

Pan-tropical spotted dolphins (*Stenella attenuata*) and other cetaceans around St Helena in the tropical south-eastern Atlantic

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The occurrence, distribution and structure of cetacean communities in the tropical South Atlantic beyond the shelf edge are poorly known with little dedicated research occurring within this region. At 15°58'S 005°43'W, the island of St Helena is one of the few areas of land within this region and the only one that lies in the tropical south-eastern Atlantic. As a result, St Helena offers a unique opportunity to study cetaceans within this area using small boats and land-based observations. This paper describes the results of a preliminary, short-term survey of the cetacean community around St Helena in the austral winter of 2003. Pan-tropical spotted dolphins (*Stenella attenuata*) were the most numerous species recorded, followed by bottlenose dolphins (*Tursiops truncatus*) and rough-toothed dolphins (*Steno bredanensis*), a species not previously reported from St Helena. This last species was only recorded occurring in mixed groups with bottlenose dolphins. Pan-tropical spotted and bottlenose dolphins differed in their spatial distribution around St Helena. While pan-tropical spotted dolphins were primarily recorded resting in large groups in the lee of the island during daylight hours, bottlenose dolphins and rough-toothed dolphins were recorded closer to shore and on both the windward and lee sides. Humpback whales (*Megaptera novaeangliae*) were also recorded once during the survey, but interviews with local fishermen suggest that this species regularly occurs in the waters around St Helena in small numbers during the austral winter. The results of this preliminary survey suggest that the cetacean community around St Helena during this survey was relatively simple, consisting of up to three species that are present year-round and one seasonally occurring species in the nearshore waters, with a small number of additional species occurring occasionally in deeper offshore areas.

INTRODUCTION

The oceanic cetacean community in the tropical south-eastern Atlantic beyond the West African shelf edge is poorly known and there has been little dedicated research into cetaceans in this area. At 15°58'S 005°43'W, the island of St Helena (an Overseas Territory of the United Kingdom) lies in the middle of this region and, as the only land mass within it, St Helena offers a unique opportunity to study oceanic cetaceans in the tropical south-east Atlantic using small boats and land-based observations. Such methods allow research to be undertaken relatively cheaply and with few of the logistical difficulties often associated with research into oceanic cetacean communities, such as the requirement of a large vessel capable of spending prolonged periods of time at sea.

St Helena is a relatively small island, being approximately 17 km long by 10 km wide, with an area of around 122 km². The highest point is 820 m above sea level. The island is of volcanic origin and represents the tip of a complex of extinct volcanoes which rise some 5000 m above the surrounding abyssal plain. The base of the volcanic complex is approximately 130 km across (Ashmole & Ashmole, 2000). The waters around St Helena can be divided into three

zones (Figure 1). The first zone is the deeper offshore waters (exclusively beyond the 200 m depth contour) which cover the steep sides of the volcanic complex and the surrounding abyssal plain at depths of around 5000 m. The remaining two zones are coastal and are situated almost entirely over the narrow volcanic platform which surrounds St Helena. This area has been created by the erosion of the volcanic complex which formed St Helena and mostly consists of waters less than 200 m deep with a relatively gentle seabed gradient, usually within 2 km of the shore. The two zones are the Windward Coastal Zone (WCZ), consisting of the south-east facing windward side where waters are relatively rough for most of the year, and the Lee Coastal Zone (LCZ), consisting of the north-west facing coasts in the wind shadow created by the mass of St Helena interacting with the south-east trade winds and where waters are usually relatively calm. In total, the coastal zones represent an area of approximately 150 km², with the WCZ being the larger of the two (Figure 1). The waters of St Helena are relatively cool considering their latitude (sea surface temperatures range from 22°C in winter to about 26°C in summer) due to the influences of the Benguela Current bringing cooler water up the western coast of Africa. The prevailing winds are the south-east trade winds which blow almost continuously

