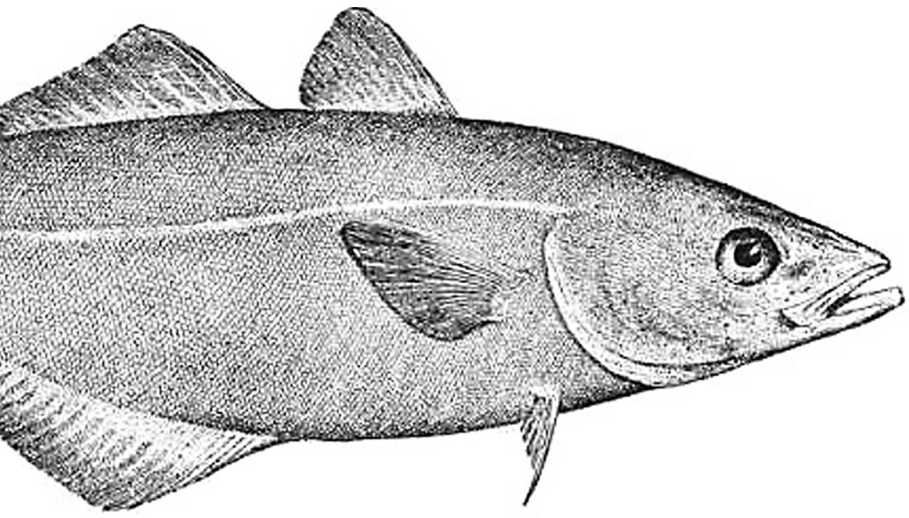
CATCH SHARE DESIGN MANUAL

VOLUME
2

Cooperative Catch Shares

Sarah E. Poon, Kate Bonzon and Tonya Van Leuvan



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Introduction

Fishery stakeholders are increasingly interested in catch shares as an effective approach for managing fisheries. The **Catch Share Design Manual, Volume 1: A Guide for Fishermen and Managers**, first published in 2010, provides the first ever step-by-step planning guide of catch share design. Drawing on experience from around the world, it highlights the flexibility of catch shares and outlines how they can be specially designed to meet the specific characteristics and goals of different fisheries. The Design Manual is not prescriptive: It is a series of questions whose answers help guide and inform the catch share design process.

This volume of the **Catch Share Design Manual** builds on **Volume 1** and provides more detailed guidance on the design of group-allocated catch shares, commonly referred to as "Cooperative catch shares."[1] These are a specific type of catch share program in which secure fishing areas or shares of the catch are allocated to one or more groups of participants. Although Cooperative catch shares currently only account for about 15% of all catch shares, there is growing interest among managers, fishermen and other stakeholders in their design and application.

Worldwide, there are both quota-based and area-based Cooperatives. While this volume provides a generalized discussion of Cooperatives, it specifically focuses on quota-based programs in which secure shares of a science-based catch limit are allocated to Cooperatives or to individuals who form them. Cooperatives that are allocated a secure fishing area, commonly known as Territorial Use Rights for Fishing (TURFs), are discussed in detail in **Catch Share Design Manual, Volume 3: Territorial Use Rights for Fishing**.

1 **Volume 1** generally refers to Cooperatives as group-allocated catch shares. In this volume, the term "Cooperative" is used because it is a familiar and accepted term in many fisheries. The guidance in **Volume 1** will help you determine whether a Cooperative is the most appropriate type of catch share for your fishery, including whether to allocate quota-based and/or area-based privileges. Throughout these documents, "Cooperative" is capitalized when referring to a group that has been allocated and manages a secure, exclusive share of the catch or area of a fishery, as in a Cooperative catch share program. When not capitalized, "cooperative" refers to an organized group that has not been allocated secure fishing privileges, but may coordinate other activities, such as marketing.

This volume is intended to help you—whether you are a manager, a fisherman, a scientist or another interested party—design successful Cooperative catch share programs. It should be used in conjunction with **Volume 1** of the **Catch Share Design Manual**, as well as additional research, analysis and consultation of experts in order to design the most appropriate catch share program for your fishery.

It follows the same seven-step design approach, but expands upon the decisions that are unique to Cooperative catch shares. It also includes four in-depth **Catch Shares in Action** reports, starting on page 79, that highlight real-life examples of Cooperative catch shares and design decisions in action:

- United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program
- Japanese Common Fishing Rights System
- United States Bering Sea and Aleutian Islands Crab Rationalization Program
- Spanish Galicia Goose Barnacle Cofradía System

The reports provide a snapshot of the diversity of Cooperative catch shares, including both area-based and quota-based approaches, and different ways in which quota are allocated to and managed by Cooperatives.

Before you begin designing a Cooperative catch share program, you should assess the existing state and context of the fishery. Most fisheries already have a management structure in place with established regulations, institutions, participants and stakeholders. Years or decades of fishing and management influence the current state of the fishery, and these traditions should be taken into account when considering, designing and implementing a catch share approach.

Assessing your fishery—from the ecological, economic and sociopolitical perspective—can help drive appropriate and effective design. It will help you identify current strengths to be leveraged, as well as challenges that can be addressed during the design process. See **Volume 1** for a more extensive discussion of actions to take before designing your catch share program.

WHAT IS A COOPERATIVE CATCH SHARE?

A Cooperative catch share is a specific type of catch share in which one or more groups of participants (organized into Cooperatives) are allocated a secure portion of the catch or a secure fishing area and, in exchange, accept certain fishery management responsibilities. The primary function of a Cooperative is to coordinate members' fishing activities to ensure compliance with their collective quota and to maximize benefits—both in the near term (e.g., optimizing economic return) and in the long-term (e.g., ensuring healthy fish stocks for future fishing opportunities).

In this volume, the term "Cooperative" is used broadly to refer to any organized group of fishermen that has been allocated secure areas or shares (such as a harvesting cooperative, association, fishermen organization, sector, producer organization, guild, union or community), whether or not the Cooperative has legal or formal recognition. Cooperatives are generally comprised of fishermen (often from the same community) who share commonalities, such as the same target species, fishing area or gear type. A key characteristic of successful Cooperatives is that members share common goals.

Hundreds of Cooperatives participate in catch share fisheries around the world and are used in a variety of contexts, including artisanal and industrial fisheries in developed and developing countries. In addition to the strong record of biological, economic and social performance that has been shown for all types of catch shares (see **Volume 1** for a complete discussion), research and experience have shown that well-designed Cooperatives can achieve a number of additional benefits, including:

- Fulfillment of management responsibilities, such as monitoring and enforcement of fishery regulations (Deacon, 2012; Ovando et al., 2013)
- Enhanced stewardship (including bycatch reduction) through cooperation (Ovando et al., 2013)
- Reduced risk of fishery closure and financial losses from overharvesting (Holland and Jannot, 2012)
- Opportunities for efficient spatial distribution of fishing effort (Schlager, 1994)
- Increased market power (Deacon, 2012)
- Avoidance of gear conflicts (Schlager, 1994)
- Social and economic rewards for communities (Tindall, 2012)

The way Cooperatives are organized and the functions they perform vary depending on the social, economic and political contexts in which they operate, as well as their capacity and maturity as organizations. A well-functioning Cooperative aligns the incentives of its members with the long-term welfare of the group, thereby preventing overharvesting and a competitive race for fish. Cooperative members share a common goal of sustainable management and are collectively rewarded for stewardship. This volume describes the design considerations for establishing effective Cooperatives in which the incentives of fishermen are aligned with the long-term health of the resource.

HOW DO COOPERATIVES FIT INTO CO-MANAGEMENT?

Cooperatives typically participate in some form of co-management, a process by which the government and Cooperatives share management responsibilities. A co-management approach can allow for locally appropriate management and real-time decision making where Cooperatives conduct basic management activities while complying with performance standards set by the government, such as maintaining a sustainable stock. Each design decision in this volume can be made by fishery managers, by the Cooperative or jointly by both parties, depending on the specific institutional arrangement in the fishery. While most of the design steps pertain to the relationship between fishery managers and the Cooperative, some design decisions determine how Cooperatives are organized and administered internally.

This volume addresses the design features that drive successful Cooperative co-management. The way in which these features are implemented and the resources and processes needed to do so will vary based on current legal frameworks, level of organization among fishermen and more. A clear understanding of the management and administrative capacities of the government, groups of fishermen and other co-managing entities can help ensure designated roles and responsibilities are appropriate. In order for Cooperative catch share programs to be effective, fishermen must be organized, and the degree of organization at the onset of the program may vary. Program design may incorporate existing organized fishermen groups, or it may be necessary to establish an appropriate organizational structure. Whatever the starting point may be, Cooperative catch shares are flexible and should be designed based on the existing context. A key design step is to assess performance and innovate, and catch share programs can be, and regularly are, adapted and improved over time.

HOW ARE COOPERATIVES FORMED?

Some fishery management goals are best met by fishermen working independently, while others can be best accomplished when fishermen work together. When given the right incentives and responsibilities, fishermen tend to figure out how best to organize to meet their goals. But the suite of fishery goals is rarely met purely by individuals or groups. Cooperative catch shares create a flexible structure for fisheries to achieve a balance between individual and group behavior.

Cooperatives take on a variety of forms. As described in Table A, typical structures range from Cooperatives in which the group governs both quota allocations and harvesting decisions, to Cooperatives in which individuals have more autonomy. Because Cooperative catch share design is flexible, the details of their functions vary broadly, and not all design structures are represented in the table. The ways in which Cooperatives form will likely depend upon the existing context and management structure. Cooperatives may form organically, may be directly incentivized or may be required to form by fishery managers. Additionally, Cooperatives may use a variety of methods to manage members' fishing activity to comply with quota allocation.

Cooperative catch share design is flexible and can be adapted to diverse fishery contexts. Whether allocated directly to Cooperatives or to individuals who form them, well-designed Cooperative catch shares can end the race for fish and allow organized groups of fishermen to achieve biological, economic and social goals. Once they are established, Cooperatives and co-management institutions can evolve over time to continue to meet fishery management goals and to progressively improve management outcomes.

TABLE A | EXAMPLES OF COOPERATIVE ALLOCATION AND HARVEST MANAGEMENT

SHARE ALLOCATION AND POOLING	HARVEST AND COOPERATION	EXAMPLE
Shares allocated directly to a Cooperative	Cooperative manages harvesting activity to stay within its allocation and prevent a race for fish	Chilean National Benthic Territorial Use Rights for Fishing Program – El Quisco Union
	Cooperative subdivides quota among individual members (Some quota may be reserved to meet Cooperative goals)	Japanese Common Fishing Rights System – Mutsu Bay sea cucumber fishery
Shares allocated to individuals who join a Cooperative and pool quota	Cooperative manages harvesting activity to stay within its allocation and prevent a race for fish	Some Cooperatives in the U.S. Bering Sea and Aleutian Islands Crab Rationalization Program
	Cooperative subdivides pooled quota among individual members (Some quota may be reserved to meet Cooperative goals)	U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program
Shares allocated to individuals who do not pool quota	Individuals fish their own quota but agree to Cooperative rules that affect their harvesting behavior	British Columbia Geoduck Individual Vessel Quota Program – Underwater Harvesters Association

Sources: Gallardo Fernández, 2008; Makino, 2011; Fina et al., 2010; North Pacific Fishery Management Council, 2010; and James, 2008.

CATCH SHARE BASICS

WHAT IS A CATCH SHARE?

A catch share program allocates a secure area or privilege to harvest a share of a fishery's total catch to an individual or group. Programs establish appropriate controls on fishing mortality and hold participants accountable.

Catch shares can be either quota-based or area-based. Quota-based programs establish a fishery-wide catch limit, assign portions (or shares) of the catch to participants and hold participants directly accountable to stay within the catch limit. Area-based programs, or TURFs, allocate a secure, exclusive area to participants and include appropriate controls on fishing mortality that ensure long-term sustainability of the stock. Many catch share programs are transferable, meaning participants can buy, sell and/or lease shares. This market allows the fishery to internally adjust to changes in the catch limit and allows participants to enter and exit the fishery.

Catch shares are fundamentally different from other management approaches and are generally implemented after a variety of other approaches prove inadequate for meeting specific goals. Most commercial fisheries start as open access, where anyone who puts in the effort is allowed to catch fish. As competition increases, managers often limit access by licensing participants. When licenses can no longer effectively control fishing effort and catches, managers implement more and more effort-based regulations to control catches. Examples of these regulations include limitations on the amount of catch allowed per trip, the size of vessel, fishing days and more. In many cases, these management efforts do not succeed in maintaining stable fish populations or in promoting profitable, safe fisheries.

By allocating participants a secure share of the catch or fishing area, catch share programs give participants a long-term stake in the fishery and tie their current behavior to future outcomes. This security provides a stewardship incentive for fishermen that was previously missing or too uncertain to influence their behavior toward long-term conservation. Catch share programs align the business interests of fishermen with the long-term sustainability of the stock, and provide more stability and predictability within a fishing year and over time. Furthermore, catch share fishermen are held accountable—they are required to stay within their allocated share of the overall catch, or to ensure harvesting activity in their allocated area complies with science-based controls on fishing mortality.

Icons Key | Icons used throughout the Design Manual to highlight key catch share design features


Single-species


Individually-allocated


Quota-based


Transferable


Multi-species

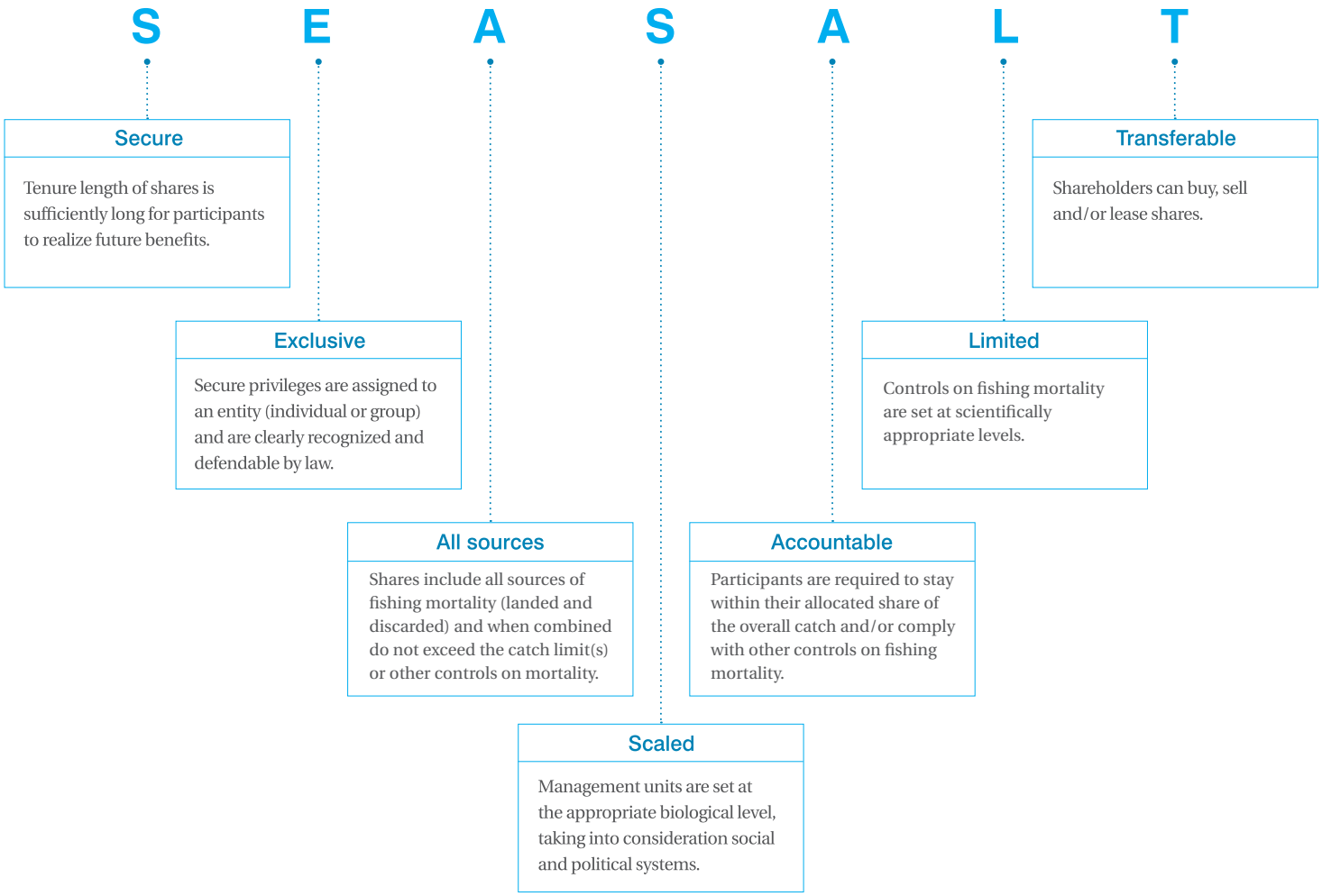

Group-allocated


Area-based


Non-transferable

WHAT ARE THE KEY ATTRIBUTES OF A CATCH SHARE?

In order to better understand catch share programs, it is useful to outline their key attributes. The SEASALT mnemonic, developed for the **Catch Share Design Manual**, describes commonly occurring attributes of catch share programs. It is based on a review of existing catch share programs and theoretical literature. Not all of these components are required for a catch share to be successful. However, the more completely a program is designed to incorporate each of these attributes, the higher the likelihood of meeting the program's biological, economic and social goals.



WHAT ARE THE KEY PRINCIPLES OF CATCH SHARE DESIGN?

Volume 1 of the **Catch Share Design Manual** outlines 13 design principles that highlight clear lessons learned from around the world and basic rules of thumb for a successful catch share program. These design principles are summarized here for quick reference, along with three additional design principles for Cooperative catch shares. The principles are discussed in further detail in the design steps in this volume.

Basic Catch Share Design Principles

1. Design the catch share program based on clearly articulated goals with measures of success.
2. Consider including in the catch share program species that are commonly caught together.
3. Create separate catch limits and shares for each species, stock and zone in the catch share program. Catch limits should be science-based and account for all sources of fishing mortality, prevent overfishing and rebuild overfished stocks, if needed.
4. Develop mechanisms for accommodating new entrants during the design of the catch share program and prior to initial share allocation.
5. Allocate shares for sufficient length to encourage stewardship and appropriate investment by shareholders and associated industries. This can be achieved by allocating in perpetuity and/or for significant periods of time with a strong assumption of renewal, provided rules are adhered to.
6. Employ percentage shares, when possible, of the overall cap rather than absolute weight units for long-term shares.
7. To increase program flexibility, consider transferability of shares, permanent and/or temporary, which is generally a hallmark of catch share programs.
8. Develop a transparent, independent allocation process that is functionally separate from the rest of the design process. Allocations that retain the relative equity positions of stakeholders are the least contentious.

9. Employ an allocation appeals process that allows eligible participants to refute allocated amounts with verifiable data.

10. Encourage cost-effective, transparent trading that is easy for all participants.

11. Employ transparent catch accounting and complete regularly enough to ensure compliance with catch limits.

12. Design and implement a fishery information system that keeps costs low and is effective for conducting catch accounting, collecting scientific data and enforcing the law.

13. Assess performance against goals and encourage innovation to improve the program over time.

Cooperative Catch Share Design Principles

1. Develop mechanisms to ensure the Cooperative is accountable to its catch limit and prevents a race for fish among members.

2. Clearly define the roles and responsibilities of fishery managers, Cooperatives and other entities to reflect program goals and the relative strengths and capabilities of each group.

3. Establish Cooperative administrative systems including a clear process for decision making and bylaws or contracts to formalize rules, roles and responsibilities.

Checklist

Step 1

Define Program Goals

- ☐ Identify the program's biological and ecological goals
- ☐ Identify the program's economic goals
- ☐ Identify the program's social goals
- ☐ Balance trade-offs

Step 2

Define and Quantify the Available Resource

- ☐ Determine which species will be included
- ☐ Determine which stocks will be included
- ☐ Delineate the spatial range and identify zones
- ☐ Determine the allowable catch limit for each species, stock and zone

Step 3

Define Eligible Participants

- ☐ Decide if privileges will be allocated to Cooperatives via groups or individuals
- ☐ Determine who may hold and fish shares
- ☐ Define Cooperative membership
- ☐ Establish limits on concentration of shares
- ☐ Determine how new participants will enter the fishery

Step 4

Define the Privilege

- ☐ Decide whether the privilege will be quota-based or area-based
- ☐ Determine how the Cooperative will be accountable to its catch limit
- ☐ Determine the tenure length of the privilege
- ☐ Define the long-term share
- ☐ Determine the annual allocation unit
- ☐ Decide if the catch share will be permanently and/or temporarily transferable
- ☐ Determine any restrictions on trading and use of shares

Step 5

Assign the Privilege

- ☐ Establish a decision-making body for initial allocation
- ☐ Determine when allocation will occur
- ☐ Establish an appeals process
- ☐ Determine who is eligible to receive shares
- ☐ Decide whether initial shares will be auctioned or granted
- ☐ Determine how many shares eligible recipients will receive
- ☐ Identify and gather available data for allocation decisions

Step 6

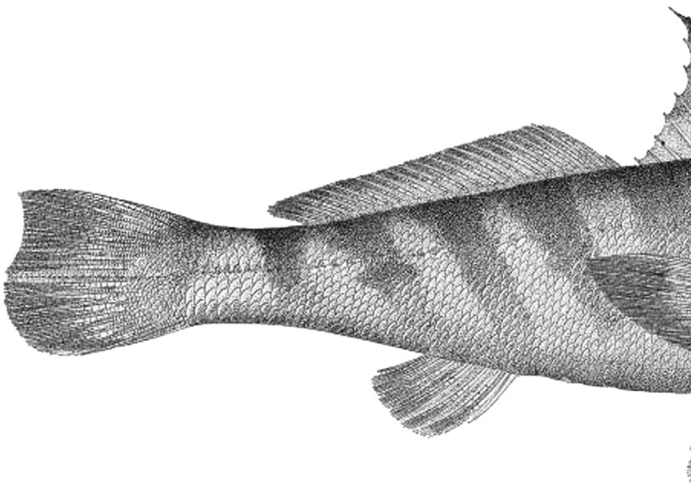
Develop Administrative Systems

- ☐ Determine the roles and responsibilities of the Cooperative
- ☐ Determine how the Cooperative will be governed
- ☐ Determine how trading, catch accounting and information collection will occur
- ☐ Determine how the Cooperative will be administered and funded
- ☐ Determine how coordination across Cooperatives will occur

Step 7

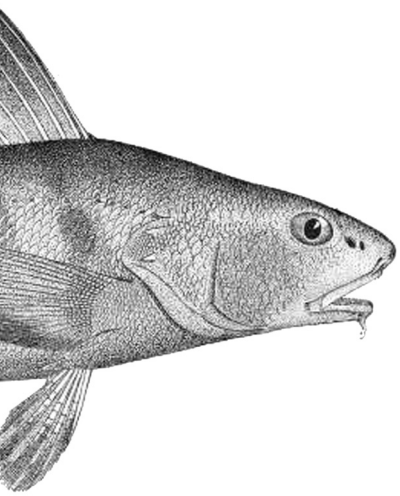
Assess Performance and Innovate

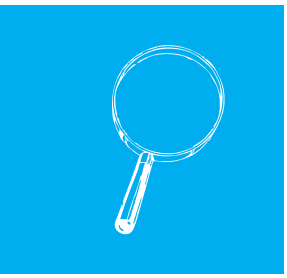
- ☐ Conduct regular program reviews
- ☐ Assess performance against goals
- ☐ Encourage innovation



Step
1

Define Program Goals





At a Glance

Defining goals is perhaps the most important step to ensure a well-designed catch share program. Goals should be clearly articulated prior to catch share design: They will drive design decisions and provide a basis for evaluating success.

KEY PRINCIPLES

Design the catch share program based on clearly articulated goals with measures of success. | 14

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Step 1

Define Program Goals

The first step to designing any catch share is to clearly define program goals. First, defining goals will help determine if a Cooperative catch share is best for your fishery. Second, clearly defined biological, economic and social goals will guide design decisions for your Cooperative catch share.

A Cooperative catch share will have many of the same goals as other types of catch shares (see **Step 1** of **Volume 1**). Cooperatives can facilitate coordination and information sharing among fishermen, and therefore, Cooperatives may be more effective at achieving certain goals. In this section, common catch share goals are highlighted with an emphasis on goals that are often identified for Cooperatives.

In a Cooperative catch share, goals may be set by both fishery managers and the Cooperative. A Cooperative catch share may be most successful if fishery managers and Cooperative members collaborate to set goals. Once goals are defined, Cooperatives are generally well suited to determine how to meet them in a way that works best for their localized situation.

A key benefit of Cooperative catch shares is that Cooperatives can define group-specific goals in addition to fishery-wide goals. Fishermen dedicate time and resources to cooperating because the benefits of cooperation exceed the costs; accordingly, many Cooperative goals are designed to bring additional economic and social benefits to their members. It is important to ensure Cooperative goals are compatible with fishery-wide goals and to assess performance against both sets of goals.

DESIGN PRINCIPLE

Design the catch share program based on clearly articulated goals with measures of success.

1.1 WHAT ARE THE PROGRAM'S BIOLOGICAL AND ECOLOGICAL GOALS?

Biological and ecological goals of catch shares include ending overfishing to support long-term stock sustainability, rebuilding overfished stocks and reducing non-targeted catch. Collaboration and information sharing between fishermen, as often accomplished through a Cooperative, can be useful for meeting these goals.

Cooperatives are commonly established as a way to formalize collaboration between fishermen and fishery managers in setting and meeting biological targets. Cooperatives often contribute to improvements in fishery science by collectively gathering data, funding data collection and advancing technological improvements.

Cooperatives may be especially well positioned to deliver on these types of outcomes because fishermen have a structure for working together.

Cooperatives are sometimes implemented to reduce non-targeted catch (including bycatch and discards) via self-imposed rules, innovations and information sharing (De Alessi et al., 2013). For example, Cooperatives often implement gear restrictions and develop innovative gear modifications to avoid non-targeted catch. In some Cooperatives, participants share information on non-targeted species locations and establish collective agreements on avoidance techniques (see Snapshot 1.1).

SNAPSHOT 1.1 | Meeting Biological Goals

Bycatch Avoidance Innovations through Cooperation

In order to meet fishery management goals to reduce bycatch of biologically sensitive species, Cooperatives targeting pollock in the U.S. Bering Sea and Aleutian Islands have a voluntary agreement to implement real-time closures in areas of high chum salmon bycatch. An independent third party, SeaState, Inc., is responsible for implementing closures of bycatch "hotspots" using real-time federal observer program bycatch data. This bycatch avoidance system is enabled by a rigorous onboard observer program and a partnership between fishery managers, Cooperative members and SeaState. Fishermen agree to allow SeaState to access and analyze observer data daily, which is provided electronically by the National Marine Fisheries Service (NMFS) within 20 minutes of submission from observers (Pollock Conservation Cooperative and High Seas Catchers' Cooperative, 2010). Fishermen can verify the data, and SeaState can determine real-time closures to avoid further bycatch of chum salmon. These targeted hotspot closures have been shown to be effective in reducing chum salmon bycatch, and additional measures may be implemented to further reduce bycatch in the fishery (North Pacific Fishery Management Council, 2012).

1.2 WHAT ARE THE PROGRAM'S ECONOMIC GOALS?

Economic goals are commonly identified as critical to the design and performance of a catch share. Cooperative catch shares usually have the same economic goals as other catch shares, such as increasing revenue and profits, reducing overcapitalization and supporting stable, long-term employment and fishery viability. Economic goals are a common driver for implementing Cooperatives because this structure allows fishermen to collectively work together, which may enhance economic performance. However, to ensure overall economic gains from Cooperative management, it is important to weigh the costs of administering Cooperatives against the benefits reaped from coordination.

Achieving higher returns is a priority economic goal for Cooperatives. In some fisheries, cooperation can help participants achieve higher economic returns by improving marketing opportunities and increasing efficiency. Common methods of increasing revenue and decreasing costs via cooperation are summarized in Table 1.1.

Another economic goal of catch shares is to reduce the overall costs of management and administration for the government and industry. Appropriate administrative duties can be vested in Cooperatives, and by addressing some management needs at the local level, overall costs can be reduced in some fisheries.

Another common goal of Cooperatives is to provide economic stability for the industry. Cooperatives may be designed to provide economic buffers for fishermen against fluctuating stocks and revenues. For example, a cohesive Cooperative can coordinate the timing of landings to buffer against price fluctuations, or can redirect Cooperative funds to provide stability when revenue is low. Coordination can also offer financial stability by ensuring that biological standards (such as limits on non-target catch) are met to avoid fishery closures.

TABLE 1.1 | COMMON METHODS FOR ACHIEVING ECONOMIC GOALS THROUGH COOPERATION

INCREASE REVENUE BY	REDUCE COSTS BY
• Coordinating timing of product delivery in accordance with favorable market conditions • Coordinating harvest timing to catch fish at more valuable life stages • Slowing the race for fish to improve product quality via careful handling of fish, improved training, new equipment, etc. • Creating economies of scale to increase market access and ability to better negotiate prices with buyers • Achieving higher market value through industry certifications	• Coordinating harvest, reducing fishing capacity and distributing fishing effort efficiently (e.g., to avoid congestion and gear damage) • Sharing information to harvest efficiently, such as through reduced search time • Purchasing inputs (fuel, ice, bait, etc.) in bulk • Sharing equipment or infrastructure, such as boats, docks, transportation, processing facilities, etc.

