

Developments in South American Squid Fisheries

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The developments in South American squid fisheries depend on the conjunction of several factors, such as the general situation of the fisheries near the continent, the actual existence of squid resources, and the marketing possibilities of the product.

General Situation of Fisheries in South America

Table 1 shows total yields of each South American coastal country, as well as principal species and squid catches. Total yields of the continent decreased between 1970 and 1977, but

these values only reflect the collapse of the Peruvian anchovy fishery ("anchoveta," *Engraulis ringens*); all the other countries have sustained or increased their catches.

Pacific Coast

Chilean landings stabilized in the last few years with an average of a little more than 1.1 million t/year, and traditional resources seem to be at their maximum rate of exploitation. Catches could be doubled with nontraditional resources; and bathypelagic fish, Antarctic krill, and continental slope re-

sources could also be exploited (Arana et al., 1975). Up to now squids have been only a minor and scarce resource in the Chilean fisheries, recorded as "insignificant amount" in statistics. The commercially exploited species is *Dosidicus gigas* ("jibia," "calamar gigante," Humboldt squid) with a mantle length of up to 1 m and a weight of 35 kg. It is fished mainly in summer-fall along the north and central coasts of Chile, with purse seines or angling; occasionally, their shoals strand on the beach. It is used as bait, fishmeal, and, sometimes, as canned "squids in their ink" (20 t in 1971, Calbuco Port). Between 1963 and 1971 "jibias" landings were as follows:

1963: 2,700 t 1967: 300 t 1971: 124 t
1965: 145 t 1969: 53 t

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Table 1.—South American figures (metric tons) for total fisheries and principal species and squids. Data from FAO (1978). Data of 1978: Argentina (press statements of Government); Brazil (INFOPESCA, 1979b); Uruguay (Instituto Nacional de Pesca, 1979). (E = estimation, F = FAO estimation.)

	Year									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	
ARGENTINA Total	214,800	229,000	238,200	302,100	296,361	229,298	281,727	392,789	480,000	
Argentine hake			102,800	151,400	162,200	109,000	174,906	273,630	330,000	
Argentine anchovy			41,100	34,300	30,400	19,200	20,426	21,770	16,000	
Short-finned squid			1,600	3,900	4,900	4,100	7,493	1,986	55,000	
Common squids			100	200	200	140	128	255	250 E	
BRAZIL Total	526,300	581,800	601,600	703,500	740,322	772,146	707,938	790,000 F	840,000	
Sardinella			159,000	172,300	191,688	138,923	97,255	163,327		
Shrimps			56,800	53,900	57,200	62,470	93,899	93,899 F		
Common squids			400	500	181	397	848	848 F		
CHILE Total	1,209,300	1,505,900	817,500	691,000	1,157,053	929,452	1,406,490	1,285,316		
Chilean pilchard			131,700	187,500	391,053	231,772	355,362	596,656		
Peruvian anchovy			367,900	191,800	389,194	239,847	434,045	15,069		
Hake			66,900	46,500	43,483	32,433	29,639	36,534		
Squids			insig.	insig.	insig.	insig.	insig.	insig.		
COLOMBIA Total	54,500	37,700	110,700	105,300	62,418	66,575	75,107	75,107 F		
Characins (freshwater)			57,400	52,300	22,405	26,158	32,692	32,692 F		
Other freshwater fishes			25,400	20,800	14,829	15,917	18,745	18,745 F		
Pacific seabobs (Peneidea)			1,800	6,100	4,394	2,846	3,342	3,342 F		
Squids			insig.	100	123	100	24	24 F		
ECUADOR Total	91,400	106,700	108,200	153,900	174,400	263,400	315,000	475,500		
Pacific thread herring			55,200	95,000	110,000	175,000	225,000	383,000		
Skipjack tuna			5,500	6,000	8,500	12,000	13,000	15,000		
Marine molluscs			2,700	2,800	3,000	3,000	3,000	3,000		
PERU Total	12,534,900 F	10,528,600	4,725,200	2,328,500	4,144,858	3,447,490	4,343,125	2,529,995		
Chilean pilchard			6,300	132,300	72,605	62,851	174,701	870,899		
Peruvian anchovy			4,447,400	1,513,000	3,583,476	3,078,810	3,863,050	792,106		
Chilean jack mackerel			18,800	42,800	129,211	37,899	54,155	504,552		
Squids			720	300	133	466	1,092	275		
SURINAME Total	3,100 F	3,200	3,600	4,500	4,887	6,093	6,510	6,311		
URUGUAY Total	13,200	14,400	20,600	17,500	16,000	26,333	33,804	48,374	74,223	
Hake			8,500	4,500	1,500	9,847	11,675	22,511	41,323	
White croaker			2,800	2,800	4,000	5,594	9,434	11,920	13,980	
Short-finned squid			200	200	100	520	773	362	2,182	
VENEZUELA Total	126,400	138,900	152,200	162,400	150,085	153,407	145,731	152,234		
Round sardinella			45,400	47,500	22,835	47,608	36,733	35,752		
Ark clams			6,200	9,100	12,178	8,751	11,101	16,287		
Common squids			1,200	1,700	2,208	1,625	1,202	1,937		
SOUTH AMERICA (includes Bolivia and Paraguay)	14,796,000	13,167,000	6,801,000	4,494,000	6,775,000	5,920,000	7,340,000	5,783,000		
World total	71,000,000	71,000,000	67,000,000	68,000,000	71,000,000	71,000,000	75,000,000	74,000,000		

