

## ON GLOBICEPHALA AND SOME OTHER DELPHINIDAE FROM THE INDO-AUSTRALIAN ARCHIPELAGO.

By

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On the second January 1923 a large shoal of Dolphins was stranded in Madura Strait on the N. coast of E. Java, east of the village Besuky. An account of this event appeared first in the East-Java papers and a few days later in those of West-Java, but just at that time it happened that I was away on a collecting trip and I did not hear of these reports before my return to Buitenzorg. The reports, however, were not all the same, some speaking of a huge whale stranded at the place indicated above, others of a large shoal of a smaller species. Before I got the necessary information six weeks after the date of the stranding had already lapsed and I was not on the spot before the 14th February after a 3 days' journey from Buitenzorg.

By that date the stranded dolphins had already been buried for a considerable time, most of them on the beach, but, fortunately, two specimens which got more inland were buried in a clayey soil. These latter specimens were still in a fairly good state of preservation.

But before going further I will let Mr. J. H. MARONIER (head-engineer of the sugar factory Boedoean near Besuky) describe how the stranding of the dolphins took place <sup>1)</sup>:—

“On the 2nd January fishermen of the dessa Mlandingan, east of Besuky, saw a large shoal of about a hundred fishes swimming in a westerly direction. These fishes were coming regularly to the surface of the water, spouting clouds of fine waterdust. The natives had never seen such fishes before, nor could they tell the name of these beasts. After a time the shoal was split into several smaller ones, one of which returned and remained near the coast. Probably this latter shoal got at last into the more shallow part of the sea between some banks. At ebb tide the water recedes a great distance here leaving the shore dry for about 100 Meters. At ebbing, about 3 p. m. that day, the animals were enclosed in a deeper part of the water at the mouth of a small rivulet cut off

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<sup>1)</sup> This same account has been published also in the “Tropische Natuur”, Vol. XII, 3, March 1923.



*Globicephala indica*, stranded near Besuky, N. coast of E. Java.

from the sea by the banks. When high tide arrived it was spring flood, and the fishes were cast still higher and higher on the shore by the waves and a strong wind, a few even getting over the edge of the beach and arriving in a dry pond.

"The following day no less than 55 specimens could be counted, most of them lying on the beach almost in a straight line (see photographs Pl. VI). All the beasts were covered with severe wounds which they got by rolling over and over the sharp-edged pieces of coral on the shore. The greater part was already dead but those which were lying in the above-mentioned pond and the deeper water at the mouth of the river were yet alive, still spouting and groaning as if a herd of cows were bellowing.

"The animals are without any hairs; the uppersurface being of a dark colour, shiny and nearly black; the underparts are of a somewhat lighter hue. The skin is very thin with an underlayer of lard of 5 to 8 cm. thickness. Underneath the back there runs a channel with fluid oil. The flattened head is very heavy; the eyes are small and not bigger than human ones. In the lower jaw there are 18—20 sharp teeth in a row <sup>1)</sup> curved backward a little and fixed deeply in the jaw. They are pure white resembling ivory. In the upper jaw there are no teeth <sup>1)</sup> nor whale-bones. There are two blow holes <sup>1)</sup> covered by a very flexible valve.

"The biggest fish reached a length of 5.50 M. measured from the tip of the snout to the incision of the caudal fin, the latter being more than 1 M. wide and 55 cm. in length. The body at the pectoral fins is about 80 cm. in diameter, whereas the fins themselves are stiff and leathery and measure 90 cm. The whole shoal of 55 specimens was sun-baked and decaying rapidly and the obnoxious odour drove everyone away. The Civil Service officials had to force the population to perform the disagreeable task of burying the remains of these fishes. The burying had to be repeated several times as the waves washed up the bodies again and again, while crocodiles, attracted by the malodour, also rooted up the remains at night, crows and dogs being present as well at these orgies. Among the stranded animals there were several females which whelped in death agony; also in the rotting bodies foetus were observed.

"Remarkably enough nobody endeavoured to collect the precious oil, the lard or train. Probably the many Chinese who came to look at the spectacle did not realize what a big fortune could be gathered there or, maybe, the necessary implements to collect the lard or oil were not at hand".

Mr. MARONIER and others also furnished us with photographs of the stranded Cetacea and from these we concluded that the species was a Globi-

<sup>1)</sup> Here the reporter is certainly wrong, see the following pages.

cephala. Mr. MARONIER's statement about the dentition was apparently wrong and as soon as I could examine the skulls it became evident that there were fewer teeth and that they were present both in the upper and lower jaw.

When I arrived on the spot I found that Mr. MARONIER had thoughtfully given instructions for two specimens, lying at a short distance from the main road from Sitobondo to Besuky, to be unearthed ready for my inspection<sup>1)</sup>.

These two specimens, having been buried in a clayey soil, were still well-preserved but of course not quite fresh after several weeks of decay. The outward shape was somewhat deformed and several ribs and some other bones were piercing through the skin. The skin itself was, of course, already somewhat discoloured but seemed to be of a uniform hue without any marks or bands.

The fins were rather badly damaged owing, I think, to the rough way of burying. So in the first specimen we skeletonized the caudal fin had disappeared and the pectoral fins were incomplete. In the other, fortunately, the tail was present; one of the pectoral fins was fairly complete but the other was missing except for the larger bones.

Also the teeth were missing in both specimens except the smallest ones, they having been taken away as keepsakes by the many visitors who came to see the unusual sight. Mr. MARONIER, however, could furnish me with quite a number of teeth of different shapes, so we were able to put in a complete set of teeth in the specimen (No. 392) which is mounted now in the Museum.

