

Trip Report - IUCN Mission to Dhamra, India

Dec 10-17, 2007

The objectives of the recent mission to Bhubaneswar and Dhamra, in Orissa State, India, were to address the potential for impacts from dredging and to develop mitigation measures to minimise any interactions with marine turtles during this critical phase of construction. The Port intends to dredge some 60 million cubic meters of material, with about 5 million cubic meters of sand from a borrow area to build up the actual Port facility, and the balance being dredged to deepen the access channel, berthing area and turnaround point.

Following a careful search amongst sea turtles experts within the MTSG, Dena Dickerson (US Army Corps of Engineers) and Eric Hawk (NOAA/NMFS) volunteered to assist on the mission, having spent many years working on just these subjects. Phillip Bates (a design engineer with US Army Corps of Engineers also volunteered to participate but was held back over some paperwork issues). Dena has spent many years designing systems to minimise entrainments on dredging operations in the US, and Eric has spent a similar amount of time developing regulatory measures to guide mitigation efforts. Nicolas Pilcher, Co-Chair of the MTSG, who has been involved nearly since the inception of the Dhamra Port Company Limited (DPCL) – IUCN link-up first started, also participated on the mission.

The first half of the mission was spent in consultation with the Port and with the dredging firm's engineers, learning about detailed plans for the dredging (schedules, vessel design and specifications, locations of borrow and dump sites, etc) and coming up with a rough plan for mitigating impacts. Dena provided a very thorough history of ways in which turtle – dredger interactions have been minimised in the past (such as through the use of draghead deflectors), following 27 years of history working on these issues in the US and elsewhere around the globe. Eric provided an example of a very succinct mechanism for monitoring interaction levels (inflow screening, for instance) and regulating operations in such a manner as to minimise turtle entrainments (through the use of relocation trawling, as an example). During this phase of the mission the IUCN team and officers from DPCL also took the opportunity to meet with the Principal Secretary for Orissa State and also the Chief Wildlife Warden and the Senior Research Officer (Wildlife Department) to discuss the status of the port development, and to start building the foundations upon which lighting ordinances may be based in the future (another concern associated with the Port development).

Following the theory side of things in Bhubaneswar, the team travelled to the Port site at Dhamra and went offshore to inspect the dredgers themselves, looking at possible ways to install deflectors and inflow screens, and understanding the actual operation cycle of the dredgers to better understand what interventions might be best for turtles. During this at-sea phase, the dredging experts both agreed that the habitat in the channel area appeared unlikely to be a habitat where turtles spent significant amounts of time resting on the seabed (the only way they really interact with the hopper dredgers used on the project) - the seabed is composed of fine silts which form a soft cloud-like layer above the firmer sediment, which would be too soft for turtles to rest on. In support of this

opinion were the number of floating and stranded dead turtles which were likely the result of fishery-induced mortality, rather than any of the ongoing dredging works, given the fact that the carcasses were whole and not damaged by any mechanised dredger equipment. The real concern then was the potential for turtle-dredger interactions at the sand borrow area, which lies about 5-10 km north of the wildlife sanctuary's northern marine boundary. It is at this site that turtles are more likely to be entrained during dredging operations, given the nature of the substrate and the proximity to the wildlife sanctuary. Based on this, the IUCN team recommended installation of inflow screens and an observer programme to detect any such entrainments, relocation trawling efforts to reduce the number of turtles in the vicinity of the dredger, installation of deflectors on any new vessels arriving to assist with the works, and retroactive fitting on vessels in the area already which are found to entrain turtles.

Protocols for each of these activities were developed by the IUCN team for DPCL, based on existing protocols in use elsewhere in the world (see Annexes to this report summary). In brief however, protocols developed for DPCL were based on those developed for ports in Baltimore and Ocean City MD, Charleston and Georgetown SC, Galveston and Freeport TX, Miami, Tampa, Cape Canaveral FL, Brisbane, Queensland, Australia, and many, many other projects which require upfront and maintenance dredging throughout the world. The team also designed the terms of reference for observers on both the dredgers and the relocation trawlers, and drafted a series of minimum requirements for the observer team.

It is now the responsibility of DPCL to apply for permits from the Orissa State Government and from the Ministry of Environment to conduct relocation trawling exercises, and other related research which would be associated with this (tagging, measuring, DNA sampling, etc.), based on the protocols contained herein, and to engage with a fleet of trawlers which would be able to conduct the work safely and efficiently.

In the interim, there is no reason the Port should not require inflow screening to be installed immediately on any vessels dredging in the sand borrow area, and establish and implement an observer programme for the dredgers themselves. Should entrainments be detected in the vessel currently on site (Ylaanderer XX), it is recommended this vessel be equipped immediately with a deflector. This can be done through collaborative dialogue amongst the USACE engineers and the engineers from International Seaport Dredging, and will likely require several days of downtime while the vessel travels to Paradeep port for refitting. It is recommended any future vessels intended for use at the sand borrow areas be installed with deflectors at their home port and prior to arriving on site.

