

Sicilian dolphinfish (*Coryphaena hippurus*) fishery*

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SUMMARY: In 1996, a census was taken of the Sicilian fisheries that engage in dolphinfish (*Coryphaena hippurus* L. 1758) fishing. Two different surveys were conducted; data on fishing boats were obtained from the Naval Registers and from interviewing boat owners on the wharf. The area sampled was divided into 3 zones and 6 strata. 205 boats were recorded in the eastern zone (Tyrrhenian and Ionian seas), 57 boats located in 4 different strata were recorded in the western zone. Fishing activities in the Ionian area begin in early August and end in December. In all other areas of Sicily, dolphinfish fishing begins in early September and continues until December. A census was also taken of the equipment used by the various boats for this activity in the different areas. The surveys showed that FADs are the most commonly employed method for dolphinfish fishing. The geographical distribution, number and characteristics were recorded for each area surveyed. The catches for the 1996 fishing season distributed for strata and zone are reported.

Key words: Sicilian fisheries, fleet structure, FADs, fishing season, *Coryphaena hippurus*, central Mediterranean.

INTRODUCTION

At the end of summer and during the autumn (August-December), along the eastern and western coasts of Sicily, dolphinfish juveniles are caught by a large number of vessels using surrounding-nets to capture fish under the Fish Attracting Devices (FADs) typical of the Mediterranean. They are called "cannizzi", or floating drifting objects (Bono *et al.*, 1998; Morales Nin *et al.*, 1995; Potoschi and Sturiale, 1996). In Malta, in Tunisia and in the Balearic islands this activity is practised in the same period and with similar procedures and equipment (Galea, 1961; Lozano Cabo, 1961; Massutí and

Morales Nin, 1991; Zaouali, 1997). There is no documented information for other Mediterranean areas. The adult dolphinfish (age 1+) is also by-catch in albacore and swordfish fisheries (De Metrio *et al.*, 1997). The aim of this work is to contribute to the knowledge of the fleet, the equipment and the fishing techniques, and also to estimate the fishing yields in the 1996 fishing season in Sicily and its islands.

MATERIAL AND METHODS

At the beginning of the 1996 fishing season, a frame survey was carried out through a census in all ports of Sicily, Egadi Islands, Pelagie Islands and

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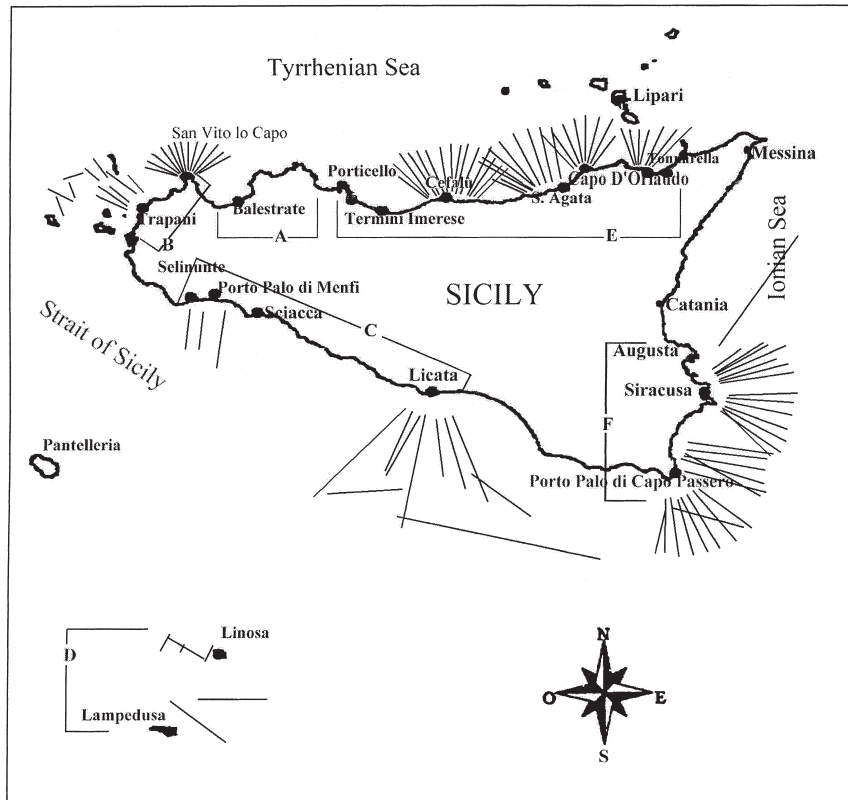


FIG. 1. – Geographical position of “cannizzi” and dolphinfish fisheries in Sicily Island.

