

## TWO NEW RECORDS OF ZIPHIIDAE (CETACEA) FOR THE AZORES WITH AN UPDATED CHECKLIST OF CETACEAN SPECIES

FRANCISCO REINER, JOÃO M. GONÇALVES & RICARDO S. SANTOS

### ARQUIPÉLAGO



REINER, F., J.M. GONÇALVES & R.S. SANTOS 1993. Two new records of Ziphiidae (Cetacea) for the Azores with an updated checklist of cetacean species. *Arquipélago*. Life and Marine Sciences 11A: 113-118. Angra do Heroísmo. ISSN 0870-6581.

Two strandings in 1989 of a Cuvier's Beaked Whale, *Ziphius cavirostris* G. Cuvier, 1823, on the island of Santa Maria, and of a Gervais' Beaked Whale, *Mesoplodon europaeus* (Gervais, 1855), on the island of Faial, represent the first records of these species in the Azores archipelago. Body measurements of both specimens and the skull biometry of *M. europaeus* are presented. An updated checklist of 22 cetaceans recorded from the Azorean waters is also presented, although the presence of 3 of them are actually dubious.

REINER, F., J.M. GONÇALVES & R.S. SANTOS 1993. Duas novas ocorrências de Ziphiidae (Cetacea) nos Açores e actualização da lista de espécies de cetáceos. *Arquipélago*. Ciências Biológicas e Marinhas 11A: 113-118. Angra do Heroísmo. ISSN 0870-6581.

Os arrojamentos ocorridos em 1989, dum zífio, *Ziphius cavirostris* G. Cuvier, 1823, na ilha de Santa Maria, e duma baleia de bico-de-Gervais, *Mesoplodon europaeus* (Gervais, 1855) na ilha do Faial, representam os primeiros registos destas espécies para o Arquipélago dos Açores. As medidas externas dos dois espécimes e a craneometria de *M. europaeus* são apresentadas. Fornece-se também uma lista actualizada das 22 espécies de cetáceos registadas para as águas dos Açores, embora a presença de 3 delas seja actualmente duvidosa.

Francisco Reiner, Projecto Delfim, Grupo de Investigação sobre os Golfinhos, Praceta Gonçalves Zarco, 5, 4º Dto, PT-2780 Oeiras, Portugal. - João M. Gonçalves & Ricardo Serrão Santos, Departamento de Oceanografia e Pescas, Universidade dos Açores, PT-9900 Horta, Açores, Portugal.

### INTRODUCTION

The investigations of marine mammals in the Azores in recent years have included studies of live animals in the wild, using visual, photographic, biochemical and acoustic techniques (cf. ALLEN et al. 1979, MARTIN 1986, and GORDON et al. 1987, 1988, 1989, 1990). However, strandings continue to be an important source of material and provide confirmation of the identity of some species (e.g. TEIXEIRA 1978, REINER & SANTOS 1984, MARTINS et al. 1985, REINER 1986, REINER & LACERDA 1989, GONÇALVES et al. 1992, SEQUEIRA et al. 1992). The presence in Azorean waters of two new ziphiids and the minke whale is only known from such events. The present paper adds two new species to the list of cetaceans occurring in the Azores and updates previous checklists by CLARKE (1981), REINER (1988) and GALHARDO (1990).

### MATERIAL AND METHODS

The remains of a *Ziphius cavirostris* (Fig. 1) were found stranded on a shallow reef, in an advanced state of decay near S. Lourenço beach in the island of Santa Maria on the 15 of February 1989. Measurements were made by local naturalists (Table 1).

A single *Mesoplodon europaeus* was found stranded in Porto Pim beach in the island of Faial on the 21 of August 1989. The measurements of this specimen are taken according to NORRIS (1961) (Table 1). The skull of *M. europaeus* was removed and preserved (Fig. 2). It is now deposited at the National Museum of Natural History (Museu Bocage) in Lisbon (record no. 18403). Posterior craneometric data have been taken from this skull (Table 2) according to MOORE (1963). The stomach contained fish otoliths, not yet identified.

