History and Perspective of Exploratory Fishing

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INTRODUCTION

Working with this Center was one of the real privileges of my life. I look back with a great deal of nostalgia about my involvement and about the topic that we're going to discuss this morning, that is, the history of exploratory fishing and gear research at the Northwest and Alaska Fisheries Center and its predecessor organizations.

Exploratory fishing has a particular element that is somewhat different from the mainstream of biological investigations. The term "exploratory fishing" is used to imply a variety of different types of activities and has different meanings around the world. It reminds me of a story about the young executive who had done extremely well in business and managed to parlay his capital from a very small amount of money into a multimillion dollar corporation. He was thinking about getting into the fisheries business and thought he needed a consultant--a fisheries economist like Jim Crutchfield or a fisheries biologist like Murray Hayes--who knew something about the assessment business or perhaps going with the theme of the day, he thought he should get himself a lawyer. There are, you know, an awful lot of legal issues surrounding the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA). He thought, "I'll call in some of these people and see how they respond to various questions." And so he sent for the economist and he said, "Now tell me--what's two and two?" And the reflected for awhile and said, "Well, if you don't discount for future value, it is probably four." The executive said, "Okay, that's interesting," and called the biologist in and asked the same question. "What's two and two?" The biologist paused and replied "Well, under most circumstances and in the ideal situation, it's likely to be four, but there may be some variation around the mean." The executive said, "Well, that's fine--I understand that," and called in the lawyer and repeated the question, "What's two and two?" The lawyer scratched his head, took off his glasses, and said, "Well, what would you like it to be?"

HISTORY

Let's go back and do a little reminiscing and perhaps be a little bit pejorative about the history of exploratory fishing at the Center. I

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looked at the dictionary just to see what they said about "to explore" and it said to "seek for or after, to search for or into, to penetrate or range over for discovery, to examine by means of a probe, to make or conduct a systematic search." I thought those definitions were fairly descriptive of what the whole exploratory fishing process was all about.

If you look back in the history of the North Pacific, which is rich in exploratory activities, and you read your 50th Anniversary history from 1931 to 1981, you'll see that the process really began before there was a formalized exploratory fishing unit at the Center. We have the very early Alaskan crab investigations that went on between 1940 and 1941. I remember the poignant words of an old friend, Lowell Wakefield, who said that the $90,000 that we spent for the early crab surveys was by far the most effective investment the United States ever made in fisheries development--the investment that produced a fishery worth over $50 million annually.

It was the beginning of a search or a probe process. It was indeed a probe, because it was not very systematic or organized. It didn't have all the elements of a sophisticated, well-planned, scientific activity; investigators went to a little known area and searched and gathered information. The results said clearly, "there's more there than we had realized." Obviously fishermen had known these resources were there, but the survey gave new dimensions to a resource which would become one of Alaska's major industries. It was followed by exploratory fishing in the Carl Carlson era (1944), which was called the Alaska Fisheries Exploratory Commission. Carlson began to examine the shrimp resources and to generate concepts for examining the southeastern Alaska pandalid shrimp beyond traditional fishery areas.

We have, of course, the activity aboard the well-known vessel, Pacific Explorer, in 1949. This work can also be categorized as a probe. It was not as well structured as a scientific process or study, but an activity that put a number of people and ideas together and provided the United States with its first real look at the Bering Sea resources and added to the knowledge garnered from foreign explorations.

It wasn't until 1949 that we had the genesis of what would ultimately be called the Exploratory Fishing Group. And at that time, we didn't have a research vessel. There wasn't any fisheries research vessel in the Pacific Northwest capable of offshore work at that time. If you wanted to go out and carry out biological studies you asked permission to go on one of the commercial rigs and if the captain had space on the boat, you brought on a tagging board and measuring equipment, etc., and carried out your studies. The unit formed in 1949 chartered the vessel Deep Sea, followed by a charter of the old vessel Oregon that began to make further probes into the king crab and groundfish resources. Further work was done on the albacore resources of the North Pacific. They were the predecessors of the more formal process that came following the launching of the John N. Cobb, a vessel which (in my view) has a prominent place in the history of marine research.

