Name of the case study	Northern Pacific Rim -Revitalization of indigenous technologies and traditional management system to restore social-ecological resilience -USA, Canada [Transformation]	
What about this case makes it interesting? How does this case contribute to understanding of resilience and/or regime shifts in the Arctic?	Pacific salmon is a key species for Indigenous communities around the Northern Pacific Rim. They have harvested the salmon for more than 10.000 years, reproducing their knowledge, culture, beliefs, institutions, and food systems around this species. Through generations, they have established a sustainable management system, using several technologies based on their knowledge. Colonial policies, industry expansion, and climate change, are constraining the community´s-salmon relation. Colonization disrupted this traditional management system, introducing new management based on mixed-stock fisheries. This contemporary system denies Indigenous communities the right to access and manage their resources. Furthermore, it vanishes the use of traditional fisheries technologies (weirs, seine nets, dip nets) and the knowledge encompassed in these practices, generating ongoing conflict, and influencing the values of the system. Other exploration projects such as dams and mining have destroyed salmon habitat, causing a decreasing Salmon population. In addition, climate change has intensified the impacts on salmon's habitat and stock, contributing to the collapse of many commercial fisheries' stocks. Regardless of social-economic and environmental challenges, indigenous communities have been able to keep their traditional knowledge. There is increasing recognition that Indigenous knowledge and management systems can restore the productivity and resilience of aquatic ecosystems and fisheries. Although local governments keep using a modern fisheries approach, several initiatives in the area recognize the value of traditional management and use it to improve salmon populations and monitor the ecosystem.	
Templated completed by: *Main contributor	Carla Lanyon, Stockholm Resilience Centre Juan Rocha, Stockholm Resilience Centre	**Key references: Cite in the text using (1), (2), (3) etc. and provide a reference list at the bottom of the template.** (1) Atlas, W. I., N. C. Ban, J. W. Moore, A. M. Tuohy, S. Greening, A. J. Reid, N. Morven, E. White, W. G. Housty, J. A. Housty, C. N. Service, L. Greba, S. Harrison, C. Sharpe, K. I. R. Butts, W. M. Shepert, E. Sweeney-Bergen, D. Macintyre, M. R. Sloat, and K. Connors. 2020. Indigenous Systems of Management for Culturally and

		Ecologically Resilient Pacific Salmon (Oncorhynchus spp.) Fisheries. BioScience(biaa144). (2) Malick, M. J., M. B. Rutherford, and S. P. Cox. 2017. Confronting challenges to integrating Pacific salmon into ecosystem-based management policies. Marine Policy 85:123–132. (3) Grant, S.C.H., B.L MacDonald, and M.L, Winston. 2019. State of Canadian Pacific Salmon: Responses to Changing Climate and Habitats. Can. Tech. Rep. Fish. Aquat. Sci. 3332. ix + 50 p. **(*) Mainly all the information comes from (1). Otherwise, is explicit cited**

Reviewed by (name and affiliation)								
Category	**Resilience/ Adaptability**		**Loss of resilience**		**Transformation**			
					X			
Case study details:	**Country**	**Place**	**Scale – space**	**Scale – time**	**Sector(s)**	**Other (e.g. disturbance)**		
	Canada USA	Northern Pacific Rim		1800-2020	Fisheries			
Drivers (mark with X in appropriate boxes)	**Climate**	**Geopolitical**	**Mineral/ oil extraction & infrastructure**	**Tourism**	**Shipping**	**Biological invasion**	**Rapid demographic change**	**Other: Socio-economic**
	x	x						

	Biophysical:	**Social**
1. **Basic description of coupled**	a) What types of ecosystem(s) and other major biophysical features are present?	c) Who are the key groups of people in this case?

