

## Theme Session L

### Marine mammals, seabirds, and fisheries: Ecosystem effects and advice provision

#### ICES CM 2006/L:01

##### Modelling and mapping trophic overlap between seabirds and marine fisheries on a global scale

Vasiliki Karpouzi, R. Watson, and D. Pauly

Coexistence of foraging seabirds and operating fisheries may result in interactions, such as competition for the same prey resources. We used GIS-based modelling at a scale of 30-min spatial cells to: (a) map the foraging distribution of seabirds; (b) predict their annual food consumption rates in a spatially-explicit manner; and (c) estimate a spatially-explicit seabird – fisheries overlap index. Information on population size, diet composition, and foraging attributes of 351 seabird species was compiled into a database. Global annual food consumption by enumerated seabirds was estimated to be 96.4 million tonnes (95% CI: 78.0 to 114.7 million tonnes), compared to a total catch of nearly 120 million tonnes by all fisheries. Krill and cephalopods comprised over 58% of the overall food consumed and fishes most of the remainder. The families *Procellariidae* (albatrosses, petrels, shearwaters, etc.) and *Spheniscidae* (penguins) were responsible for over 54% of the overall food consumption. Seabird foraging distribution maps revealed that areas around New Zealand, the eastern Australian coast, and the sub-Antarctic islands had high species richness. However, temperate and polar regions supported high seabird densities, and most food extracted by seabirds originated there. Furthermore, maps of food consumption rates revealed that most food consumed by seabirds was extracted from offshore rather than near shore waters, and from areas where seabird – fisheries overlap was low. The trophic overlap maps identified ‘hotspots’ of highest potential for conflict between fisheries and seabirds. Thus, this study may provide useful insight when developing management approaches for designing offshore marine conservation areas.

Keywords: seabird–fisheries interactions, trophic overlap, at-sea distribution, seabird food consumption.

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#### ICES CM 2006/L:02

##### Is harp seal predation an important consideration for recovery of the Northern Gulf of St. Lawrence cod population?

Daniel E. Duplisea and Mike Hammill

The Northern Gulf of St. Lawrence (NGSL) cod population is currently at about 50% of its 80,000 tonne limit reference point ( $B_{lim}$ ). A model for NGSL cod was developed which partitioned natural mortality into harp seal predation and residual components. Mortality, functional response and recruitment parameters were fitted using historical series (1974–2005) for cod and seals. The complete data series could not be fitted with only one set of parameters; therefore, we fitted a pre-collapse (1974–1990) set and recent state (1999–2005) set. The pre-1990 parameters showed that cod constituted 2–6% of harp seal diet, according well with stomach contents data, while cod constituted less than 1% of the diet in the recent period.

Projections using the early period parameters predicted stock extirpation in 8 years even without a fishery. Projections using the recent period parameters suggest that without fishing, the cod population would attain  $B_{lim}$  in 14 years, and without seal predation this would decrease to 9 years. With a fishery exploitation rate of 10% SSB, the stock would reach  $B_{lim}$  after 35 years, and with a 30% reduction in seal inflicted mortality this would drop to 20 years. This approach could be used for any predator-prey pair, given data availability, to inform advice on the most effective means of achieving a recovery target in the minimum amount of time. For the present example, it suggests per capita mortality inflicted by harp seals on cod is currently less than in the pre-1990 period. It shows that although reductions in seal mortality on cod could decrease the recovery time of the stock, fishing is a more important source of mortality.

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#### ICES CM 2006/L:03

##### Strandings of decayed harbour porpoises in Belgium during the first fortnight of May 2005: what did they die of, where did they come from?

Jan Haelters, Thierry Jauniaux, Francis Kerckhof, José Ozer, and Serge Scory

At the Belgian coast a remarkably high number of dead harbour porpoises *Phocoena phocoena* washed ashore in

the first half of May 2005. In total 16 were counted between 3 and 16 May. This is a number without precedent in this area. The state of decomposition of all animals was similar: all were coded as 'fours', or very decomposed. It was estimated that the animals had died at least 2 to 3 weeks before. All dead animals were necropsied.

