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Discussion Paper

**The Sardine Fishery:
Sustainability and Development**

Prepared by the CPSA December 2009

FOREWARD

This Discussion Paper outlines some of the relevant issues affecting the sardine fishery in BC. Central to the discussion are two aspects: the need for a sustainable resource and the need for an economically viable fishery. These are clearly stated objectives under the New and Emerging Fisheries Policy (NEFP). The former is usually addressed through DFO's management policies, particularly the setting of quotas through the PSARC process. The latter, economic viability has never been defined nor is there in place any DFO mechanism to implement or evaluate that policy objective.

This Paper reviews both objectives within the context of the present situation. It finds that both need to be reviewed by a rigorous analysis of the science underlying the sardine biomass and the setting of quotas and the concept of "economic viability" (what is it?).

The rationale for this review is to ensure Canada maximizes the benefits for this new fishery while achieving the objectives of a sustainable fishery and economic viability for a fledging industry. Some of the potential benefits are detailed by examining some regional benefits to Vancouver Island Coastal communities.

EXECUTIVE SUMMARY

This Discussion Paper looks at the sardine fishery through the lens of the benefits from the fishery applied in a regional development context. In doing so, it reviews the twin objectives of the New and Emerging Fisheries Policy (NEFP), which requires a sustainable resource and an economically viable fishery. The Paper raises several issues that need to be addressed: a review of the underlying science and the methods of determining quotas, the need for defining what is meant by economic viability, and finally estimating the potential economic benefits to coastal communities. This latter aspect is crucially important for a depressed region.

The current method of setting the quotas for sardines has some serious scientific and methodological limitations. The underlying major assessment model (SS-2) used by the US has proven to be inadequate. Indeed, the US Pacific Fisheries Management Council (PFMC) has mandated that the model incorporate US industry aerial survey data and data from the DFO *W.E. Ricker* trawl survey. Second, the BC quota is based upon the US assessment and on a calculated migration rate of sardines into BC waters. Given these deficiencies in the allocation process the Paper recommends a “Made in BC” Science policy to set realistic sustainable quotas.

Economic viability is a stated objective of NEFP. However, it is defined nowhere nor part of any current management policy in the sardine fishery. Given the depressed state of most fisheries the time is ripe for having a fishery wherein fishermen and processors make profits. Thus, economic viability must consider the financial aspects of the sardine industry. Unfortunately, there is no hard data such as audited financial statements available specifically for the sardine fishery. The simple immediate alternative is to ensure sustainable quotas and attempts to lower costs. Nonetheless, DFO and the industry through the SIAB process must ensure that this objective is addressed in detail.

Finally, the potential exists for many economic benefits to arise from a sustainable and viable sardine fishery. Some of these benefits can be measured in aggregate terms from a review of regional benefits from the current and an expanded fishery. Indeed, the majority of the benefits will accrue to the coastal communities, such as 150 new jobs from a sustainable sardine fishery.

In conclusion, a determination to maximize the benefits from the sardine fishery requires a rigorous analysis of the current scientific basis for setting quotas and addressing the need for economic viability. From this, much needed benefits such as jobs will flow. This Paper details how it can be done.

INTRODUCTION

Sardines (*sardinops sagax*) have returned to BC waters after a fifty-year absence. At one time they were the largest fishery in BC, annual landings of over 80,000 tons were used for reduction into oil and meal. The current biomass is variously estimated, subject to controversy, at 1.5 million metric tonnes (MT). A large portion of this comes into BC waters. Currently, there is some disagreement among the scientists and by fishermen about the size of the biomass and the amount in Canadian waters. In 2009 the industry landed over 15,000MT. About 10,000MT were landed in Port Hardy (fishing areas 8-13).

Sardines have the potential to be a larger economic generator of incomes and jobs on Vancouver Island and elsewhere. Presented here is some preliminary data and analysis demonstrating the need and potential for sardines as an economic fishery. The conclusions are that sardine landings have generated full-time jobs (seasonally) in the processing sector and seasonal jobs in the fishing sector. The economic values are about \$2.5 million landed value and over \$11 million in export value. These data provide some measure of the economic potential from sardines. The regional benefits for Vancouver Island are substantial: up to \$20 million in regional benefits (accepted regional multiplier of two).

However, to achieve future benefits new initiatives and new development planning are required. The constraint is lack of infrastructure for processing landings. The catch-22 is that new infrastructure will not develop without the assurance of a stable (and perhaps larger quota) and a larger quota cannot be processed without infrastructure.

