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SOME OBSERVATIONS OF HUTTON'S SHEARWATER

By G. HARROW

ABSTRACT

The breeding cycle and breeding range of *Puffinus huttoni* in the Seaward Kaikoura mountains are described. Measurements and characteristics of adult birds, their chicks and eggs at the breeding colonies are recorded. The effects of weather, moon phase, and snow on breeding and navigation are noted. Information about mortality and predation is given. Observations of *P. huttoni* near the New Zealand sea coast are outlined, and some historical background is presented.

INTRODUCTION

The discovery of breeding grounds of Hutton's Shearwater, *P. huttoni* Mathews, 1912, has been described (Harrow 1965). The present paper reports the results of visits to the breeding areas in the Kaikoura mountains and adjacent feeding grounds at sea, from 1965 to 1974.

Description of P. huttoni from Kaikoura breeding area:

Falla (1965) and Serventy (1939) described the plumage characters of this species. All the Kaikoura birds handled had the underwing coverts mostly light brown or smudgy, and the long axillaries brown, although a few individuals have shown a faint white tip on the axillaries. Five birds on the colony at the head of the Wharekiri Stream were noted as having conspicuous white flecking on the brown head and nape with feet pinkish and inner legs light pink to dark pink and mauve, and on the outer side of legs dark grey.

Sexes are alike, with juveniles like adults. The nestling is clad firstly in a mid grey protoptile down, succeeded by a light grey mesoptile plumage.

Measurement of live adult P. huttoni at Wharekiri colony 23 September 1967:

Body weight	mean of	17	364.1 g	
Wing length	„	„ 58	223.3 mm	± 6.5
Bill length	„	„ 58	36.0 mm	± 1.7
Tarsal length	„	„ 58	44.1 mm	± 1.9

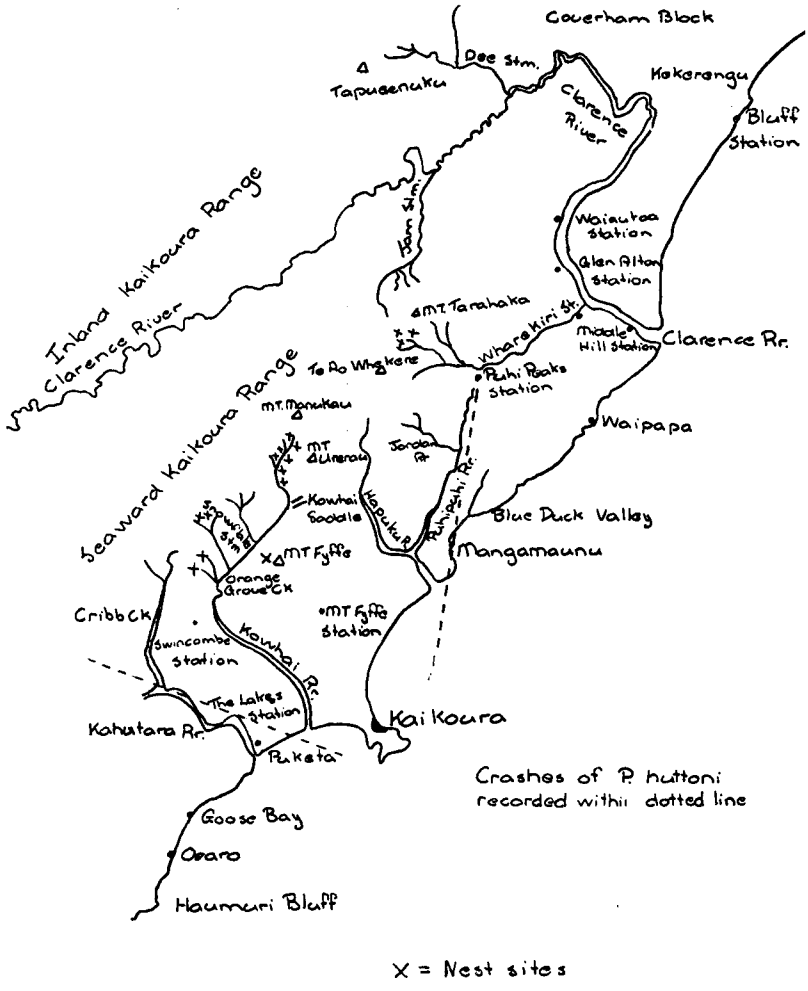

FIGURE 1 — Breeding ground of Hutton's Shearwater.
del.: Belinda Harrow

Logistics and methods including banding:

Most of the data were obtained during weekend visits with usually six visits per season. The timing was varied each year where possible, so that observations were made at both breeding colonies and at sea to include all months of the year. The 1965 and 1966 seasons were used to prove the extent of the breeding range of *P. huttoni*. Many more nesting sites were found in widely separated parts of the Seaward Kaikoura Range (Fig. 1). None of these sites are easily reached, and all are above 1,200m above sea level. An area of high density burrows about an acre (0.4 hectare) was selected in the upper gorge of the Kowhai River for random banding of birds found at night on the surface, and for banding older chicks taken from burrows during the day.

