

RESEARCH ARTICLE

(Open Access)**Fishing activity of small pelagic in Albania: 1948-1990**ROLAND KRISTO¹, FATOS HARIZAJ¹, ADRIAN MACI¹, IDA.G. AURSAND², LEIF GRIMSMO², JERINA KOLITARI¹¹Faculty of Agriculture and Environment, Agricultural University of Tirana, Albania²SINTEF Fisheries and Aquaculture, Brattørkaia 17B, N-7465 Trondheim, Norway**Abstract**

The small pelagic species are important commercial fishes of the Adriatic Sea. In Albania, the fishing activity of Sardines had a key importance still in 1990, as it represented about 70% of total catch. The main fishing method used was purse seine using light attraction that represented about 80% of total catches of sardines and the rest was mid-water pelagic trawl nets towed by two vessels. Albanian catches of sardines reached a maximum value, in 1982-1985 with value from 5,000 to 6,500 tons and maximum at 1984 with 6,596 tons. In 1990, the Sardine fleet consisted of 60 fishing vessels, from which 28 in Vlora, 12 in Durres, 12 in Shengjin and 8 in Saranda.

The number of fishing vessels for bottom trawl fishing was as average 21 and 23 for 1985 and 1989 respectively, with a maximum of 28 fishing vessels. The average of fishing days was about 142 days/year. The production for 1985 was 1899.6 tons and for 1989 was 2324.2 tons.

The number of fishing vessels for mid water pelagic pair trawls was as average 17 and 8 for 1985 and 1989 respectively, with a maximum of 27 and 16 fishing vessels. The production for 1985 was 2230.2 tons and for 1989 was 744.6 tons.

The number of fishing vessels with purse seines with light attraction was as average 34 and 37 for 1985 and 1989 respectively, with a maximum of 38 and 45 fishing vessels. The average of fishing days was about 137 days/year. The production for 1985 and 1989 was 3319.2 and 2919.8 tons respectively.

The number of coastal fishing vessels was as average 13 and 15 for 1985 and 1989 respectively, with a maximum of 14 and 19 fishing vessels. The average of fishing days was about 109 days/year. The production for 1985 and 1989 was 166.7 and 188.9 tons respectively.

Keywords: *small pelagic fishery, purse seine, fishing fleet, historical data.*

1. Introduction

The small pelagic fisheries are very important in the Adriatic fishery (in particular, anchovy and sardine) both for economic reasons (total value of catches) and for social reasons (number of fishermen involved). They represent about 85% of the Italian small pelagic catches, 85% of the Croatian total catches, and a considerable percentage of the catches of Slovenia (2). In Albania, this activity is not developed in such a degree, due to a list of reasons connected with the changes of economic structure of the country and the development of fisheries sector. Since the 1990s, the small pelagic fishery has drastically regressed because of the socio-economic changes, which took place in the country and because of the development of the demersal fishery (5).

Another reason for decrease is the closure of sardines processing factories in Albania, due to the old technology used and the loss of traditional markets in Eastern Europe. The collapse of the Albanian processing industry are also caused by the relatively high production costs of canned sardines produced by Albanian factories and simultaneous changes in these markets towards more valuable species such as shrimps, hake, red mullets etc.

The small pelagic fisheries is of various importance for the different Adriatic countries. The economically most important shared stocks listed are: anchovy (*Engraulis encrasicolus*), sardine (*Sardina pilchardus*), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*), and sardinella (*Sardinella aurita*). (9). During the last 60 years, the fisheries have developed in differently on the Eastern and the

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Western side of the Adriatic Sea, both in the used fishing techniques and regarding the most commercially important species caught. On the western side, the Italian Adriatic part, the most important species has been anchovy, while on the eastern part, Slovenia, Croatia, Montenegro and Albania, the main species was sardines. (2). Accordingly in the eastern part several processing factories of sardines were built, four of them located in Albania. In Albania, out of the total sardine caught, 17.7% were mainly sold to the national market as fresh fish, 72.1% was sent to the processing factories for further processing, mainly canned sardines destined for both national and international markets. The remaining 10.2 %, mainly represented by undersize fish, was going to production of fishmeal.

