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Neotype designation of the Short-tailed Albatross *Phoebastria albatrus* (Pallas, 1769) (Aves: Procellariiformes: Diomedeidae)

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Abstract

The Short-tailed Albatross *Phoebastria albatrus* (Pallas, 1769) is a threatened seabird widely distributed in the northern Pacific Ocean with its largest breeding sites on the Senkaku Islands and Torishima Island, Japan, which are separated by over 1700 km. A recent taxonomic revision based on morphological, behavioral, and DNA sequence evidence has revealed that this species consists of two cryptic species: a smaller species which breeds mainly in the Senkaku Islands, and a larger species which breeds mainly on Torishima Island. However, it has remained unclear to which of these species the scientific name *Phoebastria albatrus* applies, because the type specimens are lost. Here a neotype is designated to resolve this taxonomic issue. From now on, the scientific name *Phoebastria albatrus* should be applied only to the smaller species breeding on the Senkaku Islands. The name of the larger species is more problematic, as the types of each synonym of *P. albatrus* must be traced, found, and examined.

Keywords: nomenclature, cryptic species, endangered species, seabirds, taxonomy

Introduction

The Short-tailed Albatross *Phoebastria albatrus* (Pallas, 1769) (Procellariiformes: Diomedeidae) is a large seabird widely distributed in the northern Pacific Ocean (Carboneras *et al.* 2020). The albatross is considered a threatened species: although in the past it was a common breeder on a number of islets off Japan and adjacent areas, its numbers eventually declined to near-extinction due to excessive exploitation for feather collection in the late 19th and early 20th centuries (Hasegawa & DeGange 1982). Recently, as a result of continuous conservation efforts, the Short-tailed Albatross has shown signs of recovery (Hasegawa 2003; BirdLife International 2018).

A recent taxonomic revision has now revealed that, at least utilizing the general lineage species concept, this threatened albatross actually consists of two cryptic species (Eda *et al.* 2020): one breeding mainly on the Senkaku Islands (25° 48' N, 123° 36' E), southwestern Japan, and the other breeding mainly on Torishima Island (30° 29' N, 140° 18' E), ca. 1720 km northeast of the Senkaku Islands in the Izu Islands, Japan. Genetic evidence shows that considerable time has elapsed since the two species separated (~ 600,000 years; Eda 2018). They also differ morphologically in that the Senkaku species has a smaller body and a relatively longer bill than the Torishima species (Eda *et al.* 2020). Since the late 1990s, a few individuals of the Senkaku species have visited Torishima Island during the breeding season (Eda *et al.* 2011) and recently this number has increased owing to as-yet unknown factors (Eda *et al.* 2016). On Torishima, the two species show a clear tendency for assortative mating, albeit with a few possible cases of hybridization (Eda *et al.* 2016). Differences in arrival times on the breeding site and in the courtship dance seem relevant to the observed assortative mating (Eda *et al.* 2016).

To which of these two species does the scientific name *Phoebastria albatrus* apply? This species was first

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described as *Diomedea albatrus* by Peter Simon Pallas (1741–1811) in 1769 (Pallas 1769). Pallas's description was based on collections and manuscripts from Stepan Petrovich Krasheninnikov (1713–1755) and Georg Wilhelm Steller (1709–1746), the first explorers of the Kamchatka Peninsula and the adjacent coasts of the Bering Sea and the Sea of Okhotsk. By that time, Krasheninnikov had published on his explorations (Krasheninnikov 1756). Although the exact sites where albatrosses were collected are unknown, the original description mentioned albatrosses as abundant in Penzhina Bay (now Shelikhov Bay in the Sea of Okhotsk), the whole of the inner Kamchatka Sea (the old name for the Sea of Okhotsk), and the Kuril Archipelago. Thus, the "Kamchatka Sea" (=Sea of Okhotsk) may be considered as the type locality. Present distribution of the albatrosses indicates that the Sea of Okhotsk is likely used by both species. Archaeological remains of albatrosses (~ 1,000 years ago) from the Hamanaka site on Rebun Island (45° 23' N, 141° 1' E), located where the Sea of Japan and the Sea of Okhotsk meet, includes bones from both species (Eda *et al.* 2012), although recent studies show that this sea is used more by the Senkaku species than by the Torishima species (Naoki Tomita, pers. comm.). Based on multiple museum specimens collected by Steller, Pallas (1769) reported plumage color characteristics, but these do not serve to distinguish between the two species. Pallas also reported twelve measurements, but it is not clear whether they all had been taken on a single individual. Given that some of them—such as wingspan and lengths of the humerus and ulna—could not be taken on museum specimens, the measurements likely included those taken by Steller from live or freshly killed individuals. Thus, the body proportions cannot be used for species identification of specimens. Eda *et al.* (2020) reported six of the twelve measurements for Senkaku and Torishima species, allowing their univariate comparison. The comparison (Table 1) shows that the tail length reported by Pallas (1769) falls exclusively within the range of the Senkaku species, whereas the length of exposed culmen reported by Pallas (1769) falls exclusively within the range of the Torishima species. However, because the ranges of these measurements show a large overlap between the two species, and because their sample sizes are rather small, we cannot draw any conclusions about the species identity from this result. The remaining four measurements were uninformative for species identification. Thus, the species could have been described from specimens of one or the other species, or even both species. Because the original description is unclear regarding this issue, there is no alternative to using the type specimens themselves for establishing the application of the name *albatrus* Pallas.

