THE PELAGIC ECOLOGY OF MANX SHEARWATERS *PUFFINUS PUFFINUS* OFF THE SOUTHEASTERN UNITED STATES OF AMERICA

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SUMMARY

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Knowledge of the biology of Manx Shearwaters *Puffinus puffinus* is largely based on data obtained in and around breeding colonies. In this paper I provide information on various aspects of the marine ecology of this shearwater. The information presented here on age and sex ratios, masses, moult sequence and food habits is the first recorded away from the species' breeding grounds. Whereas not common, Manx Shearwaters occur regularly in pelagic zones off the southeastern United States of America and the number of birds appears to be increasing. As expected, most occurrences are from migration periods and 38% of the total records and reports (n=121) are from the northern spring (March–May). The timing of migration is masked by the presence of birds throughout the northern winter and a small number of summer records. The local occurrence of moulting adults and immatures indicates that at least some segment of the population does not undergo transequatorial migration. Based on banding records and other information it appears that summer birds are largely, and perhaps exclusively, immatures that need not return to their nesting areas in northern latitudes.

INTRODUCTION

The purpose of this study is to present information on the pelagic ecology of the Manx Shearwater *Puffinus puffinus*. The study is based primarily on at-sea observations and specimens personally obtained between 1975 and 1989 off the coast of North Carolina (USA). The information base is supplemented with the published reports of others and museum specimens from the southeastern United States of America.

Through the early part of this century Manx Shearwaters were considered accidental in the western hemisphere with only single records from Greenland, Long Island, New York and Maine (American Ornithologists' Union 1931). By the 1960s when Post (1967) summarized records of black and white shearwaters there were many more records of Manx Shearwaters for the United States of America, but only three records were known from the southeastern United States (Maryland to Texas). At that time all southeastern USA reports were from Florida. First records from elsewhere in the southeastern United States of America were not recorded until much later: Maryland, 1974; Virginia 1975; North Carolina, 1970; South Carolina, 1985; and Georgia in 1982. The first Gulf of Mexico record was from Texas in 1975 and the species has since been found on the Gulf Coast of Florida and Alabama (see Appendix I). Subsequently there have been a considerable number of additional records from the southeast. Here I compile 121 records of occurrence. The increase in numbers is to some extent an artifact of the increased regional field effort expended on seabirds, but during this same time period there has been a well documented population increase and range expansion of Manx Shearwaters in the North Atlantic (see below).

Manx Shearwaters may have nested on Bermuda until

1905 (Dwight 1927, Bourne 1957), but the evidence is not conclusive (Bannerman 1959). Fossils have been reported from St Croix, Antigua, the Bahamas (Crooked Island) and Florida (Bond 1956, Brodkorb 1963, Wetmore 1938, Wing *et al*. 1968), but none of the material was verifiable to species (Olson & Hilgarter 1982). Bierregaard *et al*. (1975) reported birds incubating and later a large downy chick in a burrow on Penikese Island, near Martha's Vineyard, Massachusetts, the first known nesting record for Manx Shearwaters in North America. Storey & Lien (1985) followed the development of the first known North American colony in Newfoundland between 1977 and 1981. They found the colony growth to be slow, consisting mostly of young birds with low reproductive success. The colony was apparently just forming as their studies progressed. Some of the birds present had been previously banded in European colonies as chicks. A specimen in the US National Museum (USNM 395071), however, suggests that the species may have been breeding there as early as 1947 (see Clapp *et al*. 1982).

Manx Shearwaters have the most northerly breeding distribution of any of the shearwaters (distribution maps in Harrison 1983). Whereas the nominate race of the Manx Shearwater is one of the best studied of the world's seabirds (Lockley 1942, Harris 1966, Brooke 1990; see also Cramp & Simmons 1977, Clapp *et al*. 1982) relatively little is known for the species outside its breeding season.

METHODS

Records of Manx Shearwaters were compiled from the southeastern United States (from Maryland to Texas). Published information from the Antilles is also summarized, but is not included in totals or percentages presented. Records were obtained from the literature, regional reports in *American Birds* [to vol 47(1)], personal correspondence, museum specimens and personal observation. All references to season pertain to the northern hemisphere.

Between 1975 and 1989 231 one-day transects through as many marine zones as possible were run from the Outer Banks of North Carolina, USA. These transects were conducted from chartered fishing boats that departed from Oregon Inlet or Hatteras Inlet. Shallow inshore waters, the edge of the continental shelf, and deep waters were surveyed, including the Gulf Stream and its inner edge. Small samples of birds were collected with shotguns. Birds were frozen and processed later at the museum. Water temperature, LORAN positions and sea conditions were recorded regularly as well as at the time of sightings of Manx Shearwaters. Water depths were later calculated from LORAN positions. Although day length varied considerably the number of hours spent surveying was similar (8–10 h) for all seasons. Values for the figure illustrating seasonal distribution of Manx Shearwaters off North Carolina were calculated using the average number of individuals seen per trip by two-week intervals.

