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## Numbers of Black-browed Mollymawks (*Diomedea m. melanophrys*) and White-capped Mollymawks (*D. cauta steadi*) at the Antipodes Islands in 1994-95 and their population trends in the New Zealand region

ALAN TENNYSON<sup>1</sup>, MIKE IMBER<sup>2</sup>, and ROWLEY TAYLOR<sup>3</sup>

<sup>1</sup>Museum of New Zealand Te Papa Tongarewa, P.O. Box 467, Wellington; <sup>2</sup>Department of Conservation, P.O.Box 10-420, Wellington, New Zealand; <sup>3</sup>22 Waterhouse Street, Nelson, New Zealand

### ABSTRACT

We present population size estimates of mollymawk species at Bollons Island in the Antipodes group based on counts in 1994 and 1995. Totals of 115 pairs of Black-browed Mollymawks *Diomedea m. melanophrys* and about 20 pairs of White-capped Mollymawks *D. cauta steadi* were estimated to be nesting. Based on previous counts from Bollons Island and population estimates from other islands in the New Zealand region, we conclude that numbers of *D. m. melanophrys* have increased in this region, in contrast to *D. m. impavida* which has decreased. The few data on the population size of *D. cauta steadi* hint at a population increase in that taxon also.

KEYWORDS: *Diomedea melanophrys*; *Diomedea cauta steadi*; albatross; population size; subantarctic islands; Antipodes Islands

### INTRODUCTION

Two species of mollymawk (Black-browed *Diomedea m. melanophrys* and White-capped *D. cauta steadi*) breed on Bollons Island (49°39'S 178°49'E) in the Antipodes group (Clark & Robertson 1996). Despite twice-yearly servicing of the castaway depot on Antipodes Island between 1886 and 1927 by New Zealand Government vessels carrying competent observers (Fraser 1986, Taylor 1992), no mollymawks were noted ashore at the Antipodes group until 1950. In that year about 30 birds (mainly Black-browed Mollymawks *D. melanophrys subsp.*, but also at least two Grey-headed Mollymawks *D. chrysostoma*) were seen (Warham & Bell 1979). Although some probable mollymawk chicks were seen in 1969 (Warham & Bell 1979), it was not until 1978 that breeding by *D. m. melanophrys* was confirmed (Clark &

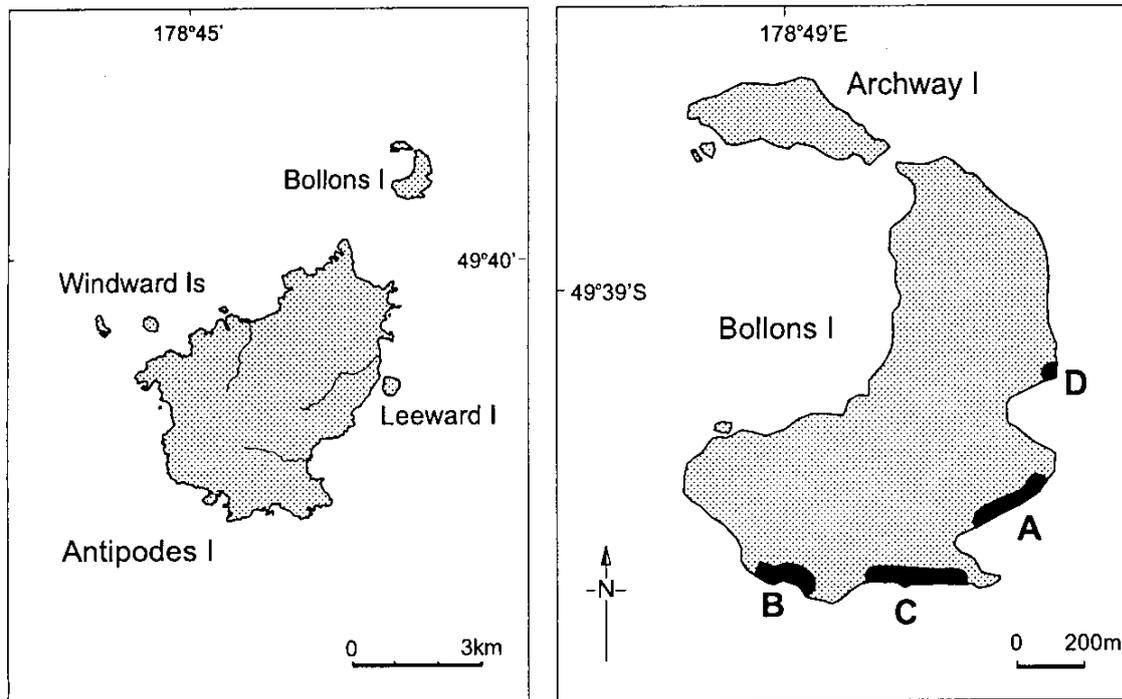


FIGURE 1 - Antipodes Island group, showing mollymawk nesting and prospecting sites.

