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Fibropapillomatosis on sea turtles, a sentinel of ecosystem health?

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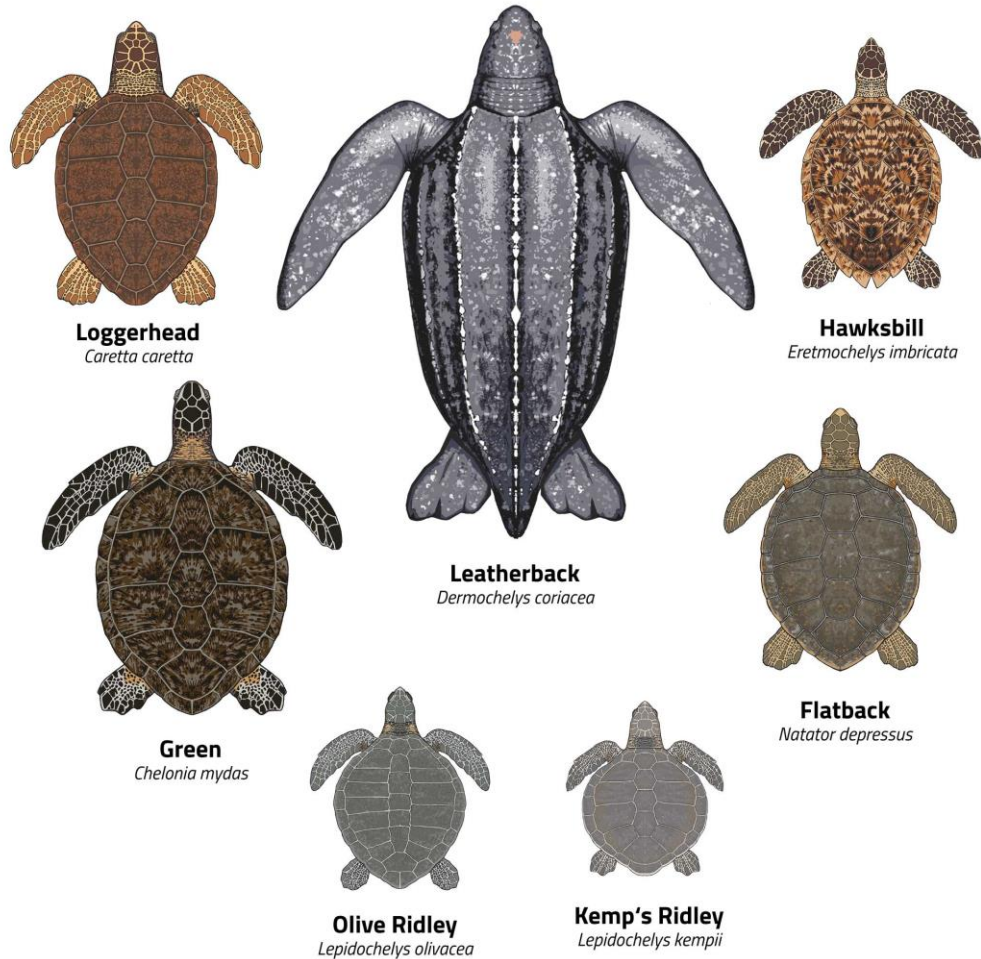


Introduction

Sea turtles are large aquatic reptiles that inhabit tropical and subtropical seas. They spend most of their lives on the high seas and do not return to land until every 2-4 years after reaching sexual maturity. The wild populations of sea turtles have been declining in the last decades. Illegal hunting, ingestion and entanglement of marine debris, marine pollution, artificial lighting of the nidification sites, beach erosion, habitat destruction, invasive species predation, and warming of the oceans due to climate change.

In the last years fibropapillomatosis, a neoplastic disease, that has been affecting sea turtles' populations throughout the world and contributing to their decline. Little is known about the disease, although recent studies suggest a viral etiology, linked to environmental factors such as pollution or climate change.