The scope of this paper is that by analysing the data of small pelagic fisheries activity, landings, fishing methods as well as the importance that this sector has been in the past in Albania, may suggest to managers a greater attention to support the development of this activity. The drastic reduction of the fishing fleet targeting small pelagic since 1990, is not related to stock collapse or excessive fishing capacity. Currently, Albanian bottom fisheries is the most important fishing activity and fishing effort is too high. A diversification of fishing activities in terms of species that are less exploited may be an appropriate way for a sustainable fishery development in Albania, in order to increase revenue and fishery sector employment, mainly in the processing of small pelagics products.

2. Material and Methods

In the preparation of this paper, historical unpublished data on the development of fishing activity in Albania are used. This data was elaborated, categorizing them by ports, years, by fishing activities and by species. On this bases, the data was elaborated putting them in summary tables and graphically, for reaching the conclusions of this paper.

Before the '90s, the data on the development of fishing activity were collected on a routinely basis, for each port, fishing vessels and fishing activity. These data were archived in paper form at the Directorate of Fisheries and the Fisheries Research Institute in Durres. Unfortunately, there was no existing procedure for preservation and use of the data and a significant part of them were lost. Through the framework of FAO Adriamed Project, the restoration and digitalization of the available data on paper was

performed. In addition, an effort was made to put the remaining data in electronic format thus avoiding any possible future lost. Those data was putted only in electronic format without any classification or further elaboration. We have to do with written records of all fishing activities in Albania, of about 9000 pages, which are digitalized. Some data are not complete, missing data of some years, months or sometimes data from a fishing port. In this paper, we used only the data that are complete and only them that are connected with the purpose of this study. Although there is a lack of some data, we are at the opinion that the results and conclusions are not affected. This is connected with the fact that in the period in question, prices were unchanged for gasoil, fish, labour and maintenance costs as well as fishermen salaries. Market and market policies were uniform and in this context, the distribution of fish in the market, factory or other destinations was the same for many years.

These data were analysed with the support of the SEAMED Project.

3. Results and Discussion

The Albanian fishing fleet According to EAC, (Experts Agribusiness Council), "History of the Albanian Agriculture and Agroindustry" (6), the first professional fishing vessels arrived in Albania in the years 1945-1946. The first registered fishing of sardines in Albania was recorded in 1948.

During 1951-1952 three wood fishing vessels with 140 HP arrived in the country. At the same time Durres shipyard began building new fishing vessels for sardines with 80 Hp. Furthermore, 5-6 boats were received from the Albanian Navy and six vessels were bought in Italy. These 30 vessels were representing the Albanian fishing fleet in 1960.

In the '80, more effort was put into increasing the number of fishing vessels. The goal was to increase the engine capacity of the old trawler fleet from 40 HP to 400-578 HP and to construct new fishing vessels for sardines with 300 HP. In total was constructed 97 fishing vessels from which: 20 vessels model 2K - 400, 30 meters length with 400 HP, 24 fishing vessels model 2K - 408, 30 meters length with 578 HP, 26 fishing vessels model KP - 300, 25 length with 300 HP, 22 vessels for artisanal fisheries 14 meters length with 140 HP. Was constructed too other 5 fishing vessels as experimental vessels. (Data from personal communication with former chief engineer of State Enterprise Shipyard).

The sardine fisheries with light attraction and mid-water trawler had a great development because of lower labour costs compared to bottom trawl fisheries and high quantity of fish. Before the '90, economic policies required large quantities of fish at lower prices to ensure supply of fish, regardless of quality. In this context, small pelagic fisheries as well as aquaculture production of the cyprinids [grass carp (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys molitrix*), silver carp (*Aristichthys nobilis*), common carp (*Cyprinus carpio*) and bream carp (*Abrams brama*)], were supported. In addition around 30 centres for the production of fingerlings were created (with annual production of about 35 million pieces/year, data from Fisheries Directorate) for restocking programmes in agricultural dam, natural and artificial lakes, etc. The retail market prices for fishery products for both small pelagic and demersal fish were similar; accordingly, fishing activities were oriented towards species that could have a higher market price. Exports of fresh fish products was not existent, and the retail price was programmed and did not reflected the real market value. The only product exported was canned sardines, mainly for eastern Adriatic countries. The Albanian economy was closed to foreign market and based on the principle of meeting the needs of domestic market with local production. In 1990, the Sardine fleet consisted of 60 fishing vessels, from which 28 were registered in the fishing

port of Vlora, 12 in Durres, 12 in Shengjin and 8 in Saranda.

