

Map of West Africa.

# THE COMMERCIAL SHRIMP POTENTIAL IN WEST AFRICA DAKAR TO DOUALA

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The increasing demand for shrimp for human consumption has created worldwide interest in using unexploited stocks. This interest is particularly evident in tropical and semitropical zones, where the right combination of environmental conditions can produce and support large populations of this highly prized crustacean. The West Coast of Africa is one such area.

Recently, countries in this area have become aware that they might have offshore shrimp resources that could be harvested to start a new industry. The African Development Bank (ADB), headquartered at Abidjan, Ivory Coast, is alert to these possibilities and has established a development program. ADB requested the Food and Agriculture Organization of the United Nations (FAO) Investment Center at Rome, Italy, to recruit someone to make a 3-month preliminary survey on the present knowledge about these shrimp resources.

The survey objectives were: (1) to ascertain biological information on shrimp from local research centers, (2) to determine the interest of existing commercial fishing companies in fishing for shrimp, and (3) to prepare an outline for a shrimp-resource survey. The writer made this survey during February-April 1969. This article was extracted from the report.

Marine research expanded in West Africa during the last decade. Most of it was directed toward implementing the harvest of finfish for local consumption; however, some shrimp research was conducted.

In 1966, Monod described shrimp species of West Africa and, in 1967, Crosnier, deBondy, and Lefevre identified 11 species believed available in commercial quantities:

*Penaeus (M.) kerathurus* (Forsk.)  
*Parapenaeopsis atlantica* Balss  
*Penaeus (M.) duorarum notialis* Perez Farfante  
*Parapenaeus longirostris* (Lucas)  
*Solenocera membranacea* (Risso)  
*Plesionika williamsi* Forest  
*Plesionika martia* (A. Milne Edwards)  
*Aristeus varidens* Holthius  
*Plesiopenaeus edwardsianus* (Johnson)  
*Glyphus marsupialis* Fihol  
*Parapandalus narval* (Fabricius)

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Fig. 1 - The 'President Kennedy,' a training and research vessel built in U.S. for Ivory Coast, at dock in Abidjan. It was a joint Ivoirian-US AID enterprise. It is being used now in an FAO sardine project.

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The first three species are found primarily within 50-fathom depth range; the other 8 between 50 and 400 fathoms.

### FISHING CRAFT AND FISHERMEN

Throughout the world's tropical zone, natives traditionally use dugout canoes for fishing. In West Africa, canoe fishing employs many people and is important to the local economy. The canoes used in the marine fisheries are 25 to 50 feet long, cost \$50 to \$100 each, are made usually of soft wood because of its buoyant quality, and have an average useful life of about  $1\frac{1}{2}$  to 2 years. Outboard motors have been introduced but, because of their cost, are beyond the reach of most fishermen, who depend on a combination of sails and paddles.

An example of this fishery has been compiled by the Nigerian Federal Fisheries Service in a study of a typical coastal village of about 1,000 inhabitants. Of about 300 adult men, 280 are all-season fishermen. During the dry season, January to May, about 80 additional fishermen are attracted to the village from the neighboring countryside because of the high prices paid for fishery products. Working from this village are 180 canoes, usually two men to a canoe. They use a variety of gear, including cast nets, traps, set nets, seines, and hooks.

Most of their effort is for finfish. However, juvenile shrimp (*Penaeus duorarum notialis*) are caught in the estuaries during nocturnal ebb tides by a net stretched between anchored canoes. The most productive fishing is during March and April, when the average daily shrimp catch per canoe is about 50 pounds. (Shrimp weights given are heads on, unless specified otherwise.) Assuming that at least 100 canoes from the village fish each day, the total shrimp catch would be about 2.5 tons per day during the peak production period. During the rainy season, the shrimp catch decreases, but the Federal Fisheries Service estimates that this village catches about 400 tons of shrimp per year. When this catch is multiplied by numerous similar villages throughout West Africa, the combined catch of juvenile shrimp must be impressive.



Fig. 2 - A pompanolike fish, *Lichia* sp., on sale in Abidjan, Ivory Coast. In 90° F. and above temperatures, and refrigeration or ice lacking, fresh fish must be sold quickly.

