Sperm whale (*Physeter macrocephalus)*; Jubi Lee

During Singapore's golden jubilee year in 2015, a dead sperm whale was spotted off Jurong Island, giving rise to its name Jubi Lee. This was the first time a sperm whale had ever been documented in Singapore. It was surrounded by blood and a deep cut was present in its tail. Underneath that cut, the bone was broken into four pieces. The injury sustained by the whale was likely caused by a collision with a ship. The Lee Kong Chian Natural History Museum worked to retrieve the whale for research purposes, and for the skeleton to eventually be displayed in the gallery. They worked around the clock to preserve the whale skeleton. The whale measured 10.6 m in length and was identified to be an adult female sperm whale.

Firstly, the whale was secured to a boat with ropes by divers from the Maritime and Port Authority Singapore. The whale was then towed carefully to the Tuas Marine Transfer Station across the West Johor Strait. It reached Tuas at around 9pm, where Marcus Chua (then mammals and birds curator) and Foo Maosheng (scientific officer) began working on collecting tissue samples. The whale had likely been dead for a week before it was found, with a bloated body and foul smell. Steak knives were used to slice through the thick whale skin and blubber. Masks, gloves, boots and overalls were used to protect the researchers. This entire defleshing process took around two months and nine days. The skeleton and bones were labelled accordingly during the process to avoid confusion during reassembly. The skeleton was subsequently degreased and cleaned before being displayed in the museum, with the entire process from obtaining the carcass to display taking over eight months. Over $1.3 million was raised for the Jubilee Whale Fund, which contributes to restoring and maintenance of the whale, and marine biodiversity education, research and conservation.

There were also investigations of the gut contents and origin of Jubi Lee. Researchers managed to recover about 80% of the stomach contents. Of what was recovered, 97% consisted of squid beaks, which is made of protein and pigments that are difficult to digest. These beaks are typically regurgitated. Over 1,800 upper beaks and 1,657 lower beaks were present in her stomach, coming from at least 25 cephalopod species. There was no fresh tissue found in the gut. Besides the squid beaks and other animal content, plastic debris was present in the stomach. This included plastic cups, food wrappers and a plastic bag, some of these appearing to be of Indonesian origin. This plastic was not sufficient to cause death, but it showcases the prevalence of marine trash. Additionally, ingestion of plastic has been known to cause death in sperm whales due to gastric blockage or rupture, and may cause entanglement or injuries as well, even in other marine species.

Mitochondrial DNA haplotype and hydrodynamic modelling was used to determine the possible origin of the sperm whale. Hydrodynamic modelling suggested an easterly drift of the carcass for a few days. This together with genetics and diet analysis suggested that the whale likely originated from a pod in the Southern Indian Ocean.

Description: Sperm whales are the largest toothed carnivores in the world, reaching lengths of 15 to 18 m, and weighing 35 to 45 tonnes. They are sexually dimorphic, with females being

smaller (reaching around 11 m and 15 tonnes) than male (reaching around 16 m and 45 tonnes) individuals. Their name comes from the spermaceti organ which is located at the forehead of the whale. This organ is encased in a muscular “case” and is made of spongy tissue filled with spermaceti oil, and bonded on both ends by air sacs. Asymmetry present in parts of the skull and air passages around the spermaceti organ, and their blowhole points forward and to the left. The sperm whale, along with killer whales, have the largest brain of any animal. They have 20 to 26 large conical teeth which are only present on their lower jaw. These teeth are not for chewing. Body is dark gray, usually with white lining to the mouth, and may have white patches on their belly. The flippers are relatively small and paddle shaped, and the flukes are fairly flat and tri- angular shaped. The dorsal fin is low, thick, and usually rounded.

Distribution: Widely distributed. Can be found throughout the waters, ranging to near the ice-edge in both hemispheres, and also common near the equator, especially in the Pacific. More common in areas with deep waters. Sexes have different distributions.

Diet: They feed on larger organisms that inhabit the deep ocean. They mainly feed on squids and other cephalopods. When foraging, they make repeated deep dives, typical of around 600 m depths for 45 minutes.

Behaviour: Sperm whales perform echolocation. They vocalise, producing clicks and sounds for foraging and social communication. They are social animals, with females always in the company of other females, some of whom can be her relatives. A family unit can consist of around 10 females and their young, with most females remaining in the same unit throughout their lives. Communal care for young occurs, with females suckling calves that are not their offspring. They form different defensive patterns to protect the unit. Males would leave the unit between age 4 and 21. They may form “bachelor schools”.

Life history: Low birth rate, slow growth and high survival, with single births and equal sex ratio.

Conservation/threats: Sperm whales are listed as Vulnerable (VU) in the IUCN Red List. Sperm whales face various anthropogenic threats. This includes fisheries or bycatch where sperm whales can get entangled in gillnets, long lines or other fishing equipment. Pollution including plastic waste threatens sperm whales. Vessel traffic and collisions have been known to kill sperm whales. Deep sea mining, oil and gas exploration, produce loud sounds and noise pollution, affecting echolocation, communication and may cause harm. Climate change also affects the sperm whales.

Whaling for the spermaceti and sperm oil, used in lamps and candles happened in the 18th and 19th century. Currently, commercial whaling is illegal following the International Whaling Commission’s 1986 moratorium. However, their population growth has stagnated.

They play important ecological roles. Additionally, when they die, they would sink down, helping with carbon removal.