

Charles Darwin University Animal Ethics Committee

Standard Operating Procedure:

DPAW SOP 08.2020 Marking of marine turtles using flipper and PIT tags

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NOTE: Reference 5.2 *Locating and approaching turtles* - In addition to specified SOPs, **Turtles must be allowed to initiate nesting and lay eggs prior to the turtle being approached and tagged**

Standard Operating Procedure

MARKING OF MARINE TURTLES USING FLIPPER AND PIT TAGS

Prepared by: Species and Communities Branch, Science and Conservation, Department of Biodiversity, Conservation and Attractions

Prepared for: Animal Ethics Committee

Version 1.1

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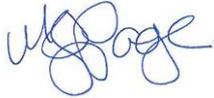
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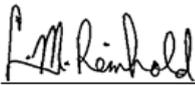
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This document has been reviewed and endorsed by the Department's Animal Ethics Committee

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1 Purpose

Marine turtles, such as flatback (*Natator depressus*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and loggerhead (*Caretta caretta*), can be individually marked using a tag in each fore flipper and/or a PIT tag. The tag data are used to provide information on the population dynamics and nesting biology of marine turtles (Balazs, 1999). This type of tagging is most commonly carried out on beaches where female marine turtles nest. Techniques for patrolling beaches and tagging turtles vary depending on the: nature of the monitoring or research program, beach, turtle species, and the timing and density of turtle nesting activity. These specific details and techniques are determined by the team leader and the team should follow these instructions at all times. Tagging success, in terms of tag retention and maintaining individual identity, depends on the: species and size of the turtle; condition of the tagging equipment, number of tags applied, degree of fouling of the tags, migration of the tags; and skills and experience of the tagger (Balazs, 1999). By keeping these factors in mind the success of tagging can be improved.

This standard operating procedure (SOP) provides advice on marking marine turtles using flipper tags and PIT tags. This SOP does not provide advice on marking freshwater turtles and tortoises.

2 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department's Animal Ethics Committee. However, this SOP may also be appropriate for other situations.

This SOP applies to all fauna survey and monitoring activities involving marking of marine turtles with flipper and PIT tags undertaken across the State by Department of Biodiversity, Conservation and Attractions (hereafter Department) personnel. It may also be used to guide fauna monitoring activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All Department personnel involved in marine monitoring should be familiar with the content of this document.

Projects involving wildlife may require a licence under the provisions of the *Wildlife Conservation Act 1950* and/or the *Biodiversity Conservation Act 2016*. Personnel should consult the Department's Wildlife Licensing Section and Animal Ethics Committee Executive Officer for further guidance. In Western Australia, any person using animals for scientific purposes must also be covered by a licence issued under the provisions of the *Animal Welfare Act 2002*, which is administered by the Department of Primary Industries and Regional Development. This SOP complements the *Australian code of practice for the care and use of animals for scientific purposes* (The Code). The Code contains an introduction to the ethical use of animals in wildlife studies and should be referred to for broader issues. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (<http://www.nhmrc.gov.au>).

3 Definitions

Animal handler: A person listed on an application to the Department's Animal Ethics Committee who will be responsible for handling animals during the project.

Flipper tag: An externally placed tag made from titanium (a non-corrosive metal which will not irritate turtle skin / flesh). The tags are self-piercing and self-locking and are stamped with a unique number on the top and a Department return address on the underside.

PIT Tag: An internally placed transponder. The tags are inserted into the turtle using a pre-loaded needle applicator. The tags are pre-programmed with the PIT tag number that can be read using an appropriate scanner.

4 Equipment

The following equipment is required:

General:

- Pencils, sharpener and eraser
- Datasheets and/or notebook
- Personal protective equipment and enclosed shoes
- Head torch, preferably with red light
- Hand-held radio
- Bag, tool belt or box to transport gear
- Water

Flipper tagging:

- Titanium tags (non-corrosive)
- Tag applicator
- Long nose pliers

PIT tagging:

- PIT tags
- PIT applicator
- PIT tag scanner
- Sharps disposal container
- Spare batteries

Measuring:

- Several flexible fiberglass tape measures (calibrated weekly against a steel tape)

5 Procedure Outline

5.1 Preparation

Preparation is required prior to the tagging season and also prior to nightly tagging.