RESULTS AND DISCUSSION

Phenology and distribution

Atlantic Manx Shearwaters are largely obligate trans-equatorial migrants. After the breeding season they migrate south and winter off the west coast of South America at latitudes ranging from 10° to 50°S (Blake 1977, Cramp & Simmons 1977). Based on numerous transects off New England, over Georges Bank and in the Gulf of Maine, Powers (1983) estimated there were 5000 Manx Shearwaters using shelf waters in the northern summer, 2000 in the northern autumn and less than 1000 in the northern spring. The season of occurrence for Manx Shearwaters was described by Lee (1988a) for North Carolina and generally the patterns outlined by his studies are also true for the rest of the southeast. Whereas the species occurs regularly in the offshore waters of the southeast it is not common. A compilation of all shearwater observations from offshore North Carolina between 1975 and 1989 (pers. obs.) showed that Manx Shearwaters accounted for only 0.35% of 25 032 birds counted. Appendix I and Figs 1 and 2 present and summarize reported occurrence for the southeast. Autumn migration is underway as early as 10 October and peaks in late December. The northern spring migration is apparent by 16 March (42 individuals in a single day off North Carolina) and continues until mid-June (13 June, Maryland). This extends the period of migration as outlined in Cramp & Simmons (1977). Precise timing of local migration is masked by small to modest numbers of birds found throughout the winter. There are only two winter records (mid-December-February) from Maryland and one record for 18 individuals off Virginia in early February but wintering birds seem to be encountered regularly from North Carolina southward to Florida (Appendix 1). Several northern summer records of single birds are available from the northern portion of the southeast (Maryland, 8 August 1974; Virginia, a dead bird found 29 June 1975, but perhaps from earlier in the season; 21 August 1988 and 3 August 1991; and

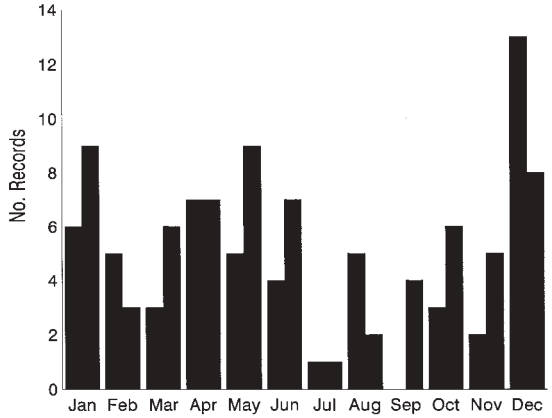

Figure 1. *Seasonal distribution of Manx Shearwater* Puffinus puffinus *records and reports from the southeastern United States of America by two-week periods.*

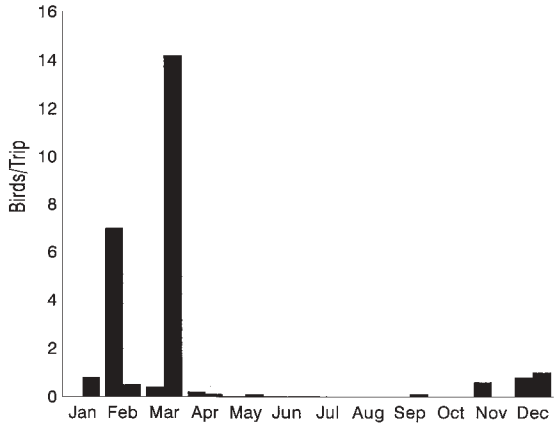

Figure 2. *Seasonal distribution of Manx Shearwaters* Puffinus puffinus *for North Carolina, United States of America by two-week periods.*

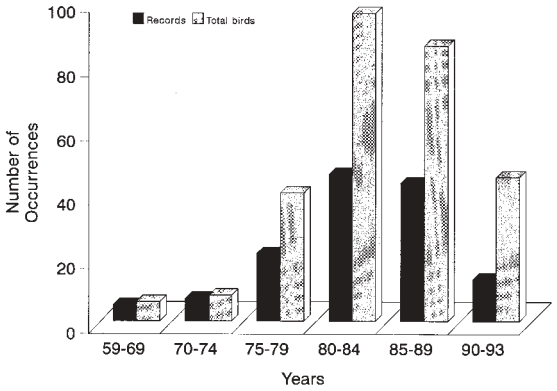

Figure 3. *Increase in number of reports of Manx Shearwaters* Puffinus puffinus *off the southeastern United States of America from 1959 to mid-1993.*

North Carolina 26 June 1984, 1 August 1988, and a dead bird on 26 June 1978 from earlier in the season). A large percentage of the records from south of Cape Hatteras and the Gulf of Mexico is not from the migration period. Off Bermuda Manx Shearwaters occur from 3 February to 23 June (Amos 1991).