### Spaniards Fishing Since 1950s

A Spanish fishing fleet has been dragging off West Africa for deepwater species of shrimp since the early 1950s. *Parapenaeus longirostris* and *Plesiopenaeus edwardsianus* are the major part of its catch. The vessels are 100 to 170 feet long, powered by 600- to 900-horsepower diesel engines, have freezing capacity of 45 to 180 tons, and usually carry 20 to 30 men. Shrimp trawls of Spanish design, with footrope lengths between 197 and 310 feet are used; however, catch rate does not increase in direct proportion to increase in footrope length. The best depth range for dragging varies between species, and between seasons of the year. Variations in catch rate have been observed between day and night drags and phases of the moon. Dragging normally is carried out round the clock; individual drags last between 3 and 5 hours (table). The vessels stay on the shrimp grounds 7 to 9 months and, approximately once a month, are supplied by a vessel from Spain, to which they transfer their catch.

## Catch Data from a Spanish Shrimp Vessel

Date	Drag Began	Drag Ended	Depth Fished	Catch of		Catch	
				Heads-on	Shrimp	per Hour	
			<u>Fathoms</u>	<u>kg.</u>	<u>lb.</u>	<u>kg.</u>	<u>lb.</u>
<u>1968</u>							
12/19	0500	0930	136	235	517	52	114
"	1030	1430	136	250	550	62	136
"	1515	1900	136	154	339	40	88
12/20	0500	0945	140	231	508	48	105
"	1030	1330	140	190	418	63	138
"	1445	1830	140	150	330	40	88
12/21	0500	0900	130	150	330	37	81
"	0945	1445	130	150	330	30	66
12/22	0400	0830	210	300	660	66	149
"	1100	1600	210	250	550	50	110
"	1630	2030	210	275	605	68	150
"	2100	0200	210	300	660	60	132
12/23	0515	0915	120	200	440	50	110
"	1030	1430	120	250	550	62	136
"	1510	1910	120	300	660	75	165
"	2100	2400	120	300	660	100	220
12/24	0600	1000	212	375	825	93	215
"	1030	1430	210	450	990	112	246
"	1500	1900	210	400	880	100	220
"	2100	0100	210	350	770	87	191
12/25	0500	0900	212	400	880	100	220
"	0930	1430	212	450	990	90	198
"	1500	1915	210	300	660	70	169
"	2000	2400	210	250	550	62	136



## SHRIMPING BY SOME WEST AFRICAN COUNTRIES

During the survey, I visited 8 countries and discussed shrimp resources with personnel of either national or international research organizations. I talked to owners, managers, and captains about local commercial fishing. They helped compile the following information.

### SENEGAL

Commercial fishing for shrimp is more developed in French-speaking Senegal than in any other West African country. Its total coastline is about 275 miles. (All distances are given in nautical miles.) Its Continental Shelf is 10 to 50 miles wide. In 1967, shrimp production was 1.9 thousand short tons.

An organized canoe fishery has flourished since 1960, when 120 tons of young estuarine shrimp were produced for export. By 1968, this catch had increased to nearly 900 tons. Most of this production comes from the Casamance River system, which has nearly 1,000 fishermen at the height of the season. The Saloum and Senegal river systems contribute to this production. The fishery is active all year, but May through July is the peak production period.

Shrimp catches in offshore waters for adult *Penaeus duorarum notialis* began incidental to fish catches in 1963. For the next few years, several trawlers spent part of the year catching shrimp exclusively. Trawlers designed for shrimping began to appear in 1967; 28 vessels were shrimping actively in 1968. They work primarily in two areas off the coast--Dakar north to St. Louis, and Dakar south to Cape Roxo.

North of Dakar, shrimping is conducted on mud bottom in 15 to 40 fathoms. The normal season begins in November and ends in April or May. Catch rates in 1966-67 season averaged 350 to 750 pounds per day. Some high-line vessels were able to double the production of average vessel.

South of Dakar, the fishing is also seasonal; the highest production is between December and July. This region has been more productive than northern one. Catches up to 1 ton have been made in 6 hours of dragging. Daily average catch rates have ranged from 450 to 1,600 pounds.