Robertson 1996). In 1994, White-capped Mollymawks were first seen ashore and confirmed as breeding (Clark & Robertson 1996).

The numbers of each species breeding on Bollons Island have not been clear because recent counts were made either at the wrong time of the breeding season, or without the knowledge that two species bred on Bollons. Virtually all the mollymawks on Bollons Island nest on ledges on inaccessible cliffs, which makes them difficult to count (Clark & Robertson 1996). The most recent summary noted White-capped Mollymawks breeding and that "...*D. m. melanophrys* has been and probably still is breeding [on Bollons Island]" but that the "...population may have declined or shifted..." (Clark & Robertson 1996).

In this article, we present mollymawk population size estimates based on counts made in 1994 and 1995 at the Antipodes group and provide unpublished details of some earlier counts by Rowley Taylor (RT). We compare these data with other counts in the New Zealand region to look at population size changes.

## METHODS

Our population size estimates are based on observations made on 17 December 1994 by Mike Imber (MI) (Clark 1995) and between 30 October and 26 November 1995 by Graeme Taylor and Alan Tennyson (AT). MI counted mollymawks from a boat, but weather conditions during his party's visit to the island group did not allow a landing to be made on Bollons Island. On 30 October AT landed on Bollons and visited some of the nesting mollymawks and later photographed the colony from the boat using a 300 mm telephoto lens. These photographs were the basis of

TABLE 1 - Summary of mollymawk counts on Bollons Island. References: 1 = Warham & Bell (1979), 2 = RT (unpub. data), 3 = Clark & Robertson (1996), 4 = Miskelly *et al.* (1990), 5 = this study. The 11 November 1978 count was made from a small boat (RT unpub. data), not from aerial photographs (Clark & Robertson 1996). The 2 January 1993 count was made from a boat (RT unpub. data). The 7 January 1994 count was made from aerial photographs (RT unpub. data). Other count techniques are given in the above references. Counts of adults not on nests have not been included if a complete nest count was available for the same day.

BB = Black-browed Mollymawk adults on nests, WC = White-capped Mollymawk adults on nests, GH = Grey-headed Mollymawk adults, ads = mollymawk adults of unknown species, mostly on nests, but probably not all on nests, BB cks = Black-browed Mollymawk chicks, WC ck(s) = White-capped Mollymawk chick(s), cks = chicks of unknown species, --- = count covers more than one area, 0 = no birds present, ? = probably, - = not counted

Date	Area (see Figure 1 for location of areas)				Reference
	A	B	C	D	
11 Nov 1950	-----c.30 birds, mainly BB but at least 2 GH -----				1
1 Mar 1969	-----c.6 BB?cks -----				1
11 Nov 1978	75 ads	22 ads	14 ads	-	2
21 Nov 1978	c.50 presumed BB	c25 BB	-	-	3
7 Dec 1989	62 presumed BB	15 presumed BB	9 presumed BB	-	2
16 Oct 1990	58 presumed BB	----30 presumed BB----		0?	4
2 Jan 1993	87 presumed BB + some cks	----6 presumed BB----		-	2
7 Jan 1994	c.100 nests (c.48 ads, c.50 cks)	-	-	-	2
27 Feb 1994	52 cks incl. 5 WC cks	0	4 cks	1 WC? ck	3
12 Mar 1994	76 cks incl. 1 WC? ck	0	-	-	3
22 Mar 1994	several cks	0	-	-	3
17 Dec 1994	90-100 ads on nests (incl. site D)	----15-20 BB-----	few ads (see Area A)	-----	5
30 Oct 1995	c.95 BB, c.18 WC	11 BB	9 BB?	0	5
20 Nov 1995	130 ads	-	-	-	5
21 Nov 1995	130 ads	-----27 ads-----		-	5
23 Nov 1995	147 ads (+ 12 flying)	---31 ads incl. 23 BB---		-	5

the detailed 30 October counts presented below. Further counts of mollymawks on Bollons Island were made using a telescope from the main island 2 km away on 20 November 1995 by AT and on 21 and 23 November 1995 by Graeme Taylor.