Bycatch was the most probable cause of death of most of the animals. Using the models developed at MUMM to simulate the displacement of objects at the surface and in the water column, the most probable region where the animals had died was an area between the western part of Belgian territorial waters and an area offshore Boulogne – Le Touquet off northern France (eastern Channel). The results of the multidisciplinary research indicate that (1) necropsies, even of decayed porpoises, can in many cases reveal the most probable cause of death; (2) mathematical modelling of the drift of cetacean carcasses can play a useful part in revealing the place where they died; and (3) in spring a porpoise bycatch problem exists in the southern North Sea – eastern Channel.

Key words: *Phocoena*, harbour porpoise, bycatch, southern North Sea, eastern Channel, models, multidisciplinary research.

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## ICES CM 2006/L:04

### Abundance of harbour porpoise and other small cetaceans in European Atlantic continental shelf waters

P. S. Hammond and K. Macleod

Bycatch of the harbour porpoise and common dolphin, mainly in bottom set gillnets and pelagic trawls respectively, is a major conservation concern in European waters. The Habitats Directive specifies that Member States should employ conservation measures to ensure that bycatch does not have a serious negative impact on cetacean populations. Information on abundance is fundamental to an assessment of population status and to inform conservation actions. The SCANS survey (1994) provided the first robust estimates of abundance for small cetaceans in the North Sea and adjacent waters. The SCANS-II surveys were carried out in July 2005 to generate new estimates of cetacean abundance for the entire European Atlantic continental shelf. Seven ships and three aircraft surveyed the area. The survey and analysis methods accounted for the probability of detection on the transect line being less than one and for movement of animals in response to ships. Shipboard transects covered 19,000 km and aircraft flew 15,220 km on effort in an area of 1.4 million square kms. A preliminary estimate of harbour porpoise abundance throughout the area is 344,000 (CV=0.14). There were regional dif-

ferences in density within the North Sea and adjacent waters between 1994 and 2005. Density was generally lower in northern strata and higher in southern strata in 2005. Final estimates for the harbour porpoise and other species will be presented. Harbour porpoise abundance estimates will be incorporated into the management procedure being developed to allow safe bycatch limits to be recommended.

Keywords: abundance, bycatch, harbour porpoise, small cetaceans, line transect surveys.

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## ICES CM 2006/L:05

### Modeling trophic interactions between parental common murre and capelin off the northeast Newfoundland coast

A. D. Buren, M. Koen-Alonso, W. A. Montevecchi, J. T. Anderson, B. deYoung, and G. K. Davoren

This presentation focuses on trophic interactions between capelin (the major forage fish species in the Northwest Atlantic) and its primary avian predator, the common murre (*Uria aalge*) at the species' largest colony, Funk Island. Diet is evaluated through parental deliveries to the chicks during the breeding season and the prey availability is estimated from pelagic trawl data within avian foraging range. Diet composition is evaluated using percentage by number (%N), with its confidence limits obtained by bootstrapping. Since the common murre is a capelin specialist and feeds on capelin larger than 100 mm, three prey categories were considered: small capelin (100–140 mm total length), large capelin (>140 mm total length) and "others" (prey species other than capelin).

Considering the densities of these prey groups as explanatory variables and assuming a multinomial probability distribution for the individual prey deliveries, the common murre's diet is being modeled in two different ways. The first one is purely statistical and uses a standard multicategory logit model.

The second one, mechanistically derived, estimates the probabilities of consuming different prey categories from a generalized form of the multispecies Holling functional response. Overall, both models describe well the observed diets, but the model with ecological roots has a better fit than the purely statistical one. Furthermore, in years when abundance of capelin greater than 100 mm was high the proportions of large and small capelin consumed were not significantly different, while they were in years of low capelin abundance.

