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Biodiversity as a Result of the By-Catch from the Commercial Trawl Fisheries off the Southern Portuguese Coast

by

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Abstract

In recent years there has been a global tendency for fishing fleets to extend their fishing areas to deeper waters, mainly due to overfishing of the majority of traditionally exploited resources. As a consequence several species, for which little biological information is available, have became frequent in the catches. In general, demersal fisheries have a greater by-catch than pelagic fisheries since, in a demersal habitat, fish diversity is greater, and most species tend to form small concentrations that mix with other fish schools. In demersal fisheries, fleets using less selective gears, such as trawls, catching almost everything in their way, should, potentially, have greater by-catch rates than those using more selective gears, such as those of the group of hooks and purse-seines. This study was carried out from April 1996 to June 1999 off the southern Portuguese coast. During the sampling period, a total of 46 fishing trips (28 crustacean trawls and 18 fish trawls) were sampled. Crustacean trawls ranged from 97 to 644 meters in depth (mean depth) and fish trawl ranged from 43 to 268 meters in depth (mean depth). The results of the study demonstrate that there is a significant biodiversity (about 240 species) of demersal species off the south coast of Portugal, the biodiversity being slightly higher in crustacean trawls than in fish trawls.

Introduction

By-catch has always been an integral component of fishing, but only in recent years has the issue attracted serious attention from both the research and management sectors of fisheries. There is now widespread national and international recognition that by-catch in many world fisheries constitutes an importance waste and raises conservation, ecological and economical considerations that require the attention of fishing management.

The recent global assessment of fisheries by-catch and discards estimated an average of 28.7 million tons of by-catch and 27 million tons of fish discarded each year (annual discard range of between 17.9 and 39.5 million tons) in commercial fisheries worldwide.

In Portugal, relatively little research has been carried out and little literature exists about this subject. However, since 1996, the importance of by-catch and discards in the south coast of Portugal has been the subject of a study financed by the European General Directorate of Fisheries.

Material and Methods

The study was carried out from May 1996 to December 1999 off the southern Portuguese coast (Fig. 1). During the sampling period a total of 59 fishing trips (36 crustacean trawls and 23 fish trawls) were carried out at mean depths ranging from 97 to 644 m in crustacean trawls and from 43 to 268 m in fish trawls.

The presence of observers on board the vessels allowed the identification of target species as well as the commercial by-catch species. Target species and commercial by-catch quantities were also recorded. Estimates of the total amount of by-catch discarded by metier, haul and season were also made on board. Samples were taken to the laboratory where all the specimens were, whenever possible, identified to species and sampled.

Results and Discussion

The results of the study demonstrates that there is a significant biodiversity (about 240 species) of demersal species off the south coast of Portugal, the biodiversity being slightly higher in crustacean trawls (n = 192 species) than in fish trawls (n = 177 species) (Table I).

In both metiers studied, the greatest number of species observed belonged to the class Osteichthyes (n = 83 CT; n = 79 FT), followed by, respectively, Malacostraca, Cephalopoda and Chondrithyes. Only one species of the class Desmospongiae was collected, and capture only from the crustacean trawl. The specimens belonging to the class Cirripedia were captured only by fish trawl (Fig. 2).

The number of trips, by metier, changed through the years of sampling. In both types of metiers the class Osteichthyes was most representative with respect to the number of species captured, percentages ranging from 28 to 52%. In terms of percentage the Class Malacostraca and Cephalopoda were most representative, following by Osteichtyes. With respect to others Classes, annual variations were observed in both metiers, the percentage never exceeding 10% (Fig. 3).

References

Borges, T. C.; Bentes, L.; Castro, M.; Costa, M.E.; Erzini, K.; Gomes, J.; Gonçalves, J.M.S.; Lino, P.G.; Pais, C. & Ribeiro, J. (1997). Studies of the discards of commercial fisheries from the south coast of Portugal. *Final Report to the European Commission Directorate General XIV Fisheries*, 30p.

Borges, T.C.; Bentes, L.; Cristo, M.; Costa, M.E.; Erzini, K.; Olim, S. & Pais, C. (2000). Analysis of fisheries discards from the south coast of Portugal (DISCALG). *Final Report to the European Commission Directorate General Fisheries*, 42p.

FAO, 1996. Report of the technical consultation on reduction of wastage in fisheries. Yokyo, Japan, 28 October – 1 November 1996. *FAO Fisheries Report*. Nº. 547. Rome Italy, 27p.