For identification of both specimens, the



Fig. 1 - Stranded specimen of *Ziphius cavirostris*. Right side view from front.

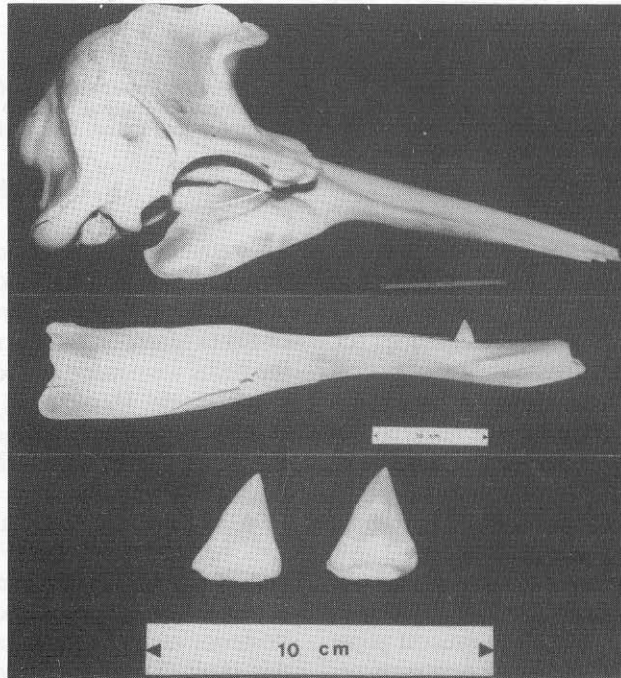


Fig. 2 - The skull of *Mesoplodon europaeus*. A - Right lateral view; B - Mandible; C - Teeth.

guides by LEATHERWOOD & REEVES (1983), RIDGWAY & HARRISON (1985), DUGUY & ROBINEAU (1987) and EVANS (1987) have been used. Photographs of both specimens were taken (F. Reiner collection).

Reports of species in the literature were only included if they were found within the 200 miles of the exclusive economic zone (EEZ) of the Azores.

## RESULTS

### - *Ziphius cavirostris* G. Cuvier, 1823

The specimen (Fig. 1) was a male with a total length of 620 cm (Table 1). According to KENYON's (1961) table, the weight of this animal would have been about 2800 kgs.

This species is the most cosmopolitan and abundant of the beaked whales, distributed in all oceans and most seas, except in the high polar waters (MOORE 1963, HEYNING 1989).

### - *Mesoplodon europaeus* Gervais, 1855

The specimen was a female with a total length of

315 cm (Table 1). Colouration was uniformly dark gray on the back, slightly lighter underneath with irregular white markings on the ventrum, specially in the genital region.

This species is known only from the Atlantic, where it appears to prefer warm temperate and subtropical waters. It may be closely associated with the Gulf stream (LEATHERWOOD & REEVES 1983).

The measurements taken from the skull (Table 2) are only part of the MOORE (1963) craniometrical suggestions, because the anterior parts of rostrum and jaws were damaged.

Table 2

Cranial measurements (in mm) of *Mesoplodon europaeus* from Porto Pim, Faial island (taken according to MOORE 1963)

