Morphological Analysis of Gastric Nematodes in Pygmy and Dwarf Sperm Whales (Kogia breviceps and Kogia sima) Using Stereoscopy, Scanning Electron Microscopy, and Histology

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Pygmy and dwarf sperm whales (Kogia breviceps and Kogia sima) are deep-diving cetaceans with limited internal health data due to low visibility. Necropsies often reveal stomach infestations by nematodes, parasitic worms that damage tissue and impair digestion. This study examines differences between nematodes embedded in gastric tissue and unattached nematodes in stomach lumen. I aimed to compare nematode external and internal morphological traits, document interactions with stomach tissue, assess bacterial presence, and measure widths and developmental features. Nematodes were analyzed using stereoscopy for broad analysis, scanning electron microscopy (SEM) for detailed surface morphology, and histology for internal organs and tissue interactions. Embedded nematodes averaged 181 µm in width, lacked spicules and bacteria, had smaller teeth, and had ridged striated cuticles that damaged gastric tissue and caused possible tissue immune responses. Unattached nematodes were larger, averaged 261 µm in width, showed spicule emergence, smoother cuticles, hexaradiate lips with sharp teeth, and frequent bacterial colonization on their cuticles. Cuticles, excretory cells, ventral and dorsal nerve cords, lateral epidermal cords, radial muscles, intestines, testes, and ovaries were visible in cross sections. This study uses multimodal microscopy to establish benchmarks for nematode internal organs and tissue damage patterns. Nematodes from whales infect seafood such as fish and squid, posing a health concern when humans consume nematode larvae through anisakiasis. Treatment strategies begin with understanding nematode morphology and interactions with host tissue. Multimodal microscopy helps document nematode features, which guides treatment strategies for both humans and whales.

Awards Won:
Second Award of $2,400