Introduction

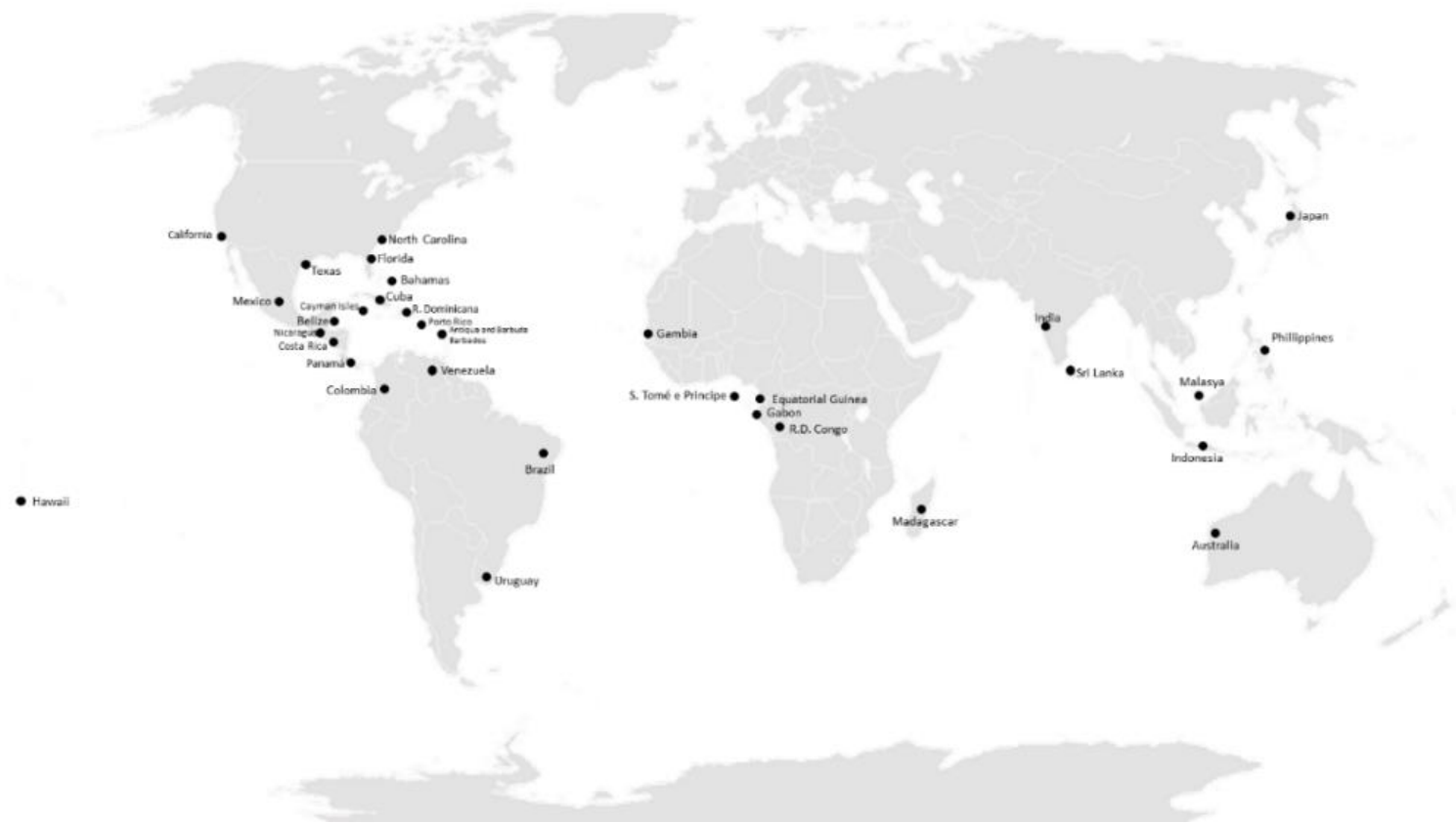


Affected species and conservation status (IUCN Red List of Threatened Species 2014)

Specie	Population	Conservation Status
<i>Caretta caretta</i>	Wild	Vulnerable
<i>Chelonia mydas</i>	Wild, Captivity	Endangered
<i>Dermochelys coriacea</i>	Wild	Vulnerable
<i>Eretmochelys imbricata</i>	Wild	Critically in Danger
<i>Lepidochelys kempii</i>	Wild	Critically in Danger
<i>Lepidochelys olivacea</i>	Wild	Vulnerable
<i>Natator depressus</i>	Wild	Data deficient

The first occurrence of skin fibropapillomatosis was reported in a green sea turtle (*Chelonia mydas*) from Florida (USA) in 1930. Even though the prevalence is higher in *C. mydas*, this disease has also been reported in Loggerhead (*Caretta caretta*), Kemp's Ridley (*Lepidochelys kempii*), Hawksbill (*Eretmochelys imbricata*), Flatback (*Natator depressus*), Olive ridley (*Lepidochelys olivacea*), and the Leatherback (*Dermochelys coriacea*)