1.3 WHAT ARE THE PROGRAM'S SOCIAL GOALS?

Social goals are often of key importance to fishermen, managers and other stakeholders, and Cooperatives are often expressly designed to provide secure access and stability to fishermen and fishing communities. Another common social goal is to maintain the historical structure of the fishery and to direct fishery benefits to certain groups of users, such as a group of local fishermen or a community. These benefits may include revenue and employment from harvesting, processing, marketing and distribution of fishery products. Additionally, Cooperative revenues can be used to employ community members in administrative and scientific roles.

Cooperatives are sometimes implemented because they align with the traditions and values of stakeholders, and they can be designed to preserve those traditions. Stakeholders who identify closely with a community (whether spatially or socially defined) may consider Cooperative catch shares an attractive approach.

Sometimes Cooperative catch shares are implemented to formalize traditional fisheries management approaches. This is common in TURFs, which are discussed in detail in **Volume 3: Territorial Use Rights for Fishing**.

In addition to fishery-wide social goals, Cooperatives may establish their own social goals. The goals may relate to the function of the Cooperative, including developing capacity and maintaining fair and equitable decision-making processes. Cooperatives often seek to provide direct benefits to their members, both for the benefit of the group and to ensure members are incentivized to participate in the Cooperative. Sometimes these include non-fishery related benefits, such as improving social and/or political standing, funding education, providing health care or pensions and providing community infrastructure. These goals drive the design of internal Cooperative organization and governance structures.

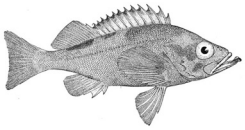
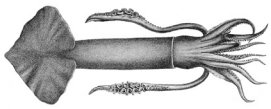
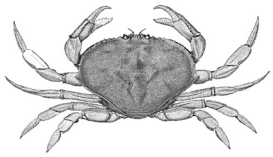
1.4 BALANCE TRADE-OFFS

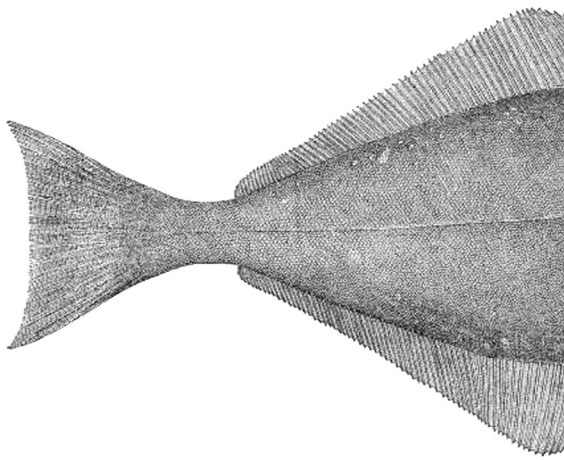
As in any fishery management approach, there are often trade-offs between the identified goals for Cooperative catch shares. Meeting biological goals should be paramount since managers are generally required by law to do so. Even if no legal mandate exists, keeping fish stocks productive is essential for meeting economic and social goals. There may be trade-offs between economic and social goals. For example, maximizing economic efficiency may not always be compatible with maintaining the traditional structure of a fishery.

Finally, there may be differences in goals between fishery managers and Cooperatives, and from one Cooperative to another. Developing and prioritizing mutual goals can help balance this trade-off. Ranking goals by importance and revisiting them over time can help ensure the program is meeting its objectives and that Cooperatives are able to meet managers' goals while still meeting their own.

Step 1 – Define Program Goals

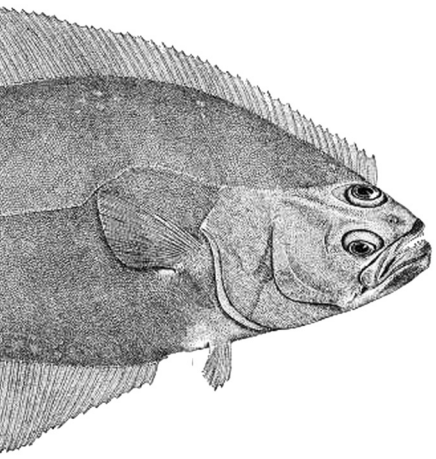
This chart provides a brief summary of the **Step 1** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

	1.1 BIOLOGICAL & ECOLOGICAL GOALS	1.2 ECONOMIC GOALS	1.3 SOCIAL GOALS
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	Reduce bycatch and create individual accountability for bycatch reduction	Increase economic returns Improve revenues from target species by avoiding fishery closures	Allocate resources based on historical participation Minimize negative impacts on participants of adjacent fisheries
Japanese Common Fishing Rights System 	Conserve stocks Engage communities in management	Increase revenue Improve efficiency Stabilize fish prices	Protect small-scale coastal fishermen from outside fishing pressure
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	Enhance resource conservation	Improve economic efficiency	Increase safety for fishermen Provide stability and equity for regional fishermen
Spanish Galicia Goose Barnacle Cofradía System 	Reduce overfishing Engage local biologists in management	Stabilize revenue stream Increase profits	Preserve traditional fishing institutions Empower local communities



Step
2

Define and Quantify the Available Resource



SEASALT

All sources

Limited

At a Glance

Defining and quantifying the available resource provides the biological basis for the catch share program. By carefully completing this step, you will ensure that you have included sources of significant mortality and established an effective, science-based catch limit.

KEY PRINCIPLES

Consider including in the catch share program species that are commonly caught together. | 23

Create separate catch limits and shares for each species, stock and zone in the catch share program. Catch limits should be science-based and account for all sources of fishing mortality, prevent overfishing and rebuild overfished stocks, if needed. | 25

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2.1 Which species will be included? | 22

2.2 Which stocks will be included? | 23

2.3 What will the spatial range be, and will there be different zones? | 23

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Step 2

Define and Quantify the Available Resource

Defining and quantifying the resource provides the biological basis for the catch share program. This step requires biological data and information to set effective, science-based limits for managed species to ensure you have appropriately **Limited** the catch. Defining and quantifying the resource will also help you ensure **All sources** of fishing mortality are included.

This step may be the responsibility of fishery managers, Cooperatives or both, and the roles of each group should be clearly defined. Fishery managers generally retain the authority for setting and enforcing performance standards like catch limits, while Cooperatives commonly contribute to fishery science through data collection and by providing funding for monitoring and science (see **Step 6** for a complete discussion of Cooperative roles and responsibilities).

Catch limits should be set based on science and with the sustainability of fish stocks as the primary objective. In fisheries where data are limited, there are new and emerging approaches for setting catch limits with minimal information. See **Science-Based Management of Data-Limited Fisheries: A Supplement to the Catch Share Design Manual** for a framework and methods for assessing data-limited stocks.

2.1 WHICH SPECIES WILL BE INCLUDED?

Fishery managers will typically be responsible for determining which species to include in a Cooperative catch share. The program may be single-species or multi-species, depending on program goals and the characteristics of the resource. It is important to consider which species are caught in the fishery and how those species must be accounted for to meet management goals (see **Step 2.1** of **Volume 1** of the **Catch Share Design Manual**).

Single-species

Catch shares often manage only one species when there is low non-target catch, or when single-species management is already present. Often Cooperatives are initially designed and implemented to manage one species, and then expanded to manage multiple species over time. For example, the Chilean National Benthic Territorial Use Rights for Fishing Program (Chilean TURF Program) was designed to manage the high-value loco (Chilean abalone) fishery, and other species were incorporated based on the interests of participating Cooperatives (see **Catch Shares in Action: Chilean National Benthic Territorial Use Rights for Fishing Program** in **Volume 1**).

Multi-species

When fishermen commonly catch more than one species (targeted or non-targeted), a multi-species catch share program may be more effective for meeting fishery goals.

Cooperatives are often well positioned to co-manage multi-species fisheries to meet biological goals. Fishery managers can set performance standards for conserving fish stocks and reducing non-target catch, and Cooperatives can determine the means by which these standards will be met. By collaborating and sharing information, Cooperatives can reduce non-target catch through gear modifications, bycatch "hotspot" avoidance (see Snapshot 1.1), and other methods. The ability to harvest alternative species may allow groups to reduce fishing pressure on biologically sensitive stocks, providing greater flexibility in achieving biological goals.

Some Cooperatives have formed expressly to manage bycatch or species with relatively low catch limits. For example, in the United States Pacific Coast Groundfish Limited Entry Trawl Individual Fishing Quota Program, fishermen with individual quota have created "risk pools" to manage species that have lower abundance (see Snapshot 3.1). By coordinating to avoid these low quota species, the fleet can collectively catch more of the higher quota species.

Allocating privileges for multiple species can also help meet economic goals by allowing Cooperative members to diversify their fishing activity. Access to multiple species can provide for higher revenues and greater economic stability when landings or prices fluctuate (Kasperski and Holland, 2012).

DESIGN PRINCIPLE

Consider including in the catch share program species that are commonly caught together.

2.2 WHICH STOCKS WILL BE INCLUDED?

Most fisheries encounter multiple, biologically distinct stocks, and catch share fisheries can account for these by creating stock-specific catch limits and quota allocations. Cooperatives may form to match stock boundaries. For example, the Mexican Baja California Regional Federation of Fishing Cooperative Societies (FEDECOOP) manages a region along the Pacific Coast of Baja California that covers one spiny lobster stock (see **Catch Shares in Action: Mexican Baja California FEDECOOP Benthic Species Territorial Use Rights for Fishing System** in **Volume 3**).

Cooperative catch shares are sometimes managed using multiple zones to account for multiple stocks. In the United States Bering Sea and Aleutian Islands Crab Rationalization Program, for example, nine separate stocks are identified among the five managed crab species. Catch limits are determined for each stock to ensure individual stocks are managed appropriately.

2.3 WHAT WILL THE SPATIAL RANGE BE, AND WILL THERE BE DIFFERENT ZONES?

As in any catch share program, the spatial range and zones of a Cooperative catch share are usually driven by the species and stock biology. For example, a pelagic fish like anchovy will likely have a single, large zone. Species that are more subject to localized depletion, such as abalone, may benefit from multiple, smaller zones.

Management zones can also reflect social considerations such as the spatial arrangement of fishermen, including any existing organizations or communities of fishermen that predate share allocation. However, it is also important that the fishermen within a Cooperative have similar goals, and zones may be designed accordingly. For example,

community Cooperatives for the inshore groundfish fishery of the Canadian Scotian Shelf were defined based on a combination of geography, the home ports of fishermen and the spatial arrangement of "like-minded" fishermen (Peacock and Annand, 2008). One geographically defined management zone was subdivided to reflect two distinct groups of fishermen.

There may be tradeoffs between biological and social goals in defining management zones. When possible, zones should be defined to help balance these trade-offs. A Cooperative may be a subset of a broader biologically appropriate management unit, or conversely, it may encompass multiple biological management units. Management at the appropriate biological scale may require coordination between Cooperatives that share stocks (see **Step 6.5**), or between Cooperatives and other sectors.

For species and stocks subject to localized depletion, Cooperatives can help facilitate more fine-scale management. For example, abalone divers in Victoria, Australia, work together to assess and manage micro-stocks of abalone. Fishermen agree to use voluntary minimum sizes and catch limits for designated subzones to address localized variability in the stock (Prince et al., 2008). In general, for stocks with significant life history variation across the stock range, it is prudent to create management zones for each sub-population to reduce the risk of localized overfishing.

TABLE 2.1 | EXAMPLES OF COOPERATIVE PARTICIPATION IN FISHERY SCIENCE AND MONITORING

PROGRAM	COOPERATIVE ROLES	DESCRIPTION OF INVOLVEMENT
Chilean National Benthic Territorial Use Rights for Fishing Program	Stock assessments Setting quota Monitoring	Each Cooperative is responsible for hiring an external consultant to develop a baseline biological study of the TURF area. The Cooperatives use this information to develop catch limits. Follow-up assessments are performed annually.
Mexican Baja California FEDECOOP Benthic Species Territorial Use Rights for Fishing System	Stock assessments Monitoring	Each Cooperative is responsible for monitoring stocks and hiring a technical biologist to conduct a baseline study of the area for lobster and abalone. These data are used in conjunction with federal stock assessments to inform catch and effort limits.
Spanish Galicia Goose Barnacle Cofradía System	Data generation Setting quota Monitoring	Each cofradía is responsible for hiring an on-site fisheries ecologist to regularly monitor local goose barnacle populations and generate data for management decisions. Cofradías also have designated landing sites and markets where catch data are collected. Based on this information, cofradías develop annual management plans specifying daily catch limits, which can be adjusted during the season in response to new data.

2.4 WHAT WILL THE ALLOWABLE CATCH LIMIT BE FOR EACH SPECIES, STOCK AND ZONE?

Setting biologically appropriate controls on fishing mortality, usually in the form of catch limits, is a critical step for any fishery management plan. An appropriate catch limit, when enforced, ensures harvest occurs at a sustainable level. As this volume is focused on quota-based programs, setting catch limits is an essential step to program design. See **Step 2.4** of **Volume 1** of the **Catch Share Design Manual** for a detailed discussion about setting catch limits. Some Cooperative catch shares—specifically, some TURFs—employ other science-based controls on fishing mortality if catch limits are not feasible.[2]

In many Cooperatives, the government retains the responsibility to set the catch limit. However, a key benefit of Cooperative catch shares is that some management responsibilities, including biological monitoring and target setting, can be devolved to the Cooperatives. In New Zealand, for example, the Challenger Scallop Enhancement Company sets its own catch limit based on an agreement with the government that ensures high quality scientific information, and managers approve and enforce statutory rules (Mincher, 2008). The role of Cooperatives in setting catch limits varies and can include developing stock assessments, conducting biological surveys and monitoring catches. Data generated by fishermen can greatly improve the quality of information used to inform management decisions. Examples of Cooperative involvement in science and monitoring are highlighted in Table 2.1.

It is important for both Cooperatives and government fishery managers to ensure that catch limits are based on sound science and sustainable targets. If multiple Cooperatives exist, the government or another coordinating body should ensure that the collective catch limits are sustainable.

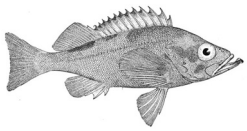
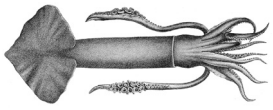
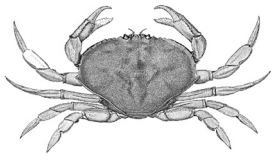
DESIGN PRINCIPLE

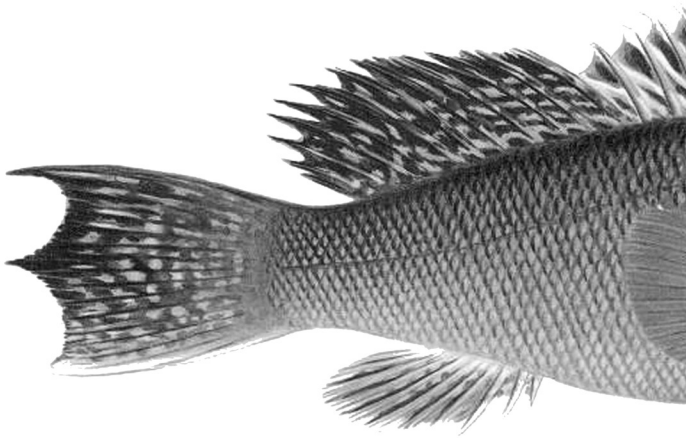
Create separate catch limits and shares for each species, stock and zone in the catch share program. Catch limits should be science-based and account for all sources of fishing mortality, prevent overfishing and rebuild overfished stocks, if needed.

2 This document is specifically intended to provide guidance on designing Cooperatives in which there is a science-based catch limit and quota-based shares are allocated to Cooperatives or individuals who form them. Cooperatives have been known to successfully manage their resources in the absence of formal catch limits when they have secure, exclusive area-based privileges (TURFs). The attributes of these privileges incentivize fishermen to manage their resources using appropriate controls on fishing mortality, including self-imposed catch limits or other controls. These area-based catch shares are discussed in detail in **Volume 3: Territorial Use Rights for Fishing**.

Step 2– Define and Quantify the Available Resource

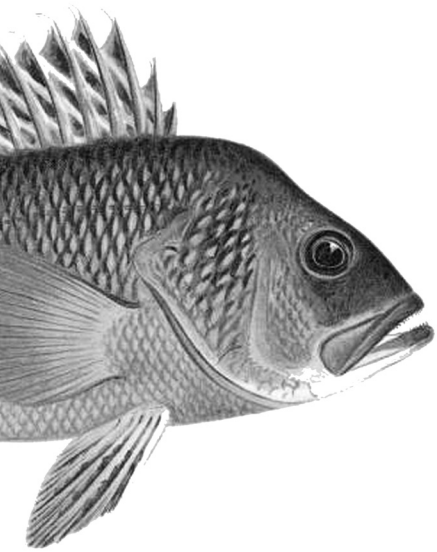
This chart provides a brief summary of the **Step 2** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

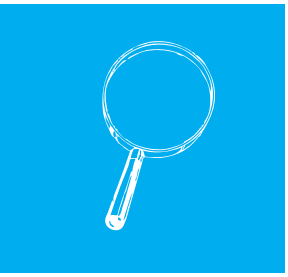
	2.1 SPECIES INCLUDED	**2.2** STOCKS INCLUDED	**2.3** SPATIAL RANGE AND ZONES	**2.4** SCIENCE-BASED CATCH LIMIT
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	6 target groundfish species Sideboard limits for 5 non-target groundfish species 3 prohibited species	2 subareas, one with 3 districts	U.S. federal waters of the Bering Sea and Aleutian Islands	Determined by fishery managers according to national policy Maximum sustainable yield Divided among subareas and districts for some species
Japanese Common Fishing Rights System 	Multiple coastal species, including invertebrates, groundfish and migratory fish	All coastal stocks	All coastal waters Zones based on geopolitical boundaries	Catch limits for 8 species set by national government Cooperatives set additional controls
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	5 crab species	9 spatially-defined stocks	U.S. federal and Alaska state waters of the Bering Sea and Aleutian Islands	Determined by fishery managers according to national policy Maximum sustainable yield Established for each stock
Spanish Galicia Goose Barnacle Cofradía System 	Goose barnacle	Local populations managed within each TURF	Coastal waters of Galicia, northwest Spain (within 3 nautical miles from shore)	Daily catch limits for each fisherman within TURFs approved by government



Step
3

Define Eligible Participants





At a Glance

In completing this step, you will identify the parameters for participation in the catch share program. This will govern the ways in which current and future shareholders are permitted to operate within the program.

KEY PRINCIPLES

Develop mechanisms for accommodating new entrants during the design of the catch share program and prior to initial share allocation. | 37

SUB-STEPS

3.1 Will privileges be allocated to Cooperatives via groups or individuals? | 30

3.2 Who is allowed to hold and fish shares? | 32

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3.4 Will there be limits on the concentration of shares? | 35

3.5 How will new participants enter the fishery? | 36

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Step 3

Define Eligible Participants

Clearly defining eligible participants ensures that Cooperative catch share privileges are **Exclusive** and that the program is **Scaled** to existing social units. By pursuing a Cooperative catch share program and reading this volume, you have already determined a group-allocated catch share is the best approach for your fishery based on your goals and the fishery's underlying characteristics. The tradeoffs between allocating to individuals or groups in a catch share are discussed in detail in **Step 3.1** of **Volume 1** of the **Catch Share Design Manual**. This step will help you determine whether shares will be allocated directly to a Cooperative or to individuals who then form Cooperatives.

In this step, you will also determine the parameters for participating in the catch share program. Fishery managers generally identify the types of entities that are eligible to receive allocation, including requirements for a group to be recognized as a Cooperative and rules regarding individuals who may participate in Cooperatives. Cooperatives themselves sometimes have a role in determining who may participate in the catch share by setting eligibility requirements for membership.

3.1 WILL PRIVILEGES BE ALLOCATED TO COOPERATIVES VIA GROUPS OR INDIVIDUALS?

There is flexibility in how privileges are allocated in order to form a Cooperative catch share. Cooperatives can be allocated privileges via one of two paths: (1) by allocating shares directly to a pre-organized group or (2) by allocating shares to individuals and allowing, requiring or incentivizing them to create groups. Deciding upon one of these alternative methods of allocation may depend on the goals of the Cooperative program and/or the current management structure of the fishery. Allocation directly to groups is the more common approach, however, Cooperatives are also emerging in maturing Individual Quota programs.

Allocation directly to a group

In many Cooperatives, shares are allocated directly to a group that cooperates to manage the allocation. The Cooperative itself is accountable to comply with its catch limit and typically has flexibility in determining how to do so (see **Step 4.2**). For example, some Cooperatives sub-allocate shares to individual members who are then held accountable for complying with their individual quotas. Direct allocation to Cooperatives may be most compatible with many of the common social goals of a Cooperative catch share program, such as directing fishery benefits to particular communities.

Shares can be allocated to a group newly formed for that purpose or to an existing group (e.g., a fishermen's organization, marketing cooperative or community association). In either case, the group will be allocated secure privileges in exchange for taking on new responsibilities. Delivering on the responsibilities of managing quota and coordinating fishermen's harvest requires significant coordination and effort. See **Step 6** for a more complete discussion of Cooperative organization and responsibilities.

TURFs are often allocated to community-based groups. Cooperative management of TURFs is discussed in detail in **Volume 3: Territorial Use Rights for Fishing**.

Allocation to individuals

Some Cooperatives form when individual shareholders come together to accomplish common goals. In these Cooperatives, initial allocations are tied to individuals, but through Cooperative membership, individuals agree to abide by rules that may control all or some of their fishing activities. Sometimes these Cooperatives are formalized through legal contracts.

These types of Cooperatives may be formed as part of the initial catch share design, or they may emerge over time, such as when participants in pre-existing Individual Quota programs choose to come together to achieve specific goals or solve specific challenges. For example, individual quota holders may increase stability and optimize production through cooperation. Some fishermen pool their quota for biologically sensitive stocks and agree to bycatch-avoidance strategies to prevent fishery closures (Snapshot 3.1).

In some cases, the government requires individuals to join a Cooperative to "activate" or access their individual shares. Members in these Cooperatives usually hold and fish their individual quota. However, it is not uncommon for members to collectively fish against the entire group's quota, especially if individuals have relatively equal amounts of quota shares.

Trade-offs

In practice, Cooperative allocation and share management occur in a variety of ways, balancing the role of the group and the role of individuals. Deciding whether the best design is to allocate shares directly to a group, or to individuals who can then be required or incentivized to join a group, will depend on the goals of the program and the characteristics of your fishery. You may also use a combination of these approaches for different sectors of your

SNAPSHOT 3.1 | Cooperation in an Individual Fishing Quota Program

The United States Pacific Coast Groundfish Limited Entry Trawl Fishery

In 2011, the United States Pacific Coast Groundfish Limited Entry Trawl Fishery transitioned to an Individual Fishing Quota (IFQ) program to improve the biological and economic performance of the fishery. Shortly thereafter, some individual quota holders formed an innovative "risk pool" to provide increased stability for their fleet by pooling together their individual shares for bycatch species.

As part of the IFQ program, small quotas for overfished bycatch species were distributed to participants. Because the groundfish fishery is a multi-species fishery targeted by trawl gear, it can be difficult to avoid bycatch species, and a single trawl tow could cause an individual to overfish his individual quota. As a result, the fishermen would have to find another fisherman willing to sell his limited quota for that species in order to continue fishing. The limited availability of quota could make it difficult to obtain and potentially very expensive (Holland and Jannot, 2012).

The risk pool is designed to minimize this risk by allowing members access to a larger pool of bycatch quota. Risk pool members contribute their shares to be accessed collectively by the group, in exchange for complying with rules to minimize bycatch of overfished species. These rules are formalized through contracts and ensure fishermen are working to avoid bycatch, rather than taking advantage of the pooled quota. In addition to ensuring individuals have quota to cover their bycatch, the risk pool can help prevent full fishery closure by promoting best practices for avoiding bycatch among all risk pool participants (Holland and Jannot, 2012).

fishery. Group-based management may emerge over time as individuals in quota programs choose to form Cooperatives to meet specific goals, and the guidance in this volume can help these voluntary Cooperatives to be successful.

Because biological goals are the priority, it is important to consider whether group or individual allocations will best ensure compliance with the fishery-wide catch limit. Allocating to a group requires that the group can account for the catch of its members to ensure the group allocation is not exceeded. Furthermore, it is important for the group to manage its allocation to avoid or minimize a competitive race for fish among its members to help meet biological goals (such as reduction of non-target catch and protecting habitats), as well as economic and social goals.

Other goals, such as increasing efficiency, reducing overall management costs or staying consistent with tradition may be important secondary considerations for determining whether to allocate to groups or individuals. How these goals are best met may depend largely on the local context and the existing structure of the fishery. For example, pre-existing organized groups may be able to manage a group allocation to meet goals. If no such groups exist, it may be appropriate to allocate shares to individuals and give them the opportunity or incentive to self-organize into groups that align with their goals and interests. Social norms, traditions and political feasibility will also play roles in determining whether group or individual allocation is a better fit for your fishery.

3.2 WHO IS ALLOWED TO HOLD AND FISH SHARES?

Eligibility criteria for a Cooperative catch share are determined at two stages. First, fishery managers will be responsible for determining which groups or individuals will be eligible to hold and fish shares. Next, fishery managers and/or Cooperatives will determine who can join a Cooperative. This decision is discussed in detail in **Step 3.3**.

Group eligibility

It is important for fishery managers to clearly define what groups may be allocated shares. The term "cooperative" can have many meanings: the group may be a legally recognized cooperative, partnership, corporation, association, community or another organization of fishermen. As in any catch share, fishery managers must ensure that appropriate legal structures are set up to allow such entities to hold shares.

A Cooperative as it pertains to catch share management can be any organized group of fishermen that can accept certain management responsibilities in exchange for secure, exclusive fishing privileges. Thus managers' criteria for recognizing Cooperatives may be largely tied to the willingness and demonstrable ability to meet certain fishery goals. In particular, the Cooperative must be capable of ensuring its participants stay within the group's allocated share.

Fishery managers often create formal requirements for Cooperatives, which are sometimes defined by law and may include a combination of the following:

- Establishment of a member agreement, contract, bylaws, etc.
- Having a minimum number of members
- Having a clearly defined organizational structure, decision-making process and representatives (e.g., Board of Directors, Officers and/or a Manager)
- Legal recognition and registration as a partnership, corporation or other type of business
- Non-profit status

Additionally, in accordance with the common social goals of Cooperative catch shares, eligibility to receive shares can be based on the participant makeup of the Cooperative. For example, managers may require Cooperatives to represent the current composition of the fishery or to include both fishermen and processors.

Individual eligibility

When fishery managers allocate shares to individuals (rather than directly to groups), the individual generally holds the share but may share some responsibilities for accountability within the Cooperative. Individual eligibility requirements typically include historical participation in the fishery and other basic requirements (see **Step 3.2** of **Volume 1** of the **Catch Share Design Manual**). Fishery managers sometimes require individuals to be a member of a participating Cooperative in the catch share program in order to hold and fish shares.

In Cooperatives formed from individual quota-holders, it is important for fishery managers to consider whether the Cooperative will be allowed to hold shares on behalf of its members. Individuals sometimes pool their shares to be fished collectively by the Cooperative so it may be necessary to ensure that the Cooperative (or another entity) has the legal ability to hold pooled shares. Pooling of shares may also need to be considered when determining limits on the concentration of shares **(Step 3.4)**.

3.3 HOW WILL COOPERATIVE MEMBERSHIP BE DEFINED?

Fishery managers and/or Cooperative leaders will typically determine the criteria for individuals to join a Cooperative. Ideally, requirements will be determined jointly by Cooperative leaders and government fishery managers to promote equity, transparency and program support. As with any catch share, eligibility requirements should reflect the goals of the program.

Government criteria for membership

Government fishery managers often establish basic Cooperative membership criteria to ensure attainment of fishery-wide goals. Some of these criteria are the same basic requirements for participating in a fishery:

- Citizenship
- Possession of a current license
- Historical and/or current participation in the fishery
- Membership in an existing organization of fishermen, community or family
- Holding shares in an existing individual quota program
- Connection to the resource and/or reside near the resource
- Maintenance of active participation
- Compliance with fishery regulations and Cooperative rules

The role of fishery managers in setting membership criteria varies depending on the goals of the program and the types of decisions fishery managers choose to vest in the Cooperatives. Managers sometimes require Cooperatives to accept all eligible license holders as members, thereby pre-determining Cooperative membership requirements. However, it may be important for Cooperatives to have a role in who may (or may not) join in order to meet their goals. Some fishery managers specify that the nature of membership is completely voluntary (i.e., the member and the Cooperative agree to membership).

