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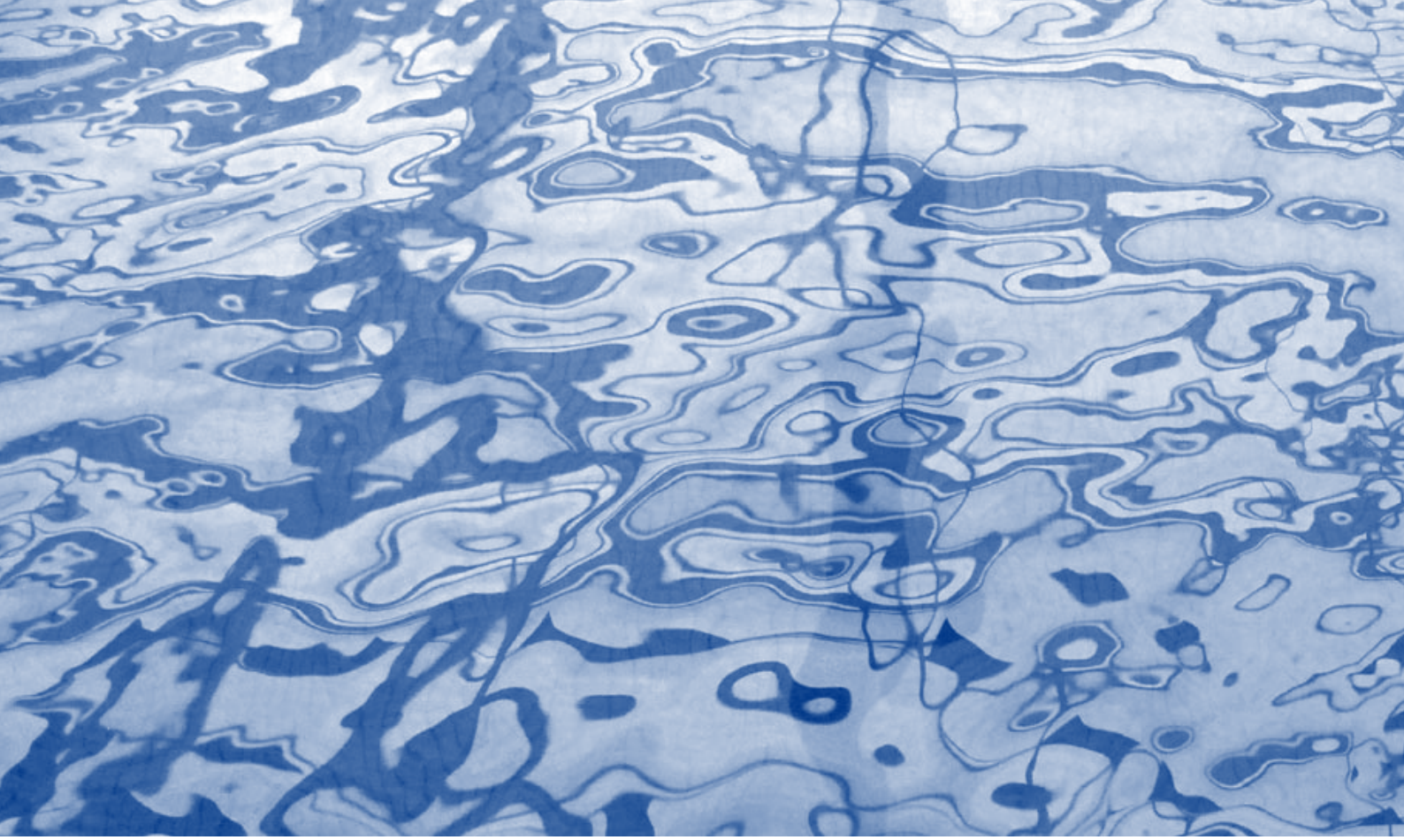

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Allocating property rights as incentives for developing underutilized fisheries: a case study of Oregon's developmental fisheries program

