Ostional beach, Costa Rica
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Global Assessment of Arribada Olive Ridley Sea Turtles

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The olive ridley sea turtle (*Lepidochelys olivacea*, Eschcholtz 1829) is a pantropical species that nests through most of its distribution range. Although it is a widely distributed species this turtle reaches its highest abundance in the Indian Ocean and along the coastal areas of the Eastern Tropical Pacific (ETP) Ocean (Cornelius, 1986). This species is thought to be the most abundant sea turtle species in the world (Marcovaldi, 2001). This belief is primarily supported by the fact that, aside from nesting solitarily, this turtle can nest *en masse* giving rise to a phenomenon known as arribada (Valverde et al., 1998). This mass nesting phenomenon is characterized by the participation of tens or hundreds of thousands of females that nest synchronously on a relatively small section of beach over a few nights (Richard and Hughes, 1972; Hughes and Richard, 1974). Today this mass nesting phenomenon still occurs in large numbers in Gahirmatha and Rushikulya beaches in India (Pandav et al., 1994; Shanker et al., 2004), in La Escobilla in Mexico (Márquez-M. et al., 1996), and at Ostional beach in Costa Rica (Russell et al., 2000). In addition, minor arribada rookeries are known to occur in Nicaragua and Panama. Unfortunately, the gregariousness of olive ridleys has contributed to the decimation of at least three arribada assemblages in Mexico due to overexploitation (Cliffton et al., 1982), and perhaps also at Nancite Beach in Costa Rica, due to low hatching rates that may occur under high density conditions (Valverde et al., 1998). Illegal take of adult ridleys in Mexico and legal use of their eggs in Ostional for human consumption continue today, but the impact of this take on the adult population has not been elucidated (Plotkin, 2007). The decimation of arribada assemblages mentioned above underscores one of the main reasons to designate the species as endangered or threatened (Groombridge, 1994). It is perhaps due to these designations and associated protection measures that some arribada assemblages, such as those at La Escobilla and Ostional Beaches, appear to be exhibiting signs of good health, although these and others, such as those in India, continue to suffer from high mortality as a consequence of fisheries bycatch (Shanker et al., 2004). However, arribada nesting beaches are characterized by the lack of sound historical records regarding the abundance of the various arribada populations. It is important to emphasize that the lack of long-term monitoring of the nesting populations using sound methodology prevents biologists from determining the actual impact of natural events and anthropogenic activities on the health of regional populations.

Population status is one of the most difficult aspects of the biology of sea turtles to ascertain. This is because sea turtles exhibit long life cycles, wide distribution, and complex life histories, which make it difficult to obtain direct, long-term reliable data on particular life stages (Meylan, 1995). Thus, the long-term monitoring of the nesting population remains one of the best, albeit imperfect, proxies to assess the health of a population (Bjorndal et al., 1999). When monitoring nesting populations it is generally accepted that a persistent significant decline in nesting may be indicative of the extinction of a rookery (Márquez-M. et al., 1996). Thus, it is fundamental to generate accurate nesting population estimates that can be used as an index of population stability and health. Currently, although few estimates exist, most methodologies used to generate nesting population estimates are flawed, making these estimates unreliable. In addition, these methodologies tend to be rookery-specific, preventing direct comparison of nesting numbers among rookeries. This precludes the use of interannual nesting abundance as a reliable index of the health of the populations. Given the lack of reliable information on sea turtle abundance it is imperative that sound and consistent methodology be used at all major arribada beaches to monitor annual and interannual nesting population fluctuations.

Project Objective:
The overall objective of this project is to conduct a census of all major arribada beaches in the world to determine the health of the various populations. Over time, it is expected that annual estimates of arribada abundance will help device improved protection measures to ensure the conservation of this vulnerable species.

Major accomplishments:

The bulk of the arribada censusing work was conducted between June and December of 2006. The beaches targeted during this period were Ostional and Nancite beaches in Costa Rica and La Escobilla in Mexico. The scope of the project called for the inclusion of the Indian beaches (Rushikulya and Gahirmatha) later in the Spring of 2007. However, there was no arribada at this time and thus, my collaborator Dr. Kartik Shanker could only train field assistants to be ready to undertake the censusing work in the event of an arribada occurrence. The physical barriers imposed by the distance in between the various rookeries included in this project were overcome by the use of internet. Indeed, one of the major accomplishments of this project was the demonstration of our ability to work in a coordinated fashion, integrating the work of all collaborators from a single point, Southeastern Louisiana University. Below this report summarizes the main accomplishments toward the fulfillment of the major goal of the project.

<u>Arribada estimates</u> – estimates were successfully generated for arribadas in Ostional, Nancite and La Escobilla for the reporting period by applying the strip transect in time method developed by Dr. Charles gates in collaboration with the PI and other colleagues (Gates et al., 1996; Valverde and Gates, 1999). This method was designed specifically for estimating arribada turtle abundance using the same methodology, which allows us to make directly comparable estimates among rookeries. The method is statistically sound, robust, flexible and relatively easy to implement. The data generated by this method can be expressed as number of effective nesting females (i.e., number of females that actually oviposited) or number of nests. This aspect facilities the understanding of the ecological impact of the arribada phenomenon from the stand point of the adult nesting population and the productivity of the turtles. Results of the censusing efforts are summarized in figures 1-3 for the three beaches. Note the different magnitude of the range on the Y axis for the three beaches. Fig. 4 summarizes the information of Figs. 1-3 and provides an estimate of population abundance per rookery by dividing the total

number of nests during the season by the annual nest frequency per turtle, estimated at 2.5 clutches per turtle.

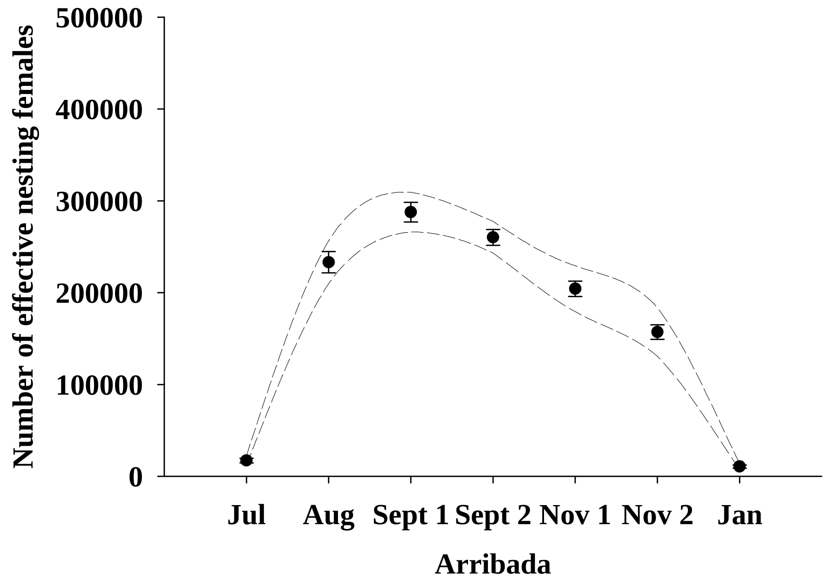

Fig. 1. Data on arribada abundance at La Escobilla Beach, Mexico during the 2006 peak nesting months. Data are plotted as number of effective nesting females is equivalent to number of nests laid. Data points include estimate, standard error of the estimate, and confidence interval of the estimate.