Only nine records are available from the Gulf of Mexico and most are specimen records apparently associated with storms (see Appendix 1). The 11 August 1980 bird from south of Port Arkansas and the three records off the east coast of Florida suggest that small numbers may remain in the greater Caribbean area throughout the summer. These are probably immature birds as indicated by a first-summer bird banded in England and found on 28 June 1980 in the Dominican Republic (British Trust for Ornithology files) and a Texas band recovery of a two-year old bird (Clapp *et al*. 1982). Only four records (one a young bird based on age at time of banding) have been obtained off the south Atlantic coast north of Cape Canaveral during the summer, despite extensive offshore field work by myself and others during this period.

Loftin (1992) reviewed records in *American Birds* between 1947 and 1990 and found no reports of Manx Shearwaters for the Greater or Lesser Antilles. There are only a few records for the Antilles (see Appendix 1). Nevertheless, I suggest the general lack of records is more a reflection on the limited coverage for the area and should not be interpreted as an absence of birds.

In summary, records from off the southeastern United States are from the migration period, during the breeding period (probably of immature birds) and from the November to mid-January period when the species is believed to be wintering primarily in the southern hemisphere.

A marked increase in the number of records since the mid-1970s (Fig. 3) is seen after all the records (n=121) and total number of birds (n=279) known from the southeastern United States and its offshore waters are compiled. It is not possible to say what portion of this increase is a result of an increased awareness of the importance of reporting unusual birds or of the increase in the amount of time spent in pelagic bird study. Offshore from North Carolina, however, where systematic surveys of pelagic birds have been conducted since 1975, there has been an increase in the number of reports without an increase in the amount of coverage (pers. obs.). This period of increase is similar to the time period in which the Newfoundland colony was becoming established.

To date all western North Atlantic specimens are of the nominate subspecies *P. p. puffinus*, including the 21 that I examined from the southeastern United States. Four banded Manx Shearwaters have been recovered in the southeast, all from breeding colonies in Great Britain. The other North Atlantic taxa, *P. p. yelkouan* and *P. p. mauretanicus* of the Mediterranean, are to date unknown from the western Atlantic and are considered by Bourne *et al*. (1988) to be coastal and not pelagic.

Occurrence and behaviour at sea

Nearly all records are of birds observed on offshore excursions and only rarely are birds seen from shore. There are no inland records of storm-driven birds and only 15 specimens of birds found dead on the beach are available for the southeast. There are several reports of birds seen flying close to shore, but except for those reported by Buckley (1973) at Cape Hatteras, few have details which would provide confirmation. By far the majority of records are of individuals or small groups seen far out at sea.

In the Gulf of Mexico and from Cape Hatteras, North Carolina and south all but 19% of the records (n=62) are of single birds. North of Cape Hatteras records of small groups of birds are more common (53% of 59 records). The relatively large number of birds for the smaller area of southeastern coast north of Hatteras represents 49.5% of total records for the southeast (n=121) and 73.4% of total individuals (n=279). Because the higher percentage of records in the northern portion of the study area is of groups of birds this information may provide clues to migratory movements. I suggest that both northern spring and autumn migrants in the western North Atlantic are few and typically pass east of the Bahama Banks and therefore these shearwaters are only occasionally encountered in the southeast south of Cape Hatteras. This is indicated by the smaller number of individual birds (only 24.0% of total birds from the southeast are south of Cape Hatteras) and the infrequency of the presence of groups (Appendix 1). Farther out in the Atlantic the spring migration is better defined. Amos (1991) reports an average of 96 birds per hour passing off Bermuda between 9 and 14 March. Eastern Atlantic breeding birds migrate south via West Africa and do not normally cross to the western Atlantic north of the Equator (Brooke 1990).

Surface-water temperatures at sites of foraging Manx Shearwaters for 13 fall and winter (3 December–2 April) records off North Carolina show that birds foraged over a wide range of surface temperatures (6.9–23.5°C, mean

17.5°C). However, in nearly all cases the birds were near the inner (west) wall of the Gulf Stream where they foraged in both warm (16.5–23.4°C) and adjacent cold (7.0–9.5°C) water. Off South Carolina birds seen between 1983 and 1985 were at sea-surface temperatures ranging from 10° to 28.3°C (mean 19.7°C, n=11) (J.C. Haney pers. comm.).

