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# Cephalopods in the diets of three odontocete cetacean species stranded at Tierra del Fuego, *Globicephala melaena* (Traill, 1809), *Hyperoodon planifrons* Flower, 1882 and *Cephalorhynchus commersonii* (Lacepede,1804)

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**Abstract**: Cephalopod remains from the stomachs of four pilot whales *Globicephala melaena* (Traill, 1809), two bottlenose whales *Hyperoodon planifrons* Flower, 1882 and eight Commerson's dolphins *Cephalorhynchus commersonii* (Lacepede, 1804) stranded in Tierra del Fuego, Argentina were identified and measured. A total of 3365 lower beaks (mandibles) were identified and measured and from the rostral, crest and hood length, total wet and dry mass, mean mass and mean mantle length for each taxon were estimated. Over 68% of the cephalopods eaten by the pilot whales and all cephalopods eaten by the bottlenose whales were oceanic squid species (oegopsids). The Commerson's dolphins had only eaten shelf species of the families Loliginidae (97.5%) and Octopodinae (2.5%). Sixteen cephalopod families comprising 23 species were represented. In samples from *Globicephala melaena*, *Loligo gahi* represented 31% by number and 7.1% by estimated dry mass, *Histioteuthis eltaninae*, 29% by number and 4.9% by dry mass and the onychoteuthid *Moroteuthis ingens* 17.2% by number and 51.5% by dry mass. In samples from *Hyperoodon planifrons*, *Histioteuthis eltaninae* represented 24.0% of cephalopods by number but only 5.2% by dry mass, *Taonius pavo* 53% by number but only 2.5% by dry mass and the large onychoteuthid *Kondakovia longimana* only 2.5% by number but 65.8% by dry mass. In samples from *Cephalorhynchus commersonii*, the neritic *Loligo gahi* contributed 97.4% by number and 97% by dry mass and a neritic octopodinid contributed the rest of the cephalopod part of the diet. While the cephalopods contributed the major part of the diets of these particular cetaceans, other remains included fish and polychaete worms.

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**Key words**: Cephalopods, diet, odontocetes, *Globicephala melaena*, *Hyperoodon planiformis*, *Cephalorhynchus commersonii*

## Introduction

Many cephalopod species in the diet of cetaceans are rarely caught by fishing methods devised by man. From an examination of the cephalopod remains in the diet, particularly the indigestible, chitinous lower mandibles or "beaks", much new information on the cephalopod species such as distribution, size ranges, growth, sexual maturity, relative numbers and other aspects of their biology can be obtained (Clarke 1980). The beaks can number several thousand in even a small cetacean's stomach, and the specific identification of such collections (Clarke 1986) has extended our knowledge of cephalopod predators' food and migration habits.

Collections of cephalopod remains from the stomachs of four pilot whales (*Globicephala melaena*), two bottlenose whales (*Hyperoodon planifrons*) and 10 Commerson's dolphins (*Cephalorhynchus commersonii*) stranded in Tierra del Fuego, Argentina were identified and measured and complement small collections of stomach contents of these cetaceans collected from other regions (Clarke & Kristensen 1980, Desportes 1985, Gales *et al*, 1992). The present collection comprised 8340 beaks with no flesh attached and, of these, 3365 were lower beaks of which all but a few were identified to genus or species. The collection shows the relative importance of the families, genera and species in the diet and which of three species of cetacean had been feeding on the Continental shelf prior to being stranded.

## Material and methods

The details of the cetaceans from which stomach contents were removed are given in Tables I–III. It is not certain that any of the collections examined represent all the cephalopod remains from any stomach but they are likely to represent random samples. Beaks were washed and stored in 75% ethyl alcohol. Lower beaks were later separated from upper beaks, both were counted and the lower beaks identified according to Clarke (1986). Lower rostral length (LRL) or, for the Octopoda, crest length (LCL) and hood lengths (LHL) were measured to the nearest 0.02 mm with Vernier calipers or with an eyepiece

**Table I.** Number of cephalopod lower beaks of each species, the total number of species represented and the number of upper beaks from the stomachs of four pilot whales, *Globicephala malaena* stranded in Tierra del Fuego.