Eolie Islands. Thus, all the fishing boats which fish dolphinfish by means of “cannizzi” and purse-seine were identified. All captains of the boats were interviewed for information on the structural features of the boats, nets and FADs; in addition, information was obtained on the number and the geographical position of all the FADs placed in 1996. On the basis of this information the study area, consisting of the fishing areas of the aforementioned boats, was divided into the following strata (Fig. 1):

1. Stratum A - **Balestrate**;
2. Stratum B - **San Vito lo Capo, Trapani**;
3. Stratum C - **Selinunte, Porto Palo di Menfi, Licata**;
4. Stratum D - **Lampedusa, Linosa**;
5. Stratum E - **Tonnarella, Falcone, Capo D’Orlando, S. Agata Militello, Cefalù, Termini Imerese, Porticello, Lipari**;
6. Stratum F - **Augusta, Siracusa, Porto Palo-Marzamemi di Capo Passero**.

In each of these strata at least one sample port (in bold type) was randomly selected, with the probability of selection proportional to the number of fishing boats of the port (Cochran, 1977; Bazigos *et al.*, 1984; Andreoli *et al.*, 1995). In some sample ports of strata A, B, C, E and F the catch-effort data were

acquired on a time and space sampling basis by interviewing fishermen at landing. In practice interviews were conducted from the start to the end of the fishing season three times a week (Monday, Wednesday and Friday) on landing, with as many fishermen as possible. In stratum D (Lampedusa and Linosa) and in the sample ports of S. Agata Militello (stratum E) and Siracusa (stratum F) a time and space census system was adopted which enabled the catches of all the boats on all fishing days to be recorded.

RESULTS

Fleet characteristics

Table 1 shows the number of boats per port and their characteristics for west (Strata: A,B,C,D) and east (Strata: E,F) Sicily. A substantial difference can be seen between the two fleets. This difference is mainly in the overall length and the gross tonnage. The boats of west Sicily have an average overall length of 9.85 m and a gross tonnage of 5.76 t, while those of east Sicily have an average length of 11.41 m and an average gross tonnage of 10.42 t. The low

TABLE 1. – Structure of the dolphinfish fishing fleet by port and by sample stratum on the west and east of Sicily for 1996.

FISHERIES	N° Boats	Overall length (m) average	Overall length (m) SD on average	Gross tonnage Total (tons)	Engine Power Total Hp
STRATUM A - Golfo di Castellammare					
Balestrate	8	5.70	0.66	15.25	163.00
Total Stratum	8	5.70	0.66	15.25	163.00
STRATUM B - Capo San Vito - Capo Feto					
San V. Lo Capo	15	9.50	1.93	96.87	984.00
Trapani	14	11.23	2.36	110.80	2356.00
Total Stratum	29	10.33	2.14	207.67	3340.00
STRATUM C - Capo Feto - Punta Braccetto					
Selinunte	2	7.15	0.45	5.30	49.00
Porto Palo di Menfi	1	9.20	-	5.40	24.00
Licata	9	10.10	0.89	50.14	188.40
Total Stratum	12	9.53	0.91	66.14	261.40
STRATUM D - Pelagie Islands					
Lampedusa	2	28.00	1.00	28.31	373.00
Linosa	6	7.70	1.35	11.22	286.00
Total Stratum	8	12.77	1.26	39.53	659.00
Total West Area	57	9.85	3.22	328.59	4423.40
STRATUM E - Tyrrhenian Sea					
Tonnarella	9	10.72	1.74	62.61	877
Falcone	3	10.70	1.64	21.30	259
Capo d'Orlando	4	7.00	1.04	11.60	130
S. Agata Militello	17	10.70	3.10	168.90	1715
Cefalù	15	10.70	2.05	102.27	1538
Termini Imerese	11	12.68	3.35	138.31	1597
Porticello	51	12.21	1.56	581.00	7165
Lipari	7	13.94	3.06	134.52	1583
Total Stratum E	117	11.08	2.19	1220.51	14684
STRATUM F - Ionian Sea					
Augusta	3	9.83	0.76	28.40	209
Siracusa	27	14.81	2.97	493.98	5228
Portopalo Marz.	21	12.23	1.85	205.60	2807
Total Stratum F	51	12.29	1.86	727.98	8244
Total East Area	168	11.41	2.10	1948.49	23108