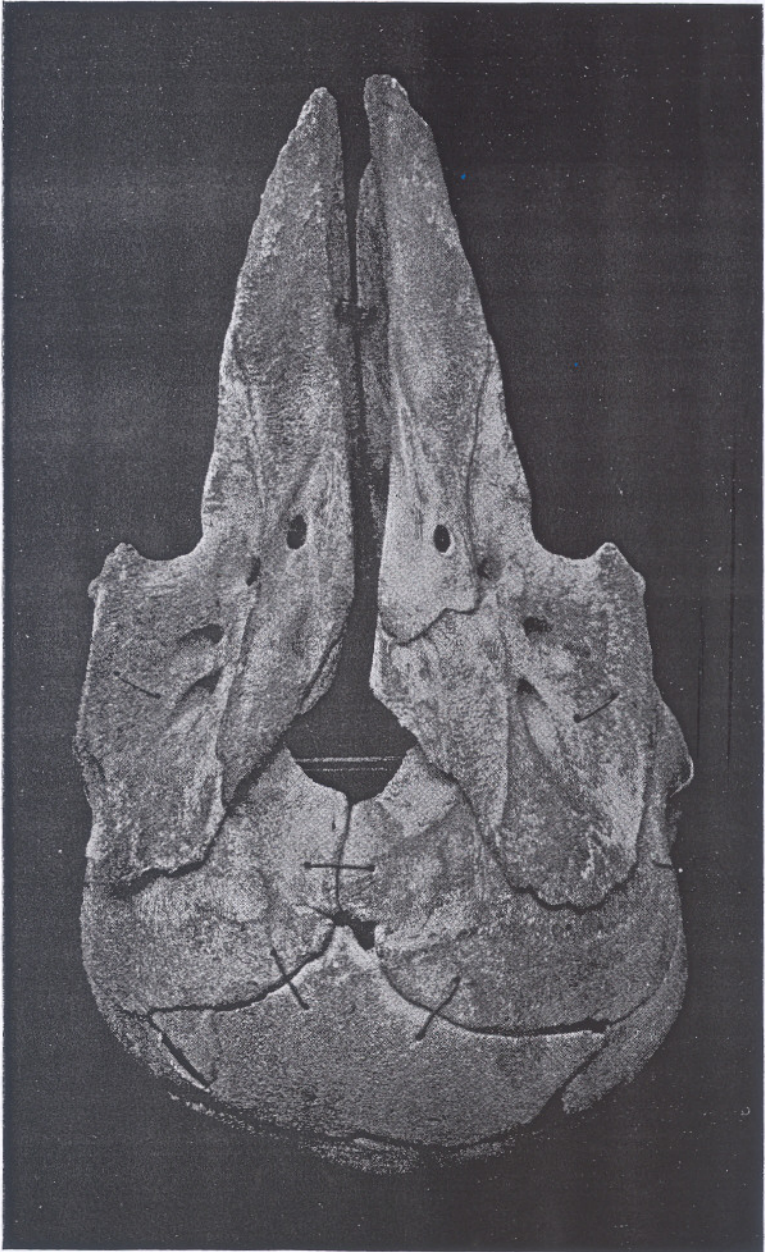
Upon the whole the specimens were not in such a state as to allow exact measurements of the exterior but still some measurements could be taken and others could be deduced from the fine photographs which were obtained of the animals shortly after the stranding.

When we were laying bare the bones of the first-mentioned specimen (No. 390) several small bones were excavated from the putrified mass of flesh and earth at the place of the abdomen. At the moment I was puzzled what these bones could be, but soon, much to my delight, it became clear that they were the bones of an embryo. We searched for and found nearly all the bones of the skull which were all loose and a few vertebrae and ribs. At Buitenzorg I could reconstruct the skull almost completely and we give a photograph of it (Pl. VII). We will refer to this skull again in the following pages.

The other specimen which we brought to Buitenzorg was a male, so far as we were able to ascertain on account of the bad state of preservation of the fleshy parts.

Besides these two specimens we collected two more skulls on the beach. We tried to dig out some more animals buried on the shore but these were all absolutely rotten and, moreover, nearly all incomplete.