Overall the mission was a success, and the positive commitments made by DPCL suggest impacts to turtles through the dredging operations can be minimised. The IUCN team will continue to work with the DPCL officers to ensure the observer programmes are up and running efficiently in the near future, and to assist the dredging firm with design specifications for deflectors and inflow screens. The outcome documents for the mission are appended herein.

ANNEX I: DPCL MARINE TURTLE CONSERVATION PROJECT

Protocols for Dredging Observer Watch Procedures

These protocols complement the general DPCL Marine Turtle Conservation Project observer programme protocols, but are aimed specifically at dredging operations. During each observer watch, primary duties will be to observe all draghead, inflow, and overflow screens whenever available but not less than once each time the hopper is completely unloaded. The vessel will be required to have 100% screening of all inflow. This is to be done by placing screening baskets with a 10-cm mesh at the point where the intake pipe discharges into the hopper, but the screens may be located elsewhere.

Observer Duties and Requirements

- The observer should report to the Captain of the vessel upon boarding;
- The observer should liaise with the dredging Superintendent to coordinate monitoring activities;
- During dredging operations, the observer should remain on the bridge and monitor for at-sea turtles and other key sightings;
- At the conclusion of each loading cycle, the observer should inspect each of the screen baskets for turtles or parts thereof;
- The observer will be required to don a work vest and safety harness before opening the top gate of the screening basket, then climb into the basket to inspect it for any sea turtle body parts;
- If the screens are clogged with seaweed, rocks or debris, the observer is expected to clean the screens at that time in order to keep them functioning properly. Also, if the screens have been damaged in any way, the observer should report this immediately to the Captain or Superintendent so that the repairs can be completed before the next loading cycle;
- The draghead should be checked after every load as well to ensure that marine turtles have not been entrained there;
- Dead turtles or turtle parts found in the screens should be identified, measured and photographed;
- A Sea Turtle Incidental Take Data Form should be completed and should include comments as to the estimated freshness of the kill in order to provide information to those who must later decide if the taking was or was not apparently due to the dredging activity. It is extremely important that the observer be completely objective in estimating the freshness of the take and not be influenced in any way by the opinions or statements of others on board, including the other (off-duty) observer. Obviously, the information being provided by the observer will be used by DPCL/IUCN personnel off the dredge to make a decision as to whether the taking will be attributed to the action of the dredge or not;
- If the taking is a fresh kill, it will normally be counted against the total turtle take allowance set in advance by DPCL/IUCN. In spite of this, observers must not

allow themselves to feel pressured in any way or influenced by any input at all other than their own objective, scientific observation;

- Occasionally the observer may recover incomplete viscera, small carapace fragments, or other body parts from the dredge screens that are suspected to be from a sea turtle, but are too incomplete to be identified in the field with normal taxonomic keys. The NOAA document [*Anatomy of Sea Turtles*](#) may be used as a reference for an educated guess.
- After recording each lethal taking, or the capture of a live turtle, the observer must notify the DPCL Manager (Environment) within 8 hours by radio, telephone, fax or email;
- Whether sea turtles or sea turtle parts are found in the screens or not, the observer will fill out a Load Data Form for each load dredged. It is important that the observer list all species being deposited on the screens. The number of specimens of each species should be included, even if only estimated, where possible;
- When not checking screens or completing reports, the observer will remain on the bridge of the vessel to record any in-the-water sightings of sea turtles. Occasional visits to the drag tender's station should also be made to observe draghead operations;
- At the end of each day, a Daily Report form must be completed which will summarize the events of the day, characterize the material being dredged and list the biological specimens being deposited on the screens. A Bridge Watch Summary Form will also be completed and included;
- The Daily Report forms and Weekly Summary forms, with copies of any Sea Turtle Incidental Take Data Form(s), should be submitted to the DPCL Manager (Environment) on a weekly basis. The observer will maintain a copy for his/her files.
- A Sea Turtle Incidental Take Data Form form should be completed by the Observer with all available information on the remains, including the address and telephone number of the receiving laboratory.

Protocol for Turtle Takes During Dredging Operations

In extremely rare cases, a turtle may survive entrainment and may be recovered alive on the inflow screens. Whether injured or not, the turtle should be photographed, weighed, and measured, and released at least three (3) nautical miles from dredging operations, or at the offshore load dump site. The observer will be authorized to dispose of dead turtles or turtle body parts at sea. This should be done in the dredge disposal area, and not in the area being dredged.

The following actions are taken in the event the dredge takes a turtle:

- Remove any turtle parts from the discharge box;
- Identify species (if identity cannot be determined, list as "unknown");
- Take appropriate measurements and record;
- Complete a Sea Turtle Incidental Take Data Form;

- Photograph parts individually (use label stating species, name of piece, dredge name, project area and load number);
- Any tags on these turtles should be recovered prior to disposal and tag numbers noted on the Sea Turtle Incidental Take Data Form.
- Weigh body parts, spray paint the carapace with an X, and dispose of at the dump site;
- Fax incident report and load sheet to the DPCL/IUCN office.
- If a live turtle is encountered, move the turtle to a safe and shaded area on the deck;
- Partially cover the turtle with a wet towel. Cushion or secure the turtle so it is not further injured by activities on deck or vessel rolling (laying it on its back on a tire may be appropriate);
- Notify the Captain;
- Keep skin moist;
- Photographs will be taken of each turtle captured. Each photo will be accompanied by a 4- x 6-inch (10- x 15-cm) card with tag numbers, date and location written in black letters.
- Data will be entered on standard data sheets.
- Remain with the turtle until transported to release site.
- Other photos should be taken of injured turtles, unusual bycatch and any item of technical interest.

