Theme session D

From iconic to overlooked species: How (electronic) tags improve our understanding of marine ecosystems and their inhabitants

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The use of both external and internal archival electronic tags has allowed for many physiological and environmental parameters to be measured directly in-situ by various marine organisms. Increasingly, advanced and miniaturized technology allows tagging of not only large, often iconic, but also small to medium sized species. Recent advances in this technology have allowed tags to progress from external badges requiring fishery dependence on reporting a recapture towards sophisticated electronic sensors recording a wide range of measurements. Beyond the traditional growth and mortality estimations, such data can now be used, amongst others, to allow for better estimation of seasonal distribution, migrations, homing and nursery grounds of both coastal and oceanic species. Additionally, detailed information can be gained on post-release mortality and behaviour of target, non-target, and by-catch species in order to allow for better management practices to be initiated in both harvest and non-harvest fisheries. Behavioural studies are facilitated by electronic or acoustic tags revealing both habitat use, aggregation behaviour, diurnal activity patterns, etc. Through corresponding insights into the ecology of a variety of species in relation to both changes in their physical environment as well as to e.g. catch data there can be significant improvements in the understanding of (marine) ecosystems and anthropogenic impacts. As a novel sampling approach (and processing technique), electronic, archival tags can for example contribute significant information to the ecosystem approach in fisheries research.

The session was attended by approximately 30-40 participants. Contributions included 10 talks and 2 posters and addressed several aspects of the use of electronic tags: (1) novel methods to evaluate data from archival tags to facilitate or increase the precision of geolocation methods; (2) spatial investigations of migration and distribution of a variety of species; (3) applications of tagging studies in both citizen science and basic research projects.

Several papers and a poster addressed studies conducted on the endangered European seabass. Data from both data storage (DST) and satellite tags were used to both identify behavioural patterns (D:322) as well as to improve geolocation models (D:323). Different behavioural and activity patterns derived from according depth data series could be related to seasonal functional behaviours (feeding, migrating, spawning). Through comparing distribution patterns using different Hidden Markov geolocation models, an improved understanding of seabass population structure as well as movements within or across stock management units. A forthcoming project I-BASS, addressing the effectiveness of spatial management for seabass through the use of acoustic telemetry was also presented (D:286) as was a poster on the use of acoustic telemetry to monitor competitive interactions between European seabass and gilthead seabream in an estuarine system (D:315).

As an -in a way- novel development, several studies were presented that highlighted the use of electronic tags to investigate non-indigenous, invasive or introduced species in both marine and riverine systems, either to increase knowledge on their habitat use, seasonality and catchability in order to facilitate directed fisheries as a control mechanism (D:354), or to investigate e.g. dispersion and home ranges in relation to anthropogenic disturbance effects on recreationally targeted, introduced species (D:155).

Further papers/posters highlighted the broad range of applications of electronic tags: Data from corresponding tags can either be used to assess spatial distribution patterns of fishes in marine protected areas to e.g. evaluate the effectiveness of protection measures (D:477), to investigate possible attraction effects and interactions of salmon farms/cages and benthic invertebrates (D:526), to assess further anthropogenic influences of electromagnetic fields (e.g. through offshore windfarms and cables) on migratory and electro-sensitive species in an experimental setup (D:381), or to investigate species interactions through predation (D:471).

A common issue with geolocation methods using data derived from archival tags are limitations including low horizontal resolution, flawed land boundary treatment and long computational time. Paper D:339 introduced a GPU-accelerated particle filter geolocation method that addressed these issues and improved the precision of geolocation for demersal fish species.

A paper highlighting the cooperation of stakeholders and participants of recreational sport fishing with universities in form of citizen science projects introduced the IGFA Great Marlin Race (D:517). It was shown that based on the quantity of billfishes tagged, both technical improvements (e.g. increasing retention times of tags) as well as improvement in management strategies through better knowledge of migration patterns, vertical habitat use etc. could be derived.

After the presentations, the main topics of the session were discussed. In a more general discussion it was highlighted that there seems to be a lack in communication amongst scientists regarding experiences and knowledge in terms of tagging techniques, tag programming etc. It was felt that individual tagging study setup, deployment times and results could significantly improved through a better communication of such issues or a possible “handbook” of established techniques. Another issue that was discussed was the perception of some of the session attendants that more sensor types might be required on tags for different studies, which the few manufacturers seemed to be reluctant to develop. Finally, it was discussed that the common perception of conventional tagging studies being more cost effective than electronic tagging studies might be wrong considering the quantities of tags that need to be deployed and the logistics involved in order to get a sufficient number of –fishery dependent- returns. In this context, it was mentioned that a cost-effective alternative could be a sensorless, cheap pop-up tag that merely transmitted the position where it detaches from the tagged specimen. Altogether, the advancing miniaturization of electronic tags was shown to broaden the scope of in-situ studies of not only iconic but increasingly also hitherto overlooked species.