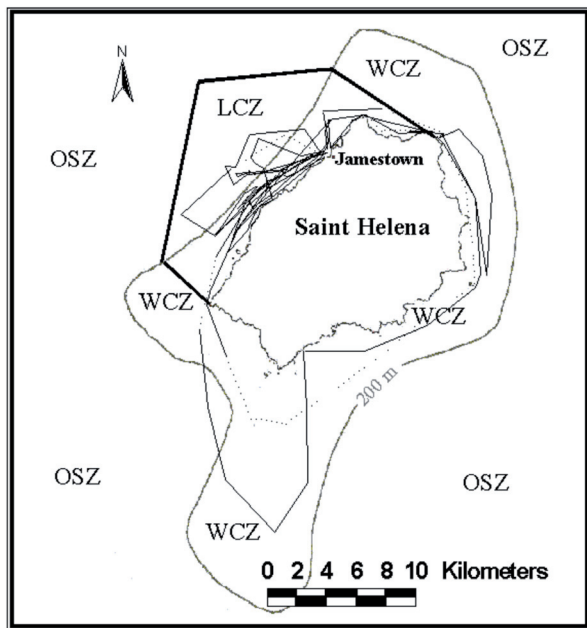


Figure 1. The maritime zones around St Helena, with routes of surveys conducted between 13 and 29 June 2003. LCZ, Lee Coastal Zone; WCZ, Windward Coastal Zone (landward of 200 m contour line); OSZ, Offshore Zone. Solid lines, on effort 15 min survey sections (sea states Beaufort 3 or less); and dashed lines, off effort 15 min sections of surveys (sea state Beaufort 4 or more).

around the island at a speed of around 15 to 25 km/h (Ashmole & Ashmole, 2000). As a result of the interaction of the surface currents and prevailing winds with the mass of St Helena, an apparent island wake forms around the island. From coastal cliffs, current patterns caused by this island wake effect can be observed forming at the point where the two coastal zones meet, dividing the lee waters from those affected by the trade winds.

Knowledge of the cetacean community around St Helena can best be described as sketchy (Edwards, 1990). Whales and dolphins were reported around the island as early as 1634 (Peter Mundy quoted in Edwards, 1990). However, details of the exact species involved are unclear. Perrin (1985) undertook observations on the small cetaceans in the area between April and June 1983. He reported the presence of pan-tropical spotted dolphins (*Stenella attenuata* Gray, 1846) in the LCZ, as well as bottlenose dolphins (*Tursiops truncatus* Montague, 1821), from sightings during his visit. The only other small cetacean confirmed to occur in St Helena is the spinner dolphin (*Stenella longirostris* Gray, 1828), although records of this species are limited to a single skull collected from the island in 1926 (Perrin, 1985). Perrin (1985) also received reports from local fishermen of other possible species including 'whale killers', 'blackfish', a small delphinid known locally as the 'white-bellied porpoise' and 'black porpoise'. However, none of the species to which these terms applied was identified with certainty. In addition, Perrin (1985) reported small cetaceans described by local people which he tentatively identified as rough-toothed dolphins (*Steno bredanensis* G. Cuvier in Lesson, 1828).

The humpback whale (*Megaptera novaeangliae*) is the only large cetacean species known from the near-shore waters around St Helena with adults, sometimes with calves, being recorded

from July to September (Edwards, 1990). Humpback whales have been recorded around St Helena as far back as the early 19th Century (Edwards, 1990) and the descriptions of whales seen during a visit in 1634 by an English Naturalist, Peter Mundy, are consistent with humpback whales ('...wee sawe a couple of whales, said to bee in heate or katte, for they went wallowinge, puffinge and spoutinge, sometimes side by side, then their tailles, then their heads aloft;'—cited in Edwards, 1990). Further offshore, sperm whales (*Physeter macrocephalus* Linnaeus, 1758) may occur and at one point St Helena was a major rendezvous point for American whalers targeting this species (Edwards, 1990). Other large whales known to locals include 'blue' and 'right whales', although the exact species these refer to is unknown (Edwards, 1990).

Until 1979 when whaling was banned and all local cetaceans received official protection, both pan-tropical spotted dolphins and bottlenose dolphins were hunted by the islanders, with up to several hundred pan-tropical spotted dolphins and about five to 15 bottlenose dolphins being taken each year (Perrin, 1985). Since 1979, few or no dolphins have been hunted directly. Humpback whales were also hunted close to St Helena in the 19th Century, with locally-based fisheries primarily targeting humpback whales being set up in 1833 and 1875. A final, unsuccessful, attempt was made to set up an island-based whaling industry as late as 1910 (Edwards, 1990). All these whale fisheries appear to have failed, although the reasons for the failures are unclear.