average size of the boats of west Sicily is due to some small boats which fish near the coast. The fleet of east Sicily is represented by larger boats that only perform this type of fishing for a limited period of the year. In other periods they engage in fishing activities in which the length, tonnage and engine power have considerable importance, such as long-line and drifting-net fishing for swordfish, and purse-seining for small pelagics. In west Sicily the smaller fishing boats are engaged in fishing dolphinfish from September to December. During the other months they fish using “trammel-net”, bottom long-lines or gill-nets and drift-gill-nets for small and medium-sized pelagics. The larger fishing boats are generally engaged from the end of fishing dolphinfish to March in fishing with hand lines or bottom long-lines, and from March to August in fishing sword fish with long-lines or small and medium-sized pelagics with purse-seine.

FADs and FAD deployment

Figure 1 shows the geographical arrangement of the “cannizzi” per port. Lines were drawn on the basis of knowledge of the coordinates of the two outer FADs, the total number of FADs and the average distance between the FADs. Each line represents the fishing area by single fisherman.

The FADs were very similar in shape for the two areas, and are similar to the “kannizzati” used in Malta (Fig. 2a). There are differences in the composition of the ballast and floats between different areas. The FADs are constructed with a number of empty plastic bottles tied together to form a single float, which is tied in turn to 2 palm branches. The anchor line exits from this floating unit. At about 1.5 metres in depth, 4 more palm branches are tied to this anchor line about 1.5 metres apart from each other. The entire FAD is anchored to an anchor typ-