Except for a few birds sighted from the beach, all North Carolina records are from the Outer Continental Shelf. Nearly all birds were found along or near the inner edge of the Gulf Stream where it paralleled the 200–1000-m contour. This is a region of strong upwellings and frontal boundaries which dependably collect macroplankton which in turn attracts larger organisms (pers. obs.). On 16 March 1984 35 of 42 Manx Shearwaters seen were found along the edge of the Gulf Stream where the water temperatures at the frontal boundary were 14.4° and 19.4°C. That day the inner edge of the Gulf Stream paralleled the 200-m contour. Five birds were along a small tideline inshore of the Gulf Stream in 30 m of water. Here the cool shelf water was 6.8°C. Two birds were found in the Stream between 300 and 400 m where water temperatures ranged from 20.6° to 21.4°C. On the same date three of 35 birds along the edge of the Gulf Stream were seen feeding in an area where a hard bottom caused the current to ripple visibly the surface despite the fact that the area was in 200 m of water. Off South Carolina and Georgia birds were found over shallower water (20-300 m, mean 42 n=11, J.C. Haney pers. comm.). Off Maryland Manx Shearwaters were found over water from 20 to 200 m but deeper areas were not well surveyed (Rowlett 1980).

On 14 February 1987 14 Manx Shearwaters were observed feeding with 400 Bonaparte's Gulls *Larus philadelphia*, two Common Loons or Great Northern Divers *Gavia immer* and one immature Greater Black-backed Gull *Larus marinus*. The birds were in 10.4–10.7°C water 30 m in depth. The area was well inshore and northwest of the Gulf Stream. The mixed group of birds were foraging over a school of Albacore *Thunnus alalunga*. No Manx Shearwaters were seen in or along the edge of the Gulf Stream on that date. This was the only time I observed these shearwaters feeding over fish schools and one of the few times they were not associated with frontal boundaries.

Diet and feeding behaviour

Stomachs from birds collected off North Carolina contained 0.5–10.7 g (mean 4.2 g, n=16) of food. All but two exclusively contained remains of small, mostly digested fish. One contained 60% fish remains and 40% small (20-mm total length) squid and the other large pieces of squid. Fishes that could be measured were 40–60 mm in total length. Those identified were Clupeidae and Stromateidae. In addition to fish, most gizzards (58%) contained small broken squid beaks, three contained small (2–4-mm) pebbles, two contained *Sargassum* leaves and floats and one had crustacean remains. Monofilament line (one gizzard) and two small plastic beads were also recovered. Percent frequency of occurrence for all specimens was as follows: fish 87.5%, squid 68.7%, crustaceans 6.2%, plant material 12.5%, plastic and Monofilament 18.8% and sand 18.8% (Moser & Lee 1992). The presence of *Sargassum* suggests foraging around sargassum mats, a feeding behaviour commonly exhibited by Audubon's Shearwaters *Puffinus lherminieri* (pers. obs.). A beached specimen found in January 1979 in Brevard County, Florida contained squid beaks, angiosperm seeds, capsules and foliage (W. Hoffman pers. comm.).

Off North Carolina Manx Shearwaters flew one to two metres above the surface of the sea. Birds were seen surface-dipping while on the wing, but were seldom observed diving or feeding while swimming. I watched two individuals dive from a swimming position on 15 March 1984. They remained under water 5-10 s. Feeding birds were solitary or in loosely-formed groups and were generally not seen in close association with other foraging seabirds.

All previous information on the diet of Manx Shearwaters is from northern seas, and most from breeding populations (Lockley 1942, Brooke 1990). Cramp & Simmons (1977) summarize "Fish, mostly small; also cephalopods, small crustaceans, and surface floating offal. Feeds by day by pursuit-plunging, pursuit-diving, and by surface-seizing; in varying numbers from single birds to small flocks." This species is also known to feed at night (Watson 1966). Brooke (1990) notes that information on food is meagre and summarizes the few studies at breeding colonies.

Plumage, moult and age and sex ratios

Manx Shearwaters exhibit little variation in plumage between age classes or sexually dimorphic plumages (Cramp & Simmons 1977). James (1986) showed that more males had filoplumes and had larger numbers of these feathers than did females and that the number of filoplumes increases with age. Examination of birds obtained off the southeast showed filoplumes on four adult male specimens collected on 16 March 1984.

Adults of both sexes obtained off North Carolina in December had fewer filoplumes.

Cramp & Simmons (1977) indicate that there is little if any information on moult sequence in Manx Shearwaters, although they recognize that moult occurs at sea away from breeding colonies. Specimens obtained off North Carolina suggest that moult of flight feathers in adults starts soon after the birds leave breeding colonies.

Adult birds from December (one female, four males) were replacing primaries and just starting to replace secondaries and showed no to little signs of head, neck, or body moult. The female's moult was several weeks in advance of the males'. A January male had all new primaries, with #9 (descendant sequence) 90% grown and #10 emergent. Secondaries and secondary coverts were in moult. The head, nape, body and tail feathers were in heavy moult. Two 14 February males from North Carolina had all new primaries with the outermost sheathed and both showed tail, head and neck moult. A third male specimen from that date had completed its primary moult, but had heavy body moult and sheathed tail feathers.