ANNEX II- DPCL MARINE TURTLE CONSERVATION PROJECT

Guidelines for Endangered Species Observers

Dhamra Port Company Limited (DPCL) seeks endangered species observers who can function on dredges (e.g., hopper dredges) and dredge disposal (e.g., tugboat) operations off the Dhamra coast. The following criteria should serve as a guideline for sea turtle observers. Approved sea turtle observers should have a variety of experiences, enabling them to perform the required duties with necessary skill and familiarity. Each observer is evaluated on a case-by-case basis, but the following criteria will assist in determining qualified candidates. Supporting information and documentation on these criteria should be included with the candidate's application.

Education & Experience

- Please note that a degree is preferred, but not required if the candidates have a diversity of suitable experiences.
- The candidates will be evaluated in terms of their experience aboard vessels, including but not limited to the criteria listed below.
- Has the candidate worked for a minimum of two months in any capacity aboard fishing/shipping vessels?
- Has the candidate worked in any capacity with wildlife conservation?
- Does the candidate have documented field experience focused on the species or its habitat?

Skill sets to be Provided

The successful observer candidate should possess certain skills in order to effectively perform the observer duties.

- Is the candidate able to identify sea turtle species, including morphological differences?
- Is the candidate able to handle live sea turtles and is he/she knowledgeable of holding and release procedures for the respective species?
- Is the candidate able to take standard field measurements of samples for sea turtles?

ANNEX III - DPCL MARINE TURTLE CONSERVATION PROJECT

Relocation Trawling Scope of Work

Introduction

The following scope of work is to remove sea turtles from the area being dredged to minimise turtle interactions with the dredgers, and for assessment of the relative abundance of sea turtles in entrance channels and borrow sites which are being dredged by hopper dredges. Sea turtles will be captured by trawling, which will provide supplementary information on the times of occurrence and general location of turtles in these channels. Species, size, sex, and general condition will be recorded for captured turtles.

Objectives

To safely remove and relocate turtles from the immediate vicinity of dredging operations and determine relative abundance of sea turtles in the area of concern during dredging operations.

Trawling Specifications

- Trawling will be conducted to capture turtles for removal and to determine relative abundance in the dredging zones.
- Trawlers will be hired from the fleet based at Dhamra fishing jetty and crews will be trained by the DPCL Manager (Environment) and made aware of the purpose of the work.
- Operations and survey methods and equipment will be standardized as much as possible including data sheets, nets, trawling speed and direction (with or against tidal current), duration of tow (minutes), and length of tow (km).
- Trawling will be conducted with repetitive 30-minute (maximum total time) tows in the areas of concern in front of dredging vessels.
- Data sheets will be provided by DPCL/IUCN
- Nets to be used will be the standard trawl turtle nets used in the region, to be upgraded to 8-in mesh in the future.
- Trawling speed will be at a constant rate and consistent for each tow (approximately 2.5-3.0 knots).
- Trawling will be conducted in such a manner as to maximize the opening width (i.e., spread) of the net but also to maximize trawl coverage in the path of the dredge. This shall be decided in consultation with the boat captain and consistent with vessel/personnel safety concerns.
- Trawlers will operate in close radio communication with the dredger to maximise safety and operational efficiency.

- Tow times will be capped at 30 minutes (“trawl doors in the water, trawl doors out of the water”) so as not to drown the turtles. Tow times will be measured precisely, starting when the trawl doors are first submerged below the water surface at the beginning of a set, and ending when the trawl doors first reach/regain the surface at the end of a set.
- Trawls will be conducted, as much as safely possible, in front of the dredger, and to the extent possible following the trackline that the dredger will follow.
- Positions at the beginning and end of each tow will be determined from GPS positioning equipment.
- Tow speed will be taken at the approximate mid-point of each tow.

Net Specifications

- The trawlers will be fitted with one 40-foot trawling net constructed from 2- to 8-inch mesh (stretch) as specified in the attached description. The nets will be fitted with mud rollers / weights and floats as specified.