Since 1972, landings were smaller than 11 t/year. Landings averaging 15 t/year of another Chilean squid (*Loligo gahi*) were recorded between 1961 and 1965, but since then the amounts caught have been insignificant (García-Tello, 1965; Hancock, 1969; Nesis, 1970; Instituto de Fomento Pesquero, 1972, 1976).

Peruvian fisheries have been dominated by anchovy up to 1970-71 (11-12 million t/year). Even now, in spite of the reduction of total yields, squid landings are unimportant.

Polish trawlers probably fish "jibias" as by-catch of other resources off Chilean and Peruvian coasts, but no specific information is available (Lipiński, 1973).

Ecuador shows a similar situation for squids, and fishery statistics do not differentiate them from the other mollusks (Villón et al., 1970; Mora et al., 1976, FAO, 1978). 1972 seems to be the exception, when Ecuador's frozen squid exports were about 800 t, and there were 100 t for domestic consumption (Mora et al., 1976).

Squids are also not important in traditional small-scale fisheries in Chile, Ecuador, and Peru (Seminario Regional Sobre Pesca Artesanal, 1976; Nesis, 1970).

Colombian fisheries are dominated by freshwater fish, and here squids are also irrelevant.

Atlantic Coast

Argentinian total yields have been increasing in the last few years, being the goal of the Marine Affairs Secretariat (Secretaría de Intereses Marítimos) to catch 1 million t in 1980. At present the main fishery resource is the hake ("merluza," *Merluccius merluccius hubbsi*), and traditionally the second one has been the anchovy ("anchoíta," *Engraulis anchoita*). Until 1977 squids had little importance; the short-finned squid ("calamar," *Illex argentinus*) was hake's by-catch, and the common squid ("calamarete," *Loligo brasiliensis*) shrimp's and coastal fishery's by-catch. In 1978 the situation changed because some trawlers started to fish only short-finned squid, working at a greater depth than the usual 100-200 m for hake. In 1978, *Illex* took second place in the Argentinian fisheries with 55,000 t; there are

