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EDITORIAL

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Welcome to Issue 24 of IOTN, in which papers describe threats to sea turtles, including entanglement of adult turtles in fishing gear and potential destruction of nests by vegetation and ants, and an update from the Students Sea Turtle Conservation Network in India. Also described is a new book about sea turtle conservation in India by IOTN founding editor, Kartik Shanker.

As distance prevented many from South and South East Asia from attending the 36th Annual Symposium on Sea Turtle Biology and Conservation held in Lima,

Peru, in April 2016, we encourage you to read the International Sea Turtle Society's President's Report for highlights of the symposium. The 2017 symposium will be held in Las Vegas, USA, and we recommend that those planning to attend apply for an ISTS travel grant to reduce travel costs. IOTN24 also reports on a workshop on the ecology and conservation of sea turtles in the Persian Gulf. Organisers of future conferences and workshops in the Indian Ocean region are encouraged to advertise their event and report its outcomes in IOTN.

CALL FOR SUBMISSIONS

The Indian Ocean Turtle Newsletter was initiated to provide a forum for the exchange of information on sea turtle biology and conservation, management and education and awareness activities in the Indian subcontinent, Indian Ocean region, and south/southeast Asia. If you would like to submit a research article, project profile, note or announcement for Issue 25 of IOTN, please email material to iotn.editors@gmail.com before 1st November 2016. Guidelines for submission can be found on the last page of this newsletter or at <http://www.iotn.org/submission.php>.

ARTICLES



THREATS TO OLIVE RIDLEY TURTLES ON THE SUNDARBANS COAST OF BANGLADESH

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Marine turtles demonstrate continued population decline across their ranges due to an array of natural and anthropogenic threats. Threats are pervasive because turtles share multiple geographical localities and habitats (Márquez, 1990) and are often affected by both direct and indirect factors, including incidental capture in fishing nets, direct exploitation, or disturbance to nesting areas (Pandav *et al.*, 1997). Consequently, marine turtle species are listed with different level of endangerment in the wild (IUCN, 2016).

Five species of marine turtles are recorded from the coastal waters of Bangladesh: the olive ridley, green, hawksbill, loggerhead and leatherback turtles (Ahmed *et al.*, 1986). Coastal Bangladesh extends from the southeast Teknaf peninsula and adjacent St Martin's Island to the southwest beaches of the Sundarbans. The largest nesting populations of all species, with the exception of loggerheads, which are not known to nest in Bangladesh, occur on St. Martins Island. Olive ridleys are the most abundant nesting species at this location (Islam, 2002) and are also reported to nest on the sandy south-face beaches of the Sundarbans in Bangladesh (Gani, 2000). However, research and conservation efforts have been mainly confined to St. Martin's Island with little information available about populations in the Sundarbans islands.

The Sundarbans is the largest halophytic mangrove forest in the world, covering 10,000km² between Bangladesh and India. The forest includes a maze of rivers and creeks flowing from north to south into the Bay of Bengal, and human communities in north and east. Of the many isolated forest islands in the south of the Sundarbans, Dublar char (island) is home to thousands of artisanal fishers for six to eight months every year (Huda & Haque, 2001). Fishers employ a wide variety of gear, including gillnets (drift, large mesh, fixed, and bottom set), estuarine set bag nets, trammel nets, beach seines, push nets, drag nets, and different types of hand-operated gears and traps (Hoq, 2007).

A field survey from December 2015 to March 2016 for a tiger study allowed an opportunistic survey for sea turtles on several isolated beaches in the Sundarbans, from Mandarbaria in the west to Dimer char in the east (approximately 11km of coastline) (Figure 1). Beaches were examined for indications of turtle nesting, fishing activities on beaches and nearby coastal waters, remains of dead turtles, and beach erosion. Interviews with 14 fishermen in Dublar char fishing village were also conducted.

No signs of sea turtle nesting on the islands surveyed were observed during our brief study. However, nine dead olive ridley turtles (Figure 1) were recorded, seven of which were within the Dublar char fishing village and included three freshly killed individuals and four older carapaces partially covered by sand. Two additional carapaces were observed in the forest and had been eaten by wild boar.

There were no indications of entanglement in nets around the neck and flippers of dead turtles, although this would have been difficult to observe on older carcasses. However, interviews with fishers indicated that all turtles died after entanglement in fishing nets and were carried back to the village by fishers with their catch then discarded. There was no indication that turtle meat was removed to be eaten before the carcasses were discarded. Other turtles were thrown into the sea for fear of detection by staff of the Forest Department (Marine turtles known to occur in Bangladesh are included in the Schedule I of the Bangladesh Wildlife Protection & Security Act 2012 (MoEF, 2012). Such turtles are likely washed on to beaches across the Sundarbans.

The number of dead turtles observed during the 4-month survey suggests a need to more precisely quantify bycatch rates and mortality in the area during the fishing season (mainly from October to February). Although no butchered turtles were observed in this study, many communities, including those living in

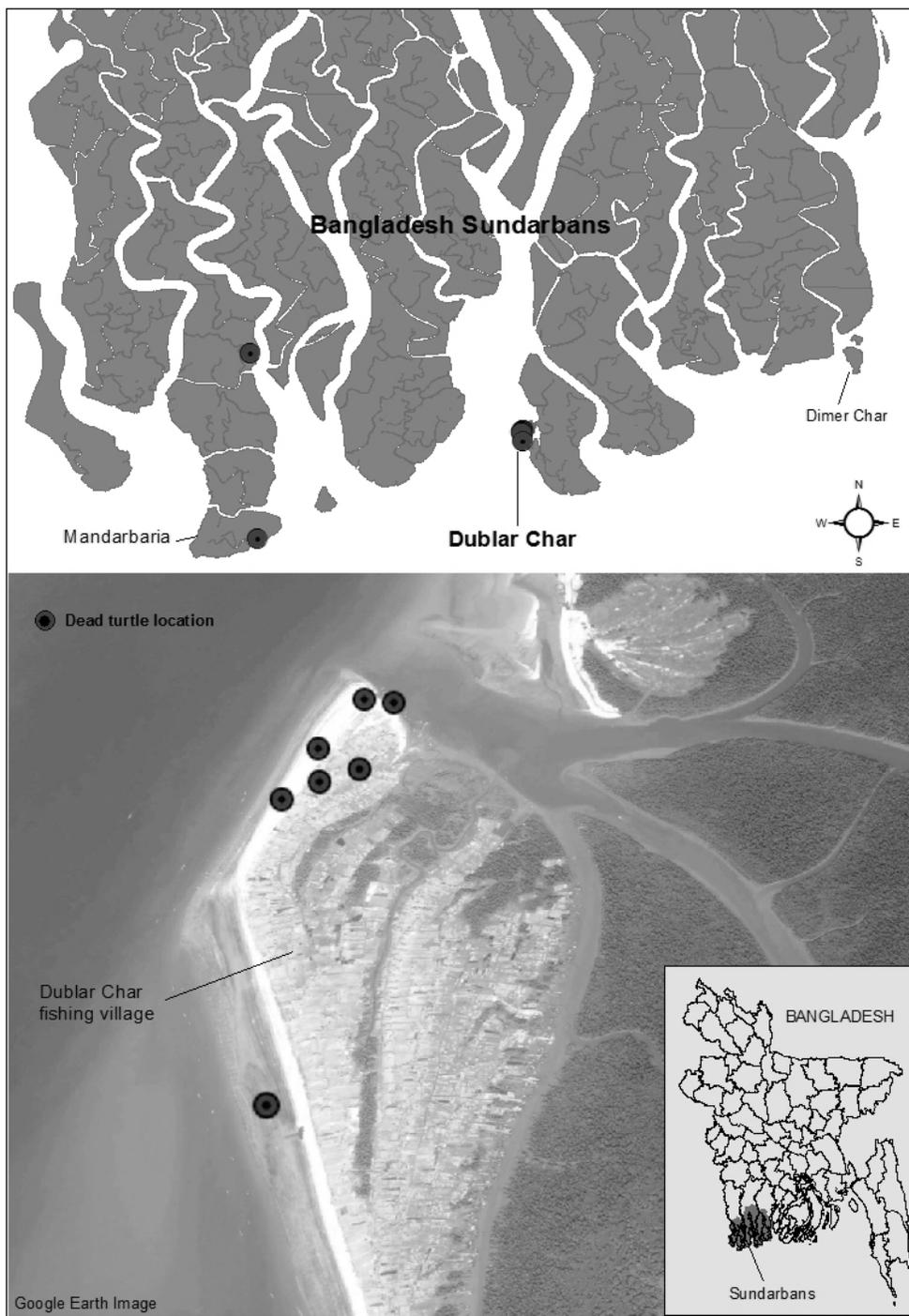


Figure 1. Study areas and locations of dead turtles of the Sunderbans coast.

the Sundarbans, are known to consume turtle meat and trade turtle products (Islam, 2001), so it is also possible that live turtles, turtle meat or eggs may be traded to local markets in Khulna and elsewhere.

Disturbance of nesting turtles in the Sunderbans may

also occur. Seine nets were prominent off beaches from December-March, which coincides with the turtle nesting season in Bangladesh from October to April (Islam *et al.*, 2011), whilst activities such as fishing, anchoring, loading and unloading of fishing vessels, drying of fishes, and repairing fishing nets

were common on the beaches of fishing communities such as that at Dublar char. Observations suggest that many beaches in Mandarbaria which were previously used for turtle nesting (Gani, 2000) are now exposed muddy banks potentially unsuitable for nests.

