

female specimen of this Jabiru as having the iris of a "bright yellow." It would seem that this colouring of the iris is peculiar to the female bird.

The menagerie of the Zoological Society of London now contains an adult pair of Saddle-bill Jabirus, and also an adult pair of Indian Jabirus (*Mycteria australis*).

In each of these pairs of birds the larger individual, which Mr. Bartlett (to whom I am indebted for this observation) considers, and no doubt correctly, to be the male, has the iris of a very dark and deep brown; whilst the smaller bird of each pair, which Mr. Bartlett believes to be the female, has the iris of a clear straw-yellow.—J. H. G.]

XXV.—*Notes on some of the Birds inhabiting the Southern Ocean.**

By Captain F. W. HUTTON, 23rd Royal Welsh Fusiliers, F.G.S., Deputy-Assistant Quartermaster General at Dublin.

THE notes that I have the honour to read to the Society this evening are compiled from personal observations made during seven voyages round the Cape of Good Hope, at various times of the year, and from information obtained from my friend Mr. Richard Harris, R.N., who was engineer on board Her Majesty's ship 'Adventure' in 1857, in which ship I made my last voyage. Mr. Harris sailed from London early in June 1832, with a sealing-party, and arrived at the Prince Edward Islands, in the Southern Ocean, in September. He stopped there until the following January, when they left for Kerguelen's Land, or Desolation, as the sealers call it. They reached this latter place at the end of January; and on the 16th of March, while they were on shore engaged in taking seals, their ship was wrecked, and they remained on the island until the 6th of December, when they made the bold experiment of sailing in a boat, built from the remains of their ship, for Tasmania, and happily reached Macquarie Harbour in safety after a voyage of six weeks. While Mr. Harris was on these little-known islands he made many careful observations of the habits of the birds that

* Read before the Natural History Society of Dublin, March 3, 1865.

frequent them during the breeding-season, which he kindly communicated to me, and which, although made so long ago, will not, I trust, be found without interest. Most of these birds have been admirably figured and described by Mr. Gould in his 'Birds of Australia.' I have therefore confined myself to mentioning only those peculiarities of plumage and habits which are either new, or still disputed points. Before commencing, however, I wish to thank Dr. Selater, Mr. G. R. Gray, Dr. Perceval Wright, and, more especially, Dr. A. Carte and Mr. Gould, for the kind way in which they have answered my numerous questions on many of the points touched upon in this paper.

CHIONIS MINOR, Hartlaub. Lesser Sheath-bill.

This bird is common on both the Prince Edward Islands and Kerguelen's Land, and is called "Wide-awake" by the sealers. When Mr. Harris first landed, the birds were so tame that he frequently had to kick them out of his way; and when he hid himself behind the rocks they would come and peep over at him, chattering, and seeming quite pleased at having found him. They are always found near the sea, but do not fly much, only from one rock to another, and never leave the land. Mr. Harris never saw the nest or eggs of this bird, and therefore supposes that they breed in some place out of sight, either under the rocks along the shore, or in the high moss and grass, like the Skua-Gull.

LESTRIS CATARRHACTES (L.); *Stercorarius antarcticus*, Lesson. Gould, B. Austral. vii. pl. 21. Skua-Gull.

This bird is the "Cape-hen" of sealers, and the "Port-Egmont-hen" of Captain Cook. It does not skim over the water like the Petrels, but flies low with a heavy slow flapping of its roundish-looking wings, and is therefore easily recognized. It is rare at sea north of latitude 45° S., one individual only having come under my personal observation. It is, however, very numerous on the Prince Edward Islands and Kerguelen's Land, where it breeds on the low flats among moss and grass two or three feet high, making no nest, but laying three brown, dark-spotted eggs on the ground. The young birds are dark brown, mottled with white. During the breeding-season the old birds are very

fierce, flying round the head of an intruder, dashing every now and then at him, and making at the same time a curious croaking noise in their throats. Mr. Harris has never seen one chasing another bird.

DIOMEDEA EXULANS, L.; Gould, B. Austral. vii. pl. 38.
Wandering Albatros.

Average breadth across the wings ten feet; the smallest measured being nine feet, and the largest twelve feet; length from tip of beak to end of tail four feet. Some have a rose-coloured streak on each side of the neck, as mentioned by Dr. Bennett in his 'Gatherings of a Naturalist in Australasia' (p. 72). I have never seen this on either the young or very old birds, and the only one I ever captured with it was a male. I have also only seen these marks between June and August, and I am therefore disposed to believe that they distinguish the middle-aged male bird previous to the breeding-season; but I am not sure of this. According to the experience of myself and Dr. Bennett, the food of the Albatros consists entirely of the oceanic *Mollusca*, small Crustaceans, *Medusæ*, and the refuse thrown overboard from ships. I have never found any remains of fish in its stomach; and, indeed, I do not see how it could catch them, for it never pounces suddenly, like a Frigate-bird or a Gannet, on anything floating in the water, but always settles first, and then devours it at its leisure; in fact, it sits down to dinner. For this reason it can only be caught with a hook when the ship is going slowly—not more than four or five knots—and when plenty of line can be payed out, so as to give the bird time to look at the bait before he swallows it. The best bait is a piece of the rind of raw salt-pork, as this is so tough that the small birds cannot get it off the hook. The hook need not be barbed, as it always catches in the curved end of the upper mandible. The bait must be floated by means of corks.