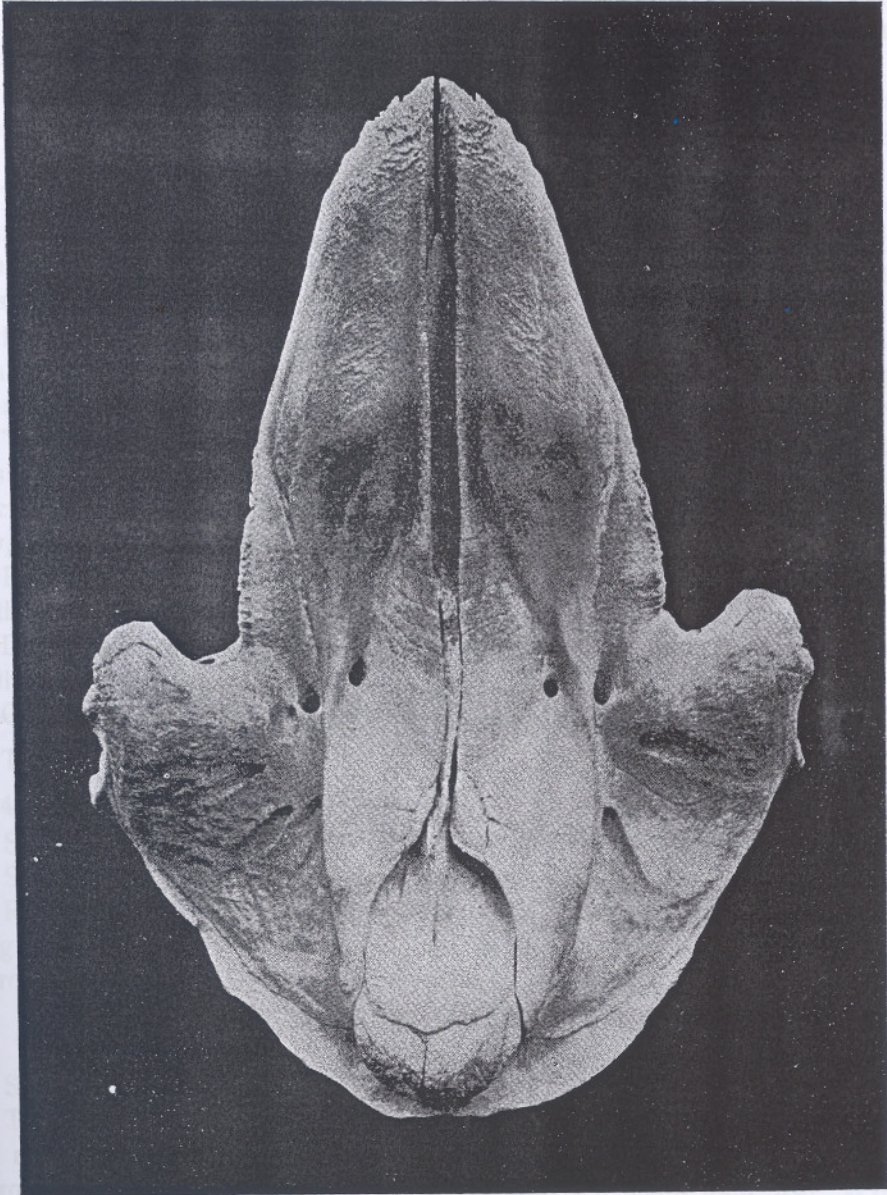
<sup>1)</sup> I have to thank here the manager of the Sugar factory Boedoean and his staff for their hospitality and the liberally lent assistance during my stay at Boedoean.



*Globicephala indica*, skull of embryo.

After a careful examination of the skull of the ... beyond doubt that we had to refer our species to the genus ... the Blackfishes, Pilot or Caving Whales. Also the way of showing ... typical of this genus. The common European blackfish (*Grampus griseus*) is known to show ...

Pl. VIII



*Globicephala indica*, skull of adult.

The parietal is the most different from that of the adults, it being still strongly swollen and convex; there is not yet a trace of the prominent crista

After a careful examination of the skulls it was beyond doubt that we had to refer our species to the genus *Globicephala*, the Blackfishes, Pilot or Ca'ing Whales. Also the way of stranding is typical of this genus. The common European blackfish (*Globicephala melas*) is known to strand from time to time in enormous numbers, up to even 1000 specimens; the whole shoal seems to follow blindly the leading male as sheep do the ram and wherever the first is going the others will follow.

Now we will first give a description, as complete as possible, of this *Globicephala* from Java and then see with which species it may be identified.

The head is globose and the forehead protuberant.

The length of the female specimen (No. 390) was estimated at 3.70 M., an exact measurement being impossible as the tail was missing; the length of the male (No. 392) was 3.82 M., but as stated above by Mr. MARONIER, the species can attain a length of 5.50 M.

From the photographs we can deduce further the following figures:— At a total length of 4.20 M., the length of the dorsal fin is 60 cm., the expanse of the tail 1.20 M., length of the pectoral fin 70 cm., its breadth 20 cm.

The pectoral fins are long, narrow and falcated; we could actually measure a very large pectoral fin, its length being 77 cm. at a breadth of 23 cm. The length is about 16—17 per cent. of the total length of the body, whereas its breadth is 28.6 per cent. of the length of the fin.

Phalanges of the first digit are 0—1, of the second 11 in number, of the third 9 and of the fourth 3.

Dorsal fin, long and situated far forward, anterior to the middle of the length of body. Caudal ridge very prominent extending to the dorsal fin.

Colour uniform black, the underparts alone being of a lighter shade.

Teeth  $\frac{6}{8}$  to  $\frac{8}{8}$ . Vertebrae:— C. 7 (the first 6 or all 7 coalescent), D. 10, L. 14, Ca. 25 = 56.

Skull (See Pl. VIII and for measurements the table on page 344).

Skull large, its greatest breadth about 70% of the total length.

Rostrum more long than broad at the base, the breadth at this place being 75—78% of the total length. Intermaxillae expanded anteriorly over the rostrum but the margin of the maxillae is left free; separated in the median line throughout. Pterygoid bones large, touching each other in the median line. Temporal fossae oval, the breadth being 42.7—59 per cent. of the length.

Skull of the embryo (No. 391, Pl. VII).

The skull of the embryo is much more rounded than in the adult specimens and more elongated, its breadth being only 58% of the total length. Also the rostrum is more slender, its breadth at the base being only 70% of the length. The asymmetry of the skull, so conspicuous in the full-grown ones, is already clearly expressed.