(a) Obtain sufficient flipper tags from Stockbrands, ensuring that they are stamped in accordance with the Department number sequence (WA prefix) and return address.

- (b) Obtain sufficient PIT tags and applicators, and scanners.
- (c) Ensure that scanners are in good working order.
- (d) Determine the time the team will arrive at and depart from the beach (may be based on tide times where applicable).
- (e) Check ALL tagging gear to ensure you have everything you need and that it is in good working order.
- (f) Check that you have sufficient number of flipper and PIT tags. Record the quantity of tags in your kit on the 'Tag Checklist' for that kit. This is very IMPORTANT as all tags must be accounted for.
- (g) Check tape measures for stretching or damage, if so they must be replaced. Carry spares in case of damage. Periodically check the tape measure against a steel rule and discard any that differ by more than 2mm at the 1m mark.
- (h) Ensure that sufficient data sheets are available at all times.
- (i) The team leader will determine who will perform each of the duties in the tagging team.

5.2 Locating and approaching turtles

- (a) Walk the beach as instructed by the team leader, preferably with no light or low intensity red lights. Do not shine lights into the water or over the beach, because turtles will actively avoid bright lights and may not emerge from the water or may return to the water if already on the beach.
- (b) If a turtle is emerging from the water when it is encountered, remain still or slowly back away. Wait at a distance, until the animal is well up the beach slope, before attempting to approach it from behind. If a turtle track is sighted, follow the track and approach from behind. Keep a low profile to prevent the turtle from being startled.
- (c) Equipment should be carried on your person (in a bag or tool belt), but if this is not possible, place any equipment a distance away from the turtle, to prevent the turtle from trampling the gear when returning to the water.
- (d) Some tagging teams apply paint marks on the carapace to show that it has recently been tagged and it should not be further disturbed. Others drag a line through the track of the turtle (above the high water mark) to show that the turtle has been recorded. Look for a paint mark or drag line to determine if the turtle has been processed.

5.3 Recording data

- (a) If the turtle has not yet been processed on a given night, confirm and record species identity (see Figure 1), check for tags (see Section 5.4) and record tag numbers.
- (b) Measure and tag the turtle, as instructed by the team leader. The appropriate time to approach and tag a turtle varies with the skills and experience of the animal handler, species of turtle, density of nesting (which can vary widely between seasons) and presence of other beach users, such as tourists. The appropriate time to check for tags and tag turtles must be determined by the team leader.

(c) Desirable minimum data requirements are: full names of tagger and recorder, location, date, time, species, tag numbers, activity, position on the beach and carapace measurements. Care must be taken to fill in the datasheets correctly and clearly. Data entry is difficult if a form is incomplete or difficult to read.