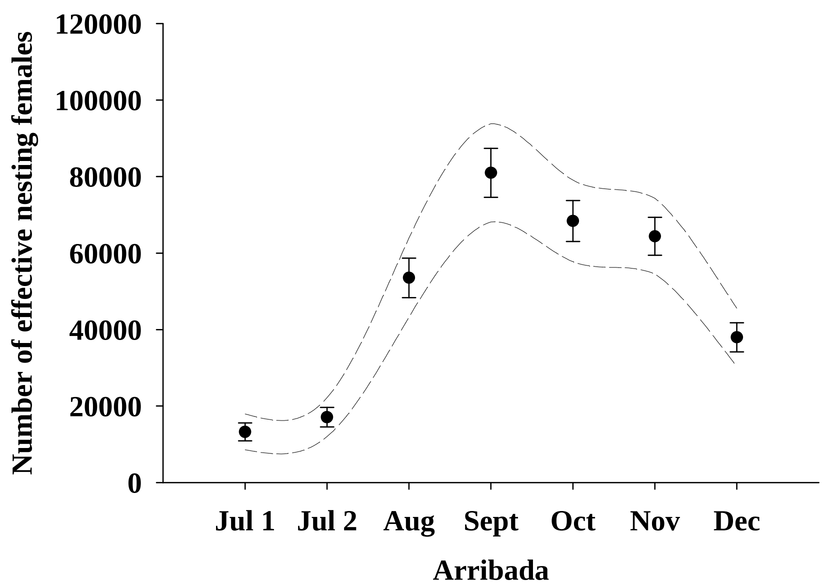

Fig. 2. Arribada abundance at Ostional Beach, Costa Rica during the 2006 peak nesting months. Data are plotted as number of effective nesting females is equivalent to number of nests laid. Data points include estimate, standard error of the estimate, and confidence interval of the estimate.

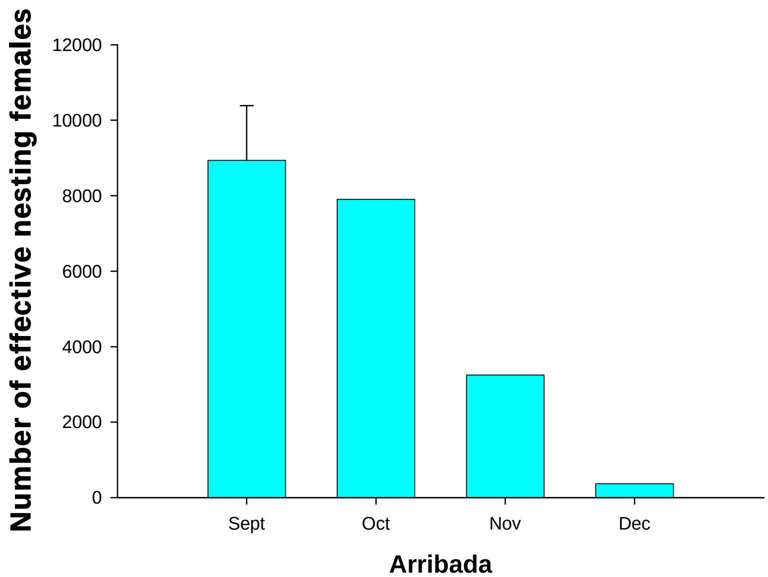

Fig. 3. Arribada abundance at Nancite Beach, Costa Rica during the peak nesting months of 2006. Data are plotted as number of effective nesting females is equivalent to number of nests laid. Only the September arribada was estimated by strip transect in time method. Data points include estimate, standard error of the estimate, and confidence interval of the estimate. October, November and December arribadas were estimated by direct count due to logistic problems.

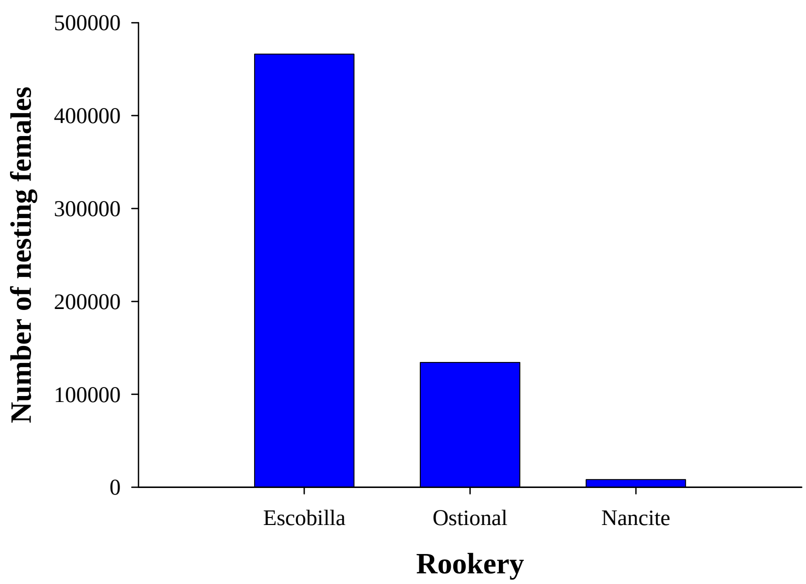

Fig. 4. Total nesting population estimate for La Escobilla, Ostional and Nancite beaches for the 2006 peak nesting months. Numbers were obtained by adding all arribada estimates for the months and dividing by the nesting frequency of 2.5 nests per year.

Discussion:

Arribada estimation data show that the olive ridley is indeed an abundant turtle species in the Eastern Tropical Pacific. Data indicate that La Escobilla exhibits the largest arribada assembly in the ETP, which is at least four times larger than its Ostional counterpart, at least as shown this year. It is important to emphasize that only long-term monitoring of these beaches will tell us whether the magnitude observed this year is indeed real or if the various beaches were sampled at particularly bad or good year.