I was there as a fledgling biologist when the vessel was launched and when she was finally put into commission in the early 1950s. I look back and think about our primitive gear and equipment, but we thought it was the real thing.

We had a 4-foot dredge to look for shrimp in Alaska and we thought that it was the cat's meow in terms of conducting a shrimp investigation. We had two bathythermographs on the boat, both of which were lost when we ran them through the blocks on the second day of the Cobb's operation. We were scared to tell headquarters in Washington, D.C., and Andy Anderson that we lost our investment at that particular point in time.

Money was scarce and equipment was scarcer. The early exploratory group in the Pacific Northwest was built around four individuals, but had its counterparts in the southeastern United States and with the growing operations in the New England area.

It was a new venture. What was this thing--people going out and looking for fish for fishermen? What did that have to do with science? Why did we need that sort of activity? Fishermen could take care of their own surveys. They didn't need somebody looking beyond existing fisheries. There was a "schism" that developed in the old Bureau of Commercial Fisheries (BCF) at that time. Many of you who were around then remember this well--a certain skepticism about this so-called exploratory fishing. Was it really scientifically oriented? Did they really know what they were up to? What did it have to do with the quantitative aspects of the Beverton and Holt model or the Schaefer model? What did it have to do with the logistic growth curve? These were the things respectable biologists worked with. Why are these people going out cataloging resources--information that nobody is using or will use? Why are they looking at the size, distribution, and behavior of fish that nobody really wants?

The "schism" was very strong and the skepticism stronger. In retrospect the criticism had a certain legitimacy. The early exploratory work was not very well structured--not because of a lack of dedication or ability of those involved, not because of the quality of their education--but because the explorers were young, lacked experience, and perhaps were overambitious. Also, few people had given any thought to quantitative resource surveys of unexploited resources. That's looking beyond the boundaries of this convention, looking outside of what was the day-to-day process of the fishery biologist, laying down a heritage of knowledge about resources that at the time nobody was all that interested in. I hark back to Lowell Wakefield's words, "the richest investment ever made was the 90-some thousand dollars spent on a probe of exploratory fishing in western Alaska."

A decade of exploratory fishing and evolution of methodology occurred in the 1950s, led largely by the Seattle group and Harvey Bullis' group in the Gulf of Mexico and Caribbean. The development of methods of exploratory fishing, the acquisition of quantitative techniques, the acquisition of taxonomic capabilities within the group--even the addition of a population dynamics specialist: What was he doing with the young Exploratory Fishing Group?

Mike Tillman was one of the first. He helped that process become more quantitative and improved experimental design and methods. The development of attendant oceanographic observations followed. With maturation of the group came the start of a process of population enumeration and dynamics for latent resources. That took about a decade, a decade needed to develop an

era of legitimacy with our counterparts in other biological fields. At the end of that decade, one began to feel a little more comfortable about the business of exploratory fishing. Letters from Jule Philips came that said the exploratory process evolved in the Pacific Northwest was evolutionary and leading the world. Carl Hubbs wrote that the contribution to the ecological understanding of the resource as the result of the exploratory process had added more to our knowledge than any other activity that had gone on in that particular area. Dr. Keith Ketchen said the summary report on demersal fishes resulting from the exploratory work was better than anything that had preceded it. Finally even Don McKernan caved in and said in the 1960s when we began the renegotiation of the International North Pacific Fishery Commission, "You have the only information on groundfish that's of value in the renegotiation process."