Turtle Handling and Measurements

- All turtles that are caught will be identified, measured, tagged and released back into the channel at some 3-5 nm from the point of capture.
- Turtles will be returned to the water as soon as possible after capture.
- Measurements will be taken according to the protocol detailed in the IUCN/MTSG Technical Manual #4. At a minimum, curved carapace length, tail length, and weight should be taken.
- Turtles will be tagged with Stockbrands Pty Ltd tags in each of the front flippers according to IUCN MTSG protocol.
- Aseptic conditions will be maintained for tag attachment and tags.
- Data on turtles will be entered in a standard data sheet in a format provided by IUCN/DPCL.
- Photographs will be taken of each turtle captured. Included in the photograph will be a 4 in x 6 in card with the tag numbers, date, and location written in large black letters.
- Additional photographs will be taken of methods, injured turtles, unusual bycatch, or other items of technical interest.
- All photos will be provided to IUCN/DCPL.
- Comatose turtles will be maintained on board and revived where possible following standard turtle handling practices (maintained in a rear-up position, kept damp and cool, allowed to recover and drain water from lungs).
- NOTE: CAUTION SHOULD BE TAKEN WHEN OPENING THE COD BAGS TO RELEASE TURTLES UNHARMED.

Sample Periods

- Trawl surveys will be conducted in front of dredgers (or as near the dredge as safely possible) during all dredging operations on a continuous (24 hour) basis.
- It is recommended that two trawlers be contracted to operate on a 12-hour shift followed by another two trawlers to operate the second 12-hour shift, to match the 24 hour operations of the dredgers.
- Trawl operations, if possible following the projected dredger path, should continue even when dredgers leave the area to dump the dredged sediment load.

Permits

- Permits for handling threatened and endangered species and for collecting other organisms will be obtained from the appropriate Indian Government and Orissa State agencies.

ANNEX IV - DPCL MARINE TURTLE CONSERVATION PROJECT

General Observer Guidelines and Responsibilities

When stepping onto a vessel for one day, one week, or one month, be it on a sea turtle assessment or relocation trawling vessel, or a dredger, you the observer are entering a workplace and a home. It is a place where the crewmen have already established a system of communication and responsibilities. An individual observer's ability to deal with the situation is a reflection of the person's flexibility and resilience. The environment can be lonely, unwelcoming, cramped, and sometimes hostile. Your sleeping and eating habits will definitely be disrupted. The quality of your working relationship with the crew can be more important to the overall nature of the trip than the nature of the vessel itself. A good working relationship with the crew makes a good trip. A good working relationship on a good boat makes a great trip! An observer's job has two important phases. The first is the initial collection of the data at sea. The second is processing and verifying the data on land. At the end of a trip, you'll begin the debriefing phase with the DPCL Manager (Environment). With SAFETY and INTEGRITY as the watchwords of your job, it is of primary importance that you conscientiously follow the guidelines outlined below:

- It is your responsibility to observe and accurately record biological research data as instructed.
- Everything you record is available to the vessel operator or his designate and is subject to legal interpretation. Almost everything you record may be made available as public information.
- You are not to record extemporaneous comments or personal opinions. It is not your job to evaluate or interpret data; simply record your observations on the data forms that you are issued.
- It is your responsibility to maintain open communication with the vessel captain/operator and other vessel personnel to facilitate a clear understanding as to what data are being collected.
- It is your responsibility to advise the vessel operator of all data items recorded. If he or she is in disagreement with you, allow operators to record their own views on the original data forms. If they choose, the vessel operators may record their own comments on these forms.
- You are hired to be an observer, *not* an enforcement agent. You are not empowered to write citations, make arrests, or carry out enforcement activities. Your responsibilities require you to make observations and collect data, some of which pertain to Orissa State regulations.
- Your responsibility of observing and recording data is to be performed in such a manner as to minimize interference with relocation trawling / dredging operations. Likewise, the vessel operator and any other vessel personnel are not to interfere with your duties.

Responsibilities

- Sea-assignment readiness is determined by personal fitness, training preparation, and staff assessments. Alcohol dependency and other illicit drug use are incompatible with observer duties and are not tolerated. If detected, disciplinary action will be initiated.
- Unless previously approved in advance by the DPCL Manager (Environment), personal research is prohibited aboard vessel assignments. The DPCL Manager (Environment) shall review/coordinate/authorize any piggy-back research requests from outside individuals / research institutions / universities / agencies, etc.
- Retaining specimens (especially “edible” seafood) of any kind for any personal reason is prohibited. Edible catch may or may not be retained by the crew, subject State of Orissa trawl research permit guidelines. It may be that all incidental catch has to be returned to the sea, or it may be that the State will allow the vessel to retain all or a portion of its catch. The observer shall not share in this catch.
- Intentionally entering the water from an assigned vessel is prohibited; such activity will compromise personal safety and data collection duties.
- Observers do not choose vessel assignments; however, observers have the right to refuse deployment on a vessel they perceive as unsafe. The DPCL Manager (Environment) selects sea assignments through a predetermined sampling plan.
- Relocation / assessment trawling and dredging activities dictate vessel departures and arrivals. Since vessel notification requirements may limit response time, observers should be prepared for sudden sea assignments of extended and uncertain duration.
- An observer’s vessel assignment (trip) continues until the vessel returns to port or his/her shift is concluded and a return transfer craft is available.
- Never leave your assigned vessel prematurely without approval from the DPCL Manager (Environment), or acting designate; to do so is grounds for dismissal.
- Safeguard the return of your data to the port field station. Your work is a valuable investment; treat it like your wallet. Data loss **may be grounds for dismissal**.

