Standard Operating Procedure

SC25-05 MARKING OF MARINE TURTLES USING FLIPPER AND PASSIVE INTEGRATED TRANSPONDER (PIT) TAGS

Animal welfare is the responsibility of all personnel involved in the care and use of animals for scientific purposes.

Personnel involved in an Animal Ethics Committee approved project should read and understand their obligations under the *Australian code for the care and use of animals for scientific purposes*.

Version 1.3

June 2025

GOVERNMENT OF WESTERN AUSTRALIA

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Approved by the DBCA Animal Ethics Committee: 

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Chairperson, Animal Ethics Committee
Department of Biodiversity, Conservation and Attractions

Contents

1 Acknowledgements

This standard operating procedure was originally developed by Marissa Speirs and Vanessa Richter, with contributions from Holly Smith, Anna Vitenbergs and Kellie Pendoley.

2 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 Passive Integrated Transponder (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.

3 Scope

This SOP has been written specifically for scientific and education purposes, and approved by the Department of Biodiversity, Conservation and Attractions' (DBCA) Animal Ethics Committee (AEC). 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 Western Australia by DBCA (hereafter department) personnel. It may also be used to guide fauna related activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All department personnel involved in fauna research and management should be familiar with the content of this document.

This SOP complements the *Australian code of practice for the care and use of animals for scientific purposes* (The Code). The Code provides the ethical framework and governing principles to guide decisions and actions of all those involved in the care and use of animals for scientific purposes and should be referred to for all AEC approved projects. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (https://www.nhmrc.gov.au/about-us/publications/australian-code-care-and-use-animals-scientific-purposes).

4 Animal Welfare Considerations

To reduce the level of impact of flipper and/or PIT tagging on the welfare of animals, personnel must consider, address and plan for the range of welfare impacts that may be encountered. Strategies to reduce impacts should be identified during the planning stage to

ensure that they can be readily implemented during tagging, and contingencies for managing welfare issues have been identified. All personnel involved in the project should be aware of the range of issues that they may encounter, the options that are available for reducing impacts and improving animal welfare, and the process for managing adverse events.

Department projects involving marking of marine turtles will require approval from the department's AEC. The key animal welfare considerations that should be considered when marking marine turtles using flipper and PIT tags are listed below and are highlighted throughout the document.

4.1 Injury and unexpected deaths

If adverse events including injury, unexpected deaths or unplanned requirement for euthanasia occur, then it is essential to consider the possible causes and take action to prevent further issues. Adhering to the guidance in this SOP will assist in minimising the likelihood of adverse events. For projects approved by the department's AEC, adverse events must be reported in writing to the AEC Executive Officer as soon as possible after the event by completing an *Adverse Event Form*. Guidance on field euthanasia procedures are described in the department SOPs for *First Aid for Animals* and *Euthanasia of Animals Under Field Conditions*. Where infectious disease is suspected, refer to the department SOP for *Managing Disease Risk and Biosecurity in Wildlife Management* for further guidance.

4.2 Level of impact

Flipper tagging, and PIT tagging to a lesser extent, are considered invasive procedures because tags pass through living tissue.

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

- Disturbance caused by lights, noise and sudden movement.
- Distress (caused by handling, discomfort).
- Pain and bleeding 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).

If animals are properly monitored and preventative actions are utilised, then the risk and overall impact should be low and short-term. Project planning must involve the identification and mitigation of all potential welfare risks to minimise their impacts as much as possible. Note that whilst these impacts are specifically associated with the procedure of tagging, an animal may also experience other impacts from associated procedures. Investigators must be aware that the effects of a series of stressors, such as capture, handling, transportation, sedation, anaesthesia and marking can be cumulative.

5 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)

6 Procedure Outline

6.1 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 or WB prefix) and return address.

(b) Obtain sufficient PIT tags and applicators, and scanners.

(c) Ensure that scanners are in good working order and fully charged.

(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 a 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, and if so, they must be replaced. Carry

spares in case of damage. Periodically (at least weekly) check the tape measure against a steel ruler and discard any that differ by more than 2 mm at the 1 m mark.

(h) Ensure that sufficient data sheets are available at all times (see Appendix 1).

(i) The team leader will determine who will perform each of the duties in the tagging team.