In June 2003, we conducted a pilot study to assess the feasibility of setting up a long-term research project on the occurrence, abundance and ecology of the cetacean community around St Helena. While this pilot study was of relatively short duration, it allowed a preliminary assessment of what species of cetaceans regularly occur around St Helena and on differences in the distribution of the most commonly encountered species. It also allowed a comparison to be made with observations collected at a similar time of year in the early 1980s (Perrin, 1985) regarding the daily occurrence of pan-tropical spotted dolphins in the LCZ, revealing how this has changed, possibly in response to changes in local human hunting pressures.

MATERIALS AND METHODS

Between 13 and 29 June 2003, data were gathered from dedicated boat surveys and incidental sighting reported by local people. Nine boat surveys covering 272.56 km (218.64 km 'on effort' when the sea state was Beaufort 3 or less and 53.92 km 'off effort' when the sea state was over Beaufort 3; Figure 1) were conducted using locally available boats ranging in length from eight to ten m. At least two observers and one crewman were onboard during each boat survey. The surveys could be divided into two types: (1) short surveys of the inshore waters of the LCZ; and (2) long surveys that circumnavigated the island, passing through both the LCZ and the WCZ. The occurrence of either type of survey was strongly weather-dependent, particularly for the second type, and these surveys were conducted whenever the sea conditions were suitable.

For the duration of each survey, the position of the boat was recorded using a hand-held Garmin global positioning system receiver along with the direction of travel, speed and

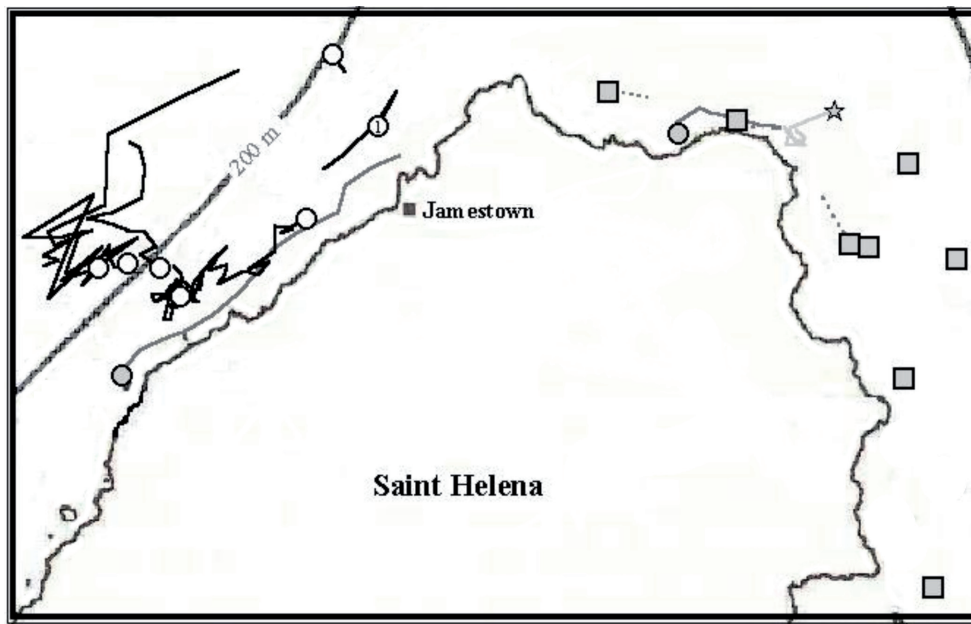


Figure 2. Positions and tracks of individual cetacean groups encountered. The start position for each encounter is indicated by a symbol (white circles, pan-tropical spotted dolphins; white circle with numeral in centre, mixed group of pan-tropical spotted dolphins and bottlenose dolphins; grey circle, mixed group of bottlenose and rough-toothed dolphins; grey square, bottlenose dolphins; star, humpback whales). The line associated with each symbol represents the subsequent position of the group recorded at 5-min intervals.

environmental conditions such as sea state, wind strength and direction, visibility and type of precipitation. During 'on effort' periods, at least one observer was stationed on each side of the boat and scanned an area from directly ahead of the vessel to approximately 135° from the bow of the vessel. Due to the low eye-height above sea level (generally between 1.5 and 2.5 m) and the stability of the vessels being used, scans were primarily conducted with the naked eye to detect cetaceans. During 'off effort' periods scans were conducted on a more opportunistic basis with at least one observer scanning the 270° arc ahead and to the sides of the vessel. Whenever a group of cetaceans was encountered, a position was recorded within 100 m of the group and the group was subsequently followed until either the group was lost or it was determined that the survey would have to be continued in order to be able to complete it in the available time. When with a group, the number of animals, composition and behaviour was recorded every 15 min along with an updated position. Between these 15-min periods, opportunistic recordings of behaviour were recorded along with photographs (using a Nikon F90x fitted with a 100–300 mm lens) and video footage (using a JVC digital video camera). Behavioural recordings consisted of noting the timing of specific behavioural events of individuals or small groups of animals close to the vessel using a microcassette recorder.