Dakar, the capital, has a population of 375,000. Its large port has over 6,500 feet of dock space for trawlers, and almost 1,300 feet for tuna vessels. Ice-producing capacity is 180 tons per day; plans are being made to double this. Diesel fuel for fishing vessels is not taxed and costs 16 cents per gallon. Fishing vessel regulations, enforced by Department of Fisheries, prohibit wooden vessels older than 15 years, and steel vessels older than 20. Annual fishing permits cost \$40 per gross ton. Also, Senegalese-registered vessels pay a tax of \$0.01 per ton of landed catch, and non-Senegalese vessels pay 13% of catch value.

The life cycle of the shrimp of Senegal are being studied jointly by a biologist of the Department of Fisheries and two biologists of the French research organization, Office de la Recherche Scientifique et Outre-Mer (ORSTOM).

### SIERRA LEONE

Commercial fishing is relatively undeveloped. The only activities are the local canoe fishery, which includes shrimp, a tuna-transportation facility, and 9 local small bottom trawlers. In the port of Freetown, the capital with a population of 128,000, dock space for fishing vessels is limited to 130 feet at the tuna facility. The 9 trawlers unload into canoes while at anchor.

The country has 3 large estuarine areas that should produce shrimp in commercial quantities. Its coastline is approximately 200 miles; its Continental Shelf varies from 22 to 75 miles wide.

The official language is English.

### LIBERIA

Commercial fishing is conducted by two private companies that charter foreign-flag vessels. These catch shrimp incidental to fish--but do not attempt to catch shrimp exclusively. As a result of 2 months of exploratory shrimp fishing, one company is building 4 shrimp vessels for use this year.

A canoe shrimp fishery supplies fresh shrimp to local market. Best production is in spring, although catch statistics are not maintained.



Liberia's coastline is about 285 miles; its Continental Shelf 15 to 35 miles wide. Monrovia, with a population of 81,000, is the capital and major port. There is limited dock space for fishing vessels, but adequate waterfront space for more docks. Fishing-vessel licenses are \$150 per vessel; diesel fuel is 15 cents per gallon.

English is the official language.

### IVORY COAST

Three large estuaries provide excellent nursery areas for shrimp in Ivory Coast. The canoe fleet catches juvenile shrimp almost all year; in 1968, it caught nearly 400 tons.

Offshore commercial fishing for shrimp is very limited. At present, two trawlers drag for shrimp during July to October, the season of highest production. Their production, plus the incidental shrimp catch from fish trawlers, was: 1964--160 tons; 1965--145 tons; 1966--155 tons; 1967--171 tons.

Ivory Coast has 280 miles of coastline; its Continental Shelf is 10 to 16 miles wide. Abidjan, the capital of this French-speaking country, has 180,000 persons. At the turn of the century, it was a fisherman's camp; now it is an important industrial and commercial fishing port. The fishing vessel dock is being extended. A cold-storage plant will be built in the fishing port complex. It will have a blast freezing capacity of 90 tons per day, and a holding capacity of 3,000 tons.