Managers should carefully consider membership criteria to ensure they are compatible with Cooperative success. It may be valuable to enable some flexibility, so that fishermen can form Cooperatives based on their interests and commonalities. Flexibility can also allow Cooperatives to determine how best to meet their goals. For example, some Cooperatives have non-fishing members who perform onshore duties or monitoring and enforcement roles, and it may be important to consider these types of Cooperative roles when defining membership criteria. In the pilot phase of the United States Central Gulf of Alaska Rockfish Cooperative Program, processors were incorporated into Cooperatives, and each Cooperative delivered the majority of its catch to the associated processor. This unique design feature ensured that benefits of Cooperative management extended to shore-based processors.

Cooperative criteria for membership

Cooperatives often have their own eligibility requirements in addition to those designed by fishery managers. The most basic requirement is that members agree to comply with Cooperative rules, typically by signing a member agreement, contract or bylaws. Cooperative rules are described in more detail in **Step 6.2**.

Cooperatives rely on a commitment from their members to meet their goals and as a result, they often set requirements to ensure this commitment. Some Cooperatives may limit membership by creating prerequisites, such as working as a crew member or an apprentice, to ensure participants have a vested interest in joining. Some Cooperatives have established minimum time requirements for membership, and a person may leave the Cooperative or join another Cooperative only after that time period has elapsed. In the United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program, for example, members may only join, leave or switch Cooperatives at the beginning of each fishing year. Without limitations in place, the Cooperative could be at risk. For example, members could exit a Cooperative mid-year to avoid incurred penalties, or could move from one Cooperative to another while fishing more than their share in each. In the case of severe rule violations, these time requirements may be overridden and the offending member expelled from the Cooperative.

Additional considerations

Cooperative leaders and fishery managers should weigh the benefits and consequences of membership restrictions. Creating appropriate limits on Cooperative membership affects exclusivity and therefore may affect participants' incentives and the performance of the program. Cooperative catch shares will often be designed based on the organization of pre-existing groups, and the structure and goals of those groups may pre-determine membership requirements.

The number of members in a Cooperative can range from few to hundreds, and the characteristics of your Cooperative and/or fishery may partially define the appropriate number of members. Generally, large groups may need greater structure and leadership, whereas it may be easier for small groups to maintain a strong partnership between Cooperative members. Social cohesion may lead to greater success in meeting goals (Gutierrez et al., 2011), and homogeneous groups can maintain social cohesion at higher numbers than can heterogeneous groups. A larger group may have a greater ability to adopt specialized roles, including non-fishing roles. In Cooperatives where members conduct enforcement, groups must be large enough to monitor fishing activity and defend their resource (e.g., patrol their TURF). Fishery managers and groups of fishermen may find ways to scale group size to the characteristics of their fishery. For example, large groups may subdivide into smaller, more manageable groups, with a committee organizing across subgroups.

Limiting membership may not always be compatible with the social goals of the program. Shared decision making between Cooperatives and fishery managers can help ensure membership requirements are appropriate for meeting fishery-wide goals and Cooperative goals. It may be appropriate to adapt membership requirements over time and/or allow fishery participants to move between Cooperatives. Allowing groups to stratify based on interests, skills and needs can support greater social cohesion within each Cooperative.

3.4 WILL THERE BE LIMITS ON THE CONCENTRATION OF SHARES?

Concentration limits specify what percentage of the total quota share any one participant or entity (such as a Cooperative) can hold or fish. Concentration limits are discussed in detail in **Step 3.3** of **Volume 1** of the **Catch Share Design Manual**, and additional considerations for Cooperative catch shares are provided in this section. Concentration limits may apply to the portion of shares any Cooperative may hold, the portion of fishery-wide shares individuals within a Cooperative may hold, or the portion of a Cooperative's shares each of its members may hold. Concentration limits often reflect the structure of the fishery at the time of program implementation. These limits will often be set and enforced by government fishery managers, but Cooperatives will sometimes be responsible for determining and enforcing what portion of its shares each member may hold.

Cooperative concentration limits

When determining how many shares a Cooperative can hold, it is important to consider the goals of the program. Economic goals are best supported when Cooperatives have flexibility to take advantage of economies of scale. Consequently, some programs allow Cooperatives to hold a substantial portion of shares. Higher concentration limits may also be appropriate for Cooperatives that are export-oriented and vertically integrated. However, many Cooperative programs have social goals of maintaining the historical fleet structure, or limiting market power held by Cooperatives. If your goals are supported by having many Cooperatives (e.g., to foster participant flexibility or to maintain a diverse fleet structure), it may be appropriate to set concentration caps for Cooperatives at a lower level.

Individual concentration limits

Fishery managers or Cooperative leaders may want to limit the amount of quota any one individual in a Cooperative can hold or fish. Concentration caps for individuals may refer to a maximum share of the fishery-wide quota or a limit on the amount of the Cooperative's quota an individual may harvest. Both types of caps achieve the social goal of supporting balanced distribution of shares among fishermen. Determining which type of limit to apply may depend on the structure of the fleet and the goals of the program.

Cooperatives are often formed with the intent of creating economic efficiencies, facilitating trading and allowing members flexibility in fishing. As such, individual concentration caps are not always compatible with economic goals. In the United States Bering Sea and Aleutian Islands Crab Rationalization Program, individuals are not subject to concentration caps if they join a Cooperative (Fina, 2005). The result is an incentive for members to join Cooperatives, which in turn supports the efficiency gains intended by the program (see **Catch Share in Action: United States Bering Sea and Aleutian Islands Crab Rationalization Program**). The tradeoffs between economic goals and social goals should be considered when determining whether concentration limits will apply to Cooperative members.

Additional considerations

Economic and social goals can sometimes be balanced in the same program by having different concentration caps for different fleets. In the United States Central Gulf of Alaska Rockfish Cooperative Program, for example, different Cooperative concentration caps were applied to different types of vessels (NOAA Fisheries Service, 2011). Members of the catcher-processor fleet, which has a historically high capital investment and a small number of highly productive vessels, were allowed to hold more shares than members of the catcher vessel fleet, for which historical catch has been more widely distributed across a larger number of vessels.

Concentration caps may not be relevant for all cooperatively managed fisheries. In some Cooperatives (especially those allocated TURFs), the Cooperative holds the entire fishery-wide quota. To meet social and equitability goals, these Cooperatives may use other approaches to ensure they accommodate a certain number of participants.

3.5 HOW WILL NEW PARTICIPANTS ENTER THE FISHERY?

Accommodating new entrants in a catch share is important for ensuring the longevity of the fishery. Purchasing or leasing shares is the most common way to enter a catch share fishery. Four additional methods for accommodating new entrants are discussed in detail in **Step 3.4** of **Volume 1** of the **Catch Share Design Manual**. They include (1) share holdbacks, (2) share redistribution, (3) providing financial support for leasing or buying shares and (4) community permit or quota banks. Cooperative catch shares can be designed to accommodate new entrants by allowing entrants to form new Cooperatives or join existing Cooperatives.

Determining how to accommodate new entrants may depend upon the goals of the program and the characteristics of the fishery. In some fisheries, new entrants are allowed to choose which approach is most compatible with their interests. It is important to consider how groups are defined in the fishery and how new entrants will affect existing participants.

Forming new Cooperatives

New Cooperatives can be allowed to form when new groups of users are incorporated into a Cooperative catch share program, or when existing organizations of fishermen are allocated catch share privileges. Planning for new Cooperative formation at the program's onset will ensure there is enough quota or fishing area for these new groups, such as through set-asides.

Allowing new entrants to form new Cooperatives can support economic and social goals by enabling groups to stratify based on their interests and commonalities. New entrants may have different goals or characteristics than existing Cooperatives, and may better accomplish their goals by forming a Cooperative that meets their needs. Rather than prescribe which Cooperative a new entrant joins, fishery managers will often set minimum requirements for Cooperatives and allow new ones to form as appropriate.

New entrants can be incentivized or required to form Cooperatives to access exclusive fishing privileges. In the Chilean TURF Program, for example, fishing communities can only apply for a TURF in their local waters after they meet basic requirements set by the government to demonstrate a degree of organization and an ability to participate in fishery management (i.e., setting catch limits). In exchange for organizing into a Cooperative and accepting management responsibilities, they are granted exclusive area-based privileges and incorporated into the national TURF program (see **Catch Shares in Action: Chilean National Benthic Territorial Use Rights for Fishing Program** in **Volume 1**).

New entrants in existing Cooperatives

In many fisheries, new entrants are allowed to join existing Cooperatives. In community-based Cooperatives, for example, members of the community who wish to join the fishery may be required to do so through the Cooperative. New entrants may cause a Cooperative to expand, or new entrants may only be allowed to take the place of exiting or retiring members.

In Cooperatives where privileges are allocated directly to the group and the share of the fishery-wide catch or TURF is fixed, increasing membership can have a negative impact on existing members because the fixed resource will then be shared across a larger group of fishermen. Limiting new entrants by maintaining a fixed number of members may be appropriate.

In Cooperatives formed from individual quota holders, groups may be more willing to expand for new entrants, as the individual will bring quota to the Cooperative rather than dilute the shares of current members.

Additional considerations

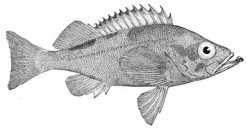
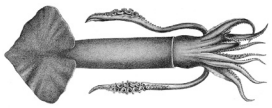
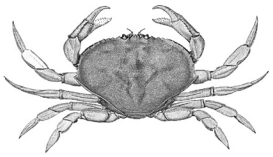
It is important to consider whether new entrants can receive fishing privileges without interrupting the security and exclusivity of the existing members' privileges. The decision to allow new entrants into a Cooperative catch share should depend on whether allowing new entrants will help meet the goals of the Cooperative and of fishery managers. Social goals typically include supporting the livelihoods of fishing communities, which in many cases have increasingly more people engaged in fishing. However, without appropriate mechanisms in place, new entrants can impact a Cooperative's success by eroding a group's sense of exclusivity and weakening social cohesion. Thus, the path by which new entrants will enter a fishery should be considered in program design and should involve both fishery managers and Cooperatives. The benefits of allowing new entrants should be balanced with the impacts on the Cooperative's functionality and effectiveness.

DESIGN PRINCIPLE

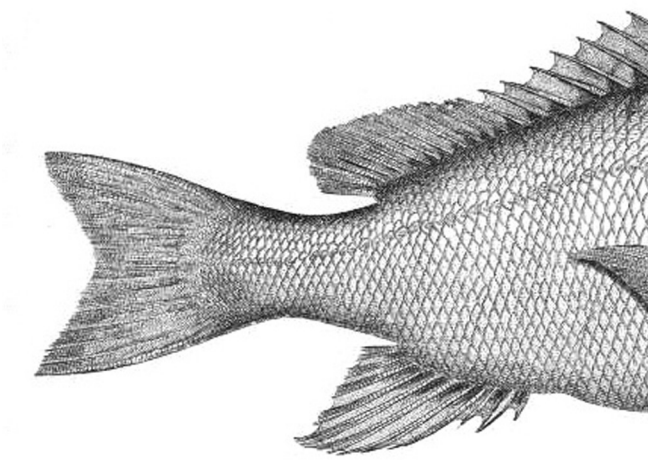
Develop mechanisms for accommodating new entrants during the design of the catch share program and prior to initial share allocation.

Step 3– Define Eligible Participants

This chart provides a brief summary of the **Step 3** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

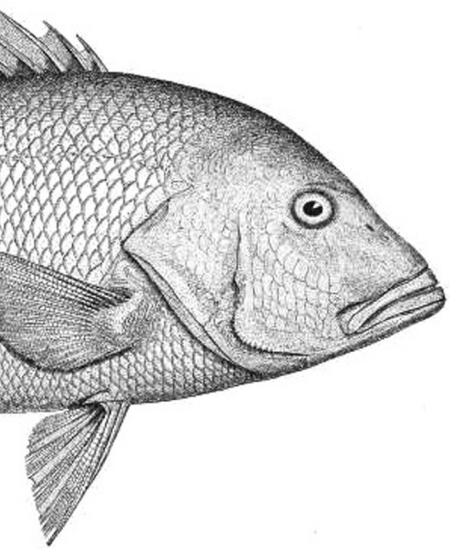
	3.1 ALLOCATED VIA GROUPS OR INDIVIDUALS	**3.2** ELIGIBILITY REQUIREMENTS	**3.3** COOPERATIVE MEMBERSHIP REQUIREMENTS
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	Groups Participants access quota by joining a Cooperative Non-Cooperative participants fished competitively	Historical participants in the limited license program	Minimum of 9 members (later reduced to 7 to enable formation of additional Cooperative) Limits on corporate ownership
Japanese Common Fishing Rights System 	Groups	Existing organizations formed into Fishery Cooperative Associations	Must have a history in the fishery and compliance with regulations
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	Individuals and community-based groups Many participants voluntarily join Cooperatives and pool shares	Past and current participants, including vessel owners and crew Processors with historical participation eligible for processor shares	Cooperative membership is voluntary Minimum of 4 members Agree to Cooperative bylaws
Spanish Galicia Goose Barnacle Cofradía System 	Groups (community-based traditional fishing guilds, or cofradías)	Limited licenses allocated by government Cooperative membership Cooperative membership	Membership in a cofradía Payment of membership dues

3.4 CONCENTRATION LIMITS	3.5 NEW PARTICIPANTS
Individuals and corporations limited to 30% ownership of the Cooperative's share Vessels limited to 20% of fishery-wide limit	Enter by purchasing permit and shares from current participants
None required by government but may be implemented by Cooperatives	Determined by Cooperatives; usually undergo a trial period
Varies by stock: vessel concentration caps range from 1 to 10%; crew concentration caps range from 2 to 20% Cooperatives not subject to concentration limits Processors have a limit of 30% of the processor quota pool	Enter by purchasing or leasing shares from current participants
None	Enter by receiving a license from Galician fisheries ministry and becoming a member of an existing cofradía



Step
4

Define the Privilege



SEASALT

Secure
Scaled
Transferable

At a Glance

This step requires you to define the privilege and its main attributes. Many of these decisions will determine ongoing management of the program, as well as the stability and flexibility participants will have under the program.

KEY PRINCIPLES

Develop mechanisms to ensure the Cooperative is accountable to its catch limit and prevents a race for fish among members. | 43

Allocate shares for sufficient length to encourage stewardship and appropriate investment by shareholders and associated industries. This can be achieved by allocating in perpetuity and/or for significant periods of time with a strong assumption of renewal, provided rules are adhered to. | 46

Employ percentage shares, when possible, of the overall cap rather than absolute weight units for long-term shares. | 46

To increase program flexibility, consider transferability of shares, permanent and/or temporary, which is generally a hallmark of catch share programs. | 47

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Step 4

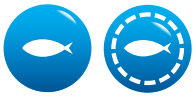
Define the Privilege

Defining the privilege is an important step because it allows managers and fishermen to clearly establish the attributes of the privilege being allocated. These decisions are outlined in **Step 4** of **Volume 1** of the **Catch Share Design Manual**, and expanded upon for area-based privileges in **Volume 3: Territorial Use Rights for Fishing**. Additional guidance as it pertains to Cooperative catch shares is provided in this section.

By effectively defining the privilege, you will ensure participants have **Secure** access to the fishery so they can effectively make long-term business decisions and determine **Transferability** of shares to support flexibility. Defining the privilege also includes making sure it is **Scaled** appropriately to fit the specific biological, social and political attributes of the fishery.

Cooperatives are often granted harvesting privileges in exchange for accepting certain management responsibilities. Especially when shares are allocated directly to the Cooperative, the most important role of the Cooperative is to ensure its members are **Accountable** to the catch limit (**Step 4.2**). **Step 6 – Develop Administrative Systems** describes other roles that the Cooperative may assume—such as monitoring, catch accounting and enforcement—as well as how the costs of these roles are covered.

4.1 WILL THE PRIVILEGE BE QUOTA-BASED OR AREA-BASED?



Cooperative catch shares may be quota-based or area-based. However, this volume is dedicated to providing design advice for quota-based systems. Determining whether your catch share will be quota-based or area-based may depend upon a variety of factors and may occur even before you decide to manage the fishery via Cooperatives (see **Step 4.1** of **Volume 1**).

Quota-based privileges may be assigned directly to a Cooperative, or individuals with quota-based privileges may form a Cooperative. In either case, cooperation can occur to achieve certain goals in a quota-based fishery, such as increased economic efficiency through coordination.

Many Cooperatives around the world have been allocated area-based privileges, commonly known as TURFs. TURFs are often implemented because they are compatible with the common social goals of fisheries management, are effective for the target species and/or comport with customary fishing rights that occur in some geographies. In some contexts, area-based privileges may be more feasible to administer than quota-based privileges. See **Volume 3: Territorial Use Rights for Fishing** for in-depth design guidance.

4.2 HOW WILL THE COOPERATIVE BE ACCOUNTABLE TO ITS CATCH LIMIT?

In a catch share, participants are allocated fishing privileges in exchange for agreeing to comply with fishery regulations and stay within their allocated share. Whether the Cooperative is directly allocated a share, or individuals with their own shares choose to pool their allocations, a hallmark of Cooperative catch shares is the group responsibility to ensure compliance with the collective share.

In addition to staying within the catch limit, the Cooperative is responsible for promoting the biological, economic and social goals of the program by ensuring there is not a race for fish between members. To prevent competitive fishing, some Cooperatives manage their group quota by sub-allocating shares to members, while others implement self-imposed rules for fishing the share collectively. The Cooperative's decision to sub-allocate quota or to collectively fish its group allocation should depend upon the Cooperative's goals and management capacity. These decisions are discussed below.

Sub-allocation of shares to members

Cooperatives can sub-allocate shares to individuals either formally or informally, and hold individuals accountable to their sub-allocated shares so that the Cooperative stays within its group allocation. For example, some Cooperatives in the Chilean TURF Program evenly allocate shares of the catch limit to fishing teams (Cancino et al., 2007). Individual shares are one way to prevent a race for fish between Cooperative members, which can help meet biological goals and promote efficiency in the fishery (especially when shares are transferable between members).

In rare cases, Cooperatives with area-based privileges divide the allocation into individual harvesting plots; this is the case for the Pescadores de Vigía Chico Cooperative that manages the Punta Allen spiny lobster fishery in Mexico. Individual members are allocated a *campo*, or individual fishing area, in which they have exclusive privileges to set their harvesting gear. They are also responsible for complying with harvesting rules in their campo (see **Catch Shares in Action: Mexican Vigía Chico Cooperative Spiny Lobster Territorial Use Rights for Fishing Program** in **Volume 3**).

A Cooperative's decision to sub-allocate shares will likely depend on the Cooperative's ability to administer an individual quota program among its members. In Cooperatives comprised of diverse members with limited social cohesion, individual allocation may be more feasible than collective harvest management. For some Cooperatives, however, individual quotas may be challenging to administer and monitor. It is essential to pair individual quotas with an effective accounting system that holds each member accountable for his quota. If the Cooperative decides to allocate its quota or area to its members, it is advisable for the Cooperative to go through each step of **Volume 1** of the **Catch Share Design Manual** to design and administer an effective individual quota program among its members.

DESIGN PRINCIPLE

Develop mechanisms to ensure the Cooperative is accountable to its catch limit and prevents a race for fish among members.

Harvesting effort coordination

Many Cooperatives employ fishing effort coordination mechanisms in which they dictate where, when, how and/or how much members can harvest. The Cooperative controls harvest by distributing fishing effort among members. Unlike conventional input restrictions, fishing effort coordination is often implemented to promote economic efficiency (see Snapshot 4.1) or to promote fairness among members. Achieving efficiency and promoting fairness may be at odds with each other under certain circumstances. Cooperatives should consider these tradeoffs when designing fishing effort coordination systems, and determine which outcome is more important in order to guide design.

Input restrictions

Conventional input restrictions include trip limits, size limits, seasons, gear restrictions and vessel size restrictions. These or other self-imposed restrictions can be used to limit harvest to ensure the Cooperative stays within its share. Cooperatives may implement conventional input restrictions because they are familiar—for example, if the government has already implemented these types of restrictions—and may have lower administrative and monitoring requirements. Cooperatives can often implement input restrictions at a finer scale than government fishery managers, which may be more appropriate and effective for meeting fishery goals. When designed well, input restrictions may be effective at reducing fishing effort to achieve the desired harvest. However, input restrictions have a less direct connection to catch and pose a risk of allowing overharvesting. Regular adjustments (usually, increasing restrictions) are often required to meet biological targets, but these restrictions may undermine economic goals. Input restrictions alone do not prevent a race for fish, and they often result in higher fishing costs, lower profits and reduced safety for fishermen. It is important to recognize the limitations of managing the Cooperative's share via input restrictions. If they are the most feasible option, input restrictions must be designed and enforced as effectively as possible to ensure the Cooperative stays within its share and prevents a race for fish.

Individual effort allocations

Cooperatives occasionally use individual effort quotas to control fishing mortality. Individual effort quotas are a special case of input restrictions, in which individuals are allocated an amount of effort they may apply to fishing. Effort units may include a number of traps that may be deployed, a number of days that may be fished, or other measurable units. Ideally, effort units are defined so that they have a clear, direct relationship to fishing mortality and cannot easily be substituted for through the use of other inputs. Allowing transferability of effort units between Cooperative members can improve efficiency. If the total amount of effort units allocated to Cooperative members is closely tied to the Cooperative's total quota allocation, individual effort quotas may be effective for managing the group's quota. A key challenge, however, is that as harvesting efficiency increases, a greater amount of fish can be harvested using the same allocated effort unit. It may be important to adjust the effort allocation over time to ensure increases in harvesting efficiency do not interfere with fishery sustainability. For more information on individual effort quotas, see **Transferable Effort Shares: A Supplement to the Catch Share Design Manual**.

Spatial restrictions

Spatial restrictions are typically used in combination with other limits to ensure sustainable harvest. These can be permanent, temporary or seasonal restrictions and can relate to different fishing sectors, e.g., certain gear types. No-take reserves can be used to limit fishing mortality by limiting the total area in which Cooperative members can fish. Appropriately designed no-take reserves can have numerous biological benefits, including increased size of fish within reserves and replenishment of stocks in nearby fished areas (Gell and Roberts, 2003; Halpern et al., 2010). Scientists and fishery managers are developing innovative ways to use no-take reserves to meet fishery targets. For example, reserves can have flexible boundaries to meet

SNAPSHOT 4.1 | Meeting Goals through Fishing Effort Coordination

Most Cooperatives engage in some form of coordinated behavior, ranging from information sharing to coordinated harvesting regimes ("effort coordination"). Effort coordination can help eliminate the race for fish because all fishermen are working together to harvest within the group's allocation. Consequently, the biological impacts of the race for fish—including overharvesting of target or non-target species—are eliminated.

Economic efficiency is a common driver of effort coordination. For example, Cooperatives may require members to alternate fishing days, reducing effort to the optimal daily level. Cooperative members may rotate through fishing grounds or fish in designated places to reduce congestion in prime fishing grounds (Uchida and Watanobe, 2008). Cooperatives may choose to create specialized roles and assign only the best fishermen to fish in order to optimize efficiency.

The perception of fairness is often important for maintaining social cohesion and thus the effectiveness of the Cooperative. When species abundance varies spatially, rotational fishing can be used to allow all members equal access to the best fishing grounds. For example, the Hiyama Fishery Cooperative Association in Japan uses a highly organized rotational scheme to distribute fishing effort for walleye pollock in a way that is perceived as fair by its members (Uchida and Watanobe, 2008). Similarly, Cooperatives may engage in effort coordination to ensure members have a fair distribution of profits.

Effort coordination typically occurs within a Cooperative, but it is sometimes utilized by neighboring Cooperatives targeting the same resource. The Sakuraebi Harvesters Association, for example, was formed to coordinate effort between two Cooperatives in Japan that disputed over sakuraebi shrimp, which gain size as they move north between the Cooperatives. The association's committee, made up of vessel owners and skippers from each Cooperative, handles the many decisions that manage daily fishing activities. These include whether the fleet should fish that day, vessel departure time, vessel locations, which vessels will fish, target harvest amount and landing amounts in each port (Uchida, 2007).

fishery management goals (stock rebuilding, fishing mortality control, increased yield). They may be set at their largest size when stock rebuilding is a priority, and reduced in size as stocks recover. No-take reserves and other spatial restrictions are commonly used in area-based catch shares and are discussed in more detail in **Volume 3: Territorial Use Rights for Fishing**.

Cooperatives may limit total harvest using whichever of the above methods are most compatible with the Cooperative's goals and management capacity. Ultimately, the Cooperative is responsible for effectively limiting harvest within its allocation, as measured by stock status (assessments) and yield.

4.3 FOR HOW LONG WILL THE PRIVILEGE BE ALLOCATED?

Ensuring the optimal tenure of shares is key to providing stability and security to catch share participants. Shares should be allocated for a sufficient length of time for shareholders to realize the benefits of sustainable fishing practices. If Cooperatives sub-allocate shares to members, it is also important for the tenure of those shares be sufficiently long to promote stewardship by individuals.

In Cooperative catch shares, it is also important to consider the effect of the tenure of shares on Cooperative function. Developing and administering a Cooperative requires a commitment of time and resources. Participants will want to ensure that their efforts in organizing the Cooperative are sufficiently rewarded. Cooperatives often tend to improve over time, as participants' trust and social bonds are strengthened and as the group adapts to better meet its goals. A sufficient tenure length allows Cooperatives to strengthen and to innovate.

Because Cooperatives often accept important management responsibilities in exchange for fishing privileges, it may be valuable for fishery managers to establish a formal renewal process. A renewal process can be designed to ensure continued tenure is contingent upon fulfillment of Cooperative responsibilities. In the Chilean TURF Program, for example, Cooperatives' area-based privileges are renewed every four years based upon compliance with national laws.

DESIGN PRINCIPLE

Allocate shares for sufficient length to encourage stewardship and appropriate investment by shareholders and associated industries. This can be achieved by allocating in perpetuity and/or for significant periods of time with a strong assumption of renewal, provided rules are adhered to.

4.4 HOW IS THE LONG-TERM SHARE DEFINED?

Catch shares are commonly allocated for more than one year. Managers must determine the long-term share unit, which generally falls into two broad categories: either a percentage of the overall catch limit, or an absolute weight measurement. These two approaches are discussed in detail in **Step 4.3** of **Volume 1** of the **Catch Share Design Manual**.

Experience has shown that a percentage-based system is superior to an absolute weight system because a percentage share provides a direct incentive for conservation. As the stock and the catch limit increase, the amount of fish a participant is allowed to catch in a year also increases.

DESIGN PRINCIPLE

Employ percentage shares, when possible, of the overall cap rather than absolute weight units for long-term shares.

4.5 WHAT WILL THE ANNUAL ALLOCATION UNIT BE?

Most catch share programs differentiate between the long-term privilege and the annual catch allocation. The annual allocation is the measurement of the seasonal allocation that is issued to privilege holders (i.e., the annual quota that can be fished by the Cooperative) and is computed based on their long-term share. The allocation can be expressed in weights or numbers. These methods are discussed in detail in **Step 4.4** of **Volume 1** of the **Catch Share Design Manual**.

4.6 WILL THE PRIVILEGE BE PERMANENTLY AND/OR TEMPORARILY TRANSFERABLE?

When privileges are transferable, participants are allowed to buy and sell shares permanently, temporarily or both. Transferability increases flexibility in the program and can enhance attainment of economic and biological goals. Transferability supports economic goals by allowing members to improve efficiency, to cover catch or bycatch and/or to maximize their catch within the biologically appropriate limits. **Step 4.5** of **Volume 1** of the **Catch Share Design Manual** discusses considerations for including permanent and/or temporary transferability in your catch share program.

Due to the diversity of Cooperative management structures, transferability of shares can take many forms. Transfers may occur within a Cooperative (intra-Cooperative transfers), between Cooperatives (inter-Cooperative transfers) or from Cooperatives to non-cooperative fishery participants. In some cases, fishery managers or Cooperatives limit or prohibit transfers to support certain program goals (**Step 4.7**).

Intra-Cooperative transfers

Cooperatives often facilitate trades between members to achieve efficiency gains and comply with catch limits. For example, a specific goal of the United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program is to increase economic returns by enhancing operational efficiency and enabling more complete harvests of target species via cooperation. In order to optimize target species harvest, Cooperative managers oversee in-season transfers between members to cover individual overages of target and non-target species quota (see **Catch Shares in Action: United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program**).

Inter-Cooperative transfers

Inter-Cooperative transfers can also help achieve economic goals by increasing flexibility. Inter-Cooperative transfers can occur in several ways: Cooperatives trade Cooperative shares directly; individuals trade shares with individuals from other Cooperatives; or, members move between Cooperatives. The type of transfer will depend upon the structure of the Cooperative, such as whether shares are held by the individual or the group. In programs where individuals hold the allocation, it is important to clearly define how movement of members between Cooperatives affects shares. Typically, members bring their shares with

DESIGN PRINCIPLE

To increase program flexibility, consider transferability of shares, permanent and/or temporary, which is generally a hallmark of catch share programs.

them, effectively transferring shares from one Cooperative to another.

Other transfers

In some cases, Cooperatives may engage in transfers with non-Cooperative fishery participants to meet economic and social goals. Members may transfer shares to or from non-Cooperative fishery participants, such as individual quota holders in other sectors. A Cooperative may also lease annual quota to other fishery participants, but the long-term shares (the allocated percentage of the fishery-wide catch) and the revenues from leasing remain in the community. Revenues help support program goals of economic development and poverty alleviation, and provide other economic and social benefits for rural communities.