A successful fishery requires two things: a) a sustainable resource and b) economic viability for the industry. This paper reviews both of these aspects in detail and makes some recommendations, principally that the science and methodology behind the setting of quotas needs a significant review and, equally, the economic viability of the industry should be addressed by DFO management.

BACKGROUND

The sardine fishery was developed under the New and Emerging Fisheries Policy (NEFP) and is now a full-fledged commercial fishery, with 50 licensees, 25 commercial and 25 communal (held by various First Nations). The fish are processed at various locations in BC, Port Hardy, Quadra Island, Ucluelet, Zeballos, and in the Lower Mainland. The lack of processing infrastructure on Vancouver Island necessitates trucking the fish to processing facilities in the Lower Mainland. These are perhaps unnecessary costs and the loss of jobs on the Island, due to limited processing capacity.

The sardine fishery, being new, developed without any overall planning or design. The industry, particularly the fishermen, was instrumental in its development; funding science and management costs, finding markets and developing the fishery. The official policy of DFO is that Emerging Fisheries must be sustainable biologically and economically. In spite of the requirement of DFO to do so, especially under the NEFP, no efforts have been made to ensure the fishery is economic, let alone efforts to see it developed further. This is new ground, DFO has always paid lip service for the need for fisheries to be economic but this is the first time it is explicitly required. This new policy poses a difficult question: *what is an economically viable fishery?* An easy answer is a fishery that produces profits for fishermen and processors. In reality it a complex undertaking to estimate returns from a specific fishery as both sectors, fishermen and processors, also participate in other fisheries. (For detail see "Pacific Commercial Fishing Fleet: Financial Profiles for 2007", Stu Nelson.) How does one allocate between fisheries such items as overhead, depreciation and other necessary accounting procedures?

Lacking detailed financial performance data it is possible to show the economic benefits from the sardine fishery as a whole, bypassing any individual vessel or processor assessments, based upon some preliminary data from a report prepared by the Coastal Community Network (Smith, in References). Thus, the connection between a sustainable fishery and an economically viable fishery and the resultant economic benefits can be demonstrated. It is a two-step process: a sustainable fishery and its quotas are examined and then the flow of benefits is reviewed.

THE RESOURCE AND THE INDUSTRY STRUCTURE

A. The Resource:

Sardines arrive in BC waters in the early summer, coinciding with the 12° sea surface isotherm that moves northward from California beginning in early June. A warm water phenomena such as an 'El Nino' or the

present day warming trend affects the range of migration, duration of stay, and is conducive to overall stock well-being. It should be noted that the sea surface temperature for sardine habitat is fairly low and has been common in BC waters every year since records have been kept. Sardines in BC are a function of their overall abundance as demonstrated by their disappearance in the late forties. By 1950 there were none above Cape Conception (Santa Barbara, California). The fishery in California continued until the early sixties with the Mexican fishery continuing nonstop until today. The return to greater abundance, the stock increased, accounts for their return to California in the eighties and BC in the early nineties.

The setting of BC quotas and the stock assessment has evolved. In particular, modifications have been made to the migration rate of sardines into BC waters, which was simply estimated at a conservative average of the (10%). The current method of stock assessment in BC is done by the DFO survey vessel *W.E. Ricker*, in an area off Vancouver Island. It proceeds from the mouth of Juan de Fuca Straits to Cape Cook, a distance of 180 miles. It is a limited survey as sardines are commercially harvested above Cape Cook and have been reported as far as the border with Alaska, another 320 miles. Time and budget constraints in DFO preclude any assessment above Cape Cook and those stocks are not factored in any way into the current stock assessment. This is a serious deficiency. In 2009 the landings into Port Hardy from the un-assessed area above Cape Cook were 80% of the total landings for all BC. The '*Ricker*' survey has shown for the last three years an estimated biomass only in the study area of 250,000 to 300,000 metric tons. This in turn has been extrapolated into an 18.3% migration rate into BC, of the US estimated biomass. These data and a 15% exploitation rate produced a total BC TAC of 18,195 metric tons in 2009. This is the current method approved at PSARC.