In the head of the Wharekiri Stream random banding along similar lines to the Kowhai colony was carried out from 1967 to 1970 and in addition burrows were marked with their occupants' band numbers. Aluminium foil tags were wired alongside burrow entrances, and although the tags are easily numbered and indestructable, they are difficult to relocate in tall snow tussock (cf. Fig. 5). Manuka sticks were used in deep snow to mark the site of pairs of birds defending territory. Banding of crashed birds has been done at Puhi Peaks sheep station, and at Kaikoura township from 1967-1975. At the time of writing there have not been any recoveries of banded birds other than on the breeding sites and these have all been recoveries of adult birds of unknown age. Banded Hutton's Shearwaters have been observed among flocks close to the Kaikoura shore, but as the numbers could not be read, it is not known where they were banded.

Only about 5% of *P. huttoni* nest chambers can be reached from the burrow mouth, without damage to the site and some brooding birds deserted after handling so that later observations were limited to the surface.

BREEDING COLONIES

In the first account of a breeding colony, Harrow (1965) discussed an area directly below Mount Urerau, at the headwaters of the Kowhai River. Further exploration of this river has revealed extensive burrowing up stream in the high tussock areas, and also further downstream, high on the true left bank above the middle gorge in the Kowhai River. The number of burrows at the headwaters of the Kowhai River would be counted in tens of thousands. A discrete colony was found at the headwaters of the Snowflake Stream and this, like that found on the SE flank of Mount Fyffe, appears to be a remnant of larger breeding sites occupied years ago. Today these hillsides are badly eroded with few burrows left in the remaining islands of tussock.

Some of the more likely accessible areas of the Hapuka River have been searched for breeding sites without success, but Creswell (pers. comm.) reports dead shearwaters at 2,300m a.s.l. in this catchment, and two farmers hearing "mutton birds" calling at night,

suggest that there may be nesting in this valley. There have been several records during the 1950 to 1970 era of large numbers of "mutton birds" landing about farm houses in the middle Puhi Puhi Valley and these birds may have been heading into breeding places in the Jordan Stream. Mr S. Pilbrow, of Puhi Peaks sheep station, usually has several flocks of Hutton's Shearwaters crash around his homestead lights on foggy nights each year from September to March. Immediately west of Mr Pilbrow's homestead, on steep snow grass bluffs below Mount Tarahaka, extensive colonies of Hutton's Shearwater were found in the Wharekiri Valley.

Muttonbirding by local deershooters has been alleged to have occurred in the Jam Stream in recent years but shearwater breeding has not been confirmed here. Mr E. M. Wilson (pers. comm.) states that, during the spring of 1935, while on goat destruction in the Coverham block of the Bluff Sheep Station, at dawn one morning he observed a flock of black and white sea birds fly out towards sea from burrows under snow tussocks at about 1500m a.s.l. on the flanks of Mount Tapuaenuku.

Breeding areas of *P. huttoni* are known to exist over a distance of some 32 km on the coastal watersheds of the Seaward Kaikoura Range and are suspected to breed on the Inland Kaikoura Range (Fig. 1). No breeding areas have been located below 1,200m a.s.l. and the greatest concentrations are between 1,200 and 1,500m. A few burrows are found as high as 1,828m in favourable aspects where snow tussock reaches this level. Hutton's Shearwater breeding colonies vary from 9 to 24 km inland.

Siting of Burrows:

Burrows can be on gentle slopes of 15° or greater and have been found on almost vertical bluffs, provided there is soil and tussock sufficient to allow burrowing (Fig. 2). Rocky or shingly soils are avoided. Bare eroded soils are sometimes utilized in all breeding areas and many collapsed burrows are found in these parts of the colonies. Burrows have been found facing every aspect, except north-west. The burrow mouth commonly has the base of a snow tussock (*Chionochloa* or *Poa*) as a veranda, although sometimes an *Aciphylla* or *Dracophyllum* serves as an alternative. Usually one burrow opening leads from a veranda, but sometimes this is shared in common with one or rarely two other entrances to neighbouring burrows. Nests collapsed by deer, chamois or ornithologists were measured. No part of any burrow was found deeper than 500mm below the surface. From a sample of thirteen burrows that had a finished nest chamber, the shortest was 0.6m long and the longest was 2.5m and the average length was 1.2m. One damaged burrow was extended a further 0.6m the following year. The nest chamber at the end of the burrow is a little bigger than the approach tunnel, and lined with dry snow tussock and white shearwater feathers. Examination of material at lower levels of the nest chamber produced egg fragments, and skeletons, indicating occupation of the burrow for some years.