| Whale No. | 523 | 974 | 979 | 1028 | Total |
|---|---|---|---|---|---|
| Sex | F | F? | F (foetus) | M | |
| Month stranded | 4 | 11-12 | 11-12 | 11 | |
| Year stranded | 1977 | 1981 | 1981 | 1982 | |
| Whale length cm. | 307 | 396+ | 451 | 471 | |
| Note | deformed | – | – | stomach lesions | |
| Locality | Harberton | San Sebastian | Sara | Ea.Viamonte | |
| Cephalopod species | | | | | |
| *Moroteuthis ingens* (Smith, 1881) | 4 | 8 | 2 | 5 | 19 |
| *Brachioteuthis riisei* Chun, 1910 | 9 | – | – | – | 9 |
| *Gonatus antarcticus* Lönnberg, 1898 | 1 | – | – | – | 1 |
| *Alluroteuthis antarcticus* Odhner, 1923 | 1 | – | – | – | 1 |
| *Histioteuthis eltaninae* Voss, 1969 | 31 | – | – | 1 | 32 |
| *Chiroteuthis veranyi* Férrussac, 1835 | 5 | – | – | – | 5 |
| *Mesonychoteuthis hamiltonii* Robson, 1925 | 7 | – | – | – | 7 |
| *Teuthowenia "megalops"* Prosch, 1849 | 8 | – | – | – | 8 |
| *Galiteuthis "armata"* Joubin, 1895 | 1 | – | – | – | 1 |
| *Loligo gahi* d'Orbigny, 1835 | 6 | 13 | 13 | 2 | 34 |
| *Octopodid* | 1 | – | – | – | 1 |
| Total lower beaks | 74 | 21 | 15 | 8 | 118 |
| Upper beaks | 43 | 24 | 12 | 8 | 87 |
| No. of species | 11 | 2 | 2 | 3 | 11 |

**Table II.** The number of cephalopod lower beaks of each species from the stomachs of *Globicephala malaena* stranded in Tierra del Fuego with estimates of the wet and dry mass and mean mantle lengths of the cephalopods represented by the beaks.

| Cephalopod species | Number | | Wet mass (g) | | | Dry mass (g) | | | ML (mm) |
|---|---|---|---|---|---|---|---|---|---|
| | No. | % | total | % | mean | total | % | mean | |
| *Moroteuthis ingens* | 19 | 16.1 | 10184 | 51.7 | 536 | 2190 | 60.5 | 115 | 212 |
| *Brachioteuthis riisei* | 9 | 7.6 | 1543 | 7.8 | 171 | 333 | 9.2 | 37 | 136 |
| *Gonatus antarcticus* | 1 | 0.8 | 80 | 0.4 | 80 | 17 | 0.5 | 17 | 151 |
| *Alluroteuthis antarcticus* | 1 | 0.8 | 138 | 0.7 | 138 | 30 | 0.8 | 30 | 293 |
| *Histioteuthis eltaninae* | 32 | 27.1 | 1701 | 8.6 | 53 | 209 | 5.8 | 7 | 52 |
| *Chiroteuthis veryani* | 5 | 4.2 | 538 | 2.7 | 108 | 56 | 1.6 | 11 | 161 |
| *Mesonychoteuthis hamiltoni* | 7 | 5.9 | 332 | 1.7 | 47 | 35 | 1.0 | 5 | 220 |
| *Teuthowenia "megalops"* | 8 | 6.8 | – | – | – | – | – | – | – |
| *Galiteuthis "armata"* | 1 | 0.8 | 61 | 0.3 | 61 | 6 | 0.2 | 6 | 268 |
| *Loligo gahi* | 34 | 28.8 | 2924 | 14.8 | 86 | 304 | 8.4 | 9 | 128 |
| *Octopodid* | 1 | 0.8 | 2198 | 11.2 | 2198 | 440 | 12.1 | 440 | 160 |
| Total lower beaks | 118 | 100.0 | 19699 | 100.0 | – | 3620 | 100.0 | – | |
| No. of upper beaks | 87 | | | | | | | | |
| No. of species | 11 | | | | | | | | |

