

Project Update: March 2014

India's only coral reef atolls, the Lakshadweep Islands, boast of crystal clear waters, tranquil island living and diverse marine life. These ecologically sensitive geological wonders host a population of over 70,000 in a meagre combined land area of 32 km². Living closely connected to both land and sea, the islanders derive income primarily from coconut cultivation and fish harvest.

Tuna constitutes over 80% of Lakshadweep's total marine harvest and majority of the harvest is carried out using the pole and line fishing technique, a small-scale commercial method that has low habitat impact and high species selectivity (Figure 1). The fishery uses small planktivorous fish from island lagoons and reefs as live-bait to harvest oceanic skipjack tuna (*Katsuwonus pelamis*); thus targeting the lower trophic levels in the reef ecosystem (Figure 2) and higher trophic levels in the open ocean system, avoiding the sensitive slow growing, late maturing top predators of the reef.

However, recent changes in tuna stock abundance and associated fishing practices threaten the sustainability of this fishery.

This project is an interdisciplinary collaborative study to document the socio-ecological dimensions of Lakshadweep's primary fishing industry. Currently, declining tuna catch, coupled with baitfish unavailability is threatening a shift in fishing pressure from open ocean tuna stocks to reef fish. The project has three main objectives: to assess baitfish stock, evaluate fisher perspectives regarding the pole and line tuna fishery, and, initiate a community based catch monitoring program, in the hope of facilitating a shift from that of exploitation to sustainable utilization amongst resource users.

Funded by the Nilekani funds and Rufford Small Grants for Nature Conservation, this project began in mid-2012. Over the past year and a half we have conducted in-water surveys of baitfish populations and socio-economic interviews of fishers in the islands of Agatti, Kadmat, Kavaratti and Minicoy. Fisher interviews have revealed significant declines in tuna catch volume and size over the past decade, and this has been accompanied by the spatial expansion of fishing grounds. Factors most often cited for declines in tuna catch include changes in currents, especially since the 2004 tsunami, increase in external fishing pressure and tuna tagging. There was little to no concern regarding baitfish abundances. However, regional and site-specific differences in baitfish abundances are evident from both fisher interviews and in-water surveys (Figure 3). Our ecological surveys found a limited relationship between baitfish abundance and fishing pressure (Figure 4), indicating the role of environmental factors as drivers of these lower trophic level planktivorous fish species. Our ongoing ecological surveys are aimed at teasing apart these factors.

The recent declines in tuna landings and the limited access to profitable markets pose significant threats to fisher livelihoods. Accompanying these downwards trends are increases in unsustainable fishing practices including the use of Fish Aggregating Devices (FADs) to enhance tuna catch as well as the switch to commercial reef fishing. FADs contribute to growth overfishing as they tend to attract smaller skipjack. Catch from FADs

most often comprises of undersized skipjack along with high levels of bycatch of juvenile yellow fin, rainbow runners and mahi (Figure 5). Despite recognising this as a detrimental practice, fishers and fisheries managers alike promote this strategy as it provides fishers guaranteed catch and security in this era of rising fuel prices and variable landings. In the absence of tuna, fishers have also started targeting highly sensitive reef fish such as groupers and snappers, and mechanisms to export of these high value fish are opening up. If left unchecked, these changes can have serious and long-lasting impacts on both open ocean and reef ecosystems.

Our proposed community-based catch monitoring programme hopes to shed light on these developments and help fill existing data gaps. This fisher-based and fisher-maintained monitoring programme has the potential to provide valuable information on resource use while increasing stakeholder participation. Fishers in the island of Kavaratti helped design catch monitoring books, which are now in circulation in Agatti, Kadmat and Kavaratti (Figure 6). This has generated considerable interest and as data continues to be generated, we are currently discussing the next steps with the community, as at the core, this exercise is for the benefit of the fishers themselves. We hope to involve community members in data processing and sharing, while maintaining strong community data ownership rights. The trajectory of this intervention is yet to be realised, but so far the interactions with fishers have been positive and engaging.

Over the last 2 years our work in the Lakshadweep has evolved from being a largely ecological investigation to one which now includes and relies on community participation and feedback. By involving fishers directly in the design and implementation of this monitoring programme, we perceive this work to be a strategy complementary to environmental education. Our research data as well as that collected by the community could potentially be used in community-based governance and policy making. Our challenge now lies in developing this programme in a low-cost and low-tech manner in order to maintain its long-term viability.



*Figure 1. A typical Lakshadweep pole and line boat, Share Mubarak, fishes for tuna near a Fish Aggregating Device (FAD) 12nm off the coast of Kavaratti, using *Spratelloides gracilis* from the reef as live bait.*



Figure 2. Variety of baitfish used in the Lakshadweep pole and line tuna fishery including but not limited to clupeids¹, caesionids², apogonids³ and pomacentrids⁴.

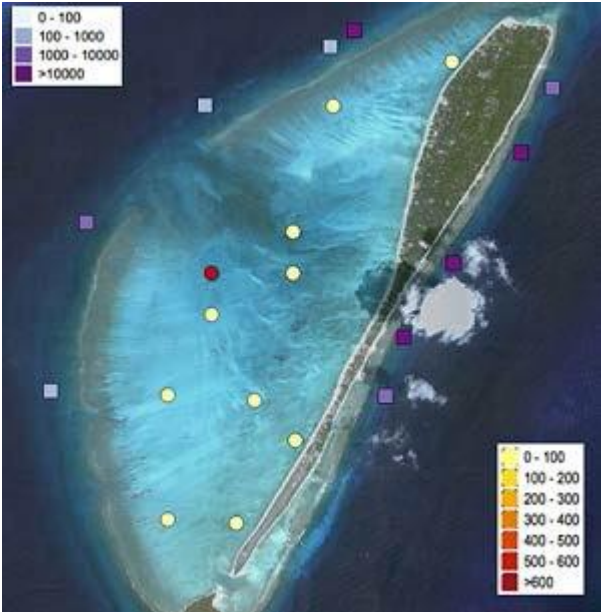


Figure 3. Our ecological surveys highlight significant spatial differences in baitfish densities. Reef baitfish densities (squares) were higher on the eastern aspect of all islands as shown here for the island of Agatti.

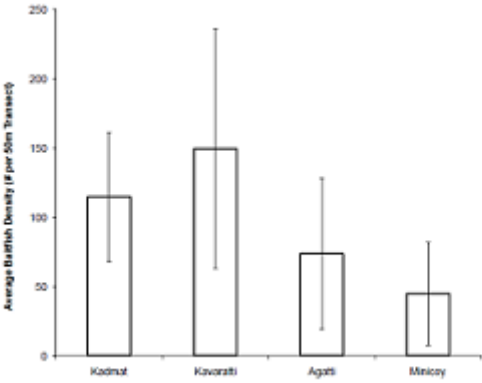


Figure 4. Average lagoon clupeid & atherinid abundance (\pm S.E.) sampled in Lakshadweep islands in increasing order of fishing pressure.



Figure 5. Mixed species catch from one of Lakshadweep's FADs consisting of juvenile skipjack, yellow fin and kawakawa tunas and a lone carangid, that unfortunately go unrepresented in departmental statistics due to inadequate monitoring.



Figure 6. Community--based fisheries monitoring notebook for the Lakshadweep pole **and** line tuna fishery designed and maintained by fishers in the islands of Agatti, Kadmat and Kavaratti.