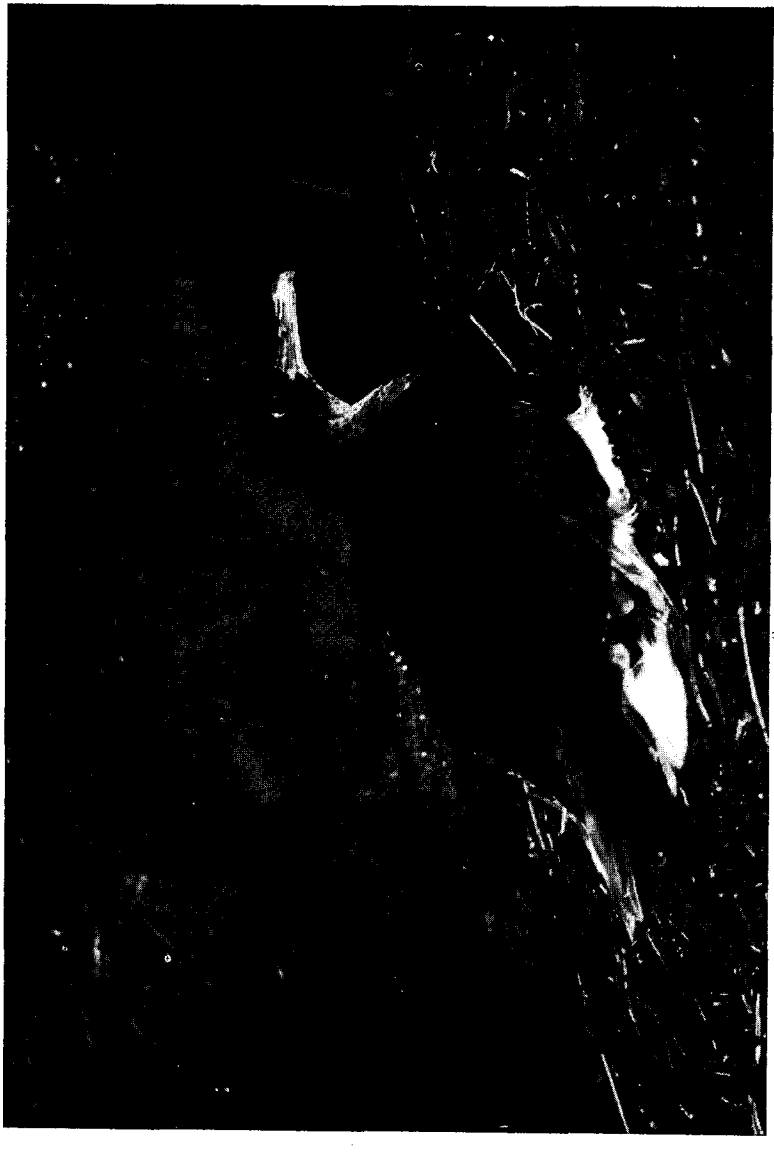

FIGURE 2 — Hutton's Shearwater at burrow entrance, Kowhai colony, Seaward Kaikoura range. Photo: G. Harrow

THE ANNUAL CYCLE

Winter Prior to Re-occupation Period:

Weekend visits were made to nest sites of *P. huttoni* over a period of seven years, and records have been taken to cover at least one night each fortnight of the year.

The observations were not made consecutively in one season. Thorough search at night on the upper Kowhai gorge colony on 26 April 1969, 16 May 1970, 29 May 1971, 12 June 1965, 26 June 1965 and 12 August 1967 failed to find any shearwaters. Observations at night at the Wharekiri colony on 13 July 1968 and 1 August 1970 resulted in no signs of shearwaters. The winter visits were made in varying phases of the moon.

The earliest record of *P. huttoni* on the breeding grounds was on 27 August 1966 at the Wharekiri site, when several snow free burrows were occupied by Hutton's Shearwaters by day and small numbers were scratching out burrows at night or noisily calling on the mixed snow and tussock covered slopes. By mid-September in seasons of moderate snowfall, half of the Wharekiri colony is snow free and vast numbers of shearwaters visit the area at night. Single birds and pairs were located in most burrows by day where the nest chamber could be reached. There was also much vocalisation within the burrows during daylight. During September 1965, 1966 and 1968 there were large areas of the breeding sites under deep snow. Many shearwaters were sitting quietly, often in pairs that were sometimes seen to preen each other mutually (Fig. 3). Other pairs of shearwaters were fighting a third intruder and, even though they were located on a deep snow drift, this behaviour suggested territory defence (cf. Figs. 4 & 5). Three such pairs were banded and the site marked with a pole and numbered tag. One pair was relocated at a burrow mouth within 0.6m of the pole marked with their band numbers during the next visit, and a single bird was removed from a second burrow by the second pole the following season, with a corresponding band number. This would suggest that *P. huttoni* are able to fix the approximate location of the burrow when it is covered by snow.