micrometer for the smallest beaks. From the rostral, crest or hood length, published formulae relating these lengths to total wet weight and mantle length of the cephalopods, according to their families, were used to estimate total and mean wet weights and mean mantle lengths of each taxon identified (Clarke 1986). In a few rare species (e.g. *Batoteuthis skolops*) this was estimated from a related family having similar body and beak characteristics. The few beaks concerned introduce insignificant error into general conclusions. Dry weights were estimated for each taxon by applying ratios derived from Clarke *et al.* (1985). Where this is not known for the rarer families we have chosen the ratio which best fits the type of body concerned: e.g. muscular squids such as *Ommastrephes* sp. having a dry weight equal to 0.26 of the wet weight and ammoniacal squid such as *Histioteuthis* sp., having a dry weight equal to 0.123 of the wet weight. Energy values have a mean of 20kJ $g^{-1}$ dry weight. The LRL distributions and the LRL at which darkening of the wings of the beaks takes place (taken as the interval between the largest LRL at which the beaks have undarkened or no wings and the smallest LRL at which they have darkened wings) were recorded to aid identification and for comparing samples from different regions. Such comparisons sometimes indicate differences in size selection

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between predator species but often show great similarity. It must be pointed out that isolated beaks may have been carried several hundred miles from the place of capture (Clarke 1980).

## Results

### *Whales*

*Globicephala melaena.* A total of 118 lower beaks comprising 11 cephalopod species were identified from the four pilot whales (Table I).

Over 68% of the lower beaks belong to nine oceanic (oegopsid) species, *Moroteuthis ingens*, *Brachioteuthis riisei*, *Gonatus antarcticus*, *Alluroteuthis antarcticus*, *Histioteuthis eltaninae*, *Chiroteuthis veranyi*, *Mesonychoteuthis hamiltoni*, *Teuthowenia* sp. ("*megalops*" type figured in Clarke (1980)) and *Galiteuthis* ("*armata*" type figured in Clarke (1980)). These species are all known from the subantarctic waters around Tierra del Fuego. Almost 32% of the beaks belonged to two neritic families and the size and form of the beaks, as well as the known distribution of the species, strongly suggests that they belong to the species *Loligo gahi* and an octopus, possibly *O. fontanianus* d'Orbigny, 1835.

Table II shows wet and dry masses and mantle lengths derived from LRL data. *Moroteuthis ingens* contributes 60.5% of the dry mass of the cephalopods in the diet.

*Hyperoodon planifrons.* A total of 3137 lower beaks comprising 21 squid species were collected (Table III) from two whales and all of these species are oceanic (oegopsid).

Over 65% of the dry weight of the cephalopods is contributed by *Kondakovia longimana* although *Taonius pavo* contributes 53% by number (Table III). Other principal contributers are *Gonatus antarcticus* (8.7% by number, 10.3% by dry mass) *Histioteuthis eltaninae* (24%, 5.1%), *Galiteuthis* (4.9%, 1.0%) and *Moroteuthis ingens* (0.4%, 6.6%).

*Cephalorhynchus commersoni.* Of the lower beaks, 115 are *Loligo gahi* d'Orbigny, 1835 and three are an octopus, which is possibly, from its size and distribution, *Octopus ?fontanianus* d'Orbigny, 1835. Beaks were collected from eight dolphins (Table IV). The LRL distribution for the *Loligo* in the diet is shown in Fig. 1.

### *Cephalopods*

Ommastrephidae. Beaks only occurred in *Hyperoodon planifrons*. They were present in both whales and contributed 0.8% of the cephalopods (Table III). All beaks appeared to be *Martialia hyadesi* which is known from the region (Piatkowski *et al.* 1991). The size distribution of the beaks has a peak near 7–7.5 mm (Fig.1).

Onychoteuthidae. Three species of the family were collected. *Moroteuthis ingens* was present in all samples from both *G. melaena* and *H. planifrons* (Tables I & III) while both