Data from Ostional indicates that the arribada assemblage there may either be stable or declining precipitously. Indeed, data published based on reports generated by researchers from the University of Costa Rica indicates that yearly arribada abundance at Ostional went from some 300,000 turtles in 1990, increasing rapidly through the year 2000, reaching a peak of 2,000,000 annual nesters (Eguchi et al, 2007). In contrast, our estimate for that assemblage in 2006 amounts to 335, 555 annual nesting turtles, well below the number of nesters estimated in the year 2000 by the UCR group. Interestingly, data included in this publication (Eguchi et al, 2007) also indicate that the Ostional assembly is approximately twice as large as that of La Escobilla for that time period, significantly contrasting with our findings (see above). We feel that the lack of congruence between our data and data generated by the UCR team is due to the use of significantly biased methodology. The strip transect in time method used by our team was developed in collaboration between the PI, Dr, Charles Gates and others and has been published in peer reviewed journals (Gates et al., 1996; Valverde and Gates, 1999). This method is statistically sound, unbiased, flexible, powerful and relatively easy to implement. The method allows the user to generate an estimate of the number of arribada turtles, along with an estimate of the associated standard error and confidence intervals. In contrast, the UCR method is significantly biased; this method consists of censusing the low beach near the water a strip of beach parallel to the length of the beach. All turtles entering the (presumably since they have no way to ascertain the actual transect width) 10 m-wide strip are counted as the observer walks the 1-6 km of beach. The strip is censused again as soon as the observer reaches the other end. Because there is no way to determine if a turtle has already been counted and no time is allowed for all turtles to complete their nesting excursion this method cannot ensure that the same turtle is not counted multiple times, which is likely to occur. Additionally, during large arribadas this problem is exacerbated by turtles that cannot find a nesting site in the upper beach, which forces them to incur in multiple excursions during the same night or over subsequent night, thus overestimating the number of turtles. In essence, we believe that the Ostional assemblage may still be healthy, although our data do not resolve the potential impact of the nearly three decade-long egg harvest at this beach, which may be significant (Fig. 5).

Fig. 5. Community effort leading to the extraction and commercialization of olive ridley eggs at Ostional. Legal harvest is allowed during the first 36 hours of an arribada and typically amounts to millions of eggs.

A similarly controversial situation arose when comparing our estimates at La Escobilla with those previously published for this beach. Published historical records indicate that La Escobilla assembly increased from approximately 100,000 turtles in the 1980s when this population was significantly targeted by direct take of adults, to reach a maximum of approximately 1 million annual nesters in the year 2000. Our data indicate that in 2006 this assemblage included 1,169,995 turtles, suggesting that there has been very little change in this population over the past six years. If accurate, this would indicate that this population is stable. Altogether, our data strongly argue for the continued monitoring of all beaches included in this project.

It is unfortunate that we were not able to record arribada data at the Indian beaches given that the expected arribadas did not occur. However, published historical data (Shanker et al., 2003) indicate that the Indian arribada assemblages may be of similar size or smaller than those of Ostional. This is mainly due to the fact that Indian arribadas include only one or two events any given year whereas nesting at Ostional arribadas may occur year round. The relatively low abundance of the Indian assemblages may reflect the heavy impact of the incidental fisheries that may cause substantial losses to the stock in the Bay of Bengal. A separate report from our collaborator Dr. Kartik Shanker, who is in charge of the project in India, is attached (Kousik et al, 2007).

Capacity Building –

Workshops

One of the most important aspects of the project is that it has resulted in significant technical capacity build up, both at Ostional and at La Escobilla. As part of this project we have organized three arribada estimation workshops at Ostional Beach, Costa Rica. One was held in the Spring of 2005 and was attended by locals and other Costa Ricans. The second workshop took place in the Spring of 2006 and was attended by our Mexican collaborators. The third one occurred in December of 2006 and was attended by our Indian collaborator, Dr. Chandrasekhar Kar, Senior Research Officer, Wildlife Organization of the Forest Department, Government of Orissa, India (Fig. 6). This occurred prior to the beginning of the arribada season in India. The main objective of these workshops was to train our teams of collaborators on the intricacies of the strip transect methodology from a field, practical perspective.

Fig. 6. Drs. Kar and Valverde during the December 2006 arribada at Ostional Beach, Costa Rica. During this arribada Dr. Kar received hands-on training on the strip transect methodology.

As a result of these workshops, our collaborators of the Ministry of the Environment and Energy of Costa Rica (MINAE) were able to continue to collect arribada data in the dry months (January – May) at Ostional, after the project had ceased activities in January 2007. This is very important because MINAE personnel, even though they are not a research institution, have demonstrated significant interest and support for the project. In addition, our collaborators at the Centro Mexicano de la Tortuga (CMT) have adopted the new strip transect in time methodology in replacement of the older one (Márquez-M. and Van Dissell, 1982). In addition, MINAE authorities are now planning to use the technique to manage the level of egg extraction at the beach by looking at the proportion of nests harvested against the total number of nests laid.

As part of the capacity building efforts of this project the PI was able to train in field activities a Costa Rican student, Diana Solis, to coordinate data collection at Ostional. Currently, Diana has joined the PI's lab and is conducting her Master's thesis work at Southeastern Louisiana University. The idea is that Diana can make a significant contribution to the conservation of the olive ridley in Costa Rica once she returns to the country.

Other –
The controversies described above regarding the incongruence between our data and historical assemblage estimates underscore the importance of our work at all arribada beaches. Indeed, in the Spring of 2007 the Marine Turtle Specialist Group of the International Union for the Conservation of Nature met in the Spring of 2007 to discuss the status of the olive ridley. A power presentation generated by Dr. Alberto Abreu to lead the discussion, which is appended at the end of this report. In essence, the MTSG agreed to change the category of the olive ridley from endangered to vulnerable given that the major arribada populations (Ostional and La Escobilla) exhibited signs of "recovery". This seems controversial given that it is not clear that the Ostional assemblage is increasing in abundance. The main difficulty resides in the poor quality of the historical estimates for that assemblage. Given this situation, it is fundamental that monitoring of the Ostional assemblage be continued for the long term; only then will we have an accurate representation of the trend of that population.

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Study of the 2006-2007 olive ridley nesting season at Rushikulya, Orissa, India

Final Project Report submitted to
Southeastern Louisiana University &
Forest Department, Government of Orissa

June, 2007

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Photo credits: Aarthi Sridhar, Anusha Kousik and Kartik Shanker

Introduction

Olive ridleys (*Lepidochelys olivacea*) are famous for their mass nesting phenomena. Instead of arriving individually, like other sea turtles, these turtles nest on select beaches in large aggregations over a 3-4 day period. There are mass nesting rookeries in Pacific Costa Rica, Pacific Mexico, and in Orissa on the east coast of India.

Mass nesting at Rushikulya K. Shanker

Hatching at Rushikulya, K. Shanker

Olive ridleys nest at a number of sites in the western Indian Ocean, Indian subcontinent and Southeast Asia (Shanker and Pilcher, 2003). However, the most significant breeding area for olive ridleys in the Indian Ocean is Orissa, which has three known arribada beaches at Gahirmatha, Devi River mouth and Rushikulya (Pandav *et al.*, 1998; Shanker *et al.*, 2004b). This is an evolutionarily distinct population and of considerable conservation importance (Shanker *et al.*, 2004b). n spite of the large numbers of olive ridley turtles nesting in Orissa, the death of over 100,000 turtles in the last ten years has made serious conservation efforts necessary (Shanker and Choudhury, 2006). The key reason of mortality is unlawful gill net and trawl fishing in the offshore waters where the turtles die as incidental catch (Pandav, 2000a). Regardless of bans on mechanised fishing in near-shore waters (5 km off the Orissa coast, 20 km in Gahirmatha), trawlers carry on operating and mortality has risen over the past ten years (Sridhar *et al.*, 2005).