Data Collection Priorities

As an observer in the IUCN/DPCL turtle conservation project, your primary duty is to obtain reliable information about sea turtle interactions. All sea turtle data and sample collection has higher priority than any other data. In instances where there is a sea turtle interaction collect all data and samples and just make a note if you are not able to collect lower priority data such as temperature and water depth. Keep in mind that while you are collecting sea turtle data and samples you still need to be aware of ongoing operations so additional sea turtles are not missed.

Data Collection Instructions

If the information requested on a data collection form is not available or not applicable, leave the data field or code box blank. Describe the situation in the Comments section of the form.

1. Use a soft (#2) pencil on all forms. Line out any errors, and write the correct data above the struck item. DO NOT try to make any changes over a number that is already recorded.
2. Print legibly.
3. Observe and accurately record descriptive and quantitative data with explicit notes and explanations. Record data as events occur, trust nothing to memory.
4. Record times as four digits using the 24-hour clock format, for example, 5:30 P.M. is written as 1730, and 5:30 A.M. is written 0530.
5. Sea turtles are top priority. Never allow collection of secondary data to interfere with the collection of sea turtle data.
6. If data are not available in the proper units, write the measurement and units in the margin or Comments section for later conversion: for example, meters from feet.
7. If additional space is required on a data form, continue data entries on additional forms.
8. Include all pertinent facts when writing notes or narrative explanations. Remember that people who were not present will read about the event(s) you are describing. Don't assume that the readers will automatically know what you are describing if you did not write it down.

Sea Turtle Handling and Data Collection

If a sea turtle is caught incidentally there are specific protocols that must be followed when handling it. These protocols and guidelines have been developed to reduce the risk of further injury to the turtle and to the people handling the animal. When a turtle is caught, work with the crew to get the turtle on the deck safely. Once a sea turtle has been safely brought onboard, your job is to collect samples, photographs, measurements, apply tags to turtles being released or retrieve tag information from previously tagged turtles, and draw a sketch. All information is to be documented on the appropriate form. Incidentally-caught sea turtles need to be reported to the DPCL Manager (Environment) as soon as possible.

Care and Release of the Turtle

During relocation / assessment trawling turtles will usually be brought on board alive and fit. Occasionally during dredging turtles will be brought on board alive, in varying health states. Any and all turtles that appear dead or comatose (unconscious) should be brought on board to attempt to revive the animal when practical. The following resuscitation techniques should be implemented:

1. Place the turtle on its bottom shell (plastron) so that the turtle is right side up and elevate its hind quarters at least 15 cm for a period of 4 to 24 hours. The amount

of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. This is easily accomplished by placing the rear of a turtle on a tyre. Periodically, rock the turtle gently left to right and right to left by holding the outer edges of the shell (carapace) and lifting one side about three 10 cm, then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.



2. Sea turtles being resuscitated must be shaded and kept damp or moist, but under no circumstances be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method of keeping a turtle moist, but do not cover its nostrils.



3. Sea turtles that revive and become active must be released from the area of the boat that is closest to the water only when fishing or scientific collection gear is not in use, when the engine gears are in a neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be disposed of at the dump site, after marking with spray paint.

Data Collection

Photographs that need to be taken for turtles brought on board include dorsal, ventral and frontal views. Data collected on turtles will be used to determine the number, species, size, and condition of sea turtles involved in the dredging operations in the areas of concern. Other data are recorded on the movements and preferred habitats of the various populations of sea turtles. The following data are critical to the development of conservation and recovery strategies for these marine reptiles:

1. Photographs and a sketch
2. Applied or existing flipper tag numbers
3. Identifying characteristics described
4. Measurements for landed turtles
5. Skin biopsies from all turtles
6. Position and time of capture and release (for live turtles)
7. Detailed description of how turtle was landed and handled on deck

Measuring Turtles and Applying Metal Flipper Tags

Turtles are measured following the descriptions by Limpus et al. (1983b). Measurements are to be taken with a fiberglass tape measure (± 0.1 mm) of the Curved Carapace Length (CCL). Curved Carapace Length (CCL) – measured over the curve of the carapace along the midline from the anterior point at the midline of the nuchal scute to the posterior tip of the surpacaudal scutes See figures 1-3).



Fig 1. Measuring curved carapace length with a fibreglass tape.



Fig. 2: Exact positioning of tape at edge of nuchal scute behind the head.



Fig. 3. Exact position of tape at midline inside the notch at the rear of the carapace.

Adult turtles are also to be weighed with a spring balance (± 0.5 kg; Fig 4).



Fig. 4: An example of weighing a turtle safely without damaging the flippers.