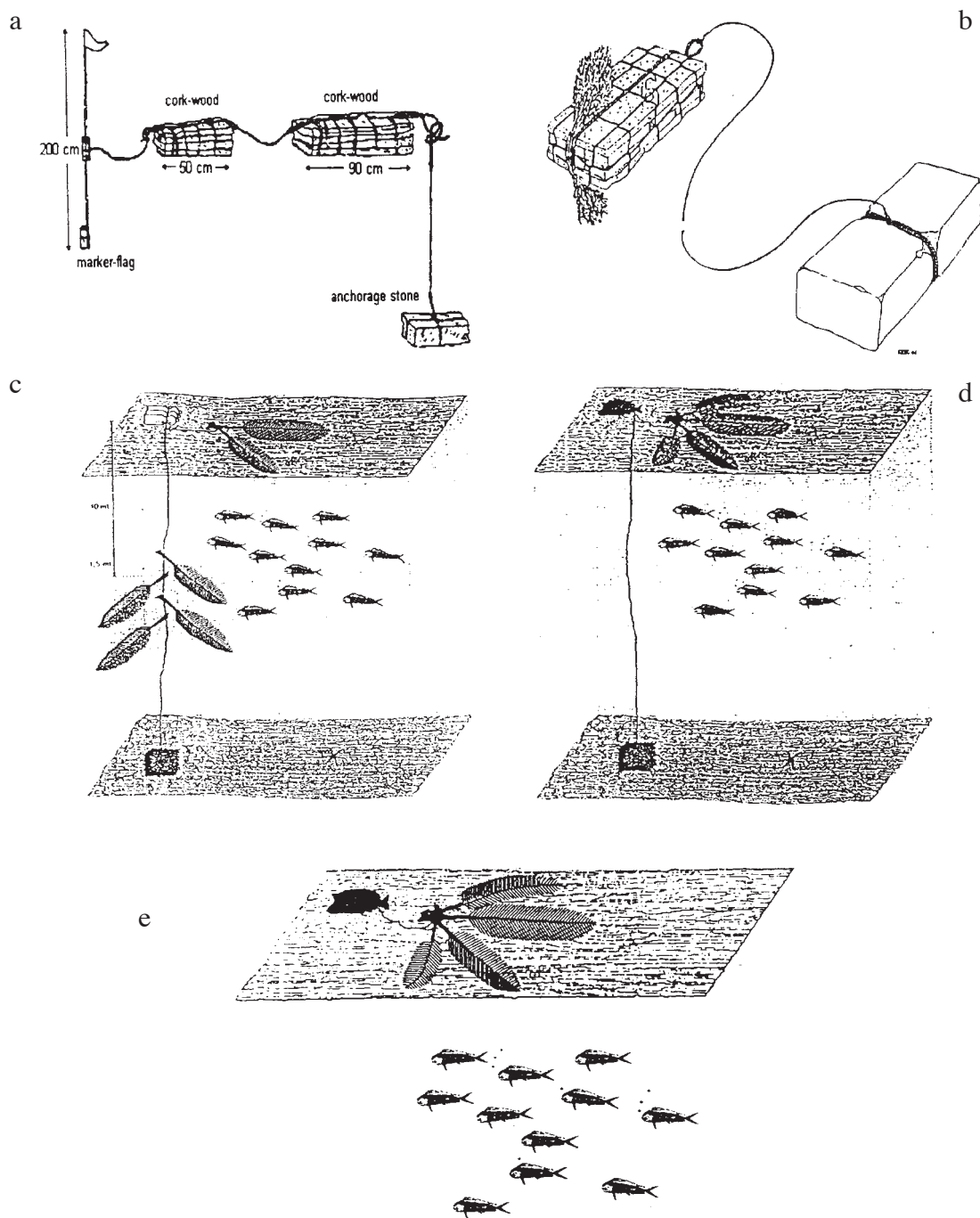


FIG. 2. – FADs used in Mediterranean *C. hippurus* fisheries: a) Malta “Kannizzati” (Galea, 1961); b) Balearic Islands “capcer” (Massutí and Morales-Nin, 1991); c) West Sicily “cannizzi” (Morales *et al.*, 1995); d) Pelagic Islands “cannizzi” (Morales *et al.*, 1995); e) Pelagic Islands “drifting FADs” (Morales *et al.*, 1995).

ically made of one or more large stones or anchor blocks (Fig. 2c-d).

In the Pelagic Islands, the float consists of slabs of polystyrene placed in a jute sack. Four palm branches are tied to this float, and the entirety, with no submerged palms, is anchored as described above. Drifting FADs are occasionally used (Fig. 2e).

In Stratum A, the boats placed approximately 110 FADs in a corridor of sea extending between 0.5 km and 11.0 km from the coast. The FADs are spaced 300 m apart and are examined periodically, weather permitting. In Stratum B each boat placed about 50 FADs. The area where the FADs from San Vito lo Capo fleet are deployed extends through an arc of

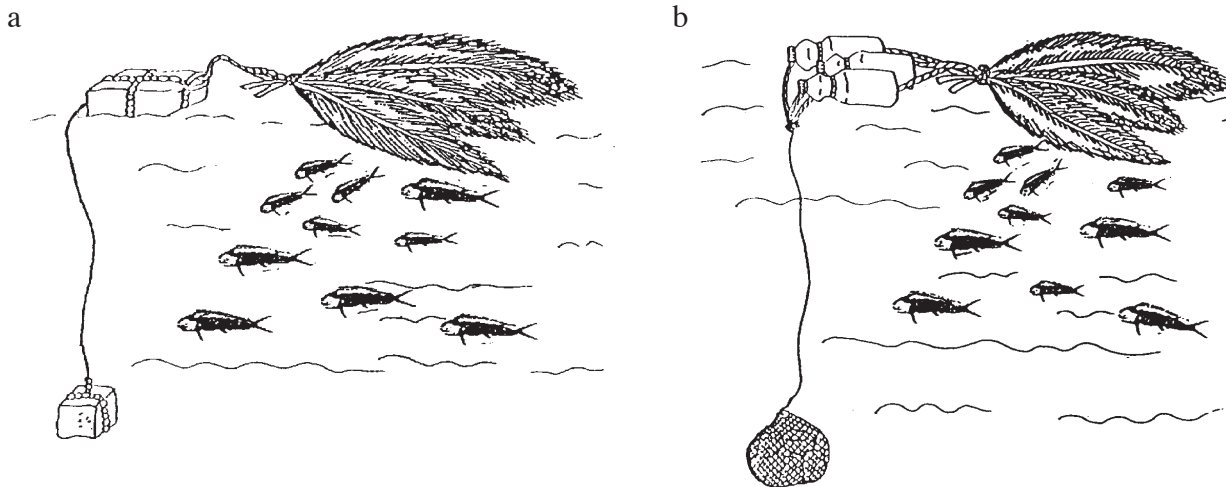


FIG. 3. – Ionian (a) and Tyrrhenian (b) sea “cannizzi” (Morales *et al.*, 1995).

