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Sightings of *Delphinus* cf. *tropicalis* Van Bree, 1971 in the Red Sea

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Abstract. *Delphinus tropicalis* Van Bree, 1971 is an extremely long-beaked form occurring in neritic habitats in the northern Indian Ocean and neighbouring seas. In June 1984 and March 1993 we observed dolphins in the southern Red Sea which agreed with the external characters described for this form. The animals were identified with *tropicalis* by their most prominent feature: a very long beak as compared to *D. delphis* L., 1758 from the North Atlantic and Mediterranean Sea. The beak also appeared considerably longer than in *D. capensis* Gray, 1828 from the eastern Pacific and South Africa. The taxonomic history and distribution of *D. tropicalis* is reviewed. A limited study of six *Delphinus* skulls from the Arabian peninsula suggests that *D. tropicalis* and *D. capensis* cannot be readily separated. It is suggested that *D. tropicalis* may constitute a very long-beaked form or population of *D. capensis*.

Key words. *Delphinus tropicalis*, *D. capensis*, Red Sea, Arabia, taxonomy, distribution.

Introduction

A plethora of names has become available for the many varieties of the cosmopolitan genus *Delphinus* L., 1758; see the review by Hershkovitz (1966). Most modern handbooks on Cetacea, however, recognize only one highly variable species, *Delphinus delphis* L., 1758 (Hershkovitz 1966, Leatherwood & Reeves 1983, Evans 1987, Martin et al. 1990, Klinowska 1991). The complexity of the problem is illustrated by the fact that Banks & Brownell (1969) distinguished two species in the eastern Pacific: *D. delphis* and *D. bairdii* Dall, 1873, the latter having been treated as a valid subspecies by Hershkovitz (1966). Brownell et al. (1982), following Van Bree & Purves (1972), synonymize *bairdii* with *delphis* but distinguish another species, *D. tropicalis* Van Bree, 1971. In a revised edition of this 1982 checklist, Mead & Brownell (1993) include the latter form with *delphis* again, thus reverting the genus *Delphinus* to monotypy. Evans (1994) appears indecisive as to recognizing one or three species of *Delphinus*.

Heyning & Perrin (1994) studied large samples of *Delphinus* from the eastern North Pacific, using both external and skeletal characters. They arrive at the conclusion that in this area there are indeed two species occurring in part sympatrically: a short-beaked and a long-beaked form. Their review of earlier publications on the subject and of the many available names reveals that the short-beaked form is conspecific with *D. delphis*, the long-beaked form with *D. bairdii* which, however, is synonymized with *D. capensis* Gray, 1828, as was earlier suggested by Van Bree & Purves (1972). According to Heyning & Perrin (1994), *D. delphis* occurs in tropical and temperate waters of the Atlantic and Pacific Oceans, whereas *D. capensis* is as yet known from rather scattered localities in tropical and warm-temperate waters of

the Atlantic, Indian and Pacific Oceans, between 40° N and 40° S. Moreover, *D. delphis* occurs in both oceanic and inshore waters, whereas *D. capensis* appears to be restricted to inshore, neritic conditions. The conclusions of Heyning & Perrin (1994) are corroborated by the outcome of a genetic analysis of material from the eastern North Pacific and the Black Sea (Rosel et al. 1994).

No material of *D. tropicalis* has been included in the study by Heyning & Perrin (1994) though these authors do review the literature on this putative species and compare the published characters with the two species distinguished by them. They conclude that the colour pattern of *tropicalis* does not seem to differ from that of *capensis*. The skull characters, however, stand out in that they exceed those of *capensis* in the average number of teeth, in rostral length, and particularly in the ratio rostral length/zygomatic width. For this reason, and because material attributed to *D. capensis* and to *D. tropicalis* has been collected on the coasts of the Arabian peninsula (Van Bree & Gallagher 1978), they tentatively keep the two species apart while leaving open the possibility that *tropicalis* would eventually turn out to be an extremely long-snouted form of *capensis*.

