

Establishment of multi elements simultaneous determination of the plasma trace and major element status in sea turtles in Okinawa by PIXE

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Abstract

The aim of this study was to establish multi elements simultaneous determination of the plasma trace and major element status in sea turtles in Okinawa, Japan. We evaluated the reliability of direct determination of trace and major element concentrations in plasma samples from wild and captive sea turtles, the relationships between carapace parameters as indicators of age and plasma elements in captive hawksbill sea turtles, and the concentration of trace elements in the plasma of sea turtles that inhabited the suburban (Okinawa Main Island) and the rural coast (Yaeyama Island) in Okinawa, Japan. The particle induced X-ray emission method allowed detection of 23 trace and major elements. The wild sea turtles were found to have high concentrations of As and Pb in plasma compared with captive, but there were no significant changes in the Al and Hg concentrations. Loggerhead sea turtles were found to have significantly higher accumulation of As and Pb in plasma in comparison to other species. There were significant but weak correlations between the virtual carapace surface area and plasma Br, P, Pb and Sr, while there were no significant correlations with other elements. The wild sea turtles in the suburban coast in Okinawa were found to have high concentrations of Pb, Si and Ti in the plasma when compared to the rural area but there were no significant changes in the Al, As and Hg concentrations. These results may help to suggest the status of some elements in a marine environment. Further, monitoring the plasma trace and major element status in sea turtles can be used as a bio-monitoring approach by which specific types of elements found here could indicate effects that are related to human activities.