(j) Ensure that the head torches have a "red" mode. If possible, carry a spare torch and batteries on the beach.

(k) Not all PIT scanners are the same. Ensure that all personnel are trained in the use of each scanner.

6.2 Locating and approaching turtles

ANIMAL WELFARE: 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 cause them to 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. Turtles must not be tagged while laying eggs as this may cause it to retain some eggs in the oviduct, which is an unnecessary loss of eggs to the population.

(a) Walk the beach as instructed by the team leader, preferably with no light or low intensity red lights. Unless necessary for personal safety (e.g., checking for saltwater crocodiles), 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 non-toxic paint marks on the turtle's 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.

6.3 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 6.4) 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 (GPS co-ordinates of the nest/body pit/apex of the track) and carapace measurements. Care must be taken to fill in the datasheets correctly, clearly and completely. Data entry is difficult if a form is incomplete or difficult to read.

ANIMAL WELFARE: 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).

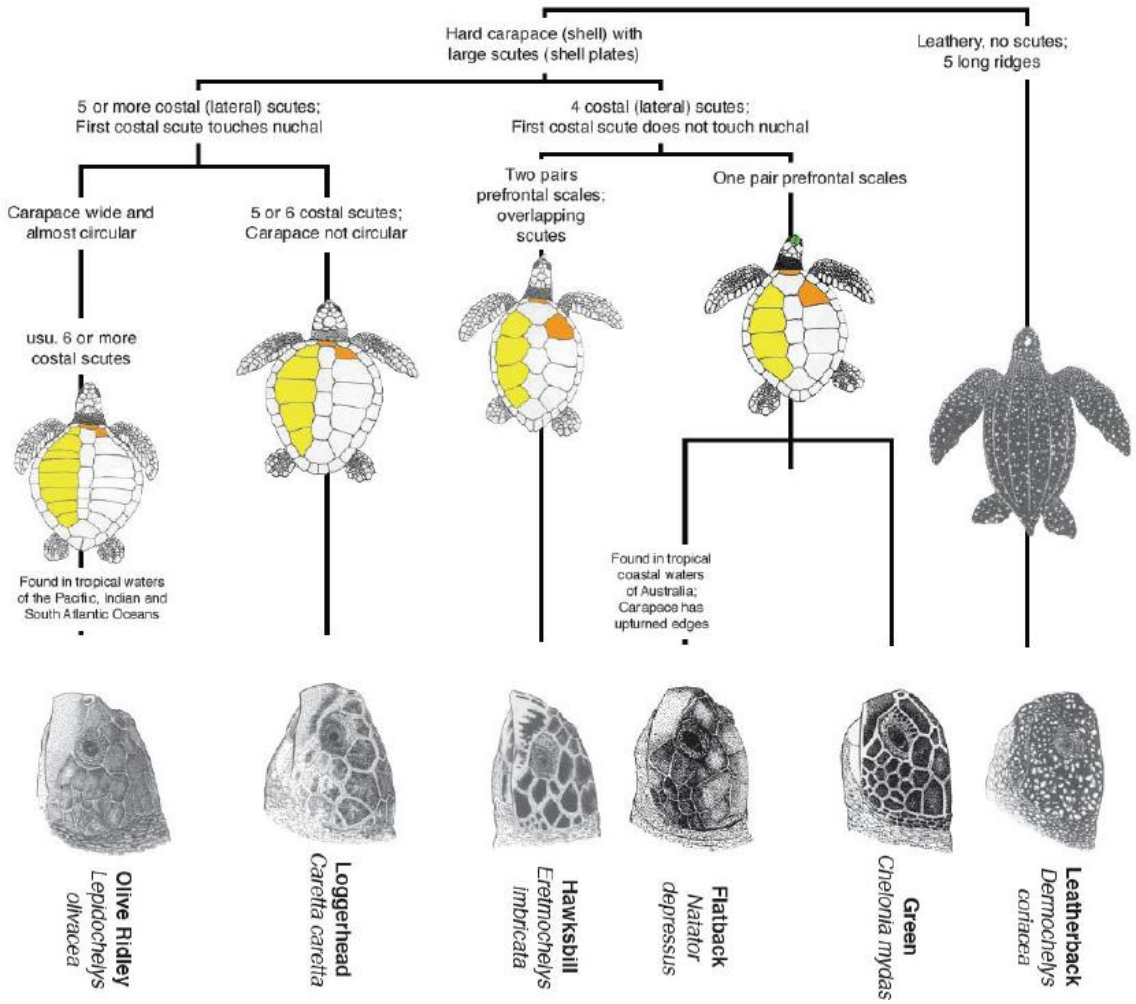


Figure 1 Key to the identification of Indo-Pacific marine turtles. Yellow indicates costal scutes, green indicates prefrontal scale and orange indicates relative position of the first costal scute to the nuchal scute. Image: Pritchard and Mortimer, 1999.

