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Diet of English Channel cetaceans stranded on the coast of Normandy

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Abstract:

During 1998-2003 stomach contents of 47 cetacean were obtained from strandings on the coast of Normandy. These animals were examined by a veterinary network an stomach contents were analysed at the University of Caen: 26 common dolphins (*Delphinus delphis*), 4 bottlenose dolphins (*Tursiops truncatus*) 7 harbour porpoises (*Phocoena phoecoena*) and 5 grey seals (*Halichoerus grypus*) 2 long-finned pilot whale (*Globicephala melas*) 1 white beaked dolphin (*Lagenorhynchus albirostris*) 1 minke whale (*Balaenoptera acurostrata*) 1 Stenella coeruleoalba. Food items determination was based on hard parts (i.e. fish otoliths and cephalopod beaks). Diet indices were computed including prey frequency and percentage by number. Common dolphins eat mainly gadoid fish (*Trisopterus sp*), gobies and mackerel. Cephalpods occur in small numbers and fished Cephalopod species (cuttlefish and common squid) are scarce. The results are analysed in the light of previously published data and the food regime of English Channel top predators is compared to the one of other populations.

Keywords: Stomach contents, cetaceans, trophic relationships.

Résumé:

De 1998 à 2003 les contenus stomacaux de 47 cétacés échoués sur les côtes de Normandie ont été récoltés. Ces animaux sont repérés et autopsiés par un réseau de vétérinaires et les estomacs sont analysés par l'Université de Caen : les résultats présentés concernent 26 dauphins commun (*Delphinus delphis*), 3 grands dauphins (*Tursiops truncatus*), 7 marsouins (*Phocoena phocoena*), 3 phoques gris (*Halichoerus grypus*), 2 globicéphales noirs (*Globicephala melas*), 1 lagénorhynque à bec blanc (*Lagenorhynchus albirostris*), 1 dauphin bleu et blanc (Stenella coeruleoalba) et 1 rorqual de Minke (*Balaenoptera acurostrata*). La détermination des items alimentaires a été réalisée à partir des parties dures (otolithes de poissons et becs de Céphalopodes). Les indices utilisés pour décrire le régime sont la fréquence d'apparition des proies ainsi que leur pourcentage en nombre dans le bol alimentaire. Les dauphins communs mangent surtout des gadidés (*Trisopterus sp*) des gobies et des maquereaux. Les Céphalopodes sont trouvés mais sont peu nombreux et notamment les espèces de Céphalopodes exploitées (seiches et calmars Loliginidés) sont rares. Les résultats sont analysés à la lumière des données déjà publiées sur ces prédateurs et le régime des animaux de Manche est comparé à celui d'autres populations.

Mots clés: Contenus stomacaux, cétacés, relations trophiques

I Introduction :

Studies of the foraging activity of marine mammals are useful to determine food web interactions. Also they can provide a description of nektonic communities different from those based on trawl surveys (Santos *et al*, 2001). The mains source of data on cetaceans diet is derived from stomach contents analysis of stranded animals (Hyslop, 1980). A lot of publications on cetaceans diets are based on examination of a small number of carcasses of stranding or by-caught animals (Clarke and Pascoe, 1985; Bello, 1993; Santos *et al*, 1994). Sampling size limits the area covered by each study and the present paper is the first opportunity to present results about marine mammals feeding in the English Channel ecosystem.

Since many years, GECC (Groupe d'Etude des Cétacés du Cotentin) and, its president Gerard Mauger are deeply involved in the monitoring of populations of marine mammals off the Normandy coast, which size and role in the English Channel ecosystem were unknown before. GECC has established, with the help of a veterinary network, a *post mortem* examination protocol in order to understand reasons of stranding. During autopsies, stomachs are collected and frozen ; they are sent to the University of Caen for the analysis of cetacean diets.