Today according from Albanian Fishing Fleet Register of 2013, the sardine fleet consists of only 7 fishing vessels, from which 5 are multipurpose using both bottom trawl and mid-water pelagic trawl nets, and the two others vessels have light attraction purse seines. Table 1 shown the distribution of vessels by vessel type for 2013.

Table 1. Distribution of vessels by vessel type for 2013, (Source Albanian Fleet Register 2013, Fisheries Directorate).

Vessel Type	Number	%
Trawlers	207	37.43%
Artisanal fisheries	339	61.30%
Purse seiners	2	0.36%
Multipurpose vessels	5	0.90%

The Albanian processing industry

Four factories for canned sardines was constructed in Vlora in 1956, Saranda in 1976, in Shengjin in 1978 and in Durres in 1988. The biggest was Vlora factory, while the others were built during the years as catches increased.

In Figure 1, the Sardines production from 1950 until now are shown.

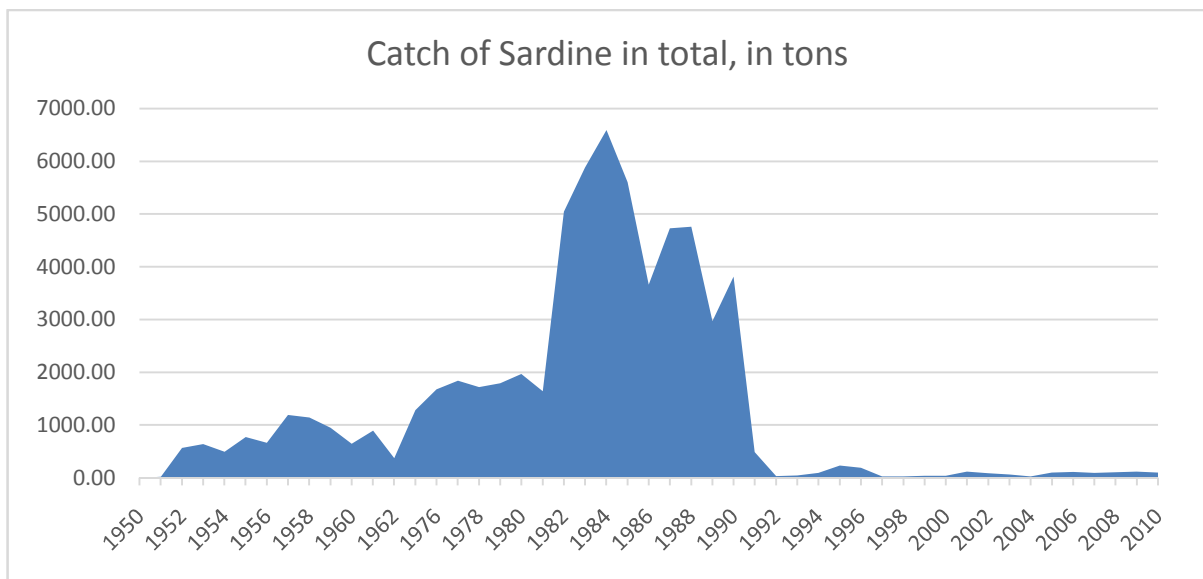


Figure 1. Historical data from Fisheries Directorate.

Following the trend of sardine production, the processing of canned sardines increased from 1950s until early 1990s mainly for export. About 70% of total catch was destined for processing industry.

Shengjin	89.15%	4.39%	6.47%
Saranda	72.92%	20.66%	6.42%
Total	72.10%	17.72%	10.19%

In the table below is shown the distribution of catches of year 1985:

Table 2. Catches destination (in percentage) in 1985.

Historical data from Fisheries Directorate.