Long term ecological monitoring of marine turtle populations and their beach habitats across whole coastal waters of Bangladesh including Sundarbans is strongly recommended. Working with Dublar char fishermen to raise awareness about the ecological importance of turtles and introduce devices to reduce bycatch, such as LEDs (Ortiz *et al.*, 2016), may help reduce the killing of marine turtles.

ACKNOWLEDGEMENTS

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ENTANGLED HAWKSBILL TURTLE SAVED BY FISHERFOLK OF MULOOR, KARNATAKA

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On October 3rd 2015 the fisherfolk of Muloor, Udipi District of Karnataka, India, found a hawksbill turtle (*Eretmochelys imbricata*) entangled in a ghost gillnet and struggling to swim at a depth of 6m around 3km from the shore of Kaup Beach (13.22361°N, 74.73722°E). As they were aware that turtles need to be protected, they brought the turtle to the shore, cut the entangled net and released it back to the sea. The curved carapace length was measured at 65cm and the weight estimated at ~48kg. The hawksbill is a critically endangered sea turtle as per global IUCN listing. In India, hawksbill turtles nest in the Andaman and Nicobar Islands and to a lesser extent in Lakshadweep (Andrews *et al.*, 2006). There are no confirmed reports of hawksbill turtles nesting along the Karnataka coast, but fisherfolk have previously reported sighting hawksbill turtles offshore of Udipi and Uttara Kannada districts in Karnataka (Ravi & Rakesh, 2013) and hawksbill turtle carapaces have been found in fishers' houses in Karnataka (Sharath, 2006).

Infrequent, and not recent, hawksbill turtle nesting has been observed in Maharashtra (Katdare, 2013) but not in Kerala (Dileepkumar & Jaykumar 2002, 2006), states to the north and south of Karnataka respectively. Therefore, this turtle could have been a small breeding female migrating to its nesting beach. Alternatively, it may inhabit the local area; hawksbill turtles have been observed by fishers in Karnataka (Pandit & Soans, 2013). Hawksbill turtles inhabit a wide range of habitats during their adult life, including coastal waters (Baillie & Groombridge, 1996), lagoons, coral reefs, estuaries, and mangrove swamps (Gaos *et al.*, 2012). Off Kaup Beach, there are small, rocky shallow islands and mangroves that the turtle could have inhabited until it was tangled in the ghost gillnet. On 20th January 2015, the fishermen of Muloor released three olive ridley turtles similarly trapped in a gillnet.

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LESSER KNOWN NATURAL THREATS TO PROTECTED OLIVE RIDLEY NESTS IN COASTAL MAHARASHTRA

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Sea turtles are a significant component of the diverse life forms found along the 720km coastline of Maharashtra, India. Hawksbill, green turtle, leatherback and olive ridley turtles are reported from five coastal districts of Maharashtra (Giri & Chaturvedi, 2003). Of these, only the olive ridley has been observed nesting, mainly on the sandy beaches of the Raigad, Ratnagiri and Mal van districts of Maharashtra, where the beaches are sparsely populated and fishing activity is low (Giri *et al.*, 2006; Sanaye & Pawar, 2009; Katdare, 2012).

Since its establishment in Maharashtra in 1992, the environmental NGO Sahyadri Nisarg Mitra (SNM) has coordinated a number of marine turtle conservation programmes, including the protection of more than 600 nests and release of 29,234 hatchlings from 10 hatcheries throughout Raigad and Ratnagiri districts of Maharashtra between 2003 and 2011 (Katdare, 2012). Through the monitoring efforts of SNM and surveys conducted by other agencies, including the Bombay Natural Historical Society (BNHS) and the Forest Department, many natural and anthropogenic threats to sea turtles and their nests have been identified along the Maharashtra coast (Giri & Chaturvedi, 2003; Giri *et al.*, 2006; Sanaye & Pawar, 2009; Katdare, 2012). Some of the lesser known threats are worth reporting as greater awareness may be useful in improving nest management practices in India.

Beach morning glory (*Ipomea pes-caprae*), a perennial pan-tropical plant, is a fast growing, aggressive creeper vine which spreads in areas with extreme temperature, high salinity and nutritionally deficient environments (Devall & Thien, 2005). The roots of *I. pes-caprae* may penetrate one meter vertically into the sand so the plant can remain dormant even when the surface vegetation dies (Devall, 1992). *I. pes-caprae* is important among sand dune vegetation for its beach stabilisation potential. Around the world there are reports of *I. pes-caprae* destroying the nests of freshwater, estuarine and marine turtle species

and a detailed study of its impact on leatherback sea turtle nests (see Conrad *et al.*, 2011). Olive ridley turtles are known to nest near sand dune vegetation (Pandav *et al.*, 1994; Subramanean, 2005; Islam *et al.*, 2011) so *I. pes-caprae* is mechanically cleared from the interior and at least 20 feet surrounding hatcheries along the coast of Maharashtra prior to each nesting season. In March 2013, the invasive roots of *I. pes-caprae* were observed invading olive ridley turtle nests in hatcheries at Velas beach and Karde beach of Ratnagiri district, both penetrating and encircling the eggs. Upon examination, *I. pes-caprae* plants adjacent to the hatchery sites demonstrated lateral root growth instead of the typical vertical growth. There was no plant growth or runners towards the hatcheries observed above the sand. Such atypical growth of *I. pes-caprae* roots and destruction of turtle nests is being reported for the first time in India. This observation points to the need for additional efforts to eradicate *I. pes-caprae* near hatcheries by regularly monitoring the above and below ground plant growth throughout the nesting period and using intensive mechanical removal methods. Understanding variations in plant root morphology and growth in *I. pes-caprae* could also help plan improved management practices.

Another threat to sea turtle nests on the Maharashtra coast are ants (species not identified) that destroy nests and devour hatchlings. Ant-sea turtle interactions were observed for the first time in India at Karde Beach in the Ratnagiri district, Maharashtra. In March 2016, no hatchlings were produced in three of six nests protected in a hatchery. During the routine post-incubation inspections, ants were found to have invaded all three of the nests and were observed inside the eggs devouring the almost developed hatchlings in all 312 eggs. The presence of the ants had not been noted on the sand surface during day. This threat has not been reported from other beaches in India, but has been observed and studied in Florida and other places in USA and El Salvador, Central America

(Allen *et al.*, 2001; Wetterer & Lombard, 2010; Wetterer *et al.*, 2016). Some species of ants, including *Solenopsis geminata* and *S. invicta*, are known to have a negative impact on turtle nests and hatchlings (Allen *et al.*, 2001; Wetterer *et al.*, 2016). Further studies are needed at Karde Beach to identify the ant species, determine their ecology, and describe their invading behaviour (Hoffmann *et al.*, 2016). Constructing the turtle hatchery away from dune vegetation (Wetterer *et al.*, 2016) and closely monitoring the constructed hatchery for signs of ant activity during the night are recommended immediate conservation practices; applying a known fast degrading, low toxic (to vertebrates) formicide with an active ingredient such as Hydramethylnon (Plentovich *et al.*, 2010; Wetterer *et al.*, 2016) can be considered after thorough assessment of the risks.

Natural threats such as ants and *I. pes-caprae* may not affect a stable population of turtles adversely, but nest and hatchling loss may affect the overall size and viability of a small population of solitary nesting olive ridley turtles. Since 2006, the number of turtle nests on Karde beach of Ratnagiri district in Maharashtra has been slowly increasing (Katdare, 2008; www.snmcpn.org). On average, 4 to 6 nests are found on Karde beach each year, suggesting that it could be the most promising site for turtle nesting on the Maharashtra coast. However, the less obvious natural threats on this beach may add to the already known anthropogenic and natural threats, thus further reducing the hatching success and overall effectiveness of sea turtle conservation initiatives in this area. In conclusion, it is recommended that the impact of these natural threats be considered and detailed studies resulting in best management practices be implemented in turtle conservation programmes.

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HATCHING OF OLIVE RIDLEY TURTLE TWIN HATCHLINGS

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OBSERVATION

A clutch of 126 olive ridley (*Lepidochelys olivacea*) turtle eggs was laid at Palapetty Beach, Thrissur District, Kerala on 15th January 2016 and relocated by members of the Kanyakumari Turtle NEWS Club to the hatchery at Palapetty. On 02nd March 2016, after 46 days of incubation, 58 hatchlings emerged from the nest unaided in the early morning. The nest was excavated three hours after emergence of the first hatchling, at which time 14 more hatchlings emerged from the exposed eggs including two pairs of twins (Table 1; for example see Figure 1) which emerged from the eggshells on their own. The hatchlings were transported to a holding tank 15min post-hatching. The twin hatchlings were unable to remain afloat and their movement on land was also impaired as they remained connected by the respective yolk sacs. The first pair of twin hatchlings died half an hour after hatching, while the second pair of twins survived for six hours. Four other hatchlings which emerged from the exposed eggs died before being introduced to the holding tank. The surviving hatchlings were released to sea approximately nine to thirteen hours after hatching.