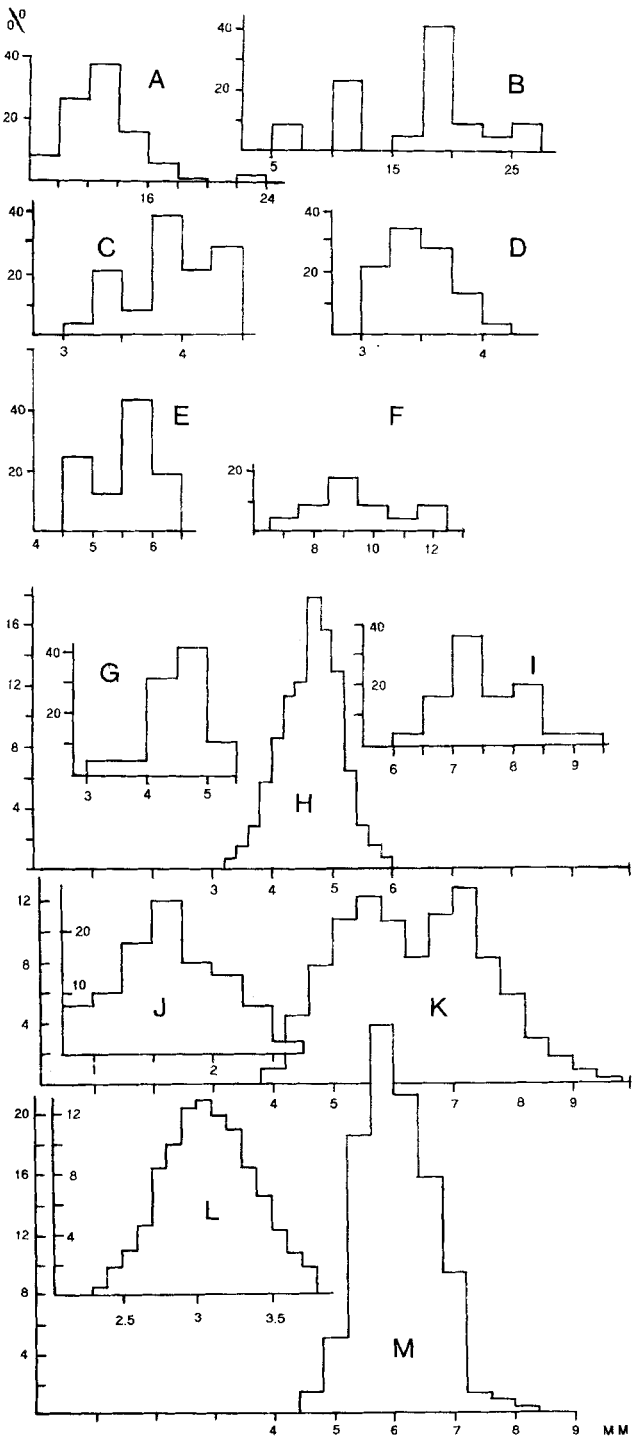


**Fig. 1.** Cephalopod lower rostral lengths (mm). Percent frequency distributions for species from the stomachs of *Hyperoodon planifrons* except for *Loligo gahi* (J) which are from stomachs of *Cephalorhynchus commersonii*.
**A.** *Kondakovia longimana*; **B.** *Mesonychoteuthis hamiltoni*; **C.** *?Brachioteuthis* B; **D.** *Brachioteuthis riisei*; **E.** *Moroteuthis knipovitchi*; **F.** *Moroteuthis ingens*; **G.** *Alluroteuthis antarcticus*; **H.** *Galiteuthis armata*; **I.** *Martialia hyadesi*; **J.** *Loligo gahi*; **K.** *Taonius pavo*; **L.** *Histioteuthis eltaninae*; **M.** *Gonatus antarcticus*.

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**Table III.** The number of cephalopod lower beaks of each species from the stomachs of two *Hyperoodon planifrons* stranded in Tierra del Fuego with estimates of the wet and dry mass and mean mantle lengths of the cephalopods represented by the beaks.

