

Economics of the Pacific Whiting, *Merluccius productus*, Fishery

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Introduction

Interest in the economics of Pacific whiting, *Merluccius productus*, production and consumption has been stimulated in recent years by expanding U.S. participation in the fishery formerly dominated by foreign fishing and processing. This has raised several questions within the U.S. fishing industry: 1) Will it be profitable for additional U.S. fisherman and processors to enter the fishery? 2) What configuration will the U.S. Pacific whiting industry take? and 3) What will be the nature of markets for Pacific whiting products? This paper summarizes the conclusions of several reports and studies which bear on these questions.

The answers to the questions will be determined by the forces of supply and demand for Pacific whiting products and, to some extent, by government action. The first subject discussed here is potential markets for the various Pacific whiting products, and constraints on the demand for these products. This discussion is followed by an examination of the cost factors which affect supply, and which determine how the fish will be caught and processed.

Markets

The most obvious potential markets for U.S.-processed Pacific whiting products are those which currently consume the output of the foreign and joint-venture fisheries. However, these markets are primarily in Communist Bloc countries which do not have normalized trade relations with the United States. While it

is possible that provisions for trade in Pacific whiting and other fishery products could be negotiated with these countries, it is not considered likely (Earl R. Combs, Inc.¹). Therefore, entirely new markets will probably have to be found.

Although some authors suggest that Pacific whiting fillets, both fresh and frozen, could be successfully marketed (Pacific Fishery Management Council, 1982; and Richards²) this seems unlikely due to the problem of flesh fragility and rapid decay.

Another possibility is that Pacific whiting could compete in the huge frozen groundfish fillet block market. There are several obstacles to this development which some writers feel are insurmountable (Kramer, Chin, and Mayo, Inc.³ and Richards²). To begin with, the problems of parasitism and flesh fragility will probably prevent successful penetration of the highly quality-conscious western European segment of the

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market (Earl R. Combs, Inc.¹). In the United States, the same problem will leave Pacific whiting at a serious competitive disadvantage if attempts are made to sell it in retail stores as frozen breaded or battered portions cut from blocks. This might change if consumers could be persuaded to adopt the cooking method required to avoid enzymatic softening of the flesh, namely deep-fat frying without first thawing. However, consumers may resist changing their cooking habits, and since they are unfamiliar with this species, a great deal of consumer education effort may be required.

One marketing channel in which handling methods could be carefully controlled, thereby reducing the quality impediment, is the sale of frozen portions to institutional buyers, who usually deep-fry their products (Earl R. Combs, Inc.¹). To make inroads into this segment of the groundfish market, it will be necessary to overcome the resistance of buyers to frying without first thawing the fish (Fisherman's Marketing Association of Washington⁴) and to assure the buyers of reliable supply

¹Earl R. Combs, Inc. 1979. Study of the economics of the Pacific hake fishery. Unpubl. manusc. prep. for Coos-Curry-Douglas Economic Improvement Association and the Oregon Department of Economic Development. Earl R. Combs, Inc., 2737 77th S.E., Mercer Island, WA 98040.

²Richards, J. A. 1982. Economic information for the management of the groundfish fisheries of Washington, Oregon, and California. Unpubl. manusc., 117 p. Northwest Reg. Off., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point, Way, N.E., Seattle, WA 98115.

³Kramer, Chin, and Mayo, Inc. 1982. System strategy for California, Oregon, and Washington fishing industry and public ports infrastructure needs and assessment, final report and technical analysis. Unpubl. manusc., prep. for West Coast Fisheries Development Foundation and the National Oceanic and Atmospheric Administration. Kramer, Chin, and Mayo, Inc., 1917 1st Ave., Seattle, WA 98101.

⁴Fishermen's Marketing Association of Washington. 1980. Offshore factory trawler demonstration project. Unpubl. manusc., prep. for West Coast Fisheries Development Foundation and National Oceanic and Atmospheric Administration under cooperative agreement 80-ABH-00052, 49 p.

quantities of consistent quality. The latter is not an easy task for any new industry. Converters, the firms which cut blocks into fish sticks and portions to varying specifications of their customers, may prefer not to buy blocks of a species which can be sold only to a limited class of customers. Therefore, it may be that Pacific whiting processors will have to invest in the capability to do their own converting and sell directly to institutional customers if they are to market blocks successfully (Earl R. Combs, Inc.¹)

Other product forms which have been considered for Pacific whiting include such products as frozen blocks of headed and gutted (H&G) fish, precooked breaded portions, chowders (where the flesh characteristics are less important), cured products, and industrial products such as meal, oil, and fertilizer. Some or all of them may eventually play minor roles in the industry, but the markets for these product forms are not thought to be large (Earl R. Combs, Inc.¹). Two studies have been released (one based on actual experience) which predict that on-board heading and gutting will be profitable (Philbin, 1980; Fishermen's Marketing Association of Washington⁴).