social-ecological system in focus **(**What are the key components and stake holders) If possible draw a systems diagram or conceptual map of the case – this can be a series of diagrams to capture different periods in the case and the drivers/ actors/ events that characterize the period.	Ocean, rivers, lake, the coastline in the Northern Pacific Rim b) How are the case boundaries defined in terms of ecosystems or biophysical characteristics? The Northern Pacific Rim delimits the boundaries of the system.	First Nations from Canada in the Northern Pacific Rim. First nations are Indigenous people who are not Inuit or Métis. Indigenous communities from Alaska d) What kinds of livelihoods are important in the system? Traditional fishing uses indigenous technology connected with the ecosystem, respecting the life cycle, and protecting biodiversity. They practice selective harvesting, secure the rights for other tribes to access salmon. Indigenous management focuses on future generations guided by traditional knowledge and law. They have complex institutions of governance that protect the spiritual world and have stewardship practices that reinforce the sustainable management of salmon. Contemporary management system: Promotes commercial fisheries focusing on profit in the short term. It uses a mixed-stock harvest to maximize the catch affecting the biodiversity of the ecosystem. e) What institutions are key to this case? Indigenous governance institutions. Each tribe or nation has its law and management system based on traditional knowledge recognizing the deep connection between human nature. Values and beliefs reinforce these laws. Canada and United States Government: -Fisheries and Ocean departments

		- Wildlife department f) How are the case's boundaries socially defined, and how do these social boundaries relate to biophysical boundaries? In this case, the area is defined by political boundaries, the Canadian and USA area of the Northern Pacific rim.
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2. **Timeline** Draw a timeline of *key* events/ developments to the case. Define the time period (decades – centuries) over which change is considered, Provide a brief description of event/ actors, and ecological impacts Is it possible to identify periods of change from one type of system to another, transformations? Identify disturbances or events that challenged, built, or reduced resilience or adaptive capacity in the system. Consider both biophysical and social dimensions. Mark particularly significant events with *.	1870´s: Colonial jurisdiction and law excluded Indigenous fishers from the use of fish traps and weirs 1879: Introduction of European technology in the river. They constructed salmon traps. 1904- 1904: Weirs were forcibly removed by the federal government affecting the Indigenous management of salmon. Causing conflict and starvation in Indigenous communities. 1034-1959: Fish traps were banned from Oregon to Alaska due to the decrease in the salmon population. Before, there were no restrictions on salmon catch leading to overharvesting. 1946: Department of Marine and Fisheries installed a weir to monitor the abundance of returning adult salmon. This technology was similar to the traditional technology used by Lake Babine Nation. 1960´s: Authorities recognized the critical state of salmon. To protect salmon stock, they reduced the commercial licenses and fishing boats in remote and indigenous communities. 1965-1970: Combination of artificial spawning channels and weirs supports food, and traditional and commercial fisheries, creating a sustainable local economy for indigenous communities and the local population. 1985: Pacific salmon Treaty (PST) to have cooperative management of ocean salmon fisheries between the United States and Canada 2008: Re-installation of weirs in Lake Babine. The use of this technology provides data for conservation, and in combination with artificial spawning channels, they have supported food security, cultural traditions, and commercial fisheries, creating a sustainable local economy. 2013: Re-installation of traditional weir system in Koeye River by Haílzaqv nation to monitor the returning salmon abundance. 2019: Pacific Salmon Treaty (PST) was updated, enhancing bilateral management of salmon fisheries. This agreement defined management objectives, allocation, and monitoring systems in both countries. These elements are defined with few participation of indigenous communities.

	2019: Lowest caught and value of salmon in Canada, forcing commercial fisheries to close.	
3. **Disturbances** What are the key disturbances in the system (present and past)	a) Have there been major biophysical disturbances that are relevant for the case? - Change in fish distribution and abundance of key species - Marine heatwaves and drought are increasing in their frequency affecting the salmon population	b) Have there been major social disturbances that are relevant for the case? -Reduction of commercial licenses and fishing, affecting the access to salmon-fishing livelihoods and food security. -Pacific Salmon Treaty defined the management of salmon fisheries. Central authorities set the agreement without addressing indigenous knowledge and values. -Conservation conscience in the government increase due to the decrease of fish stock, acknowledging indigenous technology to have sustainable management of salmon.