On return to shore all data were entered into a geographical information system (GIS) constructed using ESRI Arcview 3.2 software. The total level of effort was calculated by plotting the 15-min positions and calculating the surveyed distance between them. The positions and tracks of individual cetacean groups were also plotted within the GIS and compared between species. Finally, the temporal trends in the position of groups of pan-tropical spotted dolphins within the LCZ were investigated. Three separate comparisons were undertaken: (1) a comparison of the latitude of first sighting of

each group of dolphins and time of day; (2) a comparison of all positions recorded for all dolphin groups and time of day; and (3) a comparison of the latitude of each group with the time since the start of the encounter.

RESULTS AND DISCUSSION

Four species of cetaceans were sighted. These were pan-tropical spotted dolphins, bottlenose dolphins, rough-toothed dolphins and humpback whales. Reports were also received from local fishermen of pilot whales (*Globicephala* spp.) and beaked whales (of undetermined species) in offshore waters.

Pan-tropical spotted dolphins were sighted seven times (Figure 2). On each occasion the sighting consisted of a large group of animals (mean: 143, range: 70–300) dispersed into smaller sub-groups of about 20–30 individuals over an area of up to approximately one square kilometre. There was some evidence of age/sex segregation with some sub-groups being primarily made up of juveniles, others adults and small calves, and others of larger individuals with higher levels of white pigmentation on the tip of the beak and on the 'lips', presumably representing adult animals. All encounters with pan-tropical spotted dolphins occurred in the calm waters of the LCZ, and they were sighted on seven out of eight days when the LCZ was surveyed. During each survey when pan-tropical spotted dolphins were encountered, only a single group was seen, with no evidence of additional separate groups occurring in the LCZ at the time.

Pan-tropical spotted dolphins were observed for a total of 446 min (mean duration of an encounter: 63.7 min, range: 10–112 min). Throughout each encounter behaviours such as logging, milling, bow-riding, breaching and other surface activities were frequently observed. Most aerial behaviours, such as jumping and breaching, were undertaken by calves or juvenile animals and often consisted of multiple sequences

