Temporal evolution of infaunal and suprabenthic communities on the Galician continental shelf (NW, Iberian Peninsula), after the *Prestige* oil spill

Santiago Parra and Inmaculada Frutos

Instituto Español de Oceanografía, Centro Oceanográfico de A Coruña, 15001 A Coruña, España. santiago.parra@co.ieo.es

Introduction

In November, 2002 the tanker *Prestige* sank 130 miles off the coast of Muxía (A Coruña, Galicia). Roughly 50,000 tons of fuel oil spilled into the sea, causing a vast black tide which mainly affected the entire Galician coast. During the 2002-2004 period a series of oceanographic surveys were conducted to acquire knowledge on the state of the communities and resources (Sánchez, 2003; Serrano *et al.*, in press). A sampling strategy was designed to include bottom stations located in three geographic zones organized in a radial arrangement at three depth strata. This paper presents new data on the temporal evolution of the sediment characteristics in all the zones and depth strata during the 2002-2004 period and temporal changes in the infaunal communities (only zone 2, depth strata A and B) and suprabenthic communities (zone 3, depth strata A, B and C) during the first year of study (2002-2003).

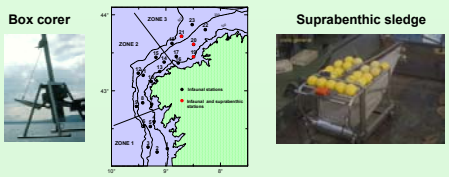

Fig. 1. General view of sampling stations and gears.

Material and methods

To study the sediment characteristics, sediment samples were collected from 23 stations distributed over three impact zones (1: min; 2: max; 3: moderate) and three depth strata (A: 70-120 m; B: 121-200 m; C: 201-300 m; Fig. 1). The sampling procedure was repeated in these stations during four different periods: winter 2003, spring 2003, autumn 2003 and spring 2004, with the exception of depth stratum C which was only sampled in the spring of 2004. Particle size analysis was performed by a combination of dry sieving and sedimentation techniques. Organic matter in the sediment was estimated as weight loss of dried (100 ºC, 24 h) samples after combustion (500 ºC, 24 h).

Infaunal samples were collected with a modified Bouma box corer (0.0175 m^2; Fig.1) and 3-5 samples were taken (sampling area = 0.0525-0.0875 m^2) in each station. Macroinfauna samples were sieved on board through a 0.5 mm sieve, anaesthetized with a $MgCl_2$ solution and then preserved with 8 % buffered formaldehyde. Correlations of wet weight (WW) to ash-free dry weight (AFDW) were calculated to estimate the biomass of each individual species (López-Jamar *et al.*, 1996; Parra & López-Jamar, 1997). This paper presents preliminary information on the winter 2002, spring 2003 and autumn 2003 periods, but only for stations 8, 10, 11 and 14, in zone 2, where studies are underway on both infaunal biomass and trophic groups.

Suprabenthic samples were collected using a sledge trawl with two plankton nets 3 m in length and a 0.5 mm sieve (Fig. 1). The sampling area covered by the nets was 0.450 m^2 for the lower net and 0.225 m^2 for the upper net. During this survey, a depth sensor (SCANMAR) was attached to the sledge frame to guarantee the correct trawling operation on the sea bottom. Suprabenthos sampling was conducted during the day at three stations (St.19, 20, 21; Fig. 1) on the continental shelf near La Coruña (Zone 3) at three depth strata. The trawl lasted approximately 2 minutes in all the stations.

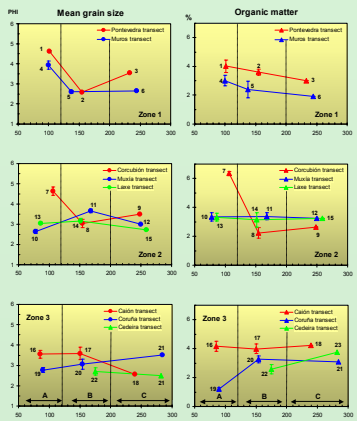

Fig. 2. Effect of water depth at stations on mean diameter of particle size (PHI units) and percentage of organic matter in sediments on the continental shelf off Galicia by zones.

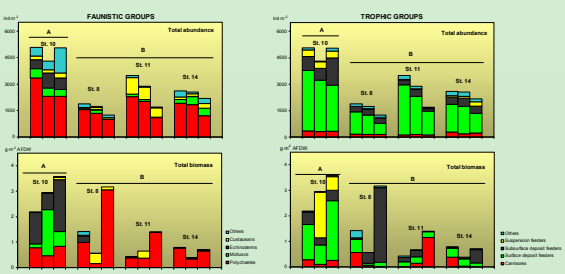

Fig. 3. Temporal evolution of total infaunal abundance (ind·m^{-2}) and biomass (g·m^{-2} AFDW) by taxonomic and trophic group at stations 8, 10, 11 and 14 in Zone 2 (A: stratum 70-120 m; B: stratum 121-200 m; W 02: winter 2002; S 03: spring 2003; A 03; autumn 2003).

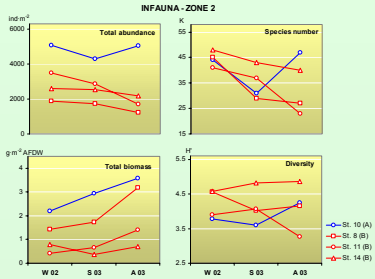

Fig. 4. Temporal variation in total infaunal abundance and biomass, number of species and diversity in Zone 2 by depth stratum.