History and distribution of *Delphinus tropicalis*

After having slumbered in the synonymy of *Delphinus delphis* for a long time, the nominal species *D. longirostris* Cuvier, 1829, based on a skull from Malabar, India, was given specific status again by Van Bree (1971 a) under the name *D. dussumieri* Blanford, 1891, since Cuvier's name was preoccupied and therefore unavailable for the genus *Delphinus*. The same, however, applied to the name given by Blanford so that Van Bree (1971 b) renamed the species *D. tropicalis*. Apart from the holotype, Van Bree (1971 a) studied two specimens collected off Berbera, north-western Somalia.

Pilleri & Gihr (1972 a, b) identified the species among material from Pakistan: a skull from the surroundings of Karachi (1972 a) and five specimens collected on the Makran coast (1972 b). Later, Pilleri & Gihr (1974) discovered two more specimens originating from the Malabar coast, India.

Van Bree & Gallagher (1978) described three skulls from the west coast of Sharjah, United Arab Emirates, in the eastern Arabian (Persian) Gulf, and included a skull from the South China Sea (probably collected near Pontianak, Borneo, Indonesia) in *D. tropicalis*, thereby extending the species' known range far beyond the limits of the north-western Indian Ocean. The authors referred a skull from the Khuria Muria Islands, Oman, to *D. delphis*; this specimen was identified with *D. capensis* by Heyning & Perrin (1994), based on the measurements published by Van Bree & Gallagher (1978). Another specimen of *D. tropicalis* from the South China Sea, caught in the Beibuwan Gulf (Gulf of Tonkin) was examined by Zhou et al. (1980).

De Silva (1987) mentions one skull of *D. tropicalis* from Sri Lanka and one specimen from the Sind coast, Pakistan. A photograph of the Sri Lanka skull was published by Leatherwood & Reeves (1989) who also give a record of an otherwise unspecified "common dolphin" from Trincomalee, Sri Lanka. Robineau & Rose (1984) reported on two specimens from Djibouti. Small & Small (1991) identified an

animal caught off northern Somalia with *tropicalis* (the exact locality was not given). These authors observed many groups of *Delphinus* along the Somali coast but could only identify the above specimen that was caught.

Gallagher (1991) records one skull of *D. tropicalis* from the eastern tip of Oman; all other specimens of *Delphinus* from that country were identified with *delphis*. The identifications were carried out by P. J. H. van Bree. Unfortunately, however, Gallagher (1991) does not give the criteria for referring the material to one species or another. In his enumeration, he includes the Arabian material studied earlier by Van Bree & Gallagher (1978), but omits a skeleton from Bahrain, southern Arabian Gulf, identified as *D. tropicalis* by P. J. H. van Bree and preserved in the Zoological Museum Amsterdam (ZMA 20.294, coll. 26-ii-1978). In their review, Heyning & Perrin (1994) include the waters off Oman within the distribution area of *D. capensis*, which here would occur sympatrically with *D. tropicalis*. As these authors do not refer to Gallagher (1991), their map in this respect is based on the skull from the Khuria Muria Islands only, mentioned by Van Bree & Gallagher (1978). Finally, Henningsen & Constantine (1992) recorded two sightings of *D. delphis* in the northern Persian Gulf, and Robineau & Fiquet (1994) found two skulls identified as *delphis* on Abu Ali Island, Saudi Arabia, in the same area. None of these authors give any details of their criteria for identification.

There are few published illustrations of the external characters of *D. tropicalis*. Van Bree (1971 a) reproduces a drawing of the head made by A. Fraser Brunner in Somalia. Pilleri & Gihr (1972 b) give photographs of a bycaught animal in Pakistan, with clear details of the head; and Small & Small (1991) publish a photograph of the animal caught off northern Somalia. All these pictures clearly show the extremely long beak of the species.

