GENERAL NOTES

Indian House Sparrow attacks grass snake.—On a cloudy afternoon in May 1966 I witness a determined encounter between a male House Sparrow (*Passer domesticus*) and a grass snake (*Natrix* sp.). The snake, about 40 cm long, was crawling through a plot of fallow land when the House Sparrow suddenly attacked it and repeatedly pecked it on the head. The snake turned and tried to slip away, but the sparrow hopped along and continued pecking different parts of its victim's body. The snake then stopped, raised its head, and swayed back and forth, possibly to locate and threaten its attacker. The House Sparrow appeared frightened and retreated, but kept a watchful eye on the snake. After a while the snake continued toward a nearby bush. It had crawled only about a meter when the sparrow came hopping and resumed pecking it repeatedly from behind with the same vigor as before. The snake changed direction, but again failed to escape the agile bird. The scuffle continued for about 10 minutes until the snake finally managed to hide under a bush.

It is a common belief that snakes destroy eggs and young birds, but the Indian House Sparrows commonly nest in crevices of walls and in ventilator holes 8 or more feet above ground, well beyond the reach of snakes. Moreover, I know of no record of a snake preying on House Sparrows. M. M. Nice (Trans. Linnaean Soc. New York, 6: 257, 1943) reported that one of her Song Sparrows (*Melospiza melodia*) once pecked at a garter snake 60 cm long when it crawled underneath its nest; another Song Sparrow craned its neck but showed no further alarm when a snake was released into its cage. The reason why the House Sparrow attacked the snake remains obscure.—S. N. Sen Gupta, *Department of Zoology, University of Calcutta, Calcutta, India.*

Laysan Albatrosses swallow indigestible matter.—That marine birds swallow indigestible materials is well documented. Simpson (1965) discusses the ingestion of pumice by the Brown Skua (*Catharacta skua lonnbergi*) and Bierman and Voous (1950) present information on stomach stones found in Antarctic petrels. Additional records of pumice in birds' stomachs are reported by Sutherland (1964) for the Slender-billed Shearwater (*Puffinus tenuirostris*) and by Gill (1967) for the Antarctic Prion (*Pachyptila desolata*). George Watson (pers. comm.) found pumice in the stomachs of petrels (*Oceanites*), the Cape Pigeon (*Daption capensis*), and the White-chinned Petrel (*Procellaria aequinoctialis*). Fisher (1903: 788) states that candle nuts (*Aleurites molluccana*) found on Laysan Island "were almost undoubtedly ejected by albatrosses." No quantitative report on the variety of indigestible materials ingested by the Laysan Albatross (*Diomedea immutabilis*) has been recorded previously.

An inspection of the Hawaiian Islands National Wildlife Refuge from 8 to 28 September 1966 gave us an opportunity to examine the hard materials in the remains of young Laysan Albatrosses that had died in the June–July 1966 fledging period. On 24 September we collected specimens from 100 carcasses on Southeast Island, Pearl and Hermes Reef (27° 46′ 45″ N, 175° 48′ 45″ W). On a circuit of Southeast Island, the maximum dimensions of which are approximately 900 by 300 meters, we counted a total of 386 dead albatrosses above the high-water mark. Most of the birds were on the beach or in the vegetation (primarily *Tribulus* and *Portulaca*) near it. A few were scattered farther inland. Remains of some at the tideline that had been broken into fragments by wave action were not enumerated, but after examining all beaches and inland areas we estimated at least 450 to 500 Laysan

Albatrosses had died there shortly before fledging. We also identified remains of about 50 Black-footed Albatrosses (*Diomedea nigripes*). Counts from aerial photographs taken in December of 1956 and 1957 showed some 14,000 pairs of Laysan Albatrosses on this island (Rice and Kenyon, 1962). Surface counts of chicks in subsequent years were: March 1965, 5,000; March 1967, 5,300; March 1968, 11,269. These counts indicate that the nesting population of Southeast Island is variable and that mortality in the final stages of fledging may lie between 4 and 10 per cent. (The remains of young that die in early stages of development have disintegrated and cannot be enumerated after the fledging period.)