no definite figures for 1979 yet, but it is estimated that landings by the Argentinian fleet that year will reach 100,000 t. There is no available information on the amount fished by foreign ships just off (?) the 200 mile limit. Up to now the Argentinian harbor is Mar del Plata (MP, Fig. 1) and the bulk of the fleet works northward from lat. 40°S, but hake seems to be fished at their maximum potential in this area; due to this problem, in March 1979 fishing was forbidden north of lat. 40°S to ships bigger than 600 m³ hold capacity (INFOPECA, 1979c; press statements of the Argentinian Government). Argentinian fisheries will expand especially on the Patagonian shelf, where hake and squid are also found (Boschi, 1970); because of the characteristics of this area, ships working there must be bigger and the development of suitable ports will be necessary. *Illex argentinus* is a squid of up to 33.5 cm mantle length, which inhabits the shelf and

upper slope between 80 and 800 m depth, and between lat. 35° and 54°S (Castellanos and Menni, 1969; Brunetti¹). Palacio (1977) recently recorded three male *Illex argentinus* from the Brazilian coast, one of them as far north as Rio de Janeiro (RJ, Fig. 1), at 60 m depth. Because of the species habits and the hydrology of the area, it is probable that substantial amounts of this squid reach north of lat. 35°S, deep on the Brazilian continental slope.

Uruguay shares with Argentina a common fishery area in front of Rio de la Plata. In 1974 a Fishery Development Project began, which slowly allowed yields to increase, particularly those of hake. Short-finned squid is captured as by-catch of hake and it is seldom especially looked for by ships. In spite of that, "calamar" yields

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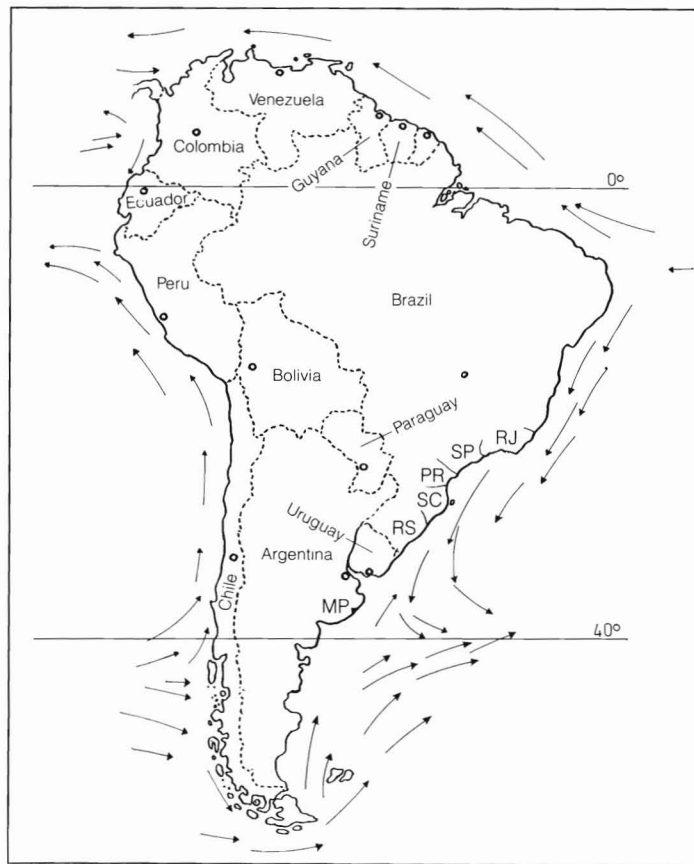


Figure 1.—Map of South America showing areas referred to in the text.

increased a great deal in 1978; it was estimated that they would reach 3,000 t in 1979. There is little local consumption of fresh squid, and the bulk of it is exported frozen to Japan, Spain, Brazil, and other countries.

Brazil finished its third Fishing Development Program in 1979, and a fourth was being projected. Yields increased markedly in the 1960's, but only slowly in the last decade.

