooms.	Exclusive access rights, extensive infrastructure and financial and social capital has enabled the Mexican benthic hookah fishers of Baja's cooperatives to adapt and face climate and market shocks.		