By September, 2 to 3 months after death, dermestid beetles and other insect larvae had consumed all soft body parts, leaving only feathers, bones, and hard items that were in the gastrointestinal tract at death. Body oils, rain, and salt spray had stuck the feathers together like a tent, protecting the skeleton and other hard items within. The exposed side (usually the back) was easily lifted off to reveal the contents of the body cavity (Figure 1). Examining each bird in order along the beaches we took a sample of body contents from 50 birds along the western beaches and 50 along the eastern beaches of the island. No selection was made, other than omitting birds that were mutilated and their parts scattered, presumably by wind or the passage of monk seals (*Monachus schauinslandi*). All foreign nonfood items were collected and tabulated. Later in Seattle these were washed, dried, sorted, and

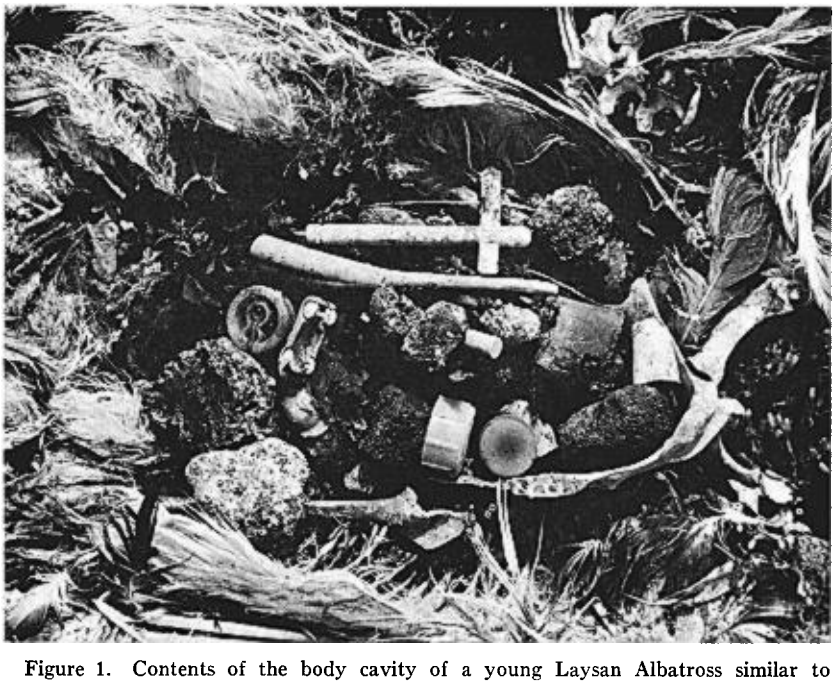

Figure 1. Contents of the body cavity of a young Laysan Albatross similar to many found on Southeast Island, Pearl and Hermes Reef, 24 September 1966. Plastic container caps and toys, pumice stones, and squid beaks were revealed, cradled in the sternum, after the back (feathers and skeletal material) was lifted off. Beetle larvae had consumed all soft parts in the 2 to 3 months following death.

weighed (Table 1). Squid beaks, being the remnants of normal albatross food, were not preserved for the present study, except that samples were taken for identification.

Table 1 summarizes the number of pieces and weights of various items found. Squid beaks were numerous in most of the birds, ranging from about 10 to several hundred. Only 9 birds were empty and only 11 contained no squid beaks. This indicates that nearly 90 per cent of these dead birds were fed until shortly before they died. When placed in water, 99.4 per cent of the items found in the dead birds floated. Of the items in Table 1 that did not float, two appeared to be parts of some plastic device that may have floated, and one was a bone, presumably from a food organism. The two small pebbles appeared to be bits of limestone or coral

TABLE 1

INDIGESTIBLE MATERIAL IN 100 LAYSAN ALBATROSS CARCASSES ON SOUTHEAST ISLAND, PEARL AND HERMES REEF, HAWAII, 24 SEPTEMBER 1966

Item	Number	Weight	Frequency of occurrence	Greatest number in one bird
ITEMS THAT FLOATED		g	Per cent	
Pumice[1]				
Large (40–60 mm)	27	235		
Medium (25–39 mm)	173	563		
Small (10–24 mm)	346	265		
Totals	546	1,063	85	93
Plastic				
Caps (bottle and tube)	83	69		
Misc. (broken pieces, toys, etc.)	157	111		
Bag (polyethylene)	1	3		
Totals	241	183	74	8
Nuts				
Kukui (*Aleurites moluccana*)	7	45		
Walnut (*Juglans cineria*)	3	15		
Strongylodon	2	3		
Totals	12	63	12	1
Squid beaks[2]	unknown	unknown	89	
Charcoal	13	68	10	3
Wood	4	21	4	1
Sponge	4	2	4	1
Line	2	3	2	1
NONFLOATING ITEMS				
Pebbles	2	3	2	1
Bone	1	1	1	1
Hard plastic	2	1	2	1
Totals	827	1,408		

[1] Greatest dimension is measurement shown.

[2] C. H. Fiscus examined the cephalopod beaks and stated: "Probably 10 to 12 species of squid are represented in the collection. The following families were tentatively identified: Octopodoteuthidae, Ommastrephidae, Onychoteuthidae, and Sepiolidae or Sepiiadae. One beak was positively identified as *Tremoctopus* sp."

rock. The specific gravity of the pumice material present in greatest quantity was less than one-half that of water (6.5 g pumice displaced 15 cc water), thus the total volume of the indigestible matter was approximately 3,000 cc. Figure 1 gives some indication of the size (volume) of the individual items that were ingested. The largest item was a piece of *Paulownia* charcoal (a fuel commonly used for cooking on Japanese fishing vessels), the greatest dimensions of which were 178 × 33 mm.