Turtles are then to be tagged in the axillary position of both front flippers with titanium tags bearing a return address and contact numbers. Turtles are tagged so that they may be identified upon subsequent recaptures or as strandings. All turtles should be checked for presence of previous tags or signs of tag loss prior to placing new tags, and notes should be kept on signs of old tags. Old tags should be replaced when they appeared heavily corroded and could be easily lost, and all previous tag numbers are to be recorded to maintain a long-term history of the turtle. Turtles that show signs of having been tagged previously but which have lost their tags should be recorded as such, as this provides information on the rate of tag loss. New turtles are to be tagged on the proximal trailing edge of each front flipper to reduce the chances of abrasion, entanglement and tag dislocation. All turtles should be checked to ensure the tag was securely attached, and that the sharp point of the tag had looped through the receiving hole and curved into a locking position. A 0.5 cm gap should be left between the trailing edge of the flipper and the rear edge of the tag to allow for growth in the coming years. All tags shall be cleaned (to remove oil residue) and disinfected before being used. First, wash the tag with soap and rinse thoroughly. Next, rinse the tag with disinfectant. Applicators must be cleaned (and disinfected when appropriate) between animals.

1. Remove a tag from the strip and record its alphanumeric number. Be careful not to bend the tag from its original shape.
2. With the piercing side of the tag up, place your index finger tip inside the bend of the tag. The piercing side of the tag has the numbers stamped into it. (Figs. 5 and 6).
3. Hold the tag applicator pliers in the other hand, making sure the handle with the paint mark (or label) is up. Using your index finger, pull the tag straight back into the open jaws of the applicator pliers. A firm pull will be needed to completely seat the tag into its correct position. Take care not to squeeze the applicator handles before you are ready to apply the tag. If the handles are squeezed partway and then released the bent tag will fall out and will not function properly (Figure 7).
4. Locate the correct site where the tag will be applied on the trailing edge (rear) of the front flipper. Ask for assistance holding the turtle still. Make sure to position the tag so there is some overhang after it is attached to the flipper (Figs. 8 and 9).
5. Apply the tag by squeezing the applicator handles firmly. The tag point will pierce the flipper and lock into place through the other tag end. The piercing tip must be bent over completely to lock the tag (Fig. 10). The handles of the applicator must be squeezed together very firmly at the final point in order to fully bend the point down.
6. Repeat the procedure in the same place on the other front flipper. All turtles should be double tagged. Try to use consecutive numbers on the same turtle whenever possible. If a tag is ruined, record the number of the ruined tag, and use another tag. If the recommended tagging site cannot be used, find another site on the rear edge of the front flipper.
8. For each tag applied fill out all the tag information on the data sheet and describe any difficulties encountered while trying to apply the tags.



Figure 5: Holding a flipper tag in correct orientation to load into applicator. Note that the number side of the tag is up.



Figure 6: Loading a flipper tag into tag applicator. The arrow indicates which handle should be up.



Figure 7: A fully seated tag in the tag applicator pliers.



Figure 8: Arrow indicating the preferred location for flipper tag replacement. The next preferred location is between the two large scales to the right of the arrow.



Figure 9: Applying flipper tag to a front flipper of a green sea turtle. Note the slight gap between angle of tag and edge of flipper.



Figure 10: A properly applied flipper tag.

Collecting Sea Turtle Skin Biopsies

1. Turtles are always to be protected from temperature extremes of heat, and kept moist during sampling. Place the turtle on soft pad for cushioning. The area surrounding the turtle should be clear of materials that could be accidentally ingested.
2. Stabilize the turtle by turning it over and holding it still in a supine position (face-up). If available, a second person should provide assistance.
3. Using a disposable alcohol/betadine swab, clean the skin region between the plastron and the base of the hind flippers (inguinal region). The skin in this area (ventral side at the base of the hind flippers) is normally soft and smooth and devoid of hard or enlarged keratinized scales and is the preferred area to biopsy. However, if for some reason it is not possible to sample this region, skin in the ventral pectoral area, at the base of the front flippers, may be used.
4. Carefully remove a new biopsy punch from its sealed wrapper. Exercise care in handling as the circular cutting end of this instrument is very sharp. Use caution by holding the cutting edge away from you and other persons at all times.
5. Hold the plastic handle of the biopsy punch (this is the hand-held biopsy punch) using your thumb and index finger. Place the circular cutting end on the cleaned smooth skin at the base of a hind or front flipper and rotate the punch while pressing down with moderate force (Fig. 11). A circular cut will rapidly be made through the skin. Continue to rotate and press down to about 5 mm depth, or until the blade reaches maximum penetration. For samples taken from small turtles (< 25-35 cm carapace length), cutting to a depth of only 2-3 mm, or about half the length of the steel blade, will be sufficient.
6. Withdraw the biopsy punch (this is the handheld biopsy punch) from the skin by lifting it straight out. Use clean forceps to grasp and remove the thin circular plug of skin resulting from the cut made with the biopsy punch. The plug of skin may momentarily adhere to the underlying tissue, but will easily detach when lifted away.
7. Immediately place the plug of skin in a designated container containing purified buffered salt (NaCl) solution (Fig. 12). Shake the container for several seconds after placing the skin sample inside, to make sure the sample is covered by the

salt. Using another disposable alcohol/betadine swab, clean around and inside the region of the turtle where the skin plug was taken.