Keywords: common murre, capelin, trophic model.

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#### ICES CM 2006/L:06

##### **Management procedure for determining appropriate limits to the bycatch of small cetaceans in the European Atlantic and North Sea**

Arliss J. Winship, Per Berggren, and Philip S. Hammond

Bycatch of small cetaceans in European Atlantic and North Sea fisheries is an international conservation issue. Scientific working groups have recommended the development of a management procedure for setting appropriate bycatch limits to achieve management objectives. We considered two candidate management procedures: the Potential Biological Removals (PBR) procedure used by the USA government, and a Bycatch Limit Algorithm (BLA) procedure that we developed based on the Catch Limit Algorithm of the International Whaling Commission's Revised Management Procedure. The former operates on a current estimate of absolute abundance, while the latter operates on time-series of estimates of absolute abundance, relative abundance, and bycatch. Performance simulation testing was used to compare and contrast the behaviour of the two management procedures and to 'tune' the procedures so that specific management objectives were achieved (e.g., maintain populations at >80% of carrying capacity). The operating model used for the simulations incorporated a population with age structure, density dependence, and subpopulation structure, and allowed for bias and random error in the observation and implementation processes. Multiple scenarios were explored with respect to population dynamics, population structuring and biases in observation, and bycatch to ensure that the management procedure was robust to uncertainty in these processes. We use harbour porpoise in the North Sea to illustrate how bycatch limits would be set using the two management procedures in conjunction with estimates of absolute abundance from the SCANS and SCANS-II surveys (July 1994 and 2005), estimates of relative abundance from the European Seabirds at Sea database, and estimates of bycatch from observer programmes and fishing effort.

Keywords: bycatch, conservation, harbour porpoise, management procedure, North Sea, simulation testing, small cetacean.

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#### ICES CM 2006/L:07

##### **Spatial and seasonal distribution patterns of harbour porpoises in the German Bight of the North Sea – which abiotic factors influence the distribution?**

A. Gilles, K. Kaschner, R. Mundry, M. Scheidat, and U. Siebert

Seasonal differences in the distribution of harbour porpoises (*Phocoena phocoena*) in German national waters of the North Sea (EEZ plus 12 nm zone, 41,000 km<sup>2</sup>) were investigated. Data collection was based on aerial surveys conducted between 2002 and 2005 following standard line transect methodology. Survey effort amounted to 39,513 km during which a total of 3,890 harbour porpoises were seen. Using standard distance procedures and a grid of 10×10 km, the line transect point locations were converted into mean density estimates. The density estimates were corrected for missed animals and sighting conditions. Permutation simulation analyses were used to investigate porpoise occurrence in relation to potential predictor variables (e.g. depth, several depth derivatives, distance to land, sea surface temperature SST) during different times of the year (spring, summer, and fall). The results indicated significant seasonal similarity in porpoise spatial distributions between seasons of the four study years.

Observed seasonal shifts in distributions are most likely linked to changes in harbour porpoise habitat requirements associated with different stages of their annual life cycle. In particular, porpoises appeared to be more closely associated with depth, contour index, and SST during the spring months than during other times of the year. The results emphasise the importance of year-round monitoring programmes and the consideration of seasonal aspects when developing habitat prediction models and when investigating critical habitat, particularly in the context of anthropogenic impact assessments. However, harbour porpoise habitat selection on smaller geographic and temporal scales is likely influenced by additional environmental and biological parameters.

Keywords: aerial survey, harbour porpoise, abundance estimates, distribution, habitat prediction.