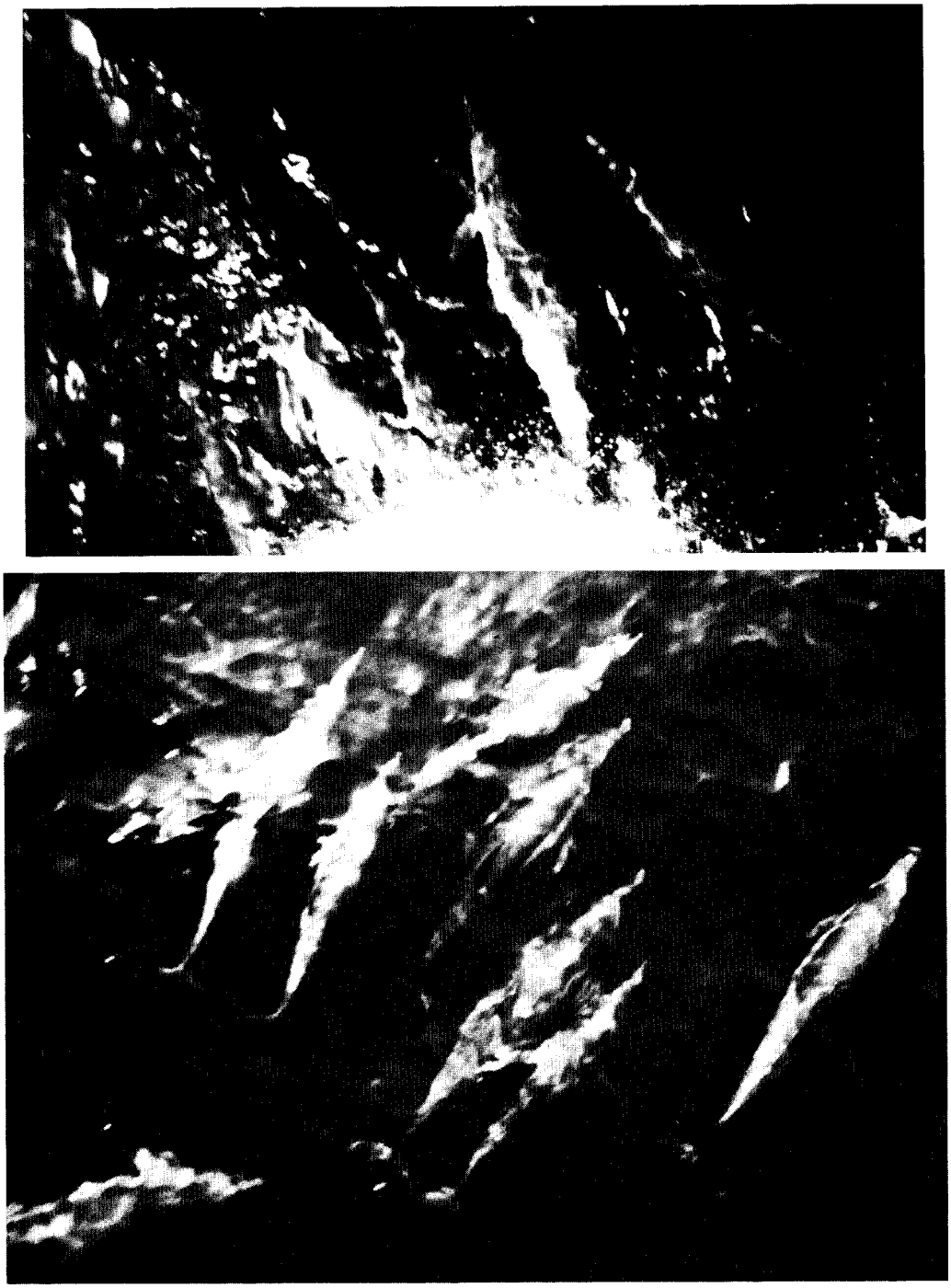
Observations of *Delphinus* cf. *tropicalis* in the Red Sea

During two voyages through the Red Sea on board the Dutch research vessel Tyro, in June 1984 and March 1993, groups of *Delphinus* were sighted on several occasions. Those animals that were seen at close range were different in appearance from *D. delphis* as it was known to us from numerous observations in the north-eastern Atlantic and Mediterranean. In 1984, the species was noted as *Delphinus* cf. *delphis*; in 1993, however, we realized that we were seeing dolphins which to all intents and purposes agreed with what is known about the external characters of *D. tropicalis*. The following details were laid down:

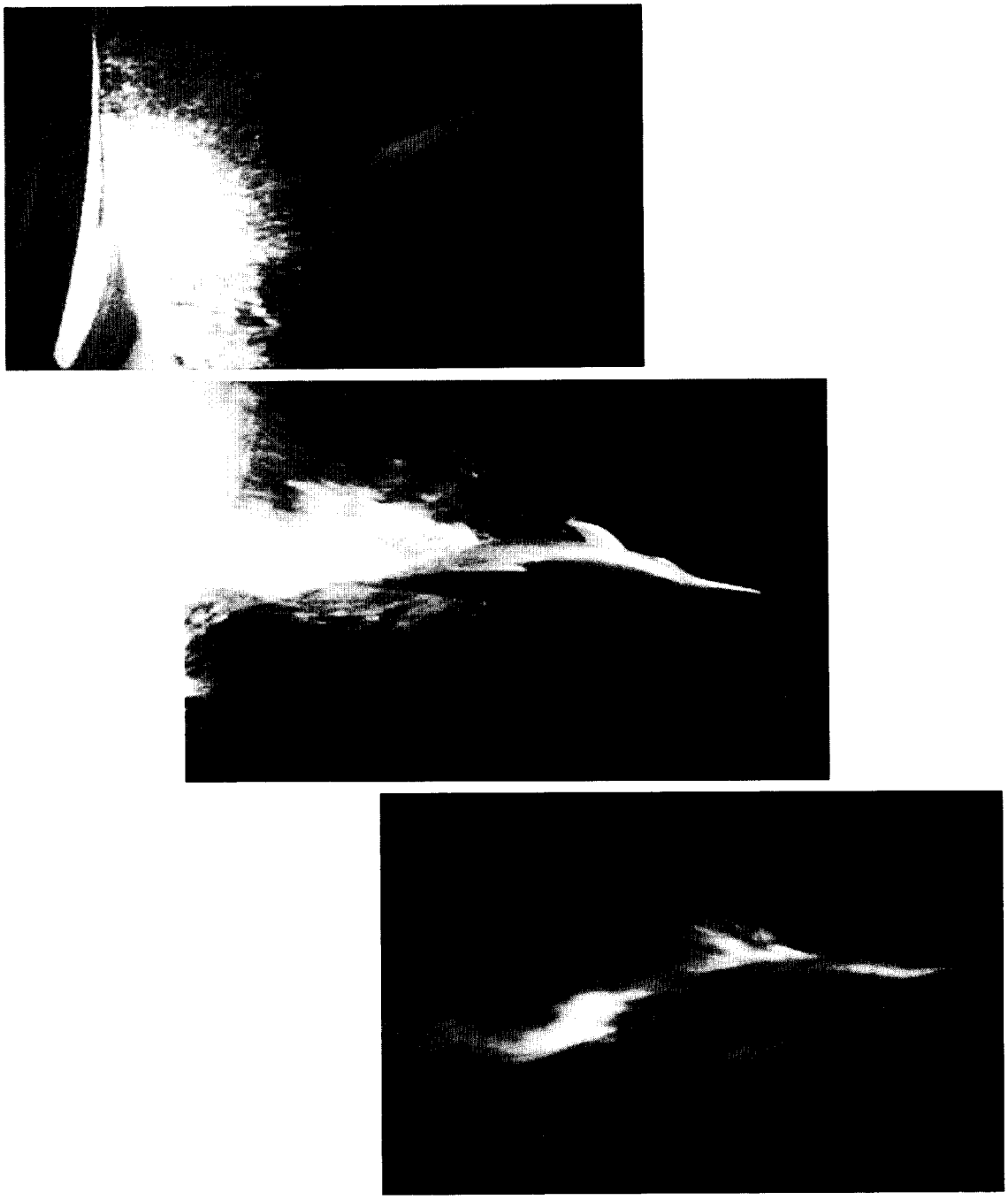
13 June 1984, southern Red Sea between Az Zubayr and Zuqar Islands off Yemen, 14° 21' N 42° 31' E, depth c. 40 fathoms (73 m). Ship's time 8:55 h, wind 2—3 Beaufort, viewing conditions excellent. Ship's speed 11.5 knots, heading 146° (ABvdB, CAWB, CS).