The parietal is the most different from that of the adults, it being still strongly swollen and convex; there is not yet a trace of the prominent crests

Species and locality.	G. indica (embryo) Besuky	G. indica Besuky	G. indica Besuky	G. indica Besuky	G. indica Besuky	G. indica Loc. unknown	G. indica? Loc. unknown	G. brachy- ptera? Loc. unknown	G. spec. Loc. unknown	
Btztg. Mus. No.	391	390 ♀	392 ♂	393	394	395	516	397	396	
Measurements (in mm.)										
Total length. . . . .	—	3700	3820	—	—	—	—	—	—	
Total length of skull . . . . .	220	578	623	585	655	548	660	655	577	
Greatest breadth of skull. . . . .	127	410	435	413	479	368	527	521	420	
Breadth in per cent. of the length	58%	71%	70%	70.6%	73%	67%	79.8%	79.5%	73%	
Length of rostrum . . . . .	94	290	319	284	321	283	342	326	295	
Breadth of rostrum at base. . . . .	66	220	240	216	250	213	295	295	220	
Breadth in per cent. of the length	70%	76%	75%	76%	78%	76%	86.2%	90.5%	74.6%	
Breadth of rostrum at middle of beak. . . . .	53	180	210	168	220	173	259	248	181	
Greatest breadth of intermaxillae	51	179	202	165	212	167	244	250	175	
Min. breadth of intermaxillae <sup>1)</sup>	41	135	145	140	165	132	170	165	135	
Breadth between hinder margins of temporal fossae. . . . .	112	245	253	250	271	224	316	275	248	
Temporal fossae {	length	—	140	178	132	166	132	150	172	118
	breadth	34	83	76	72	98	75	110	85	87
Breadth in per cent. of the length	—	59%	42.7%	54.5%	59%	56.8%	73.3%	49.4%	73.7%	
Extremity of beak to {	anterior margin of superior nares.	122	385	420	381	451	378	480	454	389
	end of crest of pterygoid . . . . .	—	397	418	390	440	387	461	433	390
Length of tooth-line $\frac{r}{1}$ . . . . .	—	$\frac{120}{119}$	$\frac{115}{117}$	$\frac{113}{105}$	$\frac{112}{117}$	$\frac{115}{109}$	$\frac{122}{134}$	$\frac{120}{132}$	$\frac{119}{110}$	
Last tooth to base of maxillary notch . . . . .	51	177	197	185	204	178	220	200	188	
Length of mandible . . . . .	168	475	505	479	—	—	—	—	—	
Length of symphysis of mandible	—	63	63	68	—	—	—	—	—	
Length of tooth-row of mandible $\frac{r}{1}$ . . . . .	—	$\frac{125}{126}$	$\frac{127}{129}$	$\frac{123}{128}$	—	—	—	—	—	
Number of teeth <sup>2)</sup> . . . . .	—	$\frac{8-8}{8-8}$	$\frac{7-7}{8-8}$	$\frac{7-7}{8-8}$	$\frac{6-6}{\dots}$	$\frac{7-7}{\dots}$	$\frac{6-7}{\dots}$	$\frac{6-7}{\dots}$	$\frac{7-6}{\dots}$	

<sup>1)</sup> Measured anterior to the nares.

<sup>2)</sup> Except in skull 395 teeth being not present, the figures refer to the number of alveoli.



at the place where the parietal is meeting the exoccipital and the frontal, which crests are so pronounced in the adult skull and give the temporal fossae their characteristic form. Not a single tooth was present, all must have been lost; the alveoli being not yet separated from each other, forming one long excavation in the upper and lower jaw. Also the basioccipital, vomer, sphenoida, pterygoid, squamosal and tympanic are missing.

Now the question arises with which species of *Globicephala* is ours to be identified? There being no material for comparison available here we have to rely on the excellent monograph of the Delphinidae by TRUE<sup>1</sup>).

In the first place we may take into consideration the common blackfish of the Atlantic Ocean, *G. melas*. Though the cranial characters agree very well we can exclude this species almost at once as having a white mark on the throat and a whitish band along the median line of the belly and being, moreover, apparently confined to temperate seas.

As Mr. MARONIER stated, and as far as I could ascertain, the colour of our species is entirely black and no trace of whitish marks or bands were to be seen on the undersurface; also from the photographs it is clear that the belly of our *Globicephala* is of a uniform hue.

The number of caudal vertebrae in *G. melas* seems to be a little higher (27—29); also the average number of the teeth is  $\frac{9}{9}$  or  $\frac{10}{10}$  and in our species only  $\frac{6}{8}$  to  $\frac{8}{8}$ .

Now of the species with entirely black underparts we have to consider *G. brachyptera* COPE, *G. scammoni* COPE, en *G. indica* BLYTH.

In most respects our species agrees with *G. brachyptera* in both cranial and external characters but in *G. brachyptera* the intermaxillae are greatly expanded, projecting over the margin of the maxillae in the anterior half of the rostrum, whereas in our species the margin of the maxillae is left free except at the extreme end of the rostrum.

The rostrum itself is longer and narrower than in *brachyptera*, the breadth at the base being in our species about 77% and in *brachyptera* 83-93% of the total length of the rostrum.

In *G. scammoni* the intermaxillae also do not extend to the margin of the maxillae. In this species, however, the rugosities near the anterior end of the intermaxillae are said to be very strongly marked. In three of our skulls the intermaxillae are rather smooth throughout, only in our largest skull (No. 394) these rugosities are more distinct but seem to be far less pronounced than in *scammoni*, judging from the figure given by TRUE.