Project Plan

Previous work has been carried out at this rookery by Pandav (2000a) and Tripathy (2005). However, different methods have been used for monitoring of solitary and arribada nesting over the past two decades (Shanker *et al.*, 2004b). In order to establish standard monitoring protocols, the Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore executed this project in collaboration with the Orissa Forest Department.

The project aimed at:

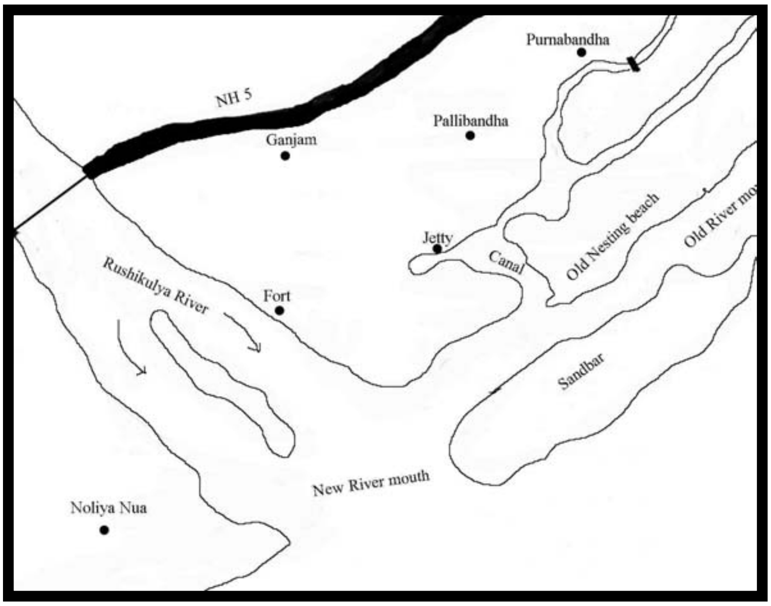
a) Off-shore monitoring of mating congregation
b) Counting of solitary nesting at the Rushikulya rookery
c) Counting of arribada nesting at the Rushikulya rookery

Local groups such as the Rushikulya Sea Turtle Protection Committee (RSTPC), Maa Ganga Devi Shanti Maitri Yuvak Sangha (MGDSMYS) as well as the Orissa Forest Department carried out monitoring of the nesting beaches during the previous seasons. The monitoring of the beaches for this project was carried out in collaboration with these groups.

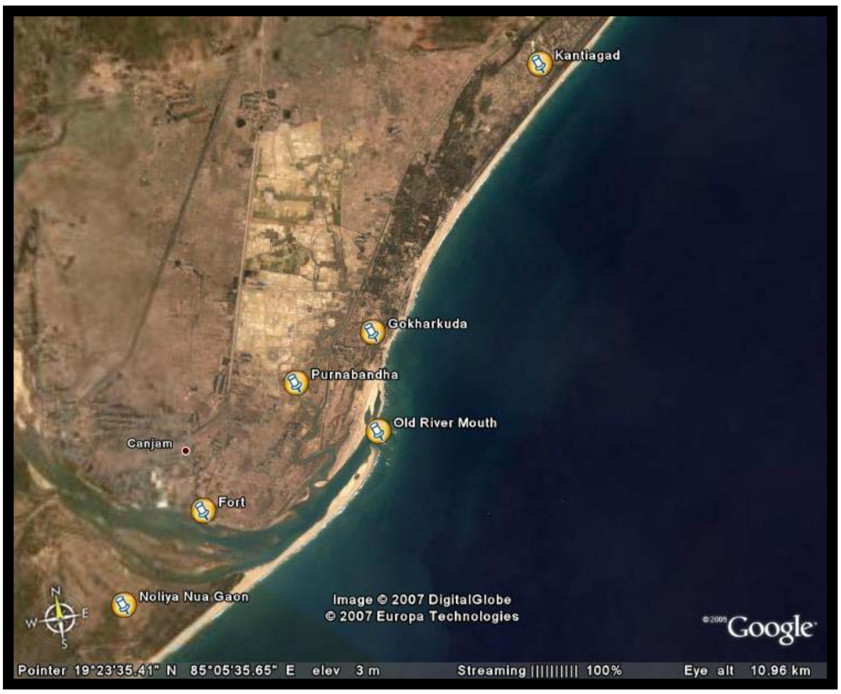
Study site

The nesting site is located near the mouth of Rushikulya River in Ganjam town along the southern Orissa coast. In previous years nesting used to occur on a 4.2km stretch from the river mouth until Kantiagad village (Tripathy, 2005). The topography of the area has changed in the past 2 years with a second river mouth being formed. This has created the formation of a sandbar in front of the old nesting beach, about 2.3 km in length. Nesting was thus expected to occur both on this new sandbar as well as the old nesting beach.

Diagram showing the Rushikulya nesting beach at present



Google Earth image showing the Rushikulya nesting beach in the year 2007



Description of the beach area

Natural beach vegetation consists of *Ipomea pescaprae* and *Spinifex littoreus*. The stretch from the new river mouth until Gokharkuda fishing village lacks *Casuarina* plantations, but *Casuarina* is in abundance from there on. The width of the old nesting beach varied from 25m to more than 300m at certain points.



Beach vegetation at Rushikulya, A. Sridhar

The sandbar lacked vegetation of any kind and had a varying beach width depending on the tide. Measurement of the sandbar showed that it was about 90 m wide at its widest point, roughly the centre.



Beach profile at Rushikulya, A. Sridhar

Nesting record at Rushikulya

Mass nesting of olive ridleys at this site was documented for the first time in March 1994 (Pandav, 2000b). Sporadic nesting of sea turtles at Rushikulya usually begins by January and continues till end of April every year. Only rough estimates are available for previous mass nesting events at Rushikulya for the 1990s (below). Tripathy estimated that 23,461 and 86,688 turtles nested during March, 2004 and March, 2005, respectively.

Olive ridley mass nesting at Rushikulya rookery from 1995 - 1998
(*Pandav. B., Rushikulya Sea Turtle Rookery –A Status Report*)

Year	Date of mass nesting	Estimated number
1995	20 - 21 March	50,000
1996	21 - 25 February	55,000
1997	01 - 03 February	35,000
1998	21 - 24 March	25,000

Methodology

a) Off-shore monitoring of mating congregation

This monitoring was carried out within an area ranging from Arjipalli, 3 – 4 km south of the Rushikulya River mouth, to Prayagi, 7 – 8 km north of the river mouth. 5 km long, 30m wide transects, perpendicular to the coast, were sampled from this area from November to February at different times of the day to get an idea of the temporal as well as spatial aspects of the congregation numbers.