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#### ICES CM 2006/L:08

##### **Prey consumption by Barents Sea harp seals in the period 1990–2005**

Ulf Lindstrøm, Kjell T. Nilssen, and Tore Haug

The Barents Sea ecosystem has experienced major fluctuations in species abundance in the past 20–30 years. The mechanisms behind these fluctuations are complex and arise from numerous interactions between species

and the environment. Previous and present attempts to assess multi-species interactions in the Barents Sea ecosystem has resulted in increased focus on the foraging ecology of the most conspicuous high trophic-level predators in the ecosystem. The Barents Sea stock of harp seals *Pagophilus groenlandicus* is, along with Arctic cod *Gadus morhua*, considered the most conspicuous high trophic-level predator in the Barents Sea ecosystem. The abundance and feeding ecology of the Barents Sea stock of harp seals has been monitored the past 15 years. Previous prey consumption estimates suggest that harp seals consume between 3.3 and 5 million tonnes of prey annually, depending on the choice of input parameters in the bioenergetic model. There was a considerable amount of uncertainty attached to the input data in the consumption model, in particular the important harp seal diets during summer (May–July). Also, uncertainty estimates of the prey consumption were not given in the previous study. The main objective of this study was to estimate the uncertainty of the prey consumption estimates by using a standard Monte-Carlo framework; random draws from probability distributions of diet and abundance were performed. Additionally, new diet data from May–July has become available and is included in the analysis. The general trend is that the consumption of large zooplankton increases with latitude, while fish (capelin, immature herring, and polar cod) dominate the consumption in the southern Barents Sea. The large variation in prey consumption is mainly due to great heterogeneity in diet composition. Krill and amphipods were consumed in greatest quantities followed by capelin, if present, and polar cod.

Keywords: Barents Sea, harp seals, diet, consumption.

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### ICES CM 2006/L:09

#### **Finding the cause of bycatch of Atlantic white-sided dolphins (*Lagenorhynchus acutus*) by pelagic trawlers: following the biological approach**

A. S. (Bram) Couperus, Cindy J. G. van Damme, and Huygen van Steen

Evidence is provided for possible causes of bycatch of Atlantic white-sided dolphins (*Lagenorhynchus acutus*) in the Dutch pelagic fishery, west of Ireland, in the nineties. The hypothesis is put forward that dolphins feed on discards in the slipstream of the trawlers at night and thus become vulnerable to bycatch during hauling or shooting of the gear. A possible mitigation measure would therefore be to stop discarding during the fishing operations, by temporarily storing discards in a “buffer-tank”, and to release the discards between fishing operations only.

In this study, an extensive description is given of the way the catch is handled on board and how discards are re-

leased and become available for scavenging dolphins. Stomach contents of bycaught specimens are compared with discards composition from sampling onboard by observers. Mackerel dominates the fresh remains of the stomach contents. The length distribution of the mackerel in stomach contents is similar to the mackerel in the discards, indicating that dolphins are feeding on discarded mackerel, rather than foraging on the mackerel when these are caught in the net. Information obtained by observers onboard the trawlers and from other diet studies confirms this hypothesis.

The possibilities and limitations of implementing a “buffer-tank” on a trawler compared to other—more technological—measures of mitigation like gear modification, are discussed.

Keywords: Atlantic white-sided dolphin, *Lagenorhynchus acutus*, diet, bycatch, discards, mackerel.

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### ICES CM 2006/L:10 – Withdrawn

### ICES CM 2006/L:11 – Withdrawn

### ICES CM 2006/L:12

#### **Marine turtle observations in different Spanish fisheries (1993–2005)**

Santiago Lens

An analysis of the information on sea turtles obtained by the Spanish Institute of Oceanography in the period 1993–2005 is presented in this paper. This information has been obtained by scientific observers through several onboard sampling schemes for the study of the target species and discards in trawl fisheries in ICES and NAFO areas, as well as in surface longline fisheries in different oceanic areas. The sampling effort was carried out opportunistically through the period considered. Information obtained in some experimental fishing trips is also presented.