Length of temporal fossa	90
Length of orbit	89
Breadth of skull across postorbital process of frontals	238
Breadth of skull across zygomatic process of squamosals	239
Breadth of skull across centers of orbits	226
Greatest span of occipital condyles	91
Greatest width of an occipital condyle	27
Greatest length of an occipital condyle	61
Breadth of skull across exoccipitals	216
Breadth of nasals on vertex	43
Least distance between premaxillary crests	28
Greatest span of premaxillary crests	110
Width of premaxillae at midlength of rostrum	35
Width of rostrum in apices of antorbital notches	158
Width of rostrum in apices of prominential notches	136
Greatest width of rostrum at midlength of rostrum	57
Greatest depth of rostrum at midlength of rostrum	34
Greatest transverse width of superior nares	111
Height of skull. Distance between vertex of skull and most ventral point on pterygoids	215
Greatest width of temporal fossa approximately at right angles to greatest length	60
Least distance between maxillary foramina	70
Least distance between premaxillary foramina	106
Distance from posterior margin of left maxillary foramen to most anterior extension of left maxillary prominence	98
Greatest length of vomer visible at surface palate	143
Length of tympanic bulla, left	45
Length of tympanic bulla, right	44
Height of mandible at coronoid process	95
Outside height of mandible at midlength of alveolus	33
Inside height of mandibles at midlength of alveolus	33
Length of alveolus	24
Width of alveolus	8
Greatest length of tooth	34
Greatest breadth of tooth	26

Table 1

External measurements (in cm) of stranded specimen taken according to NORRIS (1961) and stranding data

	<i>Ziphius cavirostris</i>	<i>Mesoplodon europaeus</i>
Date	15 February 1989	21 August 1989
Locality	Praia S. Lourenço	Praia Porto Pim
Latitude N	36° 59.02'	38° 34.08'
Longitude W	25° 03.02'	28° 36.05'
Island	Santa Maria	Faial
Sex	male	female
Total length	620	315
Tip of snout to centre of eye	-	47
Length of gape	-	26
Tip of snout to blowhole	-	40
Tip of snout to ant. insert. of flipper	-	76
Tip of snout to ant. insert. of dor. fin	-	203
Tip of snout to midpoint genital slit	-	214
Tip of snout to anus	-	237
Length flipper, axilla insert. to tip	-	38
Maximum width of flipper	-	11
Width of flukes, tip to tip	-	80

## DISCUSSION

These new records bring the number of cetaceans reported from the Azores to 22 species (Table 3). However, the status of some of the species are still considered doubtful (marked with "?" in Table 3). Despite being recorded in the past (see CHAVES 1924, FERREIRA 1935, CLARKE 1981), the presence of *Phocoena phocoena* (harbour porpoise) is dubious as it has not been sighted recently. Similarly *Eubalaena glacialis* (northern right whale) was also reported by these authors and is still listed for the Azores in recent books (e.g. LEATHERWOOD & REEVES 1983, DUGUY & ROBINEAU 1987, EVANS 1987), but has not been seen in recent years (c.f. GORDON et al. 1987, 1988, 1989, REINER 1988, STEINER & GORDON 1990). This is not surprising if the rarity of this species (see EVANS, 1987) at present is considered. The same reason could explain the previous reports of *Balaenoptera musculus* (blue whale) by CHAVES (1924) and FERREIRA (1935) also quoted by REINER (1988) and GALHARDO (1990), but not reported anywhere else (e.g. not included in CLARKE 1981).

Some doubt also surrounds the status of the pilot whales (*Globicephala* spp.) as has been pointed out by ALLEN et al. (1979). The long-finned pilot whale (*G. melaena*) has been recorded by several authors (e.g. CHAVES 1924, FERREIRA 1935, REINER 1985, 1988), but the clear distinction of the two species of *Globicephala* are only possible after 1971 (cf. CLARKE 1981). STEINER & GORDON (1990) concluded that the pilot whales observed in the summer months during cruises by S/Y "Song of the Whale" (1987-1990) off the Azores were all *G. macrorhynchus* (short-finned pilot whales), a species also reported from strandings (CLARKE 1981, REINER 1985, 1988, GONÇALVES et al. 1992). Furthermore the reports of *G. melaena* by REINER (1988) are based on rather weak evidence (a male foetus dating from 1894 in the Museum Carlos Machado, Ponta Delgada -MRCM no. 182, and on a capture of an adult male near Capelas, S. Miguel, in 1956, recorded by Mr. A. Cymbron). STEINER & GORDON (1990) suggest that the long-finned pilot whale, which has a more northerly distribution than the short-finned, may be found in the Azorean Archipelago in the winter.