I have never seen the Albatros fly at night, and its habits are quite diurnal, both at sea and on land. It is rarely found north of latitude 30° S., but so constantly does it approach that limit, that I could generally predict the day on which we should see the first. In April 1854, however, when sailing from Cape

Town to St. Helena, in about latitude 26° S., one flew past the ship in a direct line southwards, without even stopping to look at us; and I suspect that it had either been caught and turned loose again after two or three days' imprisonment, or that it had followed a ship out of its usual haunts, and was now making the best of its way back again.

They are very common south of latitude 40° S., and monopolize nearly the whole of the Prince Edward Islands and the south-east portion, or lee-side, as the sealers call it, of Kerguelen's Land, to which places they retire to breed in October. The nest, which is always placed on high table lands, is in the shape of the frustum of a cone, with a slightly-hollowed top, and is made of grass and mud, which the birds obtain by digging a circular ditch, about two yards in diameter, and pushing the earth towards the centre until it is about eighteen inches high. In this nest the female bird lays one white egg, which is not hatched until January. The nest of the Albatros has been well described by Mr. Gould on the authority of Mr. Earle and Dr. M'Cormick; and I have mentioned it here only because Dr. Bree, who, in his 'Birds of Europe' (vol. iv. p. 120), has given the latest account of this bird, has reproduced the statement of Captain Carmichael, in his "Description of the Island of Tristan d'Acunha," in the Twelfth volume of the 'Transactions of the Linnean Society,' that it makes no nest; a statement which is certainly erroneous.

At a certain time of the year between February and June, Mr. Harris cannot exactly say when, the old birds leave their young and go to sea, and do not return until the next October, when they arrive in large numbers. Each pair goes at once to its old nest, and after a little fondling of the young one, which has remained in or near the nest the whole time, they turn it out, and repair the nest for the next brood. The deserted young ones are in good condition and very lively, frequently being seen off their nests exercising their wings. When the old birds return and take possession of their nest the young one often remains outside, and nibbles at the head of the old one until the feathers between the beak and the eye are removed, and the skin made quite sore. The young birds do not go far

from land until the following year, when they accompany the old ones to sea. While the old birds are away it is difficult to imagine how the young ones obtain food, for Mr. Harris assures me that no old birds are seen near the islands for months together. Strange as this may appear, its very strangeness is in favour of its truth, as no one would think of inventing such a story; and its correctness is further corroborated by the abundance of Albatroses found at sea from April to October inclusive, and their comparative rarity, especially of the old white birds, during the rest of the year, which I believe to be the case. Of their abundance between April and October no one who has been in the Southern Ocean at that time of the year will doubt; and in the latter month, I know from my own experience that the old birds begin to get scarce. It is more difficult to collect sufficient evidence of their rarity from November to March, as few voyagers visit the regions they inhabit at this season of the year, and fewer still take notice of the birds. Dr. Pickering, however, who accompanied the United States' Exploring Expedition under Commander (now Admiral) Wilkes, states that this bird was only occasionally seen in January, while it was much more common in April; and Captain Cook's experience seems to have been much the same. In October and November 1772 Albatroses, he says, were common. In December and January they were scarce, or entirely absent; and but few seem to have been seen by him until he reached New Zealand, except on the 10th of February, 1773, when he reports an abundance; but on that day he was within a few miles of the south-east part of Kerguelen's Land, where they breed. He did not again visit these regions until the middle of December 1773, when he left New Zealand for the Pacific, and from this time until the following February, when he got too far north, he appears to have observed very few, most, if not all, being young birds. At the close of this year (1774) he doubled Cape Horn; but after November no mention is made of Albatroses—except that they were seen in Staten Island in January—until March 1775, when he says that some accompanied the ship every day until he got beyond their habitat. Sir James Ross, too, in his account of the voyage of the *Erebus* and *Terror* in 1839–43, never men-

tions Albatroses between November and March; and I am, therefore, disposed to believe that the old birds go to sea in March or April, when the young ones are about three months old. Mr. A. Earle, in his 'Narrative of Nine Months' Residence in the Island of Tristan d'Acunha,' as quoted by Gould, says that he saw old Albatroses "stalking about" their young in May; but as *D. exulans* can only just manage to get along on land by the help of its wings in a most awkward and ridiculous manner, which no one would think of dignifying by the term "stalking," I am of opinion that he mistook *D. melanophrys* for this bird. On his way out, Mr. Harris spent three weeks in August at Tristan d'Acunha, Nightingale Island, and Inaccessible Island, but never saw any Albatroses during the whole time. Mr. Harris says that when the old birds return in October he never saw them feed the young ones; and it is, therefore, evident that they must have some means of obtaining food for themselves. My impression is that the young birds are nocturnal in their habits, and go down to the sea at night, returning to their nests in the morning*. The instinct, or whatever it may be called, which enables the Albatros, after wandering over thousands of miles of trackless ocean, to find its way back to its young one every October is most extraordinary. Mr. Harris says that he feels quite certain that the same birds visit their old nests, and use them again for the next broods. In this case the landmarks which may guide the Swallow in its migrations are entirely wanting; and as the birds spread on all sides from their breeding-places, and, doubtless, sometimes traverse the whole globe, the position of the sun, which is the only natural guide that man possesses, cannot avail them anything.