1985	Processing	Market	Fishmeal
Vlora	82.58%	6.19%	11.23%
Durres	53.52%	34.45%	12.03%

The Albanian fisheries of sardines.

Of the whole small pelagic fisheries production (Anchovy - *Engraulis encrasicolus*, L. and Sardine – *Sardina pilchardus*, Walb), the most important species were sardines which represented about 70 % of the total catch in Albania (Figure 2).

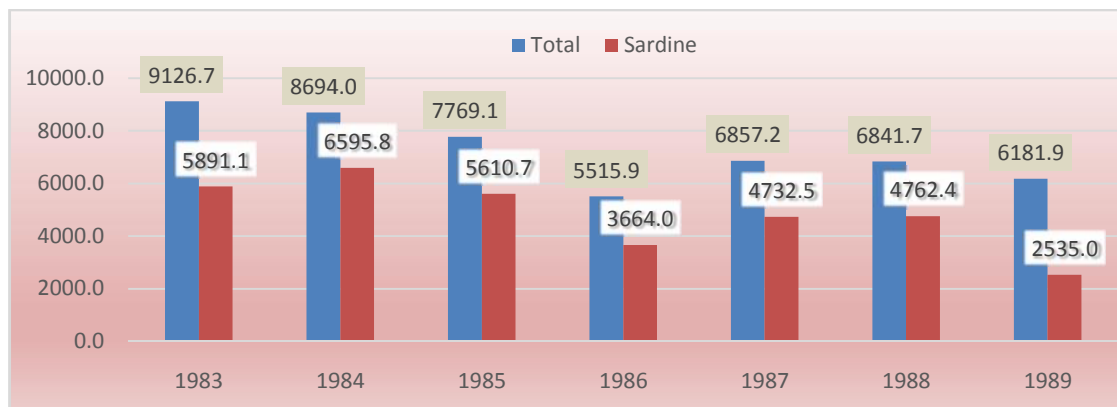


Figure 2. Sardines catch and total marine catch in metric ton for the period 1983-1989.

In 1983, total sea production was about 9100 tons, while sardines constitute 64.55%. In 1984 the production of trawl fishery decreased by about 31% compared to 1983 and sardines catches increased by 12%. In 1984, Sardines constitute 75.87% of the total marine catches. Although the trend of total catches and sardines also, has been decreasing in the years (1985-1989) following a reduced capacity of the fishing fleet (due to technical problems) to target small pelagic, the sardine catches represented in this period about 70% of the total capture marine production in Albania. To solve this problem, in this period, start a program of construction of new fishing

boats at Durres shipyard. The fishing boats had become too old with big maintenance problems. As mentioned before, the fishing fleet was made up of boats built in the years 40-50 or older. The sardine fisheries was performed all year round. During 1945 to 1950, the largest amount of catches took place in the second and fourth quarter of the year. After the year 1956, a uniform distribution of catches of sardines throughout the year were fished quarterly with about 25-35% of the total quantities were fished quarterly.

A summary is shown in Figure 3.