A summary of mollymawk counts on Bollons Island is presented in Table 1. Nesting and prospecting sites referred to in the text are shown in Figure 1.

## RESULTS

### Bollons Island, Areas A & D

In the 1978/79 nesting season about 50 nesting mollymawks were in area A, in the 1989/90 and 1990/91 seasons about 60 nesting birds were present, while in the 1992/93 season 87 nesting birds plus some chicks were counted on 2 January - all were presumed to be Black-browed Mollymawks (see Table 1). In the 1993/94 season about 100 nests were present, including about 50 unguarded chicks on 7 January (see Table 1). All chicks seen in early January must have been Black-browed, as

TABLE 2 - The laying and hatching period of the New Zealand White-capped Mollymawk. References: 1 = Buckingham *et al.* (1991), 2 = Peter Moore pers. comm., 3 = eggs 6783, 18496-18501 & chicks 12954-12956 in Museum of New Zealand, 4 = Robertson *et al.* (1997), 5 = Bartle & Paulin (1986), 6 = Mike Aviss pers. comm., 7 = Clark & Robertson (1996), 8 = Robertson (1975). Robertson *et al.* (1997) mistakenly state that hatching began on the Auckland Islands on 24 Jan 1993 (C. Robertson pers. comm.). S.W. Cape is on main Auckland Island; Adams and Disappointment Islands are in the Auckland Island group. Robertson (1985) said laying "starts about 20 November and hatching starts at the beginning of February".

Date	Location	Breeding timetable	Reference
8 Nov 1989	S.W. Cape	No eggs laid	1
19 Nov 1989	Adams Island	No eggs laid	1
22 Nov 1995	S.W. Cape	Laying had recently begun	2
26 Nov 1907	Disappointment Island	Egg present	3
30 Nov 1991	Chatham Islands	Egg present	4
9 Dec 1944	Disappointment Island	Eggs present	3
11 Dec 1976	Disappointment Island	Many incubating birds	5
12 Dec 1995	Adams Island	Many incubating birds	6
19 Jan 1993	Disappointment Island	Hatching began	7
c.23 Jan 1997	Chatham Islands	Chick hatched	4
2 Feb 1973	Disappointment Island	Eggs just hatching	8
2-3 Feb 1944	S.W. Cape	Small downy chicks	3

White-capped chicks would not have hatched by then (see Table 2). Later in the 1993/94 season up to 76 chicks were counted and a few were identified as White-capped Mollymawk chicks (Clark & Robertson 1996). In December 1994 MI counted a combined total of 90-100 occupied nests in areas A (mostly) and D (few). The main mollymawk nesting site (A) was not examined closely from onshore on 30 October 1995, but both White-capped and Black-browed Mollymawks were seen in flight in this area. However, later that day from the boat, AT counted 117 "white-headed" mollymawks ashore here. Subsequently, using photographs taken from the boat, AT counted the following mollymawks in area A: 46 definite and 35 probable Black-browed sitting on nests and 13 definite and two probable White-capped sitting on nests. There were 17 sitting birds AT could not identify using the photos, but using the ratio of the species definitely identified in area A at the time, 80% would have been Black-browed, thus about 14 of the unidentified birds would be Black-browed and about three would be White-capped. The only birds not sitting on nests in the series of photos were two White-capped standing up and one or two Black-browed in flight or standing. The White-capped Mollymawks were concentrated around the edge of the colony but some were in the centre of the Black-browed concentration. No mollymawks were noted at area D by AT, where one chick (probably a White-capped) was seen in 1994 (Clark & Robertson 1996).