Further, the nasal septum in *G. scammoni* is said not to reach above the plane of the adjacent intermaxillae, whereas in the species from Java this is the case in all four skulls.

<sup>1</sup>) F. W. TRUE. A Review of the Family Delphinidae. Bull. 36 U. S. Nat. Museum Washington 1889.

Also the skull and rostrum of *scammoni* is much broader than in our species, the breadth of the rostrum at its base being in the former species 90.6 per cent. of its total length.

In both species the pectoral fin seems to be of the same form, its breadth being in *G. scammoni* 29% of the total length of the fin; in our species 28.6% but in *scammoni* the fin is a little longer, being here 18.3 per cent. of the total length of the body against 16.6 per cent. in our species. This small difference, however, is hardly of specific importance.

As we are unable to identify our species with *G. brachyptera* or *scammoni* there remains for comparison *G. indica*.

TRUE does not discuss this species, the original description<sup>1)</sup> being too scanty and no further data being at his disposal.

BLANDFORD, however, in „the Fauna of India”<sup>2)</sup> has given a more complete description, but he also does not point out clearly the differences between the Indian Globicephala and the other species belonging to this genus. However, as far as his description goes, our Java species agrees with the Indian Globicephala in every respect:—colour, size and form. The number of teeth is the same; the vertebral formula nearly so, the total number of vertebrae is the same. In *G. indica* there are 12 lumbar vertebrae and 26 caudal ones; in our species resp. 14 and 25, but such differences are certainly within the limit of individual variation.

In both our skeletons I could not find more than 10 ribs, whereas for *G. indica*, as well as for the other Globicephala-species, 11 is given as the number of the ribs.

BLANDFORD gives the following measurements for an adult male of *G. indica*:—Length 14 ft. 2 in., pectoral fin 24 inches long and 6 broad, dorsal fin 27 long and 11 high, expanse of tail 3 ft.

Total length of skull 65 inches<sup>3)</sup>, length of rostrum 33, breadth of skull between orbits 47, breadth of beak at the middle of its length 25, breadth of premaxillae at same place 22.

All these figures correspond fairly well with those given above and in the table for our species.

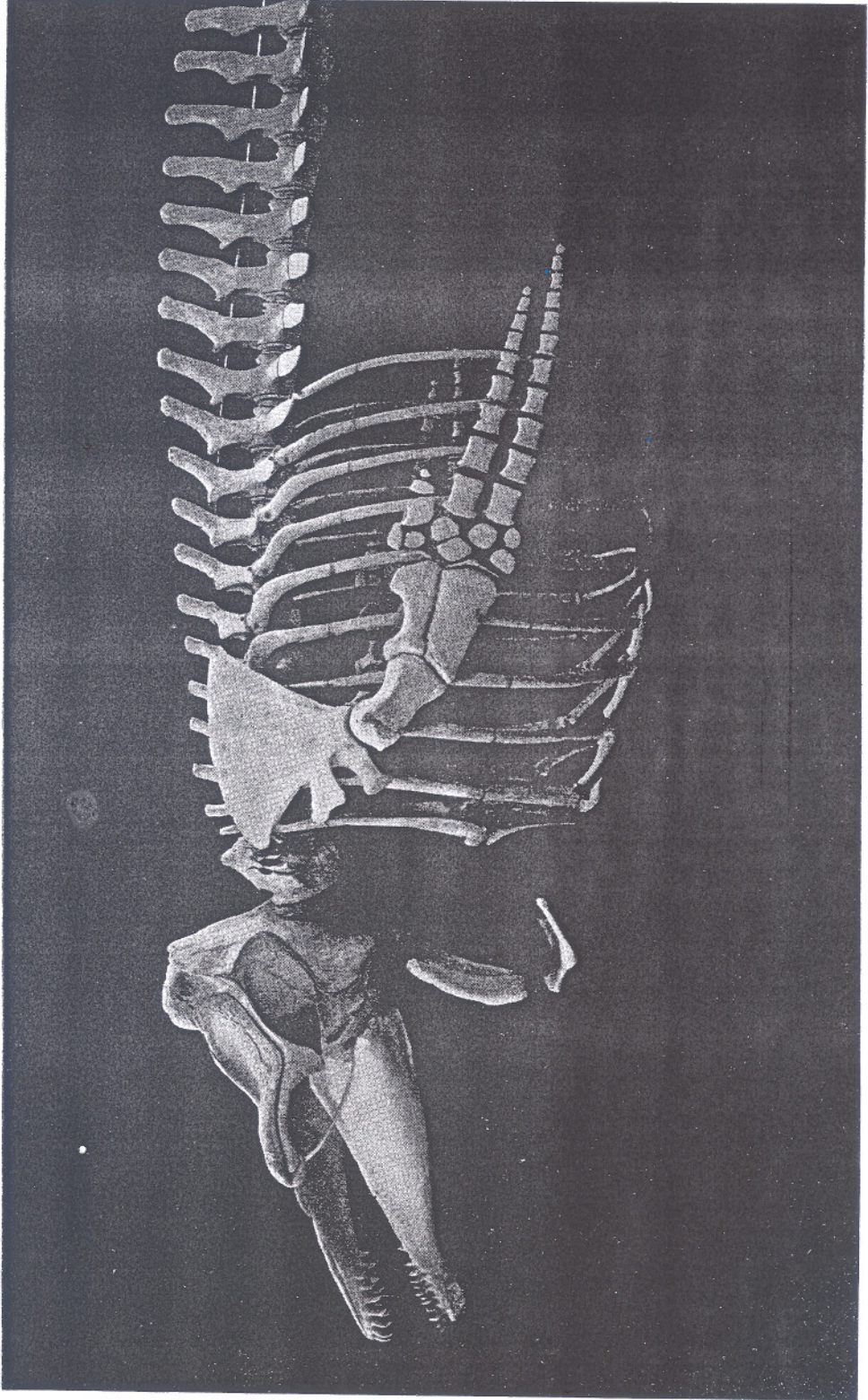
After BLANDFORD the premaxillaries in *indica* cover completely the maxillaries in the rostrum, but the breadth of the beak at the middle of its length is given as 25 cm., the breadth of the premaxillae at same place as 22, which certainly means that the margin of the maxillae is left free, as is the case in our species.

The type specimens in the Indian Museum were from a shoal of several dozens of specimens found stranded near Calcutta. The animals when observed were floundering about in the shallow water and groaning, much the same as was the case with our Java specimens.

<sup>1)</sup> BLYTH, Journ. Asiat. Soc. Bengal, XXI, 1852, p. 358; XXVIII, 1859 p. 490.

<sup>2)</sup> W. T. BLANDFORD, The Fauna of British India, Mammalia, London, 1888–91.

<sup>3)</sup> These measurements of inches are certainly a mistake; undoubtedly the meaning is cm., a skull of 65 in. would be an abnormality in a specimen of 14 ft. length.



*Globicephala indica* ♂ (No. 392), skeleton, Buitenzorg Museum.

I presume, therefore, that our species is identical with *G. indica*. As far as I am aware this species is mentioned only once before as an inhabitant of the Indo-Australian Archipelago, viz. by MAX WEBER in "Rumphius Gedenkboek," but here the name alone is reported without any discussion.

As to the remaining species of *Globicephala* allowed by TRUE (*G. sieboldii* GRAY en *G. macrorhyncha* GRAY) these are of such doubtful validity that an exact comparison is impossible.

As well as the above-described recent acquisitions, the Buitenzorg Museum possesses five more skulls of Dolphins, 3 of which belong also to the genus *Globicephala*. Unfortunately, all these skulls are without any indication of the locality where they were derived. One of the oldest native collectors of the Museum, however, could tell me that these skulls had been brought to Tandjong-Priok by a captain of a steamer of the Kon. Paketvaart Comp. and that at Buitenzorg they had to be cleaned from adhering remains of flesh and tendons. In one skull (No. 395) the teeth of the upper jaw being all present and set, also seems to indicate that they were originally still in the flesh. Evidently the skulls were not picked up somewhere from the shore, otherwise they would have been quite clean and the teeth missing, as there was no trace of flesh left on the skulls I collected on the beach near Boedoean and which had been lying there for only 6 weeks. These skulls, therefore, were probably from animals caught by natives and only roughly cleaned. Moreover, the occiput of all the skulls has been opened by large holes, apparently to get at the brains. All this together seems to indicate that the specimens are derived from a place in the Indo-Australian Archipelago where people are hunting and eating these dolphins.

Now MAX WEBER told us in Rumphius Gedenkboek <sup>1)</sup> that Solor and Lomblen (Lesser Sunda Isles) are the only islands in the Archipelago where natives are whaling and that they not only eat the flesh of Cetacea but also are opening the skulls to get the brains. It therefore seems very probable that our skulls are from one of these places, having been brought from there by a captain of the K. P. M. line whose ships run to and from the Lesser Sunda Islands.

In one of the three *Globicephala* skulls (No. 395) I find nothing whereby to distinguish it from the recent skulls from Boedoean. This young skull is a little narrower than the other specimens but that is probably due to age, the skull being in the embryo far narrower than in the adult animals and proportionally broader in the largest specimen (No. 394). The two other *Globicephala* skulls are, however, somewhat different and one is, I presume, specifically distinct from the Java specimens.

This skull (No. 397) is much heavier and proportionally broader than in *G. indica*, the breadth being nearly 80% of the length, the breadth of the rostrum at its base being 90.5% of the length of the rostrum. The skull

<sup>1)</sup> MAX WEBER, lets over walvischvangst in den Indischen Archipel, Rumphius Gedenkboek, Haarlem 1902.

responds in this respect, as in others, to the description of *G. brachyptera* given by TRUE, the breadth of the rostrum being in this species (as can be seen from TRUE's figures) 83—93 per cent. of the length. As in *G. brachyptera*, the intermaxillae of our skull No. 397 project beyond the margin of the maxillae and this margin is deeply grooved. The rugosities on the anterior part of the intermaxillae are not very prominent.

*G. brachyptera*, however, is occurring at the Atlantic coast of N. America, from N. Jersey to the Gulf of Mexico, and in the West Indies, never having been caught, so far as I am aware, in the Pacific. But being a sub-tropical species it would be no matter for surprise that it is also to be found in other tropical seas.

It is hardly thinkable that this skull has come from one of the remote localities which are known as the habitat of *G. brachyptera*. Otherwise, it comes so near to the skulls of *brachyptera* described and figured by TRUE, that I think the range of this species has to be extended to the Indo-Pacific region, unless it is proved that the external characters of the species to which this skull belongs indicate specific differences from *G. brachyptera*.

The last *Globicephala* skull (No. 396) exhibits only slight differences to the recent ones from Java. The intermaxillae are a little more expanded than in the Java specimens, extending quite to the margin of the maxillae, but they do not project over this margin as in *G. brachyptera*. Moreover, the skull is a little worn at this place so it is possible that originally the margin of the maxillae was left more free. Another difference is that the intermaxillae, which are separated from each other throughout the median line in the other specimens, are closed in the anterior half of the rostrum in this skull, being only open again at the extreme end. In one respect alone, skull No. 396 is quite distinct, viz. the temporal fossae are far less oval, nearly round, the breadth being about three-fourths its length, whereas in our *G. indica* this percentage is 40—60. In this respect the skull resembles those of *G. macrorhyncha* (cf. TRUE), but this latter species seems to be of somewhat doubtful validity. Moreover, there appears to be considerable variation in the form of the temporal fossae. From the figures given by TRUE for *G. melas*, we find that in this species the breadth of the temporal fossae varies from 50 to 75% of its length. Also in the embryo, as stated above, the temporal fossae do not exhibit such a typical shape as in the adult animals, the sharp crests so prominent in the latter being totally absent. So the form of the temporal fossae seems to be of little or no value for specific distinction.

The few differences mentioned above are hardly of such value as to consider skull No. 396 specifically distinct from our *G. indica* and I am not able to refer it to any other of the described species of the genus *Globicephala*.

After I had finished my manuscript, another *Globicephala* skull was found in the Botanical Gardens at Buitenzorg just behind the Museum, lying under the trees, thrown away as rubbish. This skull, apparently belonging to the

same lot as our old skulls just mentioned above, is a very heavy one and the largest of all (See Table p. 344, No. 516). Now this specimen in breadth of skull and rostrum comes very near to our No. 397 which we have compared with *G. brachyptera*, but the intermaxillae are not expanded beyond the margin of the maxillae nor is this margin grooved. With *G. scammoni* this skull has in common the strongly marked rugosities on the distal half of the intermaxillae, but the nasal septum stand above the plane of the adjacent intermaxillae. Quite striking in this skull are also the temporal fossae which are much more rounded than in the skulls of *indica* and respond to those in our skull No. 396.

It is a remarkable fact that as our series of Globicephala skulls is growing larger the different species are coming nearer and nearer together; and the question arises whether FLOWER was not right in believing that all Globicephala with expanded intermaxillae which are entirely black belong to one and the same species.

Now Prof. MAX WEBER, who is working out the Cetacea of the Siboga Expedition, told me recently in a letter that *Globicephala macrorhyncha* must be considered as identical with *G. indica*, and he has been kind enough to send me a photograph of a skull of *macrorhyncha* <sup>1)</sup>. From this photograph it is clearly visible that the intermaxillae are at least as broad as the maxillae; also in other respects this photo responds exactly to our skull No. 397 which I referred to *G. brachyptera*.

If *macrorhyncha* (*indica*) can have the intermaxillae so greatly expanded there seems to be no essential difference between this species and *brachyptera*. And as to *G. scammoni*, I cannot find in the descriptions anything to distinguish it from *indica* except in having the nasal septum somewhat lower, but this character too may come within the limit of individual variation. It would be a great help, in order to solve the question of how many species of entirely black Globicephala there are, to compare the types of *G. scammoni* and *brachyptera* with a large series of *macrorhyncha* (*indica*).

The two remaining Dolphin skulls of the Buitenzorg Museum belong to quite other genera. These two skulls are rather badly damaged, the whole occiput being cut away. One, No. 398, has 24 teeth on each side of the upper jaw, the other, No. 399, at least 46; the rostrum being much worn at the end does not allow an exact count of the number of teeth. This latter small skull I refer to *Delphinus roseiventris* WAGN. The total length of the skull is 398 mm.; of the rostrum, 254; the breadth of the rostrum at its base, 74 mm.; the length of the rostrum being 64.8% of the total length of the skull. Length of temporal fossae, 51 mm. In the type specimen (according to TRUE) the temporal fossae are somewhat larger, being 61 mm. long in a skull of 375 mm. length. In every other respect this skull agrees with the description given of *D. roseiventris*, only the palatal grooves are not very distinct.

<sup>1)</sup> I am also indebted to him for a few other synonyms and some useful suggestions with regard to the Key at the end of this paper.

The skull No. 398 responds to the description given of the skull of *Lagenorhynchus electra* GRAY. Its length is 412 mm.; length of rostrum, 226 mm., breadth of the rostrum at its base 122 mm., at its middle 84 mm.; length of temporal fossae 79 mm.

The two latter species have been known for a long time to inhabit the Indo-Pacific region and seem to be no rare occurrence here.

As the Indo-Australian species of Dolphins are still imperfectly known, I think it will be of some use for further studies to give below a key to the genera and species already known from this region, or likely to be found here.

**Key to the Indo-Australian Genera of Dolphins.**

- 1 a. Head with a beak more or less distinctly marked off from the forehead; teeth 20 or more on each side of each jaw . . . . . 2
- b. Beak wanting; teeth not exceeding 18 on each side . . . . . 8
- 2 a. Dorsal fin absent; rostrum broad, its breadth at the middle exceeds 1/4 its length; teeth small and numerous, 43 on each side . . . . . *Lissodelphis (Tursio)*.
- b. Dorsal fin present . . . . . 3
- 3 a. Beak short; rostrum broad, its breadth at the middle 30-40% its length; symphysis of mandible short; teeth 22-32 on each side. . . . . *Lagenorhynchus*.
- b. Beak distinct, elongated and compressed . . . . . 4
- 4 a. Teeth not exceeding 37 on each side . . . . . 5
- b. Teeth 39 or more on each side. . . . . 7
- 5 a. Symphysis of mandible shorter than 1/4 the total length of mandible; breadth of rostrum at the middle 20-30% its length; temporal fossae elliptical; teeth large and smooth, 22-25; pterygoid bones in contact . . . . . *Tursiops*.
- b. Symphysis of mandible longer than 1/4 the total length of mandible; breadth of rostrum at the middle 20% or less of its length; temporal fossae very large and rounded; pterygoid bones in contact or separated . . . . . 6
- 6 a. Crowns of teeth rugose; pterygoid bones in contact . . . . . *Steno*.
- b. Teeth smooth; pterygoid bones separated . . . . . *Sotalia*.
- 7 a. Palate with two deep lateral grooves; teeth 46-65 on each side . . . . . *Delphinus*.
- b. No lateral grooves on the palate; teeth 39 on each side <sup>1)</sup> *Prodelphinus*.
- 8 a. Dorsal fin absent; teeth 17-18 on each side, crowns spade-shaped; pterygoid bones widely separated . . . . . *Neophocaena (Neomeris)*.
- b. Dorsal fin present; teeth conical, not exceeding 14 on each side, 9

<sup>1)</sup> There are sometimes fewer teeth, but not in the Indo-Australian species.

- 9 a. Maxillary teeth absent in adults; mandibular teeth confined to the symphysis, 2-7 on each side; pterygoid bones in contact. *Grampus*.  
 b. Maxillary and mandibular teeth both present. . . . . 10
- 10 a. Teeth very large, 10-13 on each side, with flattened roots; size very large, 6-7 M. . . . . *Orcinus (Orca)*.  
 b. Teeth moderate or small . . . . . 11
- 11 a. Teeth small, occupying nearly the whole length of rostrum, 12-14 on each side; pterygoid bones widely separated . . . . . *Orcella*.  
 b. Teeth confined to the anterior half of rostrum . . . . . 12
- 12 a. Teeth 6-8 on each side; pterygoid bones in contact; intermaxillae more or less expanded over the anterior half of the maxillae. . . . . *Globicephala*.  
 b. Teeth 8-10 on each side; pterygoid bones nearly in contact; intermaxillae of equal breadth throughout. . . . . *Pseudorca*.

### Key to the Indo-Australian Species of Dolphins.

(The species with an \* are not known to be for certain from the Indo-Australian Archipelago, but are likely to occur there.)

#### Sotalia.

- 1 a. Teeth  $\frac{26}{26}$ ; dorsal fin falcate and about equal size as pectoral fins . . . . . \* *S. perniger* Blyth (*gadamu* OWEN).  
 b. Teeth  $\frac{32-37}{32-34}$  . . . . . 2
- 2 a. Teeth  $\frac{32}{32}$ ; colour milky white . . . . . \* *S. sinensis* FLOW.  
 b. Upperparts gray or blackish . . . . . 3
- 3 a. Teeth  $\frac{37}{34}$ ; dorsal fin rather large and long. . . . . \* *S. plumbea* (CUV.)  
 b. Teeth  $\frac{36}{34}$ ; dorsal fin obtuse and low. . . . . *S. borneensis* LYD.

#### Steno.

Only one Indo-Australian species . . . . . *St. rostratus* (DESM.)

#### Tursiops.

- a. Teeth  $\frac{22}{22}$ ; rostrum rather broad; total length up to 3 M. . . . . \* *T. truncatus* (MONT.) (*tursio* FABR.)  
 b. Teeth  $\frac{25}{25}$ ; rostrum longer, about  $\frac{3}{5}$  the total length of the skull; total length about 2 M. . . . . *T. catalania* (GRAY).



**Delphinus.**

- a. Teeth 58-65; rostrum 68% of the total length of the skull  
 . . . . . \* *D. longirostris* CUV.
- b. Teeth 46-51; rostrum 58-64% of the total length of the skull;  
 upper parts black, under parts white; total length about 2 M.  
 . . . . . \* *D. delphis* L.
- c. Teeth 48; rostrum 65% of the total length of the skull; upper  
 parts black, under parts pale rose-colour; total length 1.20 M.  
 . . . . . \* *D. roseiventris* WAGN.

**Prodelphinus.**

Only one Indo-Australian species. . . . . *P. malayanus* (LESS.)

**Lissodelphis.**

Only one Indo-Australian species. . . . . *L. peronii* (LAC.)

**Lagenorhynchus.**

- a. Teeth  $\frac{22}{23}$ ; belly light gray . . . . . *L. electra* GRAY.
- b. Teeth  $\frac{32}{30}$ ; neck and belly white . . . . . \* *L. obscurus* (GRAY).

**Neophocaena.**

Only a single species . . . . . *N. phocaenoides* (CUV.)

**Orcella.**

Only one Indo-Australian species . . . . . *O. brevirostris* OWEN.

**Grampus.**

Only a single species . . . . . *G. griseus* (CUV.)

**Globicephala.**

- a. Intermaxillae projecting over the margin of the maxillae .  
 . . . . . *G. brachyptera* COPE.
- b. Margin of the maxillae left free  
 . . . . . *G. macrorhyncha* GRAY (*indica* BLYTH).

**Pseudorca.**

Only a single species. . . . . \* *P. crassidens* (OWEN).

**Orcinus.**

Only a single species. . . . . *O. orca* (L.) (*gladiator* LAC.)