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Abstract

One approach to encouraging the development of underutilized fisheries is the allocation of harvest rights to successful fishermen. The Oregon Legislature created Oregon's Developmental Fisheries Program to encourage the commercial exploration and development of state managed undeveloped fishery resources. Key to this process is the allocation of secure harvest rights to pioneering entrepreneurs when a fishery successfully transitions from "developing" to "developed" status. Since the program's inception in 1993, only two fisheries, pelagic sardine and bay clam, have moved from undeveloped to developed status. Neither fishery though appears to meet the statutory criteria to transition from undeveloped to developed status. Various problems affect the success of the Developmental Fisheries Program including difficulties in designing and allocating asset rights, establishing operational program guidelines and measurable targets that meet legislative standards for a developed fishery, and financing developmental fisheries management practices. Frustration with slow progress has increased pressure to soften the standards but has raised concerns that poorly specified rights and an inadequate fisheries management regime will stifle efficiency and economic innovation in the fishery. This paper uses the Oregon estuarine clam fishery as a case study to examine the strengths and weaknesses of the Developmental Fisheries Program especially with respect to allocating rights and supporting a profitable and sustainable fishery. It notes developmental fisheries strategies used by successful programs in other regions and countries, and makes recommendations for improving Oregon's Developmental Fishery Program.

Introduction

The Oregon Legislature instituted the Developmental Fisheries Program (DFP) in 1993 to provide a management system for the commercial exploitation of Oregon's undeveloped fishery resources and to encourage entrepreneurship by participants in those fisheries. Since the program's inception, only two fisheries, the Oregon bay clam and pelagic sardines, have transitioned from the developmental program into "developed" fisheries with secure harvest rights allocated to fishermen[1]. Oregon Administrative Rule (OAR) 635-006-0810 states that a "developed fishery" is a "fishery where the level of participation, catch, and effort indicate the fishery has approached optimum sustained yield and/or there is sufficient biological information, information on harvest methods, gear types, and markets to develop a long-term management plan for the species." Neither the Oregon bay clam nor the sardine industries appear to fulfill these criteria though both have been legally declared developed and are now managed as limited entry fisheries.

The purpose of the DFP is widely supported by fishermen; its legislative requirements are sound, and its existence benefits Oregon's commercial fisheries sector. This paper seeks to improve the DFP by critiquing its shortcomings and suggesting changes to its management. Subsequent sections outline the DFP, explore its strengths and weaknesses using the bay clam developmental fishery as a case study, and identify strategies for improving the DFP with reference to successful developmental fishery programs in other regions and countries.

1 Oregon fishermen and fisherwomen prefer the term "fishermen" to "fishers" regardless of gender.

Overview of the developmental fisheries program

Oregon's DFP was established to manage underutilized fish and shellfish stocks. Currently some fifty plus species/stocks are in the program including Pacific hagfish, swordfish, and box crab (OAR 635-006-0850).

The DFP ensures pioneering fishermen have some investment protection by capping the number of available developmental permits. The DFP Board consists of a broad range of commercial industry stakeholders (e.g., harvesters, processors, and state agency personnel) who provide developmental fishery management recommendations to the Oregon Fish and Wildlife Commission (OFWC). In principle, due to limited program resources, the DFP provides for a cooperative management approach with industry. The DFP is intended to provide management expertise and resources to assist developmental permit holders in return for their help in the collection of biological and market information necessary to determine the economic and biological viability of a developmental fishery. DFP permit holders benefit from both commercial harvests of the developmental resource and the opportunity to be grandfathered into more secure property rights should the fishery be declared a developed fishery.

Allocation of developmental fishery rights

After a fishery is declared as developmental, fishermen apply to the Oregon Department of Fish and Wildlife (ODFW) for Developmental Fishery Permits. The DFP Board establishes a limited number of non-transferable permits based on consideration of the fishery's historical landings, past participation, and fishermen's existing request (McCrae pers com 2005). Fishermen are charged a small annual fee for holding them. If the number of applicants exceeds the number of available developmental permits, a lottery is held. Applicants must also obtain individual commercial fishing and/or boat licenses.