During 1998-2003, stomach contents of 47 marine mammals have been examined. Among the studied species, 6 were Odontoceti cetaceans: the common dolphin *Delphinus delphis* (Linnaeus, 1758), the bottle-nosed dolphin *Tursiops truncatus* (Montegu, 1821), the harbour porpoise *Phocoena phocoena* (Linnaeus, 1758), the long-finned pilot whale *Globicephala melas* (Traill, 1809), the white beaked dolphin *Lagenorhynchus albirostris* (Gray, 1846) and the striped-dolphin *Stenella coeruleoalba* (Meyen, 1833), 1 species of Mysticeti cetacean was also observed, the minke whale *Balaenoptera acutorostrata* (Lacépède, 1804) and 1 species of Pinnipedia: the grey seal *Halichoerus grypus* (Fabricius, 1791).

The present study aims to provide new information on the feeding habits of marine mammals occurring in French waters of the English Channel in order to compare with other geographic areas where these predators can be found. In an intensively fished area like the English Channel, fish communities can undergo changes due to exploitation which in turn can introduce variations in marine mammals feeding regime. Although this is just the first picture of the situation, such variations should be checked in the long run.

II Materials et methods :

Material collection and dissection:

Between 1998 and 2003, stranding of 47 marine mammals have been observed by the GECC veterinary network (see annex). All those animals were sexed, measured and their stomach were collected and sent to the University of Caen to (figure 1 and table 1).

Stomach dissections were carried out in the Laboratoire de Biologie et Biotechnologie Marines of the University. The contents were sorted with a 1 mm mesh size sieve. The hard remains were mainly made up of fish: otoliths, bones and lenses, and cephalopod beaks. Fish otoliths were stored dry and cephalopod beaks in 95% ethanol to avoid degradation.

Prey identification:

Fish otoliths were identified using a reference guide (Harkönen, 1986). The number of fish was estimated by half of the number of otoliths counted. Fish sizes were estimated using otoliths length measured with a binocular microscope equipped with a micrometer ocular. When the number of otoliths of one species in one stomach was more than 30, only a random subsample of 30 otoliths was considered for measurements. Cephalopod beaks were also identified using reference material and a guide (Clarke, 1986).

Prey sizes measurements:

Fish length was calculated from regressions on otoliths size (Harkönen, 1986). Fish weight was estimated via regressions from fish length using assessments made in as much as possible the same area (Dorel, 1986; Coull *et al*., 1989 et Liao *et al*., 2000). When no regressions equations were available, fish weight was directly estimated via regression from otoliths length (Harkönen, 1986). When otoliths were identified to a group of species, regressions based on combined data from all the species of the group were used. Rostral length for squid and hood length for octopus of the upper beaks were also measured with the help of binocular microscope. Dorsal mantle length and body weight were obtained from these measurements using regression coefficients compiled by Clarke (1986).

Indices describing cetaceans diets:

Relative importance of prey taxa in the diet for the different predators was estimated with the percentage of occurrence (%O), and with the numerical proportion of prey (%Np). Proportion of stomach containing food and weights ranges of prey eaten were also calculated for each species of marine mammals studied.

Feeding variations in Common dolphins:

Common dolphin is the most abundant species in the studied sample. The specimen in this species were assigned to one of two classes (mature or immature) according to their size. Males and females were considered as mature when they were at least 2 m long, which is a conservative estimate of the size-at-maturity in common dolphins of the French English Channel coast (Mauger, personal communication).

Differences between these two goups in the average number of prey per stomach, numerical proportion of prey taxa and prey occurrence were sought with basic statistical tests (Student, Chi-square). Chi-square were computed with observed numbers of preys (%Np) and numbers of stomachs containing a prey (%O).

III Results:

Diets of marine mammals:

1325 fish otoliths and 83 cephalopod beaks were collected from the samples, including 12 species of fish belonging to 8 families and 4 species of cephalopods from 4 different families (table 2 and 3).

Fish represent the most important prey consumed by most studied cetaceans. In fact, fishes were more than 60 % of identified prey items from stomachs of common dolphin, bottle-nosed dolphin, harbour porpoise and white beaked dolphin. However, two species, the long-finned pilot whale and the grey seal seemed to have consumed less than 20 % of fish.

Cephalopods are dominant preys in two species: long-finned pilot whale and grey seal with more than 70 % of prey remains whereas they are generally less common (33.3 % in bottle-nosed dolphin and less than 5 % in other studied predators).

In the common dolphin, Fishes were the main food item with Gadidae (whiting and *Trisopterus sp.*), Gobiidae, horse mackerel and Atlantic mackerel. Cephalopods like *Sepiola atlantica* were also presents but in small number.