### **Bollons Island, Area B**

In 1978 25 pairs of Black-browed Mollymawks were estimated to be in this area and in 1989 15 nesting birds, presumed to be Black-browed, were present, however, no sign of nesting was seen here in February-March 1994 (see Table 1). On 30 October 1995 AT visited area B and saw five adult Black-browed incubating, two adults presumed to be on eggs and one immature (with a slightly dark bill tip) on an empty nest. All these birds had the dark eyes of *D. m. melanophrys*. From the boat offshore later that day a further three Black-browed probably on nests which could not be seen from onshore were noted in this area. Overall, there were less than half the number of nests in 1995 as there were in 1978 and only one nest was accessible from above in 1995, compared with 12 accessible in 1978 (Clark & Robertson 1996). In February-March 1994 these nests must have been either overlooked or all had failed and been abandoned when observations were made.

### **Bollons Island, Area C**

In 1978 14 nesting birds were in this area, in 1989 nine presumed Black-browed were nesting, while in February 1994 four chicks of unknown species were seen (see Table 1). In December 1994 MI noted a total of 15-20 nests in areas B and C combined - all *D. m. melanophrys*. From the boat on 30 October 1995 AT saw nine sitting birds, probably Black-browed. AT found that birds were present in area C not only where this site is shown in Clark & Robertson (1996), but also further to the west of this area.

No other albatross species was seen ashore at any site on Bollons Island during December 1994 or in October/November 1995.

### **Mollymawks elsewhere at the Antipodes group**

Records of mollymawks elsewhere at the Antipodes Islands include a few *D. m. impavida* and two possible Salvin's Mollymawks (*Diomedea cauta salvini*) at sea close offshore (Warham & Bell 1979, Clark & Robertson 1996).

Nesting or roosting mollymawks were specifically searched for by RT during fur seal (*Arctocephalus spp.*) and seabird surveys from boat and helicopter around the entire coastline of Antipodes and its offshore islands during November-December 1978, March 1985 and December 1989 (Taylor 1992). Mollymawks were found ashore only on Bollons Island.

Clark & Robertson (1996) noted several White-capped Mollymawks flying around Inner Windward Island on 24 March 1994 and one bird taking off from a ledge. Graeme Taylor and AT scanned the eastern side of Inner Windward Island through binoculars from the adjacent part of the main island on 16 November 1995, and passed close by the eastern side in the boat as we left the Antipodes group on 26 November, but saw no mollymawks there.

Observations of mollymawks from the main island during the 1995 trip were: one adult *D. m. melanophrys* flying along the cliff tops opposite Leeward Island on

8 November (AT & Graeme Taylor), one adult and one immature Grey-headed off Stella Bay on 10 November (AT), one adult Grey-headed and one immature Black-browed (subspecies unknown) off Reef Point on 20 November (MI), one probable adult Grey-headed off Anchorage Bay on 22 November (AT), two adult and one immature Black-browed (subspecies unknown) off the northwest coast on 26 November (AT). Interestingly no White-capped Mollymawks were seen at sea close to the islands, yet several Grey-headed Mollymawks were noted (the first reported since they were seen ashore on Bollons Island in 1950 (Warham & Bell 1979)).

## DISCUSSION

### Summary of *Diomedea m. melanophrys* numbers in the New Zealand region

At all sites on Bollons Island AT counted a total of 115 (57 confirmed and 58 probable) Black-browed Mollymawks on nests in October 1995. It was not possible to determine the numbers of breeders versus non-breeders because most birds were too far away, at inaccessible sites. However, as nearly all birds were singles sitting on nests and there was little sign of non-breeding activity, e.g. standing birds displaying to each other, most were presumably incubating. Laying dates for this species in the New Zealand area (Campbell and Macquarie Islands), suggest that laying at Bollons Island should have been completed by mid-October (Marchant & Higgins 1990, Moore *et al.* 1997), so the 30 October count should give a good estimate of total nesting pairs. AT assumed that all Black-browed ashore were of the nominate race. MI counted a total of about 120 nesting birds in December 1994 - all of those seen closely enough were Black-browed but a few were assumed to be White-capped. Clark (1995) noted about "97 nests of Black-browed mollymawks" - this figure is based on MI's counts (G. Clark pers. comm.), so is an under-estimate.

Although Robertson (1985) stated that about 150 pairs of Black-browed Mollymawks breed at the Antipodes Islands (a figure repeated by Turbott 1990, Marchant & Higgins 1990 and Heather & Robertson 1996), this is an over-estimate not based on any count (see Table 1). A revised estimate by Robertson of 100 breeding pairs (Gales 1993) is presumably based on counts in 1989 and 1990, not from a survey in 1992 as stated in Gales (1993), because there was no survey in 1992 (see Table 1).

