IDENTIFICATION OF *DIOMEDEA LEPTORHYNCHA* COUES 1866, AN ALBATROSS WITH REMARKABLY SMALL SALT GLANDS

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In 1866, Elliott Coues described an incomplete, uncatalogued albatross skull in the Smithsonian Institution collection, and provisionally named it *Diomedea leptorhyncha*. The skull, which was "wanting a lower jaw," was remarkable for its small size, long slender bill, small narrow supraorbital fossae (salt glands) and broad interfossal width (fig. 1). Because the name was only applied provisionally, the specimen was not labelled, nor was it placed in the type collection at that time.

Later, Charles Richmond set aside a Smithsonian specimen as Coues' "probable type" and it was finally catalogued (USNM 346315) by Herbert G. Deignan in 1942. The presumed holotype has never been identified with any known albatross species (Deignan 1961:8), and the name was cited merely as a "doubtful species" the only other time it has been used in the literature since its original description (Salvin 1896:455).

We have identified the skull as that of a Galápagos or Waved Albatross, *Diomedea irrorata* Salvin 1883. Although *D. leptorhyncha* Coues 1866, antedates the well known *D. irrorata* Salvin by 17 years, it may be regarded as a *nomen oblitum* since it has remained unused as a senior synonym in the primary zoological literature for more than 100 years. Application has been made to the International Commission on Zoological Nomenclature to place *Diomedea leptorhyncha* Coues 1866 on the Official Index of Rejected Names.

Coues published a full set of measurements of the type and compared them with those of the Short-tailed Albatross, *D. albatrus* Pallas, which it most closely resembled. He lacked comparative material of several albatross species, however, including the then undescribed Galápagos species. The type specimen agrees closely with his description and measurements (table 1) but, presumably subsequent to his examination, the left half of the maxilla was removed (Coues gives a bill width measurement without comment). Nevertheless, we can confidently accept the specimen as the one Coues described, although nothing is known of its time and place of origin, nor of who donated it to the Smithsonian.

Contrary to Deignan's presumption that "there is a bare chance that this is the example of *D*[*iomedea*]. *culminata*? Gould recorded by James G. Cooper" (1868:12), Loomis (1918:84–85), who saw Cooper's (actually W. O. Ayer's) skull in San Francisco before it was destroyed by fire in 1906, identified it as *D. culminata* [= *D. chrysostoma*] because the "culminicorn and latericorn were largely intact." Deignan also suggests that this may be "the head and beak of a *Procellaria*" donated to the Academy of Natural

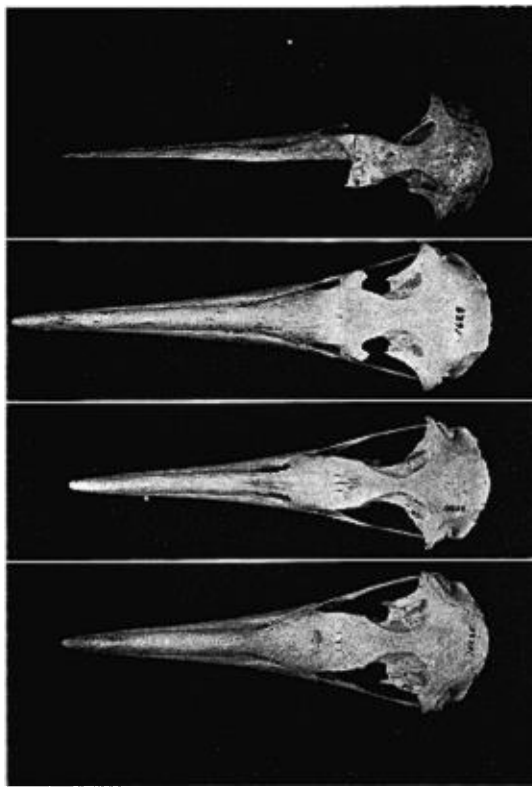

FIGURE 1. Skulls of "*Diomedea leptorhyncha*" (top); *D. irrorata*, adult; *D. albatrus*, immature; and *D. albatrus*, adult (bottom).

Sciences in Philadelphia by Samuel Grant, Jr., through Dr. Carson, 21 May 1844. Frank B. Gill (pers. comm.) reports that he is unable to locate the skull or any accession record at the Academy.

Table 1 demonstrates that although *Diomedea irrorata* has a large skull (cranial length and squamosal width) it has the smallest suprarobital fossae of any albatross. It also has a relatively long bill. The type has the smallest fossae of any skulls measured and a moderately long, slim bill. Its other measurements are likewise small, suggesting that the skull belonged to a young bird. This is further indicated by the degree of ossification of the interorbital and antorbital septa.

Some of the skull measurements of adult *Diomedea irrorata*, except those of the suprarobital fossae and interfossal width, overlap those of adult *Diomedea albatrus*. The type, in comparison with a known young *D. albatrus*, has a longer, thinner bill and markedly shorter fossae (table 1, fig. 1). Thus we are convinced that Coues' type was a young Galápagos Albatross.

The salt glands of marine birds function as extrarenal organs of osmoregulation to deal with high osmotic loads imposed by ingestion of seawater and foods with high salt content. Although young Adélie Penguins, *Pygoscelis adeliae* (Douglas 1968), and some desert and salt marsh passerines can produce renal salt concentrations higher than seawater (550 mEq/liter = 35 parts per thousand) (Smyth and Bartholemew 1966; Poulson 1969), the kidneys of most birds studied can, at best, concentrate salts to

TABLE 1. Comparative measurements of albatross skulls[a].