There are concerns and controversies over the estimating processes of the US sardine biomass. Fundamentally, no one is sure how many sardines there are and what should be the quota available to fishermen. The current US practice is to use a sophisticated model, SS-2, that uses various algorithms to set the size of the biomass and then establish the US quota (see: Hill et al. for the exact procedure). From this estimate the Canadian migration rate is established. The SS-2 model has come under scrutiny and is somewhat in disarray. The US industry has financed its own aerial surveys to provide its own estimate of the sardine population. The differences are stark: the SS-2 model estimates the stock (all fish) at 1.0 million tons whereas the aerial survey found 1.4 million tons in US waters alone. This leaves out the amount in Canada and in Mexico. The US PFMC, the governing body, forced an amendment to the 2009 SS-2

model to incorporate the US aerial survey and the Canadian trawl survey data. They appear to have no confidence in the SS-2 model.

In short, there are many difficulties in estimating the size of the sardine biomass and the amount in Canadian waters. The US and Canadian industry believe the stock is seriously underestimated. The problem is that no one really knows. The US industry is continuing its aerial survey in 2010 and Canada will continue its trawl survey. However, efforts are underway to try satellite imaging estimating techniques, which is a proven technology. Because of these uncertainties, BC scientists have taken an overly cautious and conservative approach in their calculations of quotas (see PSARC). The remedy is better science.

All this goes to the heart of the matter: are the stocks sustainable? So far, yes. But there are serious issues to be addressed. A partial list:

- is the SS-2 model valid?
- are the US aerial surveys valid?
- is the WCVI trawl survey data valid?
- is 15% exploitation rate used in BC for sardines too low?
- is the stock in the non-assessed area in BC significant to affect BC abundance estimates?

The usual practice in pelagic management is to set an exploitation rate on known abundance based on some sort of stock assessment method. This is the fundamental premise around the world, albeit with variations. DFO manages this way with herring (*the other small pelagic*) in BC and the Maritimes. The US does this with sardine itself without factoring in BC or Mexico's catch or estimated biomass. Again, the key variable is the exploitation rate: the amount of the stock you are allowed to catch.

If we were to use a 'Made in Canada' method in setting the TAC we would take the Ricker's estimate of 275KMT and use the current conservative exploitation (harvest) rate of 15%. The TAC would, under these assumptions, be 41,250 metric tons. This is fundamentally the same rate as DFO herring management on both coasts of Canada. Under the current system a 'three-year rolling average' of the fish in BC waters this procedure would minimize fluctuations, providing a degree of stability.

This approach, a 15% or 20% exploitation rate, would fit into the standard DFO 'risk-averse' management, as we would be using a biomass estimate from only 34% of our coast. We also know the reason we have sardines in BC is because of larger abundance. We must question why the current conservative approach of DFO Science is stifling the economic opportunity Canada has before it. Recognition of the realities of the stocks in BC

waters is required. At its most basic, this would require a valid estimation of the biomass beyond the *Ricker* study area.

All this goes to show that the stock is being managed in a very conservative manner by Canada in the interests of sustainability, but to the detriment of the industry. A more thorough estimation of sardines in BC can come from an expanded trawl survey (which itself has certain limiting methodological assumptions) and/or satellite imaging. The conclusion has to be, given the Canadian conservative approach and the recognized failure of the SS2 model by U.S. science that the sardine stock is seriously underestimated. It is incumbent on Canadian science to review its' methodology in light of the change in the U.S. and question whether there are other means to arrive at a Canadian TAC and ensure sustainability of the resource and economic viability for the industry at the same time.

B. Industry Structure

With a better stock estimation process one result would be higher quotas. However, the industry is currently not able to process more fish, overall existing sardine processing capacity is estimated at 20,000MT, depending upon salmon and hake fisheries abundance. Freezing and freezer storage capacity is a limiting factor. Vancouver Island has limited processing capacity and sardines must be trucked to the Lower Mainland. Transport costs to the Lower Mainland from landing ports on Vancouver Island are high. Larger freezing capacity on the Island would eliminate this cost. The need for infrastructure development is obvious. Larger quotas would generate more economic benefits. But more benefits can come from lowering processing costs through economies of scale from a larger quota. These can only be achieved from infrastructure development from increased investment.