DISCUSSION

Twinning is a rare phenomenon amongst sea turtles, and aberrant embryos usually die before the pipping stage or even if they pip, seldom emerge (Miller, 1985). This is the first published report of twin sea turtle hatchlings being alive at pipping, although Hewavisenhi (1989) described a single hatchling leatherback turtle

(*Dermochelys coriacea*) that emerged live from the egg after its smaller twin died prior to term. Twin embryos that did not reach the pipping stage have been recorded in olive ridley (Hewavisenhi, 1990), green (*Chelonia mydas*; Fowler, 1979; Kaska & Downie, 1999; Diong *et al.*, 2003), hawksbill (*Eretmochelys imbricata*; Junchompoo *et al.*, 2013), leatherback (Deraniyagala, 1930, 1932; Hughes *et al.*, 1967; Chan, 1985; Eckert, 1990) and loggerhead (*Caretta caretta*; Caldwell, 1959; Fujiwara, 1964; Blanck & Sawyer, 1981; Limpus, 1985, Peters *et al.*, 1994; Piovano *et al.*, 2011) turtles.

The twin hatchlings found in this study were of nearly equal size, but much smaller in comparison to the other hatchlings in the clutch, perhaps the result of having to share the resources available in the egg. No external developmental abnormalities were observed.

Fertilisation of sea turtle eggs occurs in the oviduct, with the deposition of albumin and formation of egg shell beginning within 72 hours of ovulation. Over the successive seven days, the zygote undergoes discoidal meroblastic cleavage to form a gastrula by Day 9; embryonic development is suspended at middle gastrulation until after the eggs are laid (Miller, 1982). Whether the formation of twins took place by the inclusion of two zygotes in one eggshell in the oviduct post-fertilisation and pre-oviposition, or due to cleavage of one zygote into two within an egg post-fertilisation is beyond the scope of this study and would require parental DNA investigations to ascertain.

Table 1. Morphometric measurements of twin olive ridley hatchlings

		Straight Carapace Length (mm)	Straight Carapace Width (mm)
First pair of twins	Hatchling 1	28.6	28.7
	Hatchling 2	27.4	26.9
Second pair of twins	Hatchling 1	28.1	27.8
	Hatchling 2	28.9	28.1
Individual hatchlings	Av. of 10	41.3	33.7

Both pairs of twin hatchlings were deposited in the National Designated Repository of the Central Marine Fisheries Research Institute, Kochi, Kerala, India and have been assigned the accession number *Lepidochelys olivacea* Misc.38.

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INTERESTING OBSERVATIONS ON SEA TURTLES FROM THE CHENNAI COAST OF INDIA IN 2016

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STRANDINGS

This season (January to April 2016) was marked by the stranding of juvenile turtles of sizes that are uncommon along the coast of Chennai, India. Two olive ridley, one green, and one hawksbill turtle (Table 1) were observed stranded between the months of February and May in the 7km stretch of beach from Neelankarai to the Adyar River estuary that is patrolled daily during the nesting season. Three of the four stranded turtles were dead when found. The olive ridley turtle found on 27 February 2016 was barely alive and coated with a greasy material. The turtle was taken to the TREE Foundation rescue centre at Neelangarai, Chennai, for treatment, where it later died despite efforts to resuscitate it. The green turtle found on 17 May 2016 was observed by one of the authors during a casual walk on the beach after the nesting season had ended. There is limited information available about the juvenile life stage of olive ridley turtles as they are completely oceanic (Bolten, 2002), therefore these observations generated much interest. In the last decade, there have been several reports in the local media and anecdotal observations of juvenile olive ridley, hawksbill and green turtles being stranded and entangled in fishing nets (Nina Simon, 2010; Frederick, 2011; Special Correspondent, 2011; Oppili, 2015; Special Correspondent, 2016). However, there are no detailed reports on the size of these turtles and, therefore, the term juvenile could have been inappropriately applied.

Pseudonesting

During an organized public walk on 26 March 2016, an olive ridley turtle (CCL- 63cm, CCW- 62cm) was

observed making a body pit, digging a nest cavity, and camouflaging the site. Care was taken to not disturb the turtle during the entire duration of the nesting process. Once the turtle returned to the sea, the volunteers probed the sand to relocate the nest to a hatchery. However, only a well-formed nest chamber was observed with no eggs. The entire camouflaged area was dug up and searched thoroughly for two hours. It was then concluded that it was a pseudonesting event. This was the first observation of such a phenomenon in Chennai, although Swaminathan & John (2011) have reported similar behaviour in olive ridley turtles at Rushikulya, Orissa. Such behaviour is not uncommon in primigravid turtles (those laying their first clutch) and may be due to limited oviductal responsiveness to hormonal stimuli and/or motility at the first nesting attempt (Phillott, pers.comm.).

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Table 1. Details of the four stranded juvenile turtles found on the Chennai coast Jan-May 2016

Turtle	Curved Carapace Length (cm)	Curved Carapace Width (cm)	Date	Comments
Hawksbill	26	24	18 th Jan 2016	Found dead
Olive ridley	18	17	15 th Feb 2016	Found dead
Olive ridley	17	16	27 th Feb 2016	Found alive
Green	36	35	17 th May 2016	Found dead

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SEA TURTLE CONSERVATION AND ALLIED ACTIVITIES WITH COMMUNITY PARTICIPATION AT VELAS, MAHARASHTRA, INDIA

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INTRODUCTION

Velas (17.9588°N, 73.0361°E) is a tiny hamlet in the Mandangad taluka, Ratnagiri District of Maharashtra, India. Velas has an isolated 3km stretch of coast-line dotted by *Casuarina* trees facing the Arabian Sea. A small stream passes through the village to the beach surrounded by dense mangroves which flood in the rainy season.

The secluded, wide beach with offshore sand bars is suitable for olive ridley turtle nesting. The sea turtle breeding and nesting season in Maharashtra lasts from November to April. In Velas, nesting usually occurs from December to the first week of April and accounts for 40% of the nesting in Maharashtra.

SNM AND THE TURTLE FESTIVAL

Sahyadri Nisarga Mitra (SNM), a non-governmental organization, initiated marine turtle conservation along the coast of Maharashtra with the involvement of the local community. Its first onsite olive ridley conservation efforts were carried out in 2002 at Velas (Katdare & Mone, 2003) and now encompasses 36 beaches and 12 villages of Ratnagiri district.

The Turtle Festival was first organised by SNM in 2006 and has occurred every year since then. Local

villagers joined the initiative in 2006 which led to the formation of Kasav Mitra Mandal (KMM), a local club of individuals supporting the conservation in Velas. At present, the local governing body i.e. the Grampanchayat along with KMM the Forest Department, Joint Forest Management Committee (JFM) and Biodiversity Management Committee (BMC) work together for the conservation programme "The Turtle Festival".

The members of KMM provide homestay arrangements for visitors to the Turtle Festival. Nineteen families initially extended their traditional hospitality wherein they serve home-cooked Maharashtrian style food to the visiting tourists. However, the number has increased to 31 in recent times and the number is expected to increase to 34 in the next year or so. Members of the KMM contribute 10% of the total income to the SNM turtle conservation programme.

One of the major fundamental activities during the Turtle Festival is to check the local hatchery and release emerged hatchlings into the sea. The volunteers of KMM check for hatchlings at 7am and 6pm and new hatchlings are released for tourists to observe. Other activities KMM hosts during the festival are visits to a variety of birdwatching sites in and around Velas via a bullock cart safari. They also project a screening on turtle conservation during the festival followed

by an interactive session with Mr Mohan Upadhye.

The members who actively participate in the Turtle Festival include self-help groups that sell home-made products, *Mahila Bachat Gats*, local villagers and volunteers, all of which are a part of KMM. The Turtle Festival lasts from January to April in which the first three months are considered to be the peak season for egg hatching. The Turtle Festival has a positive impact on the local community as it facilitates new source of income for the local community.

The Turtle Festival is a purely a conservation effort by the local community. The primary goal of the effort is to protect the olive ridley eggs from predation and other natural threats to their survival. The Turtle Festival also focuses on the active participation of the local community and visiting tourists in conservation of sea turtles and to increase the livelihood sources of local villagers

EX-SITU TURTLE CONSERVATION METHOD PRACTISED AT VELAS

SNM volunteers patrol the beach throughout day and night during the nesting season to locate newly laid nests and supervise nests in the hatchery. A hatchery of 8m x 3m

(Katdare & Mone, 2003) is established at Velas, and all the nests laid on its 3km beach are collected and placed in hand-dug egg chambers to protect them from tidal erosion and predators. A galvanised iron mesh fixed to wooden poles fencing surrounds the hatchery to prevent depredation of nests. Wooden batons are numbered to identify individual nests, which are covered with a wicker basket and a piece of jute to reduce predation of hatchlings by birds.

In the 2002/03 nesting season when the conservation programme began at Velas, SNM relocated the 50 olive ridley turtle nests laid on the beach to the hatchery (Figure 1). The number of nests has fluctuated since, with a low of 8 in 2014/15. As female olive ridley turtles reach maturity at about 13 years ranging from 10 to 18 years (Zug *et al*, 2006), SNM hopes that nesting numbers will soon reflect the conservation effort of the past years. The trend of number of eggs produced (Figure 2) follows that of number of nests laid. Emergence success also fluctuates over time, with a high of 64% in 2015/16 and low of 30% in 2006/07.