Shore-based production of frozen H&G whiting is currently supported by the relatively small Puget Sound, Wash., stock. This production is profitable because the fish are close to shore, do not deteriorate as rapidly as do the oceanic variety, and are smaller than the oceanic stocks. Their smaller size makes them attractive to low income and ethnic markets in eastern and southern states.

One problem not considered in the cited studies is that H&G Pacific whiting is a product for which there is a relatively small market in the United States, and for which there are few close substitutes, so any large-scale increase in production may depress the price significantly. However, Earley (1981) suggests that the product could be marketed successfully in Mediterranean countries, despite quality problems.

Assuming that markets can be found, there are still obstacles to profitability. One, which can be categorized as a demand phenomenon, is the low wholesale prices at which Pacific whiting products must be sold. The prices are constrained by the fact that other groundfish, including other species of whiting, are higher quality substitutes for Pacific whiting in the whitefish fillet and block market. Since Pacific whiting maximum sustainable yield (MSY) is small compared to total U.S. and world groundfish consumption (175,000 metric tons (t) Pacific whiting MSY; about 1,200,000 t round weight U.S. groundfish consumption in 1981), producers of Pacific whiting products face a more or less rigid upper limit on the price they receive. They cannot hope to significantly replace other species unless they offer their product at a price that is somewhat lower than this upper limit. It has not thus far proved profitable to do so.

Only if and when growth in world demand for groundfish outstrips growth in world supply will the prices of all groundfish products, including Pacific whiting, rise enough to make expanded Pacific whiting processing worthwhile, assuming that costs do not rise proportionately (not a foregone conclusion). There is some reason to believe that this rise in demand might eventually occur. First, demand for groundfish can be expected to grow as population and income in North America and Europe grow (Kramer, Chin, and Mayo, Inc.³). However, income growth is not certain, and because the prices of substitute protein sources like beef, pork, and poultry must be assumed to remain approximately constant, the price of groundfish is expected to be relatively unresponsive to increases in demand. The rapid growth in demand for frozen groundfish products by fast food operators and retail food chains (which constitutes a structural change in demand) is apparently near an end (Kramer, Chin, and Mayo, Inc.³). Second, while there is room for expansion in the New England and South American whiting harvests

(Richards²), maxima will be reached there eventually, and total world production of groundfish will stabilize.

The only other hope for a rise in the price ceiling is a technological improvement in the processing of Pacific whiting which would eliminate its tendency to deteriorate. This would raise the quality to a level approximately equal to that of other species and allow Pacific whiting to be sold at a comparable price.

Processing

Onshore

Turning now to supply aspects of the Pacific whiting industry, we can make some general statements about the relative merits and costs of at-sea and on-shore processing, and about why foreigners are processing large quantities of Pacific whiting and U.S. firms are not. Currently, the limited U.S. processing of this species is done on shore, where processing is generally less expensive than at sea for several reasons. For production on a small scale, there already exists plant space on shore which can be used for expansion of Pacific whiting processing at times when it is not being used for other species. All that is required in some additional equipment and labor (Earl R. Combs, Inc.¹). Thus, the current low level of U.S. production can be sustained or slightly increased at relatively low cost. This cannot be said of U.S. motherships or factory trawlers, of which there are only a few, all fishing for other species. For a large-scale expansion of the industry to occur, additional plant space or vessels would have to be built. On-shore plants are cheaper to construct than are factory ships of the same capacity, unless land costs are high enough to reverse the relationship. Foreign-built factory trawlers could be purchased new or used at much lower prices than new U.S.-made vessels (Earley, 1981), but they are prohibited from fishing in U.S. waters by the Jones Act. A similar prohibition against foreign-built motherships

no longer applies, since the U.S. Customs Service has ruled that fish processed aboard such ships may be landed in U.S. ports if the ships are registered in the United States.

With regard to variable costs, shore plants have some advantages over processing ships, since they do not require fuel to propel them, and because shore-based processing labor can be paid less than workers who must be compensated for the inconvenience and discomfort of living at sea for long periods. On the other hand, at-sea processing enjoys exemption from some of the taxes, pollution abatement regulations, and waste disposal costs that are imposed on shore-based plants.