4. **Drivers of change** Clarify what impacts these drivers have on the SES and if these are direct or indirect.	a) What are the key biophysical drivers of change? -Climate change has increased the temperature of the ocean affecting zooplankton composition and changing species composition. The increase of temperature Climate change has also affected freshwater bodies, accelerating the stratification of the sea. change in the climate had increased the event of floods and changing the precipitation altering the river's landscape (3). -Land-use change. Change in the landscape by the development of mining, dam construction, and other exploitation projects.	b) What are the key social drivers of change? - Colonization: Colonial laws excluded indigenous management systems and technologies to harvest salmon, affecting indigenous livelihoods. -Commercial fisheries introduction -Land-use change to develop agriculture, mining, urbanization, forestry practices alters the freshwater habitats salmon rely on for and part of their life cycles. These activities contribute to deforestation and water extraction and increase inputs of nutrients into freshwater ecosystems (3)
5. **Sources of adaptive capacity:** What factors allow(ed) the system to adapt to disturbances in the past and present? Give a brief assessment of recent or on-going changes (+/-/0 = increasing/ reducing/ not affecting adaptive capacity)	a) Within the ecosystem? (-) Decrease in biodiversity due to the development of mixed stock fisheries (+) Salmon populations remain resilient and often highly productive, despite the effects of climate change in salmon populations. (+) The use of selective catch techniques allows access to healthy populations. (+) Salmon possess biological traits that confer a remarkable ability to cope and recover from change	b) Within society (e.g. people, social capital, management, institutions, infrastructure): (-) Top-down governance reduces the agency of local communities and decreases access to salmon. (-) Contemporary fisheries and technology focused on maximizing the catch using mixed-stock harvesting. (-) Change in the land use affecting rivers and lakes landscape. (-) Lack of baseline data on the salmon abundance, run timing, and harvest rates in mixed-stock fisheries (+) Revitalization of indigenous technologies and management systems as an alternative to sustaining ecosystems.

		(+) Positive experience in integrating indigenous knowledge in fisheries is used as a reference point to transform the system. (+) Indigenous fishing managed at a scale of a single river maintained biological diversity and limited the geographic scope of harvest impacts, garnered broad participation, and created diverse, interconnected governance systems. (+) Indigenous fishery management is also grounded in a multigenerational understanding of the links between salmon, people, and ecosystems, promoting adaptive learning.

The next two sections break down the information in Section I. While it is not necessary to fill these sections, if you have additional information pertinent to specific rows below feel free to enter the material.

II.1-8 SES, resilience and adaptive capacity

	Biophysical	**Social**
II.1. Where do we find change and resilience in the face of change?	a) Within nature: Change: Salmon have experienced climate-driven declines in survival at sea and freshwater, contributing to the collapse of many stocks that formerly supported major commercial fisheries. Marine heatwaves and drought are increasing in their frequency, causing acute short-term impacts on salmon survival.	b) Within society: Change: Colonization installed a commercial fishing industry replacing indigenous management systems. This modern system modifies the values and understandings of fisheries. Their goal is to maximize production and satisfy market demand. This new model introduced new technologies vanishing traditional ones affecting communities' livelihoods, knowledge, and culture. The modern approach to salmon and other exploration projects

	Resilience is found in: Salmon populations remain resilient and often highly productive, despite the effects of climate change in salmon populations.	such as dams, mining, and agriculture leads to salmon habitat destruction and a decreasing salmon population. Nowadays, there is a transformation going on. Indigenous and non-indigenous people use traditional tech to have sustainable management, acknowledge the value, and revitalize Indigenous knowledge and techniques. Resilience: Despite the colonization and commercial fisheries establishment, indigenous communities are returning to their traditional practice and are recognized as a path for sustainability.
II.2. What are the system's key components?	a) Key Ecological components (e.g. lakes, coastal zones, caribou) Five types of Pacific Salmon Canada (DFO): Sockeye (Oncorhynchus nerka), Chinook (O. tshawytscha), Coho (O. kisutch), Pink (O. gorbuscha) and Chum (O. keta). These salmon are anadromous and semelparous, meaning they migrate from the ocean to freshwater to spawn, and die shortly after spawning (3) Pacific Ocean, coastal zones, rivers, lakes,	b) Actors in society (e.g. individuals, groups, public or private organizations)? How are people organised – by geography, livelihood, family, etc.? Indigenous communities followed a hereditary management authority and property right system access, following the reciprocity rule. Communities had clear rules around salmon rights and how to manage them sustainably. Contemporary fishers follow top-down policies and have access to the resource according to the fishing licenses.
II.3. What are the key linkages? E.g. ecosystem	a) From nature to society (e.g. ecosystem services) - Primary production	b) From society to nature – modifying nature, extracting resources (e.g. hunting, mining, water pollution)