Where the snow has almost melted clear of a burrow mouth, the shearwaters tunnel through the last few centimetres of snow, and scratch earth from their burrow onto the surrounding snow slope. Where snow is lying deep over the colony, birds breeding in these parts make no attempt to burrow in the snow. These birds enter their burrows up to a month later in a heavy snow season than do birds whose burrows are clear of snow early in the spring. Heavy snow delays entrance to the burrows, although snow-free winters and springs do not encourage *P. huttoni* on to the breeding grounds any earlier as was noted in the snow-free August of 1967. No evidence is available to prove that egg laying is delayed in parts of the colony

FIGURE 3 — Mutual preening by Hutton's Shearwaters at the Wharekiri colony. They appeared to defend territory on this deep snow drift. Photo: P. J. Woolman

under late snow other than chicks and fledglings at a much later stage of development by comparison with chicks and fledglings from the early snow free parts of the colony. Furthermore, there were no birds found fledging later than 24 February 1968 in that autumn when there had been a snow free winter in 1967. Brian Bell (pers. comm.) reported that between 9 and 13 March 1968 no juveniles were seen to fledge on the Kowhai Colony nor were any chicks found, although in other seasons after late spring snow he had banded many juveniles and chicks in mid March.

The nightly influx of what appears to be the greater part of the breeding population continues to come onto the breeding grounds throughout September and into the first half of October when the number of birds arriving over the colony each evening dwindles to a mere trickle by comparison with previous weeks. This may be the " honeymoon period " noted in other species of shearwaters, *P. tenuirostris* (see Marshall & Serventy 1956), *P. puffinus* (see Harris 1966). Numbers of *P. huttoni* on the breeding colonies increased again late October and early November, but counts are lower than September records.

Arrival and Departure Times on Colony:

In the first week of September, with sunset at 6.15 p.m., the first birds arrive over the breeding colony at 7.20 p.m. and within a quarter of an hour the air is alive with shearwaters calling on the wing as they circle before landing. The exodus of departing birds to the sea reaches a climax at 5 a.m. and is over by 5.30 a.m. with sunrise three-quarters of an hour later at 6.15 a.m. A month later, in the first week in October, the first bird heard calling over the colony as it arrived from the sea was recorded at 8.05 p.m. and the exodus peaked at 4.40 a.m. and was all over by 5.10 a.m. As the season progresses this pattern of later arrival in the evening and earlier departure in the morning increases; thus on 14 December 1968 the first bird arrived at 11.10 p.m. with the main influx coming between 11.20 to 11.45 p.m. In mid summer the exodus is drawn out, but there is a small build up in departing numbers between 2.30 a.m. and 3.00 a.m. Normally *P. huttoni* is only found on the surface of the colony after dark, but on 16 December 1967 on a hot summer day, two shearwaters were observed outside burrows. Once the birds noticed our party, they quickly entered a nearby burrow.

Effect of Moon Phase on Breeding Population at Colony:

The phase of the moon can have an important bearing on the numbers of incoming birds to the colony. In September and early October at full moon, there is a great influx of *P. huttoni* onto the breeding grounds which would likely account for a large proportion of the total population. There does not appear to be much difference in numbers on the colony at night during September - early October, irrespective of the moon phase. The numbers of birds ashore on the

FIGURE 4 — Courtship display by Hutton's Shearwaters at the Wharekiri colony.
Photo: P. J. Woolman

FIGURE 5 — Hutton's Shearwaters attempting copulation. The tag and wire are not attached to the wing but are driven into the snow drift above the birds. Photo: P. J. Woolman

surface dwindle spectacularly from mid October until late December, and during this time at full moon the outward appearance of the colony is particularly quiet with very few birds about, but once the moon has waned, there is small noticeable build up in numbers of birds. These could be unoccupied younger birds, looking for breeding territory or establishing pair bonds, because there is often much vocalisation from pairs sitting on the tussocks, and less frequently burrow scratching out. During late December through to early February one finds an increase in population ashore, well up in numbers compared with the November counts, but well below those of September. Moonless nights invariably bring more birds onto the colony in the summer and early autumn. Several times with a bright moon which has set during the middle of the night, only breeding birds have flown in quietly in the moonlight and quickly entered their burrows, but once the moon had set and it was really dark, many birds came in noisily calling on the wing and on the ground where they remained until just before dawn when they poined the departing occupied birds leaving the burrows. The late arrivals on these nights would presumably be non breeding younger birds.

Effect of Weather on Breeding Population at Colony:

On foggy nights there is a regular pattern of *P. huttoni* crashes into the lights of farm houses and townships on the Kaikoura coast (cf. Fig 1). These have been recorded each month from September to early April, at Kaikoura township, Puhi Peaks Station in the Wharekiri Valley, several farms in the middle Puhi Puhi Valley, farms in the lower Hapuka, Mount Fyffe Station, the Lakes Station, and Swincombe Station. Spot lighting for deer feeding on spring growth lucerne paddocks at Mount Fyffe Station is a common practice, and when the beam is turned up into the fog as mutton birds are heard passing, some can be attracted to the spot light.