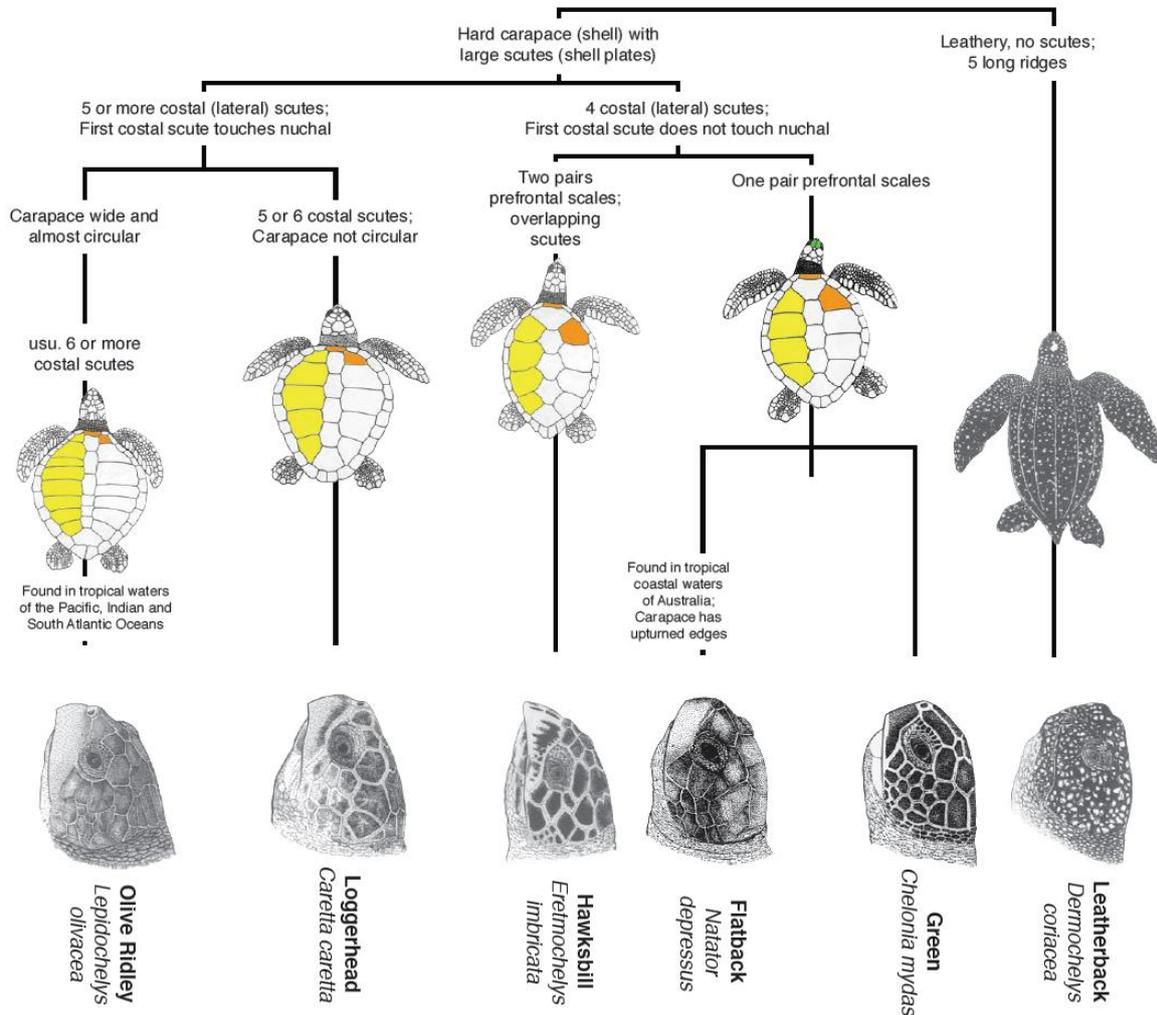


Figure 1 Key to the identification of Indo-Pacific marine turtles. Yellow indicates costal scutes, green indicates prefrontal scale and orange indicates relative position of the first costal scute to the nuchal scute. Image: Pritchard and Mortimer, 1999.

5.4 Checking for tags

(a) Maintain a low profile and, when possible, quietly approach the animal from behind. Check to see if the turtle has tags on its front flippers as instructed by the team leader, staying behind the turtle when moving from one side to the other.

(b) Check to see if the turtle has a PIT tag using the scanner. Move the scanner over the turtle’s body at a distance of approximately 3-5cm. The scanner should be moved over the turtle at all angles (45° left and right, up and down) as the tag may have migrated. Typically, if there is a tag it will be located on the left side in the upper deltoid, however if there is no reading from this side, continue to scan the entire right hand shoulder and around the head and flipper areas as tags do migrate and it is possible the tag may have been applied in the right hand side.

- (c) If a PIT tag is located the reader will beep and the number of the tag will be displayed on the screen. If a tag is not present scan for the entire length of time until the scanner beeps and displays 'no tag found'.
- (d) If PIT or flipper tags are present, record the tag numbers on the datasheet. If possible, tagger should read the number aloud clearly and distinctly for the recorder, who should then repeat it back, whilst writing it down, so that any errors can be checked and corrected immediately.
- (e) Some turtles only have one flipper tag and some have up to four. If only one old tag is present, another tag must be applied to the other flipper. If an old tag is: migrating out (Figure 5); not well clinched; or appears as if it will soon be lost, then another (new) tag should also be attached to that flipper.
- (f) If no flipper tags are present, tags should be fitted (see Section 5.6). Before fitting new tags, check to see if there is any evidence of the turtles having lost tags. You might see a slit in the scale, a small depression or line in the centre of the scale, or feel scar tissue – usually about the size and shape of a pea. Record any evidence of lost (or possible lost) tags on the datasheet, either as a written note or a sketch.
- (g) If possible, tags should be applied after measurements and other observations have been taken and recorded (see Section 5.5), but if the turtle is quickly returning to the water, application of tags becomes the priority over measurements. If applying both PIT and flipper tags, apply the PIT tag first where possible.