180° and a radius of about 25 km with Capo San Vito in the centre. The FADs are placed within this area depending on the depth, as the fishermen do not place them where the sea is deeper than 500 m. In Stratum C about 50 FADs were placed in August. Unlike the FADs used in the Stratum D, these are very similar to the Maltese FADs. They are of poly-

styrene floats with a surface of 1 x 0.5 m, placed inside a jute sack to which two palm branches are tied. These FADs are placed in a strip stretching from the coast for 40 km, following specific routes. Each boat drops between 10 and 50 FADs spaced about 300 apart. Fishermen usually go out at dawn and return at dusk, after having examined all the FADs.

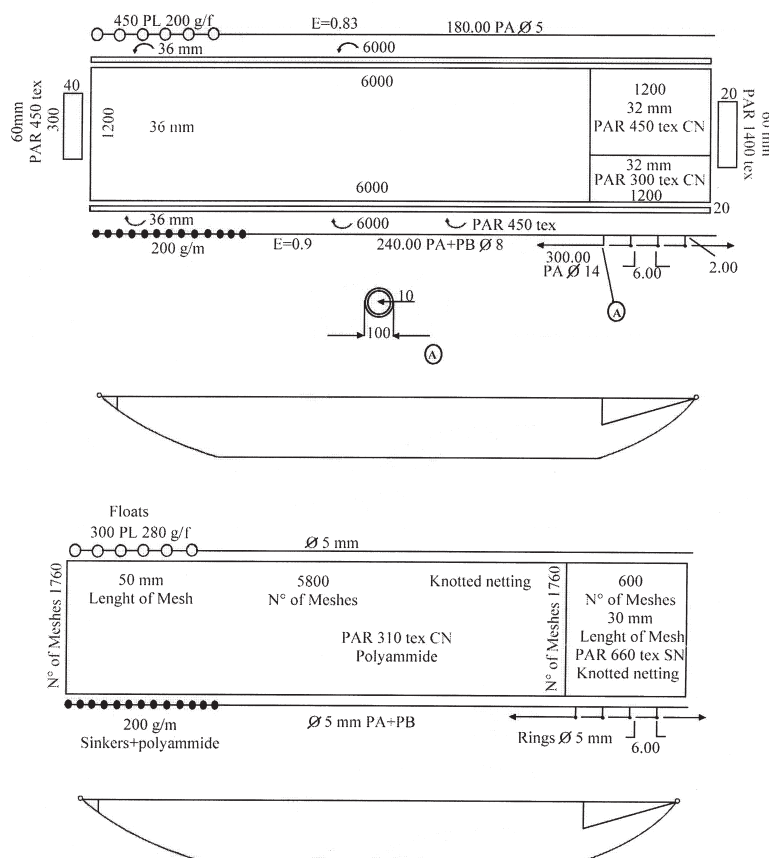


FIG. 4. – Nets used in fishing for dolphinfish , schematized according to U.N.I. (Italian National Board of Unification).

TABLE 2. – Catches (kg) of dolphinfish per month and stratum during the 1996 fishing season.