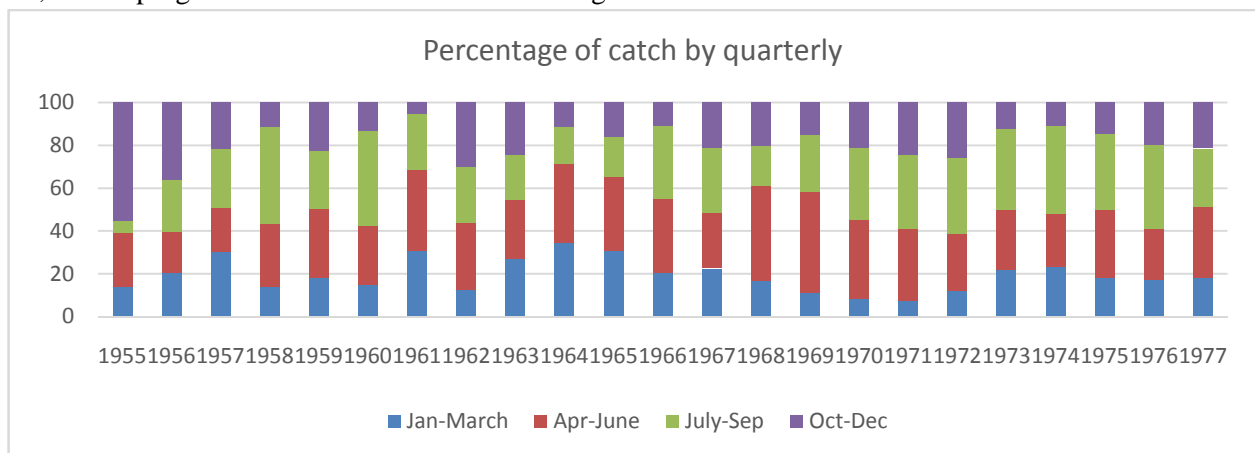


Figure 3. Percentage of quarterly catches of sardines from 1955 to 1977 (Source: 5)

The sardine fisheries in the Adriatic Sea

Albanian catches of sardines reached a maximum in the period of 1982-1985 with volumes from 5,000 to 6,500 tons. The largest volume caught per year was in 1984 with 6,596 tons landed. The Italian Adriatic catches of sardines reached a maximum in 1981 when 59,000 tons were landed. The Italian catches decreased the successive years. Slovenian sardine catches were 6,600 tons in 1983. Croatian sardine catches reached a maximum in 1983 (44,793 tons) and in 1986 (41,415 tons). Significant decreases in catches were noted after 1990. (3). Currently, according to (3), Adriatic sardines catches are about 30,000 tons in total for all countries. In Albania, a high percentage of sardine catches was directed to the fishery industry and for fishmeal.

The anchovy fisheries in the Adriatic Sea

In Albania, anchovy was not a commercially important species because there are no processing plants specialized in processing this species. Anchovies generally was reported together with sardines and was used mainly for fishmeal. There was no directed fishing for anchovies. The anchovies

were mainly as by catch in the sardine fishery like other specie swordfish, Bluefin tuna etc. In 1985, reported catches was 103.9 tonnes. Anchovy catches in Italy reached a maximum value in 1980 (60,000 tonnes) followed by a quick decay in successive years until the crash of the 1987 (3,000 tonnes). Anchovy catches in Croatia reached the maximum value in 1985 (4,300 tonnes), followed by a period of decreases. (2) In the last few years, anchovy population showed a recovery. Present catches of anchovies in the Adriatic are about 22,000 tons. (1)

The use of fishing gear in the Albanian fisheries of small pelagic species in the Adriatic Sea

Fishing for small pelagic was performed with two kinds of fishing gear: (a) Mid-water pelagic trawl nets towed by two vessels and (b) light attraction purse seines. Mid-water pelagic trawlers nets vessels generally fish only by daylight, and land their catches every evening: the fishing trips each last about 11-15 hours. Figure 4 shows a typical mid-water pelagic pair trawl net.

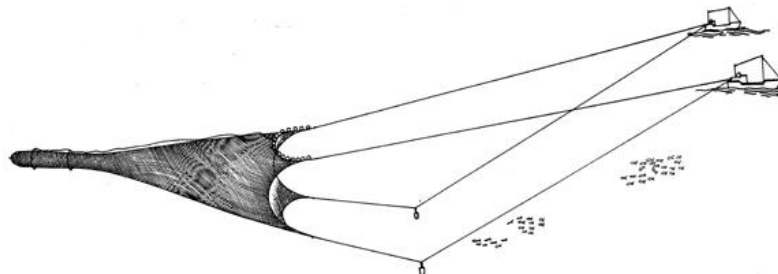


Figure 4. Mid water, pelagic pair trawl net (by FAO 2001-2013) (4)

Purse seine using light attraction fish at night in good weather, attracting fish with lights. The fishing activities start at sunset, when the fish move towards the surface, and end after dawn; thus, a trip lasts up to 16-18 hours, including sailing time. The same fishing

gear catch anchovies (*E. encrasicolus*, L.), sardines (*S. pilchardus*, Walb.), and to a lesser extent other pelagic fish such as sprats (*S. sprattus*, L.), horse mackerels (*Trachurus* spp.), and mackerels (*Scomber* spp.). A typical purse seine is shown in Figure 5.