Guerra, E. B. 1996. Discards in fisheries from the eastern central Atlantic (CECAF Region). *FAO Fisheries Report*, nº 547, Supplement. 183-214p.

Garthe, S.; Kees, C. J.; Funes, R. W. 1996. Amounts of discards by commercial fisheries and their significance as food for seabirds in the North Sea. *Marine Ecoogy. Prog. Ser.* Vol. 136:1-11.

Kennelly, S. J. 1995. The issue of bycatch in Australia's demersal trawl fisheries. *Reviews in Fish Biology and Fisheries*. 5: 213-234.

Kelly, C. J.; Connolly, P. L.; Clarke, M.W. 1998. The deep water fisheries of the Rockall through; some insights gleaned from Irish survey data. *ICES. Theme session O: Deep sea fisheries*. CM 1998/O: 40, 12 p.

Moura, O., Figueiredo, I., Bordalo, M.B. & Henriques, V.. 1998. Research on deep-water species off the Portuguese Continental coast. *International council for the exploration of the sea.* ICES CM/1998/O:67. 11p.

Van-Beek, F.A. 1998. Discarding in the Dutch beam trawl fishery. . *International council for the exploration of the sea*. ICES CM 1998/BB:5. 15p.

Moura, O., Figueiredo, I.& Figueiredo, M.J. 1995. A first approach to the definition of deep-sea species communities from the southern Portuguese coast. *International council for the exploration of the sea.* ICES CM 1995/G:14 Ref.: H. 20p.

Saila, S. B. 1983. Importance and assessment of discards in commercial fisheries. *FAO Fish. Circ.* (765), 62 p.

Table 1.

Vertebrates	Family	Gender	Number of species CT	FT
Class Chondrithyes	Chimaeridae	*Chimaera*	1	1
	Hexanchidae	*Hexanchus*	1	
	Rajidae	*Breviraja*	1	
		Raja	4	6
	Scyliorhinidae	*Galeus*	1	1
		Scyliorhinus	1	1
	Squalidae	*Centrophorus*	1	
		Dalatias	1	
		Deania	1	1
		Etmopterus	2	
		Scymnodon	1	
	Torpedinidae	*Torpedo*	2	2
Class Osteichthyes	Apogonidae	*Epigonus*	2	1
	Argentinidae	*Argentina*	1	1
	Atherinidae	*Atherina*		1
	Balistidae	*Balistes*	1	
	Berycidae	*Beryx*	1	
	Bothidae	*Arnoglossus*	4	4
	Callionymidae	*Callionymus*	2	2
		Synchiropus	1	
	Caproidae	*Capros*	1	1
	Carapidae	*Echiodon*	1	
	Carangidae	*Trachurus*	2	2
	Centracanthidae	*Spicara*		1
	Cepolidae	*Cepola*	1	1
	Chauliodontidae	*Chauliodus*	1	
	Chaunacidae	*Chaunax*	1	
	Chlorophthalmidae	*Chlorophthalmus*	1	1
	Citharidae	*Citharus*	1	1
	Clupeidae	*Sardina*		1
	Congridae	*Conger*	1	1
	Cynoglossidae	*Symphurus*	2	1
	Diretmidae	*Diretmus*	1	
	Engraulidae	*Engraulis*	1	1
	Gadidae	*Antonogadus*	1	
		Gadiculus	1	1
		Gaidropsaurus	1	1
		Micromesistius	1	1
		Molva	1	
		Phycis	2	2
		Trisopterus		1
	Gempylidae	*Ruvettus*	1	
	Gobiidae	*Deltentosteus*		1
		Lesuerigobius		1
	Lophiidae	*Lophius*	2	2
	Macroramphosidae	*Macroramphosus*	2	2
	Macrouridae	*Coelorhynchus*	2	1
		Hymenocephalus	1	
		Malacocephalus	1	1
		Nezumia	1	1
		Trachyrhynchus	1	1
	Merlucciidae	*Merluccius*	1	1
	Moridae	*Gadella*	1	1
		Mora	1	
	Mullidae	*Mullus*		2
	Muraenidae	*Muraena*		1
	Myctophidae	???????	1	1
	Nettastomatidae	*Facciolella*	1	
		Venefica	1	
	Notacanthidae	*Notacanthus*	1	
	Ophichthidae	*Echelus*	1	
		Ophisurus	1	