Infrastructure investment is necessary for a viable fishery. This will produce lower processing and fishing costs. But the industry must also compete with the US industry. They have a cost advantage in that there are little or no government overhead costs such as the current government imposed expenses under the NEFP (up to \$8,000 per license). In addition, their infrastructure is well developed with proximity to the resource; and above all, subsidized plants. This produces a distinct cost-advantage for them, difficult for Canada to overcome. Their production provides a floor price in world markets and the market must absorb this product before Canada can effectively compete with its higher prices. At the fishing level, Canadian fishermen have about \$13.00 a metric ton in Observer costs and another \$9.00 per metric ton in fees for payments for DFO Science and management costs. (This equates to paying almost two "ghost" crewman on a vessel.) In the processing sector

trucking costs of over \$150 per metric ton from Vancouver Island to the Lower Mainland add another cost. The differences are substantial, higher Canadian costs of up to \$180 per metric ton on the landed costs alone.

Canada does have some competitive advantages in that its sardines are larger and have a higher fat content making them desirable as a food item in most countries. The landed quality tends to be better because the majority of our fishery takes place in sheltered waters that is highly beneficial for the quality of landed product. A further advantage is our system of ITQs. A supplier can guarantee supply to a buyer through access to reliable quotas from fishermen. To some degree the US fishery does not allow this ability to guarantee a consistent supply. Their seasons are short and intense because there are no individual vessel quotas. Second, their fish are, on average, smaller and with a lower fat content. Investment in infrastructure would include state of the art size grading machines, which would further define the diversity of our product. BC would be able to supply a product superior to the U.S. with a larger range of size and fat content to meet a greater range of customer demands.

For Canada to take advantage of its sardine resource it must have larger individual quotas, to ensure economies of scale, and a lower costs structure from improved infrastructure. This is, as noted, means more freezing and freezer storage capacity on Vancouver Island. In addition, the fishing sector must gain lower costs from lower institutional overheads (from lower Observer costs, a smaller JPA with DFO).

By comparison with the US, approximately 25% of Canadian fishermen's gross income is for government costs (JPA, Observer, validation), whereas in the US it is slightly more than 1%. This is a built-in higher cost to Canadian fishermen.

C. Industry financial performance

a) vessels:

Detailed financial performance of the sardine fishery is not available. However, data are available that provide some insights. In a study of the fishing industry for 2007, Nelson (see *References*) found that a seiner with two area salmon licenses lost on average, \$64,924. If the vessel participated in the roe fishery, it had a contribution of \$14,811 from that fishery (pages 135 and 19). Overall, a typical seiner lost money from its fishing operations even if was able to fish salmon in two areas and participate in the roe herring fishery. Most of the sardine vessels fit this profile. From a vessel-owners point of view, it lost money in the salmon and roe herring fishery. For a vessel-owner to participate in the sardine fishery it is an absolute requirement that it is

profitable. Thus, the NEFP requirement that the operation be “viable” has special meaning for vessel-owners.

b) processing plants:

Similarly, detailed financial performance of processing plants is not available. However, an analysis of the economic benefits of infrastructure investment has been done (See Smith in References). Expanding upon his assumptions of assuming suitable infrastructure investment, in this case, Port Hardy, 7,000MT of sardines (instead of approximately 50/50 hake and sardines in his analysis) would produce \$1,420,500 to fishermen from fish purchases (page 8). In addition, the labour bill for 7,000MT would be \$636,944, at least 150 jobs.

In summary, Smith estimates the benefits from 7,000MT to the regional North Island economy total \$3.3 million, about 150 processing jobs and perhaps 20-35 fishing crew (page 8). We can assume there are also benefits to the vessel-owner. In 2009 the fleet landed over 15,000MT over which a major portion was landed in Port Hardy. From this we can derive a rule of thumb: *every 10,000MT can produce over \$4.7 million in regional Vancouver Island benefits, up to 200 jobs in the processing sector and perhaps 50 jobs in the fishing fleet.*

Similarly, the same type of benefits will accrue to the Lower Mainland sector from fish processed there. Lacking hard data it is nonetheless possible to estimate benefits of a similar magnitude. The previous 1930s fishery had an average of 40,000MT annually (Ware). Such a fishery would now possibly produce 800 jobs in the processing sector alone with the usual multiplier benefits.

All the above numbers must be used with caution as prices and costs change but they do provide a benchmark to show possible benefits to each sector. They also show the possibility of a viable fishery, given realistic quotas and infrastructure investment. To summarize: a realistic sustainable quota will induce (one hopes) infrastructure investment that will lower both fishing and processing costs. These are steps to a viable fishery.

(Note: a detailed cost/benefit analysis is available from Dave Smith’s paper, which details benefits from infrastructure investment in Port Hardy. The key is processing efficiencies from economies of scale.)