Inquiries made at Oaro, Goose Bay, and from Mr Ivan Hislop at Puketa, all south of Kaikoura Peninsula, failed to confirm any crashes or night sounds of shearwaters. Mr Hislop knows the breeding grounds of *P. huttoni* well and is very interested in this species, although H. C. Cowie (pers. comm.) has found *P. huttoni* at Puketa. Contacts made in the Blue Duck Valley, Mangamaunu, Waipapa, Clarence Bridge, Middle Hill Station, Glen Alton Station, Waiau Toa station, and Kekerengu did not reveal any knowledge of mutton birds crashing into house lights on foggy nights. The latter localities are all north along the coast from Kaikoura township and the sheep stations are inland up the Clarence Valley quite close to breeding colonies of Hutton's Shearwater. This suggests that the shearwaters may fly into the breeding colonies along defined routes, which would explain the regular occurrence of crash sites radiating out in a " V " pattern with the apex at Kaikoura township, and also the lack of reports along the coast south of Kaikoura Peninsula and north along the coast and up the Clarence Valley. No difficulty in navigation appears to be encountered by incoming birds, on clear moonlight nights,

on dark clear starlight nights, or on heavy overcast nights, so long as the cloud base is at least 1,800m, because no crashes have been recorded in these conditions. It would seem therefore that the birds are not relying on the moon or stars for navigation. Observations have also been made on breeding colonies when there have been heavy sea fogs up to 1,200m a.s.l. on the flanks of the Seaward Kaikoura Range, and large numbers of shearwaters have flown up through the cloud to their burrows. Subsequent inquires elicited no reports of crashed birds. In these conditions, the birds presumably gain sufficient altitude over the sea to break above the cloud, and then fly inland to their breeding site.

The crashes of adult shearwaters have been recorded in south east storm conditions with heavy fog or rain clouds from sea level to the tops of the Kaikoura Range. In these circumstances the birds are attracted to bright lights about houses, but are able to take off again at dawn or on improvement of night visibility. These observations would suggest that the shearwaters are navigating by land marks, and that heavy clouds prevent them from recognising these landmarks (cf. Warham 1960). Hutton's Shearwaters have been seen already stranded at night in stormy weather on the Puhi Puhi Valley road, not near any lights.

Egg Laying and Incubation:

P. huttoni lays eggs during the last week of October and in the first and second week in November, but late fledging in some parts of the colony indicates later laying when snow delays entrance to burrows.

The earliest egg found in a nest chamber was on 27 October 1968 at Wharekiri, but as only about 5% of nests can be reached, data on egg laying are meagre.

A traverse of an acre (0.4 hectare) of the colony in daylight on 27 October 1968 produced 17 whole or partly broken shearwater eggs on the open ground, and six surface eggs were found over the same area on 2 November 1968. Keas *(Nestor notabilis)*, which are common at the shearwater breeding colony, have been seen to eat surface eggs. On 2 November 1968 many birds handled from surface capture had palpable eggs in their oviducts. Jackson (pers. comm.) also reports brooding shearwaters in burrows at the Kowhai Colony in the second week in November. Incubation continued to 30 November 1968 but as there were some eggs deserted because of earlier handling of brooding birds, nest inspection was stopped at this period.

Egg Measurements:

	Range	*Average*
Seventeen whole surface eggs	52.3 - 64.5 x 36.2 - 42.7	61.1 x 38.4 mm
Ten nest chamber eggs	54.0 - 65.2 x 37.5 - 46.9	59.8 x 40.9 mm

In other shearwater species it has been observed that surface eggs tend to be longer and are narrower than eggs measured from the nest chamber and the small sample from *P. huttoni* corresponds with this tendency. It has been suggested that surface eggs are laid by young birds not in possession of a burrow, and being possibly their first egg, it could be compressed in the primiparous oviduct to longer and narrower dimensions. The average egg weight was 70 g.

The Chick:

On 15 December 1968 a nest chamber collapsed under foot, during a traverse of the Kowhai colony, on to a brooding bird breaking the egg which had a well grown chick with a yolk sac of 15 mm diameter. The earliest chick was found on 29 December 1965 (Kowhai) still being brooded. It weighed 68 g and, as the average weight of unhatched eggs is about 70 g, this chick was most likely less than a week old. Six chicks weighed at the Kowhai colony on 10 January 1966 were 115, 135, 140, 145, 150 and 170 g and they averaged 142.5 g. At night many chicks can be heard making a pleasant piping whistle and adult birds, apparently in the same burrow, respond with a crooning or soft chuckle.

Eleven chicks from the Kowhai weighed on 5 February 1966 were 400, 400, 440, 450, 470, 470, 475, 500, 510, 550 and 605 g and they averaged 479.1 g. Adult birds found in five of these burrows weighed 305, 340, 355, 355 and 370 g with the average 345 g. Small chicks were found in areas where the snow lies late, characterized by the presence of small tussocks of species of *Notodanthonia* and *Poa*, while large chicks came from areas of the colony that cleared early of snow and are grassed by the big snow tussock *Chionachloa flavescens*. The breeding seasons of 1965, 1966 and 1968 had snow drifts that did not thaw in some parts of the colony until early November. Fledging was therefore much later with the peak in the second and third weeks of March with the latest record on 3 April 1965.