Table 1. (continued)

Vertebrates	Family	Gender	Number of species CT	FT
	Peristediidae	*Peristedion*	1	1
	Photichthyidae	*Polymetme*	1	1
	Scombridae	*Scomber*	2	2
	Scophthalmidae	*Lepidorhombus*	2	1
	Scorpaenidae	*Helicolenus*	1	1
		Pontinus	1	1
		Scorpaena	2	2
		Setarches	1	
	Stomiidae	*Stomias*	1	
	Serranidae	*Anthias*	1	1
		Serranus	2	2
	Soleidae	*Dicologoglossa*	1	1
		Microchirus	3	3
		Monochirus	1	
	Sparidae	*Boops*	1	1
		Diplodus		2
		Pagellus	1	3
		Spondyliosoma		1
	Synaphobranchidae	*Synaphobranchus*	1	1
	Tetraodontidae	*Sphoeroides*		1
	Trachichthyidae	*Hoplostethus*	1	1
	Trachinidae	*Trachinus*		1
	Trichiuridae	*Benthodesmus*	1	1
		Lepidopus	1	1
	Triglidae	*Chelidonichthys*	2	6
		Lepidotrigla	2	1
	Zeidae	*Zeus*		1
Invertebrates				
Class Cirripedia				
Suborder Lepadomorphes	Scalpellidae	*Scalpellum*	1	
Class Malacostraca				
Subclass Stomatopoda	Squillidae	*Squilla*	1	1
Order Isopoda	Cymothoidae	*Anilocra*		1
Order Decapoda				
Suborder Natantia	Aristeidae	*Aristeus*	1	1
		Arostaeomorpha	1	
	Crangonidae	*Pontocaris*	1	1
	Penaeidae	*Parapenaeus*	1	1
		Penacopsis	1	1
	Pandalidae	*Heterocarpus*	1	
		Plesionika	3	1
	Pasiphaeidae	*Pasiphae*	1	1
	Processidae	*Processa*	1	
	Solenoceridae	*Solenocera*	1	1
Suborder Reptantia				
Infraorder Astacura	Nephropidae	*Nephros*	1	
Infraorder Palinura	Scyllaridae	*Scyllarus*	1	
Infraorder Brachiura	Calappidae	*Calappa*	1	1
	Galatheidae	*Munida*	2	1
	Goneplacidae	*Goneplax*	1	1
	Homolidae	*Homola*	1	1
	Majidae	*Macropodia*	1	1
		Maja	1	
		Pisa	1	
	Parthenopidae	*Parthenope*	1	1
	Pinnotheridae	*Pinnotheres*		1
	Portunidae	*Bathynectes*	2	1
		Liocarcinus	1	1
		Macropipus	1	1
		Polybius	1	1
	Polychelidae	*Policheles*	1	
	Xanthidae	*Monodaeus*	1	1
Infraorder Anomura	Diogenidae	*Dardanus*	1	1
	Paguridae	*Pagurus*	2	3

Table 1. (continued)