Introduction

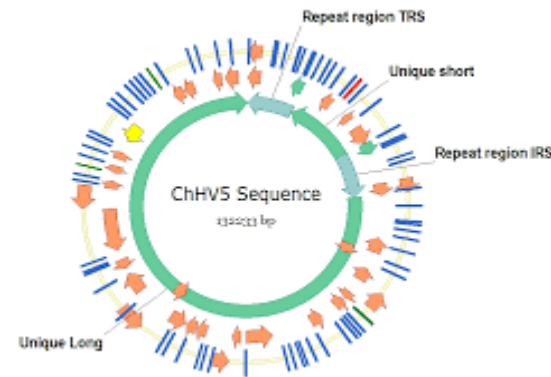


Map showing the distribution of sea turtle fibropapillomatosis.



Etiology and Transmission

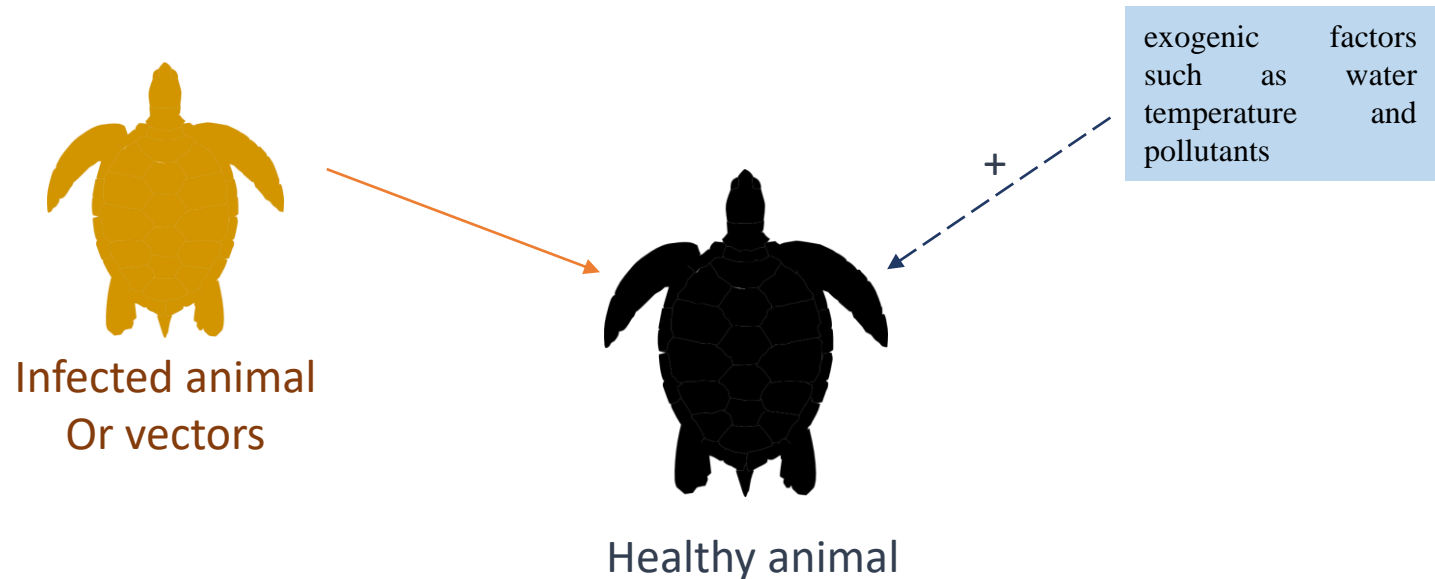
The principal main etiological agent of fibropapillomatosis appears to be Chelonid herpesvirus 5 (ChHV5), a nonzoonotic agent. Some authors refer that it is possible that ChHV5 has existed within turtles for at least 8.9 million years and evolved during this period without harming the hosts. However, exogenic factors such as water temperature and pollutants may have caused a virus-host imbalance and the onset of the disease. Recent studies have shown a higher prevalence of disease in areas of highly polluted waters (chemicals, pesticides, algae, and others).





Etiology and Transmission

The transmission of this virus is still unknown since it is hard to culture in the laboratory and almost impossible to study in vivo since most sea turtle's species are near extinction. The literature suggested that the virus may be spread through direct contact with infected animals or through contact with virus-containing substrates, horizontally. Juveniles appear to be unaffected at birth. Also, mechanical vectors (coral reef cleaner fish, the saddleback wrasse, marine leeches) may have a role in the transmission of the virus.