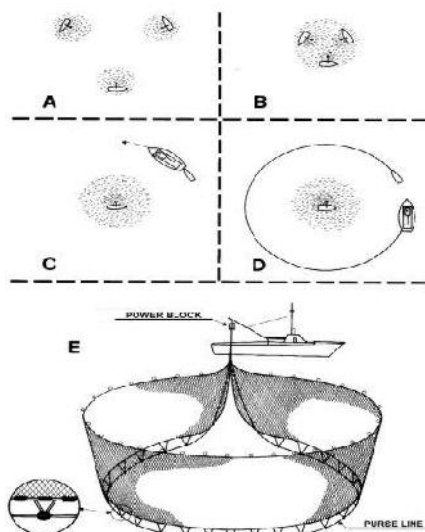


Figure 5. Purse seine using light attraction. (By FAO 2001-2013) (4)

Purse seine using light attraction was the most important fishing activities in the four fishing ports of Albania in the studied period representing between 50% and 85 % of total catches. Figure 8 is shown the

weight of catches with purse seine using light attraction in comparison of total catches of sardines by fishing ports and in percentage for 1984 and 1985.

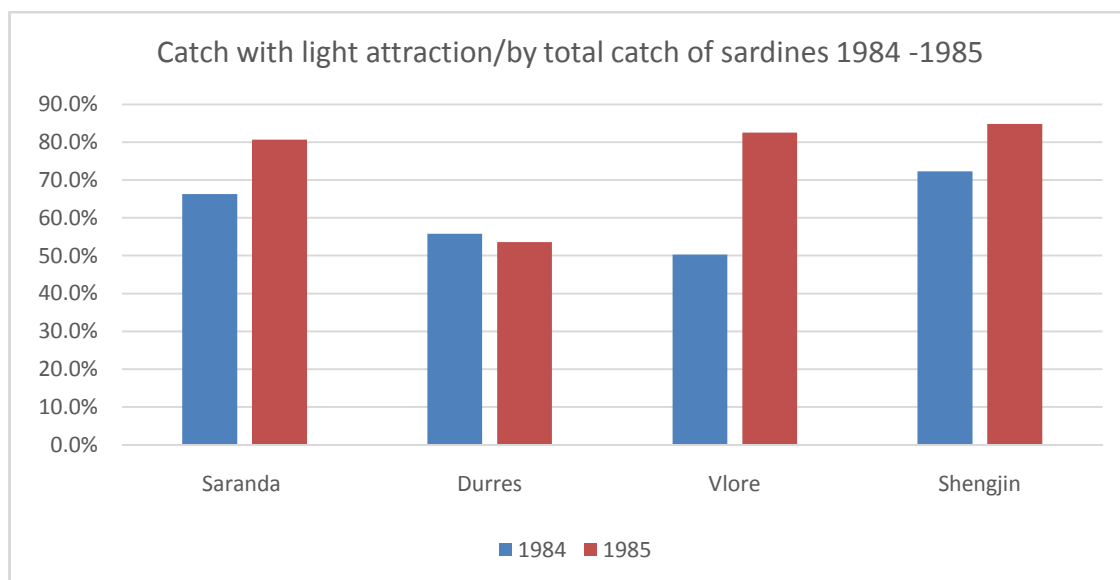


Figure 6. Comparison of percentages of catches with light attraction versus total catch of sardines, (1984 1985).

By use of artificial light for capture, sardine of different ages and sizes are collected. The young sardines are drawn closer to the light, while older sardines stay in the depth. In the illuminated area other species are also collected. While sardines are collected in the illuminated field, other species are attracted by the concentration of zooplankton, like mackerels (*Scomber* spp.) and horse mackerel (*Trachurus* spp.). The accumulated mass of sardines in the light is always greater than of mackerel and horse mackerel, but during the spring and summer their concentration can constitute up to 10-15% of the total catches.