5.5 Measuring and inspecting a turtle

- (a) Measuring should be attempted without restraining the turtle, but if restraint is needed, see Section 5.6. Remove barnacles along the centreline, using long nosed pliers, for accurate measurements and note this on the datasheet. If the barnacles have not been removed from the centreline, the measurement should not be recorded as the true measurement of the turtle.
- (b) Measure curved carapace length (CCL) and curved carapace width (CCW), as instructed by the team leader, as follows:

CCL: Measure from top to bottom of the carapace along the midline and mark the measurement on tape measure with thumb and finger at lower edge of carapace. Place the top of the tape measure where the skin on the neck joins the carapace and lay the tape measure along the midline of the carapace to the point before the carapace turns underneath at the join of the two post-vertebrae. Until you have been approved as an animal handler who can measure turtles to within 2mm of accuracy, then two or three people should measure the CCL until they get a consensus of measurement. Adult turtles may grow only 2mm a year, so this level of accuracy is important. Some turtles have a notch at the posterior edge of the carapace. For hawksbill turtles only, measure the length of the 'v' notch and record it on the datasheet.

CCW: Place the tape measure at widest part of carapace and extend to the other side. Slide the tape measure up and down the carapace edge to find the widest part and mark measurement with thumb and finger. When measuring flatback turtles CCW, the tape measure is placed taut across the carapace; do not follow the curved shape of the carapace.

- (c) Each measurement should be read aloud in centimetres and the recorder must repeat the measurement back clearly and record it neatly on the datasheet.
- (d) Check for injuries, fibropapillomas, any other observations of interest and record on the datasheet.

5.6 Restraining and tagging a turtle

With experience, and/or in certain circumstances, tags can be attached without restraining the turtle. If this is not possible, and the tagger requests restraint, one person should restrain the turtle, while the other person applies the tags.

- (a) If restraint is necessary, do so as instructed by the team leader, since the method can vary depending on the circumstances. Restrain the turtle by covering its eyes, making sure that its nostrils are exposed, so that it can breathe, and so as to minimise discomfort. Restrain by facing the turtle, pushing the head back into the carapace and downward, applying only enough pressure to stop the forward movement of the turtle. Fingers must be kept pointing upward, away from the turtle's mouth (see Figure 2), as they can be bitten (or even severed) by the turtle.



Figure 2 An example of restraining a loggerhead turtle, Note that the turtle is being restrained from the front, the nostrils are clear and the handler's fingers are pointing up and away from the turtle's mouth.

5.6.1 PIT (Passive Integrated Transponder) tagging

- (b) Select PIT tag and scan the tag before opening the packet to ensure the tag is functional. Check the number on the scanner display matches the number on the sticker. Attach a PIT tag sticker to the datasheet.
- (c) Remove the loaded needle from the wrapper. Check the needle is correctly loaded.
- (d) Locate the application site on the left shoulder by measuring approximately 2-3 finger widths below the carapace in the right half of the centre section between the neck and flipper (see Figure 3). Alternatively, insert the needle at the left point of the carapace, directly under and right up against the shell, instead of in the soft tissue (see Figure 3). If inserted in the soft tissue, the tag can migrate or be damaged. Leatherback turtles can be PIT tagged at the tail, otherwise the microchips can become broken when the turtle is caught and handled by the front flippers.