services, resource extraction. These linkages should exist. If there are not mutual links between social and ecological components the case is not a social-ecological system.	- knowledge and educational values - traditional livelihoods.	Fishing using indigenous technology such as fish traps, reef nets, seine nets, and fish wheels. Fishing follows a modern management system.
II.4. What are key interactions?	a) What are the key ecological interactions within the case? Salmon have a key role in the function and structure of several ecosystems (2). In freshwater, salmon provides marine nutrients (e.g. nitrogen and phosphorus) and organic elements (e.g, organic carbon) to aquatic and terrestrial ecosystems. It is an important food source for different animals, including birds, bears, whales, seals, and sea lions. Salmon cycle life requires several ecosystems such as rivers, lakes, and ocean environments to span and complete their cycle (2). Climate change has increased the ocean's temperature affecting zooplankton composition, decreasing the survival of salmon populations. Warmer temperatures also change the distribution of prey species from the south to the north. Warmer water species have a smaller size and less percentage of fat. Therefore, they are not a proper source of food for species higher up in the food chain, like salmon (3). Climate change has also affected freshwater bodies. Earlier	c) What collaborations, conflicts, or other key linkages exist between actors? The traditional management system worked in cooperation and respect to the different tribes among the river. For instance, multiple weir (kóonse) locations co-exist in one river. Integrating indigenous technology into commercial fisheries has led to cooperation between distributors and indigenous and non-indigenous communities. Indigenous tech such as reef nets allows it to have a selective target providing high-quality and high-value salmon for consumers. Distributors have quality products, and indigenous communities' fish in their traditional techniques. Indigenous communities cooperate with conservation organizations, transferring their fishing techniques. For instance, the use of seine nets to have a selective harvest. Collaboration between Indigenous fishers, Fisheries, and Ocean Canada and fishers to monitor sockeye, coho, and steelhead using dip nets (traditional technique) to capture and mark the fish. Other examples of national institutions and

	snow melting contributes to the freshening of the coastal Northeast Pacific. Warmer freshwater accelerates the ocean stratification limiting the nutrients available for algae growth which is the salmon food web (3). b) What are the most important biophysical tele-connections to distant systems? Due to salmon's migratory life, any disturbance in the different ecosystems will affect the population. For instance, the land-use change has affected the rivers impacting the salmon's habitat, the overexploitation in other parts of the Pacific Rim will affect salmon distribution.	indigenous fisheries cooperation in monitoring species are fish wheels. As part of a colonization process, the centralization of the authority cancels the power of the community to decide regarding salmon´s harvesting, disabling their right to practice their culture. Mismatch policies have impacted the use of indigenous technologies that support the sustainability of the system. Furthermore, the new governance system supports the increase of commercial fisheries with a short-time perspective and modern technologies that aim to maximize the catch using mixed-stock harvesting, decreasing the population of salmon. The land-use change driven by the development of projects such as mining, dams, and deforestation has affected the landscape and the composition of rivers and lakes, decreasing the survival of salmon. d) Between local actors and distant actors? Central authorities manage modern salmon fisheries at the national level. The USA and Canadian governments create bilateral agreements without integrating local communities into the decisions. There is a mismatch between management decisions and salmon's life and migration patterns that affect salmon populations. Colonization's legacy. Indigenous communities and national governments are still in an ongoing conflict. The integration of traditional knowledge may support a reconciliation process.

II.5. Culture	a) How is the relationship between society and nature viewed? Indigenous communities have deep stewardship connected by the knowledge of the ecosystem. Their traditions are based on natural cycles of life, building a reciprocity relation, expressed by practices, taboos, and laws, promoting the sustainability of the salmon. b) What meanings are attributed to nature and to interactions with nature? Nature is their source of life. Their livelihoods and culture are rooted in the landscape and ecosystems. Harvesting salmon is a representation of the stewardship of the community. Salmon connects indigenous people to place; it allows them to have a source of food and reproduce and transmit their culture.	c) What are key cultural features of relevance for the case? Harvesting traditional food, sustaining oral history, and transmitting stewardship knowledge are key cultural components. These elements are reproduced through sharing and reciprocity principles. Salmon is how these features connect with the landscape, supporting food security and cultural identity. Indigenous technologies also represent an important cultural element through antique techniques, communities connected with history, nature, and landscape. d) What are key cultural practices and beliefs related to nature? Communities believe that salmon want to support people by giving themselves. Therefore, communities have several practices related to gratefully and to protect them. Firstly, the Salmon Ceremony is a celebration to honour the salmon and encourage them to return to the area and provide food. There is a short commemoration during this ceremony, leaving the first group of fish to go to the spawning area before fishing starts. Cultural beliefs around weirs. Oral history narrows the importance of weirs in Haílzaqv territory. A supernatural carpenter constructed the first weir. This trap was created to nourish the first ancestor of the village Tiásu in Húayta.

