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Motion Analysis of Sea Turtle with Prosthetic Flippers

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ABSTRACT

"Yu Project" has begun since 2009 to make prosthetic flippers in cooperation with veterinarians, a prosthetic company, aquariums, universities and a public administration for an injured sea turtle named "Yu". A third of her right flipper and a half of her left flipper were eaten by a shark.
The purpose of this study is to contribute to design and development of prosthetic flippers from the viewpoint of motion analysis of fore flippers of sea turtles. We compared the motion of fore flippers in two and three dimensions among "Yu" herself, "Yu" equipped with prosthetic flippers, and a healthy sea turtle named "Sho" in a pool of an aquarium, an artificial lagoon and a water circulating tank. We also carried out theoretical analysis based on a wing theory to investigate the influence of the prosthetic flippers on the swimming performance of the sea turtle.
It was clarified that we have to pay attention to a flexible prosthetic flipper around the joints which makes it possible to describe a circular arc in horizontal plane and produce larger feathering angle.

KEY WORDS: prosthetic flippers; motion analysis; wing theory; sea turtle.

INTRODUCTION

We found a female sea turtle (*Caretta caretta*) at Kiisuido in the 2008 Summer. A third of her right flipper and a half of her left flipper were eaten by a shark. This sea turtle named "Yu" was rescued by Sea Turtle Association of Japan from further attacks. "Yu" had only about 60% of swim speed of a healthy sea turtle. Because we judged that we couldn't return her to the sea under such a condition, we started a project to make prosthetic flippers in cooperation with veterinarians, a prosthetic