| Whale | a | b | Number | | Wet wt (g) | | | Dry wt (g) | | | ML (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cephalopod species | | | total | % | total | % | mean | total | % | mean | mean |
| *Martialia hyadesi* | 3 | 22 | 25 | 0.8 | 16058 | 3.0 | 642 | 4175 | 0.0 | 167 | 301 |
| *Moroteuthis ingens* | 6 | 7 | 13 | 0.4 | 31943 | 6.0 | 2457 | 6900 | 6.6 | 530 | 672 |
| *Moroteuthis knipovitchi* | 1 | 15 | 16 | 0.5 | 6184 | 1.1 | 387 | 1336 | 1.3 | 84 | 170 |
| *Kondakovia longimana* | 28 | 49 | 77 | 2.5 | 313500 | 58.5 | 4071 | 67716 | 65.1 | 879 | 104 |
| *Enoploteuthis* | – | 2 | 2 | 0.1 | 197 | 0.0 | 99 | 51 | 0.1 | 25 | 180 |
| *Brachioteuthis riisei* | 16 | 16 | 32 | 1.0 | 3868 | 0.7 | 121 | 835 | 0.8 | 26 | 434 |
| *? Brachioteuthis B* | – | 24 | 24 | 0.8 | 271 | 0.1 | 11 | 59 | 0.1 | 2 | 92 |
| *Discoteuthis* c.f. *laciniosa* | – | 13 | 13 | 0.4 | 463 | 0.1 | 36 | 67 | 0.1 | 5 | 75 |
| *Gonatus antarcticus* | 58 | 216 | 274 | 8.7 | 58932 | 11.0 | 215 | 10726 | 10.3 | 39 | 215 |
| *Taningia danae* | 1 | | 1 | 0.0 | 2911 | 0.5 | 2911 | 419 | 0.4 | 419 | 444 |
| *Alluroteuthis antarcticus* | 8 | 10 | 18 | 0.6 | 3079 | 0.6 | 171 | 665 | 0.6 | 36 | 308 |
| *Bathyteuthis abyssicola* | – | 6 | 6 | 0.2 | 30 | 0.0 | 5 | 4 | 0.0 | – | 36 |
| *Histioteuthis eltaninae* | 357 | 395 | 752 | 24.0 | 43259 | 8.1 | 57 | 5321 | 5.1 | 7 | 55 |
| *Mastigoteuthis A* | 2 | 2 | 4 | 0.1 | 1081 | 0.2 | 270 | 112 | 0.1 | 28 | 188 |
| *Batoteuthis skolops* | – | 5 | 6 | 0.2 | 135 | 0.0 | 22 | 17 | 0.0 | 3 | 96 |
| *Chiroteuthis veranyi* | 2 | 5 | 5 | 0.2 | 249 | 0.1 | 50 | 26 | 0.0 | 5 | 124 |
| *Mesonychoteuthis hamiltoni* | 6 | 16 | 22 | 0.7 | 19824 | 3.7 | 901 | 2062 | 2.0 | 93 | 964 |
| *Taonius pavo* | 210 | 1453 | 1663 | 53.0 | 24254 | 4.5 | 15 | 2522 | 2.4 | 2 | 379 |
| *Teuthowenia pellucida* | – | 1 | 1 | 0.0 | 28 | 0.0 | 28 | 3 | 0.0 | 3 | 184 |
| *Galiteuthis "armata"* | 14 | 140 | 154 | 4.9 | 9909 | 1.9 | 64 | 1031 | 1.0 | 7 | 273 |
| Unidentified | 2 | 27 | 29 | 0.9 | – | 0.0 | – | – | – | – | – |
| Total lower beaks | 714 | 2424 | 3137 | 100 | 536175 | 100.00 | – | 104045 | 100.00 | – | – |
| No. of upper beaks | 1131 | + 3669 | = 4800 | | | | | | | | |
| No. of species | 15(a) | 20(b) | 21(total) | | | | | | | | |

*Moroteuthis knipovitchi* and *Kondakovia longimana* were also present in both the *H. planifrons* specimens. In *G. melaena* the *Moroteuthis ingens* were large and both their wet and dry masses contributed over 51% to the total cephalopod diet (Table II). In *H. planifrons* the *Moroteuthis ingens* contributed much less to the cephalopod diet than the larger and more numerous *Kondakovia longimana* (Fig. 1, Table II).

Enoploteuthidae. Two beaks from *H. planifrons* resemble those of the genus *Enoploteuthis* but identification is uncertain.