4.7 WILL THERE BE RESTRICTIONS ON TRADING AND USE OF SHARES?

You can limit the selling, buying and leasing of shares in a variety of ways. Limitations generally fall into three broad categories: geographic trading limits, based on either biological or social boundaries; social trading limits, based on community or fleet characteristics; and administrative trading limits, based on the management of share trading. These three categories are discussed in **Step 4.6** of **Volume 1** of the **Catch Share Design Manual**. Limiting the concentration of shares may also be important for meeting social goals, as discussed in **Step 3.4** of this volume.

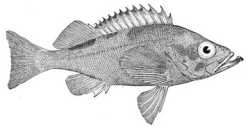
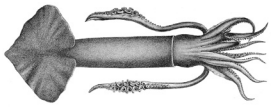
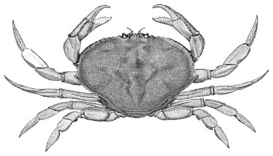
Intra-Cooperative transfers are rarely limited because they often support economic and biological goals with minimal impact to social goals. In some programs, fishery managers encourage intra-Cooperative transfers to achieve efficiency gains, and some Cooperatives have formed primarily to facilitate trading (see, for example, **Catch Shares in Action: Danish Pelagic and Demersal Individual Transferable Quota Programs** in **Volume 1**). However, in some cases, transfers between members of a Cooperative may be limited, such as when equitable distribution of shares is desired. Cooperative leaders are typically responsible for approving transfers between Cooperative members, and Cooperative bylaws can be used to clearly define any restrictions on intra-Cooperative transfers.

To support social goals, restrictions on transfers are more commonly applied to transfers outside of a Cooperative (to another Cooperative or to other fishery participants). Trading restrictions determined by fishery managers, Cooperatives or both can be designed to ensure that shares are not transferred away from a Cooperative or a sector. Cooperatives often include a right of first refusal in their contracts to ensure that members have an opportunity to purchase shares before they are transferred outside the Cooperative. You may choose to allow temporary transfers but prohibit permanent transfers.

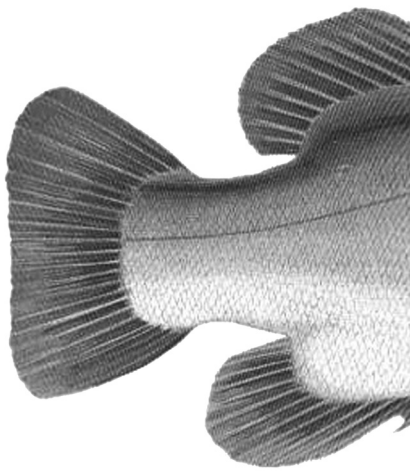
During the design process, it is important to clearly define limits on transfers and determine who will approve transfers. Transferability decisions, including approval of transfers, may be made by fishery managers, Cooperative leaders, Cooperative members or some combination of these groups. Voting or creating bylaws outlining the conditions for trading are feasible ways of obtaining member approval of Cooperative transfers (**Step 6.2**). While restrictions on transfers can help achieve certain goals, they can also reduce the effectiveness of catch shares in improving economic efficiency. The potential benefits and drawbacks of restrictions on transfers should be considered in the context of program goals.

Step 4– Define the Privilege

This chart provides a brief summary of the **Step 4** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

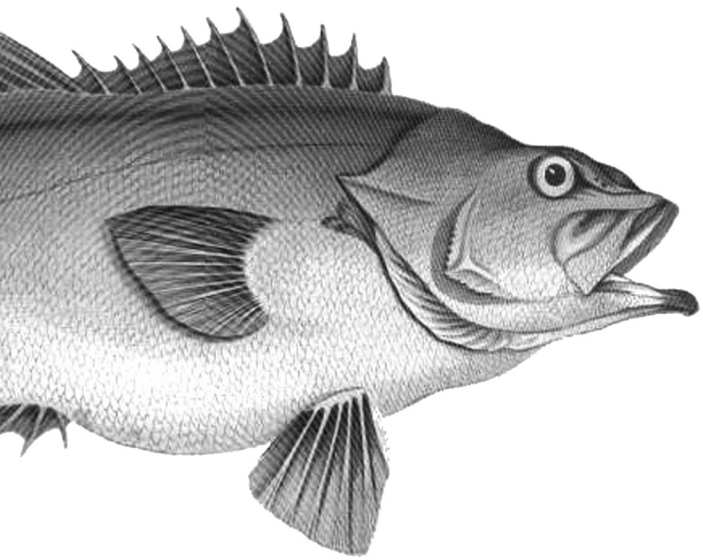
	4.1 QUOTA-BASED OR AREA-BASED	4.2 COOPERATIVE ACCOUNTABILITY	4.3 TENURE LENGTH	4.4 LONG-TERM SHARE
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	Quota-based	Members agree upon how group share will be distributed	Indefinitely	Percentage shares, called "quota shares," assigned to licenses and accessed via Cooperative membership
Japanese Common Fishing Rights System 	Area-based and Quota-based	Compliance with government regulations Cooperatives impose additional rules	Renewed every 10 years	Privilege to harvest all species
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	Quota-based	Individuals within a Cooperative fish their allocated quota, or Cooperative manages pooled quota	Indefinitely	Percentage shares, called "quota shares," assigned to vessels Processors hold a percentage share of harvested amount for processing
Spanish Galicia Goose Barnacle Cofradía System 	Area-based	Members comply with rules in Cooperative management plan, including fishing locations and maximum daily harvest amounts	Indefinitely with annual management plan approval	Privilege to harvest cofradía-specified amounts via license and cofradía membership

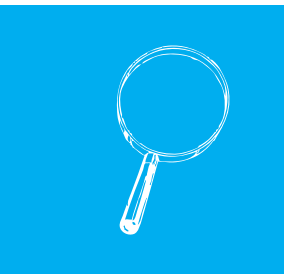
4.5 ANNUAL ALLOCATION UNIT	4.6 PERMANENTLY AND/ OR TEMPORARILY TRANSFERABLE	4.7 RESTRICTIONS ON TRADING AND USE OF SHARES
Weight-based Cooperative Quota based on the sum of members' shares	Permanently and temporarily transferable with restrictions	Participants can permanently transfer licenses and shares to new entrants Temporary transfers between Cooperatives approved by NMFS
Varies by species and Cooperative	Varies by Cooperative	Varies by Cooperative
Weight-based, called IFQ Cooperative receives combined annual IFQ of its members	Permanently and temporarily transferable with restrictions	Quota recipient must be active participant Cooperatives and Cooperative members can trade more freely than non-Cooperative participants Restrictions on processor transfers to protect communities
Daily weight-based harvest limit	On-boat licenses are transferable through the purchase of existing boats	On-foot licenses cannot be transferred Daily catch limits are not transferable and cannot be accrued



Step
5

Assign the Privilege





At a Glance

Assigning the privilege has often been the most difficult and controversial step of implementing a catch share program. Participants feel that much is at stake in the distribution of catch share privileges and initial allocation sets up the starting point for the program.

KEY PRINCIPLES

Develop a transparent, independent allocation process that is functionally separate from the rest of the design process. Allocations that retain the relative equity positions of stakeholders are the least contentious. | 54

Employ an allocation appeals process that allows eligible participants to refute allocated amounts with verifiable data. | 55

SUB-STEPS

5.1 What decision-making body will determine initial allocation? | 54

5.2 When will allocation occur? | 54

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5.4 Who is eligible to receive shares? | 55

5.5 Will initial shares be auctioned or granted? | 56

5.6 How many shares will eligible recipients receive? | 56

5.7 What data are available for allocation decisions? | 57

Step 5

Assign the Privilege

Initial allocation is a key step in transitioning to a catch share program. Allocation decisions are outlined in detail in **Step 5** of **Volume 1** of the **Catch Share Design Manual** and summarized below with additional considerations for Cooperatives. Assigning the privilege can occur at two levels for Cooperative catch shares. Fishery managers allocate privileges directly to groups or to individuals who may form groups, and sometimes groups sub-allocate shares to individuals. Because initial allocation is often difficult and controversial, it is important for each allocation process to be transparent and to occur independently of the rest of the design process.

DESIGN PRINCIPLE

Develop a transparent, independent allocation process that is functionally separate from the rest of the design process. Allocations that retain the relative equity positions of stakeholders are the least contentious.

By successfully assigning the privilege you will ensure that shares have been **Exclusively** allocated to participants in order to end the race for fish. This step may also ensure that **All sources** of mortality are included as part of the catch share.

5.1 WHAT DECISION-MAKING BODY WILL DETERMINE INITIAL ALLOCATION?

Fishery managers, fishery stakeholders or an independent third party may be responsible for determining how shares are allocated to Cooperatives. These decision makers are discussed in **Step 5.1** of **Volume 1** of the **Catch Share Design Manual**. Cooperatives that receive a direct allocation will have additional considerations for sub-allocation decisions. A Cooperative interested in distributing shares to its members will likely need its own decision-making body for allocation. Cooperatives may seek input from fishery managers or from others outside the group to help facilitate a fair and transparent process.

5.2 WHEN WILL ALLOCATION OCCUR?

Initial allocation of shares can occur at any time during the design process. The timing of allocation may depend upon the type of Cooperative catch share being implemented. In Cooperatives formed by individuals, for example, fishermen may already be assigned shares in an Individual Quota program before the Cooperative is established. When Cooperatives are directly allocated shares, allocation may occur in two stages: first to the group as a whole, and then to individuals within the group.

5.3 WILL THERE BE AN APPEALS PROCESS?

An appeals process can help ensure fairness in allocation. Appeals processes have commonly been used to address factual issues such as interpretation of regulations or corrections of accounting errors that affect a participant's allocation. Appeals processes are discussed in detail in **Step 5.3** of **Volume 1** of the **Catch Share Design Manual**. In Cooperative catch shares, an appeals process can be used to appeal allocation decisions made by the government, as well as decisions made by the Cooperative, such as sub-allocation of shares.

DESIGN PRINCIPLE

Employ an allocation appeals process that allows eligible participants to refute allocated amounts with verifiable data.

5.4 WHO IS ELIGIBLE TO RECEIVE SHARES?

Determinations regarding who is eligible to receive shares in the initial allocation process will be grounded in the decisions made in **Step 3 – Define Eligible Participants**. The decision-making body will determine which individuals or groups are eligible to receive shares based on the criteria defined in **Step 3.2**. For Cooperatives with a collective share, the same decision-making body or a different one established by the Cooperative will determine how the group's share will be distributed among Cooperative members.

In addition to basic requirements, such as holding a license and actively participating in the fishery, fishery managers sometimes require participants to join a Cooperative to receive an individual allocation (which may then be pooled with other members' allocations). Fishery managers in the the United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program allocated shares to each licensed participant based on historical landings. The program was designed to incentivize Cooperative formation by only allowing members of Cooperatives to access and pool individual shares. Non-cooperative participants fished the sum of their shares competitively in a common pool sector. The system successfully incentivized all participants to form Cooperatives in order to achieve the efficiency gains and reduction of non-target catch enabled by coordination (see **Catch Shares in Action: United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program**).

In group-allocated Cooperatives, eligibility to fish shares is based on membership criteria determined in **Step 3.3**. During the allocation process, the decision-making body will determine which individuals meet the defined membership requirements. Often the privilege to fish the Cooperative's allocation will be reserved for historical fishery participants or members of a community. Members are typically expected to agree to Cooperative bylaws in order to fish the group's share. Members may be allocated an individual share, or may take part in the collective harvest of the group's share according to Cooperative rules.

Cooperatives sometimes choose to admit members who are not eligible to fish, but who perform other Cooperative duties, such as management, administration, processing or marketing (see **Step 6**). While these members may not be authorized to fish the Cooperative's share, they will sometimes receive some of the revenue from the Cooperative's harvest. Thus, it may be important for the Cooperative to clearly define who (in addition to fishermen) will receive direct benefits from the group's allocated privileges.

5.5 WILL INITIAL SHARES BE AUCTIONED OR GRANTED?

There are two main forms of initial share distribution: auctioning and granting. Auctions require participants to pay for shares, whereas granting gives the shares free of charge to an identified set of participants at program initiation. These and other approaches are discussed in detail in **Step 5.5** of **Volume 1** of the **Catch Share Design Manual**.

5.6 HOW MANY SHARES WILL ELIGIBLE RECIPIENTS RECEIVE?

Determining how many shares to allocate to individuals is discussed in detail in **Step 5.6** of **Volume 1** of the **Catch Share Design Manual**. Additional guidance for determining how many shares groups will receive is provided below.

A Cooperative may receive all of the privileges in a fishery, or a portion of the fishery-wide limit. When a portion of the catch limit is allocated as quota to a Cooperative, the group's share is typically calculated based on the characteristics of the Cooperative and its members. Possible methodologies for assigning shares to a Cooperative are provided below.

Individual quota aggregation

A Cooperative's share of the fishery-wide limit can be determined by aggregating members' individual shares (as determined by a prior allocation process). These Cooperatives are common where data used for allocation have been collected on an individual basis or where each fisherman is assigned an equal share. In the United States Northeast Multispecies Sector Management Program, each Cooperative's annual quota is determined based on the sum of its members' shares (NOAA Fisheries Service, 2010).

Allocation based on Cooperative attributes

In Cooperative systems, shares can be assigned to each Cooperative based on attributes of the Cooperative as a whole (rather than individual members). For example, the catch history of the entire Cooperative may be used to assign shares. Shares of the walleye pollock catch limit in Japan are divided between fishing Cooperatives based on the Cooperatives' recent catch history. This methodology may be perceived as unfair because Cooperatives that choose to fish conservatively receive a reduced share in the years that follow (Uchida and Watanobe, 2008).

A Cooperative's level of investment in the fishery can also be used for determining the group's share, as it is an indication of the group's commitment to a fishery and potential catch capacity. In the case of a new fishery, the founders of the fishery may merit special consideration because of their disproportional investment compared to other participants.

Proportional allocation

Cooperative quota can be determined by calculating the proportion of fishermen who are members of the Cooperative and assigning an equal proportion of the fishery wide catch limit to the Cooperative. This is functionally equivalent to aggregating individual quota based on equal shares. Proportional allocation may be preferred in places with a strong norm for equity, or in cases where catch histories have not been tracked. However, in fisheries with variable catch histories, this methodology may be perceived as unfair. In 2002, for example, the Chignik Salmon Cooperative in Alaska was allocated a portion of the fishery-wide catch based on the number of fishery participants who joined the Cooperative. Non-cooperative fishery participants who perceived the Cooperative's allocation as unfair legally disputed the allocation, and a court ruling subsequently revoked the Cooperative's allocation in 2006 (Deacon et al., 2010).

Allocation based on existing law

Sometimes the quota allocated to a Cooperative is based on an existing treaty or legal construct, such as legal requirements pertaining to indigenous groups. For example, Nunavut Inuit communities of northern Canada are granted a percentage share of fisheries to support economic development and livelihoods within treaty-allocated lands. In compliance with the Nunavut Land Claims Agreement Act, the Nunavut Wildlife Management Board is largely responsible for determining the community's share of allocated species catch limits (Comeau and Cook, 2004).

Allocation based on independent assessment

Some Cooperatives are allocated area-based privileges along with quota-based privileges. Rather than determine a Cooperative's quota based on a defined portion of the fishery-wide limit, it may be most appropriate to define a catch limit for the Cooperative based specifically on the resource within its allocated TURF. This assessment may be the responsibility of fishery managers, the Cooperative or a third party. In the Chilean TURF Program, for example, Cooperatives can apply to the government to receive a TURF in their neighboring coastal waters. Each Cooperative is responsible for hiring an external consultant to conduct a baseline study of the area and establish the catch limit for target species. The Undersecretary of Fisheries confers final approval of the TURF after the scientific recommendations are made (see **Catch Shares in Action: Chilean National Benthic Territorial Use Rights for Fishing Program** in **Volume 1**).

Additional considerations

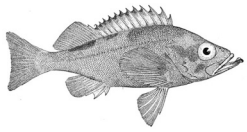
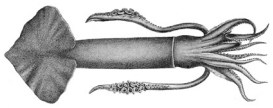
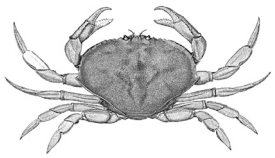
Once the Cooperative receives a group allocation, the Cooperative may sub-allocate shares to its members. When the group allocation is an aggregate of members' individual shares, the Cooperative may subdivide its allocation based on each member's contribution (though some of the group's share may be set aside as a reserve beforehand). Alternatively, the Cooperative may choose to use one of the other allocation methods outlined in **Step 5.6** of **Volume 1** of the **Catch Share Design Manual**. In any case, it is important for the sub-allocation process to be conducted in a fair and transparent manner.

5.7 WHAT DATA ARE AVAILABLE FOR ALLOCATION DECISIONS?

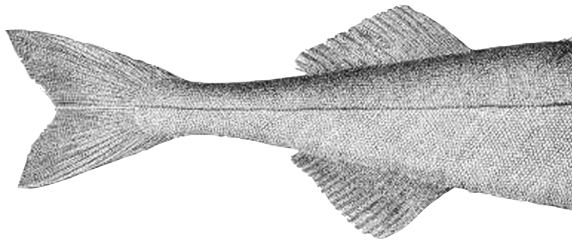
The nature of the data available will impact the method of your fishery's allocation. If data are very robust, then it will be possible to develop an allocation system that depends heavily on existing, retrievable information. However, if there are few data or the data are inaccurate, alternative methods should be developed. **Step 5.7** of **Volume 1** of the **Catch Share Design Manual** discusses data for allocation decisions in more detail.

Step 5– Assign the Privilege

This chart provides a brief summary of the **Step 5** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

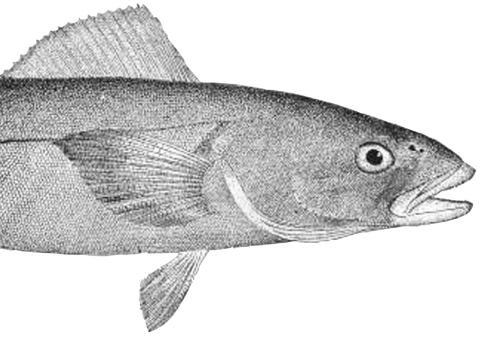
	5.1 DECISION-MAKING BODY	**5.2** WHEN ALLOCATION OCCURRED	**5.3** APPEALS PROCESS	**5.4** ELIGIBILITY REQUIREMENTS
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	Restricted Access Management Division of National Marine Fisheries Service	After program design	Yes	Vessel owners part of limited license program Participation during a specified period Access to secure share via Cooperative membership
Japanese Common Fishing Rights System 	Ministry of Agriculture, Forestry and Fisheries and prefectural governments	Allocated to groups long in existence with design features evolving over time	None	Allocated exclusively to Fishery Cooperative Associations
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	Restricted Access Management Division of National Marine Fisheries Service	After program design	Yes	Vessel owners part of limited license program Captains and crew with historical participation Processors with history of receiving crab Participation during a specified period
Spanish Galicia Goose Barnacle Cofradía System 	Galician fisheries ministry (Consellería do Medio Rural e do Mar)	After program design	None for initial allocation	Cofradías required to organize and create management plan Must be Cooperative member and receive license to fish from Galician fisheries ministry

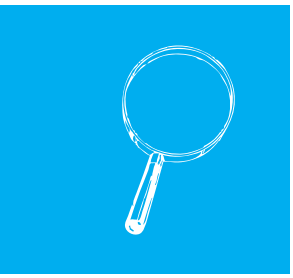
5.5 AUCTIONED OR GRANTED	5.6 SHARES RECEIVED	5.7 AVAILABLE DATA
Granted	Individual shares based on the best five years of historical landings from 1998 to 2004	Reported landings data
Granted	Area-based privileges and a portion of the fishery wide catch limit	Historical landings
Granted	Based on historical landings for a specified time period for each fishery For processors, based on processing history	Reported landings data For processors, historical processing data
Granted	Privilege to fish in designated area for target species within defined daily catch limits	Allocations based on the number of participants and independent biological assessments of available resource



Step
6

Develop Administrative Systems





At a Glance

Administrative systems are an important component of a catch share program. By developing and implementing effective administrative systems, you will ensure that participants can successfully participate in the program and are held accountable for their privileges.

KEY PRINCIPLES

Clearly define the roles and responsibilities of fishery managers, Cooperatives and other entities to reflect program goals and the relative strengths and capabilities of each group. | 64

Establish Cooperative administrative systems including a clear process for decision making and bylaws or contracts to formalize rules, roles and responsibilities. | 65

Encourage cost-effective, transparent trading that is easy for all participants. | 67

Employ transparent catch accounting and complete regularly enough to ensure compliance with catch limits. | 67

Design and implement a fishery information system that keeps costs low and is effective for conducting catch accounting, collecting scientific data and enforcing the law. | 68

SUB-STEPS

6.1 What are the roles and responsibilities of the Cooperative? | 62

6.2 How will the Cooperative be governed? | 64

6.3 How will trading, catch accounting and information collection occur? | 66

6.4 How will the Cooperative be administered and funded? | 68

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Step 6

Develop Administrative Systems

Developing any fishery management program requires consideration of how the program will be implemented and administered. **Step 6** outlines design considerations for a Cooperative catch share program to administer the Cooperative organization, track fishing participants, monitor and enforce fishing activity, conduct science and more. Many of these administrative features are outlined in detail in **Step 6** of **Volume 1** of the **Catch Share Design Manual** and summarized here with additional considerations for Cooperatives. By developing and implementing effective administrative systems, you will ensure that participants are **Accountable** to the program and their allocations.

An important element of any Cooperative catch share is the co-management arrangement between fishery managers and the Cooperatives. This step will help define the co-management arrangement, and importantly, Cooperatives and managers will jointly make many of these decisions. There may be trade-offs as to who fills which roles. Government fishery managers are often best suited to set and enforce performance standards, while the Cooperative's responsibility will be to ensure compliance with them. The Cooperative may best accomplish other functions as well, because fishermen have a close connection to the fishery and can develop localized solutions to meet fishery goals in ways that work best for them.

In addition to the overarching administrative systems of the program, Cooperatives will need to develop their own internal administrative systems to meet their goals and fulfill their responsibilities. As such, this step includes design considerations that pertain specifically to how a Cooperative will be administered internally. These internal administrative decisions are often made by the Cooperatives themselves, but fishery managers may also have a role in determining how best to set up Cooperatives to meet program goals.

6.1 WHAT ARE THE ROLES AND RESPONSIBILITIES OF THE COOPERATIVE?

In exchange for secure, exclusive fishing privileges, Cooperatives often accept some management responsibilities. Some responsibilities will be government-mandated, but Cooperatives often voluntarily implement management measures as well (Ovando et al., 2013). Therefore, administration of the Cooperative catch share program is often shared between Cooperatives, government institutions and sometimes other entities. In this shared management approach, called co-management, it is important to clearly define the roles and responsibilities of each group.

Cooperative responsibilities can vary, but often include:

- Ensuring catch limit compliance
- Monitoring catch (landings and discards) of members
- Tracking transfers among members
- Contributing to fishery science and management by collecting data and providing local expertise
- Enforcing fishery regulations
- Creating and enforcing internal fishing rules and restrictions
- Reducing non-target catch and/or habitat impacts of fishing

Determining Cooperative responsibilities will likely be a joint decision or negotiation between the government and the Cooperative, and it may evolve over time. Some of these roles, such as enforcement, may be pursued jointly by fishery managers and Cooperatives.

To fulfill its responsibilities, a Cooperative will designate roles to its members and/or hire third-party professionals.

These roles may vary depending on the number of members, complexity of operations, services provided, financial resources and the level of co-management. Examples of the roles individual Cooperative members or third parties perform are provided in Table 6.1. In addition to fulfilling Cooperative responsibilities, many of the roles members perform are intended to support the economic and social goals of the Cooperative.

Cooperative members may have specialized roles or may rotate through different roles. In the Chilean TURF Program, for example, most Cooperatives have an infraction committee comprised of three or four seats that are filled by members on a rotating basis (Cancino et al., 2007). Other Cooperatives have designated individuals whose primary responsibility is to manage the Cooperative to fulfill responsibilities and meet goals (see **Step 6.2**).

When determining responsibilities, it is important to evaluate whether the Cooperative has the capacity to perform these roles. In instances where it makes sense for a Cooperative to take on certain responsibilities, but the Cooperative does not yet have the necessary skills or resources, capacity building or financial assistance may be helpful.

The roles of a Cooperative and its members may evolve over time. Especially as Cooperatives get stronger and more mature, they may be able to take on additional

TABLE 6.1 | COMMON FUNCTIONS AND ROLES OF COOPERATIVE MEMBERS

FUNCTION	ROLES
Management	Cooperative managers or leaders Government or federation liaisons/representatives Management plan developers
Administration	Membership coordination Financial accounting Bylaw and contract development
Science	Stock assessment Surveying Quota setting
Fishery Monitoring	Catch accounting Quota management
Enforcement	Patrollers/officers Infraction committee members
Fishing	Fishermen and specialized fishermen Boat builders Mechanics Fishing gear manufacturers
Marketing	Marketplace administration Price negotiations Buyer relations
Processing	Plant operators Quality assurance specialists Drivers
Member Services	Community infrastructure Medical services

responsibilities and develop more specialized internal functions to meet their goals. The ability of Cooperatives to evolve will depend on both the structure of the Cooperative agreement and the legal and regulatory environments that govern Cooperative behavior (De Alessi et al., 2013). Building flexibility into the initial program design can support this evolution.

DESIGN PRINCIPLE

Clearly define the roles and responsibilities of fishery managers, Cooperatives and other entities to reflect program goals and the relative strengths and capabilities of each group.

6.2 HOW WILL THE COOPERATIVE BE GOVERNED?

Effective governance is a vital component of Cooperative catch shares. Without well-established systems, a Cooperative is at risk of underperforming. Implementing good governance requires specialized skills and concerted effort. The importance of well-functioning governance structures cannot be underestimated, and both managers and fishermen will likely play a role in achieving good governance. Fishery managers often set certain standards for governance, such as establishing a legally recognized entity in order to receive an allocation of quota. Some countries have formal laws that mandate certain elements of Cooperative governance (e.g., specific leadership roles and decision-making processes). Cooperatives establish internal governance systems to carry out their management responsibilities and to coordinate with government fishery managers. The following considerations are important for internal Cooperative governance.

Bylaws and contracts

It is important to have a mechanism by which members formally acknowledge and agree to the Cooperative rules. To achieve this, most Cooperatives establish bylaws, rulebooks and/or contracts outlining the Cooperative's operations and rules. They commonly detail:

- Membership eligibility requirements
- Membership fees
- Members' roles and responsibilities
- Harvesting rules
- Governance, including election of leaders and representatives, voting methods, etc.
- Leaders' eligibility requirements and roles
- Penalties for non-compliance

In the Pescadores de Vigía Chico Cooperative in Mexico, for example, members agree to a set of written rules by signing the rulebook. Their formal acknowledgement ensures penalties can be issued for non-compliance, and the Cooperative rules have even been used to protect the Cooperative in legal disputes with ejected non-compliant members (Sosa-Cordero et al., 2008).

Contracts may be executed between the Cooperative and the government, and/or between members of the Cooperative. For example, sectors in the United States Northeast Multispecies Sector Management Program agree to a legally binding contract with the National Marine Fisheries Service that establishes the rights and responsibilities of the Cooperative. Additionally, members formally agree to the Cooperative's operations plan (National Oceanic and Atmospheric Administration, 2010). In the United States Pacific Coast Groundfish Limited Entry Trawl Individual Fishing Quota Program, members forming risk pools have contracts with other members that are enforced through civil law (Holland and Jannot, 2012).

DESIGN PRINCIPLE

Establish Cooperative administrative systems including a clear process for decision making and bylaws or contracts to formalize rules, roles and responsibilities.

Some Cooperatives have rules designed to promote fairness (e.g., equal access to fishing areas, or an expectation for members to harvest a minimum amount). While the concept of fairness is important for building and maintaining social cohesion, promoting fairness can sometimes be at odds with economic goals, such as efficiency. Rules promoting fairness can also threaten biological goals if fishermen are encouraged to harvest rather than to keep fish in the water for the future. Cooperatives should carefully consider these trade-offs when setting expectations for members.

Decision making

It is important for Cooperatives to have a clearly defined process for decision making. Three factors should be considered: who votes, how votes are weighted and what percentage of votes is required for a decision to be approved.

While some important decisions are made collectively by all Cooperative members (such as election of new leaders), Cooperatives typically deputize leaders or committees (e.g., a Board of Directors) to make the majority of decisions.

The Cooperative also needs to establish clear guidelines for the relative importance of each vote cast by a member or elected leader. The most common voting methods include:

- *Equal voting*
  Commonly called "one member–one vote," this approach places equal value on each member's vote, and decisions are based on the majority. It is the most common voting method used by Cooperatives, largely because it is often perceived as fair and equitable.
- *Proportional voting*
  Under this approach, members are granted votes according to the number of shares they hold or control, and the majority vote drives decisions. This creates a tiered governance structure based on the level of investment in the fishery. This method can seem most fair when some members disproportionately support the operation of the Cooperative, such as when the Cooperative is funded through a percentage fee on landings. However, when quota holdings are unequal, proportional voting can effectively shut out members who have fewer holdings from decision making (Yandle, 2003). Many Cooperatives balance voting power by placing a cap on the number of votes one member may have (Reynolds, 2000).