6.4 Checking for tags

Maintain a low profile and, when possible, quietly approach the animal from behind. When checking to see if the turtle has tags on its front flippers, stay behind the turtle when moving from one side to the other.

6.4.1 PIT Tags

(a) Check to see if the turtle has PIT tags using the scanner. Use scanner as per instructions for that model. Move the scanner over the turtle's body at a distance of approximately 1-2 cm. The scanner should be moved over the turtle at all angles (45° left and right, up and down). If there is a tag it will be located in the upper deltoid on one or both shoulders, however if there is no reading, continue to scan the entire shoulder and around the head and flipper areas as tags can migrate.

(b) If a PIT tag is located the scanner 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'. If there is no reading, ensure the scanner is on "reading" mode and the battery is full.

(c) If the turtle is carrying scars from previous flipper tags, but no PIT tag, try to check the turtle with another scanner, just in case the scanner is faulty. Loss of identity in a long-term turtle monitoring program has implications for population assessments.

(d) Scan the same location several times to ensure you found any potential second PIT tags in the same area.

6.4.2 Flipper Tags

(a) A tag scar is the evidence remaining on a flipper once a flipper tag has migrated out. These are extremely important to record as they provide evidence that the turtle has been recorded previously. Before fitting a new tag, check to see if there is any evidence of the turtle having lost a tag (e.g., a tag scar). You might see a V-slit in the flipper 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. It is important to record any tag scars on the datasheet. It is a good idea to make a sketch of that portion of the flipper edge on the data sheet. In the case of flatback turtles only, if there is clear evidence of flipper tag loss, no new flipper tags should be applied.

(b) For turtles other than flatback turtles, 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, beside the old tag. If both tags are insecure on a double-tagged turtle, apply two more tags, one on each flipper. In the case of flatback turtles only, no new tags are to be applied where one or more are already present.

(c) If no flipper tags are present, a tag should be applied on each flipper (see Section 6.7.2).

(d) In the case of flatback turtles only, only one new tag should be applied; this goes in the left front flipper.

(e) When a turtle is less active after laying, measurements and other observations should be taken first followed by tagging (see Section 6.7), but if the turtle is quickly returning to the water, application of tags takes priority over measurements. If applying both PIT tags and a flipper tag, apply the PIT tag first where possible.

6.4.3 Recording Tags

If PIT or flipper tags are present, record the tag numbers on the datasheet. If possible, the 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. Record each tag number exactly as it appears (i.e., including any hyphens). Be careful with letters and numbers that are easily confused. Errors in recording data is one of the key issues that hampers long term mark recapture programs. Ensure the 'Tag Checklist' for each kit is cross referenced at the end of the night and all deployed tags are crossed off.

6.5 Measuring and inspecting a turtle

(a) Measuring should be attempted without restraining the turtle but if restraint is needed see Section 6.6. 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:

(c) Carapace length: Measure from top to bottom of the carapace along the midline and mark the measurement on tape measure with thumb and finger at the posterior edge of carapace. Until you have been approved as an animal handler who can measure turtles to within 2 mm of accuracy, then two or three people should measure the CCL until they get a consensus of measurement. Experienced handlers should also test themselves periodically. Adult turtles may grow only 2 mm a year, so this level of accuracy is important.

   i. CCL-min Green, olive ridley flatback turtles – All turtles have a notch at the posterior of the carapace. For these species 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 and measure to the inside of the posterior notch at the mid-line (between the supracaudal scutes) using the thumb and finger to mark the tape measure.