Bottle-nosed dolphin's stomach remains were mainly composed of Gadidae (*Trisopterus sp.* and blue whiting) and horse mackerel. Only one kind of cephalopods (*Loligo sp.*) has been observed in 4 stomachs, nevertheless it was the most important food item for this predator.

In the harbour porpoise, Gobidae represents more than 95 % of prey collected in the stomach but other species like *Trisopterus sp.*, Horse mackerel, Atlantic herring and *Loligo sp.* were also found.

Fish remains were also present in grey seal and long-finned pilot whale stomach but cephalopods and particularly cuttlefish (*Sepia sp.*) was predominant. White beaked dolphin was the only specimen without any cephalopod remains in stomach and fish were only composed by Gadidae like *Trisopoterus sp.*, cod and pollack. Crustaceans remains were also observed in this stomach.

Two species, Minke whale and striped dolphin were represented only by one specimen containing no food in the stomach although plastic bag debris were found in the Minke whale's stomach.

Size-range of cetacean preys

Prey weights derived from otoliths and beaks measurements are presented in table 4. A very wide range of sizes are observed in food items of the 6 studied species. Marine mammals are top predators who can feed on adult finn fish and cephalopods above the commercial size. Nevertheless, it must be noted that very often small items are also observed. Small preys like gobies can appear in a cetacean stomach as a result of secondary predation when animals that do feed upon gobies (like bib) are also found in the same stomach. However, a direct ingestion of gobies is observed in at least some specimen of common dolphin and harbour porpoise with only gobies and planktonic feeders (like juvenile horse mackerel) in the stomach.

In common dolphin only a subsample of 14 stomachs had all prey items measured and weights of all preys estimated. This enabled to realise how different is the picture of dolphin's diets when one considers the numerical proportion of each prey in the food or the weight percentage (figure 2 A and B). Gadidae represent the major part of food weight whereas small preys like Gobidae are among the most abundant items.

Differences between dolphins group:

Common dolphin did not show significant differences in the average number of prey per stomach according to the maturity stage. Mature animals had slightly more preys items (34 vs 27) but Student test was not significant ($t = 0.5$ $df = 21$ $P>0.05$)

Differences in the numerical proportion of the main prey taxa (*Trispoterus sp*, Gobidae and other preys) were observed (Chi-square = 38.3 df = 2 $P<0.01$). However, the occurrence of the 4 main prey species in stomachs of mature or immature animals did not reveal significant differences (for instance: in *Trisopterus sp* Chi-square = 0.43, df = 1 P = 0.51 in *Scomber scombrus* Chi-square = 2.25, df = 1 P = 0.13).

IV Discussion:

Diets of studied species:

The common dolphin was the best sampled species. Prey consumed by this species were mainly fish , most represented were Gadidae with *Trisopterus sp*. and whiting but also Gobidae, Atlantic mackerel and horse mackerel. Those results are nearly the same as those found by Collet (1981) with stranded animals coming from all over the French Atlantic coast , blue whiting replacing nevertheless whiting. A parallel study of cetaceans stranded on Portuguese coast, showed a predominance of sardine in diets (Sylva, 2001). The rare occurrence of this species in French waters of the English Channel can explain the difference between the two studies. At last, Cephalopods were also presents in diets but in small numbers. Similar results have been found in others studies from Spanish Atlantic coast to

Scottish coast (Gonzalez & al, 1994;Collet, 1981 and Santos & al,1994) where, Common dolphins were described as occasional cephalopods predators. However, this pattern is likely variable and other studies on Portuguese and South Africa coasts have reported that Cephalopods could be more important in the diet (Sylva,2001 and Young and Cockroft,1994).

Bottlenosed dolphin's stomach contained more Cephalopods. *Loligo sp*. was the most numerous prey item (and the only cephalopod taxa) but Gadidae (*Trisopterus sp.* and blue whiting) were also found in high numbers. Cephalopods numerical proportion (about 1/3) was very comparable to that reported by Barros and Odell (1990) and Santos *et al* (1994) in others areas (with species variations between locations).