CLARKE (1981) considered the status of another 2 species doubtful (not listed in Table 3): *Mesoplodon densirostris* and *Kogia simus*, both reported at genus level. The presence of the first was only suspected from sightings and the second was a possible misidentification in TEIXEIRA's (1978) report. CHAVES (1924) and FERREIRA (1935) cited *K. breviceps*, but correct identification of this species was not then possible as it had not been differentiated from *K. simus*. However, MARTINS et al. (1985) established the presence of *K. breviceps* in Azorean waters.

ALLEN et al. (1979) report another two species for the Azores: the white-sided dolphin (*Lagenorhynchus acutus*) and the white-beaked dolphin (*L. albirostris*). Both species have been reported to them by Azorean fishermen, but are considered unreliable reports by these authors, and are not listed here (Table 3).

## ACKNOWLEDGEMENTS

We would like to thank Mr. João Brum of the Department of Biology, University of the Azores. We also thank Mr. José Umberto Chaves and Mr. Adalberto Teixeira Pombo for their assistance with field work. We are grateful to Dr. James G. Mead (National Museum of Natural History - Smithsonian Institution) for having shared with us valuable data concerning the species dealt with as well as for confirmation of our identification.

We are also grateful to Dr. João Constância (Museu Carlos Machado, S. Miguel), for his assistance.

A special thanks is due to Dr. Jonathan Gordon for his critical review of the manuscript and to Dr. Malcom R. Clarke for correcting the language.

## REFERENCES

- 1- ALLEN, A., Q. BISHOP & J. GORDON 1979. *The Report of Cambridge Azores Expedition*. University of Cambridge. 46 pp.
- 2- CHAVES, A. 1924. Cetáceos que aparecem no mar dos Açores. *A Pesca Marítima* 2 (15): 41-44.
- 3- CLARKE, R. 1981. Whales and dolphins of the Azores and their exploitation. *Report of the International Whaling Commission (SC/32/O1)* 31: 607-615.
- 4- DUGUY, R. & D. ROBINEAU 1987. *Guía de los Mamíferos Marinos de Europa*. Ediciones Omega. Barcelona. 198 pp.
- 5- EVANS, P. 1987. *The Natural History of Whales & Dolphins*. Christopher Helm, Publ. Kent, U.K.. 343 pp.

Table 3

Updated list of cetaceans (Order Cetacea Brisson, 1762) recorded in the Azorean EEZ (T- strandings; S- sightings; C- catches; \* - new records; ? - species records considered as dubious).