Invertebrates	Family	Gender	Number of species CT	FT
Class Cephalopoda				
Order Sepioidea	Sepiidae	*Sepia*	2	3
	Sepiolidae	*Rossia*	1	1
		Neorossia	1	
		Sepietta	2	3
Order Teuthoidea	Loliginidae	*Alloteuthis*	1	2
		Loligo	1	
	Ommastrephidae	*Illex*	1	1
		Todarodes	1	
		Todaropsis	1	1
Order Octopoda	Octopodidae	*Eledone*	2	2
		Octopus	1	2
		Scaeurgus	1	1
Class Bivalvia	Arcidae	*Anadora*	1	1
	Cardiidae	*Acanthocardia*	1	1
		Laevicardium		1
	Carditidae	*Glans*	1	
	Mytilidae	*Modiolus*		1
	Nuculidae	*Nucla*	1	
	Ostreidae	*Neopycnodonte*		1
	Pectinidae	*Pseudamussium*	1	
	Pinnidae	*Atrina*	1	2
	Pteriidea	*Pteria*	1	1
	Veneridae	*Venus*		2
Class Gastropoda	Aporrhaidae	*Aporrhais*	1	
	Buccinidae	*Buccinum*	1	
	Cassidae	*Galeoda*	2	2
	Coralliophilidae	*Coralliophila*	1	
	Naticidae	*Lunatia*		1
	Ranellidae	*Cymathium*		1
		Ranella	1	1
	Scaphandridae	*Scaphander*		1
	Philinidae	*Philine*	1	
	Trochidae	*Calumbonella*	1	
		Calliostoma	1	1
	Volutidae	*Ampulla*	1	1
		Cymbium		1
Class Demospongiae				
	Halichondriidae	*Halichondria*		1
Class Scyphozoa				
Order Semaeostomae		*Aurelia*	1	1
Class Anthozoa	Caryophyllidae	*Caryophyllia*	1	1
	Hormatiidae	*Actinauge*	1	1
		Calliactis	1	1
	Gorgonidae	*Leptogorgia*	1	1
	Plexauridae	*Euneicella*	1	1
	Pennatulidae	*Pennatula*	1	1
Class Polychaeta				
	Amphinomidae	*Chloria*	1	
	Aphroditidae	*Aphodita*	1	1
Class Ophiuroidea				
	Gorgonocephalidae	*Astrospartus*		1
	Ophiolepidae	*Ophiura*	1	1
	Ophiothricidae	*Ophiothrix*	1	1
Class Crinoidea				
	Antedonidae	*Leptometra*	1	1
Class Holothuroidea				
	Holothuriidae	*Holothuria*	1	2
	Stichopodidade	*Stichopus*	1	1
Class Asteroidea				
	Asterinidae	*Anseropoda*	1	1
	Astropectinidae	*Astropecten*	1	1
	Luidiidae	*Luida*	1	1

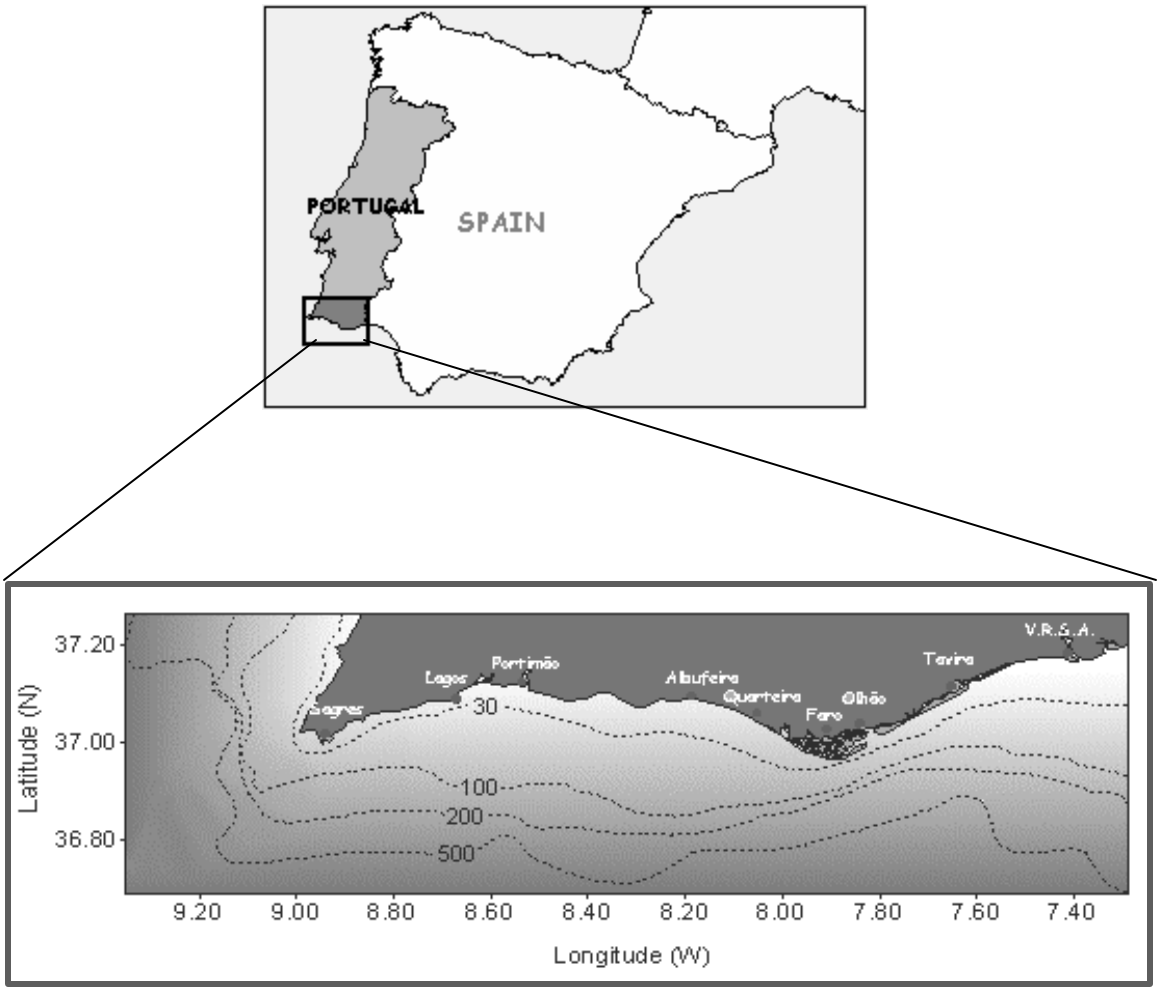
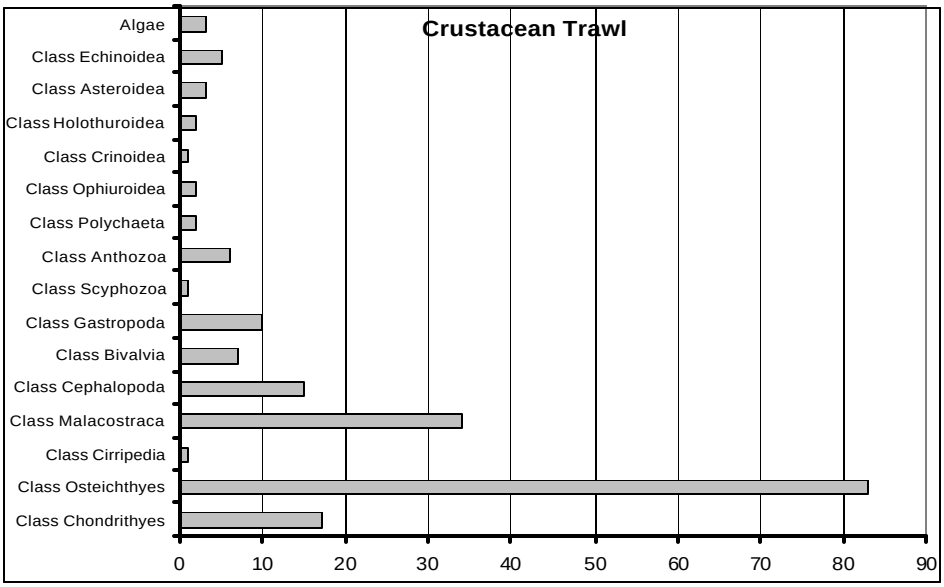