Removal of a fishery from the Developmental Fisheries List

The OFWC must determine one of five things in order to remove a food fish stock from the Developmental Fisheries List:

1. the fishery qualifies as a "developed fishery" (definition, OAR 635-006-0810);
2. the fish stock is harvested beyond its optimal sustained yield;
3. the species fished is considered threatened or endangered by the state or federal government;
4. the commercial fishery potentially leads to unreasonable habitat degradation, bycatch, or gear conflicts; or
5. the harvest leads to disproportionate user group disagreements (OAR 635-006-0840).

Managing small-scale developmental fisheries

Most Oregon developmental fisheries are small-scale with low ex-vessel prices for catch, low total harvests, few participants, and low capital investment. Small-scale fisheries face many developmental challenges, including the realization of sufficient state or private sector revenues to pay the costs of managing the fishery. Stock assessments and other biological research, for example, can be expensive, yet are necessary to the sustainable management of the fishery. In order for developmental fisheries to transition to developed status a stock assessment is necessary to determine the stock's biological viability and sustainable yield.

Cooperative research is an increasingly common remedy to constraints of management funding in fisheries (National Research Council 2004). A primary intent of the DFP is to share the responsibility of information gathering with fishermen participating in developmental fisheries. Cooperative research helps defray management costs for both the industry and the state. Unfortunately the DFP has not effectively utilized cooperative research as a data gathering initiative.

Failings of the DFP

The DFP has failed to manage developmental fisheries successfully. Key failings include:

1. Undefined operational guidelines and methods: The DFP has a defined legislative framework; however it lacks the operational guidelines necessary to take fisheries through the developmental process effectively and efficiently. Additionally, DFP fails to require ODFW and the Developmental Fisheries Board to establish specific program goals and objectives or set targets against which progress towards developed status can be benchmarked.

2. An indeterminate program time frame: The DFP does not set a time frame for moving a fishery from developing to developed status. Without a mandatory time frame, developmental fisheries management becomes moribund and participants become disempowered within the DFP process.

3. Inadequate funding and support: The DFP faces many operational limitations due to its small budget. Although ODFW allocates a portion of its annual budget to DFP, ODFW is responsible for a large number of marine conservation and fisheries management issues. Agency funding must be prioritized, and currently the DFP is low on the list of funding priorities.

4. Lack of economic incentives for fishermen to pursue developed status: Before fishermen invest in equipment and permits they require assurances from ODFW that their investments will be secure once a fishery is removed from the developmental fishery list. The DFP's record of insufficient financial support and lack of management follow-through is a deterrent to innovation rather than an incentive. DFP permits do not require the holder to aid with science collection or make a significant investment in the economic development of the fishery. Therefore, many permit

holders become free riders. They meet their annual qualifying landings but undertake no developmental work. They expect others will take the initiative to develop the fishery while they will be awarded limited entry access rights to the fishery when it transitions to a developed fishery.

5. Moving fisheries to developed, limited entry status prematurely: The decisions to move the Oregon bay clam and sardine fisheries to developed status were premature and inconsistent with legislative criteria that require fisheries to meet a set of scientific and management standards before transitioning to developed status. Failure to address fundamental management issues before exiting the DFP imperils economic efficiency and innovation and the sustainability of the resource because of inadequate scientific information and management planning.

DFP CASE STUDY: BAY CLAMS

Two Oregon developmental fisheries, bay clams and sardines, transitioned from the DFP to developed, limited entry status in late 2005. Both were moved from developmental to developed status prematurely for administrative expedience rather than because they had met required standards. Consequently, the time spent in the DFP was a lost opportunity in establishing a management framework that would allow the fisheries to meet their economic potential while remaining sustainable. The DFP did not assist the industries in developing fisheries plans to promote industry development, nor did the program consider the best approach for allocating harvest rights that would foster business innovation. Therefore, the industries have entered into developed status with inadequate property rights, incomplete market and biological information, and limited entrepreneurial intent among fishermen. A case study of the Oregon bay clam fishery illustrates these deficiencies.