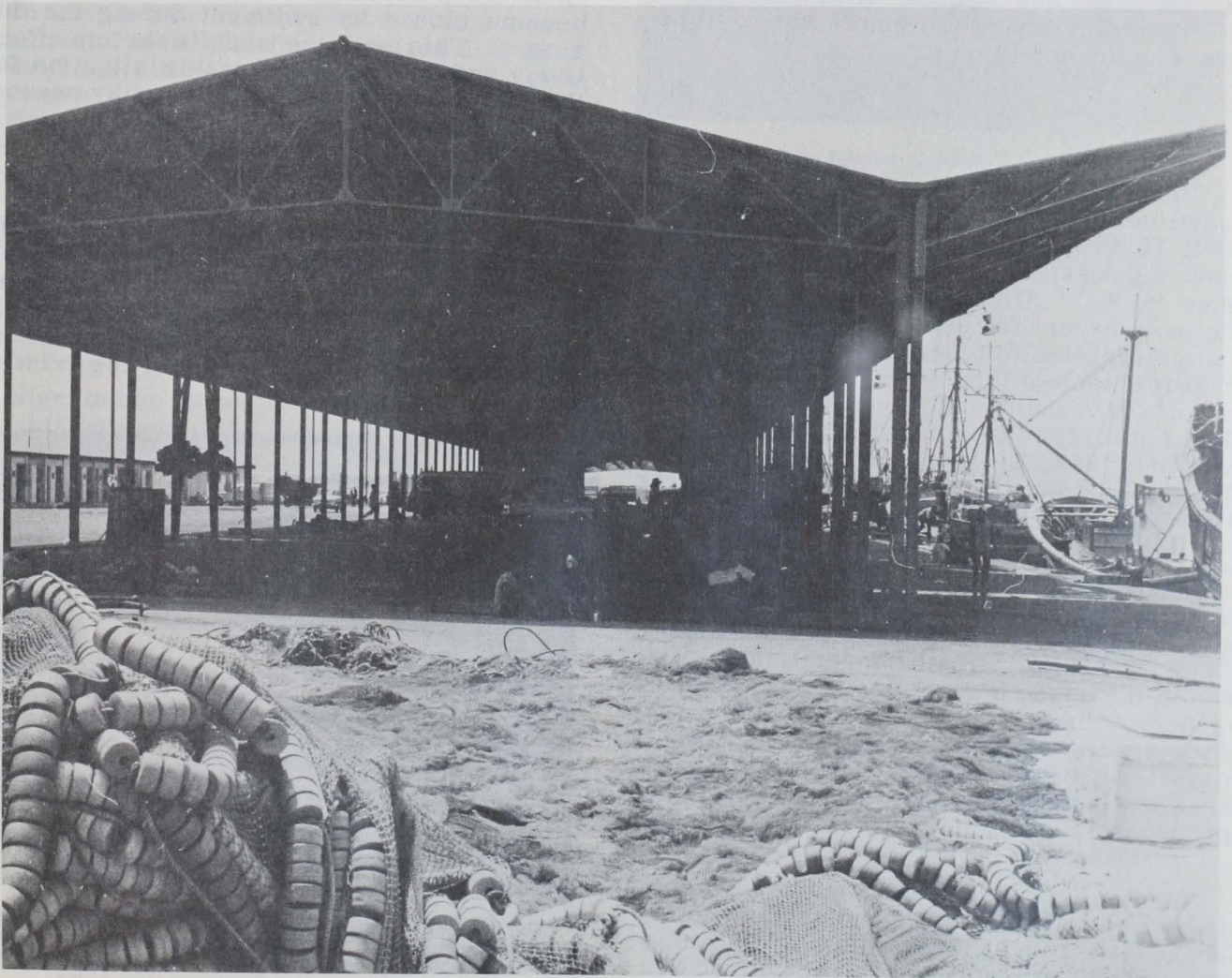


Fig. 3 - The open-air auction shed at the fishing port in Abidjan, Ivory Coast. Minimum prices are fixed by law for fish landed by local fleet.



The government recently granted permission for three French/Ivoirian fishing companies combined to introduce not more than 10 shrimp vessels during the next 3 years. The companies have agreed to pool their resources and build a modern shrimp-processing plant.

The Ivoirian Fisheries Service is cooperating with a private French/Japanese venture in shrimp mariculture. Two large cement tanks, built several years ago on the coast east of Abidjan by the Fisheries Service; are being loaned for the shrimp-farming experiment.

Two biologists on the ORSTOM staff at Abidjan are studying distribution of offshore shrimp stocks. They use the laboratory's 82-foot research vessel 'Reine Pokou' to make sampling drags between 10 and 100 fathoms about once a month.

#### GHANA

Ghana, an English-speaking country, has a coastline of about 280 miles, and a Continental Shelf 15 to 40 miles wide. It is one of the most aggressive commercial fishing countries in West Africa; Ghanaians are among the most expert fishermen. Over the years, many emigrated to other West African countries to establish local fisheries. Thirty-foot motorized vessels were first introduced into Ghana in 1952; a 75-foot-and-above class appeared in 1962. By 1967, the offshore fishing fleet had grown to 439 vessels, and the estuarine fleet to 10,000 canoes.

With the introduction of larger vessels, fish production increased dramatically: from nearly 30,000 tons in 1961 to 115,000 tons in 1967. The major part of the catch is processed in manmade port of Tema, 20 miles east of Accra, the capital. Tema has 3,400 feet of dock space, a small boatyard, and limited vessel-repair facilities. The Tema-Accra area has 13,000 tons of cold storage space and produces 100 tons of ice per day.