II.6. Disturbance What are important types of stress & shock	a) Describe important biophysical or ecological shocks and stresses (e.g. floods, storms, etc). Impact on the population of listed species such as chonook, coho, and steelhead due to the mixed-stock technique. During the 1990s and the 2000´s declining returns of adult chinook salmon and chum salmon in Western Alaska. (2) Dramatic declining of sockeye salmon in British Colombia (2) Marine heatwaves and droughts are more frequent affecting the survival rate of salmon Heatwave nicknamed “The Blob”, from 2013-2016 affected the area producing physical and biological changes (3). Due to climate change, there is an increase of floods, precipitations in the area affecting the river's temperature and landscape (3).	b) Describe important social shock and stresses (e.g. austerity policies, changes in government policy, introduction of new technologies, etc) Introduction of new techniques of harvesting related to commercial fisheries focus on efficiency and maximizing profit. They used a mixed-stock harvest overlapping population in space in time. Most of the gears used are non-selective. They based the practices on science and technical criteria with a lack of integration of indigenous knowledge. Fisheries policies that don't consider the life cycle of salmon across the ocean and freshwater bodies. Collaborative experiment with an NGO and commercial fisheries using indigenous tech to have selective harvesting and improve salmon and other species abundance. The results of the experiments present indigenous tech as a feasible tool to sustainable management in fisheries. Successful developments of projects that re-introduce indigenous technologies. For instance, the Lax Kwálaams fish trap pilot project was used for monitoring and improving the salmon management system, led by Lax Kw'alaams First Nation. This project aims to promote this tech to have a selective harvest, decrease the mortality of non-target species and collect data from the monitoring to improve the management system. Another example is the renaissance of reef neets within indigenous (e.g. WSÁNE´C Nation; Lhaq´temish fishers) and non-indigenous fisheries; the use of fish wheels by the Nisgaá Nation in a contemporary form; the use of seine nets in Wet´suwet Fisheries and Oceans Canada. - Fisheries Resources Reconciliation Agreement

		(FRRA) with Canada's Department of fisheries and oceans. The agreements establish First Nations to be co-managers of fisheries. State and federal agencies are creating policies to implement ecosystem-based management (2). Reduction of commercial licenses and fishing, affecting the access to salmon-fishing livelihoods and food security.
II.7. What are key slow variables Changes that occur over decadal or longer time scales	a) What types of ecological processes (e.g. loss of permafrost, shifts in species composition) are driving important long-term changes in ecological structures and processes? Climate change has increased the temperature of the ocean affecting zooplankton composition. Change in the distribution of prey species from the south to the north. Freshening of coastal Northeast Pacific. Stratification of the ocean	b) What types of slow social processes (e.g. aging, population growth, loss of language) are driving important changes in social institutions and behaviours? Colonization denied the access of indigenous communities to salmon. This exclusion from fisheries resources and decision making drastically undermined traditional livelihoods and created food insecurity among Change in the governance of the resource introducing policies with a lack of local perspective. Centralization of the authority cancels the power of the community to decide regarding salmon´s harvesting, disabling their right to practice their culture. Conservation consciousness: The drastic decrease of salmon stock promoted the conservation and the implementation of ecosystem-based management. One of the alternatives to promote this type of governance has been revitalizing indigenous technologies to improve the ecosystem's quality and generate accurate data according to local reality. Revitalizing Indigenous technologies and management