By March moult is essentially complete. Two males and two females collected on 16 March exhibited no moult. A fifth specimen, a male from the same date, was still replacing flight feathers (#9 nearly grown, #10 three-quarters grown), the tail was mostly composed of new or growing feathers, and the body was in light to moderate moult. A June beach-washed specimen (age unknown) showed no signs of moult.

Four young individuals (with bursas) were in moult sequences different from those of adults collected on similar dates. A 3 December male had no primary moult, some tail feather replacement and moderate head and neck moult. I assume this to be a first-year bird. A 28 December immature Manx Shearwater that, based on moult, was a post-hatching-year bird had primaries 1–8 new and 9 to the outermost growing, several tail feathers in sheath and moderate body moult. A 16 March immature had no primary moult, but tail feathers were in sheath and body moult was heavy. This is believed to be a hatching-year bird. A 6 April specimen exhibited only light body moult. The single Georgia specimen from 12 August is believed to be a young of the previous year. This is based on its very worn primaries. The tail feathers, scapulars, and several median coverts were new.

In summary, primary moult in adults is advanced by the first week in December and probably starts in late October. It is completed by mid-March, whereas tail feathers and body feathers are replaced toward the end and after the primary and secondary moult cycle. This information adds considerably to the information presented by Cramp & Simmons (1977, unnumbered figure on page 149).

Based on the presence of bursas, four of 18 birds checked were young individuals, (28 December (3), 16 March, 6 April 1987) and moult sequence indicated that two of these were first-year birds. The 12 August specimen (UG 5241) is also believed to be a first-year bird. Thus, five of 20 (25%) birds that were assigned to age classes were not adults.

The age and sex ratios are quite biased with adults representing 75% and males representing 81% of the specimens collected at sea. (Significance checked by chi-square test, $P<0.005$.) Highly biased age or sex ratios are regularly encountered in most species of sea birds I have studied off the North Carolina coast (Lee 1988b, unpubl. data). I interpret this to indicate that adult males winter north of females. In that males with at least five years' breeding experience typically arrive at breeding burrows up to a week prior to females (Brooke 1990) it seems likely that whereas most adult birds winter off South America some males winter close to their breeding grounds. This is consistent with patterns suggested by Myers (1981). It would be informative to obtain information on age and sex ratios of birds wintering off South America.

Known ages of banded birds recovered in the southeast are two years (one individual from Texas), and 17 and 19 years since their banding as adults (two birds taken off North Carolina).

Masses and measurements

Masses and other measurements of 21 of the known 32 specimens from the southeastern United States are presented in Table 1, and fall within the ranges for nominate *puffinus* (Brooke 1978). Whereas Cramp & Simmons (1977) showed in the measurements of skins of adults that males are significantly larger (wing, tarsus and middle toe) than females, this is not true for the small series of specimens collected off North Carolina. In fact, females had average greater masses, had longer total lengths, and greater total wing spans.

Masses of specimens collected at sea show females (339-503 ± 35.8 g, n=3) to have a greater mass than

TABLE 1

MASS AND MEASUREMENTS OF SPECIMENS OF MANX SHEARWATERS *PUFFINUS PUFFINUS* COLLECTED IN THE SOUTHEASTERN UNITED STATES OF AMERICA. DATA FROM BEACH-WRECKED SPECIMENS ARE NOT INCLUDED