Clinical presentation

Skin fibropapillomas in sea turtles present as elevated formations, with 0.1 to 30 cm in diameter, well defined from the surrounding tissues. Neoplasms are usually smooth, firm, and white but others may be gelatinous and translucent. They are commonly ulcerated or necrotic. These masses are found especially on soft skin but can be found anywhere on the body of the turtle (e.g., flippers, neck, chin, inguinal and axillary regions, tail). In addition, some animals may develop internal nodules



<https://www.fisheries.noaa.gov/national/marine-life-distress/fibropapillomatosis-and-sea-turtles-frequently-asked-questions>

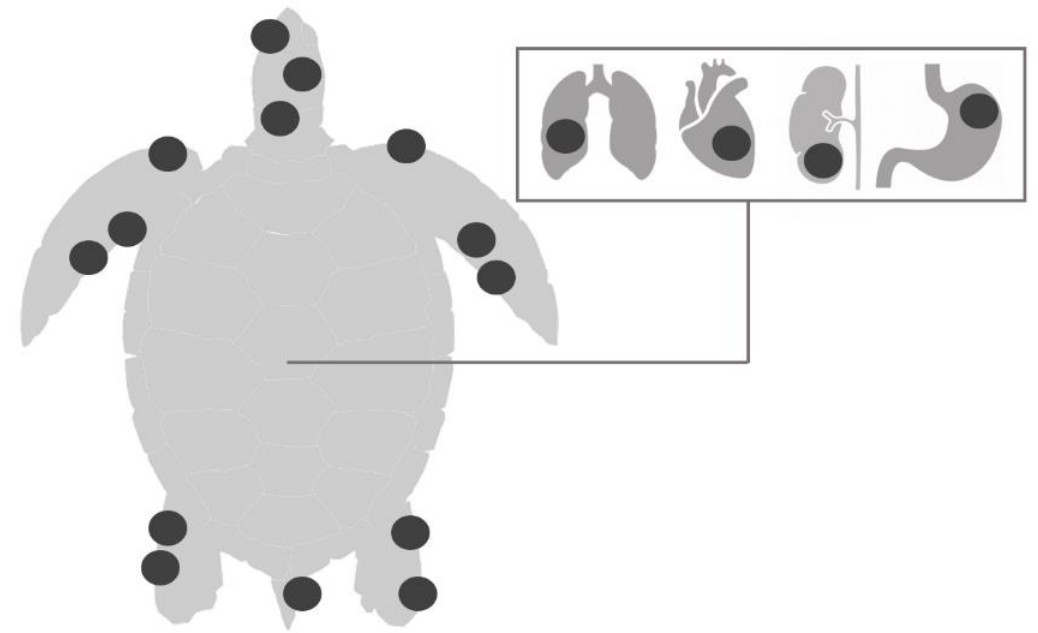


<http://okinawa-turtles.com/?p=313>



Clinical presentation

Fibropapillomas can develop all over the body and become large enough to interfere with locomotion, and vision (panophthalmia and destruction of the eyeball) and compromise other organic functions, such as feeding. The animals end up dying of starvation and dehydration or secondary infection from ulcerated masses.





The impact of climate change

Some studies have shown that water temperature has an important impact on tumour formation and the spread of the infectious agent [7,14]. Some researchers suspect that the increase in water temperature is realizing an excess of chemicals (eutrophication), such for example nitrogen, that accumulates in the food of turtles (e.g., Algae) and can be a factor that induces the occurrence of the disease.

The increase of ultraviolet light (UV) due to climate change is suspected to contribute to the emergence of tumours in ChHV5-infected animals. This is because UVB is associated with damage to DNA and increases its mutation rate, being responsible for the development of tumours in other animals.

Experiences in captive green turtles observe that they develop more tumours during the warmer months. Therefore, environment temperature probable impacts fibropapillomatosis occurrence in sea turtles, similar to what occurs in other herpesviruses in other populations.



Conclusions

Some studies have shown that water temperature has an important impact on tumour formation and the spread of the infectious agent. Some researchers suspect that the increase in water temperature is realizing an excess of chemicals (eutrophication), such for example nitrogen, that accumulates in the food of turtles (e.g., Algae) and can be a factor that induces the occurrence of the disease.

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