		systems communities reconnect salmon stewardship with harvest, Indigenizing education, and perpetuating culture through intergenerational knowledge transfer. Fisheries reconciliation processes are emerging in Canada with the potential to strengthen the legitimacy of management frameworks.
II.8. Relationships with ecological regime shifts	a) Are ecological regime shifts driving further ecological change or pressure? Climate change is changing the ocean and water bodies' landscape, composition and structure of the ecosystem affecting the rate of survival of Salmon (3). b) Are external or internal ecological dynamics potentially or producing ecological regime shift(s)? The quality of food for salmon and the changes in the different habitats his decreasing salmon´s populations (3)	c) Can social stresses or major changes be attributed to ecological regime shifts? Yes, a decrease in salmon stock and other species recognized as endangered species increased the consciousness about the need to have sustainable management. This awareness led to the integration of traditional management and techniques in certain areas, revitalizing the Indigenous practices. d) Are there specific social practices that might be contributing to ecological regime shifts Yes, commercial fisheries and colonial policies focused on maximizing the profit and catch, leading to a degradation of the ecosystem and decreased salmon and other species populations.
II.8 Regime shifts	**If a regime shift exists and is important to this case describe it below.** Please indicate whether the regime dynamics are well-established, contested, or speculative.	
II.8.a. Detailed description of alternate	Briefly describe the structure of each regime. What does each regime look like? What are differences in ecosystem structure and function? (e.g. permafrost loss, vegetation change)?	

regime shifts A case study can contain more than one type of regime shift	The indigenous management system focus on subsistence activity, where local leaders manage the system based on their traditional knowledge. With a sense of cooperation, fishers depend on trade or family networks when run fails. The methods employed by Indigenous salmon fishers varied widely but very often included fishing technologies that support selective harvest and release of non-target species. Contemporary management fisheries: Focused on commercial fisheries have centralized the authority, where policy and managers decide, local government has limited influence in policy management. They based the practices from science and technical criteria on a lack of integration of indigenous knowledge. To maximize profits in an efficient system, they used several techniques based on mixed stock, contributing to the collapse of fisheries in the past 200 hundred years.	
II.8.b. Feedback mechanisms within the system that maintain each regime	Ecological feedback mechanisms Climate change is recognized as the main ecological driver for the decrease of salmon stock. Warmer ocean has changed zooplankton composition, decreasing the survival of salmon populations. Warmer temperatures also change the distribution of prey species from the south to the north. Warmer water species have a smaller size and less percentage of fat. Therefore, they are not a proper source of food for species higher up in the food chain, like salmon (3). Climate change has also affected freshwater bodies. Earlier snow melting contributes to the freshening of the coastal Northeast Pacific. Warmer freshwater accelerated the ocean stratification limiting the nutrients available for algae growth which is the salmon food web (3).	Social feedback mechanisms As part of a colonization process, the change of governance of the resource by centralizing the authority cancels the power of the community to decide regarding salmon´s harvesting, disabling their right to practice their culture. The lack of participation of local communities has generated several mismatches in policy and has impacted the use of indigenous technologies that support the sustainability of the system. Among these, the new governance system supports the increase of commercial fisheries with a short-time perspective and modern technologies that aim to maximize the catch using mixed-stock harvesting, decreasing the population of salmon. The land-use change driven by the development of projects such as mining, dams, and deforestation has affected the landscape and the composition of rivers and lakes, decreasing the survival of salmon. The drastic decrease of salmon stock has promoted the conservation and the implementation of ecosystem-based

		management. One of the alternatives to promote this type of governance has been revitalizing indigenous technologies to improve the ecosystem's quality and generate accurate data according to local reality. This transformation of the system aims to combine different management systems to sustain indigenous and non-indigenous fisheries.
II.8.c. What key changes drive regime shifts? Describe how these changes alter the state of the system or feedback processes.	a) Drivers of ecological regime shifts (either social or ecological). Climate change Land-use change affecting freshwater bodies b) How do these changes alter biophysical feedback processes? Salmon cycle life requires several ecosystems such as rivers, lakes, and ocean environments to span and complete their cycle. Any change in their habitats will affect the salmon population and their function in the system (2). For instance, it will affect the supply change since it is an essential food source for several species. Will affect the provision of marine nutrients and organic element to the freshwater	c) Drivers of social regime shifts (either social or ecological). Colonization and post-colonial practices Land-use change due to exploitation projects The centralized governance system concerning salmon d) How do these changes alter the social feedback processes? The driver has decreased the space for indigenous communities to implement their traditional system and has generated several impacts on salmon´s habitats.
II.8.d. Ecosystem services substantially impacted by regime shift	a) Changes in ecological processes that produce ecosystem services Salmon provides several ecosystem services across different ecosystems. Contributes to ecosystem function, food provisioning (commercial and subsistence, recreation, and cultural services.	b) Changes in demand for ecosystem services (market and non-market)