Finally, Cooperatives need to determine whether a decision needs to be agreed upon unanimously or by majority vote, and if the latter, what constitutes a majority. A Cooperative may have different requirements based on the importance of the issue at hand.

Cooperative federations must also determine which voting methods to employ. Federations are Cooperatives comprised of other Cooperatives, e.g., the Mexican Baja California Regional Federation of Fishing Cooperative Societies (FEDECOOP). If a federation chooses a proportional voting method, the weighting can be based upon each Cooperative's aggregated landings, or based upon how many members each Cooperative has.

Ensuring compliance

A Cooperative's primary responsibility is to ensure members collectively stay within their allocated share. While fishermen have a strong incentive to ensure good

compliance under catch shares, it is also important to develop and implement a deliberate system for compliance. Most Cooperatives use a combination of surveillance and penalties. Fishermen or third-party professionals may fill dedicated enforcement roles, and Cooperatives often rely on members to report non-compliant behavior to the government or other deputized enforcement officers.

It is important for Cooperatives to establish and enforce an internal penalty structure for non-compliance. Penalties are typically enacted when harvesting rules are violated, such as when fishermen land more than their quota, or don't fulfill their responsibilities (e.g., reporting their catch, attending Cooperative meetings, etc.). Many Cooperatives establish a committee that is responsible for evaluating infractions and applying penalties. Clearly identifying penalties in the Cooperative's bylaws ensures members are aware of the consequences of non-compliance and adds legitimacy to the enforcement process.

The use of graduated sanctions that escalate with the severity and quantity of infractions is recommended (Ostrom, 1990). Penalties usually fall into three categories: fines, loss of harvest and expulsion. Fines are the most common form of penalty, as the amounts can be adjusted to "fit the crime." Loss of harvest—typically in the form of reduced quota, less time on the water or confiscation of harvested fish—is most commonly imposed for infractions committed while fishing. Expulsion from the Cooperative usually occurs for severe violations or after repeated offenses.

Leadership

Leadership is a critical aspect of Cooperative management, particularly in areas where formal governance structures are weak or non-existent. In many co-managed fisheries, strong leadership is the most important attribute contributing to successful management (Gutierrez et al., 2011). Local leaders who identify with the needs and challenges of fishermen and work to address them may be most effective.

Leaders often emerge naturally and assume responsibilities. In the absence of a clear leader, fishery managers or other entities may need to help build leadership capacity. Different kinds of leaders may emerge, including those who have specific authority (such as elected officials or traditional authorities), or others whose personalities or relationships position them as de facto leaders.

6.3 HOW WILL TRADING, CATCH ACCOUNTING AND INFORMATION COLLECTION OCCUR?

Just like any fishery management program, performance of Cooperative catch share programs will depend upon good information, compliance and the ability for the program to be cost-effective. **Volume 1** of the **Catch Share Design Manual** provides a thorough discussion of how to set up a trading system (**Step 6.1**), track fishermen's catch against their share holdings, known as "catch accounting" (**Step 6.2**), and set up information systems to ensure the catch does not exceed the appropriate science-based catch limit (**Step 6.3**). Setting up these systems is an essential part of administering a Cooperative catch share. They are summarized here in brief with additional considerations for Cooperatives.

Setting up trading, accounting and information systems will likely involve both fishery managers and Cooperatives. Because fishery managers are responsible for the sustainability of the resource, it is essential for them to ensure that monitoring and enforcement are effective. This may require that fishery managers maintain certain responsibilities or that appropriate checks are in place to ensure the Cooperative is fulfilling its responsibilities.

Where appropriate, it will be important to assess how existing systems can be leveraged and adapted into management to help minimize costs and simplify the process. In some communities with a history of

DESIGN PRINCIPLE

Encourage cost-effective, transparent trading that is easy for all participants.

community-based fisheries management, traditional enforcement and monitoring systems may already be in place.

Trading

In a Cooperative catch share system, permanent or temporary transferability of shares may occur within a Cooperative (intra-Cooperative) or between Cooperatives (inter-Cooperative) (**Step 4.6**). A cost-effective, transparent trading system gives participants access to reliable information about availability and prices of shares and will allow shares to be freely traded (see **Step 6.1** of **Volume 1**). Fishery managers, Cooperatives or third-party service providers may develop and administer trading systems to facilitate and track transfers. If Cooperative members will be allowed to transfer individual quota to other members within the Cooperative, it may be valuable for Cooperatives to develop their own trading protocols and platforms to facilitate intra-group trading. It is equally important for these systems to be cost-effective and transparent.

Catch accounting

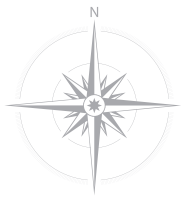
Similar to a bank account, catch accounting systems must track the Cooperative's initial balance (i.e., their annual allocation) against their catch and landings, and in the case of a transferable system, tracks any increases or decreases in shares due to trades (see **Step 6.2** of **Volume 1**). Cooperatives may be able to integrate into existing accounting systems, or accounting systems may need to be developed.

Cooperatives commonly work with third-party service providers to facilitate catch accounting. For example, Cooperatives targeting pollock in Alaska employ a third party to track landings and bycatch, which are initially collected by federal and state monitoring programs (Pollock Conservation Cooperative and High Seas Catchers' Cooperative, 2011). The third party provides real-time data online so fishermen can track their landings and share holdings, and so they can adaptively manage their fishing behavior in real time to meet goals such as reducing bycatch.

Fishery managers may require Cooperatives to report catch in aggregate or per member. Many Cooperatives track trades and catch within the Cooperative, while the government tracks Cooperative quota as a whole. For example, inshore groundfish Cooperatives of the Canadian Scotian Shelf use a system that tracks individual catch within the Cooperative, and the government's role is to ensure each Cooperative stays within its allocation (Peacock and Annand, 2008). This reduces the administrative role of fishery managers in accounting for transfers within the system. The tradeoff, however, is that reduced availability

DESIGN PRINCIPLE

Employ transparent catch accounting and complete regularly enough to ensure compliance with catch limits.



of trading information for fishery managers can introduce uncertainty in managers' assessment of performance (Fina et al., 2010).

Information systems

Information systems should be designed and used to conduct catch accounting, collect scientific data and enforce the laws (see **Step 6.3** of **Volume 1**). Fishery information systems include at-sea and dockside data collection, and information may be self-reported or collected through an independent process. It is important for information systems to be cost effective and transparent. An effective information system ensures Cooperatives and their members are accountable to government and Cooperative rules.

A Cooperative can manage information that is specific to the portion of the fishery it represents. Cooperatives can account for catch and track trades of members, monitor members' non-target catch, and collect fishery information relevant to local management decisions. Cooperatives can share information with fishery managers in whatever form is appropriate for decision making at the regional or national level.

In addition to providing information on catch limit compliance, many Cooperatives around the world are responsible for enforcing fishery regulations to prevent poaching and other illegal behaviors by Cooperative members and other fishermen. This may involve ensuring compliance with fishery closures (including no-take reserves) and/or harvest restrictions (e.g., size limits), or enforcing TURF boundaries.

DESIGN PRINCIPLE

Design and implement a fishery information system that keeps costs low and is effective for conducting catch accounting, collecting scientific data and enforcing the law.

6.4 HOW WILL THE COOPERATIVE BE ADMINISTERED AND FUNDED?

As in any fishery management program, implementing and administering a Cooperative catch share program requires effort. An important component of administration is effective and appropriate coverage of program costs. The types of costs incurred will largely reflect the goals and responsibilities outlined in this step. Some of these costs may be paid for by the management authority while others will be the Cooperative's responsibility; this will largely be determined by the roles and responsibilities identified for each entity in **Step 6.1**.

A common goal of implementing Cooperatives is to maximize cost-effectiveness of management. The government can accomplish some roles more efficiently, while Cooperatives may best handle others. Cost effectiveness should be considered when identifying roles and responsibilities. For a generalized discussion of financing the transition to catch shares and recovering management costs, see **Step 6.4** of **Volume 1** of the **Catch Share Design Manual**. This section will focus primarily on the costs typically incurred by Cooperatives and how to pay for them. An established organization may have some systems already in place that can be leveraged to help reduce startup costs.

Cooperatives may pay their internal costs in full, or the government may provide financial assistance, especially during the transition to a catch share system. The government may consider a number of factors to determine how much of the costs it will cover, including the

benefits each co-management entity will derive from the Cooperative management structure.

Costs to the Cooperative generally include governmental fees, resource management and Cooperative management. Cooperatives have typically obtained revenue to cover their costs using one or more of the following methods:

- *Membership fees*
  Cooperatives may collect entry fees or yearly dues. The fee can be equal for every participant or proportional to each participant's quota holdings. These fees are often easiest to administer and they provide upfront, predictable funds. The amount collected should account for the social and economic goals of the Cooperative. The impact of fees on participation in the Cooperative should be balanced with their role in covering some of the administrative costs.
- *Landing fees*
  Some Cooperatives collect fees based on the amount of fish landed by each member. Landing fees may be particularly appropriate if shares are allocated to individuals (either directly or sub-allocated from the Cooperative). Harvest fees may be unpredictable and may be insufficient in years of low harvest. It may be advantageous for the Cooperative to hold a reserve to ensure it can consistently cover costs.
- *Pooled revenue deduction*
  Some Cooperatives that fish collectively will pool their revenue and cover costs before distributing profits to members (see Snapshot 6.1). As long as the fishery is productive, an annual deduction ensures the Cooperative can cover all costs for each year. A reserve can help cover costs in years of low productivity. Members may find pooled revenue deduction to be less burdensome than paying direct membership or harvest fees from their perceived income.

Cooperatives sometimes employ other ways of financing their operations. For example, the Underwater Harvester's Association, which targets molluscs in Canada, requires members to use a logbook of specific format that can only be purchased through an affiliate of the Cooperative (James, 2008).

Member compensation

Cooperatives must also decide how to compensate members for participating and create a structure for payments. Cooperatives compensate fishermen and non-fishing members in a variety of ways. In Cooperatives where catch is sold collectively, it is especially important to have a good system for member compensation. On the other hand, in Cooperatives where members bring their individual quota, individuals often sell their own fish and collect revenue independently of the Cooperative. In both types of Cooperatives, there may be non-fishing members (who fill the roles described in **Step 6.1**) who are paid by the Cooperative. Member payment structures include:

- *Wages and salaries*
  Cooperatives may pay wages or salaries to fishermen and/or non-fishing members. Wages and salaries are especially common for non-fishing members who perform Cooperative duties.
- *Payments per harvested amount*
  In many Cooperatives, fishermen are paid individually based on the amount of fish they land. This payment system rewards fishermen for the resources they dedicate to fishing. It is important to consider that fishermen paid solely based on the amount landed are incentivized to compete with one another. Cooperatives using this payment system should ensure that appropriate mechanisms are in place to prevent a race for fish among members.
- *Pooled profit distribution*
  Many Cooperatives that fish their shares collectively pool their revenue and distribute profits to members. Payments may be uniformly distributed or may be weighted, usually based on the costs incurred by each member. The payment distribution method is particularly important for Cooperatives in which fairness and social cohesion support coordinated harvesting. These factors are discussed in more detail in Snapshot 6.1.

SNAPSHOT 6.1 | Distributing Member Payments in Cooperatives with Pooled Revenue

Cooperatives that harvest their allocated share collectively often achieve efficiency by pooling their harvest and revenue (Uchida, 2007). When Cooperatives pool revenue, they will need to establish an appropriate system for paying their members. The method by which payments are distributed affects the incentives of members to harvest sustainably and efficiently. Payments may be weighted based upon the contribution of each member, or they may be uniform across members (Uchida, 2007). See Table 6.2 for examples.

Weighted payment systems pay members based on differences in fishing effort, costs and/or landings. Essentially, members who contribute more in the chosen category will receive a higher payment. A weighted distribution system can serve the Cooperative's economic and social interests by rewarding fishermen for productivity. They can also promote fairness by ensuring that those with the highest skills and investments in the fishery are rewarded. However, weighted distribution can also promote competition between fishermen and lead to a race for fish that brings negative biological outcomes. Thus, if weighted systems are used, the Cooperative will need to ensure other mechanisms are in place to prevent the race for fish.

In uniform payment systems, all members are paid equally. Cooperatives using uniform distribution tend to have fairly homogenous levels of input, either naturally or as a result of Cooperative actions such as effort coordination or cost sharing. Cooperatives may choose a uniform payment system as a way to foster social cohesion among members, or simply because uniform payments are easier to administer than weighted payments (especially when catch and/or revenue are pooled). When effort is highly coordinated and evenly distributed, members will likely perceive uniform payments as fair. Because uniform systems pay all members equally, Cooperative rules may need to outline expectations for how, and how much, members will contribute to the group.

6.5 HOW WILL COORDINATION OCCUR ACROSS COOPERATIVES?

Fishery management sometimes occurs on a broader scale than a single Cooperative. For example, the fishery may extend across multiple communities, with each community having its own Cooperative. Building opportunities for local, regional and sometimes national coordination into a Cooperative system enables proper scaling of management based on stock distribution and existing political jurisdictions. The need for inter-Cooperative management is heightened when stocks extend spatially across multiple Cooperatives.

Coordination across Cooperatives can occur in a variety of ways. In many cases, the government will interface with all of the Cooperatives under its jurisdiction and implement regulations at the regional or national level. Additionally, Cooperatives often develop their own mechanisms to coordinate with neighboring Cooperatives to meet their goals and to facilitate communication with regional and national governments.

Local or regional coordinating committees can play an integral role in achieving biological, economic and

Cooperatives may combine weighted and uniform payment systems to balance the benefits of each; this is typically accomplished by having two payments. By ensuring Cooperative members are rewarded for their work while minimizing competition among members, a well-designed payment system can help achieve the biological, economic and social goals of the program.

TABLE 6.2 | EXAMPLES OF COOPERATIVE POOLING AND PAYMENT ARRANGEMENTS

COOPERATIVE	DISTRIBUTION TYPE	POOLING AND PAYMENT DISTRIBUTION DESCRIPTION	RATIONALE
Japanese Sakuraebi Harvesters Association	Uniform	Revenue is pooled and a portion covers Cooperative costs. The remaining profits are distributed evenly among groups of fishermen.	Equal distribution perceived as fair, especially because fishing effort is highly coordinated and shared among participants.
Buzos y Pescadores de Isla Natividad, FEDECOOP	Weighted (with some uniform payments)	Fishing members paid based on landings. Non-fishing members paid wages. 70% of remaining revenue is used to fund Cooperative activities, and the rest is evenly distributed to all members.	Costs are shared by the Cooperative to balance profits among members. Uniform distribution of profits rewards all members for Cooperative performance.
New Zealand Crabco Cooperative[1]	Weighted	Compensation based on Cooperative profits. Individuals' pay based on percent quota share.	Payment based on contribution to the Cooperative's revenue.

Sources: Uchida, 2004; C. Calderon, personal communication, 2012; and Soboil and Craig, 2008.
[1]This Cooperative is not currently operational (M. De Alessi, personal communication, 2013)

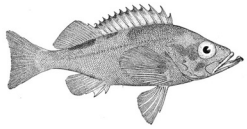
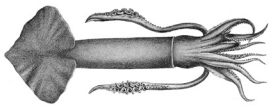
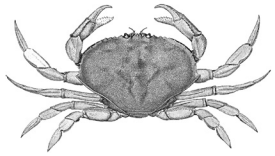
social goals. They can manage shared stocks, market fishery products collectively and share innovations across Cooperatives. Committees may include Cooperative representatives, local government representatives, scientists and other stakeholders.

Cooperatives often facilitate coordination at the broader regional or national level by forming federations. A federation is a Cooperative comprised of other Cooperatives (or in some cases, a mix of individuals and Cooperatives). The federation's role is to coordinate across Cooperatives and represent Cooperative members in regional or national decision-making processes. For example, the Mexican Baja California Regional Federation of Fishing Cooperative Societies (FEDECOOP) oversees marketing and the careful monitoring and enforcement of lobster harvest among its member Cooperatives (see **Catch Shares in Action: Mexican Baja California FEDECOOP Benthic Species Territorial Use Rights for Fishing System** in **Volume 3**). Further, federations coordinate at a national level.

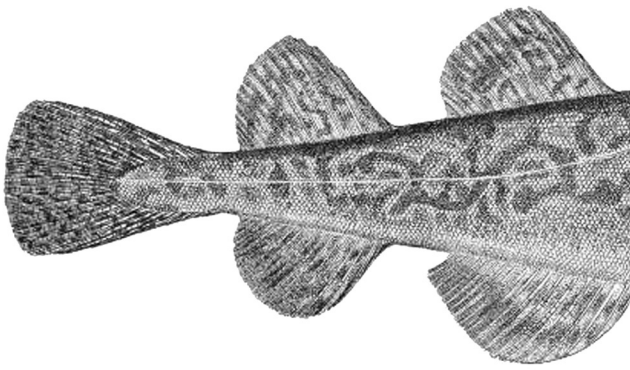
The Japanese Common Fishing Rights System is a prominent example of how effective institutions can support management across Cooperatives. This is a tiered system in which national and regional governments administer fishery regulations, and various organizations coordinate fishing activities at the local, regional and even national level (see **Catch Shares in Action: Japanese Common Fishing Rights System**).

Step 6– Define Eligible Participants

This chart provides a brief summary of the **Step 6** design decisions for the four programs featured in this Cooperative catch share volume. For an in-depth discussion of each fishery, please see the full reports in the **Catch Shares in Action** section starting on page 79.

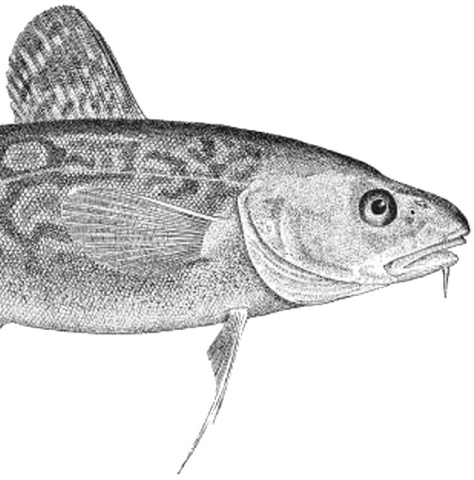
	6.1 COOPERATIVE ROLES AND RESPONSIBILITIES	**6.2** COOPERATIVE GOVERNANCE	**6.3** TRADING, ACCOUNTING AND INFORMATION COLLECTION
U.S. Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program 	Plan harvest of Cooperative Quota, with an emphasis on reducing bycatch Facilitate and approve trades	Cooperative led by Board of Directors Manager responsible for day-to-day operations Members sign membership agreement	Government-maintained, web-based catch accounting and trading platform Assistance from hired third party Data manager employed by Cooperative Stringent onboard monitoring requirements and vessel monitoring system
Japanese Common Fishing Rights System 	Ensure compliance with national and prefectural regulations Regulate and coordinate harvest of members	Internal rules agreed upon and approved by government	Cooperatives responsible for catch accounting Accounting by Cooperative staff at markets
U.S. Bering Sea and Aleutian Islands Crab Rationalization Program 	Manage intra-Cooperative trades Achieve efficiency gains and coordinate marketing	Cooperative led by Board of Directors One representative coordinates with government Members agree to bylaws Member voting proportional to shares or one vote per member	Government-maintained, web-based catch accounting and trading platform Dockside and processor monitoring Onboard observers and vessel monitoring system
Spanish Galicia Goose Barnacle Cofradía System 	Develop annual management plans approved by Galician fisheries ministry Conduct biological monitoring	Cofradías responsible for local decision making All members have voting rights Executive leadership elected every four years	Control points for tracking landings Catch can only be sold at local markets (called Lonxa)

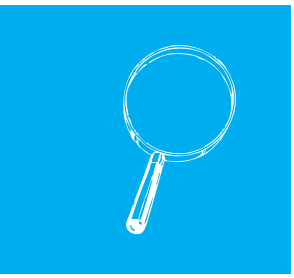
6.4 ADMINISTRATION AND FUNDING	6.5 INTER-COOPERATIVE COORDINATION
No initial cost recovery program, but one is being developed Members pay for monitoring and other Cooperative services	Coordination by National Marine Fisheries Service
Each Cooperative determines how to manage costs and member payments	National and prefectural government oversight Fishery Management Organizations Committees for highly mobile species Federations
Participants pay incremental costs of catch share management to the government via cost recovery Up to 3% of ex-vessel revenues Members pay an annual fee to the Cooperative	Fishery-wide coordination via the Alaska Bering Sea Crabbers Association Coordination by National Marine Fisheries Service
Costs of management shared between cofradía and Galician fisheries ministry Cofradía charges membership dues Members sell product to designated markets	Coordination via government oversight On-site ecologists as intermediaries/liaisons



Step
7

Assess Performance and Innovate





At a Glance

The final step of catch share design is to ensure the program is functioning well and achieving the identified program goals. You should conduct regular assessments and modify the program as necessary to meet existing and new goals. In addition to formal program changes, participants should also be encouraged to innovate in order to improve the program.

KEY PRINCIPLES

Assess performance against goals and encourage innovation to improve the program over time. | 77

SUB-STEPS

7.1 Conduct regular program reviews. | 76

7.2 Assess performance against goals. | 76

7.3 Encourage innovation. | 77

Step 7

Assess Performance and Innovate

The final step of Cooperative catch share design and implementation is to assess program performance and innovate to address emerging opportunities and challenges. A well-designed Cooperative system will have institutional support for adaptive management. It will also have a process to regularly assess program performance and make adjustments to laws, policies and regulations as needed to meet system goals. That process is co-managed by government and the Cooperative. Flexibility is a key aspect of catch shares and programs must be dynamic in order to meet the changing needs and conditions of the fishery. Completing this step is an essential part of ensuring all key attributes of the catch share program are being met.

7.1 CONDUCT REGULAR PROGRAM REVIEWS

Program reviews provide an opportunity for the government to assess Cooperative performance and alter the program design if needed to better achieve goals. Additionally, these reviews provide opportunities for dialogue between government agencies and Cooperatives that have taken on some management responsibility. Cooperatives may relay feedback on how the management structure can be improved to optimize program performance. A strong partnership can help the government and Cooperatives achieve environmental, social and economic goals. Such reviews may also inform the development of future Cooperatives and Cooperative systems.

7.2 ASSESS PERFORMANCE AGAINST GOALS

In a Cooperative catch share program, there may be a set of fishery-wide goals and a set of Cooperative-specific goals. While these will likely be closely aligned, fishery managers must decide whether to assess performance against both sets of goals, or solely against the fishery-wide goals.

Cooperatives may want to evaluate performance against the goals of both the fishery and the group itself. This provides an opportunity for Cooperatives to test whether their design decisions are bringing about their desired outcomes. It is useful to determine what data will be collected at the onset of the program so that it can also be collected as a baseline against which performance is evaluated. Performance reviews might include an assessment of member compliance with regulations, such as adherence to catch limits, and of the Cooperative's economic performance. Data on jobs and the distribution of profits may be necessary for measuring social performance. Additionally, surveying members regarding their perceptions of fairness, equity and performance will help ensure participants stay invested in the group and could help maintain transparency between the Cooperative and individual members. Cooperatives may also choose to report to members to keep them up to date on how the Cooperative is serving them.

7.3 ENCOURAGE INNOVATION

By design, catch share systems can allow for unique innovations that improve biological, economic and social outcomes. Innovations allow programs to meet new and/or changing demands and should be encouraged at the local, regional and national levels.

Building flexibility into the system during the design process can help create the conditions for innovation in Cooperative management. Members of Cooperative catch shares should be encouraged to bring forward ideas on better ways to manage quota, manage the group and enhance cooperation in order to maximize their goals. Cooperatives can adjust their own management practices to address their unique needs.

Co-management between Cooperatives and fishery managers is one way to create flexibility. Delegation of some management responsibilities to the local level allows for more rapid feedback and adaptations. Collective organization, the ability to share information and localized management may further the ability of Cooperatives to innovate from the ground up. For example, a major strategy of the United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program was to engage fishery participants in reducing bycatch. Joint research by Cooperative members and government scientists led to innovative gear modifications, which allowed vessels to herd target species into trawl nets while sweeping the seafloor instead of dragging gear along the bottom. This reduced bycatch rates and habitat damage (Marine Stewardship Council, 2010).

When designed well, Cooperative catch shares can successfully meet biological, economic and social goals. Assessing performance and encouraging innovation can allow the program to adapt over time to be effective well into the future.

DESIGN PRINCIPLE

Assess performance against goals and encourage innovation to improve the program over time.

Catch Shares in Action

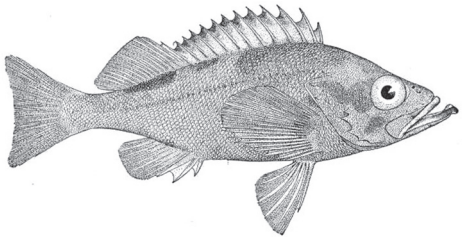
PHOTO: TONY NORG, UNITED STATES SEAFOODS

SEASALT

- Secure
- Exclusive
- Scaled
- Accountable
- Limited
- Transferable

CATCH SHARES IN ACTION

United States Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program



SPECIAL DESIGN FEATURES

MULTI-SPECIES, GROUP-ALLOCATED, QUOTA-BASED, TRANSFERABLE

The Bering Sea and Aleutian Islands (BSAI) Non-Pollock (Amendment 80) Cooperative Program was one of the first catch share programs designed and implemented to manage fishing interactions with a non-target species. The goals of the program were largely focused on reducing bycatch to enable the fleet to achieve higher retention of groundfish resources. In this program, participants were incentivized to form Cooperatives to receive exclusive access privileges. Key design elements for this program include eligibility requirements, government-approved Cooperative formation, concentration caps, trading restrictions and sideboards, which are catch limits that restrict the transfer of excess fishing capacity to other fisheries not managed under catch shares.

SYNOPSIS

The BSAI fishing grounds are among the most productive in the world, and the groundfish fishery is important commercially. Over 90% of the groundfish catch is harvested by pelagic and bottom trawl gear (NPMFC, 2010). In 2008, managers implemented a Cooperative catch share program for the 28 non-pollock trawl vessels, known as the Amendment 80 fleet. This sector targets six BSAI groundfish species: yellowfin sole (*Pleuronectes asper*), rock sole (*Lepidopsetta bilineata*), flathead sole (*Hippoglossoides elassodon*), Atka mackerel (*Pleurogrammus monopterygius*), Pacific Ocean perch (*Sebastes alutus*) and Pacific cod (*Gadus macrocephalus*). The National Marine Fishery Service (NMFS) manages this fishery with consultation from the North Pacific Fishery Management Council (NPFMC). In 2010, program Cooperatives landed approximately 181,000 metric tons of groundfish worth U.S. $278.2 million (NPFMC, 2012).

Road to a Catch Share

The BSAI groundfish fishery developed over the last century, with a significant degree of foreign trawl fishing driving its early development. Between 1976 and 1990, foreign fleets were barred from the exclusive economic zone (EEZ) in all U.S. fisheries, which enabled domestic participation to grow significantly. To limit overcapacity, managers implemented a limited license program (LLP) in 2000. However, while the LLP capped the number of participants, it did not limit the amount of fishing effort, and problems began to escalate within the fishery.

High rates of discards and premature season closures became characteristic of the non-pollock trawl fishery in the years leading up to catch share implementation. As fishermen raced to maximize their catch, discard rates increased, reaching up to 30% of the catch limit (Fina, 2011; NMFS, 2011). Early season closures became a regular occurrence as trawlers reached the limits of Prohibited Species Catch (PSC) of halibut, red king crab, tanner crab and snow crab. Fleets lost significant economic opportunity under this system as fisheries closed before they could harvest all of their target species (J. Anderson and L. Swanson, personal communication, 2011).

Managers recognized the need to address the prevailing incentives that were failing the fishery. In 2008, the NPFMC developed the BSAI Non-Pollock Cooperative Program, also known as Amendment 80. The program is a limited access privilege program that allocates Quota Shares for six groundfish species to eligible trawl catcher-processor vessels. Operators of those vessels are allowed to form harvesting Cooperatives. The program focuses on creating economic incentives to reduce discards and bycatch to minimize the negative impacts on adjacent fisheries.

Performance

Five years since implementation, the BSAI Non-Pollock Cooperative Program is considered a highly successful catch share program (Anderson and Concepcion, 2010). The program has met its goals of increasing groundfish retention and reducing bycatch of halibut, enabling fishermen to harvest a more complete share of target species (BUC, 2009). Fishermen report that the catch share program allows them to slow the pace of their fishing operations and to selectively target fishing grounds. The Cooperative structure has also led to social innovations among members to improve groundfish retention (Hiatt et al., 2010; Fina, 2011).