The number of fishing vessels for bottom trawler was as average 21 for 1985 and 23 for 1989, with a maximum of 28 fishing vessels. The average of fishing days was about 142 days/year. The production for 1985 was 1899.6 tons and for 1989 was 2324.2 tons in 1989. In 1985, catch from bottom fishery was as average 24.94 % of total catches and in 1989 was 37.62%.

The number of fishing vessels for mid water pelagic pair trawlers was as average 17 for 1985 and 8 for 1989, with a maximum of 27 and 16 fishing vessels. The production for 1985 was 2230.0 tons and for 1989 was 744.54 tons. In 1985, catch from midwater

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pelagic pair trawls fishery was as average 29.28 % of total catches and in 1989 was 12.05 %.

The number of fishing vessels with purse seines with light attraction was as average 34 for 1985, and 37 for 1989, with a maximum of 38 and 45 fishing vessels. The average of fishing days was about 137 days/year. The production for 1985 was 1899.6 tons and for 1989 was 2324.2 tons. In 1985, catch from purse seines fishery was as average 43.58 % of total catches and in 1989 was 47.27 %.

The number of coastal fishing vessels was as average 13 for 1985 and 15 for 1989, with a maximum of 14 and 19 fishing vessels. The average of fishing days was about 109 days/year. The production for 1985 was 1899.6 tons and for 1989 was 2324.2 tons. In 1985, catch from coastal fishery was as average 2.19 % of total catches and in 1989 was 3.06 %.

Table 3 and Table 4 show the catches by fishing method and number of fishing vessels by month and by fishing method.

Table 3: Catch by fishing method 1985

Month	Bottom			Mid water pelagic pair trawls			Purse seines with light attraction			Coastal			Total
	No vessels	Catch MT	% of total	No vessels	Catch MT	% of total	No vessels	Catch MT	% of total	No vessels	Catch MT	% of total	
January	15	89.21	21.42	27	236.45	56.76	26	83.35	20.01	13	7.55	1.81	416.55
February	18	151.72	25.86	25	302.26	51.52	30	124.73	21.26	11	7.95	1.36	586.66
March	20	225.95	27.97	22	315.35	39.04	33	257.51	31.88	9	8.95	1.11	807.76
April	28	177.15	33.99	16	102.37	19.64	32	225.58	43.29	14	16.03	3.08	521.13
May	24	178.95	27.63	14	83.82	12.94	36	358.72	55.39	14	26.18	4.04	647.67
June	27	125.16	48.45	9	32.84	12.71	34	85.90	33.25	14	14.45	5.59	258.35
July	31	166.79	40.87	3	14.43	3.54	38	213.48	52.32	13	13.37	3.28	408.07
August	25	179.29	35.92	8	42.12	8.44	37	264.84	53.06	11	12.92	2.59	499.16
September	22	200.64	34.23	15	94.52	16.13	36	277.52	47.35	12	13.46	2.30	586.13
October	21	147.12	23.87	18	169.62	27.52	37	288.91	46.88	13	10.69	1.73	616.33
November	12	75.12	13.93	20	233.73	43.33	36	217.38	40.30	14	13.16	2.44	539.39
December	13	182.52	10.56	25	602.70	34.87	35	921.31	53.30	14	22.00	1.27	1728.53
Total	21 average	1899.60	24.94	17 average	2230.20	29.28	34 average	3319.22	43.58	13 average	166.70	2.19	7615.72