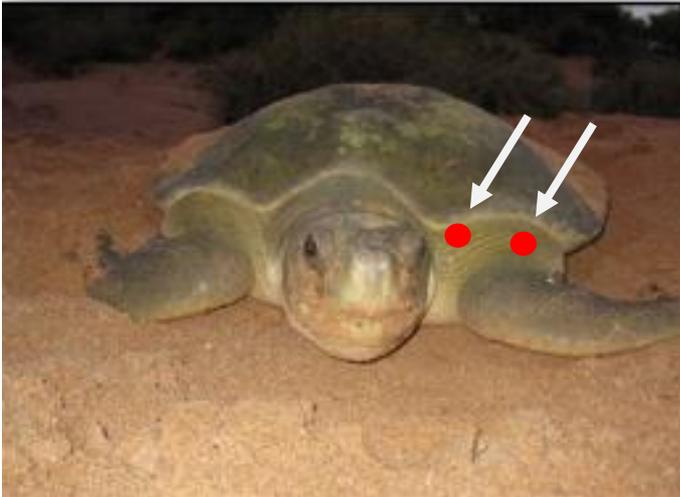


Figure 3 PIT tag application sites (red circles).

- (e) Remove the safety cap from the needle. Remove the needle cap and keep hold of it to recap. Hold the needle in a horizontal position.
- (f) The best time to apply a PIT tag is when the front flippers are stationary (e.g. when the turtle is patting down with rear flippers, or when resting during filling in or returning to water). Correct application takes about two seconds.
- (g) Place one hand on the carapace to steady yourself and to provide leverage when removing the needle from the animal, and with the other hand, in one swift and confident motion, pierce the skin at the correct angle (see Figure 4) and insert the needle gently but firmly into the shoulder muscle to the full extent of the needle, while maintaining a horizontal angle and directing the needle away from the turtle's head.



Figure 4 Inserting the PIT tag.

- (h) Immediately and quickly depress the plunger.
- (i) Retract the needle immediately, maintaining the same angle at which it entered the body.
- (j) Recap and dispose of the needle only into the sharps disposal container. The needle section can be separated from the plunger by untwisting it at the centre of the needle. The used plunger is not considered medical waste and can be stored inside the toolbox/backpack and disposed of upon return from beach.

(k) Scan the animal with the scanner to ensure the PIT tag is in the animal and is functioning correctly.

5.6.2 Flipper tagging

(a) Select tag(s) and check that the numbers are in numerical order and that the tags and locking mechanisms are correctly aligned.

(b) Select the tag with the lowest number and position in the pliers. The tag with the lowest number is applied to the turtle's left front flipper and the tag with the highest number is applied to the turtle's right front flipper. This ordering is preferable whenever possible (although not vital) as it helps when trying to decipher incomplete or incorrect records.

(c) If economic constraints mean that only one tag can be applied to a turtle, this must be applied to the left front flipper.

(d) Check the tag to ensure it is placed in the tag applicators the correct way up: number must be on the topside of the flipper and the Department address must be on the bottom of the flipper.

(e) Extend the left front flipper to avoid any unnatural alignment and / or gathering of the skin and underlying flipper tissue before you attempt to affix a tag. If the flipper cannot be fully extended, only experienced taggers should insert the tag.

(f) Position the tag as instructed by the team leader, as requirements can vary depending on the presence and condition of old tags, species of turtle and nature of the monitoring and research. Apply the tag on the trailing edge of the front flipper/s, in or next to the scale closest to the body (see Figure 5). The tag should not overhang the bottom edge of the flipper, to minimise the chances of fouling or getting caught and falling out.



Figure 5 Green turtle flipper showing a new tag inserted in the centre scale, because the old tag is growing out with the scale. Photo: A. Vitenbergs.

(g) Squeeze the tag applicators so that the sharp part of the tag pierces through the flipper and passes into the hole in the opposite end of the tag, where it bends over and locks into place.

(h) Check to confirm that the tag has clinched correctly. Feel the underside of the tag to make sure that the point has locked into place. If the tag has not clinched correctly, this

must be remedied, according to the situation and as instructed by the team leader. The tag may be locked with additional pressure with the tag applicators or removed, straightened and re-applied. However, if the tag is damaged so that it can not be re-applied, or if the point of a new tag is curled around inside the flesh of the flipper, it must be removed and a new tag inserted. Record the number of the bent tag and the new tag that was successfully applied.