A group of dolphins was discovered as our attention was drawn to jumping fish. The animals changed course and approached the ship where they remained bow-riding for about two minutes. We could see 10—15 dolphins including a half-size calf swimming in simultaneous motion with an adult. They had longer beaks and appeared larger than *D. delphis* we had seen in the Mediterranean earlier during the same voyage. They showed a rather sluggish behaviour and were less given to jumping than we had observed in bow-riding *delphis*. The animals were less vividly col-

oured than *delphis*, giving a rather "faded" impression, with a less contrasting pattern. The back was greyish-brown, flanks and abdomen white, the grey of the back forming a well-marked downward-pointing triangle below the dorsal fin. There was a white "bridle" in front of the eyes; no other markings were observed. In the photographs, the colour pattern and the long, thin beak are clearly visible (figs 1, 2).



Figs 1, 2: *Delphinus* cf. *tropicalis*, bow-riding. Red Sea, 14° 21' N 42° 31' E, 13 June 1984. Photos: Arnoud van den Berg.



Figs 3—5: *Delphinus* cf. *tropicalis*, bow-riding. Red Sea, 15° 37' N 41° 29' E, 10 March 1993. Reproductions from video-recording by Marjan Addink.

Slightly earlier the same day, at about 8:25 h ship's time, 14° 25' N 42° 28' E, depth 45—60 fathoms (82—110 m), we had seen a large mixed group of dolphins consisting of several scores of larger and smaller animals. The smaller ones were *Stenella* sp., the larger looked like *Delphinus*. The group proceeded in a broad formation, probably foraging, among many jumping fish, but did not closely approach the ship,

the distance remaining 300—500 m. Two of the larger dolphins were recognized by another observer (A. M. van der Niet) as *Delphinus* because of the dark triangle below the dorsal fin, visible when the animals jumped above the surface. These dolphins too, appeared rather heavy and sluggish, and showed a less contrasting pattern and less vivid colouration than Mediterranean *delphis*. We take it that on both occasions we were seeing the same species of *Delphinus*.

10 March 1993, southern Red Sea north-west of Az Zubayr Islands, between 15° 13' N 41° 43' E (16:15 h ship's time) and 15° 37' N 41° 29' E (18:30 h ship's time); depth at first 40—65 m, suddenly increasing to c. 500 m at about 18:15 h. Wind 3 Bft, viewing conditions good except that the light was fading by 18.30 h.; heading 330° (MJA, GCC, CS). Many groups of dolphins were seen during this period: *Delphinus*, *Tursiops* and *Stenella attenuata*. The following observations of *Delphinus* were made: 16:15 h. A group of at least 3, and another of 6—8 dolphins on either side of the ship, not approaching closely, probably foraging. The brownish back and whitish flanks were visible; in two animals a dark triangle was apparent below the dorsal fin though not very contrasting.

16:45 h. 2 or 3 dolphins, with clearly visible dark triangle below the dorsal fin.

17:15 h. 5 or 6 dolphins approaching the vessel, but disappearing when at the bow. The same pattern as above, making them recognizable as *Delphinus*.

17:20 h. About 20—30 dolphins at the bow; a few animals indulged in bow-riding for a brief moment before following the others. The *Delphinus* pattern was clearly visible, the flanks being white before and behind the dark triangle.

18:30 h. Several groups of *Delphinus* at the bow, totalling some 20—25 animals, bow-riding in a very tight formation. Light conditions were deteriorating, but the very long and thin beaks were striking. A video-recording of this group was made, see figs 3—5. The extremely long and slender beak and the rather "faded" colouration and white flanks and abdomen agreed with the dolphins seen and photographed in June 1984. The shape of the beak in particular made us identify the last group with *D. tropicalis*. Dolphins were still around the ship, some of them jumping, when it was becoming too dark for further observations.

11 March 1993, 17° 48' N 40° 12' E, in deep water (800—1500 m). Ship's time 7:30—7:45 h, wind 2—3 Bft, viewing conditions good; heading 330° (MJA). One or more dolphins ahead, but not approaching closely. The animals looked most like *Delphinus* but could not be identified with certainty. At 7:45 h one dolphin came close to the bow; this animal was *Delphinus*, with a clearly visible dark triangle below the dorsal fin. No other details were noted.