*D. m. melanophrys* nests on many widespread islands in the Southern Ocean and is the most abundant albatross in the world, with 537130 breeding pairs (Gales 1993). In the New Zealand region it nests in small numbers at three island groups apart from the Antipodes. On Toru, Western Chain of The Snares group, the first record of birds ashore was on 11 February 1984 (Miskelly 1984) and one nesting pair was noted on 15 and 29 December 1984, 19 January 1986 (Miskelly 1997, AT pers. obs.) and in late 1995 (G. Clark, unpub. data). At Campbell Island, the earliest record of a bird ashore is about 1970 and breeding has occurred since at least 1979, with 24 nests noted in September-October 1992 (Moore *et al.* 1997). At Macquarie Island the first records ashore are in 1949/50 (Copson 1988) and about 120 pairs bred in 1993 (including 91 pairs on the Bishop and Clerk Islets) (Scott 1994). An incorrect figure of 600-700 pairs was given for Macquarie Island by Marchant & Higgins (1990).

### Summary of *Diomedea cauta steadi* numbers in the New Zealand region

Determining the number of White-capped Mollymawks nesting on Bollons Island was more problematical. Their laying should not have begun by 30 October (see Table 2) and counts carried out later in the season when laying should have begun, were made from too far away to identify most of the mollymawks to species and identify non-breeding birds. Graeme Taylor and AT carried out three counts of birds on Bollons Island using a telescope from the main island during November 1995 (see Table 1). MI could not confirm any White-capped on nests on 17 December 1994 due to poor light conditions but noted about eight in flight.

By mid to late November White-capped Mollymawk laying should have begun on Bollons Island, if the breeding timetable is similar to that at the Auckland and Chatham Islands (see Table 2). If incubation is 72 days (Robertson & van Tets 1982), then some laying may occur as early as 8 November. A build up in total mollymawk numbers on Bollons Island between 30 October and 26 November would be consistent with White-capped Mollymawks laying and occupying more nests (mollymawks occupy their nest only between 21 and 54 % of the time in the pre-laying period (Tickell & Pinder 1975)). It would also be consistent with a build up in numbers of non-breeding Black-browed Mollymawks after laying - such a build up has been shown to occur in other albatross species (e.g. Pickering 1989). However, there can be only a small number of White-capped Mollymawks on Bollons Island as MI did not detect an increase in total mollymawk numbers by 17 December 1994 (compared to October-November 1995 counts), when White-capped laying should have been completed (see Table 2). Clark's (1995) estimate of about ten White-capped nests on Bollons Island was based on the eight birds seen in flight. AT's counts suggest closer to 20 pairs could be present.

*D. cauta steadi* is virtually confined to nesting at the Auckland Islands where there have been few counts. The main colony on Disappointment Island was estimated at 60000 pairs in 1972-73 (Robertson 1975), 72000 pairs on 18 February 1985 and about 74000 pairs on 15 November 1990 (Rebergen 1991); Gales (1993) listed 64000 pairs for 1990. The two smaller colonies at the Auckland Island group have been estimated as follows: S.W.Cape, Auckland Island - 4000 pairs in 1972/73 (Robertson 1975), and >500 birds on 8 November 1989 (Buckingham *et al.* 1991); Logan Point, Adams Island - 200 pairs in 1972/73 (Robertson 1975), 50 nests on 19 November 1989 (Buckingham *et al.* 1991), 50 nests on 12 December 1995 (M.Avis, pers. comm.). Gales (1993) gives undated estimates of 1000 pairs at S.W. Cape and 200 pairs on Adams Island. Apart from at Bollons Island, the only other nesting records are at the Forty Fours, Chatham Islands, where single nests were found in 1991, 1993 and 1996/97 (Robertson *et al.* 1997).