Gobidae were very dominant in harbour porpoise diet, but, those results must be treated with caution because small preys could come from stomach of others fish or could have been accidentally ingested (Pierce and Boyle,1991). However, Leatherwood et al.(1983) reported that porpoise prefers schooling fish and Rae (1965,1973) retrieved mainly small pelagic or semi-pelagic fish from stomachs of this species. A wide range of prey had also be found from this species including fish and cephalopod also consumed by harbour porpoise on Scottish coast like *Trisopterus sp*., Herring , or *Loligo sp* (Santos *et al*, 1994).

Long-finned pilot whale and Grey seal remains were mainly constituted by cephalopods, *Sepia sp.*, but also *Loligo sp.* in the case of pilot whale. This feeding preference was also recorded by Gonzales *et al*, 1994 for Long finned pilot whale, where fish were not observed but only cephalopods.

White beaked dolphin was the only one species having no cephalopod remain in the stomach, fishes (*Trisopterus sp.*, pollack , and Atlantic cod) and crustaceans were observed in its diet.

Diet analysis problems:

The problems of diet analysis using stomach remains are well known (Hyslop, 1980). In fact, using hard remains, like fish otoliths or cephalopod beaks can induce biases in the results (Santos *et al*, 1994). Time of digestion of otoliths could change with general robustness and shape (Wijnsma et al, 1999). Some feeding strategies of predators which discard fish heads can modify results (Pierce and Boyle, 1991). Also, cephalopod beaks have an indigestible nature (Harvey, 1989) implying a tendency to accumulate in the stomach.

Diets are likely to change during the year with seasonal variations in prey availability. However, stranded animals do not occur throughout the year (winter strandings dominate) and sample size is not sufficient to analyse such variations.

The case of *Balaenoptera acutorostrata*:

Among the sample, one specimen was a young minke whale which didn't had food item, but only plastic bag remains in stomach. Case of stomach obstruction of baleen are not very numerous in France and the impact of this pollution is difficult to appraise. However several hypotheses have been expressed: confusion with prey like cephalopods, accidental ingestion or only a starving animal (unfit state) which tried to eat what he had found (Mauger, 2002).

Size-range of cetacean preys

Marine mammals are top predators and the results of this study show that in the English Channel they can eat large fish and cephalopods, including adult stages of commercial species. However, the numerical proportion of food items is dominated by small preys like Gobidae, and juveniles of other species (Gadidae, horse mackerel).

The data has not been analysed in order to check the trend for larger cetaceans to eat larger preys (Santos et al, 1994) however, it seems that fish and cetacean predation do overlap. It would be interesting to see if this is a general pattern or if the high fishing pressure in the English Channel favours predation at lower levels in the food web.

Diets from different dolphins size and group size:

It should be noted here that inter-individual variability in stomach contents is high (and higher than the differences between groups of dolphins based on size and maturity). Also, some prey items like Gobidae occur rather constantly but the number of these small fishes eaten per dolfin can be highly variable (which is suggested by significant differences in numerical proportions).

In conclusion, no one of these marine mammals seems to be exclusive predators of fishes or squids (but White beaked dolphin for which only one specimen was observed). Marine mammals show an opportunistic behaviour (Würsig, 1984), and in that case their diet could change with local abundance of preys (Santos & al, 1994). Prey consumed by these top predators can belong to important fish stocks although Gadidae eaten by common dolphins are mainly juvenile bib and whiting.

To assess the effect of cetacean predation on the English Channel ecosystem would require to take into account the daily food intake and also to estimate marine mammals abundance.