The Brazilian coast is divided in four regions (south, southeast, northeast, and north); 80 percent of the industrial fleet works only in the south and southeast. *Sardinella* ("sardinha verdadeira," *Sardinella brasiliensis*) caught between Rio de Janeiro (RJ) and Santa Catarina (SC) is the main resource, but it is at or near its maximum rate of exploitation. The same holds for the shrimp fisheries of this region. Demersal fish are also an important resource on the southern Brazilian shelf, but during summer months—when the subtropical convergence moves southward—these stocks also move southward and catches diminish; these demersal fish are also heavily fished. The traditional lobster fishery at the northeast has already had overfishing problems, and the other resources of the area seem to be poor. The northern region has the biggest available biomass; however, the known resources have low densities and give low returns.

It is estimated that Brazilian yields could reach 1.4 to 1.6 million t/year; this expansion must be based on non-traditional fishing grounds and resources, including squids (Vazzoler, 1975; PDP, 1976; Yesaki et al., 1976; Mencia-Morales, 1977; INFOPECA, 1979b). Squids (called "lulas" in Brazil, *Loligo brasiliensis* and *Doryteuthis pleii* principally) are not very important nowadays, and are caught mainly as by-catch of shrimp fisheries.

Venezuelan yields have been steady in the last few years. Squids (*Loligo pealeii* and *Doryteuthis pleii*) are principally captured as by-catch of shrimp fisheries and are not an important item (Voss, 1971; Griffiths and Simson, 1972) in spite of being abundant and having a good demand in the internal market (Ginés, 1975); they are sold fresh or as canned commodities.

South American Squid Resources

There are no resource evaluations or well based estimates of squids near the continent, and only some indirect and isolated data are available.

Along the Chilean coast, García-Tello (1965) stated that *Dosidicus gigas* is one of the dominant nektonic species of the southeast Pacific area; he does not give reasons for his statement. The Institute of Fisheries Promotion of Chile (IFOP) has been interested in this species (Hancock, 1969); however, it has not conducted any specific fishery survey on it. In this same area other fishery resources have been studied, but the fishing gears used were not suitable for squid and, as several authors state, low squid yields do not necessarily mean low quantities of them (Trujillo, 1972; Yáñez, 1974; Yáñez and Barbieri, 1974; Yáñez et al., 1974; Fernández, 1978).

Nesis (1970) studying the distribution of *D. gigas* off this coast between lat. 10°N and 35°S approximately in August-November 1968, stated that the major concentrations were between lat. 10°N and 18°S. Based on the same cruises, Zuev and Nesis (1971) recorded "vast concentrations" of this squid in the Peru Current. Lipiński (1973) following the above mentioned authors—and probably the experience of Polish trawlers—affirms that "huge quantities of the Humboldt squid (*D. gigas*) occur in the vicinity of Peru and Chile."

Studies on Ecuadorian demersal resources showed that squids (Ommastrephidae) are not important up to 300 m depth, as compared with hake and other fish (Loesch and Cobo, 1972). The comments made for the Chilean coast on the fishing gears used in the exploratory cruises are also valid in this case.

This author did not find more data about the area. Other papers on southeast Pacific squids give no specific information on their stocks (Nesis, 1973; Clarke et al., 1976).

Argentina, together with Germany and Japan, is making a thorough study of its fishery resources, and surely an estimation of the *Illex argentinus* stocks and some population parameters will be available. The results of the research

cruises are still being analyzed (Brunetti, footnote 1).

Uruguay has also made some studies in its waters, but the results are not yet public. The *Illex argentinus* potential yield seems to be high (Lipiński, 1973).

Along the south Brazilian coast, research fishing surveys with trawls caught up to 1.5 t/hour of Loliginidae, but these good catches were scarce (PDP, 1976). Yesaki et al. (1976) suggested squids—together with two demersal fish species—as a choice during summer for the south Brazilian trawler fleet. However, there are very few data available to develop a fishing methodology and to assess the stocks. Studies with trawls and jigs off Sao Paulo (SP) and Santa Catarina (SC) showed almost no results (Sachet et al., 1974; PDP, 1974a, 1974b; Zenger et al., 1974; Agnes and Zenger, 1975). Juanicó (1979), studying Loliginidae between Rio de Janeiro (RJ) and Mar del Plata (MP), found that the two sympatric shelf species (*Loligo brasiliensis* and *Doryteuthis pleii*) seem not to be really mixed in the space, and that each of them would be made up by different populations or stocklets. The virtual presence of fishable quantities of *Illex argentinus* in deep waters off Rio Grande do Sul (RS) has not been studied.

