Photo-id provides new insights into barnacle longevity, growth rates, and directional translocation on sea turtles

Kostas Papafitsoros[1], Nathan Robinson [2], Gail Schofield [3] and John Zardus [4]

Abstract. The epibiotic barnacle Chelonibia testudinaria is found associating with a wide diversity of marine animals, including sea turtles. Individual turtles vary in their barnacle loads, possibly as a function of cleaning frequency or immune status (i.e., health) of the host. High barnacle loads may negatively influence hydrodynamics for turtles; yet, despite their ecological importance, knowledge concerning the biology and life-history of these hitchhiking commensals remains limited. We have begun to fill this knowledge gap through a long-term photo-identification project for loggerhead sea turtles, Caretta caretta, around Zakynthos Island in Greece. The turtles here include breeding males and females as well as adult and juvenile year-round residents. Inspection of repeat photographs of the same turtle over timeframes ranging from months to years has yielded new insights for C. testudinaria on its longevity, growth rate, and directional translocation on the host.

From a database of over 500 turtles, we selected the records of eight individuals for use in this study. These individuals were chosen because we had repeat photographs from each in which barnacles were clearly visible. After inspecting these photographs it was clear that it is possible to monitor individual barnacles over time. Indeed, we were confident that the barnacles observed in the same location on the same turtle were the same individuals over time (rather than being replaced by another individual after falling off/being removed), because: (1) the position and orientation were similar and (2) the increment in growth fitted the observed barnacle. Barnacles around Zakynthos require at least a month to grow 3-4 cm in shell length, making it highly unlikely that barnacles of a similar size found at the same location on the same turtle are due to replacement and growth of a new individual.

Repeat observations of three turtles within the same year, showed that the barnacles could remained attached to the host turtle for at least five months (max. consecutive observation period within the same year). Furthermore, across different years, we documented the same barnacle individuals on uniquely identified turtles over periods of up to four years ($n = 2$ barnacles on 1 turtle), with 15 lasting more than 1 years on five other individuals. Though C. testudinaria have been recorded surviving 5-10 years on fixed substrata, our data are the first to show that individual barnacles may live this long as well on sea turtles. We estimated a relative mean growth rate of 2 shell lengths/2 weeks, i.e., barnacles doubled their shell length every two weeks (n = 8 barnacles on 1 turtle). Interestingly, we were also able to confirm the results of Moriarty et al. (Marine Turtle Newsletter 119, 2008) who documented that attached C. testudinaria are able to translocate on their hosts (three juvenile green turtles) up to 1.4 mm per day. Similarly, we observed barnacles positioned on the head and carapace move a distance of up to 4 times their shell length within 14 days ($n = 9$ barnacles on 4 loggerhead sea turtles).

[1]Weierstrass Institute for Applied Analysis and Stochastics (WIAS), Mohrenstrasse 39, 10117, Berlin, Germany
[2]Cape Eleuthera Institute, PO Box EL-26029, Rock Sound, Eleuthera, The Bahamas
[3]Deakin University, Geelong, Australia, School of Life and Environmental Sciences, Centre for Integrative Ecology, Warrnambool, VIC 3280, Australia
[4]The Citadel, 171 Moultrie Street, Charleston, South Carolina, U.S.A.
Emails: Kostas.Papafitsoros@wias-berlin.de
nathanjackrobinson@gmail.com
g.schof@gmail.com
zardusj1@citadel.edu