The complete absence of snow on the Seaward Kaikoura ranges from June to October 1967 was followed with a peak in fledging during the third week in February 1968, and no juveniles were found at all the following month. Chicks of 400 g still fully covered in down were recorded on 5 February 1966 after the late snows of 1965, whereas in the first week of February 1968, after the snow free previous spring, juvenile chicks with adult plumage were noted.

Juvenile Hutton's Shearwaters have not been observed exercising wings at burrow entrances like other petrels, but just sit quietly on the surface before beginning their first flight to the sea. The latest juvenile seen to fledge was on 3 April 1966, and three other birds with remnants of down around the neck and flanks were noted by burrows that same night. J. A. Bartle (pers. comm.) advised that while on the trawler "Maimai" fishing on the Cone Grounds 8 km off the mouth of the Ure River from 21 to 24 March 1966, during foggy weather at night, newly fledged *P. huttoni*, some

still covered with earth from their natal burrow, landed on the vessel. These mud covered juveniles must have flown from their burrows on their fledging flight, and crashed into the floodlit trawler before landing on the sea.

Fledging Juvenile Crashes:

On 21 March 1966, with B. D. Bell and party, I had been banding fledging *huttoni* on the Kowhai colony. The following evening at the time of a thick autumn fog, a number of fledging Hutton's Shearwaters, estimated by Dr A. L. Johnston to be about one hundred, crashed into houses in Kaikoura township. Crashes of fledging juvenile Huttons' shearwaters have been recorded more frequently at Kaikoura township and surrounding farm houses from mid March through to the first week in April, than from mid-February to mid-March even though many young shearwaters leave the breeding places in the second half of February and early March. The reason is thought to be linked to the greater incidence of heavy coastal fog in late autumn compared with early autumn and late summer. F. C. Kinsky (pers. comm.) inquired if there had been a breeding disaster on the colonies during the spring of 1967 as no Hutton's Shearwater fledglings had been received during March-April 1968 from ships or around Wellington suburbs in the usual pattern. Far from being a disaster, the breeding during that season appeared to be successful with advanced chicks noted in late January and most burrows deserted by 17 February 1968. Early fledging in 1968 allowed the departing young birds a fog free flight to the ocean. Six young birds picked up under lights in Beach Road, Kaikoura, in late March 1966, had remnants of down on the nape and flanks, and one had a complete collar of down around the neck. These birds may have been deserted and left their nest in a poorly nourished condition.

Mortality:

Neither feral cats nor rats have been found on the colonies. Stoats *(Mustela ermina)* have been observed working the shearwater burrows in both winter and summer. A stoat, in ermine fur except for the black tipped tail, was seen entering several burrows on the Kowhai colony on 13 August 1967 when no shearwaters were heard or observed the previous evening. Normally at this date the breeding area is under snow in the Kowhai Valley, and an ermine stoat would be impossible to pick out against a white background. Mice are common on all colonies and may provide a food source for stoats when the shearwaters are absent from land during mid April to late August. Most of the Hutton's Shearwaters found recently dead on the breeding grounds had the neck wounds which suggested stoat predation. A stoat lair was found under a large boulder by the Kowhai River with many remains of shearwaters cached.

A New Zealand Falcon's feeding station was found in the middle Kowhai gorge, littered with dismembered parts of *P. huttoni.* On a late setting full moon that merged with dawn, in the half light,

a falcon pursued a departing shearwater. A shoulder of a spur in the gorge below prevented further observation of the fast diving pair, but some shearwaters are undoubtedly killed by falcons in these encounters. Eight freshly dead, unmutilated Hutton's Shearwaters have been found in mountain gorges and river beds of the Kowhai, and Wharekiri, and perhaps these had been concussed by a falcon in mid flight and lost in the half light.

Some shearwaters die when they crash into night lights and farm cats take some storm grounded birds. Mount Fyffe Station staff report seeing dead and live shearwaters being swept down flooding creeks during some storms experienced on this property, but the reasons for this mortality are not apparent. Harrier Hawks regularly patrol shearwater breeding areas and have been seen eating *P. huttoni* carcasses, thought to have been killed by stoats. There is a large Kea population about the colonies, but the only interference noted has been the eating of surface shearwater eggs. An Arctic Skua has been seen to attack White-fronted Terns and Red-billed Gulls that were feeding in company with Hutton's Shearwater on the Kaikoura Coast, but the shearwaters were unmolested.