It took on--and I make a point there--an aura of legitimacy with its counterparts. It began to blend with the people in the biological division and the utilization division and integrated their talent in an overall effort to describe and identify the community or resources available. Those trained in the exploratory role took on ever increasing responsibilities in the BCF-NMFS. They were Harvey Bullis, Bill Stevenson (who became a Regional Director and Acting Director of the current NMFS), and our current Assistant Director, Bill Gordon. The exploratory fishing heritage included Don Powell who was involved in the early work and gave a great impetus to the area. Mel Greenwood, Al Pruter, Wally Pereyra (who manages one of the largest fishing companies in terms of fish quantity handled in the United States), Murray Hayes, Ben Jones, Richard McNeely, and Ed Schaefer--all ended up in rather prestigious positions throughout the government system as well as in industry.

When I look back at the early surveys of the group, there were certain frailties in terms of scientific structure, approach, and methodology, but its strength was the ambition of the staff and a willingness to test hypotheses and do the unconventional. Finally the enthusiasm of the young investigators pulled us through.

I remember well when the first albacore survey was initiated and Don Powell was the chief scientist on the project. We poured over oceanographic charts which we knew very little about. We went over and saw old Doc Barnes, who was sort of the oceanographer godfather of the Northwest. We talked about thermal fronts and looked at the historical data base that was available regarding temperature isotherms by month. In addition to our scientific scoping, we added a different dimension--one that probably has played a key role with this Center over the past 20 years. We went and talked to commercial fishermen and told them what we were up to. We asked them questions, how valid were our goals and hypotheses, and what could they tell us about better structuring the work. People like A. K. Larssen, whom I see here today, Gordon White on the Oregon coast, Bill Jensen, Einer Peterson, the Hall brothers, and the Rockums. These along with other industry leaders, the Lokkens, the Yonkers, and the Salitecs, became a part of an information retrieval system for the exploratory program.

What did that early albacore survey show? What was it based on? It was based on a hypothesis that the albacore

move along thermal fronts, foraging along boundary areas. Taking this into account, the explorers set off in the early spring to go some 500 miles to the south and west of Cape Flattery; they felt they would intercept the albacore when they hit the 57-58 isotherm. Albacore were taken within 4 hours of the time they came into the appropriate temperature zone. The results of the survey provided a basic first in thermometric fishing concepts in terms of albacore distribution to lens depth of the surface layer. The survey added a great deal to our knowledge of pelagic fish with which the albacore interface along their northern boundary; eventually the results played a key part in the development of the migratory theory that now is the basis for albacore distribution and behavior off the Pacific Northwest and in the South Pacific. It added a lot more, regarding the community of resources of the oceanic area: information on the abundance of the blue shark and the jack mackerel and the widespread distribution and abundance of pomfret.

The survey added a great dimension in terms of discovery, namely a seamount...Imagine yourself as a young biologist as Don Powell was at that time, in his early 20s, sitting on a boat as chief scientist, and suddenly seeing rising out of the sea an underwater mountain in an area that showed 1800 fathoms. At 400 fathoms it showed up on the echogram, and the trace came up like a submarine, shooting straight up as a solid black streak. As it reached 50 fathoms, even the skipper became nervous; 25 fathoms and the line was still coming up towards the surface. Rather fortunately, the Cobb on that one initial run had come right up on the peak of the Cobb Seamount which later became the subject of considerable inquiry by geologists. In later years scientists would add information in terms of the involvement of seamounts in the distribution of the nekton in the North Pacific.

What about the shrimp explorations? They also began in the 1950s and carried through well into the 1960s. They began in the southeastern Alaska area, with a 4-foot dredge. Later on, because the fishermen in Petersburg got ahold of us and told us what we were doing wrong, we hired a fisherman to come on board and show us how to carry out shrimp surveys. We went to the large beam trawl that had been traditionally used in southeastern Alaska and eventually employed the Gulf shrimp trawl; later a trawl was especially designed for the pandalid shrimp of the area. We surveyed the Washington-Oregon coast and eventually up into southeast and into central Alaska and westward toward the Shumagins looking at the shrimp resources.