BAY CLAM INDUSTRY BACKGROUND

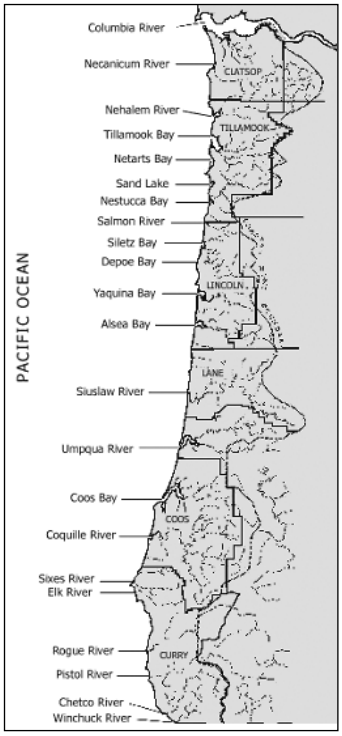
In 1996, the Oregon commercial bay clam fishery was one of the first fisheries to enter the Developmental Fisheries Program (DFP) as a "developmental fishery". A total of 15 permit holders harvest five commercial bay clam species from estuaries along Oregon's coast (Figure 1). The species harvested are the gaper or empire (*Tresus capax*), cockle (*Clinocardium nuttalli*), littleneck (*Venerupis staminea*), softshell (*Mya arenaria*), and butter (*Saxidomus giganteus*) clams.

Commercial harvests of bay clams date back to at least 1941 (Hancock *et al*. 1979). The mid-1990s saw a major change in harvesting practices with the introduction of dive gear and the authorization of mechanical harvest in two large Oregon bays, Tillamook and Coos (Figure 1). These innovations substantially increased commercial harvests in estuarine subtidal areas. Since 1996, subtidal landings have averaged 98.5% of the commercial bay clam harvest in Oregon (Developmental Fisheries Board 2004; ODFW 2004).

Oregon's only state-wide comprehensive study of estuarine subtidal bay clam stocks occurred in the 1970s (Hancock *et al.* 1979). In the mid-1990s, Golden *et al.* (1998) conducted a comprehensive follow-up biological inventory of Tillamook Bay's intertidal and subtidal benthic invertebrates, and the ODFW surveyed a portion of Coos Bay's subtidal areas for bay clam stock data to raise harvest quotas in that bay in 2004 (McCrae pers com 2005). Other than these scientific surveys, annual harvest provides the majority of modern bay clam resource knowledge.

Permit holders claim that observed resource abundances could sustain higher harvests. Annual landings and associated revenues remain low and are unable to supply full-time incomes for the 15 harvesters. The major Oregon bay clam markets are for bait and aquarium use. A human consumption market, which could command a higher price per pound for local bay clams, has yet to be developed for Oregon bay clams (Alm pers com 2005). Similar bay clam species are exploited for seafood consumption in other parts of the United States including Washington State.

Figure 1. Oregon coast and estuary map. Source: Oregon Estuary Plan Book (2006).



In 2005, after nearly 10 years in the DFP, harvesters presented various draft proposals to the DFP for moving to developed status with limited entry permits. Other than a transferability characteristic, the conditions of the developed permits sought were similar to those of DFP permits. Fishermen asked that developmental permit holders be given priority allocation of the developed permits. In November 2005, the DFP made the recommendation that the bay

clam fishery be removed from the developmental fishery list to the OFWC. The fishery received developed status at the end of 2005 despite many unresolved management issues. Fishermen received permits with limited transferability, as in the case of vessel loss or business failure. OFWC deferred consideration of full transferability until later this year pending further discussion of renewal requirements (Rae pers com 2006; Williams pers com 2006).