The beaches of Southeast Island where the dead albatrosses were studied are composed of broken coral ranging in size from coarse sand to large pebbles. Many of these were similar in size, shape, and color to the pumice stones found in the dead birds.

Pieces of pumice and plastic scraps similar to the ones contained in the albatross skeletons were scattered about the beaches. It might be presumed that the beaches were the source of the indigestible items found in the young albatrosses. Observations at Laysan Island, however, indicate that the albatrosses are the source of much of this beach refuse. At Laysan on 17 and 18 September 1966, we noted that the high-water line of the lagoon was littered abundantly with small plastic items and pumice stones. As no channel connects the lagoon with the sea, this refuse could not have been washed to the lagoon from the sea. It must have come from the stomachs of dead birds.

We examined one of a number of young and adult Laysan Albatross carcasses that lay scattered over the flats adjacent to the lagoon. It contained a plastic container cap and several small pumice stones. In dry seasons the water in the lagoon is low and many birds die on the exposed flats. During rainy periods the water rises, the disintegrated albatross skeletons are broken apart, and the plastic and pumice pieces float ashore and are deposited at the high-water line.

Although Bartsch (1922, p. 485) recorded that a Laysan Albatross regurgitated *Scaevola* berries, it is a behavioral characteristic of albatrosses (as well as some other pelagic birds) that items (food or other things) are rarely ingested on land. It is therefore not surprising that nearly all of the foreign material found in the dead birds floated. In consideration of the pelagic feeding behavior of albatrosses and the above observations, it is concluded that the plastic and pumice items were picked up at sea by the parents and then passed on with regurgitated food to the young.

To what degree large indigestible items may cause mortality among albatrosses before fledging is unknown. It is not known how much of this material is ingested by young that ultimately survive. A healthy adult Laysan Albatross taken at sea on 6 December 1948 off California contained four small pieces of pumice (Kenyon, 1950). Also Stanley Sharpe, Bird Warden of Otago Peninsula, New Zealand, showed Kenyon pumice pebbles that were found beside a nesting Royal Albatross (*Diomedea epomophora*). Sharpe said that these birds often disgorged this material.

Perhaps young birds are unable to disgorge certain bulky, indigestible items with their normal castings of squid beaks. That plastic bags may thus be eliminated was indicated by two castings that we found on Southeast Island composed partially of transparent polyethylene plastic of the kind used in small kitchen bags. These castings appeared to have been protected from disintegration by the bags, as no other castings were found.

Possibly the large volume of pumice stone, plastic scrap, and other bulky, indigestible matter prevented passage of food through the stomach or intestine. It may be significant that among the 91 birds that contained indigestible materials only one did not contain either plastic or pumice in addition to the other indigestible items listed in Table 1.

Triturating agents are not known to be required for digestion in birds that feed primarily on cephalopods and fish. Why then do these marine birds pick up and swallow indigestible materials? We suggest that, since pelagic birds gather their food on or near the surface of the sea, floating plastic and pumice are taken fortuitously.

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Arteries in the heart region of the Greater Shearwater—In his study of arteries in the neck and thorax region, Glenny (Proc. U. S. Natl. Mus., 104: 556, 1955) reports members of the order Procellariiformes to be typically bicarotid. He dissected four species of *Puffinus* (*P. griseus*, *P. nativitatis*, *P. opisthomelas*, and *P. lherminieri subalaris*) but included no specimens of *P. gravis*. Nor, aside from a few notes on ligamentous vestiges and types of sternoclavicular (coracoid) and thoracic arteries, does he describe or illustrate the smaller arteries in the heart region. The following observations are based on a single injected specimen collected off Gannet Rock, New Brunswick, Canada. The arterial nomenclature follows Bhaduri, Biswas, and Das (Anat. Anz., 104: 1, 1957).

As shown in Figure 1, the right systemic arch alone remains as the functional aortic arch. Vestiges of both the ligamentum aortae and ligamentum botalli persist. The aortic arch first sends the systemic arch and then gives rise to the innominate arteries which proceed anteriorly and laterad to the left and right before dividing to form the common carotid and subclavian arteries. Arising from the subclavian are the following major vessels: the sternoclavicular, axillary, internal thoracic, and pectoral trunk. An accessory sternoclavicular artery originates from the base of the sternoclavicular artery. The latter vessel also yields a sternotracheal branch to *M. sternotrachealis*. A minute artery supplying the pericardium comes off the accessory