Brachioteuthidae. Beaks of *Brachioteuthis riisei* were present in one *G. melaena* and both *H. planifrons* (Tables I & III). Twenty four beaks from one *H. planifrons* could not be identified although some of its features resembled *Brachioteuthis* and, since the Antarctic members of the genus are known to require revision we have called them *?Brachioteuthis* B. The LRL frequency distributions of the two species differed (Fig. 1)

Cycloteuthidae. Thirteen beaks which resembled *Discoteuthis laciniosa* but which were at an unusually advanced stage of darkening for their size, occurred in one of the *H. planifrons* specimens (Table III). The specific identity must therefore remain in doubt. The LRLs measured 3.4–5.2 mm and had a peak at 4.5 mm.

Gonatidae. Beaks belonging to *Gonatus antarcticus*, occurred in one *G. melaena* and both *H. planiforons* (Tables I & III). The LRLs from *H. planiformis* show a clear unimodal distribution (Fig. 1).

Octopoteuthidae. One *Taningia danae* beak with an LRL of 13.3 mm occurred in a *H. planifrons* (Table III).

Neoteuthidae. *Alluroteuthis antarcticus* Odhner, 1923 occurred in one *G. melaena* and both *H. planifrons* (Tables I & III, Fig.1).

Bathyteuthidae. Six *Bathyteuthis abyssicola* occurred in one *H. planifrons* (Table III). LRLs were 0.59–0.73 mm

Histioteuthidae. The common notalian *Histioteuthis eltaninae* Voss, 1969 occurred in two *G. melaena* and both *H. planifrons* (Tables I-III). LRLs show a clear unimodal distribution (Fig. 1).

Mastigoteuthidae. *Mastigoteuthis* A. as described by Clarke (1980) occurred in both *H. planifrons* (Table III).

Batoteuthidae. *Batoteuthis skolops* occurred in one *H. planifrons* (Table III).

Chiroteuthidae. *Chiroteuthis* beaks closely similar to those described by Clarke (1980) which are thought to be *C. veranyi* occurred in one *G. melaena* and in both *H. planifrons* (Tables I–III).

Cranchiidae. *Mesonychoteuthis hamiltoni* occurred in one *G. melaena* and both *H. planifrons* (Tables I–III). Although

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**Table IV.** The number of cephalopod lower beaks of each species from the stomachs of eight *Cephalorhynchus commersoni* stranded in Tierra del Fuego with estimates of the wet and dry mass of the cephalopods represented by the beaks.

| Species | Number | | Wet wt (g) | | | Dry wt (g) | | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | total | % | mean | total | % | mean |
| *Loligo gahi* | 115 | 97.5 | 4734 | 98.4 | 41 | 492 | 97.0 | 4 |
| *Octopodid* | 3 | 2.5 | 76 | 1.6 | 25 | 15 | 3.0 | 5 |
| Total lower beaks | 118 | 100.0 | 4810 | 100.0 | – | 508 | 100.0 | |
| No. of upper beaks | 88 | | | | | | | |
| No. of species | 2 | | | | | | | |

small in number, its large size (Fig. 1) makes the species important in the diet of the latter. *Taonius pavo* were numerous in both the *H. planifrons* samples (Table III). The LRLs form a bimodal distribution with peaks at 5.4–5.8 mm and 7.0–7.4 mm (Fig. 1). The former peak is comprised principally of beaks with transparent or no wings (i.e. are immature) and the latter peak is comprised of beaks with darkened wings (mature). Darkening of the wings occurred at LRLs of 0.5–0.8 mm. These beaks agree in size at darkening with *Taonius pavo* described from sperm whales and albatrosses of the south Atlantic (Clarke 1980, Rodhouse *et al.* 1987) but the mature size is not so large (peak at 7.0–7.4mm instead of 8.0–11.0mm). This possibly indicates size selection by *H. planifrons*. Only one beak of *Teuthowenia pellucida* occurred (Table III). Beaks previously described under the name *Galiteuthis armata* by Clarke (1980, see also 1986 for discussion) occurred in one *G. melaena* and in both *H. planifrons* (Tables I–III). The LRLs form a clear unimodal peak at 4.6–4.8mm.

Loliginidae. Beaks of the neritic genus *Loligo* are present in all the *G. melaena* and *C. commersoni* samples (Tables I & IV). In *C. commersoni* LRLs form a unimodal peak at 1.5–1.7mm (Fig. 1). This is likely to be the common shelf species of the region, *Loligo gahi.*

Octopodinae. Beaks belonging to an octopodinid, possibly the local *Octopus fontianus* occurred in one *G. melaena* and one *C. commersoni* (Tables I,II & IV).