Specimen	Date	State	Sex/Age	Mass	Wing	Wing span	Total chord	Tail Length	Culmen	Tarsus	Fourth Toe
NCSM 8957	28 Dec 1982	NC	male/yg	346	755	215	375	72.1	36.1	43.2	48.5
NCSM 8926	3 Dec 1982	NC	male/ad	335	775	216	371	71	33.5	43.5	48.9
NCSM 8852	3 Dec 1982	NC	male/yg	383	782	239	378	74.5	36.7	43.5	50.5
NCSM 10108	16 Mar 1984	NC	male/ad	441	776	241	363	68.5	35.5	45.5	47.5
NCSM 10109	16 Mar 1984	NC	male/ad	384	792	237	377	70.9	35.3	42.3	50.5
NCSM 10111	16 Mar 1984	NC	male/ad	390	757	221	383	75.6	35.5	43.5	46.6
NCSM 10113	16 Mar 1984	NC	male/yg	426	796	240	375	70.0	38.0	45.9	47.1
NCSM 7092	30 Dec 1978	NC	male/ad	424	787	224	385	73.5	35.1	41.5	49.5
NCSM 7093	30 Dec 1978	NC	male/ad	410	778	222	390	73.5	36.0	45.4	49.2
NCSM 7091	30 Dec 1978	NC	male/ad	430	755	216	386	73.5	34.6	42.6	46.3
NCSM 11814	19 Jan 1988	NC	male/ad	448	750	222	320	75.2	37.5	43.0	47.5
NCSM 11813	19 Sept 1988	NC	male/ad	337.2	730	227	350	72.5	38.2	43.5	51.8
USNM 610341	14 Feb 1987	NC	male/ad	441.2	(skeleton)						
LSU 131188	14 Feb 1987	NC	male/ad	449.5	–	231	–	–	35.4	–	–
LSU 131189	14 Feb 1987	NC	male/ad	445.1	–	231	–	–	35.4	–	–
LSU 131190	6 April 1987	NC	male/yg	348.5	–	228	–	71.7	33.2	–	–
UG 5241	12 Aug 1983	GA	male/yg	232.2	–	236	–	70.2	35.1	42.7	48
NCSM 7094	30 Dec 1978	NC	female/ad	503.4	822	232	403	75	35	45.9	50
AMNH 825937	1 August 1988	NC	female/?	(preserved in alcohol)							
NCSM 10110	16 Mar 1984	NC	female/ad	439.9	815	233	370	83	33.5	42	47.6
NCSM 10112	16 Mar 1984	NC	female/ad	338.8	749	225	342	75	32.2	41.5	47.5

males (335-449 ± 76.1 g, n=16) and immatures having masses well within the range of adults (mass of Georgia bird apparently erroneous and not included). Cramp & Simmons (1977) state that Manx Shearwaters breeding in the United Kingdom were significantly different in mass between March (mean 478 g) and June (mean 424 g). Means of adult males collected off the southeastern United States of America were 402 g and for females 427 g. This is somewhat lower than means provided for adults at breeding colonies (Brooke 1990, Cramp & Simmons 1977). Beached specimens weighed 300–400 g, whereas the lowest mass of healthy birds collected at sea was 335 g.

CONCLUSIONS

In conclusion, Manx Shearwaters observed and collected off the southeastern United States of America have added to our knowledge of the pelagic ecology of the species. Individuals occur in the offshore waters of the southeast throughout the year but are most numerous between mid-March and mid-June during their return migration. Adult males are more prevalent than females or immatures. During the northern winter males comprise 81% of the specimens collected in the southeast, whereas summering birds are probably all immatures. An increase in the number of regional records

may be the result of the recent establishment of a breeding colony in Newfoundland. In the southeast Manx Shearwaters are most often encountered foraging along or near the edge of oceanic fronts near the edge of the outer continental shelf. Replacement of flight feathers in adults is well advanced by early December and is essentially complete by mid-March. Diets and masses of Manx Shearwaters collected off North Carolina are similar to those of birds studied near breeding colonies.

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APPENDIX 1

RECORDS OF MANX SHEARWATERS *PUFFINUS PUFFINUS* IN THE SOUTHEASTERN UNITED STATES OF AMERICA

		Maryland	
1 June 1974	first record for Maryland		Rowlett 1974
8 Aug 1974			Rowlett 1980
6 Dec 1975			Rowlett 1980
23 April 1977	3 individuals	74 km ESE Ocean City	Rowlett 1980
30 April 1977	2-4 individuals	17-70 km ESE Ocean City	Rowlett 1980
Jan 197?			Rowlett 1980
3 Dec 1979	4 individuals	55-60 mi off Assateague Is	*Am. Birds* 34:260
6 Dec 1979	2 individuals	55-60 mi off Assateague Is	*Am. Birds* 34:260
1 May 1982	single bird	off Ocean City	*Am. Birds* 36:837
12 June 1982	single bird	off Ocean City	*Am. Birds* 36:963
26 June 1982	3 individuals	off Oregon Inlet	*Am. Birds* 36:963
23 April 1983	single bird	off Ocean City	*Am. Birds* 37:855
5 June 1983	single bird	off Ocean City	*Am. Birds* 37:975
5 Nov 1983	12 individuals	off Ocean City	*Am. Birds* 38:185
16 June 1984	2 individuals	off Ocean City	*Am. Birds* 38:1005
3 Dec 1985	single bird	off Ocean City	*Am. Birds* 40:265
8 Feb 1986	single bird	off Ocean City	*Am. Birds* 40:265
26 April 1986	single bird	off Ocean City	*Am. Birds* 40:453
15 May 1986	single bird	off Ocean City	*Am. Birds* 40:453
29 Mar 1987	single bird	3 mi E Ocean City	*Am. Birds* 41:411
13 June 1987	3 individuals	off Ocean City	*Am. Birds* 41:1419
23 Nov 1991	16 individuals	off Ocean City	*Am. Birds* 46:75
25 April 1992	single bird	off Ocean City	*Am. Birds* 46:403
		Virginia	
29 June 1975	1 found dead	Back Bay	USNM 567999
6 Dec 1975	single bird	*c*. 50 mi. E Choncoteague	Larner 1979
9 May 1982	single bird	35-63 mi off Virginia Beach	*Am. Birds* 36:837
29 May 1987	7 individuals	off Virginia Beach	*Am. Birds* 43:459
21 Aug 1988	single bird	out of Ocean City, Md	*Am. Birds* 43:81
30 May 1988	12 individuals	out of Virginia Beach	*Am. Birds* 42:417
Dec 1989	2 individuals	off Va Beach	*Am. Birds* 44:246
2 Feb 1991	18 individuals	at sea off Va Beach	*Am. Birds* 45:258
17 May 1991	single bird	at sea off Choncoteague	*Am. Birds* 45:425
26 May 1991	single bird	off Virginia Beach	*Am. Birds* 45:425
3 Aug 1991	single bird	off Ocean City in Virginia	*Am. Birds* 46:75