Paiva and Cervigón (1969) put squids in tenth place among the species that could permit the expansion of the northeast Brazilian and Guyana area fisheries; the reasons for this statement are not given.

From Venezuela, there does not seem to be more information than "sometimes squids are very abundant," as it was mentioned before (Ginés, 1975).

South America as a Consumer Market

South America, with a population of about 240 million people, shows a paradoxical situation in which part of the population are malnourished (particularly in proteins), fish resources are abundant, and fish is only little consumed. This characteristic can be extended to the global Latin America (South America, Mexico, and Caribbean countries), where in 1970 "lived

Table 2.—Fish protein as a percentage of total protein consumed in South American coastal countries, 1970. Data from FAO, after May (1978).

Country	Fish protein (%)	Country	Fish protein (%)
Argentina	1.1	Guyana	11.8
Brazil	3.3	Peru	6.7
Chile	5.6	Suriname	18.2
Colombia	2.2	Uruguay	1.2
Ecuador	2.2	Venezuela	5.4

8% of the world population but accounted for only 4% of the world's fish consumption" (May, 1978). Luna-Muñoz (1978) stated that "the deficit of proteins in Latin America has been estimated in about 2 million MT/year, which represents as a whole some 20 million MT of meat." Table 2 shows that, except Suriname and Guyana (countries with small territory and population), fish proteins represented a small fraction of the diet in the South American coastal countries in 1970; this situation probably has not changed since then. Table 3 shows that in 1976 South American coastal countries, except Brazil and Venezuela, exported most of their fish production and did not import this kind of product.

There are several and complex reasons to explain this situation: 1) The bulk of fish production comes from industrial-scale fisheries, whose elaborate products are high-priced in developed countries; this is a strong stimulus to export. Besides, the lower income groups of the population cannot pay international prices. On the other hand, the South American countries urgently need the foreign exchange earnings of these exports. 2) In many places people are not accustomed to eating marine products, and avoid incorporating them into their diets. Often, the lower income communities are the more traditional and conservative in their feeding habits. 3) The countries of the area generally lack suitable marketing systems for sea products. This fact creates problems of low prices to fishermen, high prices to consumers, and discontinuous offering of products, not always of good quality. This marketing problem has been pointed out with emphasis in several countries: Latin America (May, 1978); Argentina

Table 3.—South American figures (1976, in metric tons), by countries, of seven commodities of aquatic animal origin. P = production, I = imports; E = exports; F = FAO estimation; WD = without data. Data from FAO (1978).

		Fish		Crustaceans and mollusks (fresh, frozen, dried, salted)	Fish products & prep.	Crustaceans and mollusks products & prep.	Oils & fats (crude or refined)	Meals, solubles, etc.
		Fresh, chilled, frozen	Dried, salted, smoked					
Argentina	P	169,300	4,400	4,800	23,100	1,800	5,600	21,400
	I	124	41	669	0	3	16	insig.
Brazil	E	96,427	1,655	3,223	739	149	insig.	3,765 F
	P	50,900	34,900	16,300	39,500	1,000	1,400	20,200
Chile	I	57,200	19,396	217	1,480	17	205	250
	E	9,346	4	4,418	722	0	41	132
Colombia	P	4,700	200	6,100	12,700	2,100	35,100	251,100
	I	100	0	0	300	0	0	0
Ecuador	E	3,500	0	3,800	1,100	3,600	20,200	198,800
	P	2,200	11,100	WD	600	WD	WD	1,900
Peru	I	31 F	WD	WD	4,608 F	WD	13,300 F	3,300 F
	E	463 F	WD	4,787 F	insig.	insig.	insig.	insig.
Uruguay	P	14,200	800	4,300	16,300	WD	6,400	42,700
	I	2 F	WD	WD	1 F	WD	6 F	insig.
Venezuela	E	13,442	WD	4,309	11,138	insig.	4,851	30,143
	P	57,700	5,700	1,000	32,400	WD	108,800	856,800
Uruguay	I	insig.	insig.	0	300	0	0	insig.
	E	40,700	1,200	700	9,500	0	2,990	594,100
Venezuela	P	10,600	insig.	700	100	0	100	2,200
	I	41	2	8	197	3	437	insig.
Venezuela	E	10,198	24	688	14	2	insig.	32
	P	WD	6,300 F	4,300 F	21,000 F	WD	WD	7,600 F
Venezuela	I	900 F	1,100 F	100 F	600 F	WD	200 F	8,200 F
	E	2,100 F	200 F	5,800 F	400 F	500 F	WD	WD