The flight of the Albatros is truly majestic, as with outstretched, motionless wings he sails over the surface of the sea; now rising high in the air; now with a bold sweep, and wings

* Mr. Harris does not agree to this. In a letter to me, dated H.M.S. 'Medusa,' 19th March, 1865, he says that "the fact that they would stand to exercise their wings, shows that they had not yet got the proper use of them"; also that he "never saw them upon the wing until the return of the old ones"; and further, that the situations that some of them occupied were such as to make it "impossible for them to get to the water except by flight."

inclined at an angle with the horizon, descending until the tip of the lower one all but touches the crests of the waves as he skims over them. Suddenly he sees something floating on the water and prepares to alight; but how changed he now is from the noble bird but a moment before all grace and symmetry. He raises his wings, his head goes back, and his back goes in; down drop two enormous webbed feet straddled out to their full extent, and with a hoarse croak, between the cry of a Raven and that of a sheep, he falls "souse" into the water. Here he is at home again, breasting the waves like a cork. Presently he stretches out his neck, and with great exertion of his wings runs along the top of the water for seventy or eighty yards, until, at last, having got sufficient impetus, he tucks up his legs, and is once more fairly launched in the air. It is, I presume, this necessity of running along the top of the water before he is able to ascend from it, which has given rise to the fable—as I think I may call it, although still quoted by some of the best naturalists—of the Albatros being able to walk on the surface of the water with hardly any assistance from its wings, and that the noise of its tread may be heard at a great distance, which originated with Captain Weddell in his 'Voyage towards the South Pole in 1822-24.'

I have never seen this bird dive. When caught and placed on deck, they are unable to stand or rise from it unless a strong wind is blowing, but lie almost helpless on their breasts. After they have been on board a few minutes they generally, but not always, throw up a large quantity of oil. I have sometimes sailed past an Albatros sitting on the water, and it has not got up to join the other birds flying round the ship, but remained on the water until out of sight—a thing I have never observed in any other of the Petrels. I have not seen Nuttall's original account of this bird; but, as quoted by Dr. Bree, in his 'Birds of Europe,' it seems nearly as full of errors as words. He has evidently confounded the North Pacific species, *D. brachyura*, with *D. exulans*, although they are quite distinct*.

* This confusion seems to have been made by most of the writers on North American ornithology. Mr. Lawrence, however, has clearly distinguished the two species (Baird's B. N. Am. p. 821). *Diomedea exulans* has probably never occurred on the coast of the United States.—ED.

DIOMEDEA MELANOPHRYS, Boie ; Gould, B. Austral. vii. pl. 43. *D. chlororhynchus*, Lath. ?, *D. culminata*, Gould? Black Eye-browed Albatros.

Breadth across the wings seven feet ; length three feet. Mr. Gould says that there is no difference between the young and the old birds, except in the colour of the beak ; but in this statement I cannot concur. According to my observations, the head in the young is grey, which, as the bird grows older, becomes white—first on the cheeks, and then spreading to the top of the head, leaves a collar round the neck, which breaks first in front, and gradually spreads upwards until the whole is white. The beak remains dark blue for some time after the plumage has assumed the colours of the adult. The feet and legs of the young bird are light blue.

I am unable to give any new information as to where this bird breeds, as it is never seen on the Prince Edward Islands nor Kerguelen's Land. Commander Snow, in his 'Two Years' Cruise off Terra del Fuego,' says that it breeds in the Falkland Isles, and describes its nest as similar to that of *D. exulans*, but not more than twelve inches high ; and Captain Carmichael states that it breeds in Tristan d'Acunha.

Mr. Gould says that it is more easily caught than *D. exulans* ; but my experience is just the contrary. When on board it stands pretty firm on its legs, and I have never seen it vomit oil, as most of the Petrels do. It dives sometimes, but does not appear to like doing so, generally preferring, when anything good to eat is under water, to let a "Night-Hawk" fish it up ; then giving chase, and running along the top of the water, croaking, and with outstretched wings, it compels him to drop it, and then seizes it before it sinks again. This bird is called "Molly-Hawk" by sailors. It is common round Cape Agulhas ; and in August 1857 I saw a large number in False Bay and round Cape Hanglip. It is, apparently, quite diurnal in its habits, both at sea and near land. *D. chlororhynchus*, Lath., differs from *D. melanophrys* only in the rather lighter tint of the mark over the eye and in the colour of the beak ; in size and habits it is precisely similar ; and as the beak of *D. culminata*, Gould, is just intermediate in colour between the two, I am of opinion that all three form but one species. I am aware that Captain Carmichael

states that the nesting of the two is different ; but, as he has wrongly described the nesting of both the other species of Albatros, I cannot trust his account without further evidence. No one acquainted with these birds can read Latham's description of *D. chlororhynchus* without at once seeing that he is describing an immature bird.

DIOMEDEA FULIGINOSA, Gmel. ; Gould, B. Austral. vii. pl. 44. Sooty Albatros.

Some of these birds are grey on the back and head, with the exception of a broad black stripe round the beak, which gives the head something the look of a Jackdaw's. I am unable to say whether these are young or very old birds ; but as their legs and feet are yellow, I incline to think the latter. It breeds in the inaccessible cliffs of Kerguelen's Land and the Prince Edward Islands, and Mr. Harris was never able to get at a nest. It has an unpleasant habit of screeching at night, and is called "Pee-u" by the sealers. Sir J. Ross mentions that he saw young birds fully fledged, and, as he says, "ready to go to sea," in May, at Kerguelen's Land ; and, as no mention is made of old birds, this species may have the same habit of deserting its young that *D. exulans* has. It is, however, so shy that Mr. Harris made very few observations on its habits. The remarks of Mr. Gould, that this bird is very wary, and seldom caught, and that it alone of all the Petrels flies directly over the ship, are quite correct.

PROCELLARIA GIGANTEA, Gmel. *Ossifraga gigantea*, Bp. Consp. Av. ii. p. 186. Gould, B. Austral. vii. pl. 45. Giant Petrel.