Mating pair,, A. Kousik

Mating pair at Rushikulya , A. Kousik

b) Counting of solitary nesting at the Rushikulya site

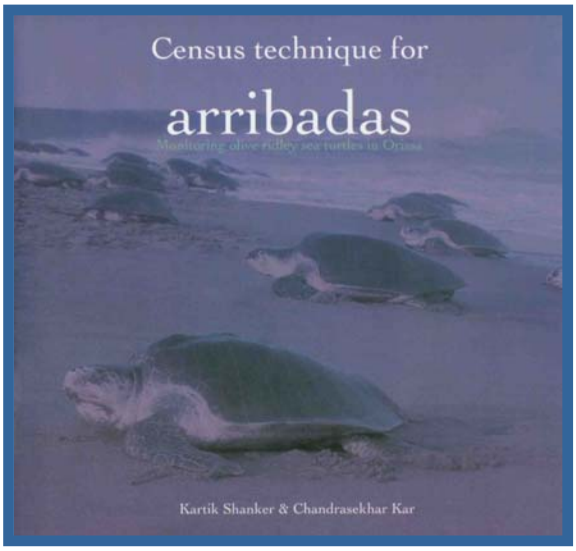
The local groups have been carrying on this count for previous seasons and help was sought from them for the 2006- 2007 season as well. Two individuals from the RSTPC were employed to visit the sandbar as well as the old nesting beach (from Purnabandha to Kantiagad) daily and count the number of nests as well as the number of false crawls. This was done from end November to mid-April. Sectors were physically marked out every 100m along the nesting beaches, and data was collected on spatial distribution of nests.

Field work at Rushikulya , A. Sridhar

Solitary nesting at Rushikulya, A. Kousik

c) Counting of arribada nesting at the Rushikulya site

Preparations were made for the counting of the mass nesting. With the help from the Forest Department, poles and sandbags were placed at 100m intervals to demarcate transects that were to be used as part of the Strip Transect Method proposed by Valverde and Gates (Valverde and Gates, 1999). Dr. Kartik Shanker and Dr. C.S.Kar, the Project Investigators produced a census technique manual.



The method detailed in the manual was that parallel transects would be established at 100 m intervals. Each transect would be surveyed each hour during the arribada, with a strip width of 2 m. Each transect is to be completed in about 10 minutes, allowing each person to cover about 5 transects. Only ovipositing turtles are to be counted within the strip area Counting is to be done from dusk till dawn as soon as it established that a mass nesting is taking place. Duration of the arribada is to be noted. The duration of oviposition should be counted for 20 nesting turtles.

The following formula provides an estimate of nesting during the arribada:

$$\text{Estimate of nesting} = \frac{\text{total available nesting area (m}^2\text{) x duration of arribada x sum total of egg laying turtles}}{\text{Width of transect x no. of sampling periods x sum of length of transects x avg. duration of oviposition}}$$

Results

a) Off-shore monitoring of mating congregation

There were no mating pairs or single turtles to be seen mid November, but from December the numbers gradually increased with a peak in end January of both pairs as well as single turtles, indicating that the actual peak was probably early January. In February, going out into the sea was difficult due to the rough seas. Looking at the data, it can be seen that the numbers are higher in the range from the river mouth till Gokharkuda waters and also from there to Kantiagad (See Table 1).

Table 1 Congregation Counts

Month		Date	No. of pairs	No. of singles
November 06	River mouth to Gokharkuda	10.12.06	0	0
	Gokharkuda to Kantiagad	10.12.06	0	0
	Kantiagad to Prayagi	11.12.06	0	0
	River mouth to Nolia Nuagaon	11.12.06	0	0
	Nolia Nuagaon to Arjipalli	12.12.06	0	0
December 06	Gokharkuda to Kantiagad	8.12.06	5	6
	Kantiagad to Prayagi	9.12.06	8	
	Gokharkuda to Nolia Nuagaon	10.12.06	3	4
	Arjipalli to Gokharkuda	11.12.06	1	4
January 07	River mouth to Gokharkuda	21.01.07	29	40
	Gokharkuda to Kantiagad	22.01.07	14	44
	Kantiagad to Prayagi	22.01.07	2	7
	River mouth to Nolia Nuagaon	23.01.07	2	3
	Nolia Nuagaon to Arjipalli	24.01.07	0	4
February 07	River mouth to Gokharkuda	6.02.07	6	11
	Gokharkuda to Kantiagad			
	Kantiagad to Prayagi			
	River mouth to Nolia Nuagaon			
	Nolia Nuagaon to Arjipalli	Sea turned choppy hence no data collection		

b) Counting of solitary nesting at the Rushikulya site

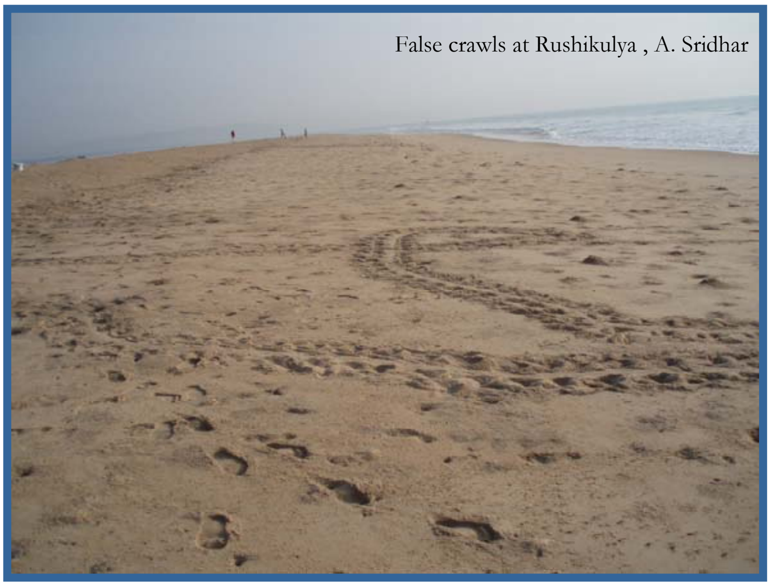
The pattern in nesting numbers across the season can be seen in the following graph. Peak nesting occurs in March with a drastic decrease in numbers in April. February also has a significant number of nests. A note was also made of the sectors in which nesting occurred every month. Sector numbering began from the river mouth side of the sandbar till its end (1-23), and the numbering was resumed on the old beach in the same pattern (23-65). Initially on the sandbar the turtles seemed to have preferred the riverward end (sectors 6-8), but as the season progressed they nested near the middle (16-18), probably because it was the widest area. On the old nesting beach they seem to have preferred the area between Gokharkuda and Kantiagad villages (sectors 38-57), probably because the fishermen do not bring ashore their boats in this area (See Table 2).