STEP 1 IN ACTION

Define Program Goals

The BSAI Non-Pollock Cooperative Program was implemented under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). As such, the program was designed to meet the legal requirements regarding stock sustainability and ecological, economic and social goals. Biological goals prescribed in the National Standards (NS) One, Three and Nine of the MSA (16 U.S.C. 1851) are:

NS1 - Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

NS3 - To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

NS9 - Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

During the catch share program's development, managers and fishermen identified a variety of goals to improve the biological and economic conditions of the fishery to accompany the legal requirements under the MSA. The goals identified for the program are (Federal Register, 2007; NPMFC, 2010):

- Reduce bycatch and create individual accountability for bycatch reduction
- Increase economic returns by enhancing operational efficiency and enabling more complete harvests of target species
- Allocate resources in an equitable manner that is based on present and historical harvesting patterns
- Minimize negative impacts on participants of adjacent fisheries that are not managed by a catch share

STEP 2 IN ACTION

Define and Quantify the Available Resource

Defining and quantifying the available resource was largely driven by pre-existing management structures, as laid out by the BSAI Fishery Management Plan (NPFMC, 2010). The BSAI Non-Pollock Cooperative Program allocates privileges for six non-pollock groundfish species among trawl fishery sectors. They are: yellowfin sole (*Pleuronectes asper*), rock sole (*Lepidopsetta bilineata*), flathead sole (*Hippoglossoides elassodon*), Atka mackerel (*Pleurogrammus monopterygius*), Pacific Ocean perch (*Sebastes alutus*) and Pacific cod (*Gadus macrocephalus*). Flatfish (yellowfin sole, rock sole and flathead sole) exist throughout the Bering Sea shelf and share similar habitat. Atka mackerel and Pacific Ocean perch are mostly targeted by vessels that operate in the Aleutian Islands, where these species are in higher abundance. Pacific cod is typically caught throughout the entire BSAI range (NPFMC, 2010). The BSAI is divided into two subareas, the Bering Sea and the Aleutian Islands. Annual

Stock Assessment and Fishery Evaluation (SAFE) reports are used to determine the annual catch limits for these Amendment 80 species.

The non-pollock fleet operates within fishing grounds that overlap with adjacent fisheries, resulting in interactions with other fleets and non-target species, and leading to high rates of bycatch and discards. To minimize participation and impact on adjacent fisheries' stocks, the catch share program imposes sideboard and prohibited species limits. Sideboard limits were established for Gulf of Alaska (GOA) pollock, Pacific cod, Pacific Ocean perch, northern rockfish and pelagic shelf rockfish (e.g., dusky rockfish). Sideboards seek to limit participation in GOA to historical levels in order to prevent fishermen from increasing their participation in other fisheries as a result of increased efficiency in the Amendment 80 fleet (Federal Register, 2007). Halibut (*Hippoglossus stenolepis*), red king crab (*Paralithodes camtschatica*), tanner crab (*Chinocetes bairdi*) and snow crab (*C. opilio*) are prohibited species, which means they must be discarded by participants.

To address groundfish discards, managers implemented a Groundfish Retention Standard (GRS) that required all vessels retain a percentage of their groundfish bycatch. The retention standard was set at 65% at the start of the program and increased to 85% in 2011 (Federal Register, 2007). However, the GRS requirement was removed in 2013 as it was found to be unmanageable due to monitoring costs and significantly higher-than-predicted compliance costs. In exchange, Cooperatives are now responsible to hire a third-party auditor to determine groundfish retention for inclusion in the required annual reports (Federal Register, 2013).

STEP 3 IN ACTION

Define Eligible Participants

In order to meet the program's goals of reducing bycatch and increasing economic efficiency, the program allocates exclusive privileges to groups. Trawl catcher-processor vessel owners who hold an LLP license can voluntarily form a Cooperative, which is then eligible to receive quota. At program implementation, 28 permits were eligible for allocation (Federal Register, 2007).[1]

During program design, strict regulations were implemented for the formation of eligible Cooperatives. Cooperatives could form only with participation from at least nine out of the 28 eligible permits. Since some fishing corporations hold multiple permits, Cooperatives were also required to be comprised of a minimum of three separate quota-share-holding corporations (Federal Register, 2011). Permit holders choosing not join a Cooperative were not allocated secure shares and were allowed to fish in a competitive limited access fishery. Starting in 2011, operators with multiple vessels could not have vessels in both the Cooperative fishery and a limited access fishery (Federal Register, 2011). Cooperative membership is established prior to the fishing season each year and members cannot move between Cooperatives within a fishing season, but may do so during the off-season.

During the first three years of the program, the Alaska Seafood Cooperative was the only Cooperative to form. It began with participation from 17 member vessels owned by five corporations. The remaining eight permits

1 Remote Western Alaskan communities are eligible to receive Amendment 80 species allocations under the Community Development Quota (CDQ) program, established in 1998 (Hiatt et al., 2010). To be considered eligible, communities must not have previously developed commercial-scale harvesting or processing capacity. These communities are able to participate in the fishery by entering into a part-ownership relationship with one or more of the BSAI companies holding Amendment 80 permits, for which they receive royalty payments on their apportioned share (NPMFC, 2010).

were assigned to the Amendment 80 limited access fishery, as there was an insufficient number to form a second Cooperative. Three years after program implementation, another amendment was approved that reduced Cooperative requirements to seven eligible permits holders and two separate quota sharing entities. The amendment also banned corporations from splitting permits between the Cooperative and limited access fisheries. This change drove a majority of vessels to join Cooperatives. The newly formed Cooperatives included all of the remaining vessels, except for one that had very limited fishing history in the Bering Sea, and eliminated the limited access fishery for non-pollock groundfish species (J. Anderson, personal communication, 2011).

To prevent fleet consolidation and retain historical fishing patterns, concentration limits were included in program design. Concentration limits were set to prevent industry consolidation at both the corporation and vessel level, while allowing for some efficiency gains to be made in order to reduce costs, such as for monitoring and enforcement. Within the program, no single person or corporation can hold or use more than 30% of the Quota Share, unless it is grandfathered in based on historical participation, and no vessel may fish more than 20% of the quota allocated to the Amendment 80 sector (Federal Register, 2007).

New entrants to the fishery must meet complex eligibility requirements defined for the fishery. Under certain conditions fishermen may enter by buying an LLP license and Quota Share from one of the current Amendment 80 participants.

STEP 4 IN ACTION

Define the Privilege

The BSAI Non-Pollock Cooperative Program allocated quota-based privileges. The long-term allocations, called Quota Shares, were granted indefinitely to eligible participants and are attached to each participant's vessel. To create an incentive for Cooperative formation, managers only allow use of Quota Shares when a vessel is a Cooperative member.

At the beginning of each season, the formed Cooperative is allocated the annual allocation unit, called Cooperative Quota. Cooperative Quota is calculated from the sum of all Quota Shares held by the current Cooperative membership and based upon the annual catch limits set for each species.

Quota Shares cannot be leased, and permanent transfers of an eligible vessel (including the associated catch history) can only be made to new entrants who are defined as eligible under the program (NPFMC, 2010).

Inter- and intra-Cooperative transfers are allowed within the program to facilitate the goal of economic efficiency and to keep the Cooperative accountable to catch limits. Within Cooperatives, members agree upon how quota will be allocated amongst themselves, according to Cooperative bylaws. Cooperative members are able to transfer Cooperative Quota before and after trips and are subject to the approval of the Cooperative manager. Intra-Cooperative transfers happen often, both between licenses within the same company and between licenses owned by two different companies (J. Anderson, personal communication, 2011). Cooperative Quota can be transferred between Cooperatives both before and after fishing trips to help cover accidental overages. All transfers between Cooperatives must first be approved by NMFS.

STEP 5 IN ACTION

Assign the Privilege

Managers were committed to assigning the privileges in an equitable manner based on present and historical harvesting patterns. To best attain this goal, a two-level allocation process was established for the Amendment 80 fleet. First, fishery managers granted privileges to individual vessel permits based upon catch history. Then, Cooperatives were allowed to make internal allocation decisions to reflect current harvesting strategies.

Initial Quota Share allocations were made by NMFS to eligible vessels with an LLP license. These allocations were based upon the five best years of catch history between 1998 and 2004. Individual bycatch allocations for prohibited species, including crab species and halibut, are proportional to Quota Share allocations and not based upon catch history (Federal Register, 2007). An appeals process enabled license holders to request a review of their allocation. This process is run through the NMFS National Appeals Office, which separates the appeals process from the initial allocation decisions.

Each season before allocations are made to Cooperatives in the Amendment 80 fleet:

- 10.7% of the catch limit for all Amendment 80 species is allocated to the CDQ program (Federal Register, 2007)
- Managers allocate incidental catch allowance of Amendment 80 species to other target fisheries in other sectors to account for all sources of mortality
- A portion of the yellowfin sole, Atka mackerel and Pacific Ocean perch are allocated to the BSAI trawl limited access sector (American Fisheries Act catcher-processors and trawl catcher vessels)[2]

The remaining allocations are then distributed entirely to the Amendment 80 sector.

STEP 6 IN ACTION

Develop Administrative Systems

A detailed administrative system has been designed and implemented to ensure real-time catch accounting and robust monitoring and enforcement. The Restricted Access Management (RAM) division of NMFS administers the program. RAM uses online administration systems to determine the eligibility of participants, allocate Quota Shares, process Cooperative applications and inter-Cooperative Quota Share transfers, collect landing fees and conduct other related activities.

Cooperatives are held accountable through internal administrative systems established by Cooperative bylaws and agreements. Internal Cooperative arrangements also determine how Cooperative Quota allocations will be made to members to fish (this is unlike individual annual allocations to vessels, which NMFS administers).

2 Currently, all Amendment 80 vessels that have applied for Quota Share are in Cooperatives, therefore the Amendment 80 limited access sector is not in operation.

Once Cooperative membership is determined for the season, Cooperative allocations are made based on the sum of member Quota Shares and can vary between Cooperatives. For example, the Alaska Seafood Cooperative first allocates quota to a quota reserve, then makes allocations to Cooperative members that reflect the Quota Shares each vessel brings into the Cooperative (J. Anderson, personal communication, 2011). The quota reserve provides a buffer against accidentally exceeding quota, and vessels must acquire member approval prior to using their quota in the reserve (BUC, 2009).

Discards were a large concern in the fishery prior to catch share implementation, and therefore an extensive monitoring system was developed for the program. Monitoring includes vessel monitoring systems (VMS), a requirement of two on-board observers for every trip with coverage on all hauls, motion-compensating scales for weighing samples, flow scales to obtain accurate catch-weight estimates for the entire catch and prohibitions on mixing of hauls and on-deck sorting (Wilderbuer et al., 2010). The on-board observers verify catch composition and quantity and collect biological information on marine resources. The on-board observer program is managed by the Fisheries Monitoring and Analysis Division of the Alaska Fisheries Science Center and has significantly improved managers' ability to estimate and enforce quota of bycatch species and allocated target species (Hiatt et al., 2010).

Catch accounting requires that each vessel in the fishery track information including daily catch receipts, product transfer reports, recorded cargo transfer reports and off-loading information. Catch accounts are established in the Alaska Region's Catch Accounting System, which provides near real-time delivery of accurate data for in-season management decisions. Data from industry are reported through the Electronic Reporting System and fed hourly into the NMFS database. Data from observers are sent electronically to the Alaska Fisheries Science Center and transmitted daily into the Catch Accounting System. These data are used to calculate quota debits from Amendment 80 vessels and Cooperatives (NPFMC, 2010). Participants use eLandings, an interagency electronic reporting system, to report all commercial fishery landings off Alaska.

Many parties are involved in the oversight of the Cooperative program, and members are held accountable through multiple channels within the Cooperative. Corporation owners, vessel captains, crew and other company personnel participate in the management process and together develop a Cooperative agreement that outlines harvest strategies, harvest shares and compliance provisions. For example, the Alaska Seafood Cooperative appoints a Cooperative manager to oversee day-to-day operations. Responsibilities include: ensuring communication among the fleet, member companies and Cooperative staff; ensuring compliance with the Cooperative agreement; ensuring harvest shares are distributed in a timely and accurate manner; and applying for annual Cooperative Quota allocations. The Alaska Seafood Cooperative also appoints a data manager to oversee all Cooperative monitoring activities, ensure that government requirements are met and make certain that Cooperative members acquire timely updates on their quota accounts.

Cooperative members pay for monitoring activities and other Cooperative services. The program was initially implemented without a cost recovery program in place, as NPFMC was unclear as to whether cost recovery regulations applied to Cooperative allocations. Upon subsequent review of the MSA, the development of a cost recovery program is now underway (G. Merrill, personal communication, 2011).

STEP 7 IN ACTION

Assess Performance and Innovate

A formal review of the program is to occur five years after program implementation to inform future management decisions. Fishery managers also designed a socioeconomic survey to help improve understanding of the program's effects on vessels and entities regulated by the catch share (Federal Register, 2011). To date, the overall program review has not been released.

It is clear, however, that the program has worked exceedingly well. The program has successfully met many of its goals, including ending the race for fish. Harvesting has slowed, allowing fishermen to better maximize harvests of the target species while reducing discards and avoiding bycatch of halibut and crab. Due to trawl gear innovations, there has been a decrease in bycatch and habitat damage through reducing bottom contact by 90% (Anderson and Concepcion, 2011). This achievement has contributed to the Marine Stewardship Council's certification of every species in the flatfish fishery, which the Cooperatives believe will support market development in high quality, sustainable seafood products (MSC, 2010).

The program has also been integral to encouraging Cooperative innovation in overcoming management challenges associated with a multi-species fishery. Cooperatives were able to create a viable and innovative alternative to the cumbersome retention policy. Cooperatives currently enforce groundfish retention in parallel with an accompanying third party audit to provide transparency (J. Anderson, personal communication, 2011). Through this innovation, groundfish discards have successfully been reduced and the capital intensive Groundfish Retention Standard policy has been discontinued. Cooperatives have also played an important role in the implementation of gear modifications that have helped reduce halibut bycatch. Cooperatives have been collaborating with NMFS to explore ways to allow for accurate observer accounting on deck so crew can discard halibut while still alive, which would reduce mortality (BUC, 2009). Cooperatives have also devised innovative solutions to discrete challenges, such as when the fishery received small allocations of Pacific cod, constraining the ability to harvest other groundfish species (L. Swanson, personal communication, 2011). To address this challenge, most Cooperative members now fish for Pacific cod only at the end of the season to avoid overages (Anderson and Concepcion, 2011).

The catch share program has resulted in some consolidation of fishing effort to save operating and monitoring costs, and this has generally occurred among vessels that are owned by the same company. The program has meanwhile provided increased economic stability for communities by bringing steadier employment opportunities to shipyards (J. Anderson, personal communication, 2011). Before the catch share, vessel captains had to conduct maintenance at the same time as other vessels during season closures. This forced shipyard managers to engage additional temporary employees during the short busy period. When the Non-Pollock Cooperative Program was implemented, vessel holders gained the ability to choose when to conduct annual shipyard maintenance, allowing for shipyards to better accommodate the industry's schedule while providing more consistent employment within the community (J. Anderson, personal communication, 2011).

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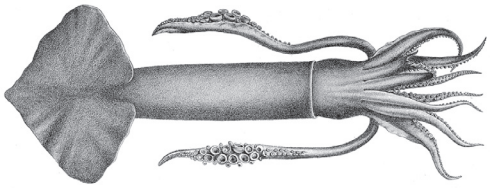
SEASALT
Secure
Exclusive
Scaled
Accountable
Limited

CATCH SHARES IN ACTION

Japanese Common Fishing Rights System



SPECIAL DESIGN FEATURES

MULTI-SPECIES, GROUP-ALLOCATED, AREA-BASED, NON-TRANSFERABLE

The Japanese Common Fishing Rights System is a comprehensive catch share program that manages the nearshore fisheries along Japan's vast coastline by allocating secure areas, or Territorial Use Rights for Fishing (TURFs), to harvesting Cooperatives. The system has evolved over time and is a model for managing mobile nearshore species through a network of scaled Cooperatives. The program depends upon a coordinated system of co-management, including nested layers of governance from the federal level down to the regional level. The program design has promoted innovative approaches—especially by fishermen—including coordination within and across TURFs (and Cooperatives), and pooling of harvesting arrangements to improve economic efficiency and resource sustainability.

SYNOPSIS

Dating back to the 1700s, Japanese coastal fisheries have been managed by organizations of local fishers, now called Fishery Cooperative Associations (FCAs). The current system was officially recognized in 1949 when FCAs were granted exclusive access to coastal TURFs. FCAs co-manage coastal fisheries along with the Ministry of Agriculture, Forestry and Fisheries (MAFF), prefectural governments, and specialized fishermen-led associations called Fishery Management Organizations (FMOs). Japan's TURF program encompasses most of the nation's coastline and includes 1,057 FCAs (JF Zengyoren, n.d.) and 1,738 FMOs (Makino, 2011).

The federal government establishes seven annual catch limits to manage eight species within the program: Japanese sardine (*Sardinops melanostictus*), jack mackerel (*Trachurus japonicus*), Pacific saury (*Cololabissaira saira*), walleye pollock (*Theragra chalcogrammus*), Japanese common squid (*Todarodes pacificus*), snow crab (*Chionoecetes opilio*), chub mackerel (*Scomber japonicus*) and spotted mackerel (*Scomber australasicus*). The latter two species are managed together under a single catch limit. All catch limits are divided and allocated to specific FCAs. Individual FCAs and FMOs can implement self-imposed catch limits for additional species as well as stricter catch limits for federally managed stocks. These coastal fisheries landed approximately 1.3 million metric tons in 2009, and coastal fishery value has been estimated at U.S. $4.3 billion (Japan Statistical Bureau, 2013).

Road to a Catch Share

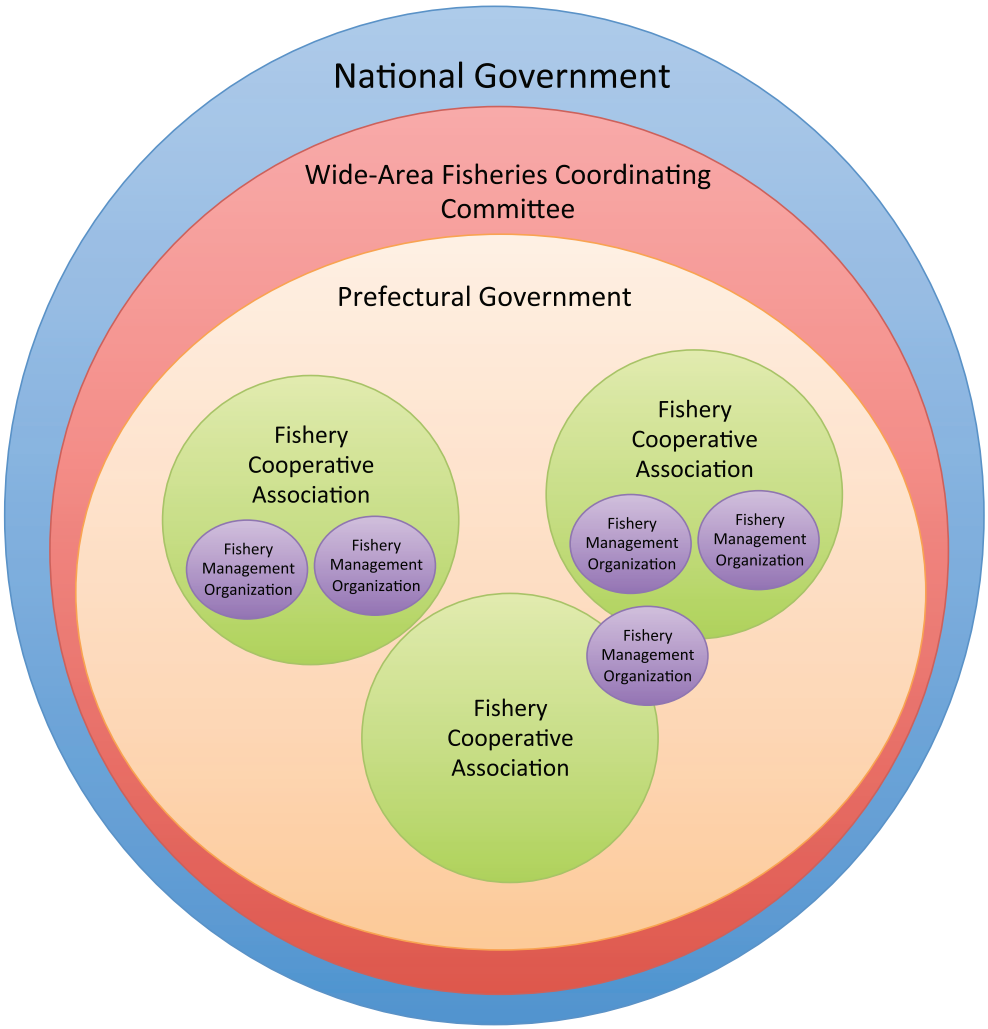
Japan's long history of locally managing small-scale, coastal fisheries provided the foundation for the current catch share program. Starting in the early 1700s, local fishermen were given exclusive use of marine resources (Yamamoto, 1985). Fishing societies formed to protect coastal areas from outsiders; these organized groups were a precursor to FCAs. In 1901, the Meiji Fisheries Law provided the first form of exclusive rights in coastal fisheries to these fishery societies. During the 1930s, as most coastal fishing boats became motorized, fishing pressure increased on coastal fish stocks. Overfishing and conflicts among fishermen, particularly between coastal fishermen and industrial trawlers, began to occur.

To address these issues, the Japanese government formalized the current rights and co-management responsibilities to FCAs as part of the Fishery Law of 1949. The Fishery Law established nested layers of governance to co-manage coastal resources (Figure 1). At the national level, the MAFF was authorized to administer the fishing rights and licensing systems to control fishing pressure (Makino, 2011). Fishery regulations, including prohibitions of species, size limitations, area closures, season closures and limitations on fishing gear were delegated to the governments of 39 coastal prefectures, which are akin to states. Prefecture governments became responsible for issuing fishing licenses and exclusive common fishing rights (TURFs) to FCAs, which in turn are subject to regulations set by the national and prefectural government agencies. Wide-area fishery coordination committees, consisting of prefectural representatives, were formed to work together for the management of highly migratory species. In the early 1980s, FMOs started to form to improve the co-management system and support innovation among FCAs (Uchida and Makino, 2008).

Performance

Almost 65 years after implementation, the program has clearly enhanced coastal fishery management by establishing a nested governance program that improves the sustainability of fish populations and strengthens fishermen's role in the management process. The system has also enabled innovation by fishermen by giving FCAs the authority to adapt and implement additional regulations tailored to local, day-to-day operations within their TURFs (Ruddle, 1987). However, the biological, economic and social outcomes vary by TURF, with some performing better than others.

FIGURE 1 | *Japanese Fisheries Co-management System*



1. National Government
Ministry of Agriculture, Forestry and Fisheries
Administers the fishing rights and licensing systems. Sets catch limits based on advice from the Fisheries Agency and Fisheries Research Agency.

2. Wide-Area Fisheries Coordinating Committee
Manage and coordinate highly migratory species.

3. Prefectural Governments
Manage coastal fisheries and implement regional fishing regulations. Allocate common fishing rights to FCAs.

4. Fishery Cooperative Associations
Manage common fishing rights (TURFs). Establish formal fishing rules for members. Coordinate with national and prefectural governments.

5. Fishery Management Organizations
Coordinate fisheries, fishing grounds, and/or gear types within or across FCAs. Establish additional fishing rules.

STEP 1 IN ACTION

Define Program Goals

The National Fishery Law of 1949 established the current key program goals for coastal fisheries, specifically (Miki and Soejima, n.d):

- Protect small-scale coastal fishermen from outside fishing pressure
- Promote strong involvement of fishermen in management processes
- Incorporate community knowledge in management decisions

In support of these goals, the National Fishery Law of 1949 formalized the management of coastal natural resources by allocating secure exclusive access to existing FCAs, and formalizing the operation of these Cooperatives.

The Law Regarding the Preservation and Management of Living Marine Resources of 1996 identified additional goals. In particular, it called for national productivity, conservation and management goals within Japan's exclusive economic zone, including the introduction of a total allowable catch (TAC) system for eight species (Makino, 2011).

Complementing the national goals, each FCA and FMO also has identified goals. These goals vary depending on ecology, resource availability and other local conditions. Consequently, an FCA prioritizes management goals in accordance with the most pressing issues occurring within its TURF and among its members. Goals among FCAs commonly include the effective use of fishing grounds, recovery of resources, increased revenue, sustainable businesses and maintaining stable fish prices (Yadava et al., 2009). FMOs can further develop and refine goals to be more specific based on the species, area or gear type. For example, the Council for Promoting Sea Cucumber Resource Utilization in Mutsu Bay, an FMO, aims to sustainably manage the sea cucumber stocks and to conduct processing and marketing activities on behalf of the fishermen (Matsuo, n.d.).

STEP 2 IN ACTION

Define and Quantify the Available Resource

The catch share program is a multi-species program with responsibility for managing eight commercially important species. In 1997, the federal government introduced a national catch limit system and a total allowable effort (TAE) system. The government set seven catch limits for 19 stocks of the eight species that were in need of conservation or targeted by foreign fleets. Stock assessments and allowable biological catch calculations are performed annually by prefectural research stations and the Fishery Research Agency, which recommends the nationally set catch limits (Nishida, 2005). The nationally set catch limits are then divided up and allocated to fishing sectors, including FCAs. These catch limits can be adjusted due to socioeconomic conditions, a practice that has drawn criticism from the scientific community (Nishida, 2005; Takagi and Kurokura, 2007; Sustainable Fisheries Partnership, 2013).

Many TURFs manage a variety of additional species, including seaweed, sedentary shellfish (clams, mussels, sea urchins, abalone and shrimp), moderately mobile groundfish (flatfish and rockfish) and migratory fish (mackerel, pollock and herring). Coastal fishermen employ various types of gear (Uchida, 2007). As only eight species are managed under government-defined catch limits, FCAs are responsible for creating management measures for any additional species within TURF boundaries. FCAs and FMOs have the authority to self-impose catch limits for managed species, and some choose to do so. Prefectural research stations may assist FCAs with conducting stock assessments and determining a scientifically-based catch limit. In 2003, 30% of FMOs adopted catch limits for some of their species, and more than 15% of FMOs had stock assessments and catch limit measures (Uchida and Makino, 2008). FCAs with limited capacity and access to scientific data may impose daily or seasonal limits to manage mortality. These management measures are approved upon submission to the Sea Area Fisheries Coordinating Committees, advisory bodies consisting of fishermen representatives, academics and public interest representatives (Makino, 2011).

Cooperatives have voluntarily established more than 1,000 marine protected areas along the coast (Yagi et al., 2010). Many are designated as no-take reserves to support stocks in their TURFs. For example, the Kyoto Danish Seine Fishery Federation (KDSFF), which is certified by the Marine Stewardship Council as a sustainable and well-managed fishery, designated permanent no-take zones for areas of critical snow crab habitat and seasonal spawning reserves. Combined, these no-take zones cover approximately 19% of KDSFF fishing grounds (Makino, 2008). Similarly, the Sakuraebi Harvesters' Association, targeting sakuraebi shrimp (*Sergia lucen*), implemented a self-imposed closure during spawning season for its target stocks (Uchida, 2007).

STEP 3 IN ACTION

Define Eligible Participants

The catch share program was designed to ensure local communities and fishermen have continued access to fishery resources while promoting their involvement in management. To meet these goals, common fishing rights are allocated only to existing local FCAs and not to individual FCA members (Uchida and Makino, 2008). To be eligible for allocation, FCAs must have a minimum of 20 members and must include the majority of the fishermen within the FCA's geographic area.

The national government also established minimal requirements for fishermen to become members in a local FCA. FCA members must have prior fishing experience, cannot have any fishery violations and cannot possess other fishing rights (Hirasawa, 1980). Members must also be residents of the community and participate in commercial fisheries a certain number of days per year (minimum number of days ranges from 90 to 120 depending on individual FCA bylaws) (Makino, 2011). These requirements were established to prevent the consolidation of rights to individuals from outside the community and non-active fishermen (Ruddle, 1987).

FCAs have the authority to modify the terms of eligibility for new entrants. The most common way FCAs allow fishermen to enter the fishery is through a trial period as a crewmember on an FCA vessel (Uchida, 2007).

FCAs are legally recognized entities that are allocated common fishing rights granted by the government and are authorized to manage coastal fisheries. In comparison, FMOs are often created by groups of fishermen utilizing

the same fishery or fishing grounds and can be considered an eligible group to fish within an FCA's TURF. FMOs are voluntary, autonomous groups of fishermen that have evolved to coordinate and scale management to the appropriate social and biological characteristics of the fishery. The federal government does not make provisions or rules regarding the operation of FMOs. FMOs often adopt stricter management measures than those in place by the FCA, including rules for catch limits, fishing effort controls, harvest coordination, monitoring and stocking (Uchida and Makino, 2008). These regulations are typically developed in coordination with, and cannot contradict, members' FCA regulations. FCAs are not required to have an FMO, although many are associated with FMOs.