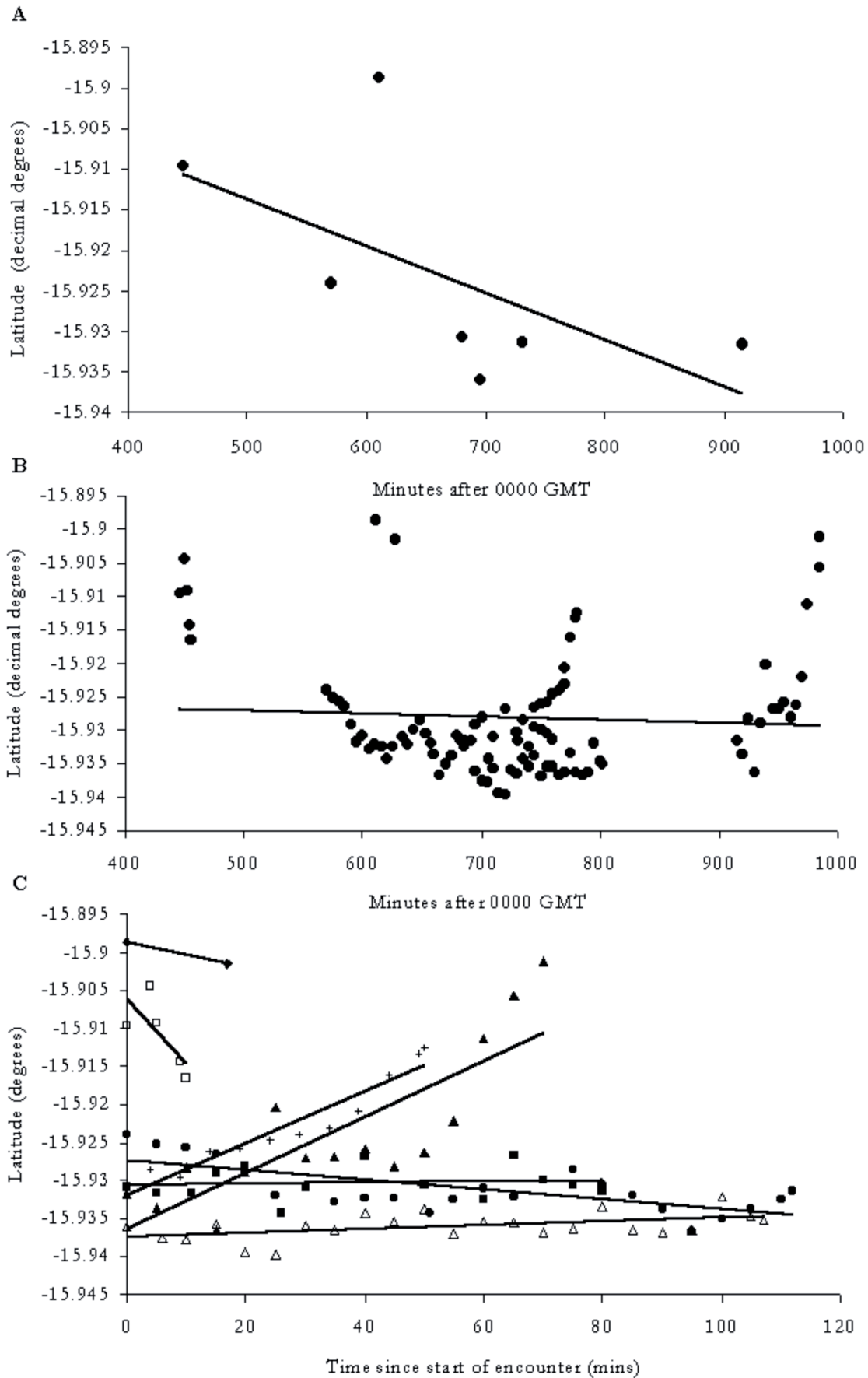


Figure 3. An analysis of trends in the location of pan-tropical spotted dolphins (*Stenella attenuata*) groups with time of day. (A) Latitude where each group was first sighted against minutes after 0000 Greenwich mean time (GMT), with linear trend line; (B) the relationship between all recorded latitudes of pan-tropical spotted dolphins groups and the number of minutes after 0000 GMT, with linear trend line; and (C) time since start of encounter and latitude of a group, with linear trend lines fitted individually for each encounter.

of up to seven or more breaches by the same individual, with each breach being lower than the preceding one. No evidence of any foraging or feeding was observed and there were no seabirds associated with the dolphins during any encounter. As a result, we conclude that pan-tropical spotted dolphins were primarily using the LCZ to rest and that although the number of animals which use this area may vary between days, all individuals using this area at any one time form a single large, dispersed group. Reports from local fishermen indicate that pan-tropical spotted dolphins also occur in deeper, offshore waters to the windward of the island (including the outer limits of the WCZ) and this may represent the primary foraging area for the dolphins which come into the LCZ to rest. This is consistent with the findings of Perrin (1985) from his visit in 1983.

However, a very different pattern of utilization of the LCZ by pan-tropical spotted dolphins was observed in 2003 from that observed in 1983. Perrin (1985) reported that in 1983 pan-tropical spotted dolphins consistently moved inshore at the southern end of the LCZ in the early morning and moved slowly north before leaving the LCZ at the northern end before noon. During this study, dolphins were recorded in the LCZ from as early as 0726 Greenwich mean time (GMT) until as late as 1625 GMT, and most groups moved a relatively short distance between when they were first sighted and when the survey boat moved on (average distance between first and last position of an encounter: 1.85 km, range: 0.30–4.32 km). For the first position in each encounter, there was an apparent relationship between position and time of day, however, this was the opposite to that observed by Perrin (1985) with the first position of groups seen later in the day occurring further south than those seen earlier in the day (Figure 3A). When all positions for each encounter (taken at 5-min intervals) were taken into account, the relationship with latitude all but disappeared (Figure 3B). For the majority of encounters there was no clear relationship between time since the start of the encounter and latitude, and, although some groups moved northward during an encounter, there was little consistency in the direction of movements between groups (Figure 3C). This contrasts sharply with time of day the LCZ was used and trends in direction of movement observed by Perrin (1985).