When Pallas accessed these specimens in the 18th century, they were stored in the Academia Petropolitana Museum (Peter the First's private museum, also known as Kunstkamera), in St. Petersburg, Russia. However, unfortunately, these specimens were lost afterwards. In the 19th century, the Academy of Sciences Zoological Museum became independent from the Kunstkamera, and Johann Friedrich Brandt (1802–1879), the museum's first director, discarded all the old skins and taxidermied bird specimens that were in poor condition at that time (Strauch 1889: 174). In this situation, only a neotype designation of *Phoebastria albatrus* can resolve the nomenclatural problem. Article 75.3.6 of the International Code of Zoological Nomenclature (ICZN 1999) requires that the neotype should be from the Sea of Okhotsk, where the original type specimens were collected. However, because *Phoebastria albatrus sensu lato* has become a rare species, it is problematic—legally, ethically and logistically—to collect new specimens at sea. Instead, we searched for such specimens in museum collections. We found a specimen collected at the type locality in 1845 in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (specimen number ZIN 4388). Here we designate this specimen as a neotype of *Phoebastria albatrus*. We also provide a diagnostic description of its morphological features.

Materials and methods

Of the 26 measurements used by Eda *et al.* (2020) to distinguish the two species, the following ten were applicable to specimen ZIN 4388: natural (i.e., unflattened) wing length from the carpal joint to the tip of the longest primary feather (**NW**), tail length from the pygostyle to the tip of the central rectrix (**TAIL**), length of tarsus (**TAR**), length of exposed culmen (**EC**), bill length from the distal end of the nares (**NF**), gape length (**GAPE**), bill width at the distal end of the nares (**NFW**) and at the base of the bill on the feather line (**BW**), and bill height taken at the distal end of the nares (**NFH**) and at the base of the bill on the feather line (**BH**) [see Fig. S1 in Eda *et al.* (2020) for further details]. We used a ruler for NW and TAIL (units: 1 mm) and a caliper for the others (units: 0.1 mm).

In addition, we used the quadratic discriminant function of the three bill measurements (EC, NFH, and BH) provided by Eda *et al.* (2020). This was shown to be quite efficient for discrimination between the Senkaku and Torishima species.

TABLE 1. Measurements of the Senkaku and Torishima species. Data other than the first two columns are taken from Eda *et al.* (2020).

measurements	Pallas's measurements on the original type specimens	ZIN4388 (Neotype)	Senkaku species								Torishima species							
			Females				Males				Females				Males			
			Min.	Ave.	Max.	N	Min.	Ave.	Max.	N	Min.	Ave.	Max.	N	Min.	Ave.	Max.	N
NW (Natural wing)	508	534	510	523.8	534	4	510	528.1	555	9	510	525	540	2	535	557	575	8
TAIL (Tail length)	150	156	150	158.8	163	4	143.6	156	163	10	150.9	154.5	158.1	2	156.6	165.4	175	8
TAR (Tarsus length)		95.6	83.3	89	92.2	4	92	96.3	100	10	94.8	97.3	99.7	2	100	104	107	8
EC (Exposed culmen)	127	135.6	132.1	135.4	140.3	4	131.3	140.7	144.8	10	126.6	130.2	133.7	2	136.7	140.3	143.4	8
NF (Bill tip to nostrils front length)	99	100.1	99.2	101.3	105	4	93	104.5	108.6	10	92.5	96.1	99.7	2	98.5	102.7	106.5	8
GAPE (Bill to gape length)	129.5	160.2	159.1	163.3	169.5	4	155.5	165.3	171.7	10	143	149	155	2	156.8	165.5	172.6	8
NFW (Bill width at nostrils)		31.3	26.6	28.6	31	4	25.2	29.6	32.5	10	27.8	29	30.1	2	29.3	31.8	32.7	8
BW (Bill width at base)		39.6					37.1	39.2	41.3	10	36.4	36.8	37.2	2	39.6	42.6	44.2	8
NFH (Bill height at nostrils)		42.3	39.9	41.2	43.3	4	37.1	42.3	45.1	10	40.5	40.9	41.3	2	45.1	46.9	48.5	8
BH (Bill height at base)		50.8					48.8	50.7	53.3	10	49.5	50.6	51.7	2	53.2	55.3	57.2	8
Wing span	1155.5		1035	1085	1126	4	1050	1117	1200	10	1100	1105	1110	2	1113	1181	1230	8