External characters of *D.* cf. *tropicalis*

In all cases, we identified our Red Sea dolphins with *tropicalis* by their extremely long beaks as compared to *D. delphis* from the North Atlantic and Mediterranean. This feature is prominent in all published illustrations of *tropicalis*, see Van Bree (1971 a), Pilleri & Gihr (1972 b) and Small & Small (1991). The beak in our Red Sea dolphins appears considerably longer than in *D. capensis*, at least in the populations of the eastern North Pacific judging from the illustrations in Heyning & Perrin (1994), and in South African waters judging from the photographs in Ross & Best (1989: publish-

ed as *D. delphis*). For the rest, we were unable to discern any notable field characteristics in colour pattern. The Red Sea animals looked paler and less distinctly marked than *delphis*, and also than *capensis*; again, as it appears from the photographs in Heyning & Perrin (1994) and Ross & Best (1989). However, a comparison of our photographs, video-recordings and impressions of incomplete views of live animals in the Red Sea with photographs of bycaught specimens from the eastern North Pacific and South Africa is perhaps not very useful. The bycaught *tropicalis* illustrated in Pilleri & Gihr (1972b) and Small & Small (1991) too, look indistinctly marked, but the drawing published by Van Bree (1971a) shows a much more contrasting pattern. The white bridle as observed in some of our Red Sea animals is also visible in *tropicalis* pictured by Van Bree (1971a) and Pilleri & Gihr (1972b), as well as in some specimens of *capensis* from the eastern North Pacific and South Africa. The general colouration of the head and flipper stripe in *tropicalis* looks rather similar to the pattern in *capensis*, as was pointed out by Heyning & Perrin (1994). Finally, *tropicalis* has a rather flattish melon, a feature that was described for *capensis* by Heyning & Perrin (1994), and which is well visible in our video-recordings and photographs, as well as in the above-mentioned illustrations. More material is needed to assess the existence of any constant colour differences between *tropicalis* and *capensis*.

Discussion

Delphinus tropicalis has now been found along the northern shores of the Indian Ocean and in adjacent waters; specimens have been identified from the Gulf of Tonkin (China), Borneo (Indonesia), Sri Lanka, the west coast of India, Pakistan, the United Arab Emirates, Bahrain, Oman, Somalia and Djibouti. Our sightings would add the southern Red Sea off Yemen though as yet no skeletal material is available from this area. The majority of *Delphinus* specimens collected by Gallagher (1991) on the coast of Oman and the Arabian Gulf, however, have been identified with *delphis* (= *capensis*). This author enumerates 28 skulls of *delphis*, all from Oman, against four identified as "cf. *D. tropicalis*": one from Oman and three from the Arabian Gulf. Elsewhere, *capensis* and *tropicalis* have not been collected sympatrically.

The problem whether *D. tropicalis* is to be regarded as a valid species can only be solved by a thorough study of external and skeletal characters as well as DNA. For this paper, we were able to examine the skulls of *Delphinus* from the Arabian peninsula in the collection of the Zoological Museum in Amsterdam. There are six skulls, five of which are mentioned by Gallagher (1991); the sixth is the unpublished specimen from Bahrain (two other skulls are so damaged that they cannot be usefully measured; they are listed as *Delphinus* sp. by Gallagher 1991). We have measured rostrum length (RL) and zygomatic width (ZW), as the ratio of these two values would, according to Van Bree & Gallagher (1978), separate *delphis* (= *capensis*) and *tropicalis* (table 1).

The following restrictions should be borne in mind concerning these measurements: (1) the tip of the rostrum of ZMA 20.321 is missing and the real ratio RL/ZW is estimated to be within the range of 1.75—1.85; (2) the skull of ZMA 20.294 is damaged so that exact values cannot be obtained; (3) the ZW of ZMA

Table 1: Some measurements of *Delphinus* skulls from the Arabian peninsula in the collection of the Zoological Museum Amsterdam (ZMA). RL = rostrum length, ZW = zygomatic width; measurements in mm.

Number	Identification on label	Locality and year	RL	ZW	Ratio RL/ZW
ZMA 20.321	*D. delphis* (= *capensis*)	Ra's al Hadd, Oman, 1978	(326)	189.3	(1.72)
ZMA 20.322	*D. delphis* (= *capensis*)	Ra's al Hadd, Oman, 1978	319	183.5	1.73
ZMA 20.898	*D. delphis* (= *capensis*)	Qurm, Oman, 1979	343	189.0	1.81
ZMA 21.169	*D. tropicalis*	Ra's al Hadd, Oman, 1980	320	174.5	1.83
ZMA 20.294	*D. tropicalis*	Akarure, nr. Malichiya, Bahrain, 1978	(308)	(165)	(1.86)
ZMA 16.995	*D. tropicalis*	Umm al Qaywayn, UAE, 1973	359	185.2	1.94

(Values in brackets): skull damaged, no exact measurement possible.