This difference between observations in 1983 and 2003 may represent a change in habitat utilization over time, with animals now making greater use of the LCZ to rest in daylight hours than in 1983. Perrin (1985) undertook his observations shortly after hunting for small cetaceans was banned in St Helena. Therefore, we suggest that the change in utilization of the LCZ area between 1983 and 2003 could reflect a long-term 'adaptation' of the local dolphin population to this cessation of a direct hunting due to official protection, with utilization of the LCZ increasing in response to a drop in the 'predation' by fishermen while the dolphins are in this area. In a similar vein, Perrin (1985) noted that while bow-riding, animals did not surface directly under the bow of the boat, from where they were traditionally harpooned, instead they moved away from the boat by several metres to surface before returning to the boat's bow. Although this pattern of surfacing was observed during this study, animals also surfaced directly

under the bow while bow-riding. Again this may reflect a change in behaviour over time since hunting ceased.

Bottlenose dolphins were encountered on nine occasions in groups ranging from two to between 15 and 20 animals. On three occasions they were sighted in mixed species groups, once with pan-tropical spotted dolphins and twice with rough-toothed dolphins. Bottlenose dolphins were consistently sighted closer to the coast than pan-tropical spotted dolphins and were most frequently seen close to shore in the WCZ (seven out of nine sightings), where pan-tropical dolphins were never sighted during this study (Figure 2). While no surveys were conducted in the offshore zone during this study, Perrin (1985) reported a group of bottlenose dolphins five to seven kilometres to the north-east of St Helena, suggesting they may also utilize deeper, offshore waters on occasions.

Rough-toothed dolphins were sighted on two occasions, in both cases as a small number of animals (five to ten on one occasion and 12 to 15 on another) encountered in a mixed group with bottlenose dolphins close to the shore (Figure 2). These dolphins remained elusive throughout both encounters and species identification had to be confirmed through photographs on both occasions. These are the first confirmed records of rough-toothed dolphins for St Helena, although, as noted above, Perrin (1985) tentatively identified this species as occurring in St Helenian waters.

Humpback whales were also sighted on a single occasion in the WCZ (Figure 2). The group consisted of three animals, two of adult size and one calf. Local fishermen reported humpback whales in waters further offshore in the WCZ throughout the period of this study. Anecdotal reports we received suggest that humpback whales occur seasonally in small numbers in St Helenian waters throughout the late austral winter from the end of June until around October both in the WCZ and the LCZ. Most reported sightings are of single animals or adults with calves. The historical presence of humpback whales in St Helenian waters and the current anecdotal reports suggest that humpback whales regularly use these waters, possibly as winter breeding/calving grounds. The only other known breeding/calving grounds for this species in the South Atlantic are off the African coast 1800 km to the east at the nearest point and off eastern South America 3260 km to the west (Walsh et al., 2000; Martins et al., 2002). Currently, it is unclear whether the humpback whales which visit St Helena are isolated from these other breeding groups or whether there is interchange with any of these areas. However, due to the distances from other breeding grounds, it is possible that the current small number of whales reported annually from St Helena are the remnants of a relatively isolated breeding population depleted by past whaling in the local area (and/or others parts of their range) and, as such, represent an additional genetic reservoir for humpback whales in the South Atlantic. The relationship between humpback whales around St Helena and those in other areas will be investigated during future research using genetic and photo-identification techniques.

In summary, the coastal waters of St Helena are utilized year-round by at least two cetacean species (pan-tropical spotted dolphins and bottlenose dolphins) and seasonally by at least one more (humpback whales). Currently, too little

is known about rough-toothed dolphins around St Helena to know whether they are present year-round, seasonally or whether they only occur occasionally around St Helena. The two species known to be present year-round appear to occupy different ecological niches within the local marine ecosystem and use coastal waters for different purposes. Pan-tropical spotted dolphins primarily use the LCZ to rest during daylight hours and forage in other areas, such as the offshore waters and the outer WCZ. In contrast, the bottlenose dolphins use the coastal waters of both the LCZ and the WCZ in daylight and anecdotal reports suggest they also use these areas at night. In addition, bottlenose dolphins utilize the areas closest to shore and the inner WCZ where pan-tropical spotted dolphins were not seen.

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