Typification

***Phoebastria albatrus* (Pallas, 1769)**

Diomedea albatrus Pallas, 1769, Spicilegia Zoologica quibus novae imprimis et obscurae animalium species iconibus, descriptionibus atque commentariis illustrantur. Fasciculus Quintus, p. 28.

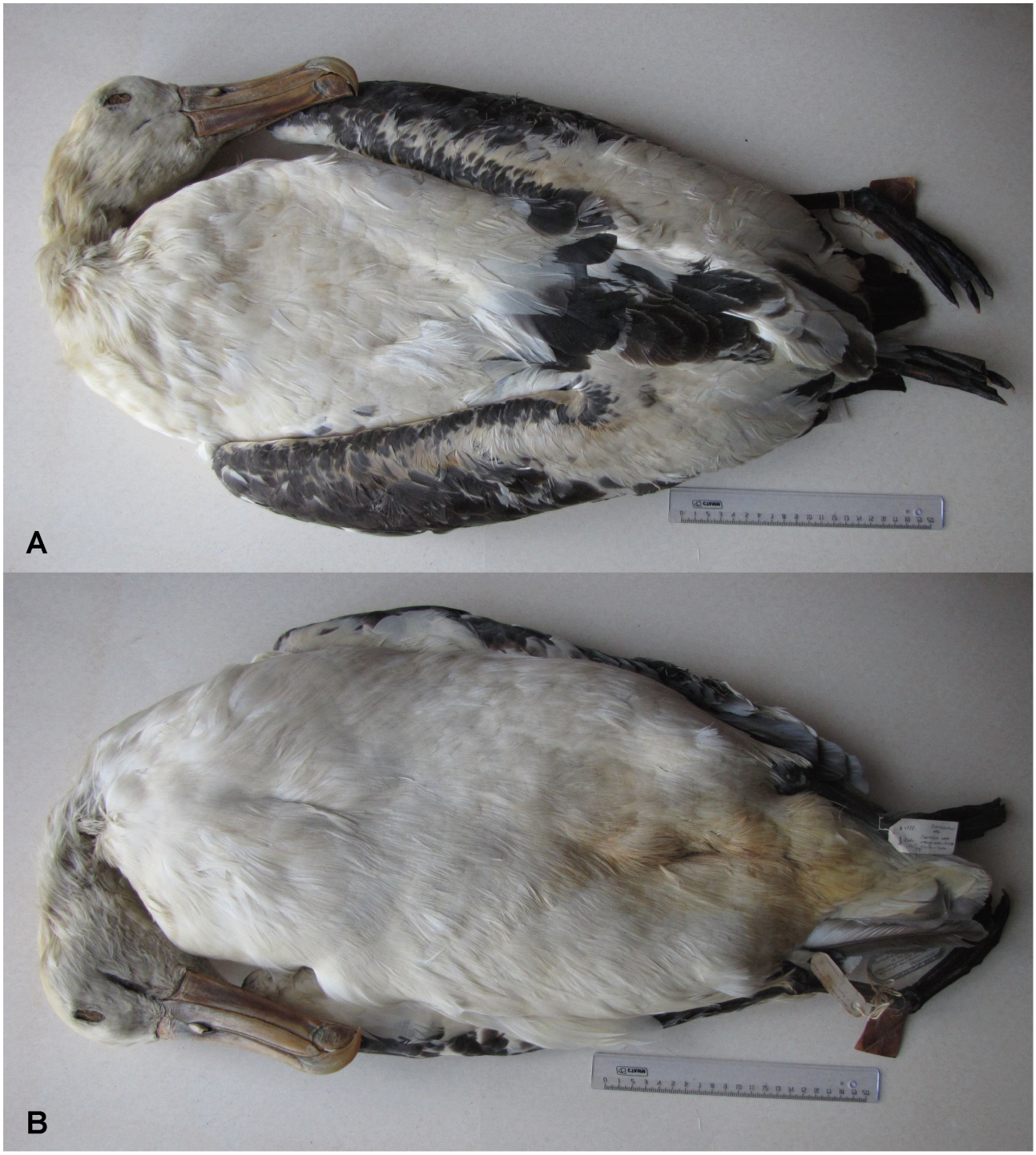

FIGURE 1. Neotype of *Phoebastria albatrus* (Pallas, 1769); ZIN 4388. (A) dorsal and (B) ventral views.