Economic potential of the bay clam fishery

In 2004, the Coastal Oregon Marine Experiment Station (COMES) commissioned a study to explore management constraints and opportunities of the Oregon bay clam industry. The study found that implementation of effective DFP management strategies could promote the ecological viability and economic potential of the fishery. Some analysis suggests that industry harvests and revenues can be far greater than current levels (e.g., 2004 industry ex-vessel revenue was $77,321). In fact, millions in revenue may be possible with the right set of circumstances.

A number of issues such as water quality testing and bay user conflicts may limit industry expansion and hence increased revenues. For example, harvests of bay clams for human consumption require more stringent water quality monitoring than bait harvests, and additional commercial harvesting areas maydisturb other bay uses (e.g., oyster lease sites). The COMES study concludes with management recommendations and provides a framework for the design of a bay clam fishery management plan.

Mired in the DFP quagmire

The DFP's absence of operational guidelines and an indeterminate time frame stifled research momentum within the Oregon bay clam industry. The DFP did not work with the industry to set detailed objectives nor consider a suitable time frame to meet developmental targets. Investment in scientific data collection and market research (e.g., exploring an Oregon human consumption market) was insufficient to encourage management modifications, such as updating harvest quotas, and allowing mechanical harvesting in more bays. Precautionary attitudes pervaded agency management decisions about the future of the bay clam fishery.

Some entrepreneurial industry members regularly offered to help the DFP collect biological data through surveys during their harvests, but the DFP resisted this assistance because of the concern that industry data could not be scientifically validated. The agency through the DFP neglected to work on innovative, cooperative methods that would involve the industry in data gathering and help defray costs of biological surveys. Low DFP funding

and low industry revenue could not meet research costs without the use of creative cooperative research strategies. The result was administrative gridlock and a near-absence of resource surveys.

The DFP's promise of secure harvest rights to successful pioneers did attract some entrpreneurial fishermen into the program. However, many of the other industry members were not inclined to invest in fishery development once they received their developmental permits. The DFP does not attach developmental requirements to permits nor stipulate any responsibilities that will move the industry forward. Only two of the 15 bay clam permit holders consistently surpassed qualifying annual landings for permits. Most commercial bay clam harvesters barely met permit landing requirements and showed disinterest in the developmental process.

The problems encountered by the bay clam industry during its time in the DFP continue to restrict advancement of the fishery. The considerable economic potential of the fishery remains unrealized. The decision of the DFP and OFWC to develop the bay clam industry was inconsistent with legislative criteria that require developmental fisheries to meet a set of scientific and management standards before transitioning to developed status (Table 1). This has potentially cost commercial fishermen and the Oregon economy thousands to millions in lost bay clam revenues.

Fishery property rights and allocation methods were not designed to drive economic efficiency, nor do continued precautionary quotas and lack of market research encourage fishery advancement. Overall, the program purpose of the DFP was not achieved for this fishery, and the new "developed" bay clam industry left the program ill-equipped to move forward.

Table 1. Management constraints on meeting developed fishery standards.

Standards for a developed fishery	Bay clam status
Stock assessments are periodic and consistent; stock abundances are estimated with reasonable confidence and monitored for changes over time.	Stock assessments are out-dated, spatially and temporally patchy, are highly uncertain and are not monitored for change over time.
Harvest levels are at, or near, optimal yield.	Insufficient data exists to determine optimal yield.
Harvest programs (e.g., season, gear, size limits, by-catch restrictions, and closed areas) are established.	There is no comprehensive harvest strategy or management plan for the fishery.
Permits are stable.	Yes.
Industry is an active participant in research and management.	Management bodies actively discouraged industry involvement in research and management.
Markets are well established.	Markets for bait are established. There is no established human consumption market.
Permits are transferable.	Permits are not transferable.
The fishery is guided by a long-term management plan.	No long-term management plan has been prepared.

