RELATIVE TROPHIC LEVELS OF SEVERAL MARINE MAMMAL SPECIES FROM THE NORTHEASTERN ATLANTIC DETERMINED THROUGH STABLE ISOTOPE ANALYSIS

Beans C. [1], Das K. [1], Mauger G.[2], Rogan E.[3], Bouquegneau J.M.[1]

[1] *Laboratory of Oceanology, Liège University B6, B-4000 Liège, Belgium*

[2] *Groupe d'Etude des Cétacés du Cotentin, CIT, Rue Louis Aragon, 50130 Cherbourg-Octeville, France*

[3] *Dept. Of Zoology and Animal Ecology, University College, Cork, Ireland*

Introduction

In recent decades the use of stable nitrogen ($\delta^{15}N$) and carbon ($\delta^{13}C$) isotope ratios has provided valuable insights into the trophic ecology of many species. Their study complements stomach content analysis in trophic studies in order to be able to relate diet information with other factors (such as pollutant levels, Das et al., 2000) since precise information on the animals' diet is not abundant (stranded animals' stomachs are frequently empty). The use of stable isotope ($\delta^{15}N$ and $\delta^{13}C$) analysis has shown to be of use in determining the trophic position of animals, as within a food web an increase in ^{15}N and ^{13}C per trophic level is generally observed (reviewed by Kelly, 2000), (**fig 1.**). $\delta^{13}C$ data has nevertheless proven more helpful in tracking carbon sources through a food chain: $\delta^{13}C$ values of organic matter are higher (less negative) in coastal food webs than in pelagic ones (Dauby et al., 1994).

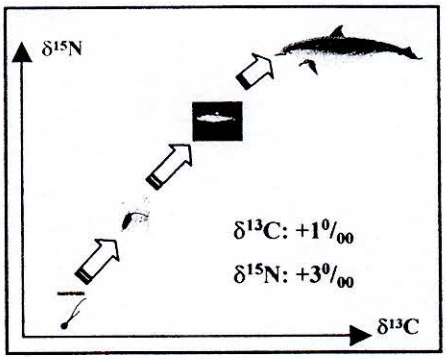


Figure 1: $\delta^{13}C$ and $\delta^{15}N$ enrichment with trophic level

Stable isotope analysis have been done on our samples in order to compare their trophic position (relative to each other) in two neighbouring regions (Irish coasts and French coasts of the English Channel). We analysed $\delta^{15}N$ and $\delta^{13}C$ in liver and muscle samples collected from marine mammals found dead along the Irish and French coasts between 1989 - 1993 and between 1998 - 2000, respectively (**table 1**). $\delta^{13}C$ and $\delta^{15}N$ measurements were performed with an isotopic ratio mass spectrometer coupled to an elemental C-N-S analyser.

Table 1: Species studied

SPECIES	N	
	IRELAND	FRANCE
Grey seal *Halichoerus grypus*	0	7
White-beaked dolphin *Lagenorhynchus albirostris*	3	1
White-sided dolphin *Lagenorhynchus acutus*	4	0
Bottlenose dolphin *Tursiops truncatus*	0	1
Common dolphin *Delphinus delphis*	14	8
Striped dolphin *Stenella coeruleoalba*	3	3
Harbour porpoise *Phocoena phocoena*	7	4

Stable carbon and nitrogen data: figure 2

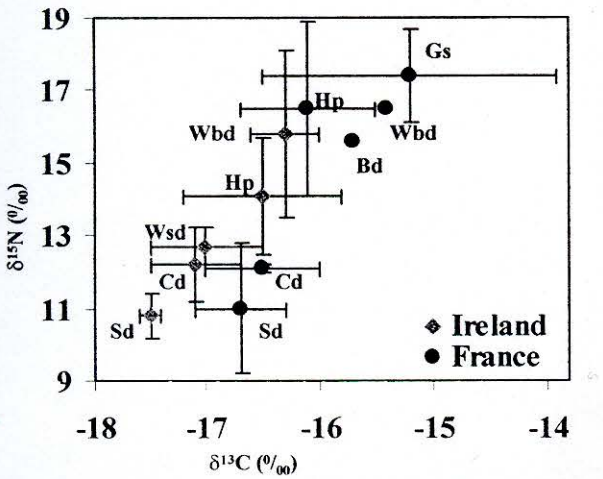
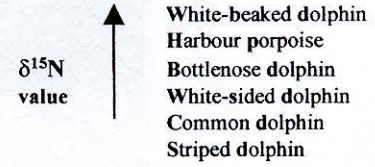


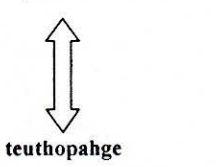
Figure 2: Muscle isotopic composition of marine mammal species stranded on the French and Irish coasts.

(**Gs:** Grey seal, **Hp:** Harbour porpoise, **Wbd:** White-beaked dolphin, **Wsd:** White-sided dolphin, **Bd:** Bottlenose dolphin, **Sd:** Striped dolphin, **Cd:** Common dolphin)

Trophic positions

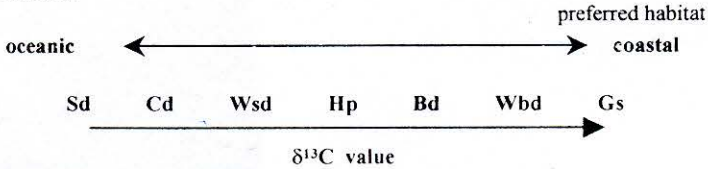


food preferences:



→ No significant differences were observed in $\delta^{15}N$ values between individuals of a same species from the Irish and French coasts ($p > 0.5$).

Distribution



→ $\delta^{13}C$ values in liver and muscle in animals from the Irish coasts were lower than those from the French coasts. This difference is significant ($p < 0.05$) for common dolphins (in muscle and liver), as well as for striped dolphins (in muscle), but not so for harbour porpoises ($p > 0.5$).

Conclusions

→It appears from this study that grey seals, white-beaked dolphins, bottlenose dolphins and harbour porpoises feed closer to shore and higher up in the food web than do the white-sided, common or striped dolphins. Some diet overlap occurs between bottlenose dolphins, white-beaked dolphins and harbour porpoises; as well as between common dolphins and white-sided dolphins.

→White-beaked dolphins, harbour porpoises, common dolphins and striped dolphins display the same relative and decreasing trophic position along the Irish and French coasts, showing conservative habits in these Northeast Atlantic areas.

Acknowledgements

The authors are grateful to R. Biondo and Mrs R. Bouhy for their valuable technical assistance. C. Beans has received a grant from the MAE (Ministerio de Asuntos Exteriores, Spain) and the CGRI (Commissariat Général aux Relations Internationales de la Communauté Française, Belgium) and K. Das has received a grant from FRIA (Fonds pour la Recherche dans l'Industrie et dans l'Agriculture). The study was supported by a grant from the Belgian Office for Scientific, Technical and Cultural Affairs (Contract MN/DD/50).

References

Das K., Lepoint G., Loizeau V., Debacker V., Dauby P., Bouquegneau J.M. (2000). Mar. Poll. Bull. 40 (2): 102-109

Dauby P., Frankignoulle M., Gobert S. and Bouquegneau J.M. (1994). Oceanologica Acta 17: 643-657

Kelly, J. (2000). Can. J. Zool. 78: 1-27