Incidental catches were observed in the trawl fishery in NAFO area, but only three incidental catches were reported on more than 20,000 monitored hauls. The great majority of the interactions were observed on the swordfish longline fishery. This fishery is mainly carried out in the Atlantic (33 monitored fishing trips) but also in the Indian and Pacific Oceans (7 and 5 monitored fishing trips, respectively). The Atlantic fishery presents the highest number of interactions with 425 fishing sets with reported interactions and 825 animals caught. The species identified were loggerhead, leatherback, kemp’s ridley, olive ridley, and green turtle.

Most of the interactions correspond to individuals that were captured and released alive. The loggerhead is the species with the highest mortality. Some additional information on the geographic and seasonal distribution of the incidental catches and on the length of the specimens is also presented.

Keywords: marine turtles, fisheries, monitoring schemes, incidental catches.

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### ICES CM 2006/L:13 – Poster

#### **Pregnancy rate in the short-beaked common dolphin *Delphinus delphis* in the North-east Atlantic**

Sinéad Murphy, S. P. Northridge, P. D. Jepson, R. Deaville, R. J. Reid, E. Rogan, M. Silva, M. Sequeira, R. Lago Garza, and A. López

Recent genetic analysis suggests that only one population of *D. delphis* exists in the North-east Atlantic. However, examination of geographical variation in skulls obtained from this region has shown evidence of population segregation, with female Portuguese *D. delphis* segregating from those in more northern latitudes. This separation of female Portuguese skulls from other areas has been attributed to *D. delphis* off Portugal possibly mixing with those in the Mediterranean Sea population. To date there is a lack of knowledge on reproductive parameters in the female common dolphin within the North-east Atlantic population. In order to assess reproductive parameters within this area, we analysed biological samples obtained by the UK, Irish, Galician (northern Spain), and Portuguese stranding projects, and also samples obtained from the observer bycatch program with the Irish tuna driftnet fishery. Samples were collected between 1990 and 2005, and both the annual pregnancy rate (APR) and average age at attainment of sexual maturity (ASM) were calculated for the whole sample, and for each area. This was in order to compare reproductive parameters in Portuguese common dolphins with those from more northern latitudes. As strandings data may be comprised of individuals suffering from severe infectious and non-infectious disease, which may prevent individuals in reproducing, a control group was also established for assessing the APR. The control group was composed of healthy individuals that stranded along the UK coastline, and were later diagnosed as bycaught during necropsies. Finally, results of the current study are compared with those from populations elsewhere.

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### ICES CM 2006/L:14

#### **Gray seal (*Halichoerus grypus*) diet composition in United States waters as inferred from fecal remains and stomach contents**

K. Ampela and A. Ferland

Considered extinct in U.S. waters prior to 1950, today there are more than 7,000 gray seals in the waters of Maine and Massachusetts alone. The impact of these seals on local fish populations has not been documented. To help address this deficiency we inspected over 250 fecal samples and 25 seal stomachs for otoliths and other hard remains. We collected fecal material twice per season from 2002 to 2006 at three seal haulout sites in Nantucket Sound, Massachusetts. We obtained stomachs from seals killed incidentally in fishing operations throughout U.S. shelf waters. We identified otoliths and other diagnostic hard parts to the lowest possible taxon, and measured otoliths and cephalopod beaks to estimate prey size. We applied correction factors for partial and complete digestion of hard parts, and inferred minimum number of individuals (MNI), frequency of occurrence (FO), and ingested biomass for all important prey taxa. Juvenile hake (*Urophycis* sp.) accounted for 53.7% of the diet by weight. Skate and squid contributed to an additional 21.6% of the diet, and cod (*Gadus morhua*) accounted for less than 6%. We found no evidence of bluefish (*Pomatomus saltatrix*), American lobster (*Homarus americanus*), or striped bass (*Morone saxatilis*). Our sampling indicates that these seals have a minimal impact on economically important fish species in U.S. waters.

Keywords: gray seal, *Halichoerus grypus*, otoliths, bones, diet estimation, feces, scat, stomach contents, fishery interactions.