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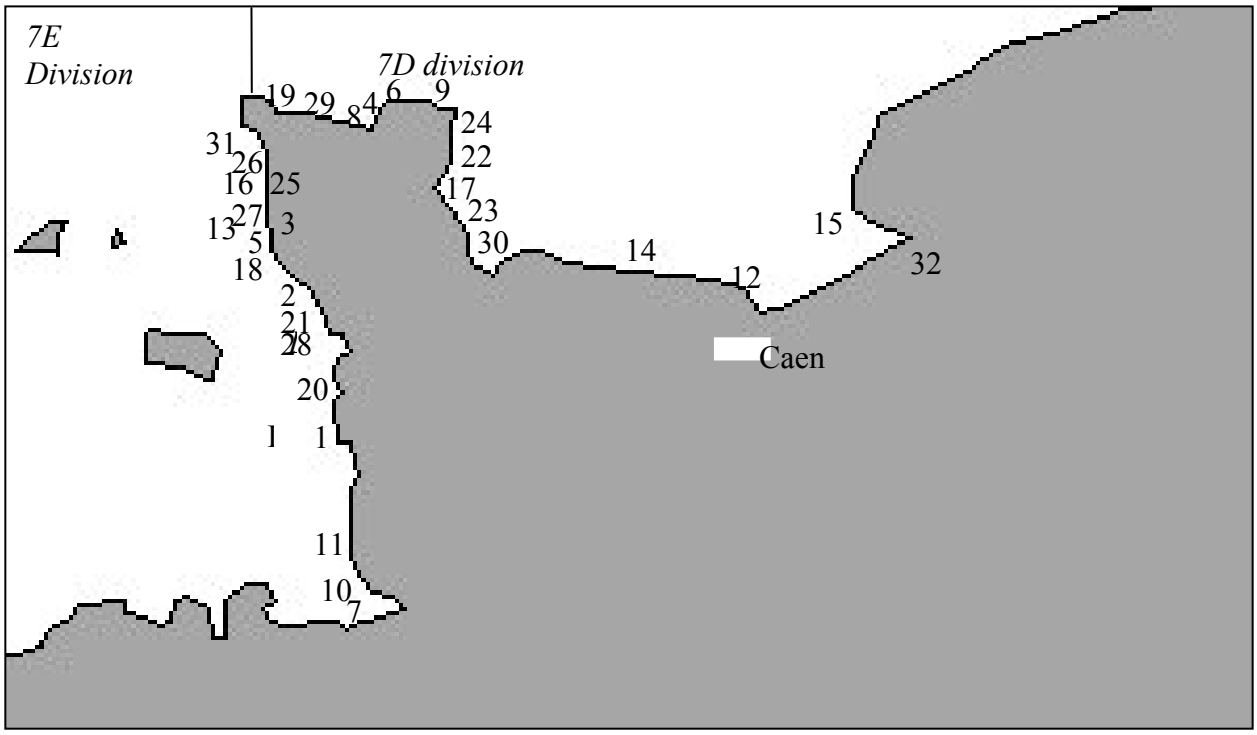

Figure 1 : **Map showing the location of the strandings of marine mammals.**

Table 1:Location of strandings of marine mammals:
Species: Dd: *Delphinus delphis*, Hg: *Halichoerus grypus*, Pp: *Phocoena phocoena*, Tt: *Tursiops truncatus*, Gm: *Globicephala melas*, La: *Lagenorynchus albirostris*, Sc: *Stenella coeruleoalba,* Ba*: Balaenoptera acutorostrata.*

N°	Location	Stranded animals		N°	Location	Standed animals
1	Agon Coutainville	1Hg,1Tt		17	Lestre	1Ba
2	Barneville	1Dd		18	Moitiers d'allone	1Dd
3	Beaubigny	3Dd		19	Omonville la rogue	1Dd
4	Bretteville sur Saire	1Dd		20	Pirou	2Dd,1Hg
5	Carteret	1Dd		21	Portbail	1Dd
6	Cosqueville	1Dd		22	Quineville	1Pp
7	Dragey	1Tt		23	Ravenoville	1Pp
8	Fermanville	3Dd,1Tt		24	Réville	1Pp
9	Gatteville	1Hg		25	Sciotot	1Pp
10	Gênets	1Pp		26	Siouville-Hague	1Gm
11	Granville	1Dd		27	Surtainville	1Dd,1Hg,1Pp,1Tt
12	Grayes sur mer	1Dd		28	Surville	1Dd
13	Hatainville	1Sc		29	Tourlaville	1Dd
14	Hermanville	1Pp		30	Utah Beach	1La
15	Honfleur	1Dd		31	Vasteville	1Dd
16	Les pieux Sciotot	2Dd,1Hg		32	Vatteville la rue	1Gm

Table 2: Diets of 3 marine mammals species stranded on the Normandy coast (Cotentin, France): *Delphinus delphis*, *Tursiops truncatus* and *Phocoena phocoena*.

