WILD SPATIAL BEHAVIOR AND PERSONALITY TRAITS: A COMPARISON STUDY FOR JUVENILE LEMON SHARKS.

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Abstract
In recent years, information on animal behavioral traits and consistent individual differences within species and/or populations has been expanding; yet, several aspects, such as the influence of personality on wild behavior, have not been addressed. This study focuses on the influence of personality on the natural space utilization and movement metrics of a free ranging predator species, the lemon shark, *Negaprion brevirostris* (Poey, 1868). Here, 12 juvenile lemon sharks were preliminarily subjected to a novel open-field test in a semi-captive environment before being released and acoustically tracked in their nursery area. Preliminary observations suggest a trend relating personality traits to space utilization in juvenile lemon sharks around Bimini Islands, Bahamas.

Keywords: Behaviour, Elasmobranchii, Monitoring, Remote sensing, Western Atlantic

The investigation of inter individual differences in behavior, called personality, is a well-documented topic in a wide range of taxa. Noticeable individual differences in the ecology (e.g. behavior, habitat and space use) of seals, sharks, tunas, and several fish have been detected in different investigations over the last decades, mostly reported via the use of telemetry methods [1]. However, in these studies, it remains challenging to determine whether the reported variations are influenced by environmental conditions or whether they are related to the individual personality traits, that is to say, if they are the result of consistent inter-individual differences in behavior across time and context. Understanding personality is an emerging field of considerable relevance and contribution to the development of a new insight in the ecological (e.g. the relationship between the individual, its environment, its con-and heterospecifics) and evolutionary implications personality traits might have for organisms and populations [2]. For practical purposes, most research has tended to involve small species of relatively short life history traits, usually captive bred, eluding the ultimate causes and consequences of personality [3]. Yet, it is acknowledged that personality in the wild is likely to have evolutionary implications, for instance in regulating the individual adaptive potential through tradeoff thresholds. It may influence the fitness of the individual, its habitat use, the size of its home range as well as its exploratory behavior [4]. This study focuses on the link between individual variations, expressed in movement, habitat and space use, and personality traits of a marine predator species of elasmobranch. The lemon shark, *Negaprion brevirostris*, is a coastal tropical shark species belonging to the Carcharhinidae family. Bimini Islands are perceived as important hotspots, encompassing diverse nursery areas of juvenile lemon sharks [5]. This species represents a relevant model for large marine predators, showing a peculiar adaptation and resilience to captivity [6]. Previous research on the movement ecology of *N. brevirostris* in the Bahamas has documented small home ranges in juveniles, which facilitate the tracking process [7]. Preliminary research on lemon shark's personality has been carried out in mesocosms around Bimini Islands, Bahamas, for the past few years, revealing evidences of consistent individual differences in behavior in lemon sharks (unpublished data). In 2015, a total of 36 juveniles were exposed to a novel open field test (widely recognize in the behavioral field of research). Each individual performance was scored. The current research intends to establish whether natural movement ecology is a reflection of the reported personality features. A subset of 12 individuals from the 36 tested in 2015 were acoustically tagged and released at their respective capture location. In order to determine the extent to which personality traits predicts natural space use, movement patterns and spatial use were monitored over an eight months period, between August 2015 and April 2016, using a passive monitoring array of 15 Submersible Ultrasonic Receivers (SUR, ©Sonotronics) and a weekly active tracking survey (Fig. 1).

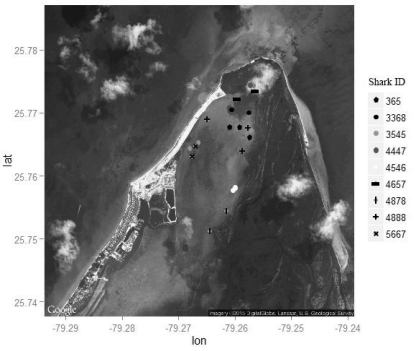

Fig. 1. Results from an active tracking effort (one day). A total of 9 juvenile lemon sharks were detected in their nursery area.

Detection range testing was performed, with results indicating that acoustic telemetry was an efficient and reliable tool for this research. To elucidate the question, the individual scores obtained from the novel open field test were considered for comparison with spatial metrics data. A first overview revealed a potential trend, relating movement patterns and habitat use to the personality traits exhibited in captivity. The current approach appears to shed light on personality traits in a long lifespan marine predator, tracked in its natural environment.

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