Developmental policy approaches of other regions and countries

A developmental fishery program is not unique to Oregon. Many other jurisdictions operate programs with similar objectives. Successful developmental programs in other regions and nations can provide guidance to ODFW to help strengthen the DFP.

Defining operational guidelines

The importance of clear program guidance cannot be understated. Clear and measurable targets are essential to tracking a program's progress and judging when a fishery is ready to be considered developed. The success of the Marine Fishery Resources Development and Management Department (MFRDMD) based in Malaysia can be attributed to a strong organizational program framework, well-defined program objectives, project follow-through, widespread partnerships, on-site research facilities, and an extensive staff of researchers and regional leaders (Marine Fishery Resources Development and Management Department, URL). MFRDMD is one of four divisions of the Southeast Asian Fisheries Development Center (SEAFDEC) and provides fishery resource development and management assistance to SEAFDEC member countries.

DFP should develop and implement a program protocol that defines steps or phases within the program and includes a set timeline with a possible sunset provision as well as measurable targets, such as the preparation of a fishery management plan. Fisheries within the DFP must have defined program objectives that reflect the specific circumstances of the fishery.

Sufficient funding and support

Without adequate resources (money, materials, and/or people) effective implementation of a developmental fishery policy is difficult. Sufficient funding of the Alaska Fisheries Development Foundation (AFDF) is a critical

factor in the success of their developmental fisheries program. In particular, AFDF aided the very successful development of Alaska's multi-billion dollar surimi industry using grants from the U.S. National Oceanic and Atmospheric Administration (NOAA). These funds allowed AFDF to reduce the risk of industry participation in the surimi project by fronting the industry harvest equipment and purchasing industry product. AFDF then sold the product to Asian markets for returns that actually generated income on the grants. All profits were allocated back to the project. Once the surimi industry was firmly established, AFDF left its intermediary position. By removing the monetary risk associated with industry development, AFDF recruited a sound group of industry pioneers who have since developed the AFDF project into an extremely successful industry.

For developmental organizations that lack sufficient funding, such as the DFP, Deputy Director of the AFDF, James Browning (pers com 2006) suggests the formation of partnerships, particularly university collaborations, as a means to meet research needs cost-effectively. AFDF frequently collaborates with Alaskan universities and graduate students to defray costs and strengthen research.

Industry responsibility for fishery research and management costs, or "cost recovery," is an increasingly common trend seen today in the US and abroad (Arbuckle and Drummond 2000; Arnason, Hannesson, and Schrank 2000; Cox 2000; Scott 2000; National Research Council 2004; Sizemore pers com 2005) and should be considered an option for Oregon's developmental fisheries. Cost recovery is generally required in response to creating wealth-generating privileges and property rights in the fishery (Sylvia pers com 2005). Contributions to management costs could be made proportional to industry revenues. This would give the management agency an incentive for early upfront investment in scientific and management research that would be recouped many times over if the economic potential of a fishery is realized.

Creating incentives for fishery development

In fisheries management, appropriate incentives can be used to motivate industry members to meet goals and carry out particular practices. Browning (pers com 2006) warns about the use of an all-inclusive incentive strategy, such as that of awarding secure property rights to successful pioneers as used by the DFP. Every fishery case is unique with a diversity of stakeholder interests, thus incentives should relate accordingly.

As well as being a source of management funds, cost recovery creates an incentive for efficiency and cost-effectiveness in fisheries management because fishermen assume the primary responsibility for fisheries management

costs. Fishermen seek the most efficient and cost-effective management strategies possible to ensure they are maximizing benefits from their financial investment. This industry push for smart management leads to greater industry participation and a cooperative management approach to fishery management, as observed in countries such as New Zealand and Australia. The National Research Council (2004) encourages this trend of industry-based funding

Management flexibility, adaptability, and improvisation

Partnerships to achieve creative, cost-effective management require adaptability and improvisation in the way a developmental fisheries program is implemented. Partnerships can also address constraints such as limited research funding. For a partnership to succeed, participants must adapt to one another's interests and capabilities.