- (i) Always retain any tags damaged during use and return them to the Department officer responsible for dispensing and administering flipper tags via your team leader.
- (j) Repeat on the right front flipper, if you have sufficient tags to apply two to each turtle.
- (k) If an animal is injured during handling / tagging, treat any superficial wounds with a topical antiseptic (e.g. Betadine®) (refer to the Department SOP for *First Aid for Animals*). For institutions with an Animal Ethics Committee (AEC), full details of injuries and deaths during handling must be documented by the team leader their annual AEC report.
- (l) Where applicable, mark the carapace with paint as instructed by the team leader and/or drag a line through the track that the turtle made to reach the nest, above the high water mark, to identify it as a recorded turtle.
- (m) Once the tags and paint mark have been applied, move clear and turn your head torches off, so that the turtle can reorient itself and return to the water.

6 Level of Impact

Flipper tagging, and PIT tagging to a lesser extent is considered an invasive procedure because tags pass through living tissue.

Potential animal welfare impacts when flipper and / or PIT tagging marine turtles include:

- Distress caused by handling (discomfort).
- Pain during insertion of the tag(s), which is usually brief.
- Infection at site of tag insertion.
- Continued tissue damage (caused from pressure of the flipper tag).

It should be noted that whilst these impacts are specifically associated with the procedure of tagging, an animal may also experience other impacts from associated procedures such as capture and restraint.

7 Ethical Considerations

To reduce the level of impact of flipper and/or PIT tagging on the welfare of animals there are a number of ethical considerations that should be addressed throughout projects involving these procedures. Department projects involving flipper tagging will require approval from the Department's Animal Ethics Committee.

7.1 Animal handling

To minimise stress to the turtles, they should only be handled for the minimum period required to mark them and to collect any necessary measurements (this can usually be

completed in a few minutes). Improper restraint, especially when dealing with a stressed and frightened animal can lead to physiological disturbances, such as hyperthermia, stress, shock and capture myopathy.

7.2 Lights, noise and sudden movement

It is important to take the utmost care in the use of lights on the beach. Bright lights, loud noise and sudden movement can stop turtles from coming onto the beach to lay or make them retreat back into the water. Ideally, the turtle's natural behaviours should not be disturbed before it has finished laying, but this is not feasible for all rookeries and circumstances. If a turtle is flipper-tagged while it is laying, it may retain some eggs in the oviduct, which is an unnecessary loss of eggs to the population.

7.3 Tag placement

Tags should always be applied as instructed by the team leader. The flipper and flipper edge must be extended properly when flipper tagging, to avoid unnatural alignment and gathering of the skin and underlying flipper tissue which inhibits the correct alignment of the tag (Prince, 1997). PIT tagging should be conducted when the front flippers are not moving, it only takes a few seconds and can be done when a turtle is resting in between movements. The needle should be inserted and withdrawn at a horizontal angle away from the head and neck area. Do not move the needle inside the turtle as this can cause internal laceration and bleeding.

7.4 Pain, tissue damage and infection

Cleanliness of all surgical and puncture techniques is essential to minimise the potential for infection. The PIT tag needles are sealed in plastic packaging until the time of use and needles are disposed of and not reused. All equipment should be kept extremely sharp and clean to minimise tearing, bruising, infection and transfer of disease.

7.5 Bleeding

Flipper and / or PIT tagging can result in bleeding, which, should it occur, needs to be controlled prior to the animal being released, with pressure at the site if possible.

7.6 Injury and unexpected deaths

If injury, unexpected deaths or euthanasia occur then it is essential to consider the possible causes and take action to prevent further deaths. For projects approved by the Department's Animal Ethics Committee, adverse events such as injury, unexpected deaths or euthanasia must be reported in writing to the AEC Executive Officer on return to the office (as per 2.2.28 of The Code) by completing an *Adverse Events Form*. Guidance on field euthanasia procedures is described in the Department SOP for *Humane Killing of Animals under Field Conditions*. Where disease may be suspected, refer to the Department SOP for *Managing Disease Risk in Wildlife Management* for further guidance.

7.7 Disease precautions

Precautions should be taken to prevent the spread of possible diseases during tagging. All tagging applicators and piercing equipment must be cleaned and disinfected after use, in

accordance with the Department SOP for *Managing Disease Risk in Wildlife Management*, particularly if equipment is to be transferred between projects or used in different regions.