19.995 was given as 159 by Van Bree & Gallagher (1978), the ratio RL/ZW as 2.22, which obviously is an error; (4) none of these specimens was sexed as the material consists of skulls of stranded animals picked up from the beach, and any sexual differences would go undetected: cf. the sexual differences within *D. delphis* and *D. capensis* apparent from the values given by Heyning & Perrin (1994). Despite all this, our ratios of 1.81 (ZMA 20.898: *capensis*) and 1.83 (ZMA 21.169: *tropicalis*) are extremely close. Judging from this limited material, there seems to be a clinal variation in this respect rather than a clear-cut difference between the putative forms, in contradiction with Van Bree & Gallagher (1978) who give an upper limit of 1.79 for *D. delphis* (including *capensis*) and a lower limit of 1.91 for *D. tropicalis*.

Future studies should reveal whether *D. tropicalis* would merit specific status, or is to be regarded as an extremely long-beaked form or population of *D. capensis*, mainly occurring in neritic conditions in the northern Indian Ocean and neighbouring seas. Our study, however limited it may be, would seem to point in the latter direction.

Acknowledgements

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Zusammenfassung

Delphinus tropicalis van Bree, 1971 ist eine überaus langschnauzige Form, welche in neritischen Gewässern des nördlichen Indischen Ozeans und der benachbarten Meere vorkommt. Im Juni 1984 und März 1993 beobachteten wir Delphine im südlichen Roten Meer, welche im Aussehen mit den für diese Form beschriebenen Merkmalen übereinstimmten. Die Tiere wurden als *tropicalis* bestimmt auf Grund ihres auffallendsten Merkmals: einer im Vergleich zu *D. delphis* L., 1758 vom Nordatlantik und dem Mittelmeer sehr langen Schnauze. Letztere erschien auch wesentlich länger als die von *D. capensis* Gray, 1828 vom östlichen Pazifik und von Südafrika. Die taxonomische Geschichte und die Verbreitung von *D. tropicalis* werden hier besprochen. Eine beschränkte Untersuchung von sechs *Delphinus*-Schädeln von der Arabischen Halbinsel weist darauf hin, daß *D. tropicalis* und *D. capensis* sich nicht einwandfrei unterscheiden. Es wird die Möglichkeit aufgeworfen, daß *D. tropicalis* wohl eine sehr langschnauzige Form oder Population von *D. capensis* darstellt.

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Book Review

Baron, G., H. Stephan & H.D. Frahm (1996): *Comparative Neurobiology in Chiroptera: Macromorphology, Brain Structures, Tables and Atlases.* Vol. 1. 530 pp., 271 figs. 53 tabs. Birkhäuser, Basel, Boston, Berlin.

This is the first of three announced volumes on the comparative neurobiology in Chiroptera. The three authors, all well-known experts in the field of brain anatomy, present the most comprehensive data set on brain morphology of bats ever seen in print. Heinz Stephan, former director of Max- Planck-Institut für Hirnforschung at Frankfurt, Georg Baron, Université de Montréal, and Heiko D. Frahm, Universität Düsseldorf, have combined their efforts and data collected over years and decades of field and laboratory work. The first volume contains first a general introduction, a documentation of methods, definitions, a list of species studied, and a list of abbreviations used throughout the three volumes. 19 families and 275 taxa of of bats were studied. In the results chapter "Comparative Brain Characteristics" the various parts of the brain are described, discussed, and compared with previous work on insectivores and primates by the same authors. A set of 52 tables provides the data used for these considerations. As an annex, a brain atlas is given for a megachiropteran and a microchiropteran brain, respectively.

This volume allows easy access to a large amount of information and will thus be of great interest to other researchers working in the same or in other fields. The three authors are to be congratulated for their service to the scientific community. The two forthcoming volumes, which focus on phylogeny and adaptive radiation, will undoubtly present more interesting facts on bat neurobiology and evolution.

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