I.INTRODUCTION

1.1 Background

Thraustochytrids are a group of single-celled marine protists that rely on consuming organic matter for energy, a characteristic known as heterotrophy (Lyu et al., 2020). The Thraustochytriaceae is a marine protist which family including includes 11 genera and 35 species, with over 15 species belonging to *Thraustochytrium* sp. They are unicellular, oleaginous, non-photosynthetic eukaryotic-stramenopile protists classified under the kingdom Straminipila, class Labyrinthulomycetes, and family Thraustochytriaceae (Bongiorni, 2012). These marine protists, part of the larger Labyrinthulomycetes group, are mono-centric and notable for their unique ultrastructure and biochemistry (Gupta et al., 2012).

Thraustochytrids have been isolated from diverse marine substrates, including seawater, mangrove leaves, sediments, estuarine water, macroalgae, marine animals, and marine snow (Li et al., 2015). Thraustochytrids are rarely found on living marine plants and do not act as plant pathogens, but they play a significant role in carbon fixation and biomass in mangrove ecosystems. The ectoplasmic net system aids in colonizing leaf litter by facilitating cell movement and attachment (Morabito et al., 2019). Their ecological role in maintaining mangrove health highlights their dual significance, making them valuable subjects for further exploration (Gupta et al., 2012).

Thraustochytrids, with a unicellular structure and no cell walls, adapt easily to environmental changes, adjusting fatty acid composition based on salinity and temperature shifts (Tsui et al., 2012). Moreover, sodium over potassium, they thrive in salinity ranging from 20% to 34%, even in extreme hypersaline environments like the Great Salt Lake (Song et al., 2023). Thraustochytrids utilize an ectoplasmic network to adhere, penetrate substrates, and produce diverse hydrolytic enzymes, including amylase, protease, xylanase, lipase, phosphatase, pectinase, esterase, and cellulase. These enzymes play a crucial role in nutrient solubilization and absorption, contributing to processes like litter decomposition, food web enhancement, and nutrient enrichment (Kalidasan et al., 2021). Thraustochytrid exhibits a notable capacity for accumulating lipids with high polyunsaturated fatty acids (PUFAs) content, featuring particularly significant levels of docosapentaenoic acid (DPA, C22:5, n-3) and docosahexaenoic acid (DHA, C22:6, n-3) (Guo et al., 2020). The commercial appeal of Thraustochytrids lies in their potential to produce DHA oil and DHA-rich biomass, gaining traction in the nutraceutical and livestock nutrition feed industries to meet the demand for health-promoting products and nutritional supplements (Bagul et al., 2021). Thus, Thraustochytrids is one of promising eco-friendly alternative to fish oil and offering commercial potential by using low-cost substrates like biodiesel-derived glycerol.

The research of Thraustochytrids has been done before by Kalidasan et al. (2021), in which marine Thraustochytrids from South Andaman mangroves is different thraustochytrid strains exhibited diverse shapes, reproductive modes, and cellular features, suggesting potential species differences. Further, the use of 18S

rRNA sequencing for 12 thraustochytrid strains showed high similarity to known groups in the NCBI database, but with varying degrees of match (92.32% to 99.66%), indicating genetic diversity among the strains. Given the variations in thraustochytrid presence and their vital importance, This research at Universiti Malaysia Terengganu is crucial for identifying the genetic diversity and identity of Thraustochytrids, providing a comprehensive understanding of their characteristics. The study focuses on decayed mangrove leaves and water samples collected from coastal areas, within the local marine environment.

1.2 Problem Formulation

1.2.1. How is the diversity of thraustochytrid isolated from marine water at coastal areas and decayed mangrove leaves of Kuala Terengganu?

1.2.2. How is the molecular characterization and genetic diversity of thraustochytrid isolated from marine water at coastal areas and decayed mangrove leaves of Kuala Terengganu?

1.3 Research Objectives

This research aim to understand the genetically variation of Thraustochytrids among different samples such as marine water collected from coastal areas and decayed mangrove leaves in the local marine environment.