8 Competencies and Approvals

Department personnel, and other external parties covered by the Department's Animal Ethics Committee, undertaking projects that involve flipper and/or PIT tagging of marine turtles require approval from the committee and will need to satisfy the competency requirements detailed in Table 1. This is to ensure that personnel involved have the necessary knowledge and experience to minimise the potential impacts of tagging on the welfare of animals. Other groups, organisations or individuals using this SOP to guide their fauna monitoring activities are encouraged to also meet these competency requirements as well as their basic animal welfare legislative obligations.

It should be noted that details such as intensity of the study being undertaken will determine the level of competency required and Table 1 provides advice for basic monitoring only.

Table 1 Competency requirements for Animal Handlers of projects involving flipper and/or PIT tagging of marine mammals

Competency category	Competency requirement	Competency assessment
Wildlife licences	Licence to take fauna for scientific purposes (Reg 17) OR Licence to take fauna for educational or public purposes (Reg 15)	Provide licence number
Animal handling and processing skills / experience	Experience in handling and measuring marine fauna	Personnel must be confident at restraint and handling of marine turtles to be able to apply flipper or PIT tags. Personnel must be familiar with how to measure turtles and operate flipper tagging equipment. This experience is best obtained under supervision of more experienced personnel. Estimated total time in the field: Min 1-2 field tagging seasons (i.e. 2-4 weeks per season).

9 Occupational Health and Safety

Always carry a first aid kit in your vehicle and be aware of your own safety and the safety of others as well as the animals when handling.

A job safety analysis is recommended prior to marking marine turtles using flipper tags and/or PIT tags. This safety analysis should include the following considerations.

9.1 Fitness for work

Personnel must have the physical ability to conduct tagging activity on beaches as determined by the team leader. Team leaders must ensure that potential animal handlers have a full understanding of the physical requirements before they participate. Personnel must not be under the influence of alcohol or drugs when tagging.

9.2 Animal bites and scratches

Handling animals can result in injuries to handlers from the animals inflicting bites and scratches. All inflicted injuries (even superficial ones) should be appropriately treated as soon as possible to ameliorate possible allergic reaction, prevent infection and promote healing.

The powerful front flippers and the nail on the front and rear flipper can inflict bruises and scratches on the arms and legs. Some turtles have barnacles on their carapace, head and skin which can also cause scratches.

Long pants, long sleeve shirts and sturdy enclosed shoes are recommended. Personnel should also have up-to-date tetanus vaccinations.

If Department personnel or volunteers are injured, please refer to the Department's Health and Safety Section's 'Report a Hazard, near-miss or incident' intranet page, which can be found at http://intranet/csd/People_Services/rm/Pages/ReportingHazards,Near-MissesandIncidents.aspxZoonoses.

9.3 Eyes

Be aware of flying sand when turtles are digging or filling in nests. Keep upwind when possible and / or wear goggles / glasses to protect your eyes.

9.4 Equipment

The sharp points of metal tags and uncapped PIT tag needles are hazardous and can easily puncture a finger. Care must be taken at all times to avoid such injuries. Recap the needle immediately after inserting the PIT tag and dispose of in a sharps disposal container. The 'PIT Tag Checklist' must be filled in at the end of the night with how many PIT tags were applied and how many were left in each kit. This needs to match the number of PIT tags that were taken out at the start of the night. This is very important so that all PIT tags are accounted for and no needles are left on the beach.

9.5 Zoonoses

There are a number of diseases carried by animals that can be transmitted to humans (i.e. zoonoses such as Toxoplasmosis, Leptospirosis, Salmonella). All personnel must take precautions to minimise the risk of disease transmission to protect themselves, their families and wildlife populations.

Advice on minimising disease risk is contained in the Department SOP for *Managing Disease Risk in Wildlife Management*

9.6 Allergies

Some personnel may develop allergies when they come in contact with animal materials. Personnel known to develop allergies should wear gloves when handling animals and long sleeved pants/shirt.

People with severe allergies associated with animals, with immune deficiency diseases or on immunosuppressant therapy should not engage in handling wildlife.

10 Further Reading

The following SOPs have been mentioned in this advice regarding flipper and PIT tagging of marine turtles and it is recommended that they are consulted when proposing to undertake marine turtle monitoring and surveys.

- Department SOP *First Aid for Animals*
- Department SOP *Managing Disease Risk in Wildlife Management*
- Department SOP *Humane Killing of Animals under Field Conditions*

11 References

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