II.8.e. What is (+/-) impacted by changes in ecosystem services directly or indirectly	a) Impacts from regime shift on ecological components - Loss of cultural and indigenous practices - Change in the food chain that may affect salmon predators	b) Impacts from regime shift on social actors Affect the agency and sovereignty of indigenous communities (shift from traditional to contemporary)
II.8.f. Potential cascading effects	Describe, if any, the likelihood of potential ecological cascading effects to other SES Due to the key role of salmon among the different habitats. A decrease in the population could decrease marine nutrients and organic elements to the freshwater and change the food chain.	Describe, if any, the likelihood of potential social cascading effects to other SES If the system transforms and integrates Indigenous knowledge and techniques, the system may recover resilience capacity. On the contrary, a failure in the integration of different management system could exacerbate the conflict between indigenous communities and national authorities
II.8.g. Where do actors intervene to alter regime shift dynamics and who can do the intervening? This can be listed here or marked with (*) in the table above	Ecological oriented interventions Conservation and fisheries institutions National authorities	Socially oriented interventions Indigenous communities and local fishers National authorities NGO´s

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(4)	
(5)	

GLOSSARY OF TERMS IN THE TEMPLATE

Actor	We use this term generally to look for individuals, groups, organisations, and so on that structure actions and/ or are stakeholders.
Adaptive capacity	Is the capacity of actors in the system to manage resilience in order to stay within a desired state during periods of change. This is related to the diversity in the system behind the provision of a function.
Disturbance	This refers to any disturbance to the system, regardless of scale, duration, intensity and frequency. See shock and stress.
Driver	Actor or process that directly or indirectly affects change in a social-ecological system. External means that the system in question (the scale being looked at) is unable to affect the driver in question – there is no feedback from the system to the driver.
Ecosystem services	The goods and services humans derive from ecosystems. These include: provisioning, regulating, cultural ecosystem services respectively.
Feedbacks	A change within a system that occurs in response to a driver, and that loops back to control the system. A feedback can help to maintain stability in a system (negative or balancing feedback), or it can speed up processes and change within the system (positive or enhancing feedback). Feedback processes play a very important role in determining system thresholds and in maintaining system resilience.

Institution	Here we refer to the humanly devised constraints that shape human interactions, such as rules, norms and laws. These can be formal or informal. Note that we are not referring here to institutions as organisations.
Regime shift	For complex systems, a substantial and enduring reorganization of the system, where the internal dynamics and the extent of feedbacks undergo change.
Resilience	This is a property, in this context of social-ecological systems. It relates to the capacity of a system to cope with disturbances and recover in such a way that they maintain their core function and identity. It also relates to the capacity to learn from and adapt to changing conditions, and when necessary, transform.
Shock	A sudden, unexpected disturbance. This kind of disturbance is often punctual, and has important impacts on large parts of the system.
Slow variable	When analysing complex system is often useful separating "fast" and "slow" variables. Fast variables often represent the primary concern of ecosystem users, for instance game or crop production. Slow variables shape the behaviour of fast ones but change slowly with respect to the overall dynamics of the system. Examples of slow variables might include permafrost thawing for a social-ecological system of Arctic hunters where the fast variable is game, or soil organic matter for an agricultural system where the fast variable is crop production.
Stress	This is a disturbance that has long persistence and often low intensity in impact.
Social-ecological system	This is an interwoven system of human societies and ecosystems. This concept emphasises that humans are part of nature and that these components function in interdependent ways. In the template identifying these interactions between the components aims to identify the processes and actors/ components that interact and particularly the feedbacks between the human-related components and the ecosystems/ biophysical components.
Stakeholder	See "actor"
Systems Diagram	This is using a diagram to illustrate the configuration of a system. This is done by defining its structure, function, and feedbacks. For a case there may be more than one diagram if the system changes in character (actors, processes, drivers, disturbances, feedbacks etc.) over time.
Timeline	The goal with the timeline is to capture important events – both punctual and over longer periods of time, identifying the causes of these events and the actors/ processes involved. This should be done chronologically and distinguishing events.