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### ICES CM 2006/L:15

#### **Fishing activity in the German Bight (SE North Sea) and its influence on distribution and habitat use of *Larus* gulls**

Philipp Schwemmer, N. Markones, and S. Garthe

Influence of fishing activity on seabirds has been studied intensively during the last two decades with the focus on utilization of discards and its role for seabird populations. The four most common gull species of the German North Sea coast, black-headed, common, lesser black-backed, and herring gull (*Larus ridibundus*, *L. canus*, *L. fuscus*, *L. argentatus*) are frequently observed at fishing vessels feeding on discards. Thus, their distribution and habitat use is expected to be highly related to fishing activities.

We analysed a multi-year dataset on seabird distribution (German Seabirds at sea database) in order to detect influence of fishing activity on distribution patterns of gulls throughout the year. The abundance of fishing vessels was highest in the eastern coastal part of the study area, which was mainly dominated by shrimp trawlers. In this area, the abundance of trawlers positively affected the occurrence of all four gull species and also had a marked influence on their behaviour. In the whole study area, species composition, numbers, and proportion of ship-following individuals of the total number observed differed substantially between seasons. Seabird distribution patterns were influenced differently by fishing activity on the one hand and the distribution of natural food sources on the other.

Thus, all four gulls exhibited different distribution patterns between individuals feeding or searching for natural prey and those foraging at fishing vessels. Moreover, it could be shown that common gulls occurring outside their natural habitat (low saline coastal waters) were predominantly associated with fishing vessels.

Keywords: seabird, scavenger, discards, distribution, German Bight, North Sea.

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## ICES CM 2006/L:16

### Spatial patterns and temporal trends in discard use by seabirds in the North Sea and Baltic Sea

Stefan Garthe

The use of discards by seabirds has been described for many parts of the world. Particularly comprehensive studies have been conducted in the North Sea while not much is known from the Baltic Sea. Here, an up-to-date overview is given on discard utilisation in these two areas. Four different types of data allow the discussion of the following topics:

- 1) The importance of discard in the diet: From a variety of diet studies on seabirds the proportion of discards in the diet is estimated. Data is available on a quarterly basis. Some local studies even allow the consideration of trends in the relative importance of discards.
- 2) The influence of fishing activity on seabird distribution: The proportion of birds following fishing vessels is estimated from data on the at-sea distribution of seabirds, as stored in the European Seabirds at Sea Database (ESAS). This data source allows trends to be investigated.
- 3) The community of scavenging seabirds: Detailed data on species composition and numbers of scavengers is available from counts of sea-

birds at commercial fishing vessels and at fishery research vessels. This data set allows spatial patterns and temporal trends to be derived.

- 4) The consumption of discards: Quantitative data on discard consumption by seabirds can be calculated from discard experiments conducted onboard commercial fishing vessels and fishery research vessels. Recent observations indicate trends in discard use.

Keywords: seabird, scavenger, discards, North Sea, Baltic Sea.

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## ICES CM 2006/L:17

### Integrating scientific studies and monitoring results into advice in the German EEZ

Søren Anker Pedersen and Christian Pusch

In November 2005, ICES and the Federal Agency for Nature Conservation (BfN) initiated the research and development project *Environmentally Sound Fishery Management in Marine Protected Areas* with the objective of developing fisheries management plans for the Natura 2000 sites (MPAs) within the German EEZ of the North Sea and Baltic Sea. The present paper will 1) give a description of the project background, 2) present conservation targets for species and habitats, 3) review available fisheries data and information, and 4) outline and discuss the road towards environmentally sound fishery management in the German MPAs.