BEACH RULES AND RESTRICTIONS PRACTISED AT VELAS

Restricted facilities for tourists: To promote the conservation of sea turtles, the use of tents, umbrellas,

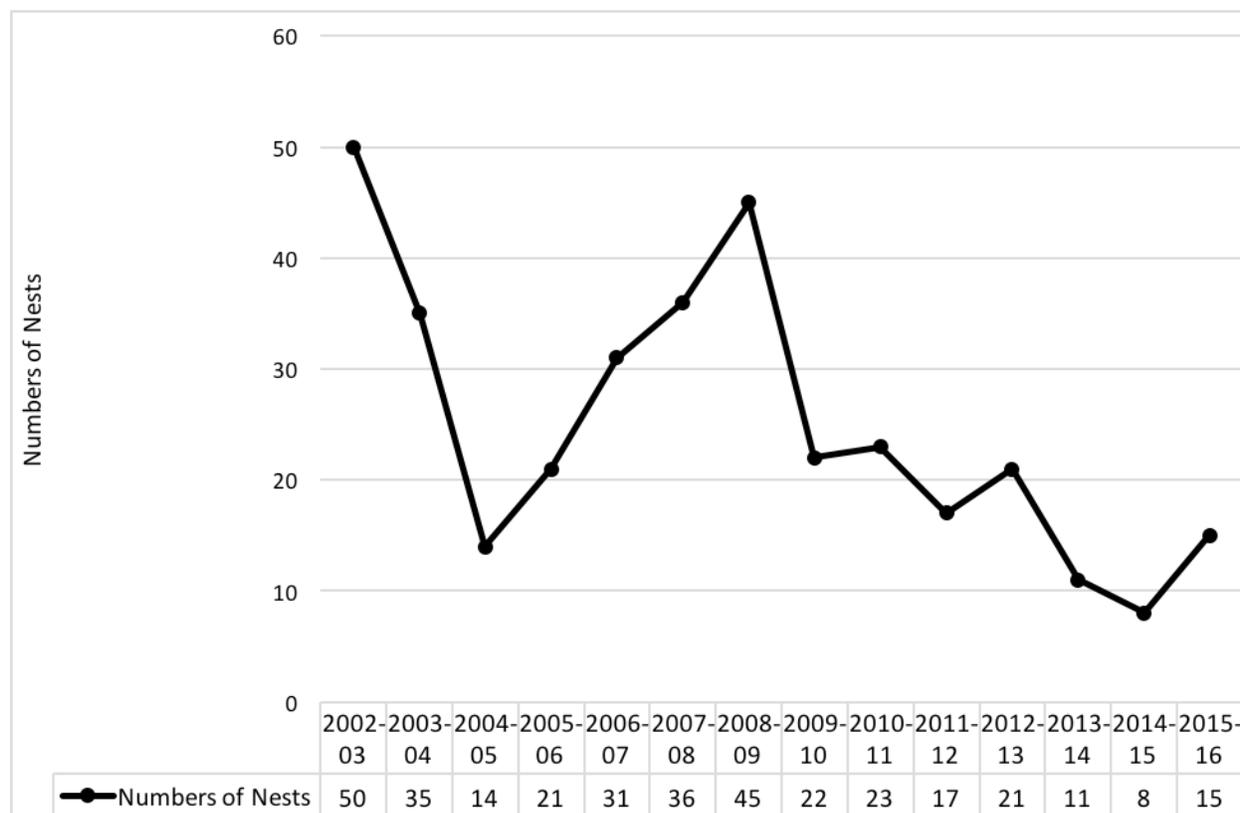


Figure 1. Number of olive ridley turtle nests from 2002-2016 at Velas Beach. (Source: SNM)

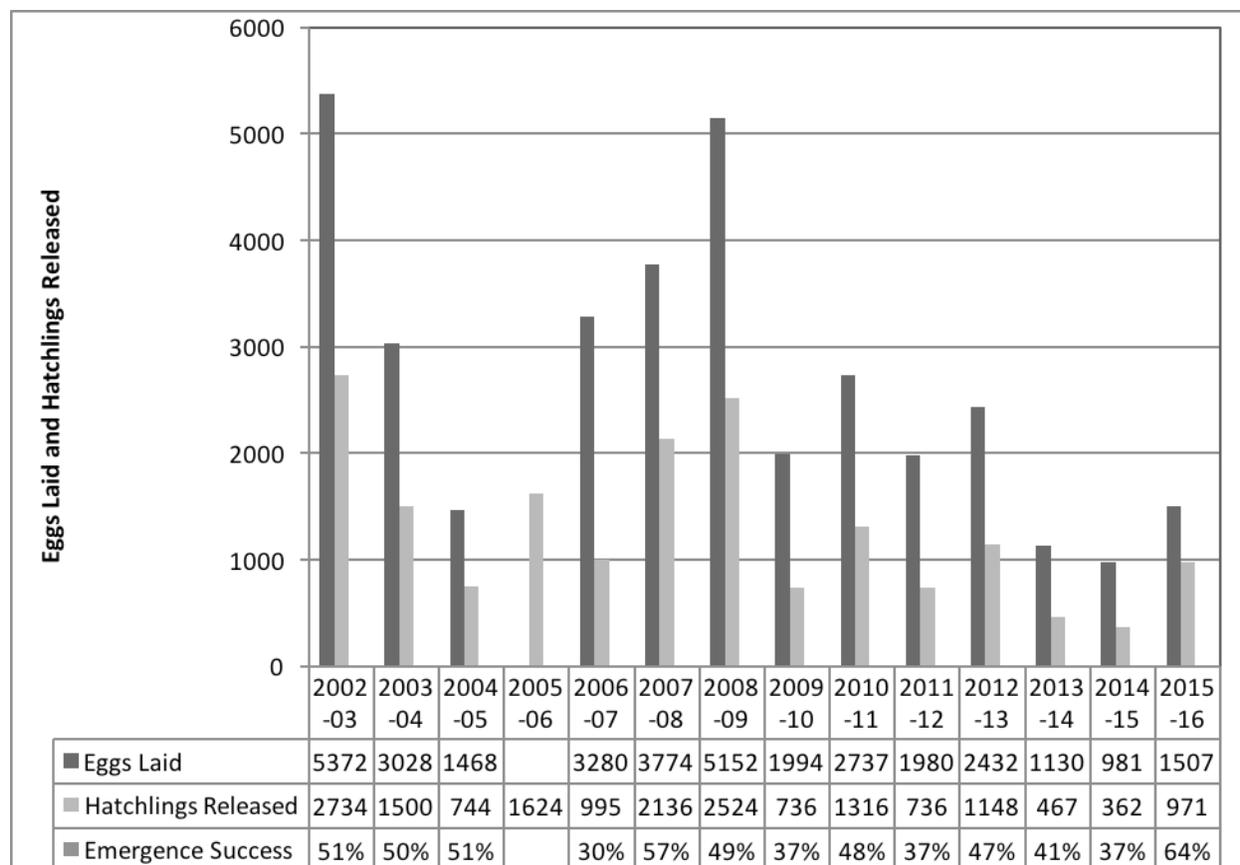


Figure 2. Eggs incubated and hatchlings released from hatcheries at Velas Beach 2002-2016. Note: 2005/06 data is not available. (Source: SNM and Forest Department).

canopies, beach chairs, sun beds at the beach is restricted as such structures can stop female turtle from reaching suitable nesting location and/or effect the nest temperature due to shading (Shenoy *et al.*, 2011). There are no accommodation facilities on the beach.

Also, the local governing body (Gram Panchayat) has recently prohibited the use and sale of thermocol plates and cups and is planning to ban the use of all plastic materials on the beach in the upcoming year.

Informal fishing ban: Before the conservation programme was in action, local fishermen used to fish during the nesting season, with purse seine, trawl, gill and cast nets in addition to hook and line gear. Turtles were entangled, drowned, bruised, killed or maimed after interactions with such gear and this was duly noted by SNM, resulting in an informal ban on fishing during the nesting season. The fishermen are provided with an alternative location (Harnai) to fish at a distance from the nesting beach.

No coastal illumination: Artificial light poses a threat to the turtles which rely solely on their visual stimuli

for finding a route to the sea; they orient using the brightness of open seaward horizon and the illumination appearing from the reflection of stars and the moonlight on water. Artificial lighting on the beach and adjacent habitat create results in poor orientation and the same can happen to adult female sea turtles as they try to return back to the sea after nesting. Disoriented turtles still on land during the day may die by dehydration, predators, exhaustion and other such similar factors (Shenoy *et al.*, 2011). Thus, it is imperative to bar any sort of artificial lighting on the beach in order to facilitate an efficient conservation programme. Keeping this in mind, SNM jointly with the Forest Department and Gram Panchayat of Velas has taken crucial steps to make sure that no artificial lighting is installed on the entire beach and on the approach road as well. A 'No coastal illumination, water or sand sports' resolution was passed in 2012-13 to help create an undisturbed habitat for the incubation of turtle nests and hatching of baby turtles.

No water sports: The boats used for water sports are mainly propeller driven and may injure turtles who visit the beach for nesting purposes. The loud

noise of the propeller under the sea may deter the turtles from arriving at the beach. Hence, no water sports are allowed during the turtle nesting season.