This all occurred in the early 1950s and through the early 1960s. You'll find that every major shrimp resource defined by the Cobb and other exploratory vessels has led to a major fishing area for pandalid shrimp. That doesn't mean that fishermen didn't add a tremendous amount of additional knowledge in terms of the resources, or that some fishermen may not have known the shrimp were there in the first place. The systematic exploration and definition of a resource, however, became a usable product in terms of going to the bank for financing, in terms of making an investment, and encouraging entrepreneurs to develop an industry. Of about $150,000 that was spent on the Alaska survey, a $40 million industry developed. The explorers can't take all the credit, that's obvious, but they can take

credit for the initial probe, for initiating interest, for stimulating the concept that there was something there that might be utilized--given the right gear, the right methodology, and the right time in terms of entering into a fishery.

The bottomfish fisheries began also in the first year of the operation of the Cobb. First off, it was in the so-called pinpoint type of trawling, finding little spots on a very difficult shelf and slope among rocky areas where glacial remains made it very difficult to trawl. Off the so-called "spit" area, and down on the Oregon-Washington coast, the knowledge was extended that the enterprising fishermen--the Hall brothers and Gordon White--had uncovered out of Newport an area of Pacific ocean perch abundance. On the first cruise that I went out on we made a set and picked up 20,000 of these critters. I looked it up in the literature and it said, "rare, very few specimens." The survey eventually defined the distribution of a resource that inhabited the whole arc of the North Pacific and was one of the major resource components of the area.

From there, we went north to Alaska through the Gulf. The trawl surveys added a great deal to our understanding of the demersal fish component of the region. They defined every one of the top 10 most abundant species that had been found or utilized in the area. They almost corresponded in their abundance in the exact order now forecast by resource biologists. They added a tremendous wealth in terms of the ecology of other groups of fishes. They extended the distribution and commercial range of sablefish into very deep water, which were later verified by Japanese exploitations. They began to put boundaries on something called the "Pacific hake," which I always called the "McNeely fish." You know, every commercial guy knew how to put the trawl on the bottom and catch hake in the spring and summer along the Washington coast, but we saw this mysterious midwater echo trace and we knew it was something but kept thinking "My God! we must be shooting on plankton." Every time we pulled the net up, we came up "skunked." We didn't have the telemetering techniques at that time, which would have allowed proper positioning of the net, and we were largely guessing. Dick put the system together that allowed us to know where the trawl was in the water column, and lo and behold! When we finally got that system to work we went off the Cape and set on that mysterious echogram that had plagued us. We came up with 40,000 pounds of hake on the first tow. And from that time on, we began to develop the study of the hake (Pacific whiting) resources.

Unfortunately, it is not one that we have yet capitalized on in terms of a totally U.S. fishery, but one in which we are now producing 45,000 metric tons (t) in a joint venture mode.

I should note the work of Frank Fukuhara and Ed Schaefers who went out on the early salmon investigations and found out that there were adult salmon of all species throughout the North Pacific. We had not bothered to read the Japanese literature and were rather surprised by the distributional features and abundance of the resources in the area. This launched the initial study, which was a long and intense survey of the pelagic-anadromous resources across the North Pacific. That, too, was a part of the early exploratory and biological efforts of this Center.

I could go on about the resources of the seamounts, the scallop studies, and

the joint industry bottomfish-clam investigation. I am also reminded to give you just a few words about the old historical Chuckchi venture, which was the time when they were looking at the potential of blasting a harbor near Point Hope in Alaska. About 4 months before the main cruise, we found dry rot in the Cobb. They began picking on the side and the next day there was a hole 4 feet across and suddenly it went across four frames and the center of the boat. We found out that it was just a few of the ribs and stringers that were holding the Cobb together. And it cost us what seems like a trifle amount now, but was a big share of our budget at that time--$40,000 to put it back into the water. We finished 2 days before sailing time. We headed north to go through the Bering Sea and checked the early efforts of the Soviets in that area and then north into the Chukchi Sea.