Scientific name <sup>1</sup>	English Name <sup>1</sup>	Portuguese Name <sup>2</sup>	Type of Record	Authors
<b>Sub-Order Odontoceti</b> Flower, 1867				
Fam. Phocoenidae (Gray, 1825) Bravard, 1885				
? 1- <i>Phocoena phocoena</i> (Linnaeus, 1758)	Harbour porpoise	Bôto	S?	1, 2, 3, 6, 7
Fam. Delphinidae Gray, 1821				
2- <i>Delphinus delphis</i> Linnaeus, 1758	Common dolphin	Golfinho-comum; Toninha-comum	S, C	1, 2, 3, 6, 7, 9, 10, 11, 16, 20, 22, 25, 29
3- <i>Tursiops truncatus</i> (Montagu, 1821)	Bottlenose dolphin	Roaz; Roaz- corvineiro	S, C	1, 2, 3, 6, 7, 9, 10, 11, 16, 22, 29
4- <i>Stenella frontalis</i> (G. Cuvier, 1829)	Spotted dolphin	Golfinho-pintado; Golfinho-malhado	T, S, C	7, 8, 9, 10, 11, 16, 29
5- <i>Stenella coeruleoalba</i> (Meyen, 1833)	Striped dolphin	Golfinho-riscado; Toninha-riscada	T, S, C	1, 2, 3, 6, 7, 8, 9, 10, 11, 20, 22, 29
6- <i>Pseudorca crassidens</i> (Owen, 1846)	False killer whale	Falsa-orca; Orca bastarda	T, S, C	3, 7, 9, 10, 23, 24, 25, 29
7- <i>Orcinus orca</i> (Linnaeus, 1758)	Killer whale	Orca; Roaz-de- bandeira	S	1, 2, 3, 6, 7, 9, 10, 25, 29
8- <i>Grampus griseus</i> (G. Cuvier, 1812)	Risso's dolphin	Grampo; Moleiro	T, S, C	1, 2, 3, 6, 7, 9, 10, 11, 16, 25, 29
? 9- <i>Globicephala melaena</i> (Traill, 1809)	Long-finned pilot whale	Baleia-piloto; Boca- de-panêla	S, C	2, 3, 6, 7, 20, 22
10- <i>Globicephala macrorhynchus</i> (Gray, 1846)	Short-finned pilot whale	Baleia-piloto-tropical	T, S	3, 7, 8, 9, 10, 20, 29
Fam. Ziphiidae Gray, 1865				
11- <i>Hyperoodon ampullatus</i> (Forster, 1770)	Northern bottlenose whale	Botinhoso	S	1, 3, 7, 9, 25, 29
* 12- <i>Ziphius cavirostris</i> G. Cuvier, 1823	Cuvier's beaked whale	Zífió	T	this note
13- <i>Mesoplodon bidens</i> (Sowerby, 1804)	Sowerby's beaked whale	Baleia-de-bico-de- Sowerby	S, C	7, 9, 20, 21, 29
* 14- <i>Mesoplodon europaeus</i> Gervais, 1855	Gervais' beaked whale	Baleia-de-bico-de- Gervais	T	7, this note
Fam. Kogiidae (Gill, 1871) Miller, 1923				
15- <i>Kogia breviceps</i> (de Blainville, 1838)	Pygmy sperm whale	Cachalote-anão; cachalote-pigmeu	T, C	1, 2, 3, 6, 7, 17, 30
Fam. Physeteridae Gray, 1821				
16- <i>Physeter macrocephalus</i> Linnaeus, 1758	Sperm whale	Cachalote	T, S, C	1, 2, 3, 6, 8, 9, 10, 11, 22, 25, 29
<b>Sub-Order Mysticeti</b> Flower, 1864				
Fam. Balaenidae Gray, 1825				
? 17- <i>Eubalaena glacialis</i> (Muller, 1776)	Northern right whale	Baleia-da-Biscaia; Baleia-franca	S, C	1, 2, 3, 4, 5, 6, 15
Fam. Balaenopteridae Gray, 1864				
18- <i>Megaptera novaeangliae</i> (Borowski, 1781)	Humpback whale	Baleia-de-bossas; Baleia-corcunda;	T, S	1, 2, 3, 6, 7, 8, 29
? 19- <i>Balaenoptera musculus</i> (Linnaeus, 1758)	Blue whale	Baleia-azul	S	2, 6, 7, 22
20- <i>Balaenoptera physalus</i> (Linnaeus, 1758)	Fin whale	Baleia-comum; Rorqual-comum	S	1, 2, 3, 6, 10, 20, 22, 29
21- <i>Balaenoptera borealis</i> Lesson, 1828	Sei whale	Baleia-sardinha	T, S	8, 11, 12, 29
22- <i>Balaenoptera acutorostrata</i> Lacépède, 1804	Minke whale	Baleia-anã;	T	2, 3, 6, 7, 22

<sup>1</sup> Classification and common names according to EVANS (1987).

<sup>2</sup> -According to SEQUEIRA (1988) and GALHARDO (1990).