No sand sports allowed: Sports like sand biking, paragliding, and beach volleyball causes sand to become compacted which causes difficulty for the sea turtles when nesting. Sea turtles lay their eggs at an optimal depth by digging a nest with their hind limbs, so hard sand requires more effort to dig which may result in reduced depth of excavation and sub-optimal incubation conditions. Sand sports may also uproots and-binding plants and result in sand erosion, and so are banned.

Although the conservation programme is at its peak and every possible effort is taken to conserve and save as many turtles as possible, last year there were a total of eight turtles found dead due to a variety of reasons which could be avoided if the following recommendations are adopted.

Recommendations:

- 1. Tag sea turtles:** Permanently marking individuals with flipper tags will give useful insight into the biology of sea turtles nesting at Velas, including reproductive biology, growth, population size, and migration. In conjunction with more extensive field surveys, data to determine the number of clutches per season and the estimated number of nesting females per season could more easily be collected
- 2. Carry out field survey seasonally on nesting beach habitat:** Field survey on nesting beach habitat could help us understand the factors that affect turtle nesting success, nest hatching success and hatchling emergence success and also enable specific recommendations to safeguard olive ridley turtles and their habitat (Anonymous, 1997).
- 3. Monitor hatchling sex ratio:** There are no previous records of hatchling sex ratios at this location hence it is highly recommended to do so. Calculating hatchling sex ratios can help determine potential dynamics in reproductive ecology and reasons of fluctuating numbers of nesting females (Wibbels, 2003) as well as provide a baseline against which to compare the outcomes of management techniques (e.g. hatcheries) which may influence sea turtle populations (Godfrey & Mrosovsky, 1999).
- 4. Replace *Casuarina* trees:** Pandav *et al.* (2006) found that *Casuarina* tree plantations are responsible for changes in the beach terrain with their permeated roots and litter which may impact the success of

sea turtle nests, but the trees also provide shelter to animals like jackals and hyenas which feed on sea turtle eggs. Mohanty (2002) reported that formation of sand dunes is greatly hindered due to *Casuarina* plantations, which ultimately leads to coastal erosion and in some cases total elimination of dunes (e.g. Orissa coast). Awale and Phillott (2014) also give valuable insights on the devastating effects of *Casuarina* spp. on factors including beach ecology, nesting habitat, and nest temperature leading to changes in the sex ratio of hatchling sea turtles. They suggest beaches be vegetated with native plant species such as neem, coconut, *banyan*, fig, *jamun*, bakul, *peepal* etc. instead of tropical plant species like *Casuarina* spp.

- 5. Fishing and other vessels:** A resolution of the fishing ban should be passed in order to prevent entanglement of female sea turtles in fishing nets during the breeding and nesting season, and the use of turtle excluder devices (TEDs) should be strictly monitored and regulated. Barges from coal-based mining activities should follow routes that do not disturb nesting females coming to the shore.

ACKNOWLEDGMENTS

I express my sincere appreciation and gratitude to the President of SNM Mr *Bhau* Katdare for providing insight and expertise that greatly assisted this article. I'd like to thank Mr Mohan Upadhye for his invaluable contribution to this article. I thank, Mr Yogiraj Rathod, for data and fact providing. I'm also indebted to Dr Sujit Sundaram for his excellent guidance and help in numerous ways. I gratefully acknowledge Dr Pradnya Sawant for offering constructive suggestions, comments and sound advice. Finally, I must thank, Swapnil Tandel, Bala Mhadgut, Dhanashree Bagade and my brother Piyush Pawar for their invaluable advice, help and continuous encouragement.

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DIARY OF THE SSTCN CHENNAI TURTLE SEASON JANUARY – APRIL 2016

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INTRODUCTION

As the Student Sea Turtle Conservation Network (SSTCN) looks back at the season just gone by in Chennai, Tamil Nadu, the primary feeling is that it was a muted one and also shorter as it ended a couple of weeks earlier than usual. In comparison, the last few years had been big, both in terms of the number of nests and in the number of dead turtles encountered! In one of our early walks this season, a fisherman told us that they were spotting many dead turtles in the sea and it would not be long before these washed ashore. We counted more than 300 stranded and dead turtles in the 2015 season and hoped not to experience another such year. Fortunately, we encountered only 85 dead adult turtles this season. While it is still a big number, it was only a third of the number of dead turtles found in the last few years. However, we also found far fewer nests, suggesting fewer nesting olive ridley turtles than in 2015.

Number of nests

We have been averaging around 100 nests per season in our southern stretch of beach, extending from Neelangarai to the Adyar River, close to the Besant Nagar beach. This year we found only 51 nests on this stretch.

In our northern stretch of beach extending from Adyar River Creek to the Cooum River, popularly referred as the Marina Beach, we found around 110 nests where we usually find between 150 and 180. In all, we ended the season with 175 nests, 75 fewer than last year and 73 less than 2014. All the nests were relocated, 101 into the two SSTCN hatcheries and 74 to the Forest Department hatchery. The two SSTCN hatcheries are set up on either side of the Adyar estuary, one to cover Besant Nagar stretch and the other to cover the Marina beach. The Forest Department hatchery was set up about 50 meters from the SSTCN hatchery on the Besant Nagar side.

Working with the Forest Department

The Forest Department and SSTCN have been co-patrolling these beaches for the past two years. We tried patrolling at different hours of the night to maximise nest collection last year, but that resulted in confusion between the two organisations. This year we divided the northern stretch into two parts and each did one stretch with the other providing back up support when required. This arrangement worked better as there was no confusion or overlap in terms of time. The Forest Department hatchery was built close to ours so that volunteers and care takers could monitor

and care for nests relocated into both structures.

New walk timings

Over the last twenty years we have been delaying the time of our patrols to later and later in the night. This year we started patrols of both the northern and southern stretches around 3am. As Marina Beach is relatively short in length, the volunteers walked back and forth to cover the stretch more than once each night. Besant Nagar is a longer beach, so leaving at 3am just about gave enough time to cover the stretch and finish by day break, especially on nights with multiple nests.

Turtle walks with the public

SSTCN turtle walks have become one of the star attractions of Chennai. As the walks are mentioned on Trip Advisor there is always interest throughout the year. During the turtle nesting season, we struggle to maintain the crowds to a manageable number (between 50 and 75 people). SSTCN decided some years ago to focus on walks for students of schools and colleges and individuals and families, but not corporate groups.

Despite having a registration procedure through email, people often join the walks without registering and at any time. We feel that people's sense of entitlement has increased over the years, with some turning aggressive when they are denied a place on the walk, and are looking for a way to resolve this. However, we had some very good pre-walk discussions this year, often stretching from 11.30 to 1.30 am or even 2 am before the walk commenced. For the past few years we have been briefing the groups in both Tamil and English. When school groups come we brief them separately. On such days we have three different groups being briefed; groups are divided according to age and language as some prefer Tamil and some are English speakers. Attitudes, questions and interests often differ between these groups. The talks were anchored primarily by Arun V, Harish N.V. and Akila Balu. This year they drew a lot of inspiration for the talks from the book "Hope Beneath Our Feet", edited by Martin Keogh, a compilation of environmental articles by practising environmentalists and ecologists.

At the hatchery

Similar to the public walks, the hatchery too draws hundreds of visitors - mostly families with young children. Shraavan Krishnan, a long term volunteer, has ably anchored this activity for many years now. School groups and families visit the hatchery in the evenings during the turtle hatching months between

March and early May and volunteers like Shraavan interact with the crowds. They then watch hatchlings being released on the beach and entering the sea.

The hatchery is monitored around the clock to check for emerging hatchlings by a group of young volunteers. Our hatchery management has steadily improved with many volunteers feeling responsible. For example, this season we had an enthusiastic volunteer Ghesna Rao who could be depended on to be at the hatchery every evening to release hatchlings, excavate nests and record relevant data. She will be sorely missed in the coming season as she has gone to Mumbai for higher studies.

We had a low hatching success this year compared to other years, with poor hatching success in the first few nests and later nests potentially impacted by the high heat and low rain this summer. We ended the season with 8,907 hatchlings (8,741 from nests in the hatchery and 166 from nests on the beach) from 101 nests (excluding 75 nests from the Forest Department hatchery) with an overall emergence success rate of 78.9%.

Our community partners

One of the most pleasant memories of this season is our partnership with the Chennai Trekking Club (CTC). It started with a conversation with the founder Peter Van Giet when we told them that turtle walking was a very lonely activity with only two people walking together on most nights. He promised help, and Vinodh Sundar a CTC member, patiently coordinated CTC trekkers to join us almost every week night.

This year the beaches of Chennai were unbelievably filthy, with tons of garbage washed ashore after the Chennai floods so there was virtually no place for the turtles to nest. CTC organized clean ups, (including one as we built the hatchery) every weekend for several weeks before the beaches became nesting friendly again.

The court case against the fisheries department

Last year, a judge in the Madras High Court filed a *suo moto* case against the Fisheries Department after seeing a report in the Times of India about the large number of dead turtles that season. Stake-holders involved in sea turtle conservation, including the Fisheries Department, Forestry Department and NGO's, were asked to prepare an SOP (Standard Operating Procedure) and implement it to ensure a reduction in the number of turtles drowning in fishing nets. Wildlife film maker Shekar Dattatri was appointed to independently audit the preparation and implementation

of the SOP of the Fisheries Department and his report was submitted to the court in July 2016. After holding a stakeholders' meeting, a compliance report was submitted by the Fisheries Department to the Hon'ble High Court of Madras on 11th August 2016.