Fig. 1. Sampling area (Algarvian Coast).



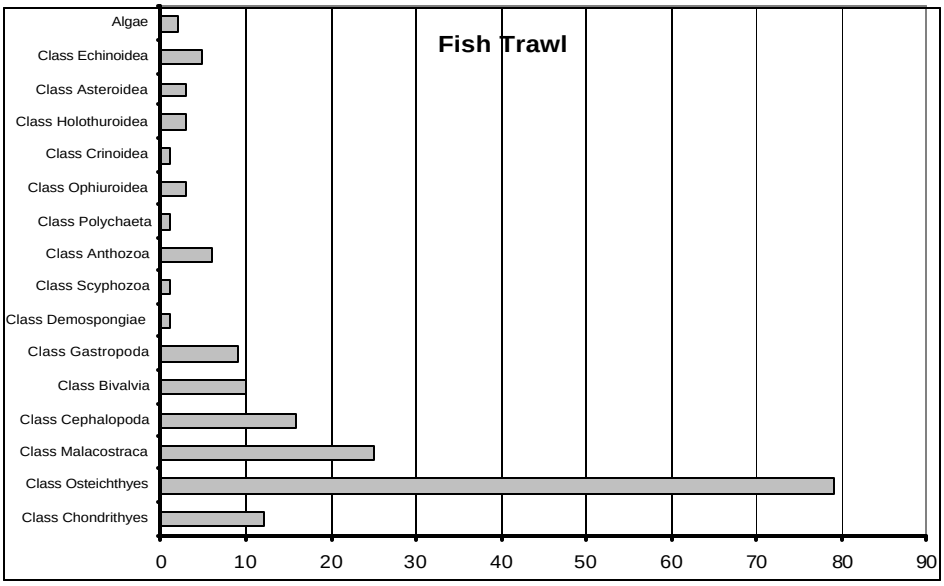


Fig. 2. Total number of species caught by class and metier in the period of study (1996-1999)

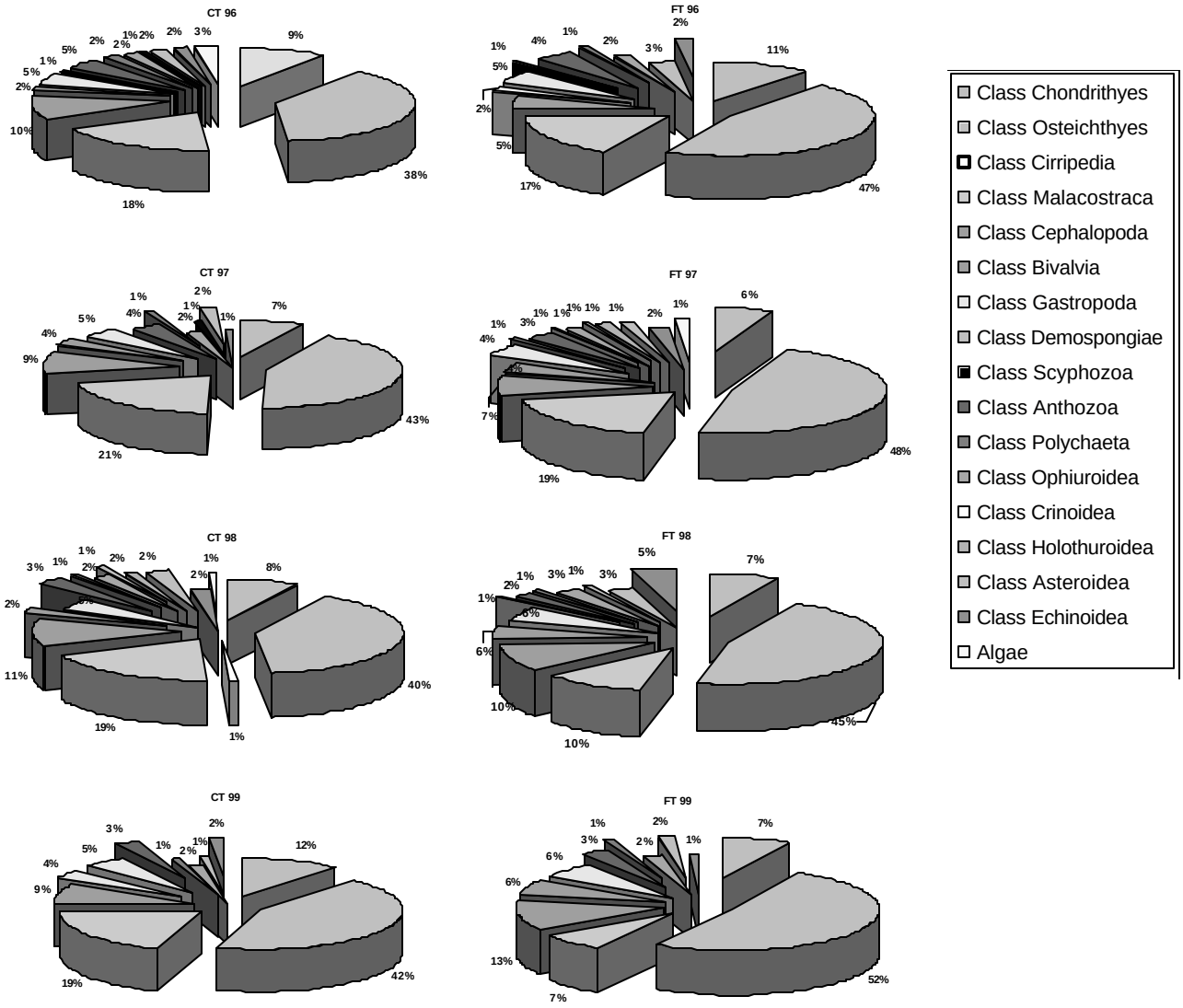


Fig. 3. Percentage of species captured by Class during the sampling period by year and metier (CT – Crustacean Trawl; FT – Fish Trawl).