Table 1. Most abundant infaunal taxa in Stations 8, 10, 11 and 14 in Zone 2 in the period 2002- 2003. Abundances in ind·m^{-2}.

Station 10 (Stratum A)	ind·m^{-2} Mean	Max
Prionospio fallax	997	1429
Oligoqueto indet.	622	1219
Amphiura filiformis	611	900
Thanyx sp.	442	697

Station 11 (Stratum B)	ind·m^{-2} Mean	Max
Ampelisca spp.	664	869
Prionospio steenstrupii	485	629
Prionospio fallax	267	572
Monticellina dorsobranchialis	229	343

Station 8 (Stratum B)	ind·m^{-2} Mean	Max
Prionospio fallax	311	457
Prionospio steenstrupii	241	324
Monticellina dorsobranchialis	86	126
Magelona cf. *minuta*	80	114

Station 14 (Stratum B)	ind·m^{-2} Mean	Max
Prionospio fallax	326	446
Monticellina dorsobranchialis	171	286
Prionospio steenstrupii	154	251
Nemertinos indet.	146	191

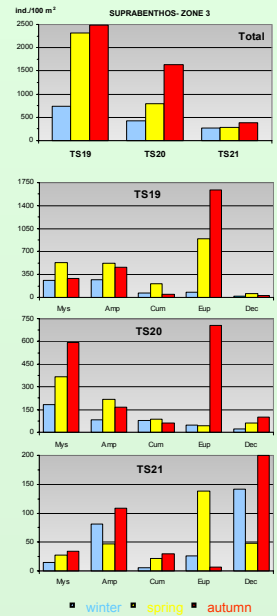

Fig. 5. Temporal variation of the suprabenthic fauna at stations 19, 20 and 21 in Zone 3.

Table 2. Temporal variation at the top suprabenthic species (D: ind/100 m^2). Amp: anfipods; Cum: cumaceans; Dec: decapods; Eup: eufausiids; Mys: mysids.

HAUL	WINTER		D	%	SPRING		D	%	AUTUMN		D	%
TS19	Amp	*Amphilochoides boeckii*	187,4	25,3	Eup	*Nyctiphanes couchi*	890,8	38,4	Eup	*Nyctiphanes couchi*	1636,4	65,5
	Mys	*Leptomysis gracilis*	89,8	12,1	Mys	*Leptomysis gracilis*	213,5	9,2	Amp	*Apherusa* spp.	129,3	5,2
		Total	277,2	37,4		Total	1104,3	47,7		Total	1765,7	70,6
TS20	Mys	*Anchialina agilis*	66,3	15,7	Mys	*Erythrops neapolitana*	139,4	17,5	Eup	*Nyctiphanes couchi*	705,4	43,2
	Mys	*Erythrops neapolitana*	48,7	11,5	Mys	*Anchialina agilis*	86,4	10,9	Mys	*Anchialina agilis*	207,8	12,7
		Total	115,0	27,2		Total	225,8	28,4		Total	913,2	55,9
TS21	Dec	*Pasiphaea sivado*	137,9	51,1	Eup	*Meganyctiphanes norvegica*	41,7	14,5	Dec	*Pasiphaea sivado*	184,8	48,1
	Amp	*Scopelocheirus hopei*	29,5	10,9	Eup	*Nyctiphanes couchi*	38,4	13,3	Amp	*Scopelocheirus hopei*	33,4	8,7
		Total	167,4	62,0		Total	80,1	27,8		Total	218,1	56,8

Temporal evolution of the communities

After the oil spill there was no evidence of any temporal changes in the granulometric characteristics or increase in the organic content of the sediment in any of the three zones under study. The four stations studied in Zone 2 have a sediment comprised of fine or very fine sands with a moderate organic content (Fig.2).

In the zone exhibiting the greatest impact from the spill (Zona 2), the total infaunal abundance underwent a steady decrease in stratum B, particularly in St. 11. The abundance of the polychaete group decreased, while the group "others" increased in St. 10, stratum A. From a trophic standpoint, the abundance of the surface deposit feeders diminished gradually in all the stations and the subsurface deposit feeders grew in number in St.10, stratum A. The temporal variation in the total biomass after the spill was characterized by a progressive increase in the stations along the Muxía transect (St. 10 and 11). In autumn 2003, the biomass of the polychaete group underwent a sharp increase in stations 8 and 11, while the echinoderms augmented their biomass in St. 10 of the shallowest stratum. The biomass of the subsurface deposit feeders in St. 8 rose dramatically in autumn, as did the biomass of the carnivores in St. 11 of the deep stratum (Fig. 3; Table 1). After the spill, species richness dropped in all the stations of the deep stratum, particularly St. 8, which went from 45 species in winter 2002 to 27 species in autumn 2003. No clear pattern was seen in the variation of diversity, with a decrease being observed in stations 8 and 11 in autumn (Fig. 4).

Total suprabenthic abundance values for each station decreased from the shallowest site (St. 19) to the deepest site (St. 21) while temporal variation showed a general increase of total abundance in each station. Eufausiids and anfipods at St. 19, mysids and eufausiids at St. 20 and anfipods and decapods at St. 21 are the main zoological groups responsible for this trend (Fig.5; Table 2).

Acknowledgements

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