In analysing all fishing activities of all vessels operating in (and adjacent to) Natura 2000 sites, the project is expected to significantly improve the quality of data used in the evaluation of potential conflicts between fisheries and nature conservation targets. The analysis will be based on existing and, where appropriate, newly accessed data or data acquired especially for this project. The project is intended to provide guidance as to how the quality of fisheries data may need to be improved when used for the evaluation of potential conflicts between fisheries and nature conservation goals. After analyses and assessments of these activities, a management concept will be developed. Part of this concept will be concrete recommendations for fisheries management measures such as the spatial and temporal regulation of the fishery (e.g., no-take zones), the introduction of sustainable fishing methods that comply with ecosystem requirements, and other management measures (e.g., stricter discard restrictions) to safeguard compliance with the Natura 2000 conservation targets.

Keywords: Natura 2000, fisheries management, MPA, ecosystem approach.

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### ICES CM 2006/L:18 – Poster

#### Stranding of a humpback whale (*Megaptera novaeangliae*) on the Belgian coast

T. Jauniaux., C. Brenez, J. Haelters, T. Jacques, J. Ozer, S. Scory, and F. Coignoul

On March 1st, 2006, a large cetacean, estimated 10 m long, was observed dead, drifting at 2 nautical miles off Calais (France). Computer models predicted a north–eastwards drift of the carcass and a stranding within two days or less. Five days later, on March 5, a humpback whale was found dead on the Belgian coast (Lombarsijde). It was presumably the same animal. The later re-processing of the observations at sea resulted in a better definition of the parameters used for predicting the drift of such large bodies. The animal was necropsied. It was a juvenile female of 10.5 m. The blubber thickness was 11.5 cm and the body weight was 15 tons. External examination of the left pectoral flipper revealed multiple ante-mortem fractures of the radius and the ulna. Internal observations revealed various intramuscular hemorrhages in the head and neck area. Otherwise the muscles were red pinkish. There was evidence of intraperitoneal hemorrhage. The whale had been in good health with a good nutritional status (normal blubber thickness) and fresh preys were present in the stomach. Both observations suggested that the cause of death was an acute process. The observed lesions (bone fractures, intramuscular and intraperitoneal hemorrhages) suggested a severe trauma, almost certainly a ship collision. Large cetacean deaths related to ship strike and net entanglement are reported with increasing frequency in the North Sea. Only the necropsy of all stranded animals could help evaluate the actual impact of such accidents.

Keywords: humpback whale, *Megaptera novaeangliae*, ship strike, pathology, southern North Sea.

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### ICES CM 2006/L:19 – Poster

#### Influence of fisheries discards and environmental variables on seabirds in northern Spanish waters (Cantabrian Sea)

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Utilization of discards by seabirds at sea was studied in Cantabrian Sea waters in 2003 and 2005 during bottom trawl surveys. More than 25 species are wintering or migrant seabirds at the North Spanish continental shelf and upper slope. Most important species in terms of abundance are the northern gannet (*Morus bassanus*), the *Larus spp.* gulls (seven species), the Balearic shearwater (*Puffinus mauretanicus*), and great skua (*Stercorarius skua*).

A total of 18 seabird species scavenged discards of trawl hauls in the area. The effect of environmental variables as depth, daytime, latitude, longitude, and distance to coast, and fishing-related variables such as trawlers density influencing on distribution and abundance of scavenging seabirds are analysed in both years. The relation between availability of the most important discard species and seabird diet is discussed. Four species comprise 90% of the undersized discards by the trawl fishery in the area: silvery pout (*Gadiculus argenteus*), blue whiting (*Micromesistius poutassou*), horse mackerel (*Trachurus trachurus*), and hake (*Merluccius merluccius*).

Statistical analysis shows the importance of several variables such as the spatial position at the continental shelf, the commercial fishing vessel's density, and the abundance of undersized silvery pout, horse mackerel, and hake. The results will improve the knowledge of discard use by seabirds to assess the role of seabirds in the marine ecosystem of the Cantabrian Sea.

Keywords: seabirds, fisheries, discards, Cantabrian Sea, feeding ecology.

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