      CCL-min Loggerhead turtles – For loggerhead turtles the posterior end of the carapace curves under, so extra training and care needs to be taken with this measurement.

   ii. CCL n-t (tip) – Hawksbill turtles. The posterior notch is highly variable for hawksbill turtles. 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 posterior point of the longest supracaudal scute using the thumb and finger to mark the tape measure. The only reason to measure the length of the posterior notch as a separate measurement would be to compare turtle sizes to previous historic data from Western Australia. All other states measure to the tip of the longest supracaudal scute.

   iii. For hawksbill turtles only, measure the length of the 'v' notch and record it on the datasheet. Some turtles have a notch at the posterior edge of the carapace.

(d) 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.

(e) Each measurement should be read aloud in centimetres and the recorder must repeat the measurement back clearly and record it neatly on the datasheet.

(f) Check for injures, fibropapillomas, any other observations of interest and record on the datasheet.

6.6 Restraining 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.

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 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.

6.7 Tagging a turtle

6.7.1 PIT tagging

PIT tags should only be inserted by experienced and endorsed personnel, or under close supervision of endorsed personnel. In Western Australia, only flatback turtles are to have

two PIT tags: one in the left shoulder and one in the right shoulder. The lower number PIT tag is inserted in the left shoulder and the higher number PIT tag is inserted in the right shoulder.

(a) Select lower number 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.

(b) Remove the loaded needle from the wrapper. Check the needle is correctly loaded and screwed on tightly to the syringe.

(c) Locate the application site on the left shoulder by measuring approximately 1-2 finger widths below the sharply curved part (i.e. pointy section) of the carapace directly into the muscle (Figure 3).

Figure 3 PIT tag application site in the left shoulder (white circle).

(d) Remove the safety cap from the needle. Remove the needle cap and keep a hold of it to recap. Hold the needle in a horizontal position (i.e., 90 degrees to the turtle's shoulder).

(e) 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.

(f) 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 smooth and confident motion, pierce the skin at the correct angle (see Figure 4) and insert the needle fully into the shoulder muscle, while maintaining a horizontal angle (i.e., 90 degrees to the turtle's shoulder) and directing the needle away from the turtle's head.

Figure 4 Inserting the PIT tag. Steady yourself and insert the needle in a smooth and confident motion, angling it away from the head. Do not move the needle inside the body. Remove it immediately after depressing the plunger maintaining the same angle at all times.

ANIMAL WELFARE: 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.

(g) Insert syringe fully before quickly depressing the plunger.

(h) Retract the needle immediately, maintaining the same angle at which it entered the body.

(i) Firmly massage/press the insertion area to check that the tag was inserted subcutaneously correctly and is not going to pop back out of the needle insertion. If practical, apply a drop of Vetbond or surgical cyanoacryllic glue to seal the exterior of the insertion puncture.

ANIMAL WELFARE: 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.

(j) Recap and dispose of the needle only into the sharp's 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.

(l) The tagger should read the PIT number aloud clearly and distinctly for the recorder who must repeat the number back clearly and record it neatly on the datasheet. For all new PIT tags applied, the sticker from the packet displaying the identifying number should be fixed to the data sheet.

(m) Repeat process for the right side of the turtle if a tag is not already present.

6.7.2 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) The tag with the lower number is applied to the turtle's left front flipper. A 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 other factors mean that only one tag can be applied to a turtle, this must be applied to the left front flipper. "New" (i.e., not previously tagged) flatback turtles only receive one flipper tag, applied to the left front flipper. Recaptured flatback turtles do not receive any new flipper tags, unless none have been applied previously. If there is evidence of previous flipper tags on flatback turtles, i.e., tag scars, no new tags are to be applied.

(d) Insert tag into tag applicators. Use your forefinger to pull the tag into the applicators until a click is heard. The tag should fit comfortably with a reassuring click when inserted correctly into the tag applicators. 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. Check that the tag's spike aligns with the hole and the semicircular depression. This may require a couple of attempts depending on the batch of tags and the model of the applicators.

(e) A second person can 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 coordinator, 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 left flippers, 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.

(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.

ANIMAL WELFARE: 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.

(h) The handles of the taggers are released immediately in anticipation of a flinch reaction by the turtle. Do not hold the handles together trying for a more secure crimping of the tag as this will tear the skin and cause additional discomfort to the turtle. The flinch reaction varies from turtle to turtle and ranges from no reaction to a forward thrust of the flipper and an exhalation.

(i) 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.

(j) *Important: If the tag has not clinched correctly, this must be remedied, according to the situation and as instructed by the coordinator.* If the spike has not come through the hole far enough this may be remedied by placing the applicator on the tag and applying more pressure. If the spike has not come through the hole at all, the point of the tag may have bent up inside the flesh of the flipper. The tag needs to be removed. The best option for the turtle is to straighten the tag and angle the tag to remove easily. Select another tag and apply it in the same hole of the first tag. Note that for flatback turtles, occasionally, blood will drip or flow from the hole where the tag was removed. Apply pressure to this wound until the new tag can be re-inserted. Record the number of the bent tag and the new tag that was successfully applied.

(k) Always retain any tags damaged during use and return them to the department officer responsible for dispensing and administering flipper tags via your coordinator.

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.

(l) Repeat on the right front flipper for all species except flatback turtles.

(m) The tagger should call the tag number and position clearly and distinctly for the recorder who must repeat the number and position back clearly and record it neatly on the datasheet.

(n) If an animal is injured during handling/tagging, treat any superficial wounds with a topical antiseptic (e.g., Betadine®) and record the injury on the datasheet.

(o) All re-migrant turtles, except flatbacks, should carry a minimum of two securely fixed tags when released. The main purpose of double tagging is to help in understanding the rates at which tags may be lost from turtles. Flipper tag loss in flatbacks has been found to be too high to be a reliable long-term identifier.

(p) Once the tags have been applied, move away from the turtle and turn your head torches off, so that the turtle can reorient itself and return to the water.

7 Competencies

A person who is competent has the knowledge, skills, and experiences that allow them to restrain and tag animals successfully, and appropriately manage adverse events as required. Department personnel, and other external parties covered by the department's AEC, undertaking turtle tagging require approval from the AEC and will need to satisfy the competency requirements (Table 1). Other groups, organisations or individuals using this SOP to guide their turtle monitoring activities are encouraged to also meet these competency requirements as well as their animal welfare legislative obligations.

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

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

Competency category	Competency requirement	Competency assessment
Knowledge	Broad understanding of the framework governing the use of animals in research and environmental studies in Western Australia	Training (e.g., DBCA Fauna Management Course or equivalent training). In applications, provide details on the course provider, course name and year.
	Understanding species biology and ecology	Personnel should be able to correctly identify the likely species to be encountered at the site(s) being studied and understand the species' biology and ecology. This knowledge may be gained through sufficient field experience and consultation of field guides and other literature.
	Understanding environmental conditions	Personnel should be aware of the environmental and seasonal conditions that may be expected on the given project and understand how these may impact animal welfare.
Animal handling and tagging skills/experience required	Experience restraining/handling/tagging marine turtles	Personnel should be experienced at hand restraint, measurement techniques, flipper and PIT tagging. This experience is best obtained under supervision of more experienced personnel. In applications, provide details on the longevity, frequency & recency of experience.

Experience managing disease risk and biosecurity in wildlife management	Personnel should be familiar with hygiene procedures. This knowledge may be gained through sufficient field experience and /or consultation of literature.

In conjunction with possessing the required understanding and knowledge of the survey technique and animal welfare requirements, a guide to the experience and skill requirements for an animal handler to be considered competent to restrain and tag marine turtles is as follows: (noting that some personnel with experience may still require initial supervision in unfamiliar locations or with species that they have not encountered previously):

- Total time in field: minimum 3 nights undertaking supervised marine turtle tagging.
- Minimum 10 marine turtles successfully tagged (for each flipper and PIT tagging technique).
- Recency of time in field: within the past 5 years.

Additional experience is required for personnel acting as a team leader. Team leaders must have undertaken at least three intensive tagging field trips and be signed off by the Chief Investigator as competent.

8 Approvals

In Western Australia any person using animals for scientific purposes must be covered by a licence issued under the *Animal Welfare Act 2002*, which is administered by the Department of Primary Industries and Regional Development.

Projects involving wildlife may require a licence/authorisation under the *Biodiversity Conservation Act 2016* (examples below).

- Fauna taking (scientific or other purposes) licence (Reg 25)
- Fauna taking (biological assessment) licence (Reg 27)
- Fauna taking (relocation) licence (Reg 28)
- Section 40 Ministerial Authorisation to take or disturb threatened species.