Table 2 Solitary Nesting Counts

Date	Nesting No.	False	Segment
Nov-06			
20th	1	Nil	6-1
25th	1	Nil	6-1
Dec-06			
9th	1	Nil	7-1
12th	1	Nil	6-1
18th	2	Nil	6-1, 7-1
20th	1	Nil	7-1
22nd	2	Nil	7-2
24th	1	Nil	6-1
Jan-07			
21st	1	Nil	Nil
22nd	1	Nil	Nil

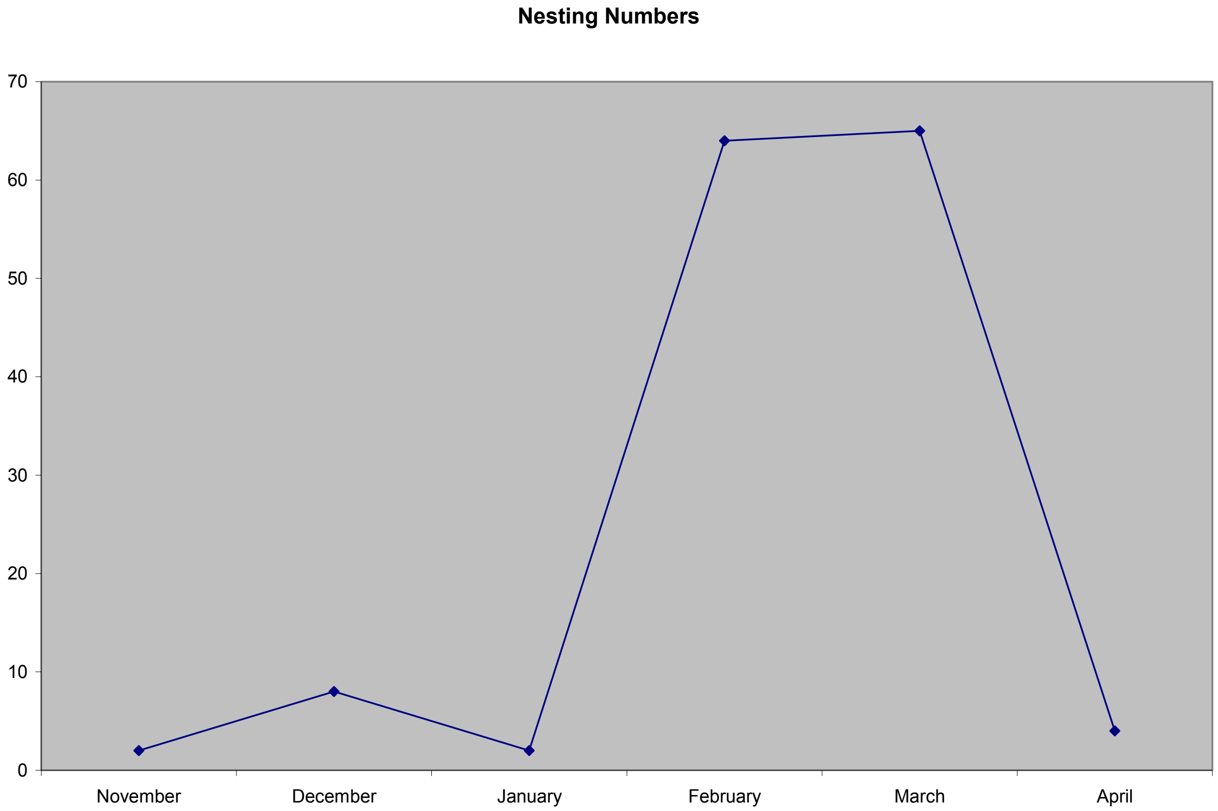
Date	Nesting No.	False	Segment
Feb-07			
5th	8	Nil	Nil
6th	16	Nil	Nil
7th	4	1	16-1, 17-1, 19-1, 19-1
8th	4	Nil	15-1, 16-1, 8-1, 3-1
9th	Nil	Nil	Nil
10th	3	Nil	16-3
11th	3	Nil	8-1, 15-1, 16-1
12th	6	2	4-1, 8-1, 16-1, 17-1, 45-1, 50-1
13th	4	1	16-1, 48-1, 50-1, 42-1
14th	2	2	6-1, 11-1
15th	1	2	43-1
16th	Nil	Nil	Nil
17th	Nil	Nil	Nil
18th	Nil	Nil	Nil
19th	Nil	Nil	Nil
20th	Nil	Nil	Nil
21st	Nil	Nil	Nil
22nd	Nil	Nil	Nil
23rd	2	1	23-1, 41-1
24th	1	Nil	46-1
25th	4	4	45-1, 38-1, 39-1, 40-1
26th	3	2	43-1,49-1, 46-1
27th	1	Nil	16-1
28th	2	Nil	37-1, 44-1

Date	Nesting No.	False	Segment
Mar-07			
1st	1	Nil	17-1
2nd	5	Nil	7-1, 14-1, 44-1, 45-1, 46-1
3rd	Nil	Nil	Nil
4th	Nil	Nil	Nil
5th	Nil	Nil	Nil
6th	Nil	Nil	Nil
7th	Nil	Nil	Nil
8th	1	Nil	54-1
9th	7	2	13-2, 17-1, 38-1, 48-1, 52-1,56-1
10th	10	6	14-1, 18-1, 41-1, 42-1, 43-1, 54-3, 55-1, 48-1
11th	2	1	54-1, 13-1
12th	2	1	53-1, 57-1
13th	2	2	47-1, 57-1
14th	1	Nil	54-1
15th	Nil	Nil	Nil
16th	4	Nil	13-1, 14-1, 16-1, 41-1
17th	Nil	Nil	Nil
18th	Nil	Nil	Nil
19th	Nil	Nil	Nil
20th	3	Nil	15-1, 47-1, 57-1
21st	2	Nil	46-1, 51-1, 55-1
22nd	3	3	46-1, 51-1, 55-1
23rd	7	2	46-1, 48-1, 14-1, 15-1, 16-1, 19-1, 20-1
24th	11	Nil	17-2, 18-2, 19-2, 14-1, 46-1, 48-1, 53-1, 51-1
25th	1	1	53-1
26th	Nil	Nil	Nil
27th	Nil	Nil	Nil
28th	Nil	Nil	Nil
29th	Nil	Nil	Nil
30th	1	Nil	Nil
31st	1	1	51-1


False crawls at Rushikulya , A. Sridhar

c) Counting of arribada nesting at the Rushikulya site

Unfortunately, mass nesting did not occur. However, the census manuals were distributed among the local groups as well as the Forest Department and it is hoped that the technique is used for the future seasons (See Appendix 3).



Conclusion

Though the main objective of monitoring mass nesting season could not be carried out, the data from the solitary nesting was indicative of possible future trends in nesting with respect to the change in the topography of the nesting area. The reasons for the non-occurrence of the mass nesting is unknown and can be due to many factors, including weather, increased activity due to proposed ports further along the coast, as well as fishing intensity. The local groups blamed the weather saying that there was no south wind, there was unexpected rain and that the temperatures rose very early in the summer. It is not possible to pinpoint any one cause for the failure of the arribada.