- 6- FERREIRA, E. 1935. Gigantes dos mares dos Açores. *Açoreana* (Boletim da Sociedade Afonso Chaves) 2: 74-86.
- 7- GALHARDO, M.L. 1990. *Cetáceos que Ocorrem nos Açores (Biologia, Ecologia e Taxonomia) e Estudos Sobre a História da Baleação nos Açores*. Relatório de Estágio da Licenciatura em Biologia e Geologia do Departamento de Biologia da Universidade dos Açores. 330 pp.
- 8- GONÇALVES, J.M., L. GALHARDO & J. BRUM 1992. Marine mammals stranded in the Azores during 1990-91. *Arquipélago. Life and Earth Sciences* 10: 113-118.
- 9- GORDON, J., T. ARNBOM, J. BRUM, C. COXSON, R. CUNHA, D. GILLESPIE, T. GORDON, K. HUGHES, T. KIRBY, K. STOREY & V. WALSH 1987. *The first cruise of "Song of the Whale" and cetacean research carried out in the Azores by the International Fund for Animal Welfare*. Cambridge. 11 pp.
- 10- GORDON, J., T. ARNBOM, D. GILLESPIE, T. GORDON, R. LEAPER, A.C. LESCRAUWERT, P. LOVELL & L. STEINER 1988. *Preliminary report on cetacean research being conducted in the waters around the Azores by the International Fund for Animal Welfare*. Cambridge. 95 pp.
- 11- GORDON, J., A. GODDARD, G. LEAPER, R. LEAPER, L. STEINER & C. WHITMORE 1989. *Report of the International Fund for Animal Welfare's. Cetacean research program in the Azores*. Cambridge. 59 pp.
- 12- GORDON, J., L. STEINER & J. GONÇALVES 1990. Sei whale (*Balaenoptera borealis*) encountered in the Azores: a new record for the Region. - *Arquipélago. Life and Earth Sciences* 8: 97-100.
- 13- HEYNING, J.E. 1989. Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1823. In: S.H. RIDGWAY & R. HARRISON (Eds.). *Handbook of Marine Mammals*, Vol. 4. Academic Press. London.
- 14- KENYON, K.W. 1961. Cuvier's beaked whales stranded in the Aleutian islands. *Journal of Mammology* 42: 71-76.
- 15- LEATHERWOOD, S. & R.R. REEVES 1983. *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books. San Francisco. U.S.A. 302 pp.
- 16- MARTIN, A.R. 1986. Feeding association between dolphins and shearwaters around the Azores Islands. *Canadian Journal of Zoology* 64: 1372-1374.
- 17- MARTINS, H.R., M.R. CLARKE, F. REINER & R.S. SANTOS 1985. A pigmy sperm whale, *Kogia breviceps* (Blainville, 1838)(Cetacea: Odontoceti) stranded on Faial Island, Azores, with notes on Cephalopod beaks in stomach. *Arquipélago. Série Ciências da Natureza* 6: 63-70.
- 18- MOORE, J.C. 1963. The goose-beaked whales, where in the world? *Bulletin of the Chicago Natural History Museum* 34: 2-3.
- 19- NORRIS, K. 1961. Standardized methods for measuring and recording on the smaller cetaceans. *Journal of Mammology* 42 (4): 471-476.
- 20- REINER, F. 1985. *Mammifère Marins de l'Atlantique Portugais et le Phoque Moine de Madère*. Thèse présentée à l'Université d'Aix-Marseille III, pour obtenir de Diplôme d'Études Doctorales. 244 pp.
- 21- REINER, F. 1986. First record of Sowerby's beaked whale from the Azores. *The Scientific Reports of the Whales Research Institute* 37: 103-107.
- 22- REINER, F. 1988 (1990). Records of Marine Mammals of the Azores Islands. *Garcia da Orta, Série de Zoologia* 15 (2): 21-36.
- 23- REINER, F. & R.S. SANTOS 1984. On the occurrence of the false killer whale, *Pseudorca crassidens* (Owen, 1846) in the waters of Azores. *Memórias do Museu do Mar, Cascais, Portugal. Série Zoológica* 3 (26): 7pp.
- 24- REINER, F. & M. LACERDA 1989. Note on the presence of *Pseudorca crassidens* in Azorean waters. *Bocagiana*, 130: 7 pp.
- 25- RICHARD, J. 1936. Documents sur les Cétacés et Pinnipèdes Provenant des Campagnes du Prince Albert 1<sup>er</sup> de Monaco. *Resultats des Campagnes Scientifiques du Prince Albert de Monaco*. Fasc. XCIV. Imprenserie de Monaco. 72 p.
- 26- RIDGWAY, S. & R. HARRISON 1985. *Handbook of Marine Mammals*. The Sirenians and Baleen Whales. Vol. 3. Academic Press. London. 361 pp.
- 27- SEQUEIRA, M.L. 1988. *Mamíferos Marinhos da Costa Portuguesa. Padrões de Distribuição e Ocorrência das Principais Espécies*. Relatório de Estágio da Licenciatura em Recursos Faunísticos e Ambiente da Faculdade de Ciências das Universidade Clássica de Lisboa. 187 p.
- 28- SEQUEIRA, M., A. INÁCIO & F. REINER 1992. Arto-jamentos de mamíferos marinhos na costa portuguesa entre 1978 e 1988. - *Estudos de Biologia e Conservação da Natureza* 7. 48 pp. SNPRCN - Núcleo de Mamíferos Marinhos. Lisboa.
- 29 - STEINER, L. & J. GORDON 1990. *Cetacean sightings made between 1987 and 1990 in the Azores*. Unpublished Report from the International Fund for Animal Welfare (IFAW). 16 pp.
- 30- TEIXEIRA, A.M. 1978. Sobre a ocorrência de um exemplar de cachalote-anão, *Kogia breviceps* (Blainville, 1838) no mar dos Açores. *Memórias do Museu do Mar, Cascais, Portugal. Série Zoológica* 1 (3): 1-5.

