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# Argos-Linked Fastloc GPS Reveals the Resting Activity of Migrating Sea Turtles

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**Abstract :** Variation in diel movement patterns during migration provides information on the strategies used by animals to maximize energy efficiency and ensure the successful completion of migration. For instance, many flying and land-based terrestrial species stop to rest and refuel at regular intervals along the migratory route, or at transitory 'stopover' sites, depending on resource availability. However, in cases where stopping is not possible (such as over–or through deep–open oceans, or over deserts and mountains), non-stop travel is required, with animals needing to develop strategies to rest while actively traveling. Recent advances in biologging technologies have identified mid-flight micro sleeps by swifts in Africa during the 10-month non-breeding period, and the use of lateralized sleep behavior in orca and bottlenose dolphins during migration. Here, highly accurate locations obtained by Argos-linked Fastloc-GPS transmitters of adult green (n=8 turtles, 9487 locations) and loggerhead (n=46 turtles, 47,588 locations) sea turtles migrating around thousand kilometers (over several weeks) from breeding to foraging grounds across the Indian and Mediterranean oceans were used to identify potential resting strategies. Stopovers were only documented for seven turtles, lasting up to 6 days; thus, this strategy was not commonly used, possibly due to the lack of potential 'shallow' ( < 100 m seabed depth) sites along routes. However, observations of the day versus night speed of travel indicated that turtles might use other mechanisms to rest. For instance, turtles traveled an average 31% slower at night compared to day during oceanic crossings. Slower travel speeds at night might be explained by turtles swimming in a less direct line at night and/or deeper dives reducing their forward motion, as indicated through studies using Argos-linked transmitters and accelerometers. Furthermore, within the first 24 h of entering waters shallower than 100 m towards the end of migration (the depth at which sea turtles can swim and rest on the seabed), some individuals travelled 72% slower at night, repeating this behavior intermittently (each time for a one-night duration at 3–6-day intervals) until reaching the foraging grounds. If the turtles were, in fact, resting on the seabed at this point, they could be inactive for up to 8-hours, facilitating protracted periods of rest after several weeks of constant swimming. Turtles might not rest every night once within these shallower depths, due to the time constraints of reaching foraging grounds and restoring depleted energetic reserves (as sea turtles are capital breeders, they tend not to feed for several months during migration to and from the breeding grounds and while breeding). In conclusion, access to data-rich, highly accurate Argos-linked Fastloc-GPS provided information about differences in the day versus night activity at different stages of migration, allowing us, for the first time, to compare the strategies used by a marine vertebrate with terrestrial land-based and flying species. However, the question of what resting strategies are used by individuals that remain in oceanic waters to forage, with combinations of highly accurate Argos-linked Fastloc-GPS transmitters and accelerometry or time-depth recorders being required for sufficient numbers of individuals.

**Keywords :** argos-linked fastloc GPS, data loggers, migration, resting strategy, telemetry
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