This bird breeds in the cliffs of the Prince Edward Islands and Kerguelen's Land, but the nests can be got at occasionally. The young are at first covered with a beautiful long, light-grey down ; when fledged they are dark brown, mottled with white. When a person approaches the nest the old bird keeps a short distance away, while the young ones squirt a horridly smelling oil out of their mouths to a distance of six or eight feet. It is very voracious, hovering over the sealers when engaged cutting up a seal, and devouring the carcass the moment it is left—a thing

the Albatros never does. It is the "Mother Carey's Goose" of Cook, and the "Nelly" of sailors. It sometimes chases the smaller species, but Mr. Harris has never seen it kill one. Whether or not it can catch birds possessed apparently of powers of flight superior to its own is doubtful; but, supposing one killed, that it feeds only on its heart and liver, I cannot believe, although it is said to do so in the works of many first-rate ornithologists; a statement which seems to have been copied from Lord Macartney's 'Embassy to China in 1712,' and since handed down from one naturalist to another as an heir-loom.

PROCELLARIA ÆQUINOCTIALIS, L. Black Petrel.

Black, with a white mark, generally crescent-shaped, but very variable, on each cheek. Chin white; beak yellow, with a black tip; legs and feet black. As the plumage of the bird here described is intermediate between the *P. æquinoctialis* of Linnæus and the *P. conspicillata* of Gould, I agree with Mr. Gray in ranking them as one species only. It is not known on Prince Edward Islands nor on Kerguelen's Land; and I have only seen it in the South Atlantic, between lat. 26° S. and lat. 35° S. Among sailors it rejoices in the name of "Stink-pot."

PROCELLARIA HÆSITATA, Licht. (*nec* Kuhl)*. *Adamastor typus*, Bp. Consp. Av. ii. p. 187. *A. cinereus*, Coues (*ex* Gm.), Proc. Acad. Philad. 1864, p. 119. Gould, B. Austral. vii. pl. 47. Great Grey Petrel.

This bird combines the appearance of a *Procellaria* with some of the habits of a *Puffinus*. Its feathers fit very close, and have a glossy look. Like all other Petrels it flies with its legs stretched straight out behind, and, as in this bird they are rather long, they make the tail appear forked. Its cry is something like the bleating of a lamb. The young bird has been figured and described by Dr. Andrew Smith in his 'Illustrations of South

* According to our contributor's wish, we have not altered his nomenclature. This bird is, however, of a very different species, and belongs to a very different group, from that which Kuhl, in 1820, described as *P. hæsitata*. The latter, the type of Bonaparte's genus *Æstrelata*, is from the West Indian Seas (*cf.* Ibis, 1859, p. 372, *note*), whence it has strayed both to France (Consp. Av. ii. p. 189) and England (Zool. p. 3691).

African Zoology,' under the name of *Puffinus cinereus*. It is very common at sea from May to August; but retires to Kerguelen's Land and other places in September or October, to breed. Each pair burrows horizontally into wet peaty earth, from two to eighteen feet. At the end of the hole they form a large chamber, and construct in the centre of it a nest similar, except in size, to that of the Albatros (*D. exulans*), in the hollowed top of which the female lays one white egg. They seldom leave their burrows in the daytime, and when one happens to do so it is at once hunted by a "Nelly," although no such jealousy exists at sea. From this habit of flying only by night it is called "Night-Hawk" by the sealers.

Mr. Harris's party, when wrecked on Kerguelen's Land, used to dig these birds out of their burrows, and eat them; and in order to save useless digging, for their spades were only made from the staves of old casks, they would hold one to the mouth of a hole, and make it cry out, when, if another was inside, it would answer. Mr. Harris informs me that he never saw the Night-Hawk on the Prince Edward Islands, but as his party was not then in want, they were not hunted for, and they may therefore breed there also; for, as they conceal themselves by day, they might easily have remained unobserved. This bird is by far the best diver of all the sea-going Petrels. It seems even fond of it, and often remains under water for several minutes, when it comes up again shaking the water off its feathers like a dog. Sometimes I have seen it, as it flies past, poise itself for a moment in the air (and hence perhaps its name) at a height of about twenty or twenty-five feet above the sea, and, shutting its wings, take a header into the water. It dives with its wings open, and uses them under water much in the same manner as when flying.

PROCELLARIA MACROPTERA, Smith. *Pterodroma macroptera*, Bp. Consp. Av. ii. p. 191. Long-winged Petrel.

This bird, when on the wing, looks very like a huge Swift. It is not by any means common; and I have only seen it east of the Cape of Good Hope. It is not found on the Prince Edward Islands nor Kerguelen's Land.

PROCELLARIA GLACIALOIDES, Smith. *Thalassæca glacialoides*, Bp. Consp. Av. ii. p. 191. Gould, B. Austral. vii. pl. 48. Silvery-grey Petrel.

Back, wings, head, and tail ash-grey, with a rudely-shaped circular ring of black near the tip of each wing; rest of the body white. Not common, and not seen by me east of the Cape of Good Hope. Not found on the Prince Edward Islands nor Kerguelen's Land. I presume that this is the bird figured by Gould, although neither he nor Dr. Smith mention the dark mark on each wing.

PROCELLARIA MOLLIS, Gould, B. Austral. vii. pl. 50. *Cookiaria mollis*, Bp. Consp. Av. ii. p. 190. Soft-plumaged Petrel.

Not found on the Prince Edward Islands nor on Kerguelen's Land. They fly well, with their wings a little bent back, like a Sandpiper. I think it probable that this bird will prove to be the young of *Procellaria cooki*, Gray.