Accepted 23 September 1993.

EDITORIAL NOTES

The editor of the Bulletin *Arquipélago*, Series Life and Earth Sciences, sincerely thanks the individuals listed below, who served as manuscript reviewers for the numbers 8, 9 and/or 10 (1990-1992):

Miguel A. Alcaraz, Spain	Otakar Kudma, Germany
Pilar Andreu, Spain	Frederico Machado, Portugal
Hans Bath, Germany	José Ávila Martins, Açores
Andrew H.R. Beaumont, Wales	Gerhard E. Maul, Madeira
Alan B. Bolten, Florida	Marc Meyer, Luxembourg
Manuel J. Biscoito, Madeira	Richard D.M. Nash, Isle of Man
George Branch, S. Africa	Trevor A. Norton, Isle of Man
Torleiv Brattegard, Norway	Steffen Oehmig, Germany
Frederick M. Broadhurst, England	Egil R. Ørskov, Scotland
Emygdio L. Cadima, Portugal	C. Pelerents, Belgium
Malcolm R. Clarke, England	Jacques Pierre, France
Michael Depledge, Denmark	Jean Michel Rabasse, France
Martim Portugal Ferreira, Portugal	R.W. M. van Soest, The Netherlands
Charles H.J.M. Franssen, The Netherlands	António Bivar de Sousa, Portugal
Jonathan Gordon, England	Ian Tittley, England
Roger T. Hanlon, Texas	Manuel Carvalho Varela, Portugal
Stephen J. Hawkins, Isle of Man	Alwyne Wheeler, England
Ray W. Ingle, England	Peter Wirtz, Madeira

---

Beginning with this number (11), the Bulletin *Arquipélago*, Series Life and Earth Sciences has been split in two series: A - Life and Marine Sciences; B - Earth Sciences.