A Government Order was passed on September 27th 2016 prohibiting mechanised boats from entering within 5 nautical miles of the shore during sea turtle migrating and nesting season from January up to April. The GO had major deficiencies: it included country craft in the 5 nautical miles ban which will greatly affect artisanal fishermen; it stated that the seasonal ban should be between January and April whereas it should actually be from November to March so as to include turtle migrating months; and it omitted skate/ray nets which cause high turtle mortality, from the ban. Requests were made by SSTCN and members of Dakshin as well as Tree Foundation to make corrections in the GO. It is hoped that these changes will be effected.

Turtle conservationists have also taken the discussion to the public by writing in newspapers both in English and Tamil.

SUMMARY

Overall, we feel it was a positive season though a muted one. Many new volunteers joined us. People are much more aware of environmental issues as reflected in the deep conversations we had with them.

Our relationship with the fishing community members too has grown over the years. They have respect for our commitment and extend support in many ways. This year saw even greater participation from the fishing community members. However, we run the risk of losing this long-cultivated relationship due to the verdict in the court case due to our portrayal as the ones opposing fishing in coastal waters. This is unfortunate, as we have always been supportive of traditional fishing. Currently we are waiting for a revision of the order which will allow small scale traditional fishermen to continue fishing in near-shore waters, as it is difficult to imagine turtle conservation without their participation.

We are also excited by the upcoming Cetacean study where we are planning to collect data and tissue samples of stranded marine mammals. This study is being done under the guidance of Dipani Sutaria and Rahul Muralidharan.

REPORTS



PRESIDENT'S REPORT ON 36TH ANNUAL SYMPOSIUM ON SEA TURTLE BIOLOGY AND CONSERVATION, 29TH FEBRUARY TO 4TH MARCH 2016, LIMA, PERU

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The 36th Annual Symposium on Sea Turtle Biology and Conservation was held in the City of Lima, Peru from February 29 to March 4, 2016. This year the Symposium's theme was *Crossroads*, highlighting the need for multi-disciplinary, multi-taxa, multi-national, and multi-gender efforts in advancing marine conservation worldwide. This meeting aimed to break down barriers and boundaries between people and countries in order to achieve marine conservation through its most global flagship, the sea turtle. The structure of the symposium was similar to past symposia, with pre-symposium workshops and regional meetings, plus 3 days of symposium meetings. Overall the meeting was a success from basically every perspective; details are offered below. A total of 685 people from 52 countries registered for the Symposium. The venue for the symposium was the Maria Angola Convention Center in the city of Lima. A total of 155 oral papers and 305 posters were presented at the symposium.

Pre-symposium Workshops & Regional Meetings:

Workshops and meetings were scheduled during the two days prior to the symposium main days. The opening was presented by Sonia Valle Rubio, representative from Cientifica del Sur University, Larry B. Crowder and Joanna Alfaro.

A total of 12 workshops were held. These were: In-water capture techniques, GIS Training, Marine mammals, Elasmobranchs, Ghost Fisheries, Survey training, Temperature-dependent Sex Determination (TSD), Photo-Identification techniques, Turtle Medicine, Leatherback Turtles of the Southeast Pacific, Environmental education and Bycatch of Sea turtles in the East Pacific. A total of five Regional meetings were held. These were: RETOMALA (Latin American), Africa, Mediterranean, East Asia, and Indian Ocean South East Asia. These meetings were successful and contributed to bring attendees

early to the symposium. Three meetings were also held: Caribbean Wider Caribbean Sea Turtle Conservation Network (WIDECAST), Freshwater Turtle and Tortoise and IUCN Marine Turtle Specialist Group (MTSG).

Key Note Speakers: Two Key Note speakers delivered 20 minutes addresses. Colin J. Limpus from Australia gave a comprehensive introduction of 'Marine Turtles at the Crossroads: Complex Life Histories Requiring Local, National and International Action for their Conservation.' Brendan J. Godley immediately followed, speaking to the audience about his 10 tips on being a successful sea turtle researcher.

Symposium Sessions: This symposium included traditional sessions held at previous symposia, such as Anatomy, Physiology and Health; In-Water Biology (Ecology, Telemetry, Foraging, Behavior); Nesting Biology (Ecology, Behavior, and Reproductive Success); Population Biology and Monitoring (Status, Modeling, Demography, Genetics, Nesting Trends, In-Water Trends); Fisheries and Threats; Conservation, Management and Policy; Education, Outreach And Advocacy; and Social, Economic and Cultural Studies.

There were four special sessions. The session Emerging Threats-Climate Change, Oil Spill and Plastic Pollution had oral presentations on innovative methodologies, and new conservation issues such as plastic debris, sea level rise and oil spills. The second special session was "Turtles in Time" where studies of turtles using historical archives was presented and discussed, and Eastern Pacific Sea Turtles sessions focused in regional aspects in turtle biology and conservation.

Poster presenters had the opportunity to answer questions and give more details on their presentations during "Meet the Authors".

Social Events: The socializing component of the symposium was conformed by the Welcome Social, Live and Silent Auctions, Video Night (23 videos were projected to symposium attendees as well as the general public), Student events, Student Awards and Farewell party. Among those events, a Speed Chatting with Experts event was held the night of the first day of the meeting, with the following lineup: Joanna Alfaro Shigueto, Bryan Wallace, Emma Harrison, Colum Muccio, Zoe Meletis, and Andrea Phillott.

The Student Committee conducted two activities. One was a workshop to discuss methods to raise funds for research using social media. The second activity was a Social Mixer, letting students meet other students as well as scientists and researchers exposing their latest investigations.

Of all these events, the Live Auction and the Farewell party were probably the most popular.

Travel grants: More than 200 registrants received a travel grant, 8 from Africa, 34 from US/Canada, 10 from Caribbean, 1 from South Asia, 6 from Asia Pacific, 3 from Middle East, 95 from South America, 18 from Europe, 38 from Mexico/Central America, others. This level of travel grant awards represents about 29% of the total registered participants. Travel grants took the form of cash and room grants, for a total of about 200 persons, which was highly advantageous for the awardees.

Auctions: We were able to collect \$25,000 through the live and silent auctions, breaking records set from previous symposia. This money will be used to help students to attend future meetings via travel grants.

ISTS Awards: During the symposium a series of awards were made to prominent members of our sea turtle society. Earl Possardt, Jeanne Mortimer and Dave Owens were awarded the Lifetime Achievement Award for their extensive and significant contributions to the promotion of sea turtle biology and conservation. ICAPO (Eastern Pacific Hawksbill Initiative) was awarded with Champion's Award. Hipolito Lima received a Champion's Award too. President's awards were given to Colin Limpus and to the Peruvian organization "Asociacion Amigos de la Naturaleza", a group of fishermen working with conservation. Debbie Sobel received the Ed Drane Award for Volunteerism. Congratulations to all the awardees.

Archie Carr Student Awards: Four students won the Archie Carr award for outstanding presentations at the symposium. Boris Tezak (Biology) and Callie Veelenturf (Conservation) won in the poster category. Karen Panlaew (Biology) and Kimberly

Riskas (Conservation) won in the oral category.

Resolutions: A very important component of every symposium is the issuing of *Resolutions*, documents that allow the Society at large to pronounce itself with regard to issues pertaining to sea turtle conservation around the world. During the ISTS 36, there were no resolutions submitted nor discussed in Lima.

Board meeting: The Board meeting held during the Lima symposium was fruitful and lasted until midnight of the first day of the symposium. The Board received and discussed reports from the Nominations Committee, Student Committee, Travel Committee, Students Awards Committee, Awards Committee, as well as reports from the Program Officer and Treasurer.

Business Meeting: Very important issues were addressed during the plenary business meeting, Travel committee chair and the Treasurer presented their reports and the attendees approved. Also, it was announced the new President-elect for symposium 2018: Yoshimasa Matsuzawa from Japan.

Frank Paladino, future President 2017, unveiled the venue where the next symposium will be held, and gave details on this. We will get together again in JW Marriot hotel & Spa in Las Vegas from 15-23 April 2017.

Society Elections: After the voting process ended in Lima, the Society will be led by President: Frank Paladino, President-elect: Yoshimasa Matsuzawa, Past President: Joanna Alfaro Shigueto, Secretary: Manjula Tiwari, and Treasurer: Terry Meyer.

The new Board of Directors is comprised of Roldan Valverde (2017), Alejandro Fallabrino (2017), George Balazs (2017), Yakup Kaska (2018), Emma Harrison (2018), Pam Plotkin (2018), Mariana Fuentes (2019), ALan Rees (2019), Andrea Phillott (2020), Laura Prosdocimi (2020), Andrews Agyekumhene (2021) and Jeanette Wyneken (2021).

The Nominations Committee added new members Kartik Shanker, Connie Ka-Yan Ng and Kate Mansfield.

