IMPACT OF BIVALVE DREDGE FISHING ON FLATFISH SPECIES IN THE SOUTH COAST OF PORTUGAL (ALGARVE)

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INTRODUCTION

The passage of a bivalve dredge, as any other type of trawl, across the seabed leads to direct mortality and/or indirect mortality of both commercial and non-commercial species. Although this type of gear is specially designed to catch bivalves some amounts of fish, and benthic invertebrates are also caught.

Presently, the dredge fleet catches a high variety of species, being the most important the clam (*Spisula solida*), the razor clam (*Pharus legumen*), the striped venus (*Chamelea gallina*), and donax clam (*Donax trunculus*).

The by-catch of this bivalve fishery, especially of the discarded fish species, was not been quantified. This study intends to give a first estimate of the impact on fish caused by bivalve dredging in the South coast of Portugal.

MATERIAL AND METHODS

Data collection of the dredge fishery was undertaken between 27th November 2000 and 28th February 2002 and was based on information gathered directly on the fishing surveys made on board of commercial dredge vessels. Operational parameters such as towing speed and duration were maintained exactly as the commercial fleet usually operates.

Individuals were identified, weighed (to the nearest 0.1 g) and measured (to the nearest lower 0.1 cm). Species were sorted, counted and the individual weight was recorded.

The percentage of each species in the total by-catch and number of fish under the minimum legal catch size (%US) was calculated.

Abundance analysis was performed in the same area were the commercial fleet operate. Surveys were performed during the summer of 2001, using two different fishing gears, the beach seine and the beam trawl. Biological information of the specimens collected in this experiment was conducted in the same way as described above for the surveys data.

RESULTS

A total of 87 surveys were conducted throughout the sampling period; 55 were targeted for *Donnax trunculus*, 20 for *Spisula solida*, 9 for *Chamelea gallina* and 3 for *Pharus legumen*.

A total of 12 surveys were conducted for abundance estimates.

Abundance composition, by-catch composition and number of collected specimens for 100 kg of bivalve are presented in Tables I, II, and III, respectively.

Table I - Abundance composition from surveys data. Sampled area ±26.000 m². N – number, sd - standard deviation.

	N	Lenght Range (cm)	Av. Length ± sd (g)	Av. Weight ± sd (g)	% undersized *
Arnoglossus thori	242	2,8-23,2	9,2±2,66	9,73±10,46	*
Bothus podas	155	3,2-23,2	8,63±3,14	10,59±11,33	*
Psetta maxima	1	-	32.1	165.2	0
Scophthalmus rhombus	23	5,8-23,1	15,47±4,85	55,6±45,71	100
Dicologoglossa cuneata	8	7,2-17,3	12,31±3,05	12,86±8,78	75
Microchirus boscanion	21	4-7,7	5,89±0,83	2,79±3,01	*
Solea lascaris	97	4,4-25	12,37±4,73	30,75±35,99	98.97
Solea senegalensis	1	-	26.5	47	0
Non flatfish	2760 (27 sp.)	-	-	-	-
Cephalopods	120 (4 sp.)	-	-	-	-

* - not regulated by the portuguese law

Table II – By-catch composition from surveys data. N – number, sd - standard deviation.

		N	Length range (cm)	Av. Length ± sd (g)	Av. Weight ± sd (g)	% undersized
C. gallina	*Scophthalmus rhombus*	4	21.7-29.7	24.7±3.5	170.8±83.7	100
	Dicologoglossa cuneata	20	9.8-23.8	16.2±4.1	46.0±33.9	40
	Solea lascaris	4	18.6-26.2	22.5±3.6	94.3±44.1	50
	Solea senegalensis	19	24.0-49.0	31.2±5.3	295.4±149.1	0
	Synaptura lusitanica	12	21.4-45.0	30.7±5.8	272.3±180.3	*
	Microchirus boscanion	1	-	6.6	3	*
	Non flatfish	333 (12 sp.)	-	-	-	-
	Cephalopods	155 (2 sp.)	-	-	-	-
D. trunculus	*Scophthalmus rhombus*	88	3,5-34,5	22,52±4,9	154,73±88,1	95.40
	Psetta maxima	11	13,5-33,7	23,18±7,1	294,17±273,1	81.82
	Dicologoglossa cuneata	19	13,4-25,4	18,11±3,5	47,59±31,2	5.26
	Solea lascaris	203	12,7-30,6	22,34±3,1	105,6±50,7	68.97
	Solea senegalensis	9	17,1-43	31,28±8	330,98±240	44.44
	Solea vulgaris	2	21-22,1	21,55±0,8	79,15±10,8	100
	Synaptura lusitanica	10	22,3-38,3	27,02±4,6	113,44±55,6	*
	Non flatfish	1772 (22 sp.)	-	-	-	-
	Cephalopods	158 (2 sp.)	-	-	-	-
P. legumen	*Bothus podas*	1	-	11.6	13.4	*
	Solea lascaris	4	20.3-26.1	23.2±2.4	103.3±35.7	75
	Non flatfish	52 (3 sp.)	-	-	-	-
	Cephalopods	4 (1 sp.)	-	-	-	-
S. solida	*Psetta maxima*	2	23.2-30.1	26.7±8.8	421.2±288.6	50
	Scophthalmus rhombus	13	14.2-39.6	21.4±8.11	144.5±195.9	84.6
	Dicologoglossa cuneata	32	10.4-37.8	21.5±5.8	92.9±79.1	15.6
	Solea lascaris	27	20.2-35.7	25.0±2.8	149.4±57	37
	Solea senegalensis	28	13.6-38.0	28.3±5.7	226.7±101.1	0
	Synaptura lusitanica	26	25.7-54.6	32.3±5.9	373.3±198.1	7.1
	Non flatfish	251 (20 sp.)	-	-	-	-
	Cephalopods	315 (2 sp.)	-	-	-	-