(Malaret, 1973); Brazil (Mencía-Morales, 1977; Braga²); Perú (Gheri, 1975); Uruguay (Brotos et al., 1978). The situation has been called to the attention of governments and international organizations. As a good example, the Inter-American Development Bank (BID) established a strategy which supports especially those projects of social and economic transcendence which are generally not very attractive to the private sector; this includes the creation of inter-regional distribution systems and assistance to traditional small-scale fisheries. Up to 1977, BID had supported the preparation of 16 Latin American fishery projects, and given loans of \$83 million; if all these projects are set up, an increase of 31 percent of the present supply of fishery products for human consumption in the area is expected (Luna-Muñoz, 1978).

The future squid marketing in South America may develop within this context. Squid demand certainly will be related to fish demand, and probably the former will be more difficult to incorporate in the popular diet because of

feeding traditions and appearance. Japan greatly increased its squid imports (the quota for the first 6 months of 1979 was 40,000 t) and will reduce by 5 percent the duties for this product from January 1980 on. On the other hand, the Japanese government claims that squid is a luxury product, and that stopping its importation will not affect the population's nutrition (INFOPECA, 1979b, 1979c).

In July 1979, a Japanese Commercial Commission was searching for this mollusk in Argentina and Uruguay; they were mainly interested in top-quality frozen-on-board animals, because Japan is a demanding market in which squids are traditionally eaten raw. The present opening of the Japanese and other markets is a stimulus for export. Prices for the Uruguayan exports of short-finned squid frozen-on-land in 1978-79 averaged US \$700-800/t FOB Montevideo (Instituto Nacional de Pesca, 1979; INFOPECA, 1979a, 1979d); prices for frozen-on-board animals are higher than US\$1,000/t. Brazil and Venezuela had imported some small amounts of squid, but this is an exception among South American countries, where the prices prove to be unsuitable for popular consumption. If South American squid yields overcome the

²Braga, I. B. 1978. Comercialização de pescado. Curso Fomento Pesquero, Instituto Oceanográfico Univ. São Paulo, Brazil, 16 p.

possibilities of exportation and if cheap and nonperishable products could be developed, this situation might change.

Conclusions

At present, the only important squid catches in South America are the Argentinian ones, and to a much less extent those of Uruguay. Estimates of squid potential yields near the continent will be available at short term only on this resource (*Illex argentinus*). Perhaps the south Brazilian trawler fleet could catch squids at short-term, but surely in smaller amounts.

The lack of suitable data on other South American squid stocks makes impossible estimating the feasibility of a future development of this kind of fishery. However, the available information points out the Peru Current "jibias" as a vitally important resource.

At present, South America is not a squid consumer and will hardly be one shortly. It does not seem probable that this continent will become an importer of squid products, even at middle-term.

Note

While this paper was in press, the author was informed about two research programs on squid resources on the Pacific coast³. Ecuador and Peru signed contracts with Japan, which is now making exploratory fishing surveys for squids along their coasts. The first results on distribution and yields will be available by the end of 1980.

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