STEP 4 IN ACTION

Define the Privilege

The Fisheries Law of 1949 formalized the unofficial TURF boundaries that dated back to the 1700s (Yamamato, 1985). The size of each TURF was based upon existing geo-political boundaries of the local communities, and encompassed the fisheries within each area. Cooperatives were granted the right to co-manage and exclusively operate in the assigned area for a period of 10 years. An FCA must then apply to the Sea Area Fisheries Coordinating Committee for renewal of the fishing right. Renewal is dependent upon whether the FCA is managing the TURF resources effectively and complying with fishery regulations.

Each FCA determines how to distribute its allocated fishing rights among its members. Not all fishermen may access the entire TURF area; some areas within the TURF may be reserved for the exclusive use of individuals and/or groups. For example, in the Yaeyama FCA, fishermen are organized into groups based on fishery type and residency location. A seasonal lottery is used to allocate fishing spots among the groups (Ruddle, 1987). Alternatively, Mutsu Bay's Council for Promoting Sea Cucumber Resource Utilization equally allocates the catch limit among eligible vessels. Each vessel is assigned to one of four harvesting groups, which determines the days they are allowed to harvest sea cucumbers. Vessels are provided a daily catch limit (Makino, 2011).

To adhere to the social goals of the program, the Fishery Law prohibits transfers, leases, loans and mortgages of TURFs. Individual FCAs, and some FMOs, have the authority and responsibility to determine regulations regarding the allocation and transferability of harvesting privileges among their respective members. As transferability rules are determined by individual FCAs and FMOs, restrictions on trading and use of shares vary across the coast. Many FCAs allow harvesting privileges to be inherited by a relative or successor who belongs to the same FCA (Ruddle, 1987). FCAs typically do not allow members to transfer their fishing rights from one FCA to another. A fishermen moving to another FCA will be required to meet the basic eligibility requirements to harvest in the new area (H. Uchida, personal communication, 2012).

STEP 5 IN ACTION

Assign the Privilege

As directed by the Fishery Law of 1949, eligible nearshore Cooperatives were allocated quota and area-based privileges called common fishing rights (also referred to as TURF rights). Common fishing rights are granted

exclusively to FCAs. A fisherman must be an FCA member to be an eligible participant. Once an FCA receives approval and the prefectural government officially issues the TURF, each FCA is allocated a percentage of the annual catch limit for the eight species managed under the national quota. While this percentage is based upon the FCA membership's catch history, the government neither assigns nor accounts for catch limits at the individual fishermen level. Rather, catch limits are managed at the Cooperative level and the FCA is responsible for ensuring its members comply (H. Uchida, personal communication, 2012).

STEP 6 IN ACTION

Develop Administrative Systems

The catch share program relies on coordinated co-management between national, regional and local organizations. The national government is responsible for setting catch limits for key species and ensuring system-wide compliance. Prefectural governments allocate rights and also ensure some coordination on a regional level. FCAs have the responsibility to ensure compliance with their allocated catch limits and have the authority to adapt and implement additional regulations tailored to local, day-to-day operations within their TURF to compliment federal fishery management (Ruddle, 1987).

FMOs emerged in the early 1980s as national policy promoted and fostered their development to improve the co-management system and support innovation among FCAs (Uchida and Makino, 2008). FMOs formed from groups of FCA fishermen with the objective of developing mutually agreed upon fishery management strategies for specific fisheries, grounds and/or gear types. FMOs have been formed by a single FCA, a subgroup of FCA members (such as trawl fishermen) or multiple FCAs (encompassing larger areas to better manage migratory stocks) (Uchida, 2007). Most commonly, FMOs are housed within the infrastructure of FCAs.

Administrative systems for the TURF program are largely decentralized and conducted by the FCAs and FMOs. Members agree upon Cooperative bylaws that define FCA rules and responsibilities, including internal governance and administrative systems. They submit the bylaws to the prefecture for approval and formalization. The self-imposed rules developed by each FCA encourage compliance from members (Yadava et al., 2009). Additional functions of the FCA include the operation of wholesale markets, collective purchasing and providing financial services (loans and crediting).

Fishermen largely land and sell their catch at the local wholesale market, where FCA staff conduct catch accounting and create reports for prefectural government agencies (Makino, 2011; H. Uchida, personal communication, 2012). Should fishermen sell catch directly to retailers or restaurants, they are required to report their catch record to FCA staff (M. Makino, personal communication, 2013).

The local FCA or FMO handles enforcement on a day-to-day basis, including fishery regulations and TURF boundaries. Violations are typically handled internally within the FCA or FMO without the involvement of third parties or government authorities. Penalties vary in severity among the Cooperatives. Government authorities largely address issues of noncompliance during the TURF renewal process when management practices are assessed for proficiency.

Operational costs of each FCA are covered through a fee system in which 3-5% of total sales from the wholesale market are collected. Administrative costs may be supplemented from direct sales of seafood as well. In such

instances, the FCA will buy seafood from its wholesale market and resell to local consumers (H. Uchida, personal communication, 2012).

FMOs typically operate within the infrastructure of an FCA and therefore have low startup costs (H. Uchida, personal communication, 2012). Additional collections for operation and administrative costs are determined on an individual FMO basis. For example, the Sakuraebi Harvester's Association pools and distributes revenues to members according to a set formula. This formula deducts costs for ice and storage, a 3% commission fee and a 1% port fee from the total revenue (Uchida, 2007). The remaining amount is divided equally among all association members.

STEP 7 IN ACTION

Assess Performance and Innovate

The Common Fishing Rights System was implemented with goals to involve fishermen in the management process and protect them from outside fishing pressure. Almost 65 years later the program has met and exceeded these goals. It has created a co-management system that allows management to operate on the appropriate scale and promotes local fishermen innovation, improving coastal fisheries for fishermen and their communities.

One of the hallmarks of this program is effective co-management though nested government entities, which has achieved an appropriate scale for proficient fishery management and enabled fishermen to incorporate local fishery knowledge and expertise into the management process. This is highlighted by the development of FMOs—entities that were not initially formed through legislation but rather evolved over time to coordinate management of fish stocks at the proper biological scale. FMOs have reduced conflict and promoted coordination between Cooperative members (Yadava et al., 2009). FMOs also allow fishermen to manage straddling stocks between FCA territories, a feature that has evolved from fishermen's ability to incorporate community knowledge into management decisions.

FCAs rarely exceed their catch limits and the catch share system has been integral in ensuring landings have not exceeded federally set catch limits. Despite good compliance in the TURF system, the current status of the eight species managed with a catch limit is mixed.[1] This may be due to catch limit overages in the offshore fleet or political pressure to raise catch limits for socioeconomic reasons (Makino, 2011; Sustainable Fisheries Partnership, 2013). In order to address this, it will be important to ensure appropriately set catch limits and good compliance from all sectors.

Every 10 years, the Sea Area Fisheries Coordinating Committees assess the operation and management practices of FCAs for effectiveness in the management of their TURFs. The Committee may revoke allocated common fishing rights if FCAs are not serving as stewards of their coastal fisheries. Individual FCAs have also chosen to conduct their own annual assessments for both biological and social impacts. For example, the Kaiwuchi-machi FCA, in partnership with a local community, conducts annual stock assessments and social assessments. Social assessments determine the impacts of the sea cucumber fishery and branding on the local economy, including jobs and tourism opportunities (Makino, 2011).

1 The Japanese government has determined that chub mackerel, sardine and walleye pollock have low stock levels; jack mackerel and snow crab have medium stock levels; and Pacific saury, spotted mackerel and Japanese common squid have high population levels (Makino, 2011)

Fishermen and Cooperatives have also adopted innovative management approaches within the program. This is evidenced by the growing prevalence of pooling arrangements within and between Cooperatives, in which fishing effort, costs and/or revenues are pooled. Such management measures may be developed and modified to promote better coordination among members and neighboring Cooperatives, to increase profits and to improve stock conditions, among other things. The more successful TURFs in Japan often have high levels of cooperative behaviors (i.e., pooling arrangements, coordination, etc.) incorporated into their management processes to achieve biological, social and economic goals (Makino and Sakamoto, 2001; TQCS International Pty Ltd, 2008; Makino, 2011). For example, the success of the KDSFF has been empirically linked to the voluntary reduction in eligible days for harvesting snow crabs and the permanent no-take zones the FMO established that increased catch-per-unit-effort and landing values (Makino and Sakamoto, 2001; TQCS International Pty Ltd, 2008). Pooling arrangements have social, financial and managerial advantages, and continue to grow in use. All of these innovations have been made possible because of privileges provided to fishermen through the establishment of the Common Fishing Rights System.

Although economic goals were not an identified priority in the development of the Common Fishing Rights System, there is growing evidence that co-management allows FCAs and FMOs to improve profitability within coastal fisheries. For example, the KDSFF has shown that landing values and revenue per unit of effort have increased. Additionally, the unit price of sea cucumbers, managed by the FMO Council for Promoting Sea Cucumber Resource Utilization, has steadily increased since 2003 (Makino, 2011).

While some TURFs may perform better than others, the TURF and co-management system in Japanese coastal fisheries is a platform for localized solutions. The successes of the Japanese system are spreading globally and gaining the attention of those who are looking for more effective ways to manage small-scale fisheries. Through supporting best practices and sharing lessons learned, the Cooperatives stand to benefit from their collective experiences.

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SEASALT
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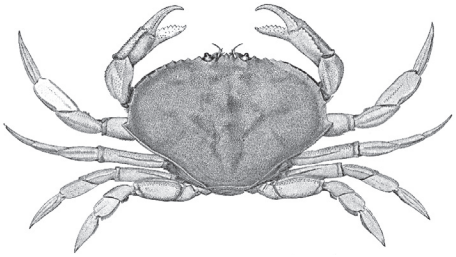
CATCH SHARES IN ACTION

United States Bering Sea and Aleutian Islands Crab Rationalization Program



SPECIAL DESIGN FEATURES

MULTI-SPECIES, INDIVIDUALLY- AND GROUP-ALLOCATED, QUOTA-BASED, TRANSFERABLE

The Bering Sea and Aleutian Islands (BSAI) Crab Rationalization Program (the Rationalization Program) was designed to improve resource conservation, operating efficiency and fishermen's safety while maintaining participation by remote communities. A number of important features account for the diverse natures of stakeholders and the fishery's historical importance to many communities. These include: a unique three-pie approach that defines and assigns different types of privileges to vessel owners, crew and processors; an industry-funded, government-operated loan program to assist new entrants and crew; and voluntary Cooperatives that assist in program administration and fishing coordination.

SYNOPSIS

Fishery managers implemented the Rationalization Program in 2005. This catch share program manages five species of crab: red king crab (*Paralithodes camtschaticus*), tanner crab (*Chionoecetes bairdi*), blue king crab (*Paralithodes platypus*), golden king crab (*Lithodes aequispinus*) and snow crab (*Chionoecetes opilio*). The five species are managed as nine distinct stocks. The program allocates individual harvester quota shares and processor quota shares.

The fishing grounds lie off Alaska's coast in the Bering Sea and Aleutian Islands, in U.S. federal and state waters. Vessels include catcher vessels and catcher-processor vessels ranging in size from 58 to 200 feet. BSAI crab fisheries are lucrative, and fishermen are often among the highest paid fishermen in the country. In 2011, fishermen landed approximately 68 million pounds worth U.S. $261 million (NOAA Fisheries Service, 2011c). The Bering Sea snow crab and Bristol Bay red king crab are the two most important species in terms of volume landed and value (Abbott et al., 2010).

Road to a Catch Share

The BSAI crab fishery began in the 1950s. Although highly lucrative, the fishery has long been characterized by poor weather, fluctuating stock abundance and unsafe conditions. During the 1990s, competition for harvest intensified, resulting in overcapitalization and a race to fish between participants. In 1997, managers restricted entry to the fishery through a Limited License Program (LLP) and implemented season lengths to limit harvests (NPFMC, 2011). These input controls did not resolve the problems, however. Competition intensified and seasons became increasingly shorter. In 2000, the Bristol Bay red king crab fishery was open for only three days. The imprecise nature of using input controls to manage the fishery, coupled with natural stock fluctuations, resulted in inconsistent harvests that were either significantly below, or above, catch limits (Fina et al., 2008). Processors were forced to keep up with the supply by processing landings as quickly as possible, resulting in reduced product quality and unstable, part-time employment opportunities (Fina, 2005). Industry profits declined, fishing conditions became more dangerous and processors began to consolidate (Fina et al., 2010; NPFMC, 2010).

Significant negative social outcomes also occurred. The short seasons forced fishermen to operate in dangerous weather conditions and the fishery became one of the deadliest in the country, with a total of 80 fatalities occurring between 1991 and 2005 (Fina et al., 2008). The then-dangerous nature of the crab fisheries was popularized through the Discovery Channel show, *The Deadliest Catch* (Discovery Channel, 2011).

In response to these failures, Congress directed fishery managers to develop a management plan that would end the race to fish. With goals of addressing biological and economic issues while minimizing impacts on dependent Alaskan communities, managers identified catch shares as the best solution. They designed the Rationalization Program to address the needs of the many stakeholders (Fina, 2005). Despite a nationwide moratorium on implementing new catch share programs between 1996 and 2004, the Rationalization Program was adopted by Congress and implemented on January 1, 2005, coupled with an industry-funded vessel buyback program that reduced the fleet size by 25 vessels (Fina, 2005).

Performance

Eight years since its launch, the Rationalization Program has improved the fishery in many ways and is meeting biological, social and economic goals for the program. The Bering Sea snow crab stock has been rebuilt and the status of crab stocks has improved (NOAA Fisheries Service, 2011a). Fishing jobs have transitioned to safer, more stable positions with higher seasonal wages and safety has dramatically improved for fishing crews (Abbott et al., 2010; Fina et al., 2010). Additionally, special design features have benefited remote communities including an increase in deliveries to shore-based processors (E. Poulsen, Alaska Bering Sea Crabbers, personal communication, 2011).

STEP 1 IN ACTION

Define Program Goals

The BSAI Crab Rationalization Program was designed to meet the legal requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) regarding stock sustainability and ecological, economic and social goals. Biological goals prescribed in the National Standards (NS) One, Three and Nine of the MSA (16 U.S.C. 1851) are as follows:

NS1 - Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

NS3 - To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

NS9 - Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Managers and stakeholders also identified a number of fishery-specific biological, economic and social goals for the catch share program, including meeting specific biological targets and creating economic benefits for vessel owners, crew and remote communities dependent upon crab processing (Fina, 2005). Specific goals for the fishery include:

- Enhanced resource conservation;
- Improved economic efficiency;
- Increased safety for fishermen; and,
- Regional stability and equity (Federal Register, 2005).

These goals are reflected in the Rationalization Program, which designates and assigns harvester and processor shares, provides incentives for Cooperative formation and includes crew in the initial allocation process (Fina, 2005).

STEP 2 IN ACTION

Define and Quantify the Available Resource

The BSAI crab fishery includes nine separate stocks of five crab species: red king crab (*Paralithodes camtschaticus*), blue king crab (*P. platypus*), golden (or brown) king crab (*Lithodes aequispimus*), tanner crab (*Chionoecetes baidi*) and snow crab (*C. opilio*). Each of the crab stocks is defined by an area and a species. Stock designations were developed in pre-existing management structures laid out in the BSAI Crab Fishery Management Plan (NPFMC, 2011).

Catch limits are established for each stock based on scientific recommendations (Fina et al., 2008; NPFMC, 2011) and set at levels to maintain or rebuild stocks, if needed. BSAI crab stocks experience fluctuations in population size from year to year that are attributed to dynamic environmental conditions, previous harvests and bycatch from other fisheries (NPFMC, 2011). The Bering Sea tanner crab and Pribilof Island blue king crab stocks were overfished prior to program implementation (Bowers et al., 2005). The snow crab stock was determined to be overfished in the early 2000s and has since been rebuilt (Bowers et al., 2005). Discarded crabs have a high survival rate, and participants are permitted to discard crab without a charge against quota holdings. However, dead discards are incorporated into the determination of future catch limits, and efforts are made within the industry to minimize discard mortality (Fina et al., 2010).

STEP 3 IN ACTION

Define Eligible Participants

This program has a number of unique eligibility characteristics to meet the goals of regional stability and equity. The program allocates long-term privileges to both individuals and groups. Allocation to individuals is made through a "three-pie" system that includes: (1) harvesting quota shares to eligible vessel owners; (2) harvesting quota shares to eligible crew; and (3) processing quota shares to eligible processors. Eligible harvesting participants include vessel owners with a history of crab landings and crew with a history of participation. Shore-based processors with a history of processing crab are eligible to receive processor quota. Additional rules require eligible vessel owners to land a certain portion of their annual allocations to processors. The program also provides a specific annual allocation to West Alaskan fishing communities participating in the Community Development Quota (CDQ) and to Adak, Alaska, a remote community in the Aleutian Islands that is reliant on commercial fishing and processing. (See Step 4 below for a more detailed description of the different types of quota).

The catch share program was designed to promote the formation of Cooperatives among participants to improve the economic efficiency of the fleet. Cooperatives may form voluntarily with a minimum of four harvester quota shareholders. Individuals are free to change their Cooperative membership from year to year or may choose to fish independently. Cooperatives are not allocated long-term quota shares directly; rather, Cooperative members assign their annual allocation to the Cooperative for that year and then work with other Cooperative members to ensure appropriate harvest.

The program design includes concentration caps to limit ownership of long-term quota shares by both vessel owners and crew, the annual catch by any one vessel, as well as processor holdings. The caps are set at differing levels to achieve the dual goals of economic efficiency and regional stability and equity. Vessel concentration caps differ across the nine crab stocks, ranging from 1-10%. Crew share concentration caps also differ across the fisheries, ranging from 2-20% of the total crew shares. Vessels that are not part of Cooperatives are restricted to fishing between 2% and 20% of the total shares. Shore-based processor share holdings are limited to 30% of the processor quota pool on a fishery basis. Cooperatives are not subject to concentration caps (Fina, 2005).

New harvesting entrants can participate in the catch share program by buying or leasing shares. To be eligible, an individual must obtain a license, which requires U.S. citizenship and at least 150 days of sea time in U.S.

commercial fisheries in a harvesting capacity. Companies are also eligible to purchase quota if an individual within the company is eligible and holds 20% or more of an ownership position in the company.

Additionally, to aid crew and captains in purchasing quota, a government-operated program provides low-interest loans for up to 80% of the quota purchase price. The loan program is funded through a cost recovery fee charged to participants in the catch share program (NOAA Fisheries Service, 2011a). Eligible borrowers are captains and crew with quota share holdings below a fishery-specific threshold that ranges between 0.1% and 1% of total quota share (Fina et al., 2010).

New processors can enter the fishery by purchasing or leasing processor quota shares, or by purchasing crab harvested under the "unrestricted shares" classes, a type of share that is can be delivered to any processor (Fina et al., 2008).

STEP 4 IN ACTION

Define the Privilege

Privileges are quota-based. They were designed to recognize the investments that crew and captains made in the fishery, and to maintain the relative structure of deliveries to remote communities. One of the hallmarks of this program is the multiple types of privileges that are defined and allocated for vessel owners, crew, processors and communities. Different classes of quota exist within many of these categories.

There are three types of long-term privileges:

1. Quota Shares (QS) were granted indefinitely to eligible catcher vessels, catcher-processor vessels and crew.
2. Processor Quota (PQ) was granted indefinitely to eligible shore-based processors.
3. Community Development Quota (CDQ) was granted to 65 eligible West Alaskan fishing communities and the community of Adak.

The CDQ is managed independently of the Rationalization Program and is not subject to regional landing requirements, although CDQ groups are required to deliver at least 25% of the allocations to shoreside processors.

The annual allocation units for harvesting quotas (Quota Shares) are defined as Individual Fishing Quota (IFQ) and are allocated to vessel owners and to crew. There are four categories of IFQ quotas, including:

1. Catcher Vessel Class A IFQ
2. Catcher Vessel Class B IFQ
3. Crew Class C IFQ
4. Catcher Processor IFQ

The four categories were allocated to particular eligible participants and specified landing location requirements:

- Catcher Vessel Class A IFQ was allocated to former LLP license holders. Class A IFQ is associated with one of the regions throughout the Bering Sea and harvests must be delivered to a processor that holds IPQ within that region.

- Catcher Vessel Class B IFQ was allocated to former LLP license holders and allows delivery to any processor of choice.
- Crew Class C IFQ was allocated to only eligible captains and crewmembers and allows delivery to any processor of choice.
- Catcher Processor IFQ was allocated to eligible catcher-processor LLP license holders.

Each season, catcher vessel quota is allocated as 90% Class A IFQ and 10% Class B IFQ. Class A shares are intended to protect processing communities by ensuring continued supply of crab, while Class B shares are intended to provide harvesters with additional market leverage for negotiating prices. The 90%:10% division is intended to ensure that harvesters and processors, as well as remote communities, benefit from the catch share.

IFQ shares are defined as a percentage of the annual catch limit. However, 10% of the total allowable catch (TAC) for each of the nine crab stocks is allocated to the CDQ program. The community of Adak is not a CDQ community, but is allocated 10% of the TAC for one crab fishery in the Aleutian Islands based on historical participation. After CDQ deductions, bycatch allowances for other BSAI fisheries are subtracted. The remaining allocations are then split among Rationalization Program participants (Fina, 2005).

The second type of annual allocation privilege, Individual Processor Quota (IPQ), is allocated to eligible processors and requires harvesters with Class A IFQ to deliver a specified quantity of catch to processors (Fina et al., 2010). These shares are regionally designated based on the location and quantity of shareholder landings during a specified qualifying period that varies by fishery (Fina, 2005).

The program allows both permanent and temporary transferability of Quota Shares and all IFQ categories, respectively. To receive shares through a transfer, individuals must be active in one of the nine crab fisheries for the prior year (Fina et al., 2010). NOAA Fisheries administers quota transfers between Cooperatives, while trades within each Cooperative are administered internally under the Cooperative's bylaws, which hold participants accountable to their collective catch limit (Fina, 2005). To further incentivize internal cooperation, fishermen who are not members of a Cooperative were not permitted to trade shares with Cooperative members for the first five years of the Rationalization Program (Fina et al., 2008).

Processor Quota Share and Individual Processor Quota are transferable to all eligible participants as long as the buyer does not hold more than 30% of the total IPQ in a fishery. However, trading of processor quota was prohibited for the first two years of the program. This was intended as a community protection measure to prevent changes in delivery patterns to individual communities (Fina, 2005). In addition, a right of first refusal to acquire any processor quota associated with a community was granted to remote communities and CDQ groups with historical dependence on the crab industry.

STEP 5 IN ACTION

Assign the Privilege

The allocation process included many stakeholders and was primarily based on historical participation in the crab fisheries. The Restricted Access Management (RAM) Division of the National Marine Fisheries Service

(NMFS) determined the eligibility of participants using catch records, including landing reports and fish tickets. Shares were granted prior to the start of the Rationalization Program.

Three types of participants were eligible for initial allocation of quota shares and processor quota: vessel owners, crew and processors. To be eligible, vessel owners must have held a Limited License Program (LLP) license and participated in the crab fisheries over a series of seasons specific to each crab stock. To be eligible for initial allocation of crew shares, captains and crew were required to prove historical participation by providing evidence of landings, either through Alaska Department of Fish and Game fish tickets or an affidavit from a vessel owner (Fina, 2005). Processors with a history of receiving crab are eligible to hold Processor Quota Shares (PQS). At the start of the program, 27 catcher-processor vessels, 294 catcher vessels, 30 processors and 200 captains qualified for quota share in the catch share program (Fina, 2005). Of the total quota pool available to the fishery, 97% was allocated to catcher vessels and catcher-processors, and 3% to crew (Fina et al., 2010).

Shareholders apply annually to RAM to receive IFQ or IPQ. If a shareholder is part of a voluntary Cooperative, then the Cooperative will file a Cooperative harvest agreement prior to the start of the fishing season and will be allocated their members' annual IFQ. Fishermen must join a Cooperative for a minimum of one year, but as mentioned above, they are permitted to change Cooperatives between seasons or apply to RAM to fish their IFQ independently in subsequent years (Fina et al., 2008).

An appeals process enables license holders to request a review of their allocation. This process is run through the NMFS Office of Administrative Appeals, which separates the appeal process from the initial allocation decision.

STEP 6 IN ACTION

Develop Administrative Systems

The Crab Rationalization Program is a well-administered program with a sophisticated system to ensure accurate catch accounting and efficient monitoring and enforcement. RAM administers the Rationalization Program and uses online systems to determine participants' eligibility, allocate IFQ, process Cooperative applications and quota share transfers and conduct other related activities.

Cooperatives are held accountable through internal bylaws and agreements. The distribution of IFQ within Cooperatives is based upon the amount of quota share holdings a member brings into the Cooperative. This method ensures all members have a stake in both the benefits and costs of the Cooperative. Many Cooperatives hire business managers to coordinate the fleet deliveries with processors and this has generally worked well to increase efficiencies for both sectors. Over the course of the Rationalization Program, an increasing number of Cooperatives have begun to manage quota centrally, rather than allowing individual members to arrange the harvests of their shares. This strategy has further contributed to efficiency (Fina et al., 2010).

The use of harvester and processor quota has helped with quota accounting and deters underreporting. The program requires 100% on-board observer coverage on catcher-processor vessels and between 20-50% coverage on catcher vessels to account for catch (Fina, 2011). Observers document the catch and the sizes of crabs harvested, and send data to the Alaska Department of Fish and Game.

All vessels are fitted with a Vessel Monitoring System to ensure compliance with landing requirements and to collect spatial data on fishing effort (Alaska Bering Sea Crabbers, 2011). In addition, all crab catch retained aboard catcher-processor vessels is required to be weighed on a NMFS-approved, motion-compensated scale. Dockside monitoring also occurs. Shoreside processing plants are required to have approved Crab Monitoring Plans that detail how a plant will ensure all crab are sorted and weighed within view of NMFS-authorized personnel. In addition, pre-trip inspections and off-loading monitoring occur (NPFMC, 2011). Participants use eLandings, an interagency electronic reporting system to track commercial fishery landings and to debit catch quota from IFQ accounts. These reports must be submitted within six hours after an offload ends.

Cooperatives manage quota for their members and coordinate deliveries. Cooperatives operate as "flow through" entities, which means that members retain the right to fish the annual IFQ they bring to the Cooperative, and pay an annual fee in return for Cooperative services. Intra-Cooperative trades are not reported to managers (Fina et al., 2007). Managers have benefited from Cooperative operations and harvesting oversight as it has reduced administrative costs (E. Poulsen, Alaska Bering Sea Crabbers, personal communication, 2011).

Cost recovery is used to cover the cost of management and enforcement arising from the Rationalization Program. Based on U.S. law, a cap of 3% of ex-vessel profits is used towards program costs. The cost of program implementation was $4,270,881 in its first year, of which more than 70% was met by the cost recovery program. By 2009, the implementation costs were reduced to $3,099,991 because of efficiency gains realized by managers and participants. These costs were fully met by the cost recovery program (Fina et al., 2010).

STEP 7 IN ACTION

Assess Performance and Innovate

The North Pacific Marine Fishery Council (NPMFC) implemented a comprehensive review process that assesses the Rationalization Program's ecological, economic and social performance in 18-month periods (Fina, 2005). This includes an annual Economic Data Reporting (EDR) system that is used to help managers assess program impacts and develop appropriate amendments (Fina et al., 2010). The EDR collects historical data prior to and after the implementation of the program to provide a comparison for assessing changes in the crab fisheries (Abbott et al., 2010). The reporting system found that overall, the Rationalization Program is meeting its goals (Fina et al., 2010), and findings have also been used to make design improvements (NOAA Fisheries Service, 2011b).

The length of the fishing season has drastically increased by more than 40% in the Bristol Bay snow crab fishery and by more than 25% in the Bristol Bay red crab fishery (NPFMC, 2007a). As the seasons have extended, managers have gained much more certainty around annual harvests and the handling of catch has improved. As a result, fewer dead crab are landed at the dock. Fishermen have increased their catch-per-unit-effort (CPUE), as they have the time to soak their crab pots for longer periods (Fina et al., 2010) and to target the most productive fishing grounds (E. Poulsen, Alaska Bering Sea Crabbers, personal communication, 2011).

A number of social changes have occurred under the new management. Fishing safety has improved, and the number of annual fishing fatalities has declined. Employment has transitioned from many part-time jobs to

fewer positions that are full-time. Remaining jobs are more stable and have higher seasonal wages (Abbott et al., 2010; Fina et al., 2010). Allocation of crew quota has provided long-standing captains and crew with an equity stake in the fishery. Implementation of a loan program in 2011 provides access to capital for eligible crew to invest in additional quota (NOAA Fisheries Service, 2011c). Community protection measures have succeeded to limit redistribution of landings away from historical processing plants in remote communities, which are heavily invested in crab fisheries (Fina et al, 2010; NPFMC, 2010).