North Carolina

31 May 1970	2 individuals	from shore, 4 mi NE Hatteras Inlet	Buckley 1973
26 June 1978	1 found dead	on beach Cape Hatteras Point	NCSM 6554
5 Dec 1978	single bird	40 mi SSE Oregon Inlet	Lee & Rowlett 1979
30 Dec 1978	5 individuals, 4 collected NCSM 7091-7094	*c*. 40 mi SSE Oregon Inlet	Lee & Rowlett 1979
22 May 1980	single bird	off Oregon Inlet	NCSM Records
28 Mar 1982	single bird	off Oregon Inlet	NCSM 8957
3 Dec 1982	3 individuals	off Oregon Inlet	NCSM 8926, 8952
28 Dec 1982	single bird	off Oregon Inlet	NCSM 8957
29 Sept 1983	single bird	90 mi E Myrtle Beach = NC	*Am. Birds* 38:89
2 Mar 1984	1 or 2 individuals	off Cape Lookout	NCSM records
3 Mar 1984	1-2 individuals	off Cape Lookout	NCSM records
16 Mar 1984	42 individuals (2 banded)	off Oregon Inlet	NCSM records and NCSM 10108-10113
2 April 1984	single bird	off Oregon Inlet	NCSM records
26 June 1984	single bird	off Oregon Inlet	NCSM 6554
20 Dec 1984	2 individuals	off Oregon Inlet	Lee 1987
22 Dec 1985	several	off Oregon Inlet	Lee 1987
20 Dec 1986	single bird	Oregon Inlet	NCSM records
21 Jan 1987	3 individuals	off Oregon Inlet	NCSM records
14 Feb 1987	15+	Oregon Inlet	NCSM records
25 Feb 1987	2 individuals	Oregon Inlet	NCSM records
8 Mar 1987	single bird	off Morehead City	*Am. Birds* 41:416
23-24 Mar 1987	2 individuals	off Morehead City	*Am. Birds* 41:416
6 April 1987	3 individuals	off Oregon Inlet	NCSM Records
7 April 1987	single bird	off Oregon Inlet	NCSM Records
30 Dec 1987	4 birds	off Oregon Inlet	NCSM 7091-94
19 Jan 1988	single bird	off Oregon Inlet	NCSM 11814
19 Sept 1988	single bird	off Oregon Inlet	NCSM 11813
1 Aug 1988	single bird	off Oregon Inlet	AMNH 825937
19 Jan 1988	single bird	off Oregon Inlet	NCSM Records
30 Jan 1988	single bird	from shore Cape Hatteras	*Am. Birds* 42:249
19 Sept 1988	single bird	off Oregon Inlet	NCSM 11813
18 Jan 1989	3 individuals	off Oregon Inlet	NCSM records
4 Feb 1989	single bird	from shore Bodie Is.	*Am. Birds* 43:464
26 Mar 1989	2 individuals	off Morehead City	*Am. Birds* 43:1303
25 May 1990	2 individuals	off Rudee Inlet	*Am. Birds* 44:407
31 Dec 1991	single bird (?)	from shore Ocracoke Is.	*Am. Birds* 45:430
21 May 1991	single bird 45:433	from shore Cape Hatteras	*Am. Birds* 45:1110;
22 May 1991	single bird	off Cape Hatteras	*Am. Birds* 45:1110; 45:434

South Carolina

29 Sept 1983	single bird	97 mi E Murrel's Inlet	Haney 1986
10 Oct 1983	single bird	70 mi SE Charleston	Haney 1986
7 April 1985	single bird	75 mi ENE Charleston	Haney 1986
17 April 1985	single bird	32°53'N, 78°53'E	J.C. Haney (pers. comm.)
17 April 1991	1 found dead	Cape Is. Charleston Co.	ChM 1992.15.053