Finances: Generous funding by many entities made it possible for the ISTS36 to be success. The organizing committee deeply thanks the donors below for their generosity. At the **Platinum level (\$25,000 and above):** US Fish and Wildlife Service Wildlife. At the **Gold level (\$5,000 - \$19,999):** Universidad Cientifica del Sur, US Embassy in Peru, Whitley Fund for Nature, Columbus Zoo and Aquarium, The Shared Earth

Foundation, CONCYTEC and Ciencia Activa (Peruvian government science funding). At **Silver level (\$1,000 - \$4,999)**: Ministry of Environment from Peru, Comision Permanente del Pacifico Sudeste, Sea Turtle Conservancy, WWF, Sirtrack and Lotek, Pew Charitable Trust, Wildlife Conservation Network, Wildlife Computers, Sociedad Nacional de Pesqueria, Darwin Initiative, and International Seafood Sustainability Foundation and Disney's Animals, Science and Environment. **Bronze level (\$500 - \$999)**: The Leatherback Trust.

Carbon Offsets: A meeting the size of the ISTS Symposium represents a considerable use of resources, primarily for travel, but also for onsite lodging and activities. Donations from the web site raised 250 USD for Amazon rainforest conservation with the local NGO Conservamos por Naturaleza.

Acknowledgments: Organizing the Lima symposium took a significant number of hours and effort. The successful organization strongly benefit from the selfless

work of a large number of volunteers. To them, my personal thanks. The symposium would not have been possible without the help and support from funders mentioned above. All session chairs are also thanked for their help and interest. However, among all the people that contributed one way or another to the success of the symposium, I would like to recognize the following individuals: the symposium Registrars Eliana Alfaro Cordova, Clara Ortiz, Elizabeth Campbell and Andrea Pasara who handled all registrations issues with utmost efficiency and dedication; and Program Chairs Natalie E. Wildermann, Mariela Pajuelo and Kelly Stewart, who did a very professional and superb job ensuring the soundness of the program and the entire abstract selection process. To Ximena Velez-Zuazo, Nina Pardo, Nelly de Paz, Shaleyra Kelez, Nicolas Acuna, Francisco Cordova, Adriana Gonzalez, Javier Coasaca, Kerstin Forsberg, Flor Gomez and Luciana Klinge who helped me in poster organization, fundraising and various tasks before and during the symposium. To the seven of them, my deep and personal thanks.

REPORT ON THE WORKSHOP 'ECOLOGY AND CONSERVATION OF SEA TURTLES IN THE PERSIAN GULF', 13 MAY 2016, QESHM ISLAND, IRAN

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INTRODUCTION

Qeshm Island (about 1490km²) is the largest island in the Persian Gulf. Situated in the east of the Gulf, it is bordered by various coastal habitats. Its northern coast is a sheltered area, comprising Hara Biosphere Reserve (the largest mangrove stand in the northwestern Indian Ocean; an area of about 100,000ha) and some smaller mud flats and mangrove swamps, whereas the southern coast is an exposed area, comprising many sandy-rocky shores and some of the healthiest coral reefs of the Gulf (Darehshouri, 2009).

Five of seven sea turtle species have been previously recorded in the Persian Gulf (Gasperetti *et al.*, 1993). Leatherback,

loggerhead and olive ridley turtles have been recorded from coastal waters of Qeshm Island, although in very low numbers (Dakhteh, 2014; Tollab *et al.*, 2015). Hawksbill turtles nest along the beach of Shibderaz village on the southern coast of Qeshm Island, and the island's coastal waters are known as foraging grounds for green turtles.

Qeshm Environmental Management Office (QEMO), founded in 2000 as a subsection of Qeshm Free Area Organisation, has run five turtle conservation and research projects over the last decade. These projects have been carried out with significant contributions from Iranian UNDP/GEF/SGP and some environmental NGOs. During the first half of May 2016, Dr. Nicolas Pilcher (Executive Director of Marine Research

Table 1. Conservation and research priorities for sea turtles in Persian Gulf suggested by participants at the workshop on 'Ecology and Conservation of Sea Turtles in the Persian Gulf'

Category	Priority
Conservation	Put excluder devices on nets to reduce mortality of dolphins and turtles; needs support from Iranian (Governmental) Fisheries Organization.
	Use results from turtle excluder device (TED) bycatch studies to continue implementation.
	Organize awareness programs with fishers to increase understanding about the importance of turtles and how to release turtles from nets safely.
	Remove unused and/or old nets from beaches.
	Increase awareness about not dumping nets at sea.
	Investigate potential exchange program or incentive to replace old broken nets (that would otherwise be dumped at sea) with new nets; maybe the government could provide an incentive to make this happen.
	Provide incentives to fishers returning old nets to land.
	Develop a special regularly published magazine for environment agencies to learn more about the issues relating to marine endangered species.
	Work with media to report on issues related to endangered marine species in the marine realm; can help raise public awareness.
	Organize a vessel to collect rubbish from at sea fishing boats.
Develop environmentally-friendly employment for local communities.	
Assist local communities to improve living conditions so that they will be keener to work with conservation programs.	
Research	Work closely with artisanal fishing communities to learn their understanding and approaches to conservation.
	Assess levels of bycatch.
	Conduct a study to determine fisher interest in participating in conservation activities.
Conduct a study to monitor seagrass beds through Iranian coastal waters of the Gulf.	

Foundation, Sabah, Malaysia) came to the Qeshm Island to lead QEMO team in a project on green turtle population structure in the island's coastal waters. To coincide with this event, QEMO hosted a workshop on "Ecology and Conservation of Sea Turtles in the Persian Gulf", which was attended by approximately 75 participants from across Iran representing the National Government, QEMO, academia, and NGOs. This report describes the workshop and its outputs.

WORKSHOP PARTICIPANTS

There were 64 registered participants at the workshop on May 13, 2016, and an additional 10 people who attended the workshop but did not register. Registered participants included governmental and non-governmental managers (27%), environmental employees (27%), Master students (19%), PhD students (14%), undergraduate students (8%) and university faculty (6%).

WORKSHOP SESSIONS

Session 1 (Keynotes) This session comprised four keynotes. At the beginning, Mohsen Rezaie-Atagholipour, the executive secretary of the workshop and QEMO marine biologist, welcomed the participants and introduced the workshop schedule. Then, Bijan Dareshoori, founder and retired general director of QEMO, gave a keynote on turtle conservation programs on Qeshm Island. He described the situation more than 15 years ago, when hawksbill nests were poached by local peoples on the beaches of Shibderaz village. But, after three conservation and educational programs, local peoples were finally convinced that protecting nests and developing environmental friendly jobs such as eco-tourism activities would be more beneficial rather than poaching and selling turtle eggs. The third key speaker in the session was Laleh Daraie, UNDP/GEF/SGP coordinator in Iran, who presented a movie of the SGP cluster programs in Qeshm Island during the last decade and gave a presentation on how QEMO in cooperation with GEF/SGP could achieve their goals, specifically through three hawksbill conservation programs at Shibderaz beach. The fourth and last key speaker in session one was Davood Mirshekar, general director for the office of marine ecosystems in Iranian Department of Environment (IDOE), who gave a presentation on hawksbill turtles nesting along Iranian islands and mainland in the Persian Gulf.

Session 2 (lectures) This session was divided into two sections, both led by Dr. Nicolas Pilcher. For the first section, he gave a presentation on general biology of sea turtles and talked about how understanding turtle

biology could help managers to design conservation programs. For example, he described sea turtle vision and then explained that urban lights would not be a threat for nesting sea turtles and their hatchlings if urban planners used low pressure sodium lights instead of high pressure lights, or shielded lights, or limited sky glow in coastal areas. After a short break, he gave a presentation on the conservation status of sea turtles in the Persian Gulf. In the second section, Dr. Pilcher talked about sex ratios and turtle population structure (see Pilcher *et al.*, 2015), migration patterns of post-nesting hawksbill turtles, and important turtle areas (ITAs) in the Persian Gulf (see Pilcher *et al.*, 2014a; 2014b).

Session 3 (presentations by Iranian researchers)

In this session, Asghar Mobaraki, general director for natural history museum and genetic resources bureau of IDOE, gave a presentation on general biology of sea turtles and specific records of turtles in Iranian coastal waters of the Persian Gulf and Gulf of Oman. Then, Dr. Majid Askari, assistant professor of Shahid Bahonar University of Kerman, gave a presentation on his project on nesting hawksbill turtles in Iranian Marine Protected Areas of the Persian Gulf, which had been carried out in 2015. Finally, Dr. Fereidoon Owfi, from Iranian Fisheries Science Research Institute (IFRO), gave a presentation on interaction between sea turtles and industrial trawlers in the Iranian Gulf of Oman.

Session 4 (Discussion and brainstorming)

In the beginning of this session, Dr. Pilcher explained to the participants that "any idea could be a good idea". Then all participants brainstormed about research and conservation priorities for sea turtles in the Persian Gulf. In this section, people discussed about different topics regarding sea turtles research and conservation priorities. All suggestions for actions were compiled and tabulated during the session (Table 1). In total, 16 ideas for conservation and research strategies were proposed by participants, of which 12 (75%) were about conservation priorities and four (25%) concerned research priorities (Table 1). Therefore, it was evident that people in the workshop mostly thought about conservation solutions rather than research programs.