### Population trends of *Diomedea m. melanophrys* and *D. cauta steadi* in the New Zealand region

The counts presented here (maximum 190 adults present at one time (see Table 1), with about 135 nesting pairs of both species combined) are greater than

previous numbers recorded - the previous maximum count of adults ashore was 111 birds on 11 November 1978 (see Table 1). Apparently no mollymawks bred at the Antipodes group at the beginning of this century because Hutton (in Ogilvie-Grant 1905) noted that Captain Bollons of the Government steamship "has never seen any species of 'Molly-mawks' on the Antipodes Islands, and it is now certain that none breed there". Falla and Turbott (in Warham & Bell 1979) saw only about 30 birds (mainly Black-browed with some Grey-headed) on Bollons Island in November 1950. The new counts presented here are consistent with a continued increase in mollymawk numbers since at least 1950. It is not clear when White-capped Mollymawks first colonised Bollons Island, but as the first birds ashore were only identified on 27 February 1994 (Clark & Robertson 1996), they are presumably recent colonists.

Population trends for these species elsewhere in the New Zealand region are not entirely clear. At The Snares Western Chain, only a single *D. m. melanophrys* nest has been recorded in three different seasons. At Campbell Island *D. m. melanophrys* is easily overlooked amongst large colonies of the endemic Campbell Island race *D. m. melanophrys impavida* with which they sometimes hybridise (Moore *et al.* 1997), so population trends can not easily be determined there. However, the fact that *D. m. melanophrys* was not recorded at either group before about 1970 suggests that the populations are more likely to be new colonists than remnants of larger populations.

Observations on Campbell Island are consistent with an increase in numbers of *D. m. melanophrys*. In the 1940s, J. Sorensen often visited the Courrejolles mollymawk colonies (Bailey & Sorensen 1962), where the highest ratio of *D. m. melanophrys* to *D. m. impavida* now occurs (G. Taylor pers. comm.), but he did not report dark-eyed birds. In one part of the Bull Rock South colony, only two non-breeders were found in 1975 and three nests were found in 1984, whereas usually five or six nests were found each season between 1987-88 and 1994-95 (Moore *et al.* 1997).

On the main Macquarie Island, the population appears to have colonised or recolonised since early this century - it has been speculated that sealers and oil-gatherers exterminated *D. m. melanophrys* last century and that the birds recolonised from nearby Bishop and Clerk Islands (MacKenzie 1968, Copson 1988), but no Black-browed Mollymawk bones have been found in natural or archaeological bone deposits on Macquarie Island (Meredith 1985, AT & P. Scofield, unpub. data). Current colony sizes at Macquarie indicate increasing numbers at the largest main island colony at Petrel Peak, although the smallest colony at North Head is declining (Gales 1993, Scott 1994).

In summary, in the New Zealand region it seems that breeding numbers of *D. m. melanophrys* have increased since 1950 (in fact there is no proof of breeding in this region until 1949/50). It is possible that *D. m. melanophrys* has colonised all islands in the New Zealand region recently, much as the Black-winged Petrel (*Pterodroma nigripennis*) has substantially expanded its breeding range recently, simultaneously colonising or recolonising many widespread islands (Jenkins & Cheshire 1982, Tennyson 1991). The evolution of the distinctive *D. m. impavida* supports this theory as it suggests that Black-browed Mollymawks in New Zealand have been reproductively isolated from other Black-browed populations for some time.

In contrast to the situation in the New Zealand area, some much larger *D. m. melanophrys* colonies outside this region have substantially declined in numbers (Gales 1993), as has *D. m. impavida* at Campbell Island (Moore and Moffat 1990). However, it is notable that on Heard Island (the nearest *D. m. melanophrys* colony to the New Zealand region), the population has increased from 230 breeding pairs in the early 1950s to 600-700 in 1987-88 (Kirkwood & Mitchell 1992).

There is little information available on population trends from any New Zealand White-capped Mollymawk colony. Although counts on Disappointment Island suggest an increase, the counts from different years are difficult to compare because they were carried out at different times of the breeding cycle (Rebergen 1991). However, Bartle & Paulin (1986) commented that on 11 December 1976 it "...seemed as though all colonies [on Disappointment] were slowly expanding, for birds nesting on the edges of major colonies had nest sites in relatively unmodified vegetation, and there were no areas of 'mollymawk-induced vegetation' without birds". The two new breeding sites (at Bollons Island and the Chatham Islands) also hint at a population increase. The S.W. Cape colony on Auckland Island is declining due to the presence of pigs (Gales 1993).

In the New Zealand region, the lack of information on population dynamics of *D. cauta stedi* and *D. m. melanophrys* and changing commercial fisheries patterns, particularly longlining fisheries which drown large numbers of these mollymawks (Gales 1993), make it difficult to predict future population trends.

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