Cetacean species		*Delphinus delphis*		*Tursiops truncatus*		*Phocoena phocoena*	
Sample size		26		4		7	
% of Stomach containing food		88.5		75		57.1	
Prey species		% N p	% O	% N p	% O	% N p	% O
Fish		**95,88**	**100**	**66,63**	**100**	**99,4**	**100**
Gadidae	**All Gadidae**	**37,68**	**56,6**	**20**	**66,66**	**1,6**	**50**
	Trisopterus luscus	21,67	52,2	13,33	33,33	1,6	50
	Micromesistius poutassou			6,66	33,33		
	Merlangius merlangus	16,01	8,7				
	Gadus morhua						
	Pollachius pollachius						
Clupeidae	*Clupea harengus*	0,28	4,3			0,6	25
Serranidae	*Dicentrarchus labrax*	2,83	17,7				
All Gobiidae		25,35	47,8	6,66	33,33	96,8	75
Scombridae	*Scomber scombrus*	11,19	47,8				
Zeidae	*Zeus faber*			6,66	33,33		
Carangidae	*Trachurus trachurus*	13,88	35,4	26,66	66,66	0,2	25
All Labridae		0,14	4,3				
Pleuronectiformes							
Anarhichadidae	*Anarhichas lupus*					0,2	25
Soleidae	*Solea solea*						
Unidentified fish		4,53	47,8	6,66	33,33	0,6	25
Cephalopods		**3,68**	**26,1**	**33,33**	**66,66**	**0,6**	**25**
Sepiidae	*Sepia sp.*						
Sepiolidae	*Sepiola atlantica*	1,42	13				
Loliginidae	*Loligo sp.*	0,28	8,7	33,33	66,66	0,6	25
Octopodidae	*Eledone cirrhosa*	1,98	8,7				
Other preys		**0,42**	**4,3**				
	Mytilus edulis						
Palaemonidae		0,42	4,3				
	Brachyoures						

Table 3: Diets of 3 marine mammals species stranded on the Noramndy coast (Cotentin, France): *Halichoerus grypus, Globicephala melas* and *Lagenorynchus albirostris*.

Cetacean species		*Halichoerus grypus*		*Globicephala melas*		*Lagenorhyncus albirostris*	
Sample size		5		2		1	
% of Stomach containing food		60.0		100		100	
Prey species		% Np	% O	% Np	% O	% Np	% O
Fish		**16,7**	**33,3**	**9,6**	**100**	**64,7**	**100**
Gadidae	**all gadidae**	**8,3**	**33,3**	**4,8**	**100**	**64,7**	**100**
	Trisopterus luscus			4,8	100	29,4	100
	Micromesistius poutassou	8,3	33,3				
	Merlangius merlangus						
	Gadus morhua					11,8	100
	Pollachius pollachius					23,5	100
Clupeidae	*Clupea harengus*						
Serranidae	*Dicentrarchus labrax*						
All Gobiidae		8,3	33,3				
Scombridae	*Scomber scombrus*						
Zeidae	*Zeus faber*						
Carangidae	*Trachurus trachurus*			2,4	50		
All Labridae							
Pleuronectiforme							
Anarhichadidae	*Anarhichas lupus*						
Soleidae	*Solea solea*			2,4	50		
Unidentified fish							
Cephalopods		**75**	**66,7**	**88,1**	**100**		
Sepiidae	*Sepia sp.*	75	66,7	73,8	50		
Sepiolidae	*Sepiola atlantica*						
Loliginidae	*Loligo sp.*			14,3	100		
Octopodidae	*Eledone cirrhosa*						
Other preys		**8,3**	**33,3**			**35,3**	**100**
	Mytilus edulis	8,3	33,3				
Palaemonidae							
	Brachyoures					35,3	100

Table 4: Range of estimated weights of preys identified in stomach contents
(nc = not computed)