I am always reminded of that cruise because of one of my own experiences. I had volunteered with Ford Wilke, who used to head the marine mammal group, to go ashore and pick up the mail. The surf did not look that bad to us and we could take the skiff through the surf. We headed in and when we got into the surf, we found the waves were a little bit bigger than we had anticipated. A little chill ran through me. We watched the waves in back of us and forward. We managed to get between two waves and kept the motor going so that we just stayed between them. We knew just how to handle the situation. We hadn't counted on the fact that offshore about 50 feet from the beach there was a berm and we ran onto that going about 20 miles an hour. Both of us went into the surf and the boat came tumbling after. We ended up on the beach, and I looked around for Ford and couldn't see him. He was under the skiff, so I had to get him out from under it.

I could go on about the outer continental studies and works that are reported in the literature under Wally Pereyra, but I think I need to say a little bit about gear research. I have alluded a little to McNeely and the innovation that he put into that particular arena. We had quite a group of gear technologists and gear people looking at various aspects of resource harvest, trying to evolve a reasonable midwater trawl system. The method worked out by Sig Yeager on the sablefish pot system became the main fishing method in the California and southern Oregon fishery. But probably nothing else will stand out greater in terms of the contributions that this particular Center and the exploratory group made to sea research than the tuna-porpoise problem. When that problem came up, Dr. White said to me, "Lee, do you think we have any chance of solving this using new gear to minimize the incidental take of porpoise?" And I said we do, and it rests with Dick McNeely, because there is a guy with a thousand ideas, 990 which are probably bad, but he will eventually come up with the right solution. You can knock him down 15 times and he will pick himself back up and he will find a solution to the problem. I remember the ulcers that Dick generated in trying to solve that problem. About a 4-year effort and a dedicated one, and much a one-man show in terms of looking at selective fishing technology to resolve a major problem confronting an industry. He had rocks hurled at him by both the industry and by the environmental groups and in the end, both of them applauded him and awarded him for his efforts in that area. I think it was an outstanding piece of gear research and the type of work that will be important in the solving of future

fishing problems. That job is finding selective techniques to minimize the impact of harvest activities on other people.

If you look at the literature today, a rich part of it that relates to the living marine resources of the northeast Pacific, had its genesis in the exploratory fishing group and subsequent elements of this group within the Center. They did, indeed, extend the boundaries of knowledge, and they evolved a methodology in terms of assessment that has become a fundamental part of techniques not only in this area, but also in terms of trawl survey and methodology being used throughout the world today.

I have looked at some of the costs involved in all this, particularly in the earlier work. I mentioned western Alaska crab studies. I said $110,000 ultimately generated more than $150 million; $108,000 in the Central area generated more than $200 million. About $150,000 were spent on shrimp surveys in the westward area; in 1 year alone the fishermen there produced close to $20 million worth of fish. I caution you, we are not suggesting that the exploratory fishing group by itself can take the credit which is due the fishermen, investors, and processors, but they did stimulate their imagination and added new information which the entrepreneurs used to develop the fisheries.

CONCLUSION

I conclude by saying exploratory fishing, if properly executed, is a process of systematic search. It is a process of sending out probes. I believe it would be a mistake if the Center were to drop back its boundaries and say "Yes, we know all about fish in the ocean." That is exactly what I was told 30 years ago! All the answers about important resources were available; we knew where all the resources were. It will be a mistake if the Center does not have a group that continues to look beyond, to look at a facet other than assessing conventional species. If that is all you do you will add little in the way of new information for future generations. The last message that I would like to leave with this particular group is that there is a future. Exploratory fishing grew up and became an important part of scientific activity at this Center as well as in the southeastern and northeastern United States, in the Great Lakes area, and on a worldwide basis.