DAPTION CAPENSIS (Linn.); Gould, B. Austral. vii. pl. 53. Pintado-Petrel.

Across the wings three feet, length fifteen inches. When caught and brought on board ship it throws up from its mouth, as soon as touched, a quantity of red, strong-smelling oil—not as a means of offence or defence, but simply from fright. Mr. Gould states that when irritated it ejects an oily fluid from its nostrils, but this I have never observed. They cannot rise from the deck, but run along with outstretched wings. Their cry is like the sound made by drawing a piece of iron across a large-toothed comb—"cac, cac, cac-cac, cac," the third being pronounced the quickest. It is called "Cape-Pigeon" by sailors. Curiously enough, although this bird is by far the commonest of all the Petrels, and is so distinct in plumage that no one can mistake it, yet its breeding-place is, I believe, not known with certainty. In Mr. Gould's account of the bird I find "it is said to breed in Tristan d'Acunha," but Captain Carmichael does not mention it. Mr. Darwin (Zoology of the Voyage of the 'Beagle') was informed that the sealers know of no other place where it resorts to breed but the island of South Georgia; and it certainly is not found on the Prince Edward Islands nor Kerguelen's

Land. Sir J. Ross, however, mentions having seen flocks of young birds in January 1841, in lat. $71^{\circ} 50'$ S., near South Victoria; and it seems, therefore, probable that they breed on islands in the Antarctic Ocean, far south of the homes of the Albatros.

Latham says that they vary much in colour, but I have always been surprised at their great constancy; and as I could detect no difference in them, I suppose that the young birds remain near their breeding-places until they have attained the plumage of the adult. According to my experience their northern limit is lat. 27° S.; but they sometimes follow a ship as far as 24° S., and one once followed the ship I was in as far as 17° S. On that day I saw Tropic-birds, flying-fish, and a Cape-Pigeon, all together—a most unusual occurrence; the thermometer, however, was only 70° F. in the shade. These and other small birds are much more easily caught with a thread than with a hook. The *modus operandi* is as follows:—A small piece of wood about an inch and a half long is tied by its middle to a line of white thread or silk; this is put over the stern and allowed to float out some thirty or forty yards. The birds, flying under the ship's stern, strike against the thread and entangle their wings in it; they are then hauled gently on board. If the ship is going fast the thread will not be strong enough to hold them, for if it is too thick they will see and avoid it.

PRION VITTATUS (Gmel.); Gould, B. Austral. vii. pl. 55.
Broad-billed Prion.

Across the wings two feet, length ten inches. They generally fly in flocks, with a sharp motion of the wings like a Snipe. I can confirm the remark of Captain (now Sir George) Grey, the present Governor of New Zealand, that it is never seen to sit on the water. It is called "Whale-bird" by sailors. According to Captain Carmichael, this bird breeds on Tristan d'Acunha. It is not found on the Prince Edward Islands nor Kerguelen's Land.

Besides these birds, Mr. Harris says that a few Ducks were found on Kerguelen's Land, and that Penguins were common upon all the islands. A night or two after their ship was

wrecked they lit a fire upon the rocks, when, to their astonishment, a large quantity of Stormy Petrels flew into it, and others dashed themselves against the rocks on which the fire was lighted, although these birds were rarely seen in the daytime. This shows that these birds are nocturnal in their habits when near land ; at sea, however, they are much more common in the daytime than at night ; and I have never heard of one of them, or any other Petrel, flying into a ship's port with a light in it, although this is by no means uncommon with flying-fish.

The extraordinary number of ocean-birds found in the cold regions of the earth, in comparison with the small number found in the tropics, is a very remarkable fact, as it is exactly the reverse of what we see on land. It can, however, I think, be accounted for as follows :—The higher plants have to deoxidize large quantities of water and carbonic acid, for the formation of the sugar, various kinds of oil, camphor, resin, &c., that they secrete ; but this process absorbs an equally large amount of heat and light, which can only be supplied by the sun, consequently they must inhabit warm or temperate climates, and live on land, or, at any rate, must have the greater portion of their leaves exposed directly to the air ; for water is such a powerful absorbent of heat-rays, that a depth of a few inches only is enough to prevent nearly all those that reach the earth on a cloudless day from penetrating further. The lower plants, however, which have little to develop but cellulose and chlorophyll, require less light, and but little heat ; they are thus enabled to live under water, and in regions where the more highly organized forms would die, and, being unopposed, they increase here in number and dimensions far more than in warmer latitudes or on land. Now, as water maintains a more equable temperature than land, it follows that in cold regions the sea supports nearly the whole of the vegetation. This entails an equally large population of the lower marine animals, which subsist on the vegetation, and in their turn supply food to the Petrels, which, carrying about with them in their lungs an apparatus for producing heat, are not under the same necessity as the higher plants of living only in warm climates ; but, as the heat in summer is much less in the southern hemisphere than in equal latitudes in the northern,

the marine plants, and, consequently, the Petrels, approach much nearer the equator in the Antarctic than in the Arctic seas. On the other hand, although the number of individuals is immense, the species are few, which is, doubtless, owing to the uniformity of the conditions under which they live.