This is the first time that there was a collaborative effort in monitoring the nesting season involving the local groups as well as the Orissa Forest Department, and one hopes that future monitoring is carried out in the same manner. The Forest Department helped the researchers install marking poles used in the transect method. The local villagers and fishermen are quite curious and interested in the studies carried out. In future it maybe more advantageous to involve these local groups in similar projects despite the additional effort it takes, since the results are far better with their participation. Despite the fact that the arribada could not be censused, the preparation in terms of training local groups and personnel, establishing transects on the nesting beach, and interactions with the Forest Department, will be invaluable for future monitoring of the nesting beaches in Orissa.

Some critical aspects that need urgent attention are disturbance due to tourist activities during the nesting season, as so far there seems to be insufficient control over who can or cannot access the beach. Feral dog menace is another very important issue, since during the season there is very little one can do to control them digging up and eating eggs/hatchlings. The fishermen in this region are traditional fisherfolk using motorised craft as well as non-motorised crafts and a variety of nets. The turtle season is an important fishing season. The fisherfolk point that the trawlers from Puri or Andhra cause much of the mortality of turtles in this part of the coast. However, there are no rigorous studies to indicate the impacts of traditional fishing on sea turtles. Thus, future work in Rushikulya must incorporate participatory monitoring of sea turtle populations and addressing these conservation issues.

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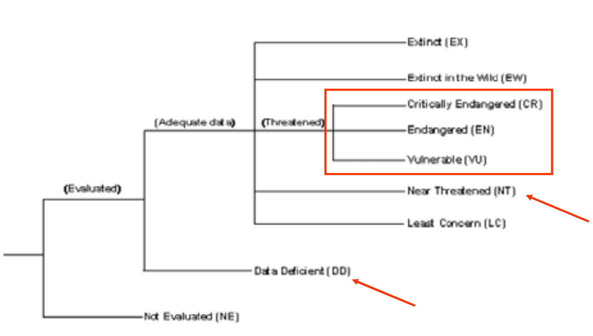
PowerPoint presentation summarizing data discussed during the MSTG meeting held in the Spring of 2007 to discuss the population status of the olive ridley.

issues, headaches, results

Purposes of Red List system

- to provide an explicit, objective (=quantitative) framework for the classification of the broadest range of species according to their extinction risk.
- however, while the Red List may focus attention on those taxa at the highest risk, *it is not the sole means of setting priorities for conservation measures for their protection*.
- although the system places species into the threatened categories with a high degree of consistency, the criteria do not take into account the life histories of every species. Hence, in certain individual cases, the risk of extinction may be under- or over-estimated.

Structure of the RL categories



Notice this guideline

2.4 Conservation priorities and actions

•The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and other biological characteristics.

•The Red List should therefore **not be interpreted as a means of priority setting**. ***The difference between measuring threats and assessing conservation priorities needs to be appreciated.***

•… It is important to emphasise here that a taxon **may require conservation action even if it is not listed as threatened, and that effectively conserved threatened taxa may, as their status improves over time, cease to qualify for listing.**

Decline criteria (Criteria A) = changes in the pop abundance

	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	> 90%	> 70%	> 50%
A2, A3 & A4	> 80%	> 50%	> 30%

A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased based on and specifying any of the following:

A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1

The process

General mandate that SGs ("Red List Authority") carry out RL assessments of their taxa

↓

Set up of assessors and, more recently Steering Committee

↓

IUCN Red List of Threatened Species (species, subspecies, or geographic subpopulations)

- Status assessments presented in the *Red List* are open to **challenge**.
- Any party may contact the Red List Programme Office (RLPO) to express disagreement with listing. If based on scientific or technical grounds, the RLPO will put this party in contact with the relevant Red List Authority with intention of resolving the disagreement without entering a formal petition process.
- Otherwise, undergo formal petition process

Elements of RL assessment

- Geographic range
- Generation length = Average age of parents
  - For the olive ridley mean age at sexual maturity used = 13 yrs (Zug et al., 2006) and estimate mean age of parents as 17-22 years. For simplicity used 20 years in assessment
- Estimates of past (3 generations ago) and current population sizes (number of mature adults)
- Estimates of population change (average, weighted by population sizes)
- Threats
- Conservation measures taken and required
- Red list assessment (e.g., VU, EN, NT, etc)

Issues & headaches for the LO assessment

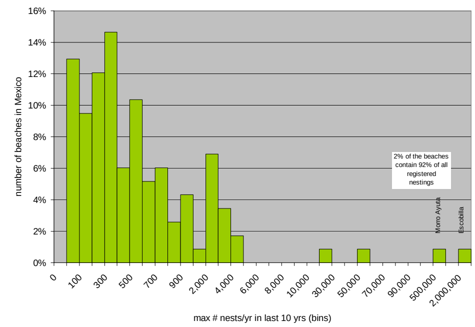
- Availability (rather the unavailability) of quantitative information
- Accuracy and uncertainty of information available (sometimes more than one method used for surveys)
- Representativity of index rookeries used in the assessment with respect to the global and regional populations. i.e. Biases in the site selection?
  - regions
  - abundances
  - protected & monitored vs. unprotected with no data

Critical discussions in the Steering Committee

1. Shouldn't we evaluate arribada and dispersed nesting rookeries independently and then combine (average) results?
   – Steering committee – *not possible for a Red List assessment, the groups would need to be subpopulations with no demographic or genetic exchange*

To get an idea of the problem…

Population size distribution of rookeries in Mexico (N=116)



Critical discussions in the Steering Committee (cont.)

2. A1 or A2 subcriteria?

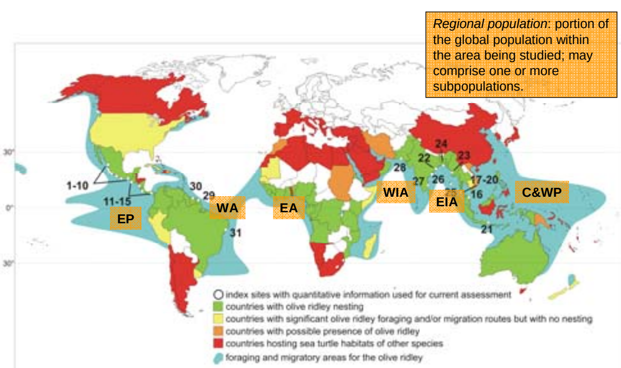
	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	> 90%	> 70%	> 50%
A2, A3 & A4	> 80%	> 50%	> 30%

A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased based on and specifying any of the following:

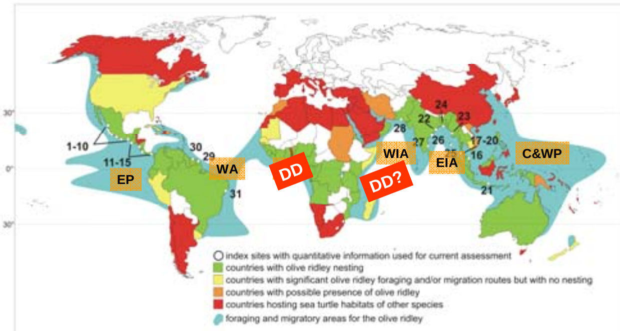
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, based on any of (a) to (e) under A1

- Steering Committee – A1 since reduction IS reversible and IS understood (overexploitation and international commerce) and HAS ceased FOR THE LARGEST POPULATIONS [WHICH ARE THE ONES DRIVING THE RESULT FOR THE ASSESSMENT]

Geographic distribution of the olive ridley and the index sites used for the analysis



Data deficient species? Regions?