ECTOPARASITES AND GECKO

Many burrows have nest chamber material heavily infested with fleas of the genus *Notiopsylla,* and a few fleas of the genus *Parapsyllus* have been found (J. R. Jackson, pers. comm.). An unrecorded species of tick has also been recovered from Hutton's Shearwater (*fide* Jackson). An undescribed mountain gecko, probably of the genus *Hoplodactylus* (A. H. Whitaker pers. comm.), found on the Wharekiri colony, may feed on shearwater fleas.

DEER, CHAMOIS AND GOATS

These introduced browsing animals were formerly common on the *P. huttoni* colonies, and their trampling frequently collapsed burrows. However, these noxious animals have been greatly reduced since 1970 and there has been spectacular regeneration of the vegetative cover over the burrows. In some breeding areas the big snow tussock appears to be more luxuriant than in non breeding parts.

ACTIVITY AT SEA

Imber & Crockett (1970) suggested that *Puffinus huttoni* is migratory, and that "the entire population of *huttoni* leaves N.Z. seas during autumn and they return in spring." Hutton's Shearwater is a sedentary species which can be seen off shore from the Kaikoura coast between the mouth of the Ure River and Haumuri Bluff on most days, if a careful search is made with an adequate telescope. I have sight records of *P. huttoni* close enough in shore for positive identification for each month of the year. Flocks of *huttoni* have been watched in mill pond seas, feeding a few metres from the beach edge, sometimes even flying low over the beach to dive back into

shoaling small fish. They are just as likely to be found on rocky parts of the Kaikoura Coast, swimming amongst kelp, frequently diving from a surface position, wings often half outstretched after small minnow-like fish. In stormy weather these shearwaters are to be found just a little further off shore, diving into or skimming the waves. Doubtless they are further out to avoid the danger of being dashed on rocks. *P. huttoni* often feeds in company of Red-billed Gulls, White-fronted Terns, and occasionally Southern Black-backed Gulls. When whitebait *(Galaxias)* are running in Kekerengu, Kowhai, or Kahutara River mouths, during late October or November, large flocks of *P. huttoni* have been seen sharing the harvest with the whitebaiters. The largest flock the author has noted at sea was about 10,000 birds feeding close inshore on 31 January 1967 about 5 km south of the Ure River mouth. A much bigger flock was photographed by several people from Kaikoura on 20 and 21 September 1967 when numerous Hutton's Shearwaters occupied the bay in front of Kaikoura township, between the Marine Biological Station and the Kaikoura Railway Station. The birds were feeding on shoals of unidentified silver fish about 35-40 mm long, which were so numerous that many were seen to become stranded on the beach. From the photographs taken on this occasion, there would appear to be possibly 20,000 *P. huttoni* in the Kaikoura Bay for those two days. The almost complete lack of vocalisation from these feeding flocks of shearwaters is surprising when one recalls how noisy they are at night on their breeding ground.

While most of my observations of *huttoni* at sea have been made from the Kaikoura Coast, I have sighted flocks within Long Bay just east of Akaroa, on Banks Peninsula, near Gore Bay, Marfell's Beach, and at the entrance to Tory Channel in Cook Strait. Falla (1965) stated that *huttoni* has been observed during September and also December in the tide rip off Karori Rock in Cook Strait, and during February in the channel between Kapiti Island and Waikanae. Sibson (1952) reported a raft of about 300 Fluttering Shearwaters at the northern end of Goose Bay, but in a recent discussion, he agreed with me that these birds were most likely to be *huttoni* rather than *gavia.* R. H. Beck, of the Whitney South Sea Expedition, collected specimens of *huttoni* just off Banks Peninsula on 28 and 29 January 1926, listed by Murphy (1930: 12) as *P. gavia* (see Murphy 1952). P. Sagar (pers. comm.) advised that a number of dead *huttoni* were picked up on a South Canterbury beach adjacent to Waimate. Serventy (1939) reported *huttoni* at sea in South Australian waters in Bass Strait, near Kangaroo Island, and an isolated specimen near Albany, in Western Australia (Fig. 6). These Australian records might possibly be juveniles from the Kaikoura population, but as yet there is no proof for this supposition. Mathews (1912) described a specimen of *huttoni* as being collected near Snares Island, but doubt about the authenticity of this location has been questioned both by Murphy and Falla. Warham (1967) did not find either *P. gavia* or *P. huttoni* on the Snares Island in recent years. All the recent New

FIGURE 6 — Extralimital records of Hutton's Shearwater in the Australian Region.
del.: Belinda Harrow

Zealand records of *huttoni* at sea are within easy flying distance of the Kaikoura breeding grounds, when it is considered that *Puffinus puffinus*, a closely related species, range up to 200 miles from its nesting island collecting food (Harris 1966).

Rafting:

Rafting of *P. huttoni* has been regularly recorded during the breeding season. Late in the day feeding ceases, and the birds gather in large idle groups riding the ocean swell. Favoured parts of the Kaikoura Coast for rafting are a kilometre or so off shore from the Kekerengu Store, also off Waipapa, and adjacent to the Goose Bay Store. These rafts could well correlate with their breeding colony directly inland on the mountain ranges.