Georgia

16 Nov 1982	single bird	off Skidaway Is.	*Am. Birds* 37:168 (actual date)
12 Aug 1983	single bird UG 5241	off St. Catherines Is. 47 fathoms	*Am. Birds* 38:189
21 Nov 1983	single bird	50 mi E Sapelo Is.	*Am. Birds* 38:189
3 Dec 1983	single bird	38 mi E St. Catherines Is.	*Am. Birds* 38:306
18 Feb 1984	2 individuals	45 mi E Jekyll Is.	*Am. Birds* 38:306
12 Dec 1984	single bird	off Sapelo Is.	J.C. Haney (pers. comm.)
9 Feb 1985	2 individuals	off Jekyll Is.	*Am. Birds* 39:157
24 Feb 1985	single bird	off St. Catherines Is.	J.C. Haney (pers. comm.)

Florida

21 July 1959	single bird	30 mi E Port Canaveral	Post 1967
30 Oct 1960	1 found dead	Jupiter Inlet	USNM 473608
11 July 1965	1 bird	33 mi E Port Canaveral	Post 1967
31 Aug 1967	2 individuals	22 mi off Grant	*Audubon Field Notes* 23:35
8 Dec 1969	single bird	Key Largo	USNM 566279
1 Dec 1970	single bird	24 mi E Cape Canaveral	J. Johnson unpubl.
26 Oct 1971	single bird	off Cape Canaveral	(WBR 1972)
26 Oct 1972	single bird	off Cocoa Beach	*Am. Birds* 26:50
9 Oct 1974	3 individuals	off Cape Canaveral	*Am. Birds* 29:44
24 Mar 1975	single bird	off Cape Canaveral	*Am. Birds* 29:679
7 April 1975	single bird	18 mi off Cape Canaveral	*Am. Birds* 29:839
30 Nov 1975	single bird	off Cape Canaveral	*Am. Birds* 30:54
8 May 1976	single bird	off Miami Beach	*Am. Birds* 30:828
9 Jan 1977	single bird	10 mi off Cocoa Beach	*Am. Birds* 31:322
19 Oct 1977	single bird	off Cape Canaveral	*Am. Birds* 32:193
6 Dec 1978	2 individuals	15 mi off Cape Canaveral	*Am. Birds* 33:274
18 June 1978	single bird	Vero Beach	PB 38434
9 Jan 1979	1 found dead	Sebastian Inlet	Archbold Bio. Stn GEW 5302
11 Feb 1979	single bird	off Fort Pierce	*Am. Birds* 33:274
17 Jan 1980	2 individuals	off Cape Canaveral	*Am. Birds* 34:265
17 Jan 1980	1 found dead	Ft Pickens, Escambia Is.	*Am. Birds* 35(3):307 UF 20622

16 Jan 1981	1 found dead	W end Santa Rosa Is.	UF 20622
17 Jan 1981	1 found dead	Ft. Pickens Escambia Co.	*Am. Birds* 35:307
21 Nov 1982	single bird (banded)	Jacksonville	Mead & Hudson 1983
10 May 1984	single bird	90 mi SE Jacksonville	J.C. Haney (pers. comm.)
20 Oct 1985	single bird	25-30 mi E Cape Canaveral	*Am. Birds* 40:100
21 Oct 1985	single bird	25-30 mi E Cape Canaveral	*Am. Birds* 40:101
11 April 1988	single bird	27 mi. off Cocoa	*Am. Birds* 42:424
10 April 1989	1 found dead	Upper Matecumbe Key	G. Woolfenden
(23 July 1991)	1 found dead (mummy)	Elliott Key	G. Woolfenden
		Alabama	
19 Dec 1983	single bird	Alabama Pt	*Am. Birds* 38:325
		Texas	
15 Feb 1975	1 skeleton found on beach (banded)	Nueces Co., N. Padre Is.	Corpus Christi Museum 84A007 Clapp *et al*. 1982
11 Aug 1980	single bird (storm)	Nueces Co., Mustang Is., S Port Aransas	Univ Dallas 2574
13 Nov 1984	1 dead on beach	Nueces Co., Mustang Is.	Texas A&M 12163
7 Oct 1987	1 dead on beach	Mustang Is.	Texas A&M 12162
21 June 1993	single bird	Mustang Is.	Photo, Texas Bird Record Committee
		Greater Antilles	
5 Sept 1975	single bird	Puerto Rico	Raffele 1983
28 June 1980	1 found dead	Dominican Republic	Brit. Ornith. Trust
?	1 found dead	Cuba	Cuban National Museum
?	1 found dead	Trinidad	van Halewyn & Norton 1984
?	1 found dead	Barbados	van Halewyn and Norton 1984