Most stakeholders agree that the Rationalization Program is a significant improvement in overall management and performance (Fina et al., 2007). However, program implementation did result in a change in distribution of work in the fishery. When the crab fishery was under a shortened race for fish, some crew could participate as a way to supplement their income from other fisheries. Now that the crab season is lengthened, fewer such opportunities are available (NPFMC, 2010). Although the average annual crew income has increased substantially under the Rationalization Program, the proportion of gross revenues has decreased, with a larger proportion of gross revenue now provided to vessel owners (NPFMC, 2010). While the catch share has successfully halted a longer-term economic decline, the distribution of privileges and fleet consolidation has been a debated issue (NPFMC, 2010). In practice, the vessel buyback and lack of vessel-use caps within Cooperatives has allowed consolidation. While this was a primary goal of the program, some have expressed concern over the outcome. NPFMC reviewed the situation to determine if Cooperative vessel caps would enable increased employment opportunities in the fisheries. However, because the crab stocks fluctuate so widely between years, the agency concluded a cap to be impractical. Fishery managers determined the no-cap policy should be maintained to enable the efficiency goals intended by the Rationalization Program (NPFMC, 2007b).

In addition to meeting program goals, a number of co-management innovations have occurred through the Rationalization Program. To encourage crew investment in the fishery, the Alaska Bering Sea Crabbers, a harvester alliance that represents all BSAI crab fisheries, recently proposed a preferential right of first offer to eligible crew: 10% of crab quota when it becomes available for sale. This voluntary program will enable crew to purchase quota in smaller and more affordable units (ABSC, 2011). Another innovation is the voluntary adoption of a pricing structure that prevents differentiation for shell quality and thereby eliminates the incentive for selective harvesting (Fina et al., 2010).

Cooperative formation was incentivized in this program and has benefited fishermen by increasing information availability and sharing for harvesters and processors, a stark contrast to the intense competition and conflicting interests of seasons past (Fina et al., 2010). Processors benefit from the Cooperative through increased efficiency in delivery coordination, which can help to reduce queues and reduce gaps between deliveries. Managers also benefit from reduced administration costs, as harvesting oversight is delegated to the Cooperative (E. Poulsen, Alaska Bering Sea Crabbers, personal communication, 2011). Within the first year of the program, 19 voluntary Cooperatives were created. By year five, the Cooperatives had merged into 11 separate entities (NPFMC, 2010). Cooperatives have an important role in the price negotiations with processors. They work with each other to ensure price information is shared with price arbitrators. Harvesters have historically acted collectively to negotiate a price with processors prior to the start of the fishing season (Fina et al., 2007).

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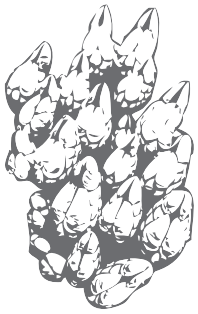
SEASALT
Secure
Exclusive
Scaled
Accountable
Limited

CATCH SHARES IN ACTION

Spanish Galicia Goose Barnacle Cofradía System



SPECIAL DESIGN FEATURES

SINGLE-SPECIES, GROUP-ALLOCATED,
AREA-BASED, NON-TRANSFERABLE

The Spanish Galicia Goose Barnacle Cofradía System was implemented to manage the highly lucrative goose barnacle fishery. Program goals were focused on reducing overfishing and restoring profitability. The program codified traditional fishing guilds, known as *cofradías* , as co-managers by granting them secure and exclusive privileges to harvest goose barnacles within clearly defined fishing areas and requiring them to responsibly manage the resource. A key program innovation is the use of on-site fisheries ecologists to conduct scientific monitoring, set appropriate mortality controls and adaptively manage mortality controls within season to ensure sustainable goose barnacle populations.

SYNOPSIS

In 1992, the Galician fisheries ministry (Consellería do Medio Rural e do Mar) developed a catch share program to increase accountability and improve management in the goose barnacle (*Pollicipes pollicipes*) fishery. The fishery occurs in coastal waters that fall under the jurisdiction of the Galician regional government (Freire and Garcia-Allut, 2000). Recognizing the management potential of existing social institutions, the Galician fisheries ministry granted exclusive harvesting privileges—also known as Territorial Use Rights for Fishing (TURFs)—to traditional fishing guilds, or cofradías. Each cofradía is accountable for developing an annual management plan and implementing appropriate controls on fishing mortality within its TURF area. With funding from the Galician fishing ministry, each cofradía enlists an on-site fisheries ecologist to assist with biological monitoring and improve the science available for setting appropriate controls on fishing mortality.

Galicia is home to an estimated 16,000 artisanal fishermen (Macho et al., 2008) and leads Spain in total fisheries landings, with an average catch of 196,000 metric tons per year valued at EUR €442 million (Macho et al., 2010). As a culinary delicacy, goose barnacle has become one of the most lucrative species harvested. The species grows in dense aggregations on intertidal and subtidal rocks. Fishermen access barnacle aggregations either on foot or by boat and typically harvest them by using a scraping device to remove the barnacles from the rocks (Pérez, 1996).

Road to a Catch Share

Spain has a long history of cooperative fisheries management. As early as the 12th century, kings granted special harvesting privileges to fishing guilds known as cofradías (Franquesa, 2004), and these social institutions have endured and adapted to centuries of political and economic transformation. The activities of modern cofradías typically involve coordination of harvesting and marketing activities over traditional fishing areas.

In the 1970s, the Galician government legally recognized the fishing grounds of Galician cofradías (J. Molares, personal communication, 2013). However, without management support or the ability to exclude outsiders, cofradías struggled to manage their areas effectively. As tourism began to flourish in Spain during the 1970s, harvests of goose barnacles increased rapidly (Macho et al., 2008). The lack of scientific information on localized populations of goose barnacles also hampered the development and implementation of appropriate controls on fishing mortality (Molares and Freire, 2003). Fisheries authorities initially responded to increased exploitation with temporal closures, which proved to be ineffective in curbing overfishing (Freire et al., 2002; Molares and Freire, 2003). The increasing market demand for goose barnacles led to the overexploitation and near collapse of the fishery in the late 1980s (Macho et al., 2008).

To address biological, economic and social challenges, there was an increased commitment by the government to work with cofradías to strengthen local management. In 1992, the Galician fisheries ministry developed a catch share program for the goose barnacle, combining secure and exclusive fishing areas (TURFs) with increased government oversight and technical support. The Galician fisheries ministry holds each cofradía accountable for managing the resource, marketing its catch and developing annual management plans.

Performance

Since program implementation in 1992, goose barnacle biomass and economic value have increased significantly (Molares and Freire, 2003; Macho et al., 2008). Co-management between the Galician fisheries ministry and the cofradías has strengthened the role of artisanal fishermen in the management process. Key benefits from the program include:

- Recovery of goose barnacle populations (Molares and Freire, 2003)
- Profit stabilization (Molares and Freire, 2003; Macho et al., 2008)
- Increased trust and cooperation between fishermen and government (Molares and Freire, 2003)
- Greater accountability and reduced illegal fishing through the development of control points for landings within TURFs and at designated auction markets (Molares and Freire, 2003; Frangoudes et al., 2008)
- Improved conflict resolution among fishermen through increased cooperation and the development of common goals (Molares and Freire, 2003)

The introduction of on-site ecologists has greatly improved the scientific and technical capacity to monitor resources and inform appropriate controls on fishing mortality in a timely manner (Prince, 2003). Funded by the Galician fisheries ministry, the ecologists drive the development of management plans, report regularly on the health of stocks, aid in surveillance and offer technical advice to the cofradías.

STEP 1 IN ACTION

Define Program Goals

The Galician fisheries ministry and stakeholders in Galicia identified a variety of biological, economic and social goals when establishing the catch share program for the goose barnacle. The primary goals were to reduce overfishing and restore profitability. Through co-management between the Galician fisheries ministry and local cofradías, the program seeks to achieve goals in a way that best addresses local needs.

STEP 2 IN ACTION

Define and Quantify the Available Resource

The single-species catch share program was primarily designed to manage the goose barnacle (*Pollicipes pollicipes,* called *percebe* in Spanish), a highly valued and historically overfished species. The goose barnacle is a sedentary cirripede that grows in dense aggregations in rocky intertidal and subtidal areas throughout the coastal waters of northwest Spain (Molares and Freire, 2003).

Harvestable populations of goose barnacles are found in 32 of the 63 cofradías in Galicia (Consellería do Medio Rural e do Mar, 2012; Perez de Oliveira, 2013). TURF boundaries are defined by the traditional fishing grounds of the cofradías, covering the intertidal rocks where goose barnacle populations can be found.

To appropriately manage fishing mortality, most cofradías enlist a fisheries ecologist (known locally as a barefoot ecologist) to regularly monitor goose barnacle stocks and inform annual management plans. Management plans specify controls on fishing mortality, which include daily allowable catch limits for each fisherman and the expected total catch per year. The expected total catch is based on historical catch data and information generated by on-site ecologists, and is not permitted to exceed the catch from the previous year by more than 10% (J. Molares, personal communication, 2013). Daily catch limits typically range between three to 10 kg per day for each fisherman (Molares and Freire, 2003). With approval of the Galician fisheries ministry, limits can be adjusted during the season in response to detected changes in stock health, shifting market demands or attainment level of the expected annual catch. On-site ecologists regularly provide information on stock abundance, while control points monitor daily landings. The collection of this near real-time data is crucial to informing necessary management changes in daily catch limits. Cofradías may also implement a rotational harvest system by designating fishing zones within the TURF and rotating harvests through the season (B. Nieto Novoa, personal communication, 2013).

Although the catch share program has been implemented to manage goose barnacles, cofradía members fish for a variety of species within their TURF. Bivalves, gastropods, annelids, algae, anemones and echinoderms are among the additional sedentary species that can be included in the official management plan (G. Macho, personal communication, 2013). To maximize broader ecological performance within their TURFs, some cofradías have implemented no-take reserves. The Lira cofradía, for example, has established two no-take

reserves in highly productive spawning and breeding grounds in order to promote larval and juvenile spillover to the surrounding TURF areas (Tindall, 2012). The reserves cover 6.75% of total TURF area and are demarcated using topographical features and coordinates (Confraría de Pescadores Lira, 2012).

STEP 3 IN ACTION

Define Eligible Participants

The Galician fisheries ministry has granted area-based catch shares (TURFs) to groups of fishermen organized in cofradías. Cofradías with harvestable populations of goose barnacle in their traditional fishing grounds are eligible to fish for the species.

Each cofradía has general requirements for membership, but typically, anyone who lives in the area can join upon paying membership dues. Individuals must also obtain a harvesting license called a "permex" (for *permiso de explotación*, or license to exploit) from the Galician fisheries ministry to harvest goose barnacles. The ministry considers the applicant's historical ties to, and dependence on, the fishery when issuing licenses. Individual fishing licenses must be renewed each year and are typically renewed with evidence of fishing activity.

New entrants in the fishery must become a member of a qualifying cofradía and obtain a license from the Galician fisheries ministry to access fishing grounds and harvest goose barnacles. New entrants may apply for a new license or purchase a boat with an existing license attached to it (G. Macho, personal communication, 2013).

STEP 4 IN ACTION

Define the Privilege

This program allocates an area-based catch share (TURF) in which goose barnacle harvesting is permitted. Cofradías have an incentive and expectation to sustainably manage their TURF boundaries and the fishing activities within. The privilege is granted in perpetuity under the condition that annual management plans are developed and approved each year (G. Macho, personal communication, 2013).

As a condition of holding the privilege and receiving financial support from the government, cofradías are accountable for developing management plans. Management plans are designed to ensure that the resource is managed sustainably. They specify:

- Grounds where fishing is allowed
- Method of capture (on foot or on vessel)
- Number of authorized fishermen (by number of licenses authorized)
- Designated control points and points of sale
- Total expected catch in a given year (not to exceed the previous year's catch by more than 10%)
- Daily individual catch limits

Daily individual catch limits vary in each cofradía and typically range between 3-10 kg per fisherman. Fishermen rarely fish every day, and to ensure that daily catch limits do not exceed the total estimated annual catch, daily limits do not accumulate over time and may not be transferred to other fishermen. TURF areas are not transferable from one cofradía to another, and fishing licenses for on-foot fishermen are not transferable. On-boat licenses are transferable within a cofradía.

STEP 5 IN ACTION

Assign the Privilege

In 1992, the Galician fisheries ministry granted the privilege to harvest goose barnacles to a total of 32 cofradías based on the presence of harvestable populations (Consellería do Medio Rural e do Mar, 2012). The Galician fisheries ministry defined TURF boundaries based on the traditional fishing grounds of each cofradía. The ministry upholds the exclusive area-based privileges of these qualifying cofradías on the condition that fisheries management plans are approved each year.

There has been no formal appeal process for the initial allocation of TURFs, as boundaries have been based on long-established fishing grounds. However, processes are in place for cofradías to adapt management of their grounds and for the Galician fisheries ministry to maintain oversight. For example, cofradías determine daily catch limits for each individual fisherman and can actively modify those limits within the season with approval by the Galician fisheries ministry.

STEP 6 IN ACTION

Develop Administrative Systems

As longstanding social institutions, cofradías were well positioned to carry out many of the tasks required for effective management. Through co-management, the catch share program has harnessed and strengthened the ability of cofradías to manage their goose barnacle resources.

Internally, cofradías have a representative structure in which all members have voting rights. The executive leadership in each cofradía is typically elected every four years, with the president acting as the legal representative of the cofradía (Alegret, 2009). Cofradías are regulated as public, non-profit bodies, with surplus earnings invested back into the cofradía to support operations (Franquesa, 2006).

Each cofradía is responsible for developing annual management plans, to be approved each year by the Galician fisheries ministry. To improve catch monitoring, each management plan specifies control points where fishermen are obligated to bring their daily landings for weighing and inspection. Cofradía members monitor these control points to record physical size and weight of landings, as well as specific areas fished. In addition to monitoring and sampling conducted by on-site ecologists, this real-time catch information can help detect overfishing and inform changes in management or daily catch limits (Molares et al., 2003).

The cofradías also have a designated market for their catches, known as the Lonxa. To prevent the sale of illegally caught goose barnacles, dealers at the Lonxa are required to show invoices to inspectors to prove their purchases are from cofradías and therefore legitimate. As fishermen are only able to sell their catch at these markets, the Lonxa serves as an additional checkpoint to ensure accountability.

The cost of management is shared between cofradías and the Galician fisheries ministry. Cofradías charge membership dues. The Galician fisheries ministry provides special funds to aid in fishery management, allowing cofradías to hire in-house ecologists and guards to assist with fishery science and surveillance, respectively (G. Macho, personal communication, 2013). Surveillance costs may also be supported internally through cofradía-imposed fines for non-compliance (Frangoudes et al. 2008; B. Nieto Novoa, personal communication, 2013.)

STEP 7 IN ACTION

Assess Performance and Innovate

More than 20 years after implementation, the catch share program is meeting its goals. Goose barnacle stocks have recovered and profits have stabilized. The program has also succeeded in strengthening existing institutions by involving local fishermen in resource management. The program has helped fishermen achieve a higher degree of organization and mutual commitment, which has improved the ability to negotiate at market (Molares and Freire, 2003).

Co-management has enhanced relationships between the fishery stakeholders and has helped align management activities at the appropriate scale. Cofradías are able to set rules appropriate for their local needs, and oversight from the Galician fisheries ministry holds cofradías accountable for developing and implementing appropriate management plans. The financial assistance provided by the Galician fisheries ministry supports the level of resources and capacity needed for cofradías to manage resources effectively.

The introduction of on-site ecologists is another key innovation. On-site ecologists provide frequent scientific monitoring of the resource to supply the high level of information needed to set and modify daily individual catch limits. Because they work within the cofradías and in close contact with the fishermen, the ecologists have developed a culture of understanding and trust between fishermen and the greater scientific community.

Control points for landings help ensure compliance and accountability within the fishery and increase the available data needed to monitor fishery health. Data generated from control points has informed necessary in-season adjustments to management.

While on-site ecologists have been extremely effective, their continued participation faces several challenges. Ecologists tend to have low salaries, insufficient recognition and a lack of long-term funding and resources from the Galician fisheries ministry. In addition, relationships with the cofradías can become stressed when ecologists make catch limit recommendations that fishermen see as unfavorable. Solutions to these challenges will need to be forged to ensure the continued success of the current management structure over time.

Some cofradías have developed more detailed and innovative management plans specifying minimum sizes for goose barnacles or providing for goose barnacle ground restoration activities. The Galician fisheries ministry can highlight and reward cofradías whose management plans result in healthier stocks and more resilient fishing communities, thereby creating an incentive for other cofradías to follow suit. Management plans that are more innovative and progressive can serve as examples, while a platform for information exchange between cofradías can enhance management across the cofradía system.

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Glossary

Glossary

Accountable – In reference to the attributes of a catch share program, participants are required to stay within their allocated share of the overall catch and/or comply with other controls on fishing mortality. See SEASALT.

All sources – In reference to the attributes of a catch share program, shares include all sources of fishing mortality (landed and discarded) and when combined do not exceed the catch limit(s) or other controls on fishing mortality. See SEASALT.

Allocation – Distribution of a secure share of the catch to individuals or groups.

Annual allocation unit (*syn.*: Quota pounds) – The measure used to determine the annual amount of fish each participant is allowed to catch, usually defined as total weight. It is often calculated as a percentage of the catch limit based on a participant's holdings. In the case of area-based programs, the unit is a specified area.

Area-based catch share – See Territorial Use Rights for Fishing.

At-sea monitoring – The collection of information on fishing activities taking place at sea, including harvesting, catch handling, biological sampling, fishing methods and interactions with protected species. At-sea monitoring is conducted with onboard observers or an electronic monitoring system.

Bycatch (*syns.*: Incidental catch, Non-target catch/species) – Fish other than the primary target species that are caught incidental to the harvest of those species. Bycatch may be retained or discarded. Discards may occur for regulatory or economic reasons (NRC, 1999).

Catch (*syn.*: Harvest) – The total number (or weight) of fish caught by fishing operations. Catch includes all fish killed by the act of fishing, not just those landed (FAO, n.d.).

Catch accounting – The tracking of fishermen's catch, including landings and discards, against their share holdings.

Catch limit (*syn.*: Total allowable catch) – The scientifically determined, acceptable level of fishing mortality.

Catch share (*syn.*: Catch share program) – A fishery management system that allocates a secure area or privilege to harvest a share of a fishery's total catch to an individual or group. Programs establish appropriate controls on fishing mortality and hold participants accountable.

Co-management – A process of management in which government shares power with resource users, with each given specific rights and responsibilities relating to information and decision making (FAO, n.d.).

Community – The populations that live and interact physically and temporally in the same area (Blackhart et al., 2006).

Community Development Quota (CDQ) – A catch share program in western Alaska under which a percentage of the total allowable catch is allocated to eligible Alaskan villages to ensure continued opportunities to participate in western Alaskan fisheries and to provide economic and social benefits (Blackhart et al., 2006).

Community Fishing Quota (CFQ) (*syn.*: Community Quota) – Catch share program in which shares are allocated to a specific community with certain rules and stipulations that tie the share, or the proceeds of the share, to that community.

Concentration – A measurement of the percent of privileges held by one entity.

Concentration cap (*syn.*: Accumulation limit) – The limit on the percentage of shares that any one participant or entity can hold and/or fish.

Consolidation – The accumulation of shares by a relatively small number of shareholders.

Controls on fishing mortality – Management measures such as catch limits, gear restrictions and seasonal and spatial closures that limit the total amount harvested each year. When set at appropriate levels, they ensure long-term sustainability of stocks.

Cooperative – 1. A group of fishery participants that is allocated a secure share of the catch limit or a secure area, and collectively manages its allocation. 2. A group of people who come together to coordinate activities in some way.

Cooperative catch share – A type of catch share in which one or more groups of fishery participants are allocated a secure share of the catch limit or a secure area, and accept certain fishery management responsibilities, including ensuring compliance with controls on fishing mortality.

Cost recovery – Partial or full recovery, by the government or management authority, of the costs of management, monitoring and/or enforcement of a fishery.

Derby-style fishing (*syns.*: Olympic-style fishing, Race for fish) – Fishing conditions characterized by short seasons and severe competition for fish, often resulting in low profits and harvests that exceed sustainable levels.

Discard (*syns.*: Regulatory discard, Economic discard) – To release or return a portion of the catch, dead or alive, before offloading, often due to regulatory constraints or a lack of economic value (FAO, n.d.).

Dockside monitoring – The monitoring of activities taking place upon a vessel's landing, including weighing or counting offloaded catch, biological sampling and identifying species composition.

Effort (*syn.*: Fishing effort) – The amount of time and fishing power used to harvest fish; effort units include gear size, boat size and horsepower (Blackhart et al., 2006).

Eligibility – Standards or guidelines that qualify individuals or entities for allocation of catch shares.

Enforcement – Measures to ensure compliance with fishery regulations, including catch limits, gear use and fishing behavior.

Exclusive – 1. In reference to the attributes of a catch share program, secure privileges are assigned to an entity (individual or group) and are clearly recognized and defendable by law. See SEASALT. 2. A program or privilege that permits only assigned users to participate, thereby ensuring that benefits and costs of the privilege will accrue to the holder.

Fish – Used as a collective term that includes finfish, molluscs, crustaceans and any aquatic plant or animal that is harvested.

Fish stock – The living resources in the community or population from which catches are taken in a fishery. Use of the term fish stock usually implies that the particular population is more or less isolated from other stocks of the same species and hence self-sustaining. In a particular fishery, the fish stock may be one or several species of fish but here is also intended to include commercial invertebrates and plants (FAO, n.d.).

Fishery – The combination of fish and fishermen in a region, the latter fishing for similar or the same species with similar or the same gear types (Blackhart et al., 2006).

Fishery information – The information needed in a fishery for science and compliance, which can be collected through various forms of monitoring and self-reporting.

Fishing effort (*syn.*: Effort) – The amount of fishing gear of a specific type used on the fishing grounds over a given unit of time (e.g., hours trawled per day, number of hooks set per day or number of hauls of a beach seine per day) (FAO, n.d.).

Fishing mortality (*syn.:* Mortality) – A measurement of the rate of fish removal from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous mortality is the percentage of fish dying at any given point in time (Blackhart et al., 2006).

Group-allocated – A catch share program in which privileges are allocated to a clearly defined group of people, often a community or fishing association.

Harvest – The total number or poundage of fish caught and kept from an area over a period of time (Blackhart et al., 2006).

Individual Fishing Quota (IFQ) – A type of catch share program in which shares are allocated to individuals or individual entities. Recipients are generally fishermen and shares may or may not be transferable.

Individual Quota (IQ) – A type of catch share program in which shares are allocated to individuals or individual entities. Recipients are generally fishermen and shares are not transferable.

Individual Transferable Quota (ITQ) – A type of catch share program in which shares are allocated to individuals or individual entities. Recipients are generally fishermen and shares are transferable.

Individual Vessel Quota (IVQ) – A type of catch share in which shares are allocated to an individual vessel. Shares are attached to the vessel rather than the vessel owner and shares may or may not be transferable. This has been used most commonly in Canada.

Individually-allocated – A catch share in which privileges are allocated to individuals or individual entities.

Input controls (*syns.*: Input regulations, Input-based regulations, Input-based controls, Input measures) – Management instruments used to control the time and place, as well as type and/or amount, of fishing in order to limit yields and fishing mortality; for example, restrictions on type and quantity of gear, effort and capacity and closed seasons (FAO, n.d.).

Landings – The number or weight of fish offloaded at a dock by fishermen. Landings are reported at the locations where fish are brought to shore (Blackhart et al., 2006).

Limited – In reference to the attributes of a catch share program, controls on fishing mortality are set at scientifically appropriate levels. See SEASALT.

Logbook (*syn.*: Logsheet) – A detailed, usually official, record of a vessel's fishing activity registered systematically onboard the fishing vessel. It usually includes information on catch and species composition, the corresponding fishing effort and location (FAO, n.d.).

Maximum Sustainable Yield (MSY) – The largest average catch that can be taken continuously (sustained) from a stock under average environmental conditions. This is often used as a management goal (Blackhart et al., 2006).

Monitoring (*syn.*: Catch control) – The collection of fishery information for the purposes of science, including setting catch limits and assessing stocks, and ensuring accountability, including catch accounting and enforcing fishery regulations.

Mortality – A measurement of the rate of death of fish, resulting from several factors but mainly predation and fishing.

Multi-species fishery – A fishery in which more than one species is caught at the same time. Because of the imperfect selectivity of most fishing gear, most fisheries are "multi-species." The term is often used to refer to fisheries where more than one species is intentionally sought and retained (NRC, 1999).

No-take reserve (*syn.*: No-take zone) – A defined marine area in which fishing and other extractive activities are prohibited.

Non-target species (*syns.*: Bycatch, Incidental catch) – Species not specifically targeted as a component of the catch but which may be incidentally captured (Blackhart et al., 2006).

Onboard observers (*syn.*: Observers) – A certified person onboard fishing vessels who collects scientific and technical information on the fishing operations and the catch. Observer programs can be used for monitoring fishing operations (e.g., areas fished, fishing effort deployed, gear characteristics, catches and species caught, discards, collecting tag returns, etc.) (FAO, n.d.).

Open access – Condition in which access to a fishery is not restricted (i.e., no license limitation, quotas or other measures that would limit the amount of fish that an individual fisherman can harvest) (NRC, 1999).

Overcapitalization (*syn.*: Excess capacity) – In the short term, fishing capacity that exceeds the level required to capture and handle the allowable catch. In the long term, fishing capacity that exceeds the level required to ensure the sustainability of the stock and the fishery at the desired level (FAO, n.d.).

Overfished – A state in which a fish stock is below a scientifically determined target biomass (e.g., one half of the biomass that produces Maximum Sustainable Yield).

Overfishing – A rate of fishing mortality that, unchanged, will result in an overfished state.

Quota – The maximum number of fish that can be legally landed in a time period. Quota can apply to the total fishery or an individual fisherman's share under a catch share program (Blackhart et al., 2006).

Quota-based catch share – A catch share program in which secure shares of the catch limit are allocated to individuals or groups and participants are held accountable to their share. Shares are based on the number or weight of fish.

Quota shares (QS) – The percentage of the annual catch limit to which a catch share privilege holder has access to harvest.

Race for fish (*syns.*: Derby-style fishing, Olympic fishing) – A pattern of fishing characterized by an increasing number of highly efficient vessels fishing at an increasing pace, with season length becoming shorter and shorter (FAO, n.d.).

Scaled – In reference to the attributes of a catch share program, management units are set at the appropriate biological level, taking into consideration social and political systems. See SEASALT.

SEASALT – A mnemonic that describes commonly occurring attributes of catch shares (Secure, Exclusive, All sources, Scaled, Accountable, Limited, Transferable).

Sector – 1. A specific division of a fishery with unique characteristics including management regulations, gear types, fishing locations, purpose of activity or vessel size. 2. A type of group-allocated catch share program, most commonly used in New England.

Secure – In reference to the attributes of a catch share program, the tenure length of shares is sufficiently long for participants to realize future benefits. See SEASALT.

Shareholder (*syn.*: Privilege holder) – An individual or entity holding a secure share in a catch share fishery.

Single-species fishery – A type of fishery in which fishermen target only one species of fish, although it is usually impossible not to catch others incidentally (Blackhart et al., 2006).

Social cohesion (*syn.*: Social capital) **–** The social resources (networks, memberships of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods (FAO, n.d.).

Stewardship – Responsible management of resources for future generations, such as maintaining populations of target and non-target species, protecting wildlife, conserving key habitats and strengthening ecosystem resilience.

Stock – A part of a fish population usually with a particular migration pattern, specific spawning grounds and subject to a distinct fishery. A fish stock may be treated as a total or a spawning stock. Total stock refers to both juveniles and adults, either in numbers or by weight, while spawning stock refers to the numbers or weight of individuals that are old enough to reproduce (Blackhart et al., 2006).

Sustainable fishing – Fishing activities that do not cause or lead to undesirable changes in the biological and economic

productivity, biological diversity, or ecosystem structure and functioning from one human generation to the next (FAO, n.d.).

Sustainable harvest (*syns.*: Sustainable catch, Sustainable yield) – The biomass or number of fish that can be harvested without reducing the stock biomass from year to year, assuming that environmental conditions remain the same (Blackhart et al., 2006).

Target species (*syn.*: Directed fishery) – Those species primarily sought by fishermen in a particular fishery. There may be primary as well as secondary target species (FAO, n.d.).

Tenure length of shares – The duration for which an individual's or group's share is allocated.

Territorial Use Rights for Fishing (TURF) (*syn.*: Area-based catch share) – An area-based management program that assigns a specific area to an individual, group or community. To meet the definition laid out in the Design Manual, one or more species in the area must have a scientifically based catch limit or other appropriate controls on fishing mortality.

Total allowable catch (TAC) (*syn.*: Catch limit) – The annual recommended or specified regulated catch for a species or species group (Blackhart et al., 2006).

Total catch – The landed catch plus discard mortality (Blackhart et al., 2006).

Transferable (*syns.*: Transferability, Tradable) – In reference to the attributes of a catch share program, shareholders can buy, sell and/or lease shares. See SEASALT.

Transferable effort share (*syn.*: Transferable effort share program) – A fishery management system that sets an effort cap based on fishery inputs and their use, allocates shares to individuals and allows trading.

Vessel Monitoring System (VMS) – A satellite communications system used to monitor fishing activities; for example, to ensure that vessels stay out of prohibited areas. The system is based on electronic devices, which are installed onboard vessels. These devices automatically send data to a shore-based satellite monitoring system (Blackhart et al., 2006).

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