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RESOURCE OF INTEREST

REVIEW OF: 'FROM SOUP TO SUPERSTAR. THE STORY OF SEA TURTLE CONSERVATION ALONG THE INDIAN COAST' BY KARTIK SHANKER

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Title: From Soup to Superstar. The story of sea turtle conservation along the Indian coast

Year: 2015

Author: Kartik Shanker

Publisher: Harper Litmus

ISBN: 9351772322

Pages: 329pp (hardcover)

Price: \$24.99 USD

To order: www.amazon.com; www.amazon.com.in; www.flipkart.com

This book is a captivating compendium of sea turtle conservation that extends well beyond India's borders. It covers "three eras of sea turtle conservation": pre-Independence; the period between Independence and the 1970s; and the period between the 1970s and today (p. 9). Shanker offers meticulous accounts of seemingly every important turtle-related event. He harkens back to the yesteryear of sea turtle conservation, but also provides insights into how large international organizations such as the World Wildlife Fund (WWF) and the International

Union for Conservation of Nature (IUCN) end up playing significant and sometimes misplaced roles in conservation. The book explores relationships between the conservation of crocodiles, sea turtles, and dugongs in India. Along the same lines, it recalls relationships between the conservation of charismatic species, and manoeuvring of charismatic politicians (e.g. Indira Gandhi, p. 76-77). Through precisely referenced stories, Shanker offers rich descriptions of conservation on the ground, while linking these to greater themes. He reveals relationships through which particular actions, actors, media campaigns, science programs, and management acts are tied to larger shifts in how we understand and value sea turtles. We are called to acknowledge the tangled webs between conservation and colonialism (past and present). For example, Shanker notes that India's history of turtle meat consumption is largely owed to the British (p. 79). He also describes different cultural and religious understandings and uses of sea turtles in India—calling attention to the country's heterogeneous population and its diverse geographies. We learn that some communities do eat sea turtle products

but members of other groups observe cultural taboos against their consumption (e.g. some people believe them to be incarnations of the Hindu god Vishnu) (p. 43).

Among the most intriguing stories are those of fieldwork under “extremely taxing conditions”, such as having to travel great distances with limited supplies, and to work long, hard, hours, with little support or relief (p. 100). I gained a new and deepened respect for such contributions after reading details. I also learned that there is a “CIFT-TED” (p. 121-124)-an “adapted in India” TED or turtle excluder device, proposed for use in trawling, to reduce harmful impacts on sea turtles.

The book references the work of many others to raise questions about common conservation practices or discourses vs. strategies that might work better for most of the parties involved. It includes powerful stories of conservation mishaps, mistakes, and failures, such as examples of both successful and unsuccessful engagement with local fishers. Shanker draws upon years of observation of fishing, laws, enforcement, and sea turtles in India to make some interesting statements about their interactions. For example, on p. 143, he argues that better enforcement of fisheries laws would have better protected both sea turtles and fisher livelihoods. In highlighting fisheries-related conservation failures, he challenges oversimplified portrayals of fishers as being some combination of: ignorant, uneducated, confused, and rebellious. Considering international influences, Shanker details various international letter writing campaigns, petitions, and pressures, offering judgements on which were most appropriate and/or effective.

This is part of the well-argued commentary on the evolution of the politics of sea turtle conservation in India. Shanker notes the long-lasting effects that “one time” events can have on conservation (e.g. a powerful cyclone in 1999; the Tsunami of 2005). He tells stories of key eras and events in Indian sea turtle conservation (e.g. conflicts over various ports and protected areas; battles over trawling and reducing its negative impacts). Such stories are also linked to several persistent debates reflected in academic writings, practitioner practice, and media treatment of the complicated relationships between humans and sea turtles. Shanker includes insightful examples of the ‘conservation vs. preservation’ debate, for example, by comparing stories of places that have experimented with sustainable use practices, vs. those that have imposed outright bans (e.g. p. 102-109). He discusses the implementations of such actions, traces their origins, and contemplates their successes and failures. Questions about success, he notes, are greatly influenced by who is asking, how

they are measuring, their conceptualization of success, and expected implications. Rather than including an explicit stance on the use of sea turtle products, Shanker calls for careful and respectful attention to contexts and cultures of influence, science, and local livelihoods.

This book is not simply descriptive; Shanker offers his own analysis of how turtles have moved “from soup to superstars”. He shares, for example, many stories of Greenpeace’s presence and actions on sea turtles in India—they are a fascinating set of tales, with mixed outcomes. He also draws attention to organizations he has been involved with or otherwise worked with such as the Martine Turtle Specialist Group of the IUCN, and suggests that some cases would have best been left in Indian hands. Further, he cautions that tales of extinction, disappearances, and species at risk are sometimes more hyperbole or hype, than proven facts backed up by good science. This complicates determining true conservation needs and best courses of action, especially with respect to local livelihoods and support for interventions.

I was dazzled by Shanker’s account of the rise of sea turtle conservation in India, but I also wondered about intended audiences for this book... This volume would be an excellent (if not slightly overwhelming) primer on: sea turtle conservation in India; greater shifts in interactions with international conservation; and/or a ‘family tree’ of individuals, labs, organizations, and their legacies in understanding sea turtle populations and conservation projects associated with India. It could also serve as a good complementary text for a university course on the social science of conservation - for readers looking to trace the evolution of conservation beliefs and practices over time, using a case study. Lastly, it would be a great addition to professional or personal libraries of all those interested in the history of sea turtle conservation, and important sites and struggles within it.

The main weakness of the book is also one of its strengths: the level of detail. While some details are quite fascinating, particularly with respect to the influence of particular individuals on conservation, I did wonder how many readers would have patience for such details. At the same time, learning about a central “conservation character’s” favourite sandwich or particularly harrowing field season helps to humanize conservation, and reminds us of hard work and key contributions.

Despite its over-attention to detail, this book is a valuable contribution to the literature on sea turtle conservation. It is an accessible survey of the history of sea turtle conservation, with India as a focal point. It is an impressive feat to write a book that bridges the

macro and the micro. The book is peppered with sea turtle conservation trivia, but facts are skilfully woven together with (mostly) elegant prose that draws together science, history, and human passions for improving our world. Alongside emphasizing successes and challenges in sea turtle conservation in India and abroad, it contains critical reminders of work that remains to be done. The book closes the way it begins, with sincere recognition of the hard work done by pioneers such as Satish Bhaskar, Ravi Sankaran, and Manish Chandi—those who braved difficult conditions, “paving the way for future generations for ecologists to seek answers...”. The passion that Shanker shares with many of those profiled in the book is reflected here: “Today, biologists study various aspects of

sea turtle biology including nesting biology, physiology, migration, genetics, evolutionary biology, ecology, and so on... So much has been done and yet so little is known. It is this that makes them not only fascinating to study, but also difficult subjects for conservation” (p. 34-35). To this end, Shanker asserts that we should all endeavour to remove our species-specific conservation blinders: “The onus is on environmental conservationists to carefully choose and implement approaches that have the best consequences not just for individual species but for ecosystems and diversity in the long run. Conservationists must seek not single-point-single-species successes, but success across geographical regions, over time and for many taxonomic groups” (p. 108). Hear hear!

INSTRUCTIONS FOR AUTHORS

Please refer to the style requirements listed below. Manuscripts should be submitted in MS Word or saved as text or rich text format. Appropriate files should be submitted by email to: iotn.editors@gmail.com. For further details please see www.iotn.org or consult a recent issue of IOTN.

Language and spelling: Please follow British spelling and grammar conventions.

Author names: Please provide full names of authors, e.g. Stanely T. Asah

Author affiliations: Please provide Department/ Centre/ Laboratory. Institution/ University/ Organisation, City, State or Province, Country, E-mail address of corresponding author. The symbol “#” in superscript may be used to denote corresponding author.

Tables and figures: Figures should not be embedded in the text file, they may be sent separately as JPEG, TIFF, BMP or PNG files. All figures and tables should carry a caption. Figures and illustrations must be accompanied by the appropriate credit/source. High resolution figures may be requested after acceptance of the article.

References in text: References should appear first in chronological then alphabetical order.

Two authors to be separated by ‘&’ symbol, e.g., as Rai & Sahu, 2001

More than 2 authors: first author *et al.* (*et al.* in italics) e.g., Roy *et al.*, 2004

Two publications of the same year for the same author(s), the reference in the text should be Sharma 1960a, b not 1960a, 1960b and the two publications should be dated accordingly in the references.

Multiple references to be separated by a semi colon and in chronological order (Zade, 1995; Mathew, 1996a, b, 1998; Sharma, *et al.* 2004; Forman & Gordon, 2005, 2007)

Page numbers are essential when quoting or referring to some aspect or information from a report (Sharma 1960: 22 or Sharma *et al.* 1960: 22).

References that are long and/or have acronyms: Only acronym in text,

e.g., INRA 2008

List personal communication references in text only. e.g. (Hariya pers. comm., 2011)

Unpublished/Undated references: In press, Forthcoming, In review, etc.

References in list: References should appear first in alphabetical then chronological order.

For references with more than 7 authors: first 7 names, *et al.*

Use complete page ranges. e.g., 371–379 (not 371–9); 227–235 (not 227–35).

Reference that are long and/or have acronyms: Full name followed by acronyms in parenthesis in reference list, e.g., Instituto Nacional de Reforma Agraria (INRA). 2008.

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