Neotype: Zoological Institute of Russian Academy of Sciences (ZIN) 4388, adult male, collected in the Sea of Okhotsk between Capes Longdar–Negotni and Nurki by Il'ya Gavrilovich Voznesensky on 18 August 1845 (Julian calendar = 30 August Gregorian calendar) (Figs. 1 and 2).

***Type locality*:** Sea of Okhotsk. Due to our neotype designation, the type locality of *Phoebastria albatrus* is restricted to the sea area between the northern part of Cape Longdar–Negotni (56° 28' N, 138° 15' E) and the southern edge of Cape Nurki (56° 46' N, 138° 33' E).

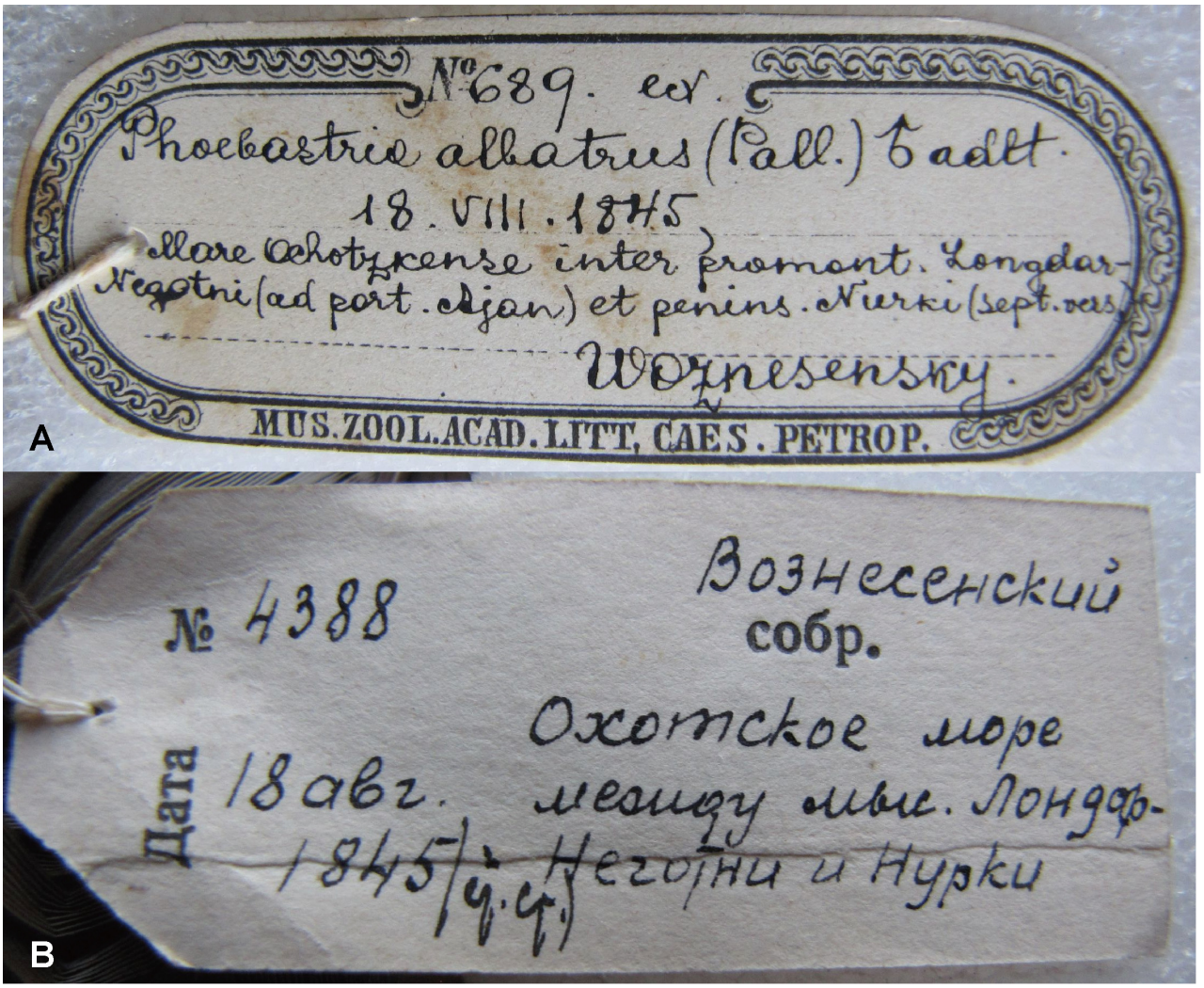

FIGURE 2. (A) old and (B) modern museum labels attached to the neotype specimen. The text on the label (A) is translated as "No. 689. museum skin. *Phoebastria albatrus* (Pall.) male adult. 18.VIII.1845. Okhotsk Sea, between Cape Longdar-Negotni (near port Ayan) and peninsula Nurki at the north turn. Woznesensky". The text on the label (B) is translated as "No. 4388. coll. Woznesensky. 18 August 1845. Okhotsk Sea between Capes Londar-Negotni and Nurki".

***Description of the neotype*:** The neotype is in adult plumage. Head and back are white washed with a golden tinge that is particularly distinct on the occiput and hind-neck. Rectrices are black but have white bases. Ventrally the bird is white. The wings are black with a white patch on the elbow joint narrowing distally along the leading edge of the wing towards the carpal joint.

***Measurements of the neotype*:** NW 534 mm; TAIL 156 mm; TAR 95.6 mm; EC 135.6 mm; NF 100.1 mm; GAPE 166.4 mm; NFW 31.3 mm; BW 39.6 mm; NFH 39.0 mm; BH 47.1 mm. For comparison with the Senkaku and Torishima species see Table 1.

***Taxonomic aspects*:** Pallas (1769) reported two color morphs (alba and fusca) of this species in the original description. Their characteristics are those of adult and juvenile, respectively. The plumage of ZIN 4388 agrees with the description of alba, and is thus evidently adult and appropriate for designation as a neotype. Size and slender bill, calculated from the quadratic discriminant function of Eda *et al.* (2020) (F_{QSM}-F_{QTM} = 18.1), identify the neotype with the Senkaku species.

***Qualifications for neotypification*:** The neotype designation here complies with the qualifying conditions for neotypification required by Article 75.3 of the Code, as shown below.

(1) We here designate the neotype to objectively establish the taxonomic application of the species name *albatrus* Pallas (Article 75.3.1).