Shrimp are taken in the estuaries by canoe fishermen and are caught incidentally in offshore fish trawling. Two fishing companies are planning to acquire new or converted vessels for catching shrimp exclusively.

The Ghanaian Fisheries Service conducts biological research and fishermen training programs. Most research is devoted to finfish because of their importance to the economy. Shrimp catch statistics are not collected. A biologist on the staff of a UN Special Fund Program at Tema has been sampling periodically offshore shrimp stocks. He plans to expand this work after he receives some needed vessel equipment.

#### TOGO

Togo's 40-mile coastline and its narrow Continental Shelf (15-20 miles wide) place a natural limitation on development of an offshore shrimp fishery. However, Togo has an estuarine canoe fishery for shrimp. The Department of Fisheries told me that the channels connecting the estuaries to the sea become closed by sediment during the dry season. This traps the juvenile shrimp effectively and creates a favorable situation for the canoe fishermen. With the rainy season, the increased flow of water reopens the channels and permits the normal shrimp life cycle to continue.

Lomé, the capital of this French-speaking country, has a population of 80,000. It has a manmade harbor for general cargo, but it does not have a fishing port. The West German government helped draw up plans to construct a fishing port about a mile east of the existing port.



Fig. 4 - Boiled, whole shrimp and live crabs at a fish market in Lomé, Togo. The shrimp are juvenile pink shrimp, *Penaeus duorarum notialis*, caught by canoe fishermen in local estuaries. This type of marketing is seen throughout West Africa.



The Togo Department of Fisheries, established in 1963, now has a program to determine the cyclical abundance of estuarine shrimp. A West German Fisheries Assistance Program operates two research vessels in fish trawling explorations. Recently, they made good catches of shrimp, incidental to fish trawling in 20 to 25 fathoms. They are constructing a shrimp trawl for a concerted effort to determine shrimp abundance.

#### NIGERIA

The commercial fishing industry is well established. Demand for fishery products is high. The availability of shrimp in offshore waters was determined several years ago when 28 vessels dragged for shrimp. During the recent civil war, most productive shrimp grounds off Niger River Delta were closed, and nearly half the vessels moved to other shrimp grounds. Fifteen shrimp vessels were restricted to working only the extreme western coastal area. This has resulted in a drop in landings, although comparative production figures are not known. The following shrimp landings by the 15 vessels for 1968 were collected by the Federal Fisheries Service. These indicate the seasonal production trend:

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Tons (short)	47	56	64	58	114	56	62	35	27	33	25	27	604

Nigeria has about 500 miles of coastline, and its Continental Shelf is 15 to 35 miles wide. Lagos, capital of this English-speaking country, has 675,000 persons. It is the largest port facility. Private fishing companies own about 2,000 feet of dock space. Cold storage space, fuel, water, ice, and repair facilities are available. State-owned dock facilities are not available, although plans have been prepared to construct a modern, centrally located fisheries terminal. Four additional ports are available: Pt. Harcourt, Calabar, Sapele, and Warri.

The Federal Fisheries Service has about 200 employes working on marine and freshwater (Lake Chad) projects. Three biologists in Lagos have been working exclusively on marine shrimp research. The Fisheries Service has a 70-foot, steel-hulled vessel for biological and oceanographic research. Shore

facilities in Lagos include laboratories, behavior study tanks, a reference collection of local marine fauna, and a library well stocked with current research publications.

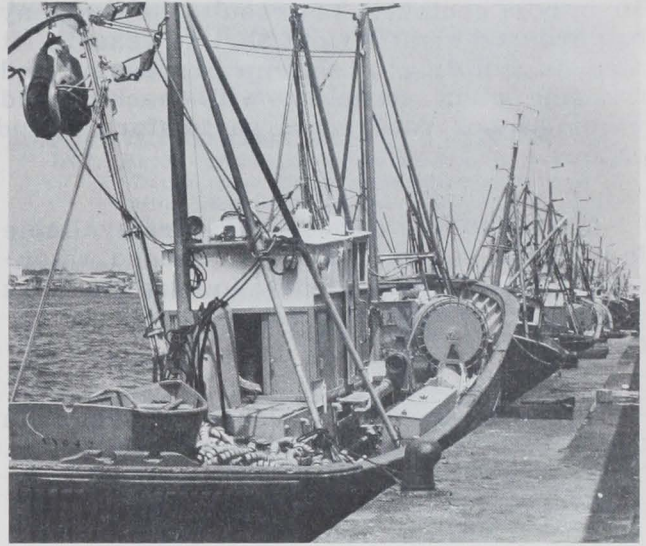


Fig. 5 - Part of the fleet of 42 sardine seine vessels in Abidjan, Ivory Coast. Vessels are licensed and the number strictly controlled by Fisheries Division.