8. Label the container with the specimen number, date, the turtle's flipper tag number, and /or any other unique identifying information available for the turtle. Samples shall be safeguarded until submittal to the DPCL Manager (Environment) for archiving/processing.



Fig. 11. Collecting a biopsy punch sample.



Fig. 12: Placing biopsy punch sample in storage vial.

Annex V- SEA TURTLE INSPECTION CHECKLIST FOR HOPPER DREDGES

1. Read protocols outlined and provided by IUCN specialists and/or all applicable permits to determine the contract or permit requirements for the protection of endangered sea turtles.
2. Read the specified documents.
3. Develop a list of inspection requirements:
 - a. Deflector leading edge angle (90 degrees or less).
 - b. Approach angle or leading edge plowing depth (6 inches or more).
 - c. Aft rigid attachment of deflector to the draghead (hinged or trunnion).
 - d. Forward deflector attachment point (adjustable pinned or cable/chain with stop).
 - e. Opening between drag head and deflector (4 in × 4 in max).
 - f. Is screening of dredged material required?
 - g. Are inflow screens or overflow screens or both required?
 - h. Are inflow basket screen openings 4 in × 4 in max and is 100% of the dredged material being screened.
 - i. Lighting of inflow and overflow screens and proper access for cleaning.
 - j. Structural design of deflector (per approved deflector submittal).
 - k. Dredge operational requirements (starting /stopping dredge pump, draghead plugging, razing draghead, turning the dredge).
 - l. Is dredging data recording, on-board recording instruments, (drag elevation, slurry density and velocity) required by specs or permit? If so is it being collected or is Silent Inspector turned on and is data being submitted?
 - m. Is turtle trawling required? If so is it being performed?
 - n. Turtle observer requirements (12 or 24 hours req.)
 - o. Assure a copy of the approved turtle deflector submittal is on board the vessel.
 - p. Ensure a copy of the contract plans and specs or any permits are on board the vessel.
4. Review turtle deflector submittal (do not allow dredging to start until submittal is approved):
 - a. Structural soundness
 - b. Deflector leading edge angle (90 degrees or less).
 - c. Is the approach angles submitted for this project dredging depths.
 - d. 4 in × 4 in opening between deflector and draghead.
 - e. Aft rigid deflector attachment to draghead (hinged or trunnion).
 - f. Forward deflector attachment point (adjustable pinned or cable/chain with stop).
5. Ensure the Contract Quality Control (CQC) performs a pre-dredging inspection:
 - a. CQC is required to review and inspect all items in paragraph 3.

6. Ensure the CQC performs a startup-dredging inspection:
 - a. CQC is required to check the turtle deflector to see if the deflector is installed and adjusted for required dredge depth of this project in accordance with the approved deflector submittal.
 - b. CQC is required to assure the drag tenders are operating the dredge pump and draghead in accordance with the specs/permit.
 - c. CQC should perform a paint test to assure the deflector is plowing at least 6 in into the dredge material while the dragtender is consistently maintaining the (approved, submitted) approach angle to a tolerance of + 0 to – 4 degrees.
 - d. CQC should note the inspection results in his QC Daily Report.
7. QA should perform dredging operation inspection soon after the dredge starts dredging:
 - a. Review and inspect all items in paragraph 3.
 - b. Inspect the turtle deflector to assure the deflector is installed and adjusted for the required dredge depth of this project in accordance with the approved deflector submittal.
 - c. Require the contractor to perform paint test to ensure the deflector is plowing at least 6 in into the dredge material while the dragtender is consistently maintaining the (approved, submitted) approach angle to a tolerance of + 0 to – 4 degrees (over penetration of the deflector could reduce production and may increase fuel consumption of the dredge but is allowed).
 - d. Ride the dredge through at least one dredging cycle (dredging, to the dump, and back to the dredge site).
 - e. Watch the dragtender to ensure he is operating the dredging equipment in accordance with the plans and specs:
 - i. Starting the dredge pump only when the draghead is firmly on the bottom by watching the slurry specific gravity and swell compensator.
 - ii. Reducing the slurry velocity to the dredge pump idle speed velocity before raising the draghead off the bottom.
 - iii. Consistently maintaining the approach angle to a tolerance of + 0 to – 4 degrees when ever the draghead is on the bottom and the dredge pump is operating
 - iv. Watch to see if the dragtender is raising the draghead off the bottom because of plugging of the draghead or ship crabbing.
 - f. Lockout tagout procedure for cleaning the inflow and overflow screens.
 - g. Talk to turtle observers to assure they are aware of contract and permit requirements and are performing inspection of screens and deflectors and reporting any maintenance required to the dredge personnel. Ensure that correct turtle observer forms are being used and filled out properly.
 - h. Talk to Dredge Captain about maintaining the screens and deflectors.
 - i. Ensure Silent Inspector data is being sent to ERDC.
 - j. All pre-dredge/post-dredge and follow up inspections should be noted in the QC and QA the Daily Reports.