Beach Patrols:

Beach patrols have been conducted on several Kaikoura and North Canterbury shorelines at irregular intervals. Eleven dead *P. huttoni* were recovered, but no *gavia* were found over a period of four years. In the ten days following the disastrous cyclonic storm that hit the Cook Strait region during April 10 and 11 1968, 25 km of beach were patrolled at Birdlings Flat, North and South Brighton, Leithfield, Goose Bay, and South Bay, Kaikoura (Fig. 6). Spotted Shag was the commonest species picked up, followed by the White-flippered Penguin, but no specimens of Hutton's Shearwater were found. Kinsky (1968), discussing seabird mortality around the southern North Island during the same cyclonic storm, reported finding only one *huttoni* corpse out of a total 578 dead birds identified. March and early April is a period when young *huttoni* are sometimes found on the Kaikoura, Marlborough, and Wellington coastlines, and at first it seemed odd that virtually none was recovered during the cyclonic storm. However, the explanation is possibly due to abnormally early fledging of *huttoni* in late January and February 1968. The winter and spring of 1967 brought no snow over the Kaikoura Hutton's Shearwater breeding grounds, which resulted in no delay in chick rearing. The early fledging of 1968 allowed the chicks almost two months at sea, and the parents a similar period to complete their moult and regain vitality after the stresses of breeding before the cyclone hit the area. Several investigators have pointed out the advantages of early fledging of Procellariidae and disadvantage of late fledging; Harris (1966) for the Manx Shearwater; Serventy (1966) for Short-tailed Shearwater; Stonehouse (1964) and Richdale (1963) for the Sooty Shearwater.

HISTORICAL NOTES

The vessel " Acheron " under the command of Captain J. L. Stokes, with Mr. J. W. Hamilton as surveyor, in 1849 did survey work on the east coast of the South Island between Wellington and Lyttelton. In Hamilton's diary on Tuesday, 13 November 1849, he gave an account of the first ascent of Mount Tapuaenuku by his

party, and also refers to Maoris taking mutton birds in the following quotation — " I was afterwards informed at Kaikoura Peninsula by the Natives that the Titi (muttonbird) breeds in large numbers on the Mountain (Tapuaenuku), and that many persons have been killed hunting for them " (Hamilton 1849). These muttonbirds could have been *Pterodroma inexpectata,* but are more likely to have been *Puffinus huttoni.*

Mr. H. Melville, an octogenarian, told me recently that when he was a young man in his twenties, he recalled an aged Maori describing annual mutton birding expeditions that the Waipapa tribe made up the Clarence River into the head of the Dee Stream, under Mount Tapuaenuku. These parties took a supply of Paua shellfish to keep them in food for the two to three days it took them to reach the mutton bird breeding grounds high in the mountains. Paua shell middens found at the bush line on the southern flank of Tapuaenuku were suggested as evidence of a Maori retreat of probably pre-European age (McLintock 1966: 200), but this is much more likely to have been the result of Maori mutton birding. Maoris traditionally avoided high mountainous country, and only entered when there was a powerful need such as to obtain greenstone over the other side of the alpine passes of the Southern Alps. Mutton birds were highly prized and traded between tribes like the greenstone, and would have provided sufficient incentive for Maoris to make these hazardous expeditions.

The Jacobs family of Oaro near Kaikoura have recounted descriptions of their ancestors mutton birding in the Kowhai Valley of Seaward Kaikoura Range. The tradition of mutton birding was most likely lost with Te Rauparaha's massacre of the Kaikoura Pa in 1828, and his later attacks at Kekerengu. I can find no evidence of serious Maori mutton birding in recent times.

EPILOGUE

Hutton's Shearwater colonies are widespread throughout the Seaward Kaikoura Ranges in great numbers with possible breeding on the Inland Kaikoura Range. This species appears to be surviving successfully. A detailed long term study would be necessary to work out the complete breeding biology, requiring much time and certainly a safer, permanent habitation than a tent fly used by the author.

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SHORT NOTE

STINKER: THE STORY BEHIND THE NAME

The OED, that never-failing source of curious information, tells us that a "Stinker" is "A sailor's name for the Giant Fulmar *(Ossifraga gigantea)* and other ill-smelling petrels," a term first noted in 1837. If, having been a victim of a Giant Petrel's surprisingly accurate and fullsome vomit, you are still intrigued by the phenomenon, the following recently-published studies will be of interest:

WARHAM, J.; WATTS, R.; DAINTY, R. J. 1976. The composition, energy content and function of the stomach oils of petrels (order Procellariiformes). *J. exp. mar. Biol. Ecol.* 23 (1): 1-13;

CLARKE, A.; PRINCE, P. A. 1976. The origin of stomach oil in marine birds: analyses of the stomach oil from six species of subantarctic procellariiform birds. *J. exp. mar. Biol. Ecol.* 23 (1): 15-30.