## Discussion

The three cetacean species differ in the composition of their food. Clearly, all ten *C. commersoni* had been feeding on the continental shelf before stranding and the two cephalopod species eaten are muscular and highly proteinaceous.

Of the four *G. melaena*, three had fed upon a mixture of neritic *Loligo gahi* and the oegopsid *Moroteuthis ingens* (the smallest sample also included the oegopsid *Histioteuthis eltaninae*). There is some evidence that *M. ingens* may come into shallow water or live close to islands at times so that these whales may have been feeding entirely on the continental shelf or close to it. The fourth whale, however, had fed on a mixture including eight deep water species which, together, comprised 90% of the cephalopods by number and 82% of the species represented so that it must have fed mainly offshore before becoming stranded. Comparison with cephalopods in the diet of *G. melaena* stranded in other regions shows that in Tasmania (Gales *et al.* 1992) they had eaten a considerably larger proportion of neritic species including *Sepioteuthis*, *Sepia* and *Octopus*. In the northern Atlantic *Todarodes sagittatus* is the main food off the Faroes while stranded animals in France had a few *Loligo* and *Sepia* but similar proportions of five oceanic species while *Gonatus* and *Histioteuthis* were most numerous (Desportes 1985 ). Off Newfoundland the principal food is *Illex illecebrosus* (Sergeant 1962). In all regions, except Patagonia, ommastrephids are important in the diet. Off eastern Australia *Octopoteuthis* are numerous.

Cephalopods in the diet of *H. planifrons* included the Antarctic cold water species *Kondakovia longimana* as well as species which are known from subantarctic waters such as *Moroteuthis ingens*, *Gonatus antarcticus*, *Alluroteuthis antarctica*, *Histioteuthis eltaninae*, *Mesonychoteuthis hamiltoni* and *Galiteuthis "armata"*. Species belonging to the genera *Bathyteuthis*, *Mastigoteuthis* and *Chiroteuthis* extend into Antarctic or subantarctic waters but also contain species having distributions in more temperate waters. *Taningia danae* extends south to the subtropical convergence. No detailed comparisons are available from other regions. Stranded whales of its northern relative *Hyperoodon ampullatus* had largely fed upon *Gonatus* and *Taonius* off Denmark and the Faroes (Clarke & Kristensen 1980). Here, *Taonius* was the most numerous and *Gonatus* ranked third by number (Table III).

All the species in the diet live in deep oceanic water and their vertical distributions extend to depths over 500 m and, in some (e.g. *Bathyteuthis*, *Taonius*), to over 1000 m.

The greatest differences between the two whale species are the inclusion in the diet of *H. planifrons* of *Taonius pavo*, *Kondakovia longimana* and *Histioteuthis eltaninae* and the much greater importance of *Gonatus antarcticus*. While the latter could be due to a different feeding locality of the one *G. melaena* consuming mainly oceanic species, in view of the regular occurrence of the species in birds not far away (Thompson 1994), the other species of squids probably reflect the greater diving depths of *H. planifrons*.

Comparison of the mean sizes of all the species eaten by the different cetaceans shows that, in all but *Histioteuthis eltaninae*, *G. melaena* ate smaller specimens than *H. planifrons*, and

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*C. commersonii* ate smaller *Loligo* and *Octopus* than the former. When compared with the same species eaten by sperm whales (Clarke 1980), *H. planiformis* ate smaller *Kondakovia longimana*, *Moroteuthis knipovitchi*, *Gonatus antarcticus*, *Mesonychoteuthis hamiltoni* and *Taonius pavo* but it took the same sized *Moroteuthis ingens* and *Histioteuthis eltaninae*. Similar comparisons held for collections of sperm whale stomach contents in Peru and Brazil. It is interesting to find that nine oceanic species common to *H. planifrons* and the wandering albatross, *Diomedia exulans*, were much the same size. This may provide further evidence for the argument that this bird commonly scavenges vomit from cetaceans (Clarke *et al.* 1981). Grey headed albatrosses, on the other hand, take much smaller *Martialia hyadesi* than *Hyperoodon planifrons* (Rodhouse *et al.* 1990)

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