To conclude: the industry in 2009 is defined as 50 licensed fishermen, several small relatively remote landing facilities, and disperse processors also processing hake and salmon. Coupled with this is a high cost structure from institutional arrangements and lack of infrastructure, especially on Vancouver Island. This places it a disadvantage to US

processors. However, an opportunity exists for Canada to increase the benefits from the sardine fishery through realistic (but sustainable) quotas, lower costs from infrastructure investment, and better marketing efforts. The sardine fishery provides a real economic stimulus to the BC economy. It is a fruitful area for economic stimulus funding.

REGIONAL BENEFITS FROM AN EXPANDED FISHERY

An expanded fishery can result from three factors, 1) a realistic, but sustainable, quota from improved stock estimates 2) a higher exploitation rate, and 3) infrastructure investment. This combination will help to overcome the BC cost disadvantage vis-à-vis the US. Lacking detailed financial data it is not possible to ensure that this will produce an “economically viable” fishery for fishermen and processors, as the NEFP requires. But it will certainly produce regional benefits. And it is a step in the right direction. Using Smith’s analysis and assumptions we can estimate some of the regional benefits to a place such as Port Hardy.

In 2009 15,000MT were landed. This would produce \$2.24 million in landed value to fishermen. It would produce about \$12 million in export value. For a WCVI community processing all this fish job creation would be substantial. Depending upon how product is processed (frozen whole, H and G, value-added) wage benefits could be in the range of \$5-6 million. This could translate into over 200 jobs in the processing sector. These estimates await a more rigorous analysis but do provide a range of values.

The issue here is one of economical viability and the potential for increased regional benefits. The problems are obvious: the resource must be sustainable and current “science” is inadequate, economic viability can only come from lower costs, infrastructure investment is crucial. The issues here are:

- a) Infrastructure investment benefits: Additional investment in infrastructure would obviously also have regional multiplier effects. The accepted multiplier for direct investment is usually given as two. A full benefit/cost analysis is not attempted here but the increased benefits to the Vancouver Island region are apparent. Investment in infrastructure would lower many transport costs making the industry more competitive and certainly allow greater efficiency in fishing. Further, the other fishing sectors, such as hake (in particular) and salmon, would benefit from better infrastructure.
- b) Job creation: an expanded fishery creates jobs in the fishing sector and in the processing sector. Every 10,000MT produces 150 jobs in the processing sector.

c)“economic viability”: this implies profits to the two sectors. It is not yet defined but an expanded fishery is a first step towards this. A simple definition would be profits to both sectors. A more rigorous definition awaits detailed analysis of the industry and acceptable benchmarks such as 1) return on investment (ROI) or 2) Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA); this equates to cash flow from operations. Currently, DFO does not have a definition for the IFMP.

5. CONCLUSIONS AND RECOMMENDATIONS

a) CONCLUSIONS

- to compete in world markets and capture the potential of the Canadian sardine fishery an expanded fishery is necessary to compete with the approximate 75,000MT produced by our direct US competitors. This requires a “Made in BC” Science policy for sardines. Sardines are present in BC and a realistic quota from better stock estimates is needed.
- the lack of infrastructure on Vancouver Island seriously constrains any further development of the fishery.
- a larger and sustainable quota would induce infrastructure investment in the North Island and the West Coast of Vancouver Island and in the Lower Mainland.
- the increased benefits are substantial, both in the fishing sector and the processing sector.
- further development of the sardine fishery could potentially create 200 full-time more jobs in the processing sector on Vancouver Island and perhaps another 50-60 seasonal jobs in the fishing sector.
- a fully developed sardine fishery will also provide more jobs and benefits to the Lower Mainland.
- a regional multiplier of two would produce many more jobs and benefits through the associated indirect economic activity.

b) RECOMMENDATIONS

The Paper has two recommendations for consideration:

1.
SIAB recommends that a Task Force of DFO personnel and the industry examine the concept of “sustainability” noted as an objective in the Sardine IFMP. The Task Force would review the present method of setting the Canadian sardine TAC and report to SIAB on its findings. Terms of Reference will be provided.
2.
SIAB recommends that a Task Force of DFO personnel and the industry examine the concept of “economic viability” noted as an objective in the Sardine IFMP. The Task Force would review the concept within DFO policy and the industry’s analysis of the concept. They report to SIAB on its findings. Terms of Reference will be provided.

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