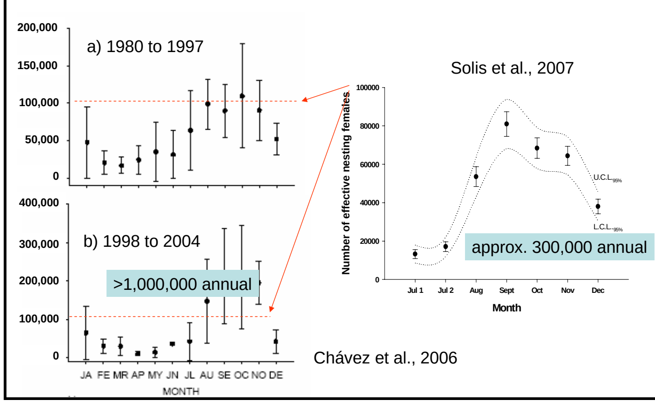
"Almost" final results by regions (1)

Region	Arribada or dispersed	N	Estimated pop decline
EA	D	0	DD
WIO	D	1	-80% to -96%
EIO	D	3	-83%
	A	1	0% (*)
W&CPO	D	5	-97%

"Almost" final results by regions (2)

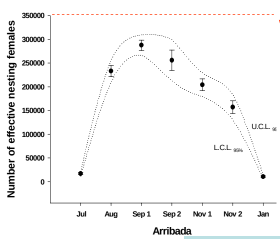
Region	Arribada or dispersed	N	Pop decline
EP	D	7	-63% to -74%
	A	8	-43% to -47% Ostional = +3260% Escobilla = +33 to +77%
WA	D	2	+324%
	A	1	-97% to -99%

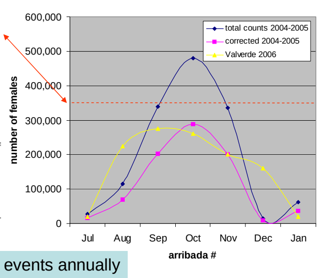
New Valverde method clears up and reduces recent estimations for Ostional!



For Escobilla.. little change through application of the new methodology?

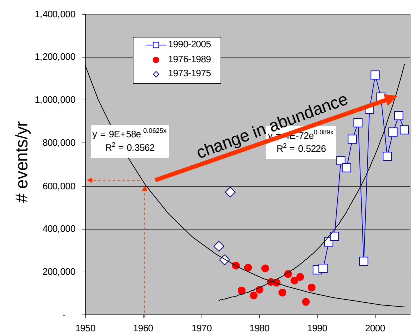
The Valverde data were taken from Roldan's presentation at this STS





"corrected" for Escobilla means multiplying by factor of about 0.7 which according to local biologists is the true proportion of females that actually lay a nest

Escobilla data and regressions



- still need to convert to # females / yr by dividing by nest frequency of 2.5
- take into account corrections for true nesting in counted females

"Almost" final results GLOBAL

	estimated population change
arribada	-40% to -44%
dispersed	-62% to -69%
OVERALL (weighted)	-41% to -45%
Red List Category = NT*	

Conclusions and recommendations

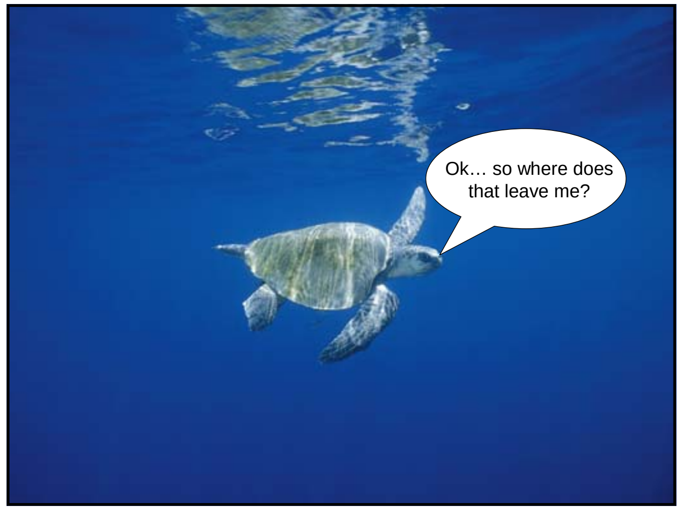
- Because of the way the Red List assessment is done (weighting by abundance) and since olive ridley rookeries are highly polarized with respect to population sizes, the results are driven by the largest (arribada) populations (which can be 3-5 orders of magnitude bigger!)
- The largest global rookeries (arribada) are doing well, BUT mask the outcome from smaller populations which undoubtedly continue to be threatened (EN or VU)
- Need an effective communication campaign to
  - underscore the true condition of smaller, still threatened rookeries which ARE in fact the most common!
  - make decision makers understand the purposes of RL and ONLY use it in combination with other considerations when drawing up management strategies
  - make public understand that species which come out of RL threatened categories remain CONSERVATION DEPENDENT
- Move forward with regional assessments!
- Know of rookeries missing from this assessment from where at least 15 yrs of nesting information is available?

From Roldan Valverde's presentation at the Symposium

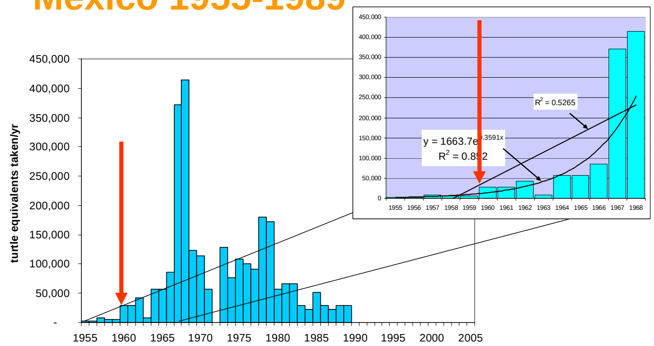
Can arribada beaches sustain themselves?
Hatching Rate (La Escobilla):
57 nests examined
3,657 total # eggs found
105 hatchlings

Beetle infestation:
32.9% of eggs destroyed by beetle (1,203 eggs)

Net hatching rate:
2.9%



Historical capture data for Mexico 1955-1989



Note: backward extrapolations for Mexican data only taken to 1960 to coincide with initiation of massive commercial exploitations that the fisheries statistics indicate