(2) The slender bill distinguishes *P. albatrus* from the Torishima species. For adult males, the quadratic discriminant function of the three bill measurements culmen length (EC), bill height at nares (NFH), and bill height at base (BH) developed by Eda *et al.* (2020) shows positive values for *P. albatrus* and negative values for the Torishima species (Article 75.3.2).

(3) The descriptions in the above five subsections and Figs. 1 and 2 are sufficient to ensure the recognition of the designated specimen (Article 75.3.3).

(4) For reasons given in the introduction, we judge that the original name-bearing types have been discarded (Article 75.3.4).

(5) As mentioned in the above subsection "Taxonomic aspects", the plumage of the neotype matches that of one of the original name-bearing types. The genders of the original name-bearing types are unknown (Article 75.3.4).

(6) As mentioned in the Introduction, the original name-bearing types were collected from the Sea of Okhotsk. As mentioned in the "Type locality" subsection, labels on the neotype (Fig. 2) indicate that it was collected from the Sea of Okhotsk (Article 75.3.6).

(7) As mentioned in the "Neotype" subsection, the neotype is deposited at the Zoological Institute of Russian Academy of Sciences (Article 75.3.7).

Discussion

The neotype designation herein clarifies the taxonomic identity of *Phoebastria albatrus* (Pallas, 1769), which now applies to the Senkaku species. The name applicable to the Torishima species is however still not established. Salvin's (1896) synonymy lists three potential candidates: *Diomedea chinensis* Temminck, 1820; *Diomedea brachyura* Temminck, 1829; and *Diomedea derogata* Swinhoe, 1874. If it still exists, type material of the first two names would most likely have been found in the National Museum of Natural History, Leiden (RMNH), the Muséum National d'Histoire Naturelle, Paris (MNHNP), or the Natural History Museum, Tring (NHMUK), where some of the Laugier collection used by Temminck in Temminck & Laugier (1820–1839) survives. However, none of these collections hold such material (Warren 1966, van den Hoek Ostende *et al.* 1997, Morioka *et al.* 2005). Two syntypes of *Diomedea derogata* are extant in NHMUK (Warren 1966), but these are dusky-plumaged juveniles and thus their measurements may not allow for reliable identification. The extraction and sequencing of DNA from these specimens will likely contribute to solving this problem. Because these species of large birds are vulnerable—considering their slow population turnover and limited breeding range—determining the name for the Torishima species is a matter of urgency.

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