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Table III - Number of specimens (flatfish, non-flatfish and cephalopods) collected in each season by 100 kg of bivalves, during the fishing surveys, according to the target species.

	Chamelea gallina					*Donax trunculus*					*Pharus legumen*					*Spisula solida*				
	Winter	Spring	Summer	Autumn	Total	Winter	Spring	Summer	Autumn	Total	Winter	Spring	Summer	Autumn	Total	Winter	Spring	Summer	Autumn	Total
Bivalve (in Kg)	-	169	631	150	950	3660	436	40	4391	8527	260	90	-	-	350	-	3621	370	-	3991
By-catch (nº ind.)	-	108	372	84	564	813	129	59	1420	2421	9	52	-	-	61	-	685	77	-	762
Flatfish (nº ind.)	-	6	45	17	68	145	15	23	216	399	3	1	-	-	4	-	117	37	-	154
Non flatfish fish (nº ind.)	-	83	209	50	342	610	107	18	1116	1851	4	49	-	-	53	-	254	25	-	279
Cephalopods (nº ind.)	-	19	118	17	154	58	7	18	88	171	2	2	-	-	4	-	314	15	-	329
By-catch (nº ind./100Kg of bivalve)	-	63.9	59	56	59.4	22.2	29.6	147.5	32.3	28.4	3.5	57.8	-	-	17.4	-	18.9	20.8	-	19.1
Flatfish (nº ind./100Kg of bivalve)	-	3.6	7.1	11.3	7.2	4.0	3.4	57.5	4.9	4.7	1.2	1.1	-	-	1.1	-	3.2	10	-	3.9
Non flatfish fish (nº ind./100Kg of bivalve)	-	49.1	33.1	33.3	36	16.7	24.5	45	25.4	21.7	1.5	54.4	-	-	15.1	-	7	6.8	-	7
Cephalopods (nº ind./100Kg of bivalve)	-	11.2	18.7	11.3	16.2	1.6	1.6	45	2	2	0.8	2.2	-	-	1.1	-	8.7	4.1	-	8.2

DISCUSSION

The information collected during the surveys reflects the information gathered during the abundance analysis. Within the flatfish group, some species seem to have the ability to avoid the dredge gear. Species like *B. podas*, *A. thori*, and *M. boscanion*, which occur in the sampled areas, were never captured (exception for one *A. thori* and one *M. boscanion*). The same occurred with the smaller specimens of the remaining collected species. Thus, when under sized specimens were captured they were juveniles near their first maturation.

The width between bars on the *Donax* dredge and the *Spisula*/*Chamelea* dredge is also an important factor for the retention of smaller specimens of flatfish species. In the case of the *Spisula*/*Chamelea* dredge, the width between bars is larger, fact that increases the flatfish probability to escape. This is the direct cause for the significant differences existing between lengths of *S. lascaris* and *S. lusitanica* captured with the two different gears.

Although the capture of undersized fish, the length composition of the capture is quite different from the faunal composition of the surveyed areas, which is a clear indicator of the good performance of the dredge gears. Due to the gear characteristics presently used, it is almost impossible to reduce the number of captured flatfishes without reduce the bivalve dredge efficiency.

Although the moderate impact on the flatfish species, the bivalve dredge fisheries should be considered in the management and conservation studies of fish stocks.

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