Ports	Aug.	S. E.	Sept.	S. E.	Oct.	S. E.	Nov.	S. E.	Dec.	S. E.	Tot. Season	S. E.
West Tyrrhenian Sea												
Balestrate	0	0	2757	489	2376	426	0	0	0	0	5133	648
Stratum Total A	0	0	2757	489	2376	426	0	0	0	0	5133	648
Trapani	0	0	5338	606	20350	2225	3036	1123	0	0	28724	2565
Stratum Total B	0	0	11057	1255	42154	4609	6289	2326	0	0	59500	5313
Strait of Sicily												
Licata	3469	1012	2948	794	772	2263	531	16	1417	565	9137	2664
Stratum Total C	4625	1349	3931	1059	10293	3017	708	21	1889	753	21446	3551
Pelagic Islands												
Lampedusa	0	0	1233	0	2929	0	569	0	0	0	4731	0
Linosa	0	0	8388	0	12202	0	10321	0	4389	0	35300	0
Stratum Total D	0	0	9621	0	15131	0	10890	0	4389	0	40031	0
East Tyrrhenian Sea												
C. D'Orlando	0	0	646	118	870	63	1155	142	0	0	2671	195
Cefalù	0	0	977	237	6738	605	2460	322	0	0	10175	725
Falcone	0	0	867	161	1297	209	763	137	0	0	2927	297
Lipari	466	129	777	174	448	150	0	0	0	0	1691	263
Porticello	1289	278	9257	887	3501	575	704	194	0	0	14751	1110
S. Agata di Mil.	0	0	6963	0	34893	0	7431	0	9510	0	58797	0
Termini	698	178	1489	359	4005	572	1348	311	0	0	7540	764
Tonnarella	0	0	2930	269	4331	458	1543	229	0	0	8804	578
Stratum Total E	2453	1421	23907	8615	56085	6591	15405	4096	9510	0	107360	11681
Ionian Sea												
Siracusa	18612	0	36134	0	19476	0	10722	0	7340	0	92284	0
Augusta	129	53	657	147	764	174	382	0	0	0	1932	234
Portopalo-Marz.	10336	1399	22522	1759	11739	896	3777	374	1372	176	49746	2455
Stratum Total F	29077	1400	59313	1765	31979	913	14881	374	8712	176	143962	2466
Total for Sicily	36155	2408	110586	8959	158018	8648	48173	4725	24500	773	377432	13557

In Stratum E the fleet uses anchored FADs as the fishing method, except in Termini Imerese and Porticello where the boats use drifting FADs. In the case of these latter fleets, the area fished is much larger than the area occupied by anchored FADs. In the zone between Capo Milazzo and Capo d'Orlando, the area where the FADs are distributed is bounded in the north by the Eolie Islands, which also represent the limit of FAD positions for the Tyrrhenian area (Fig. 3a). In this Stratum, the total number of FADs used by each boat ranges between 40 and 80, and the anchorage depth is no more than 600 metres. In Stratum F, the Ionian coast of Sicily, the sea is deeper, so positioning FADs is more difficult because of the amount of wire needed to secure them to the sea bottom and the weight of the ballast required. There are 60 to 100 FADs per boat, and the distance between them is approximately 800 metres; the anchorage depth can be up to 1500 metres (Potoschi, 1995) (Fig. 3b).

Fishing net and fishery operations

The typical net used in Sicily, known as "lampugara" or "caponara", has a length of 180 m, a height of 45 m, one float every 0.14 m and 900 weights weighing 90 kg in all (Fig. 4). Among vessels the dimensions of the net, though not corresponding proportionally to the dimensions of the vessel, increase as gross tonnage increases. The fishing

operation started in August in stratum F and in September in other areas.

Catches

During the 1996 fishing season, the catch data of dolphinfish were acquired per month and stratum in the ports (Table 2). The values included in the table show that out of a total of 377,432 tons caught in Sicily 28.44% was caught in Stratum E, 38.14% in Stratum F, 1.36% in Stratum A, 15.76% in Stratum B, 5.68% in Stratum C and 10.61% in Stratum D. The latter value increased due to the catches made by boats of Termini Imerese and Porticello, which fish by sighting the shoals which gather under the drifting floating devices. This increment is estimated to be 22,291 tons, equal to 5.9% of the catches made using "cannizzi". The monthly distribution of the catches gave the highest value in October, where the 158,018 tons represent 41.86% of the total catches for the 1996 fishing season.

CONCLUSIONS

In the Sicilian seas the dolphinfish has been fished for many years, but the fishing areas were limited and the fleet engaged in this activity was small. In recent years there has been an increase in the boats with a consequent expansion in the areas

for positioning the “FADs”, which from the southern Ionian sea has extended to the northern part, the southern Tyrrhenian and west Sicily.

The catch systems used have not undergone substantial technological changes compared to the equipment of the past.

Over recent years the conviction has prevailed among fishermen that by increasing the decoy factor (number of “cannizzi”) leads to a proportionally increase in catches. This may be considered when historical series of catch and effort are available, but at present, referring to the catches of more recent fishing seasons (Potoschi, 1996), a seasonal variable emerges which is linked without doubt to environmental factors related to ethological and biological aspects of the species, whose presence in Mediterranean waters shows scheduled periods of disappearance.

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