Species	n	Total skull length	Bill length	Bill width	Cranial length	Width at squamosals	Interfossal width	Fossa width	Fossa length	Width at squamosals / fossa width	Cranial length / fossa length
Diomedea											
"leptorhyncha"	1	202	140	27.4	59.5	44	11	8.5	26.5	5.18	2.25
irrorata	5	211.6 (200–218)	148 (137.5–154)	31.2 (29–32.5)	64.4 (61.5–66.3)	46.6 (45–47.5)	13.4 (11.5–14)	9.6 (9–10)	28 (27–28.5)	4.85 (4.5–5.28)	2.30 (2.20–2.38)
albatrus (immature)	1	197	128.5	31	63.5	41.5	6.4	8.3	32	5.0	1.98
albatrus	5	200 (193–213)	132.6 (125–142)	35.2 (32.5–37)	69.3 (67.5–72.5)	45.3 (42–46)	9.2 (8–10.5)	12.8 (11.8–14)	32.4 (29.5–34)	3.47 (3.25–3.66)	2.15 (2.05–2.31)
epomophora	2	245, 255	163.5, 183	37, 38.3	75, 76.3	51.5, 57	7.8, 11	13, 14.5	37, 40	3.55, 4.38	2.06, 1.86
exulans	5	246 (235–255)	165 (158–170)	39 (36.5–41)	84.4 (80–88)	53.4 (51–56.5)	6 (3–7.5)	19.2 (19–20)	41.5 (39–43)	2.78 (2.68–2.83)	2.03 (2.01–2.09)
immutabilis	5	171.3 (160–177.5)	113.7 (104–120)	29.2 (27.5–30)	60.8 (58.5–62.5)	39.2 (37–41)	3 (2–4.5)	12.1 (11.5–12.5)	32.2 (30–34.5)	3.24 (3.08–3.33)	1.89 (1.80–1.97)
nigripes	5	165.6 (160–170)	106.5 (100–115.5)	29.5 (28–31)	64.7 (62.3–67)	40.3 (38–42)	5.5 (4.5–7)	12.6 (12.5–13)	32.1 (30–33)	3.15 (2.92–3.36)	2.09 (2.03–2.21)
melanophris	5	181.2 (180–186)	118.2 (115–122.5)	25.6 (23.8–27)	60.8 (60–65.5)	41.3 (40–42)	6.3 (4–8)	13.6 (12.5–14.5)	34.5 (33–36)	3.06 (2.86–3.36)	1.85 (1.78–1.90)
chrysostoma	1	181	120	22.5	56.5	38	8.5	9	33	4.22	1.71
chlororhynchus[b] (immature)	1	185	117.5	28	58.5	41	11	9	31	4.55	1.88
cauta	5	194.4 (186–204)	124.8 (117.8–133.5)	26.4 (25.3–27)	64.1 (62–67)	43.4 (41.5–45.5)	6.15 (5–7.5)	13 (12–13.8)	34.9 (34–35.8)	3.35 (3.19–3.60)	1.83 (1.73–1.91)
bulleri	1	177	113	24.75	58.5	38	7.5	10	31	3.80	1.89
Phoebetria[b]											
fusca	5	164.8 (160–171)	112.1 (103–119)	21.4 (20.25–22)	59.4 (57.5–61)	38.9 (38.5–39)	1.32 (.7–2)	13.9 (13–14.5)	35.9 (34.5–36.5)	2.80 (2.69–3.0)	1.65 (1.64–1.67)
palpebrata	1	165	108.5	25.5	62.5	37.25	2	16	36	2.32	1.73

[a] Measurements (in mm) were taken as follows: bill length, from tip of culmen to posterior margin of swelling that marks the border of culminicorn and facial feathering on living bird; bill width, at widest point; cranial length, from anterior margin of frontals to posterior margin of parietals (nuchal crest); width at squamosals, at the narrowest point; fossa length, from posterior end of frontal-prefrontal suture to posterior margin of fossa; fossa width, at the widest point. The range appears in parentheses below the appropriate mean where $n = 5$.

[b] Measurements of total skull length and bill length and width taken from alcohol specimens have possible error of ± 5 mm.

about only 300 mEq/liter. All marine birds whose extrarenal salt secretions have been studied are capable of producing concentrations above that of seawater and the nasal secretions of albatrosses have concentrations up to 900 mEq/liter (McFarland 1959). The size of the gland is related to salt stress. Its volume is correlated with the volume of fluid it produces, while the length of individual secretory tubules within the gland determines the salt concentration of its secretion (Staaland 1967). Saltwater birds that presumably ingest large amounts of salt have relatively larger glands than freshwater forms. This has been demonstrated in individual Mallard Ducks, *Anas platyrhynchos* (Schmidt-Nielsen and Kim 1964); in salt- and freshwater populations of Mallards (Stresemann 1927–1934:52); within European gulls, *Larus* sp. (Technau 1936); and within the order Charadriiformes (Staaland 1967).

The small size of the salt gland fossae in *D. irrorata* suggests that this species has less of an osmotic load than other albatrosses, and presumably this is due to its diet. Most albatrosses feed predominantly on squid. The meager food habit information on *D. irrorata* indicates that, although squid constitute 90 per cent of the food of nestlings (Brosset 1963), fish may make up a large proportion of the diet of adults away from the breeding grounds (Coker 1919; Murphy 1936:535), and are also fed to young (Brosset 1963; M. P. Harris, in litt., 1970). Because teleost fish have total salt concentrations approximately one half of those found in marine invertebrates (Nicol 1960:60), adult *D. irrorata* may consume less salt than other species of albatross.

It appears that a study of the food habits of this equatorial albatross throughout the year and comparison of its salt gland anatomy and physiology with other albatross species would prove rewarding.

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