

# Comparison of behaviour across short-finned pilot whale populations

## Short-finned pilot whale (*Globicephala macrorhynchus*)

The short-finned pilot whale (*Globicephala macrorhynchus*) belongs to the family Delphinidae. At present, it is thought that there are two different subspecies: “Naisa” and “Shiho” (Cise et al., 2019). The “Naisa” type inhabit the tropical and warm-temperate waters of the Atlantic Ocean and Indian Ocean. The “Shiho” type lives in the east of the Pacific Ocean and Northern Japan whereas the “Naisa” type are found also in the west of the Pacific.

The species *G. macrorhynchus* was classified as of ‘Least Concern’ by the IUCN in 2018 (Minton et al., 2018). However, due to the similarities between this species and the long-finned pilot whale (*Globicephala melas*) it is difficult to establish estimates with confidence where the range of both species overlap.

The short-finned pilot whale is very dark brown or grey-black in appearance (Hutchins et al., 2003). There is a distinctive anchor-shaped light-grey or white patch on the throat and chest. They also have a bulbous head, small mouth, pointed pectoral fins and a rounded dorsal fin. Sexual dimorphism is shown in short-finned pilot whales with the males being of an increased length and mass, and having a more pronounced bulbous head in comparison to the females who have a relatively larger dorsal fin (Olson, 2009).

Distinguishing features between the short-finned pilot whale and the long-finned pilot whale are a shorter pectoral fin length, different shape of skull and differing numbers of teeth (Olson, 2009). Although, it is hard to identify these differences accurately when out in the ocean as previously mentioned.

They live in matrilineal social groups with the females likely stay with their mothers for life (Kasuya and Marsh, 1984). The females can lactate from 15 years while gestation is 15 months. Males may migrate between schools after weaning and move between different breeding schools after reaching puberty. Communication with group members involves various clicks and whistles with a reliance of tonal calls and echolocation (Jensen et al., 2011).

Short-finned pilot whales can be found at the top of the food chain (Alves et al., 2019). Therefore, they can be used as a bioindicator species meaning monitoring their populations can provide an insight into the health of the ecosystem overall. The whales tend to feed at night on cephalopods such as squid and octopus as well as fish (Hutchins et al., 2003). Therefore, they also assist with regulating these populations.

*G. macrorhynchus* can live either in a resident population or as a transient migrating group. Several resident populations have been identified such as in the Mariana Archipelago (Hill et al., 2019), Canary Islands (Servidio, 2014), Archipelago of Madeira (Alves, 2014), the Azores (Doksæter et al., 2008), Japan (Kanaji et al., 2011), off Santa Catalina Island, California (Shane, 1995) and Hawaii (Baird et al., 2003).

## **General behaviours of different populations**

### **Tenerife**

The resident population of short-finned pilot whales inhabiting the southwest coast of Tenerife is thought to comprise of around 636 resident individuals (Servidio, 2014). They are found mainly in water of 800-2000 m of depth between one to eight kilometres from the coast. Negulescu et al. (2017) recorded the behaviours of some short-finned pilot whales of this population. Resting was the most commonly observed behaviour, yet the whales spent the least time feeding. Other behaviours recorded were travelling, milling and socialising. The largest variety of behaviours occurred earlier in the day.

### **Madeira**

Alves (2014) studied a resident population of short-finned pilot whales that inhabit the Archipelago of Madeira. The pilot whales were observed resting, socialising, foraging, breeding, calving and birthing in this area. In autumn, there was an increase in relative density due to breeding. The transient, pelagic individuals move to inshore waters to breed with the island associated whales. 73% of the groups were composed of calves with one third of the groups in interspecific relationships. Supposed evidence for birthing in the area was the finding of four dead neonates. It is thought that the core area could be used as a feeding habitat. All groups showed resting behaviour while four fifths of groups that socialised were in the south and southeast of Madeira.

### **Santa Catalina, California**

The behaviours of short-finned pilot whales were recorded by Shane (1995) off Santa Catalina Island, California. 13% of the instantaneous records were of travelling with the water depth averaging 32.8 m. 62% of the time the travelling individuals formed a tight oval formation, compared to moving in a tight line abreast 15% of the time and being of mixed geometry 14% of the time. The pilot whales spent 17% of the time feeding usually widely dispersed (56%) or in mixed geometry (40%). They would feed in water averaging 43.7 m. Other activities such as socialising, resting and milling were rarely recorded. The short-finned pilot whales fed primarily at night for squid. The absence of socialising behaviour suggests that mating may be a highly seasonal, non-winter event.

### **Southeastern Arabian Sea**

In the southeastern Arabian Sea, a pod of short-finned pilot whales was observed moving in front of a vessel by Sajikumar et al. (2014). Some whales interacted with the vessel such as moving alongside it, rolling sideways below the surface and frequently crossing in front of it. Spy-hopping was recorded twice by two whales that kept their heads up for one minute at a time. The pilot whales spouted about one to two times per minute whilst travelling. Travelling and breathing were synchronised amongst the group. This synchronous behaviour may have been a signal for cooperation or to reduce tension, advertisement or to reinforce social bonds. When logging occurred, the pod was very tightly packed. While diving, the

whales lifted their flukes out and slapped their flukes to make a sound which is called lobtailing.

## **Martinique**

A short-finned pilot whale population living along the Caribbean coast of Martinique was 95% composed of calves (Fléchet et al., 2019). Travelling was observed 65% of the time whereas resting (4%) and hunting (4%) were rarely observed. Socialising behaviour was recorded for 24% of the time.