Marketing is an area where improvisation and adaptation are important. Consumers respond to creativity, and marketers must adapt to the tastes of their target audience for maximized sales. The AFDF hosts seafood contests and fairs as a means to attract industry participation in marketing and increase publicity for the organization and its affiliated industries. Browning (pers com 2006) suggests that the Oregon DFP promote their fisheries and seafood at local festivals or create seafood tasting contests to establish markets, educate the public, and gather program support. A sustainable fishery can gather even more marketing power if it receives an eco-label certification from an organization like the Marine Stewardship Council, which is something sought by AFDF fisheries (Browning pers com 2006). The DFP could capitalize on their industries' aim for sustainable practices.

The benefits of a neutral intermediary agency

Within a developmental fishery program, autonomy from government and industry provides scope to self-regulate and gain stakeholder support from a position of neutrality. Browning (pers com 2006) believes that AFDF's independent, intermediary placement as a non-governmental and non-profit organization among regulatory agencies, industries, processors, and manufacturers is a significant contributor to its success. AFDF is not constrained by the short-term interests of government or industry. A non-governmental developmental program in Oregon may prove more adaptive to and influential on pioneer interests. There was an equivalent to the AFDF for west coast fisheries, the West Coast Fisheries Development Foundation. This organization ceased operation in the early 1990s. This suggests any new non-governmental initiative needs to be at the individual state level, perhaps through the auspices of state Sea Grant organizations.

Conclusion and recommendations

The Oregon Legislature formed the DFP to encourage the commercial exploration and development of state managed undeveloped fishery resources, yet the legislature mandated an essentially unfunded program. Consequent to this scarce support, several deficiencies burden the DFP. Limited funding and undefined program objectives are significant program weaknesses. Fishermen frustration with slow progress has increased pressure to soften standards but this has raised concerns that weak access rights and a limited management framework will stifle long-term efficiency, economic innovation, and perhaps the ecological sustainability of the fishery. In the case of the Oregon bay clam fishery, thousands if not millions in fishery revenue may remain unrealized because of DFP shortcomings.

Developmental fisheries are often small-scale fisheries, yet their management can be complex and does not necessarily require less work and resourcing than management of larger fisheries. Frequently, state and private revenues from small-scale fisheries cannot cover fishery management costs. Thus, creative and cooperative management systems are essential to the success of small-scale fisheries developmental programs.

The DFP should be structured to incorporate the concurrent design of science and management plans. Before any fishery is included in the DFP there should be an estimate of the cost of managing a fishery within the program and meeting market and biological data needs.

For a fishery's time in the DFP to be effective, a set of fishery goals and measurable objectives that show when a fishery has reached developed status must be defined and agreed upon by both the DFP and the industry. Prior to this step, the DFP must define milestones to measure the annual progress of a fishery as it moves from a developmental to developed status.

Encouraging the creation of an association of developmental fishery fishermen could provide an opportunity for fishermen to discuss developmental issues

such as biological information needs and market development outside of Developmental Fisheries Board meetings. These discussions would allow fishermen to address issues prior to DFP meetings and prepare to articulate their ideas or concerns to the board. An association chairman should be appointed by the fishermen to facilitate these meetings.

Development responsibilities should be assigned to every developmental permit. Higher qualifying landings and fewer available permits would create greater competition between fishermen and be a driver of resource and industry development (Brown pers com 2005).

Finally, the state subsidizes a fishery when the gross costs to manage and harvest the resource exceed the gross revenues of the fishery. In this case, there should be a stipulation that the developmental fishery be closed unless 1) the industry increases its revenues to cover costs and can demonstrate the potential for positive cost-benefit ratio as a developed fishery and/or 2) there are wider social reasons for continuing a fishery, or state agencies find cost-effective management solutions, including participation in the collection of biological data to lower the costs of managing the fishery.

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