#### CAMEROON

Cameroon, a French-speaking country, received its name from Portuguese explorers who found cameroes (shrimp) schooling abundantly off the coast. Until recently, however, shrimp have not been important in local commercial fisheries. The country has a coastline of 185 miles with a Continental Shelf 15 to 35 miles wide. Douala, the major port, has a population of 190,000.

Five fishing companies operate in Douala; of these, two now process shrimp and are preparing to catch and process shrimp on a larger scale. Several foreign-flag vessels are catching shrimp for one of the companies.

In a trip completed during my visit, one of these vessels, dragging two 37-foot beam trawls, averaged 800 to 1,000 pounds of



shrimp per day. This catch, when graded, comprised two sizes: 15/20 and 40/50 per pound (heads off).

The second company used a 75-foot vessel on a shrimp exploratory survey within the 50-fathom contour. As a result, the company has ordered eight 72-foot shrimp vessels. It also is building a shrimp processing and freezing plant complete with machine and welding shops, radio room, parts storage, and offices.

About 540 feet of dock space are available for fishing vessels in Douala. Unused waterfront space is conveniently located for dock expansion, although dredging would be required.

There is no marine fishery research in Cameroon. Personnel from ORSTOM, Pt. Noire, Congo Brazzaville, have made dragging transects in Cameroonian waters.

### CONCLUSIONS

The estuarine fishery for juvenile shrimp in West Africa indicates that shrimp breed there in substantial quantities. Life cycle studies of *P. duorarum duorarum* in the United States revealed that, when the shrimp reached adult stage, they migrated from estuaries to coastal waters, where they completed their life span. Generally, they stayed within the 50-fathom contour.

Evidence from limited studies in West Africa suggests *P. duorarum notialis* has a similar life cycle. Evidence shows possibility of expanding shrimp fishery to at least double present level, but it is inadequate to determine full development. This limits amount shrimp-fishing companies are willing to invest in relatively sophisticated shrimp catching and processing equipment required to promote export-oriented operations. Some expansion of shrimp fishery can be foreseen, but further developments would be facilitated greatly if more reliable information, based on a comprehensive scientific survey, were available.

It is apparent, too, from biological sampling of research programs in West Africa, and from fishing by Spanish shrimp fleet, that deepwater shrimp also are available. Again, information is lacking on their distribution and availability. Operational costs of offshore fishing generally are greater than those of inshore fishing. Also, operational techniques and gear requirements differ for inshore and offshore fishing. This type of information should be provided to fishing companies interested in the fishery.

To provide this information, exploratory fishing operations will be necessary. Objectives would be to define seasonal availability and distribution of shrimp resources and their potential for commercial use, and to provide estimates of abundance of major species and of their potential annual yield.

Shore facilities, which would be adequate for a thriving shrimp industry, vary considerably from country to country. Docks, shrimp processing plants, ice plants, vessel maintenance shops, and dry docks ultimately will have to be expanded or built in all potential major shrimp-processing centers. Fishing centers such as Dakar, Senegal, and Lagos, Nigeria, are equipped for shrimp processing--but all other major ports will require one or more of the facilities listed above.

Shrimp vessels will have to be built or brought from other areas to make up the required fleet. Most of existing fishing fleet was not designed for shrimping; many are small purse seiners underpowered for dragging operations. The requirements for deepwater shrimp vessels would be rigorous; this type of vessel also would have to be introduced.

Undoubtedly, the potential for development of the shrimp industry in West Africa is tremendous. Its growth will have a significant economic impact on the entire area before the next decade ends. All recent technological advances in the shrimp industry--including harvesting, processing, and merchandising--should be used to fully utilize these latent resources.



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