	Delphinus delphis		*Tursiops truncatus*		*Phocoena phocoena*		*Halichoerus grypus*		*Globicephala melas*		*Lagenorhynchus albirostris*	
	min	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
Length range of studied cetaceans (cm)	132	238	156	310	88	150	118	207	440	470	256	
Weight ranges of preys (g)	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
Trisopterus luscus	1	34.8	1	41	2	10.9			21.8	219.7	10	90
Micromesistius poutassou			105.4				59.6					
Merlangius merlangus	18	138										
Gadus morhua											1960	2140
Pollachius pollachius											285	785
Clupea harengus	9.9	78.9			46.7	115						
Dicentrarchus labrax	nc	nc										
Gobidae	<0.1	3	1	2	1	6.7	<0.1					
Scomber scombrus	14	319										
Zeus faber			241.1									
Trachurus trachurus	1	102	18	198	7.3				97.25			
Anarhichas lupus					2829							
Solea solea									40			
Sepia sp.							8.1	12	34.5	925.9		
Sepiola atlantica	1.1	1.5										
Loligo sp.	90	834	27	895	139				204	319.2		
Eledone cirrhosa	15	437										
Mytilus edulis							nc	nc				
Palaemonidea	0.1											
Brachyura											nc	nc

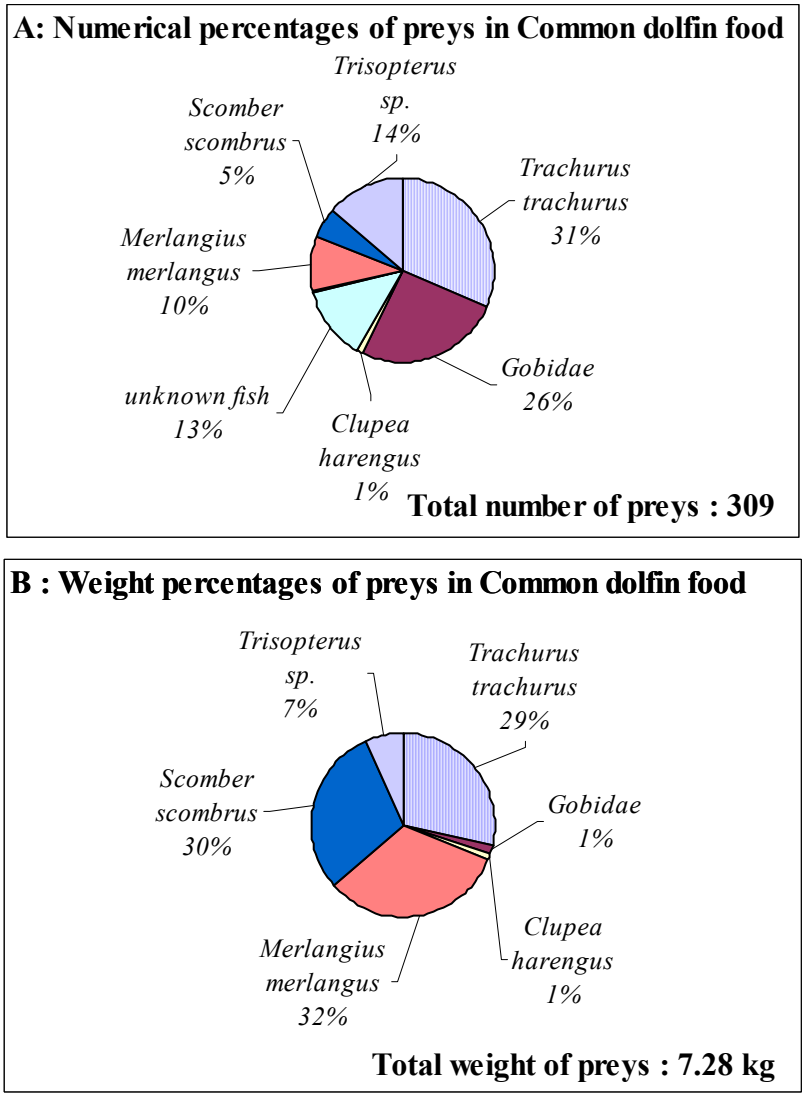

Figure 2 Comparison of indices describing common dolfin's food composition:
A. Proportions of the main prey-types by number. B. Proportions of each prey-type by weight.
(nb: these pictures are based on a subsample of 14 dolfin stomachs for which all preys have been measured)

Annex: Basic data on stranded marine mammals collected by the GECC network :