Table 4: Catch by fishing method 1989

Month	Bottom			Midwater pelagic pair trawls			Purse seines with light attraction			Coastal			Total
	No vessels	Catch MT	%	No vessels	Catch MT	%	No vessels	Catch MT	%	No vessels	Catch MT	%	
January	25	191.11	55.62	10	68.16	19.84	30	77.61	22.59	13	6.71	1.95	343.58
February	19	181.90	55.58	6	48.71	14.88	27	88.85	27.15	14	7.84	2.40	327.30
March	28	242.08	53.45	6	35.16	7.76	39	164.45	36.31	14	11.22	2.48	452.92
April	26	137.05	32.93	15	48.35	11.62	39	224.08	53.84	12	6.69	1.61	416.16
May	21	133.75	31.57	13	85.29	20.13	43	193.95	45.79	11	10.61	2.50	423.60
June	28	271.01	61.95	3	14.47	3.31	39	135.08	30.88	15	16.92	3.87	437.47
July	27	191.41	52.45	3	13.72	3.76	45	146.47	40.14	15	13.30	3.65	364.90
August	25	228.46	33.13	5	27.44	3.98	42	415.29	60.23	16	18.33	2.66	689.52
September	24	244.11	22.92	5	48.65	4.57	43	749.62	70.39	19	22.53	2.12	1064.90
October	17	160.31	23.49	9	76.33	11.18	36	420.74	61.65	15	25.11	3.68	682.49
November	21	169.89	34.61	9	121.95	24.85	34	176.91	36.05	15	22.04	4.49	490.79
December	20	173.14	35.78	11	156.32	32.31	29	126.77	26.20	15	27.61	5.71	483.84
Total	23 aver.	2324.20	37.62	8 aver.	744.54	12.05	37 aver.	2919.84	47.27	15 aver.	188.90	3.06	6177.48

The most important fishing fleet was concentrated in Vlora, which recorded the main catches of sardines.

Energy consumption versus fishing gear and season.

The Italian fishing fleet for small pelagic is dominated by midwater pelagic pair trawls, which fish only by day and land their catches in the evening. It was introduced in the 1950s but did not begin to replace purse seines with light attraction until after the mid-1960. (1) In Albania purse seines with light attraction was the main fishing method until 1990, with 37 fishing vessels as average in 1989. The mid water pelagic pair trawls fishing method has an

average of 17 fishing vessels in 1985 reducing at eight in 1989. (Actually, in Albania, only two fishing vessels use purse seines with light attraction, one in Vlora and another one in Shëngjini). The main reason of this tendency was the relatively low operational costs of purse seines with light attraction. The cost of sardines catch with purse seines with light attraction was 0.8-0.9 liter of fuel/ 1 kg fish. In this cost is comprised the cost of gasoline for Petromax lamps. The cost of mid water pelagic pair trawls fishing method (in 1983) was higher as shown in Table 3.

Table 5: Fuel consumption versus fishing gear and season.

Production kg	Engine Fuel consumption (liter)	Oil consumption(l iter)	Fuel consumption per catch (liter/kg fish	Fishing vessels name	Period
22600	55120	25	2.315	D.Milaqi	quarter III
22600	55120	9	2.438	V. Mici	
127400	159098	6.9	1.262	D.Milaqi	nine month period
127400	156628	3.8	1.229	V. Mici	

The value of fish (wholesale price) was 2 ALL as fresh fish and 3 ALL for processing. At detail, the price of sardines as fresh fish was 2,5-3.5 ALL, in relation to the quality. The price of fuel for fisheries was 0.9 ALL/liter. The official exchange rate 1 USD = 7 ALL. The exchange rate was fixed and kept low by the government and did not express the real value of exchange. Generally, the fish price was lower than cost, for all fisheries.

4. Conclusions

Albania has suffered a drastic reduction of the fishing fleet targeting small pelagic since 1990, (capture of small pelagics dropped of about 100 ton/year in the last 10 years) due to causes not related to stock collapse or excessive fishing capacity. As noted by Marano, in the Adriatic Sea, sardines represent the dominant species with 430000 – 470000 t biomass, while anchovies show more marked fluctuations with a minimum of 60000 t in 1987 and 1988 and a maximum of 300000 t in 1995 – 1996. It is estimated that in the North Adriatic 60% of all Adriatic pelagic biomass is present, in the South Adriatic only 15% of anchovy and sardine biomass can be found (7). Small pelagic catch reduction was

result of closure of processing industry, loss of traditional markets and the changes of fleet structure that was orientated versus bottom trawler. Considering the country natural resources, (including 470 km of coastline), and the historic capture production (in the '80s average landing exceeded 6000 ton per year) the small pelagics can represent an important economic resource for Albania. Considering also the long experience accrued by the country and the establishment of processing industry in Albania, the modernization of the Albanian small pelagic fleet could be successfully put in place. However, such a modernisation should be included in a framework of sustainable fisheries management it is committed to strengthen and modernize the small pelagic fleet.

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