It is very curious to note that most of the species of the *Procellariidæ* inhabiting the northern hemisphere have "analogues," or closely resembling species, in the southern hemisphere. For instance, the Albatros of the North Pacific Ocean, *Diomedea brachyura*, Temm., very closely resembles *D. exulans*, L., although it is undoubtedly distinct from it. *Procellaria glacialis*, L., and *Procellaria pacifica*, Audub., again, are nearly related to *Procellaria glacialoides*, Smith; *Puffinus cinereus* (Gmel.) and *Puffinus major*, Faber, to *Procellaria hasitata*, Licht. (*nec* Kuhl); *Puffinus anglorum*, Temm., and *Puffinus obscurus* (Gmel.) to *Puffinus assimilis*, Gould; and the Stormy Petrels of the northern seas, with the exception of *Thalassidroma leachi*, Temm., differ from those of the southern seas only in some minor points of plumage, *Thalassidroma oceanica* (Kuhl) being, as far as I know, the only Petrel common to both hemispheres. But while most of the northern Petrels have representative species in the southern hemisphere, many of the southern ones find no analogue in the northern hemisphere—e. g. *Procellaria gigantea*, Gmel.; *Daption capensis* (Linn.); *Prion vittatus* (Gmel.); *Pelecanoides urinatrix* (Gmel.), &c. These facts make it appear probable that the northern species crossed over the equator from the southern hemisphere, perhaps during the glacial period, and, having been isolated ever since, have varied somewhat from the parent forms; and the fact that, in the three cases I have mentioned, two distinct species in the northern hemisphere are closely related to one species in the southern hemisphere, points also to the same conclusion. The great extent of land in the northern hemisphere will probably explain why the genus *Puffinus*, whose habits are the least oceanic of any (except *Pelecanoides*, which does not appear to have crossed the tropics), has been so largely developed in those seas, while that of *Procellaria* is restricted to two closely allied species. The only two species of *Procellaria* at present known to inhabit the tropical parts of the Pacific are also each represented in the Southern

Ocean—viz., *P. parvirostris*, Peale, by *P. cooki*, Gray; and *P. rostrata*, Peale, by *P. lessoni*, Garn.; they both, however, differ more in colour from their types than the Arctic ones do from theirs. *Thalassidroma lineata*, Peale, also from the torrid zone of the Pacific, is a representative species of *T. melanogaster*, Gould.

The shape of the beak of the Petrels is another point well worthy of notice, so formidable is it in appearance, so harmless in reality; the bite of the Albatros even being attended with but little inconvenience, unless the point of the beak happens to catch the hand, as the whole of the inner parts are quite soft, and yield to a slight pressure of the finger. The natural food of the Petrel tribe consists of small fish, the shell-less molluscs, small crustaceans, *Medusæ*, &c., which are swallowed whole, and they do not therefore require a sharp beak fitted for cutting or tearing; for, although they may now and then regale themselves on the body of a dead seal or whale, it is evident that before sealers and whalers existed their opportunities for doing so must have been few and far between—perhaps not more than once in their lives; and if dead whales and seals were their usual food they would find the tube, formed by the nostrils on the top of the beak of many of the species, very disadvantageous, as it must prevent them striking their beaks deep into the blubber. Of what use, then, it may be asked, is the sharp, curved point of the beak? I believe it to be of little or no use; but that it simply marks their close relation to, perhaps their direct descent from, the Skuas (*Lestris*), who use it in their attacks upon Gulls. It cannot be said that those species which burrow require a harder beak than the Sand-Martin, or that those species which throw up mounds require one stronger or more sharply curved than the Flamingo; and it is certain that, for the capture of their prey, the hooked point is no more wanted in the Petrels than in the Kingfishers, Herons, Divers, &c., and not so much so as in the Gulls (*Larus*), some of which occasionally kill and devour small birds. This opinion is further strengthened by the fact that the young *P. gigantea* very much resembles in plumage the young *L. catarrhactes*, and it also inherits its habit of chasing other birds.

It is well known that all crepuscular birds have some organ

more highly developed than usual, in order to compensate for the difficulty they have in seeing at night—*e. g.* the ear in the Owl, and the mouth in the Nightjar—and there can be no doubt that the prolongation of the nostrils in the family *Procellariidae* is for the same purpose. The habits of *Diomedea*, where the tube is reduced to a minimum, are diurnal, except perhaps while the birds are young; they do not, therefore, require their sense of smell to be more than ordinarily acute. The various species of *Puffinus* and *Pelecanoides*, too, in which the tube is not so well developed as it is in *Procellaria* and *Thalassidroma*, although eminently nocturnal, take their prey chiefly under water, where smell cannot be of much use. The slanting position of their nostrils would also prevent the water being forced into them when diving. The tube is larger in *Procellaria gigantea* than in any other species of the family; and its extremely voracious appetite makes it appear probable that it requires means for obtaining food superior to any of the others.

Another point of great interest connected with these birds is the way they sometimes follow a ship for days together, and are seldom seen to settle on the water. I have been informed by Lieutenant Weld, R.N., that a Cape-Pigeon, with a piece of red ribbon round its neck, once followed the ship he was in for 1500 miles, and an albino variety of *P. gigantea* followed Mr. Gould's ship for three weeks, though this bird has by no means the same powers of flight as the Albatros. I myself have sometimes seen the same Albatros, or Cape-Pigeon, for several days in succession, while the ship has been going from 150 to 200 miles in the twenty-four hours; but these are exceptional cases.

It is, I believe, the generally received opinion of naturalists that these birds, when seen for several days together, have never slept during the whole period, but have followed the ship night and day. To me, however, it appears incredible that any animal should be able to undergo so much exertion for so long a time without taking rest; and I hope to show that it is not necessary to suppose that it does do so. Mr. Gould says that birds caught and marked are generally seen next day; but such is not my experience. I have sometimes marked ten or twelve Cape-Pigeons in a day, and seldom seen one again. Mr. Gould,

however, is quite right when he says that sometimes a marked bird turns up after being absent for two or three days; and how can this be accounted for by the theory of the birds constantly following the ship? Most of the Petrels, more particularly those that burrow, or live in holes in rocks, are, no doubt, nocturnal in their habits when they are on or near land; but, when they are at sea, they all become more diurnal. A few can certainly be often seen flying under the stern at night; and once, when I was keeping the middle watch, at about one o'clock A.M., a Cape-Pigeon, in crossing over the ship, struck a rope and fell on deck. Still they are never numerous; and, where there were fifty or a hundred birds in the daytime, there are only one or two at night.

Their defenceless condition is, as far as I can see, the only reason for the Petrels hiding themselves by day, and flying by night, for the oceanic *Mollusca*, &c., on which they feed, are equally diurnal and nocturnal. At sea, however, where they have no enemies to fear and no holes to hide in, the conditions are quite different, and it is then better for them to take their rest at night, and to be alert and feeding in the daytime, and they change their habits accordingly. I, therefore, believe that, although a few may follow a ship for a night, most of them sleep on the sea, and in the morning, knowing very well that a ship is the most likely place to obtain food, they fly high with the intention of looking for one. Some find the ship that they were with the day before; some another one. In the latter case, if the second ship is going in an opposite direction to the first, they are never seen by the first again; if, however, the course of the two ships is the same, the bird might very likely lose the second ship and rejoin the first, after a lapse of two or three days. A height of 1000 feet would enable a bird to see a ship 200 feet high more than fifty miles off; and often, although unable to see a ship itself, it would see another bird which had evidently discovered one, and would follow it in the same way that Vultures are known to follow one another. This opinion is much strengthened by the fact that at sunrise very few birds are round the ship, but soon afterwards they begin to arrive in large numbers; and I think I may safely say that this is always

the case; for, having had to be on deck from four to eight o'clock every third morning for six of my voyages, and about once a week during my last voyage, I have had better opportunities for observing this than most people. Sir J. Herschel states, in his 'Physical Geography' (p. 347), that the Albatros sleeps on the wing; but, to the best of my knowledge, no one has seen this, and it appears to me to be quite impossible; for, as I shall presently show, the bird cannot sustain itself in the air unless it has an onward movement, and if this movement was given by the wings, sleep would be no rest to it.

The unrivalled flight of the Albatros has been the admiration of voyagers from the earliest time. Day after day, with unabated interest, I have watched them, and I quite agree with Mr. Gould that the Sooty Albatros (*D. fuliginosa*) carries off the palm from all competitors. Never have I seen anything to equal the ease and grace of this bird as he sweeps past, often within a few yards, every part of his body perfectly motionless except the head and eye, which turn slowly, and seem to take notice of everything. I have sometimes watched narrowly one of these birds sailing and wheeling about in all directions for more than an hour, without seeing the slightest movement of the wings. This, however, is longer than usual. Wonderful as is this power of flight, it can all be explained by the simple mechanical laws which govern the direction and magnitude of pressures. Dr. Bennett states that he believes "that the whole surface [of the body of the Albatros] is covered by numerous air-cells, capable of a voluntary inflation or diminution by means of a beautiful muscular apparatus. * * * * * By this power the birds can raise or depress themselves at will." Now, I do not for a moment doubt the existence of this apparatus, for it is well known that all birds have it to a greater or less extent; but I *do* doubt its capability of doing the duty assigned to it, viz. raising the bird in the air. The temperature of the Albatros, as taken by Sir G. Grey, by placing a thermometer under the tongue, is 98° F., and if we add 10° F. to this, in order to allow for the difference between the head and the body, we shall have the temperature of the air-cells at 108° F. The temperature of the surrounding air cannot be taken lower than 48° F.,

as the mean winter temperature of lat. 50° S. is about 50° F. The bird, therefore, could not raise the temperature of the air taken into these cells more than 60° F. This would increase its volume not quite one-eighth; and taking 100 cubic inches of air to weigh 31 grains, and the average weight of an Albatros to be 17 lbs., as given by Gould, it would be necessary, in order that the specific gravity of the bird might be brought to that of the atmosphere, that these cells should contain 1,820 cubic feet of air; or, in other words, they must be more than 1,200 times the size of the body itself of the bird, which, to say the least, would give it when flying an aldermanic appearance, which I have never observed. In fact, it would require a sphere of more than fifteen feet in diameter to contain the necessary quantity of air. Even if it could thus buoy itself up, it would entirely defeat its own object; for it would at once destroy the whole of its momentum, and, unless propelled forward by its wings, would drift helplessly to leeward. However, I do not wish it to be inferred that I consider the air-cells of no use. The greater portion of them are situated round the neck, wings, and fore-part of the body of the bird, and I believe that by their means he is enabled to shift slightly the position of his centre of gravity, and thus, with very slight muscular exertion, to vary the inclination of his body to the horizon, according to the rate at which he is moving through the air.

Dr. Bennett, in his 'Gatherings of a Naturalist' (p. 78), gives a diagram explanatory of the flight of the Albatros; and, if I understand him rightly, says (Ibis, 1862, p. 90) that it cannot sail* directly against the wind, but only in the way which sailors call "close-hauled." This diagram represents a square-rigged ship sailing six points from the wind, a cutter sailing four and a half points, and an Albatros flying two points from the wind; from which I infer, although he does not expressly say so, that he considers that the wind helps forward the Albatros in the same way that it does the ships. But that this is erroneous is

* In this paper I use the word "sail," for want of a better one, to denote the power these birds possess of flying for a considerable time without moving their wings, and the following remarks relate to this mode of flying only.

apparent at a glance. A ship can sail at an acute angle with the wind, because the pressure of the wind against its sails being met by the resistance of the water is resolved into pressures having other directions. Advantage of this being taken by trimming the sails, it ultimately results that the ship is moved in the direction of least resistance, viz. forwards. If, however, the pressure of the wind had not been met by the resistance of the water, no resolution of it into other directions could have taken place. For this reason a balloon can only drift with the wind, and the same would be the case with the Albatros. Moreover, the statement that he cannot sail against the wind is incorrect, as Dr. Bennett himself said in his first book, 'Wanderings in New South Wales;' the truth being that he is more often seen sailing in this direction than in any other, for the simple reason that as he moves slower against the wind than with it, he is obliged to keep going for a longer time in the former direction than in the latter, in order to retain his position near the stern of the ship. However, when sailing against the wind the position of his wings, body, and tail, slanting a little downwards, is somewhat analogous to the sails of a ship close-hauled, or, still better, to the position of a kite in the air; the momentum of the bird taking the place of the resistance of the water, or the string of the kite. This momentum is entirely owing to impulses previously given to the air by means of his wings, and when, owing to the resistance of the air, it has decreased so much that he is no longer able to move with sufficient rapidity to prevent his falling, fresh impulses have to be given. For this reason, Albatroses sail much longer in fine than in stormy weather, rain especially soon destroying their momentum, and frequently obliging them to use their wings for propulsion.

It is by combining, according to the laws of mechanics, this pressure of the air against his wings with the force of gravity, and by using his head and tail as bow and stern rudders, that the Albatros is enabled to sail in any direction he pleases, so long as his momentum lasts. If, when sailing against the wind, the inclination of his body is such that the upward pressure of the wind against his wings and body just balances the force of gravity, his momentum alone acts, and he sails straight in the

“wind’s eye.” If he wishes to ascend he inclines his body more to the horizon by means of his head and tail. If he wishes to turn to the right he bends his head and tail slightly upwards, at the same time raising his left side and wing, and lowering the right in proportion to the sharpness of the curve he wishes to make, the wings being kept quite rigid the whole time. To such an extent does he do this that, in sweeping round, his wings are often pointed in a direction nearly perpendicular to the sea; and this position of the wings, more or less inclined to the horizon, is seen always, and only when the bird is turning. It will be observed that, on this principle, an Albatros sailing down wind must necessarily be descending, unless his pace is much greater than that of the air, and such I have found to be invariably the case.

It may be objected that the resistance of the air must soon destroy his momentum; but the fact is that it does not do so. A good illustration of this is seen in an experiment, common in lecture-rooms a few years ago, by which the rotation of the earth was demonstrated by means of a pendulum, composed of a metal ball suspended by a long string from the ceiling of the lecture-hall. The impetus obtained by causing the metal ball to fall through the space of a few feet only was sufficient to keep the pendulum swinging, with a velocity but little diminished, for the greater part of an hour, notwithstanding the resistance of the sand, which the point of the pendulum had to cut through twice during each vibration. The resistance of the air is well known to depend on the shape and velocity of the moving body, and to increase in proportion much more rapidly than the velocity increases. For this reason a properly shaped body and a low velocity are required to reduce it to a minimum. A certain amount of weight is also necessary to give a bird momentum sufficient to overcome the resistance for a certain time, and wings are required of sufficient expanse to support it as it sails slowly through the air. These conditions are admirably carried out in the Albatros; its expanse of wing is perhaps greater than that of any other bird, and its weight, 15lbs. and upwards, is very large. Its shape, also, when the neck is stretched out, as in flying, approaches very nearly to that of Newton’s solid of

least resistance, while more than one voyager has remarked the slowness with which it sails past. The Petrels I have mentioned sail very nearly in proportion to their size and weight. The Stormy Petrel never sails; the Cape-Pigeon only for a very short time, perhaps a minute; the "Night-Hawk" much longer, often between five and ten minutes; while the Albatros, as I have before mentioned, sails sometimes for an hour, "rising and falling," says Dr. Bennett, "as if some concealed power guided its various motions, without any muscular exertion of its own," but which we must only look upon as another illustration of the small resistance offered by the air to the passage of a properly-shaped heavy body moving through it with a low velocity.

XXVI.—*Notes on Birds breeding in the Neighbourhood of Sydney.*

By EDWARD P. RAMSAY.

[Continued from 'The Ibis' for 1864, p. 245.]

7. *PARDALOTUS STRIATUS* (Gould, *Birds of Australia*, vol. ii. pl. 38)*.

During my first visit to Cardington, on the Bell River, in the Molong district, I was much surprised and delighted at finding this beautiful species of Pardalote in that neighbourhood. My

* I at first thought that this species had been *P. affinis*. I was led into the mistake by the rarity of *P. striatus* about Sydney, and also by receiving from the southern colonies specimens of *P. affinis*, which may be easily distinguished from *P. striatus* by having the tip of the spurious wing yellow, and the third primary only being white on the outer web. *P. punctatus* is the most common species found near Sydney. There is a variety (?) which sometimes, though not very commonly, occurs about Sydney. This has the tip of the spurious wing deep orange, and the lines on the head are more even and more backwardly placed than in the common form. Mr. Gould informs us, he believes these to be young birds; but I have, however, found them breeding in September and October, and have met with them in flocks of considerable numbers, from which I procured no specimens with the orange tip to the spurious wing, although I have shot over a dozen from the same party. *Pardalotus affinis* arrives here during the months of August and September, and may be found in company with *P. punctatus*, searching for insects and their larvæ among the tops of the young *Eucalypti*, from the torn edges of the leaves of which