N°	species	Date found	location	Sex	Length (cm)	Field observations (related to stomachs):
1	*Delphinus delphis*	10/01/98	unknown	female	132	
2	*Delphinus delphis*	06/03/99	Grayes sur mer	male	213	many parasites
3	*Delphinus delphis*	12/04/99	Honfleur	female	199	
4	*Delphinus delphis*	19/02/00	Portbail	male	163	
5	*Delphinus delphis*	19/02/00	Pirou	female	208	many parasites
6	*Delphinus delphis*	10/03/00	Pirou	female	230	
7	*Delphinus delphis*	12/03/00	Beaubigny	male	230	Fish-hook
8	*Delphinus delphis*	12/03/00	Beaubigny	male	238	
9	*Delphinus delphis*	12/03/00	Beaubigny	male	215	
10	*Delphinus delphis*	17/03/00	Les pieux Sciotot	female	196	
11	*Delphinus delphis*	19/03/00	Bretteville sur Saire	male	210	highly ulcerated
12	*Delphinus delphis*	26/04/00	Granville	female	202	
13	*Delphinus delphis*	13/02/01	Flamanville	female	200	Ulcer
14	*Delphinus delphis*	25/02/01	Fermanville	male	220	
15	*Delphinus delphis*	05/03/01	Omonville la rogue	female	170	seaweed (*Codium sp.*)
16	*Delphinus delphis*	14/03/01	Moitiers d'allone	unspecified	205	No food
17	*Delphinus delphis*	11/02/02	Vasteville	unspecified	210	Ulcer + parasites
18	*Delphinus delphis*	20/02/02	Fermanville	female	195	No food
19	*Delphinus delphis*	25/02/02	Surtainville	male	195	
20	*Delphinus delphis*	26/02/02	Carteret	male	225	1 big Ulcer (D > 5cm)
21	*Delphinus delphis*	04/03/02	Surville	female	200	1ulcer
22	*Delphinus delphis*	10/03/02	Les pieux Sciotot	male	148	No food
23	*Delphinus delphis*	30/01/03	Tourlaville	male	unspecified	Ulcer
24	*Delphinus delphis*	30/01/03	Cosqueville	female	unspecified	
25	*Delphinus delphis*	31/01/03	Fermanville	male	unspecified	
26	*Delphinus delphis*	01/02/03	Barneville	unspecified	unspecified	
27	*Globicephala melas*	03/11/99	Vatteville la rue	female	470	
28	*Globicephala melas*	26/01/02	Siouville-Hague	female	440	Ulcer
29	*Halichoerus grypus*	07/12/99	Surtainville	male	207	
30	*Halichoerus grypus*	15/03/00	Gatteville	male	200	
31	*Halichoerus grypus*	05/11/01	pirou	male	172	
32	*Halichoerus grypus*	26/02/02	Les pieux Sciotot	male	118	No food
33	*Halichoerus grypus*	17/11/02	Agon Coutainville	female	unspecified	No food
34	*Lagenorynchus albirostris*	07/03/99	Utah Beach	female	256	parasites (*Anisachis sp.*)
35	*Phocoena phocoena*	05/10/98	Ravenoville	unspecified	unspecified	
36	*Phocoena phocoena*	14/05/99	Sciotot	male	88	No food, probably not weaned
37	*Phocoena phocoena*	07/07/99	Surtainville	female	96	
38	*Phocoena phocoena*	25/02/01	Gênets	male	150	No food
39	*Phocoena phocoena*	16/03/03	Quineville	female	unspecified	
40	*Phocoena phocoena*	23/03/03	Hermanville	male	unspecified	
41	*Phocoena phocoena*	23/03/03	Réville	male	unspecified	No food
42	*Stenella coeruleoalba*	21/11/00	Hatainville	female	190	No food
43	*Tursiops truncatus*	26/10/99	Dragey	female	302	
44	*Tursiops truncatus*	08/07/01	Surtainville	male	310	
45	*Tursiops truncatus*	12/09/01	Agon Coutainville	male	156	No food
46	*Tursiops truncatus*	30/01/03	Fermanville	male		Ulcer
47	*Balaenoptera acustorostrata*	06/04/02	Lestre	female	397	No food but plastic bag remains in stomach, unfit,