## **Interspecific interactions**

### **Melon-headed whales in Hawaii**

In the waters of Hawaii, an interaction was reported by Migura & Meadows (2002) involving around 15 short-finned pilot whales that joined a subgroup of approximately 30 melon-headed whales (*Peponocephala electra*). Initially, a group of 15-30 pilot whales displayed behaviours mixed logging and milling with some individuals ‘surfing’ with the swells. One calf was spotted breaching and splashing. Due to the positions assumed by the mother and calf, it was thought that the calf was nursing. When the two species met and interacted, at least two or three pilot whales were observed spy-hopping. Meanwhile, the melon-headed whales swam around the group of pilot whales. When the short-finned pilot whales were alone their whistles were infrequent yet when interacting with the melon-headed whales, they vocalised twice as frequently.

### **Sperm whales in the Gulf of Mexico**

An interaction involving several large pilot whales tail lunging and fluke-slapping at the head of an adult sperm whale in the Gulf of Mexico was documented by Weller et al. (1996). The sperm whale mother and calf were surrounded by 8-10 pilot whales in an antagonistic encounter. The pilot whales appeared excited due to swimming and surfacing at speed, performing fluke-up dives and other movements along the flanks, heads and flukes of the sperm whales. An interpretation of these behaviours may be that the pilot whales were testing the vulnerability of the sperm whales to assess whether they could separate the weak or young individuals from the group. The pilot whales were cautious due to the chance of injury from the adult sperm whale. It was concluded that the interaction was aggressive in nature.

### **Humpback whales in Puerto Rico**

Other antagonistic interspecific interactions have been recorded by MacKay & Bacon (2019) with fasting humpback whales in 2013 and 2014. The short-finned pilot whales approached the group of humpback whales causing agitation and/or distress including trumpeting, chuffing and tail slapping. In March 2013, three humpback whales and nine short-finned pilot whales were associating closely off the northwest coast of Puerto Rico. Then in February 2014, a similar antagonistic interaction was observed between three humpback whales and five short-finned pilot whales. The short-finned pilot whales travelled at high speed towards the humpback whales on the surface. When the humpback whales left the area, the short-

finned pilot whales travelled fast in pursuit. There are several suggested interpretations of these behavioural responses. One is that the interactions may have been unsuccessful attempts at kleptoparasitism or perhaps they were for social harassment or simply fun.

## **Diving and underwater behaviours**

### **Tenerife**

23 adults and subadults were tagged from the Tenerife population of short-finned pilot whales by Soto et al. (2008), with data collected from both daytime and night dives. In total, 192 dives were performed with the maximum depth reached being 1019 m. The duration of the dives varied from 0-4 minutes to 21 minutes. Deep daytime dives were performed by 14 out of 20 whales tagged with 0-7 dives per hour. The median duration was 15 minutes with maximum depths between 538-1019 m. The foraging tactic for deep daytime diving involves using echolocation and movement behaviours. At the start of the dive, the pilot whales produced clicks with the rate of clicks increasing as they descended in line with the decreasing distance to the depth later that their prey are found. The speed of descent was the same until around 500-600 m depth where the pitch angle and vertical speed reduce steadily. About 40% of daytime deep dives involved regular clicks but there was an absence of buzzes or sprints. This would suggest a failure to find suitable prey. These dives were shallower but did not vary in duration with successful prey capture dives, possibly indicating a longer search phase in the case of unsuccessful attempts. A pattern of a low-pitch search then sprinting occurred in around 55% of deep daytime dives and was performed by 12 of the 14 tagged whales (52% of all tagged whales).

During dives, Hofmann et al. (2004) made underwater behavioural observations of short-finned pilot whales off the southwest coast of Tenerife. Body contact such as pectoral fin touches or rubbing body parts was the most frequent behaviour recorded with nine counts of such. Both nursing and defecation occurred five times. Spyhopping and bubble displays were recorded 3 times each. The following behaviours occurred twice each: 'belly up', 'open mouth', penis erection and encircling. There were only lone incidences of 'belly aside', 'horizontal roll', 'vertical roll', fluke-slapping, object dragging, 'belly-to-belly', 'mouth to mouth' and 'rough housing'. 'Rough housing' was described as an adult pilot whale striking a calf, thought to be disciplinary in nature.

### **Madeira**

Alves et al. (2013) applied tags to four resident and two male transient short-finned pilot whales found in the Archipelago of Madeira. There were periods of surfacing and shallow dives throughout the day in amongst dives of 500-1000 m depth. Discluding one individual, the percentage of time spent by the whales in the top 10 m of water was over 73% with a mean of 76.8%. 61 dives deeper than 10 m were recorded with three being over 500 m deep. Mean dive rates of three individuals were 6.8, 0.6 and 0.3 dives per hour. The transient males dived significantly more times with a rate of 10.7 dives per hour in comparison to the male resident (5.8 dives per hour) and the female residents (4.5 dives per hour). 94.1% of the whales' time was spent in the 100m depth bin with 84.3% of the time spent in the top 10 m. Except for three dives, the dives that were less than 100 m were less than 5 minutes long with deeper dives being longer. The maximum depth was 988 m for an incomplete dive. For a

complete dive, the maximum depth reached was 839 m with a duration of 16.08 minutes. Dives deeper than 500 m indicated foraging by one resident and one transient whale.

## **Hawaii**

Diving behaviour of short-finned pilot whales in Hawaii was recorded by Baird et al. (2003). The deepest dives occurred in the day between 600-800 m with a maximum duration of 27 minutes. During the night, the dives were shorter in distance between 300-500m with the rate of deep dives being almost four times greater than during the day. Long durations of shallow dives (less than 100 m) or surface resting only happened during the day. The shallow dives involved the whales socialising, resting and travelling yet no feeding.

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