More importantly, however, there are two features of Pacific whiting biology which may explain the failure of the existing small-scale on-shore processing operations to expand appreciably. First, the fish migrate along the U.S. west coast during the summer fishing season, so that the stock is rarely within practical fishing range of any given shore plant for more than 3 months (Earley, 1981). It is simply not economical to build new plant capacity dedicated to a low-valued fish which is available less than 3 months a year. Since most of the other Pacific coast species which might also be processed in a new plant are already at or near maximum yield (Pacific Fishery Management Council, 1982), the expansion would have to be supported mostly by Pacific whiting. Processing ships, in contrast, can participate in Alaska groundfish fisheries during the winter when Pacific whiting are not available.

Second, the high incidence of parasitic infestation of the flesh can result in unacceptable product quality when the fish must remain in the boats' holds for more than 2 days (Earl R. Combs, Inc.¹; Philbin, 1980), even when the hold is refrigerated. This requires short trips in which actual fishing time is only a small proportion of total trip length. There is some controversy about whether product quality can be maintained after even a few hours in the hold (Richards²).

Offshore

Offshore processing takes two forms: Delivery at sea to motherships by catcher boats and the combination of fishing and processing on a factory trawler. Motherships and catcher boats are used primarily in joint ventures, while factory trawlers are used by the foreign fishing fleet. Delivery at sea is less costly to fisherman than delivery on shore because 1) less time and fuel are diverted from fishing to running to and from port, delivery is made to the processor on the grounds, and some supplies are provided by the mothership; 2) refrigeration in the fish hold is unnecessary since delivery can usually be made very soon after the fish are caught; 3) the fishing vessel crew can be smaller because the fish are not brought on board the catcher boat, but are transferred to the processor while still in the detachable codend; and 4) fishing boats can stay with the moving schools of whiting, instead of having to spend time searching for them after returning from a delivery in port.

As a consequence of these cost advantages, fisherman are willing to fish for at-sea delivery for a lower ex-vessel price than they require for delivery to on-shore processors. For comparable harvest volumes, the difference is about \$0.02 per pound, according to Richards². At the ex-vessel prices paid by joint venture buyers in the recent past (about \$0.06 per pound in 1982), there have been more applicants for fishing contracts than there are openings (McNair, 1982). It should be pointed out that there is no single price which is required to persuade fisherman to participate in joint ventures or in shore-based fishing. Rather, there is a supply function; more fishermen participate when the price is higher than when it is lower.

Of the two fishing-processing modes which do not involve catcher-processors, at-sea delivery is the mode of operations which is less costly for fisherman, while on-shore processing may be the mode which is cheaper for processors (not counting the cost of purchasing fish from fisherman).

What matters in determining the final configuration of the industry, if an entirely domestic industry does develop, is the total cost of harvesting and processing combined, along with considerations like the feasibility of maintaining adequate quality and the availability of off-season employment in other fisheries. Which of the two modes satisfies these criteria is not yet known, but the quality and limited season considerations would appear to be the deciding factors in favor of at-sea delivery and processing, at least for the major proportion of the output (Earl R. Combs, Inc.¹) It is possible, however, that the use of large, efficient fishing vessels with improved refrigeration, improved procedures for unloading fish at shore plants, and changes in processing procedures could negate the apparent advantage of at-sea processing (Richards²).

The third possible mode, combining fishing and processing in a factory trawler, has some advantages over mothership fishing. First, the time interval between capture and processing can be even shorter than when the catch must be transferred to the mothership. The risk of losing a codend full of fish during the transfer operation is eliminated. The harvest rate can easily be matched to the ship's processing capacity, so there need not be any backup of harvested fish waiting to be processed (Earl R. Combs, Inc.¹). Finally, there is no need to arrange for a fleet of catcher boats, through contract or purchase, in each fishery that the vessel participated in (Earl R. Combs, Inc.¹).

One disadvantage of a catcher-processor, compared with a mothership and catcherfleet, is inflexibility of harvest capacity, especially when the ship fished in fisheries or seasons where the optimal catcher-vessel size varied markedly. Another problem is the large size of catcher-processors: One study of Alaska groundfishing costs and returns suggests that, under average conditions, the optimal fishing vessel size is only about 85 feet (Kramer, Chin, and Mayo, Inc.³). A similar cost structure may exist in the Pacific whiting fishery. Processing,

however, may embody substantial economies of scale, with the optimal size being considerably larger than is practical in a factory trawler. At best, a factory trawler can only compromise between the optimal scales of its two functions. Finally, there is the high acquisition cost imposed by the Jones Act.

Earley (1981) concluded that, given the constraints raised by the Jones Act and the difficulty of training or importing skilled processing labor, profitable factory trawler operations on Pacific whiting are not feasible for U.S. firms. If those constraints were removed, profitability might be achieved.