**ANNEX VI - DPCL DREDGING OBSERVER PROGRAM
LOAD DATA FORM**

PROJECT NAME: _____ **DREDGE NAME:** _____

DREDGE FIRM: _____

LOAD #: _____ **LOAD start date:** _____ **Times (24hrs):** Start _____ End _____

Condition of screening : Port _____ Starboard _____ Overflow _____

Number of dragheads in use: _____ **Type of dragheads used:** _____ **Size of dragheads:** _____

Draghead deflector? YES _____ NO _____ **Condition of deflector:** _____

Type of material dredged: _____

Weather conditions: _____

Tidal stage (CIRCLE ONE): Slack Rising High Falling Low Unknown

Beaufort Sea States (Winds/Wave Height) (CIRCLE ONE)

0 = <1 knot/ 0 ft	3 = 7-10 knot/ 2 ft	6 = 22-27 knot/10 ft	9 = 41-47 knot/23 ft	12 = >63 knot/45
1 = 1- 3 knot/ 0.25 ft	4 = 11-16 knot/ 4 ft	7 = 28-33 knot/14 ft	10 = 48-55 knot/29 ft	
2 = 4- 6 knot/ 0.5 ft	5 = 17-21 knot/ 6 ft	8 = 34-40 knot/18 ft	11 = 56-63 knot/37 ft	

Waves: _____ m **Wind (speed & direction):** _____

AIR TEMP: _____ °C

WATER TEMP: Surface _____ °C Column (mid-depth) _____ °C Bottom _____ °C

SCREEN TYPE	_____ Inflow screening:	None	25%	50%	75%	100%
	_____ Overflow screening:	None	25%	50%	75%	100%
	_____ Other screening:	None	25%	50%	75%	100%

PORT SCREEN CONTENTS: _____

STARBOARD SCREEN CONTENTS: _____

Estimate number entrained on this load for the following:

Mammals (any species) _____

Shark (any species) _____

Horseshoe crab _____

Blue crab _____

TURTLE OR TURTLE PARTS PRESENT THIS LOAD: YES _____ NO _____

SPECIES OF TURTLE TAKE: Unknown Loggerhead Green Olive ridley Hawksbill Leatherback

Comments: _____

Number observers used/24hrs: _____ **% Monitoring/24 hrs:** None 25% 50% 75% 100%

Observer's name: _____

Observer signature _____

**ANNEX VIII - DPCL DREDGING OBSERVER PROGRAM
WEEKLY SUMMARY**

PROJECT NAME: _____ **DREDGE NAME:** _____

Dates: _____ - _____ **Load #s:** _____

Areas dredge worked: _____

Were there incidents involving endangered or protected species? YES ____ **NO** ____

Which species? _____

Comments: _____

BRIDGE WATCH SUMMARY

<u>Date/Time</u>	<u>Species</u>	<u># Sightings/# Animals</u>	<u>Location/Comments</u>
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____
_____	_____	/	_____

Observer name _____

**ANNEX IX - DPCL DREDGINGOBSERVER PROGRAM
SEA TURTLE INCIDENTAL TAKE DATA FORM**

PROJECT NAME: _____ DREDGE NAME: _____

DATE: _____ Time turtle take recovered (24hr): _____ Turtle take # for project: _____
LOAD #: _____ Times (24hrs): Start _____ End _____ Load start date _____

SPECIES OF TURTLE TAKE: Unknown Loggerhead Green Olive ridley Hawksbill Leatherback

Channel location of take: Latitude _____ Longitude _____
Other location / Channel description (e.g. buoy markers, landmarks): _____

Sediment Type(s): Clay Mud Silt Sand (*course*) Sand (*medium*) Sand (*fine*) Sand (*mixed*)
Shell Rock Other _____ Comments: _____

Location take recovered on dredge: _____

Number of dragheads in use at time of incident: _____ Draghead deflector? YES ____ NO ____
Condition of deflector: _____ Condition of screening: _____

Beaufort Sea State: 0 1 2 3 4 5 6 7 8 9 10 11 12

AIR TEMP: _____ °C
WATER TEMP: Surface _____ °C Column (mid-depth) _____ °C Bottom _____ °C

Condition of specimen: _____

0 = Alive; 1 = Fresh dead; 2 = Moderately decomposed; 3 = Severely decomposed; 4 = skeleton/old bone; 5 = undetermined

Sex: M F UN How determined? _____ Age class: Juv ____ Sub-Adult ____ Adult ____ UN ____

Measurements: Circle units
Carapace Curved Length: _____ cm Weight: _____ kg Tail Length: _____ cm
Measurement/description of part: _____

Genetic samples taken: YES ____ NO ____ Photos taken: YES ____ NO ____
Turtle tagged?: YES ____ NO ____ Tag type: _____ Tag #: _____ Tag date: _____

Final disposition of specimen: _____

Comments: _____

Load data form attached: YES ____ NO ____ Dredge load log attached: YES ____ NO ____

Observer's name: _____ Observer Firm: _____

Use diagrams below to illustrate specimen/part recovered:



