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Middle sized balaenopterid whale specimens in the Philippines and Indonesia

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Abstract. In 2002, 2004 and 2006, thirty eight skull specimens preserved in Silliman University, Dumaguete, the Philippines and Sea World, Jakarta, Indonesia were investigated. Among the specimens we examined twenty four *Balaenoptera omurai* and five Indopacific Bryde's whales were identified. Nine were too fragmental for the species identification based on morphological characters.
Key words : *Balaenoptera omurai* and *Balaenoptela edeni*, Bryde's whale, North Pacific Bryde's whale, Indopacific Bryde's whale, the Philippines, Indonesia, Southeast Asia.

Introduction

Knowledge on marine mammals in Southeast Asia has been accumulated by continuous efforts of a number of researchers (Pilleri & Gihr, 1974; Andersen & Kinze, 1999; Perrin *et al.*, 1995). Excellent reviews on marine mammal species from the seas around the Philippines and Indonesia have been made by several authors (Leatherwood *et al.*, 1992; Heaney *et al.*, 1998; Rudolph *et al.*, 1997). In the species description of *Balaenoptera omurai*, Wada *et al.* (2003) pointed out the problem that the so-called Bryde's whales in the North Pacific are consisted of two different species, *Balaenoptera edeni* Anderson 1878 and *Balaenoptera brydei* Olsen 1913. Species identification of the specimens can be made for *B. omurai* and *B. edeni* because comparative morphological investigations with the type specimen are possible (Anderson, 1878; Wada *et al.*, 2003). However, Olsen (1913) did not define any type specimen for *B. brydei*. Detailed morphological work of Lönneberg (1931) was accepted as full description of *B. brydei*. Junge (1950) discussed the taxonomic validity of *B. brydei* and concluded it is a junior synonym of *B. edeni*. Consequent broader acceptance of the English name "Bryde's whale" for *B. edeni* could have been an introduction of confusing situation for the species. Later, Best (1960) described the existences of offshore and inshore forms among the Bryde's whales collected in the type locality of *B. brydei* in South Africa. It is very problematic that around the type locality of a species at least two eco-types of Bryde's whales with certain physical differences including body size were confirmed and Olsen's *B. brydei* was not specified properly.

These complicated situations are summarized and both *B. edeni* and *B. brydei* are listed in Rice (1998). Molecular analyses also recognize two different groupings of Bryde's whales within one clade subsequently including *B. edeni*, *B. brydei* and *B. borealis* (Yoshida & Kato, 1999; LeDuc & Dizon, 2002). We should carefully examine the existing specimens with sufficient considerations on external morphology, skeletal morphology and molecular biology of these forms to conclude proper taxonomical positions of these related species.

Materials and Methods

The specimens examined in this study (Table 1) are preserved in the Marine Laboratory of Silliman University (SUML) in the Philippines and Sea World Aquarium (SWIN) in Indonesia. In-

Table 1. Balaenopterid specimens examined in the present study.

Country	Specimen ID	Identification	Sex	BL	Locality		Skull characters				
							1	2	3	4	5
Philipinnes	SUM0000	Indo-Pacific Bryde's whale	UK*	UK	Philippines	Bohol	?	?	+	−	−
	SUML0051	Indo-Pacific Bryde's whale	UK	UK	Philippines	Bohol	?	X	+	−	−
	SUML0141	?	UK	UK	Philippines	Bohol	X	X	X	X	X
	SUML0142	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0144	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0145	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0146	?	UK	UK	Philippines	Bohol	X	X	X	X	?
	SUML0148	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0149	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0150	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0151	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0152	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0153	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0154	?	UK	UK	Philippines	Bohol	X	X	X	X	?
	SUML0155	?	UK	UK	Philippines	Bohol	X	X	X	X	X
	SUML0156	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0157	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	X	+
	SUML0204	Indo-Pacific Bryde's whale	UK	UK	Philippines	Bohol	−	X	+	−	−
	SUML0205	Indo-Pacific Bryde's whale	UK	UK	Philippines	Bohol	−	+	+−	−	−
	SUML0206	?	UK	UK	Philippines	Bohol	X	X	X	+−	X
	SUML0207	?	UK	UK	Philippines	Bohol	X	X	X	X	X
	SUML0208	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0209	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0210	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0211	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0212	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0213	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	X
	SUML0214	?	UK	UK	Philippines	Bohol	X	X	X	X	X
	SUML0215	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	X	X	X	+	X
	SUML0216	?	UK	UK	Philippines	Bohol	X	X	X	X	X
	SUML0217	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	+
	SUML0218	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	+
	SUML0219	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	X	+	+	++
	SUML0220	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+		+	+	+
	SUML0221	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	+	+	+	X
	SUML0474	*Balaenoptera omurai*	UK	UK	Philippines	Bohol	+	+?	X	X	X
	SUML0685	?	UK	UK	Philippines	Bohol	X	X	X	X	X
Indonesia	SWIN	Indo-Pacific Bryde's whale	UK	UK	Indonesia	Java	−	+	+−	−	−

For skull characters, refer to text and Table 2. * UK: unknown.

vestigations were made during the periods of Jul. 25 to Jul. 26 in 2002, and Feb. 7 to 13 in 2004 for the Philippines, and Mar. 13 to 24 in 2006 for Indonesia.

Nearly six hundred baleen whale skeletal specimens are preserved in the Marine Research Laboratory of Silliman University, Dumaguete, Negros Oriental, the Philippines. During the early to mid-1990's, Louellla M. Dolar, William F. Perrin and their co-workers collected the specimens from the stations of the land-based whalers operated in Bohol Sea, hunting "Bryde's whales" (Perrin *et al.*, 1994). The specimen ID were given to each piece, to almost complete skulls, fragmental skull components and separate postcranial bones, as well. Since the specimens are remains of flensing at the whaling station, majority of the specimens are fragmental and individual identifications were almost impossible and hence matching skulls and postcranial elements were also impossible. In the present study we observed thirty seven skulls, mostly fragmental.

In Indonesia we could examine two specimens, one of which was an articulated whole skeleton of a blue whale exhibited in Bogol Museum. The other specimen was preserved in the Sea World, Jakarta. The specimen was prepared from an individual stranded on the northern coast of Java Island. In the present study we only discuss the latter.

Specimens were observed, photographed and measured whenever it is necessary and possible.

Characters compared in skeletal morphology

In Yamada *et al.* (2006), four characters of skull morphology and one on the first rib were selected for the identification of *B. edeni*, *B. brydei* and *B. omurai*. In the present study, however, we could use only almost complete skulls or skull fragments in the Philippines and we had to revise the characters to be used for species identification, and had to select characters only on skull morphology (Table 2.).

1. Maxilla

Posterior end of the ascending process of max-

Table 2. Morphological characters used in the present study.

	1	2	3	4	5
	Maxilla	Premaxilla	Parietal		
	Posterior end of ascending process	Posterior end	Lateral portion	Two foramina	Oblique ridge on Maxilla
				On parieto-squamosal suture	Dorsal surface near the base of rostrum
B. omurai	widens to become squarish	sinks midway and not reach frontal	flare laterally and visible in dorsal view	Present	Present
B. edeni	slender and round	relatively wide and reaches frontal	remain invisible in dorsal view	None	None
North Pacific Bryde's whale	widens to become squarish	narrower and reaches frontal	remain invisible in dorsal view	None	None
Indo-Pacific Bryde's whale	widens to become squarish	narrower and reaches frontal	flare laterally and visible in dorsal view	None	None

illa is slender and round in *B. edeni*, whereas in *B. brydei* and *B. omurai* it widens to become squarish.

2. Premaxilla

Posterior end of premaxilla is relatively wide and reaches frontal in *B. edeni*. In *B. brydei*, premaxilla is narrower and comes contact with frontal. It sinks beneath maxilla and nasal posteriorly and does not reach frontal in *B. omurai*.

3. Parietal

Both parietals remain invisible in dorsal view of the skull in *B. edeni* and *B. brydei*, whereas they flare laterally and are visible in dorsal view of the skull in *B. omurai*.

4. Foramina on the parieto-squamosal suture.

There are two small foramina only in *B. omurai* along the suture between parietal and squamosal in the posterior wall of the temporal fossa.

5. On the dorsal surface of maxilla near the base of rostrum in *B. omurai* is an oblique ridge, whereas no ridge is observed in the corresponding area in *B. edeni* and *B. brydei*.

These were chosen for the identification of disputable three species in the regions in question, namely *B. edeni*, *B. brydei* and *B. omurai*, based on Wada *et al.* (2003) and additional observations on the specimens.

During the course of the present study, we recognized individuals almost similar to "*B. brydei*" in four of the five characters mentioned above, however, with the parietals that extend laterally over the frontal so that it is visible in dorsal view of the skull. This does not fit with the character state of the "*B. brydei*" in our preceding publications. In this respect, we need to admit the existence of at least two forms of Bryde's whales among the non-*edeni* Bryde's whales. Wada *et al.* (2003) dared to resurrect the notion "*B. brydei*" for a certain individuals among which non-metric skull characters fit with those described in Lönneberg (1931), in order not to create confusions by introducing additional species name. The present result has made it clear that we have to distinguish two populations with different skull morphology among the individuals collectively recognized as Bryde's whales (*B. brydei*). We define, tentatively, a population of Bryde's whales with a set of characters described for *B. brydei* in Wada *et al.* (2003) and Yamada *et al.* (2007) as "North Pacific Bryde's whale" (Fig 1) and the population with laterally expanded parietal which is visible in dorsal view as "Indo-Pacific Bryde's whale". Further considerations, including external morphology, skeletal morphology and molecular biology should be carried out to yield convincing conclusion.

Standardized photographing (Yamada *et al.*, 2007) should be useful for the comparative analyses, however, most of the specimens we could examine in the present study were without premaxillae *in situ*, standardized photograph in a strict sense were not available.

Results

List of specimens investigated and the results of the present examinations are listed in Table 1. Species identification was made based on observations on the five characters mentioned above.

The Philippines

As a result, we confirmed four Indo-Pacific Bryde's whales (Fig. 2.), and twenty four *B. omurai* (Fig. 3.), among which thirteen were based on more than two available characters and eleven were only on a single character on the rostrum, were identified out of thirty seven specimens we examined in this study.

Indonesia

We could examine only one specimen related to the subject of this study. The specimen preserverd in Sea World Jakarta was "Indo-Pacific Bryde's whale" (Fig. 4.).

Discussion

We can summarize that most of the specimens preserved in Silliman University, *i.e.* captured in Bohol Sea, were *Balenoptera omurai*. Four out of thirty seven specimens were "Indo-Pacific

Fig. 1. Standardized dorsal view of the skull of "North Pacific Bryde's whale" i.e. "*Balaenoptera brydei* sensu Wada *et al.* (2003)" (TN9903) in the National Cheng Kung University, Taiwan. Note posterior end of maxilla ends wide and squarish, and posterior end of premaxilla is visible all the way and reaches frontal. Parietals are not visible in this view.

Fig. 2. Standardized dorsal view of the skull of "Indo-Pacific Bryde's whale" in the Marine Laboratory, Silliman University (SUM0000) (possession of Department of Biology, Silliman University). Note parietals (arrows) are visible in this view.

Fig. 3. Dorsal view of the skull of *Balaenoptera omurai* (SUML220) in the Marine Laboratory, Silliman University. Due to the lack of pre-maxillae exact standardized photograph was not obtained.

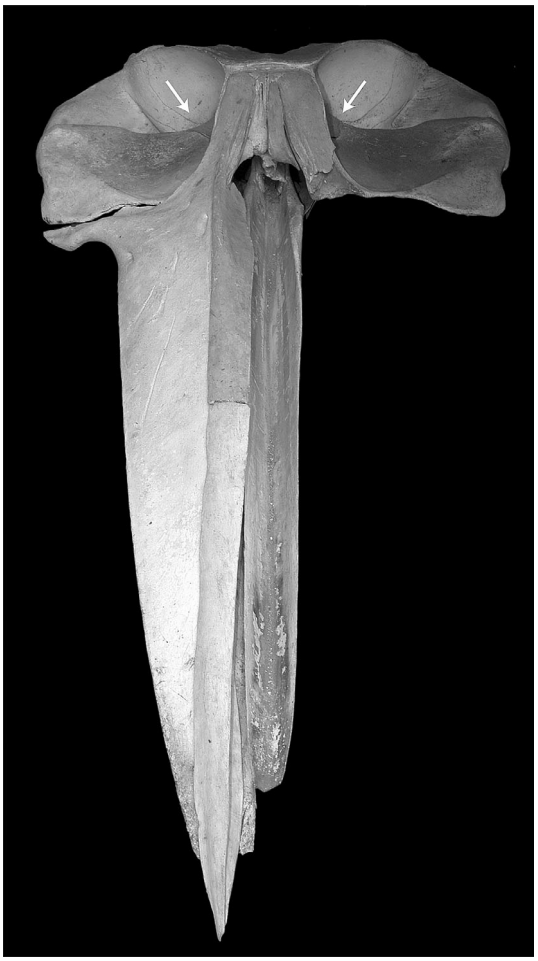

Fig. 4. Oblique antero-dorsal views of the skull of "Indo-Pacific Bryde's whale" in the Sea World Aquarium (Jakarta, Indonesia). Note parietals (arrows) are visible in this view.

Bryde's whales" (10.8%). General morphological characters of the "Indo-Pacific Bryde's whale" are closer to the "North Pacific Bryde's whale" which is understood as offshore than *B. edeni*. Considering the geographical nature of the Bohol Sea, more coastal eco-type similar to *B. omurai* are expected. Further data collection and discussions are necessary to evaluate the ecological nature of "Indo-Pacific Bryde's whale".

Systematics of middle sized balaenopterid whales found in the lower latitude in both the northern and southern hemispheres has been not well-understood. The first species described was *B. edeni* Anderson 1878. The type specimen of this species is in Indian Museum, Calcutta, India. The specimen is on exhibit and hang high from the ceiling. It is extremely difficult to make detailed observation or measurements. The second species, *B. brydei* Olsen 1913 is problematic, because there was no type specimen described. Lönneberg (1931) has been treated almost as the species description. When Junge (1950) concluded thet *B. brydei* is a junior synonym of *B. edeni*, and Best (1960; 1977) reported two forms of "Bryde's whales" in the type locality, the situation became chaotic. In the description of the third species *B. omurai*, Wada and Numachi (1991) and Wada *et al.* (2003) made a clear definition of the last species, and during the course of description, they made extensive comparative observation of as many type species as possible that may have any possibility of taxonomical affinity of the species in question, they confirmed distinct morphological differences among the specimens similar to *B. edeni* and to *B. brydei sensu* Lönneberg. Further confusion among the so-called Bryde's whales were discussed by many authors (Soot-Ryen, 1961; Omura, 1959, 1966, 1977; Kawamura & Satake, 1976; Omura *et al.*, 1981; Kato *et al.*, 1996; Kato *et al.*, 2000; Kato, 2002; Uranishi *et al.*, 2005)

In the present study, however, we found skull specimens almost comparable to this *B. brydei* with different character state that the parietal expanded laterally on the frontal and visible in the dorsal view. These Bryde's whale with dorsally visible expanded parietals should be separately grouped until we make enough analyses including molecular biological investigations.

Whether this morphological difference be below or above the species level would need further investigations including, external morphology, skeletal morphology and molecular biology.

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フィリピン，インドネシアに保存されている中型ナガスクジラ属鯨類標本

山田　格・角田恒雄・田島木綿子

フィリピンとインドネシアに保存されている中型ナガスクジラ属鯨類標本38点を調査し，骨格の形態学的形質によって，ツノシマクジラ (*Balaenoptera omurai*) 24点とインド-太平洋ニタリクジラ4点を確認した．フィリピンのボホール海域で収集された*B. omurai*の標本点数が非常に多いことが注目される．フィリピンボホール海域で収集された4個体とインドネシアで確認された1個体は，Wada *et al.* (2003) などで認識されていたニタリクジラ (*B. brydei*) とは形態学的に相違があり，今後さらなる形態学的ならびに分子生物学的検討を推進して分類学的位置を明瞭にする必要がある．タイプ標本が存在しない*B. brydei*の再定義を厳密に行わなければ，いわゆるニタリクジラの分類は確定しないことが今後の問題である．