The few existing U.S. factory trawlers have more attractive alternative opportunities year-round in Alaska (i.e., the *Arctic Trawler's* frozen cod fillet operation). One of them was used on an experimental basis for Pacific whiting fishing and processing in 1980 (Fishermen's Marketing Association of Washington⁴), and it was found that production of frozen fillet blocks was not profitable. The experiment did suggest that production of H&G whiting by factory trawlers might prove commercially successful, but no further work in that direction has been done.

With factory trawler fishing for Pacific whiting shown fairly convincingly to be economically unfeasible, the question arises, "Will domestic mothership fishing soon characterize the fishery?" Earl R. Combs, Inc.^{1, 5} predicted that it will, while the more recent reports by Kramer, Chin, and Mayo, Inc.³ and Richards² assert that rapidly rising costs and the low wholesale price of Pacific whiting products will continue to discourage entry of U.S. processing into the fishery, beyond the present small-scale shore-based activity.

Joint Ventures

Operators of foreign processing

¹Earl R. Combs, Inc. 1979. Prospectus for development of the United States fisheries. Unpubl. manusc. prep. for NOAA's Fisheries Development Task Force. Earl R. Combs, Inc., 2737 77th S.E., Mercer Island, WA 98040.

ships have found it worthwhile to purchase Pacific whiting from U.S. fishermen at sea, at ex-vessel prices sufficiently high to attract a large number of fishermen to these joint ventures (Kaczynski⁶). Foreign processing vessels have lower costs than U.S. motherships would; in some cases, their actual direct costs may be lower than those of U.S. ships, and another important factor is that these ships have often been excluded from the extended economic zones of countries whose waters they were built to fish in. Therefore, they have limited alternative opportunities (that is to say, low opportunity cost), and rather than let them stand idle, their owners are willing to use them even when profits are low or negative. The same is true of the skilled crews of these vessels. In addition, since the factory ships used in Pacific whiting joint ventures are owned by Communist Bloc nations, profit is a secondary objective in their operation, with conservation of foreign exchange and employment playing more important roles (Earley, 1981). Furthermore, as a result of the U.S. "fish and chips" policy, foreign countries have been agreeing to operate joint ventures as a condition of receiving direct harvest allocations. It may be that receiving this allocation is even worth sustaining losses in their joint venture operations. This is not true of the Soviet Union, which participates in the largest Pacific whiting joint venture, but which for political reasons receives no allocation. But political conditions can change, and it has been suggested that U.S. fishermen could successfully engage in collective bargaining or obtain government assistance in negotiating a higher ex-vessel price for their joint venture catch (Richards²).

On the basis of the factors described above, Kramer, Chin, and Mayo, Inc.³, and Richards² concluded that for the foreseeable future, the

Pacific whiting industry would continue to be dominated by joint ventures consisting of U.S. fishermen selling their catch to foreign processors. In this form, the industry will expand in the next few years, with the number of U.S. trawlers involved expected to increase, at least slightly. The additional vessels will be largely drawn from the existing west coast fresh groundfish fleet, converted to midwater trawling—and, to some extent, from converted Alaska crabbers. Some new vessels may also be constructed. The west coast trawlers will be attracted to the fishery despite the continuing opportunity to harvest traditional species of groundfish.

Richards² addresses the issue of whether permitting joint ventures is harmful to the development of domestic processing interest and capability. He concludes that it is not, because the two modes of fishing take place in different areas of the ocean: Offshore and inshore. This minimizes the effect that each fleet has in reducing the abundance of the stock on which the other is fishing, which would increase fishing costs and the ex-vessel price which must be paid the processors. It should be observed, however, that while this may be true in the short run, in the long run joint-venture fishing may affect the abundance of inshore Pacific whiting if all the whiting are members of a single stock. In addition, joint venture processors increase the competition for whiting fisherman, probably driving the ex-vessel price up. Moreover, it is possible that the nations now engaged in joint-venture processing might become importers of U.S. processed Pacific whiting products if joint ventures were prohibited. But, as noted above, this may be unlikely, and for reasons already discussed, it is probable that Pacific whiting processing would be unprofitable for U.S. firms even in the absence of joint ventures.

Conclusion

The evidence presented in the literature on the economics of Pacific whiting suggests that, for the near future, and possibly for the long run,

too, the industry will be primarily characterized by joint ventures. Action by the United States to restrict joint ventures would likely not result in large-scale expansion of domestic processing, and would sharply reduce opportunities for domestic fishermen. Joint ventures will probably expand, if permitted to do so, and will involve somewhat greater numbers of U.S. fishing vessels. Processed products from the fishery will continue to flow to the Communist Bloc nations, with some of the output being exported by them to other parts of the world.

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