

**UNIVERSITI TEKNOLOGI MARA**

**TECHNICAL REPORT**

**MODELLING OF KILLER WHALE POPULATION (ORCINUS  
ORCA) VIA THE LEFKOVITCH MATRIX MODEL**

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## ABSTRACT

Orcas, also known as killer whales, are large marine mammals found in every ocean on the planet. Orcas live in social groups called pods and use vocalizations to communicate and navigate. They have a lifespan of around 30-60 years for males and 50-90 years for females, and they give birth to a single calf after a pregnancy of 15-18 months. The rapidly dwindling population has piqued the interest of the international community, whether it be the environmental professionals or ordinary people. Hence, this study applied the Lefkovitch model which is a mathematical tool used to study population dynamics, and it has been used in the study of killer whale *Orcinus Orca* populations as well as environmental management. The life cycle of Killer Whale consists of five stages which are baby, yearling, juveniles, mature females and post reproductive. These five stages of the killer whale life cycle were used in constructing the transition matrix for the Lefkovitch matrix model. This study aims to determine the reproduction, growing and surviving parameter. The Lefkovitch matrix contains the reproduction parameter  $F_i$ , surviving parameter  $P_i$  and growing parameter  $G_i$ . The secondary data was used to gather the information. The remaining information, including the reproduction, growth, and survival parameters, was gathered by our own measurement. In this study, population of killer whales will be forecast using Lefkovitch Matrix model and also utilizing Lefkovitch matrix to forecast from 2016 until 2025. In the next future, the detail of survival in the future can be assign in detail based on the something effect on population. Furthermore, the model was validated by using reproduction grow,  $R_0$  and also seek to calculate Elasticity & Sensitivity of the population. Based on this study the Lefkovitch matrix is consider the perfect model to employ when utilizing a dependent model to simulate the *Orcinus orca* population dynamics. It recommended to the authorities of killer whale to focus on the second stage life of killer whale, yearlings which is influencing the growth of the population. In order to prevent the extinction of killer whale, first stage of killer whale that giving birth must be protected by authorities which is juveniles. Hence, the population of killer whale will steadily grow. For future research, it recommends to the researcher to observe environment of killer whale and collect more data about survival rate of killer whale. Therefore, the result of killer whale population more accurate