Personnel should consult the department's Wildlife Licensing Section for further guidance. It is your responsibility to ensure you comply with the requirements of all applicable legislation.

9 Occupational Health and Safety

The following departmental SOPs for wildlife survey and monitoring activities are relevant to occupational health and safety:

- SOP *Managing Disease Risk and Biosecurity in Wildlife Management*
- SOP *Hand Restraint of Wildlife*

Departmental personnel, contractors and volunteers have duties and responsibilities under the *Occupational Safety and Health Act 1984* and Occupational Safety and Health Regulations 1996 to ensure the health and safety of all involved. Fieldwork is to be

undertaken in line with the department's corporate guidelines, policies and standard operating procedures, including but not limited to, risk management and job safety analyses. Further information can be found at https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/SOPs.aspx

If department personnel or volunteers are injured, please refer to the departmental Health, Safety and Wellbeing Section's 'Reporting Hazards, Near-misses and Incidents' intranet page, which can be found at https://dpaw.sharepoint.com/Divisions/corporate/people-services/HS/SitePages/Reporting-Hazards,-Near-Misses-and-Incidents.aspx

10 Further Reading

The following SOPs have been mentioned in this advice, and it is recommended that they are consulted when proposing to tag marine turtles:

- Department SOP *Managing Disease Risk and Biosecurity in Wildlife Management*
- Department SOP *First Aid for Animals*
- Department SOP *Euthanasia of Animals Under Field Conditions*

National Health and Medical Research Council (2013) *Australian code for the care and use of animals for scientific purposes*, 8th edition. Canberra: National Health and Medical Research Council.

11 References

Balazs, G.H. (1999). Factors to consider in the tagging of sea turtles. In Eckert, K.L., Bjorndal, K.A., Abreu-Grobois F.A. and Donnelly, M (Eds.) *Research and Management Techniques for the Conservation of Marine Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Pritchard, P.C.H. and Mortimer, J.A. (1999). Taxonomy, External Morphology, and Species Identification. Pages 21-38 in Eckert, K.L., Bjorndal, K.A., Abreu-Grobois, F.A. and Donnelly, M. (Eds.) *Research and Management Techniques for the Conservation of Sea Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

Speirs, M. (Ed). (2006). *Protocol for the Department of Environment and Conservation marine turtle flipper tagging programs*. Perth, WA: Pendoley Environmental Pty Ltd.

12 Glossary of Terms

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.

Carapace: The dorsal (back, upper) convex part of the shell structure of a turtle or tortoise.

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 return address on the underside.

PIT Tag: An internally placed passive implant 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.

Scute: A turtle's scute is a bony external plate that forms part of a turtle's shell. Multiple scutes form the hard outer layer of the carapace. Scutes are made of keratin. Depending on the turtle species, the number and pattern of scutes may vary.

Supracaudal scutes: pair of marginal scutes located at the rearend of the turtle's carapace (i.e. above the tail).

Appendix I: TURTLE TAGGING DATASHEET

Location/Beach _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Coordinates Lat - _ _ . _ _ _ _ _ Lon _ _ _ . _ _ _ _ _ WGS 84

Calendar date _ _ / _ _ / 20_ _

Time _ _ : _ _ 24HR

Species

[Flatback] [Hawksbill]

[Loggerh.] [Green]

[Ol. Ridley] [Unsure]

Data captured by _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Sex [_] Female [_] Male [_] Unsure

FLIPPER Tag(s) Does turtle have old FLIPPER tag(s) ? [_] yes [_] no [_] did not check

	Tag number	New tag?	Scale	Barnacles?	Securely fixed?	Tag Scars?
LEFT	☐☐☐☐☐☐☐	[Y] [N]	[1] [2] [3]	[Y] [N]	[Y] [N]	[Y] [N]
	☐☐☐☐☐☐☐	[Y] [N]	[1] [2] [3]	[Y] [N]	[Y] [N]	[Y] [N]
RIGHT	☐☐☐☐☐☐☐	[Y] [N]	[1] [2] [3]	[Y] [N]	[Y] [N]	[Y] [N]
	☐☐☐☐☐☐☐	[Y] [N]	[1] [2] [3]	[Y] [N]	[Y] [N]	[Y] [N]

PIT tag present? [_] yes [_] no [_] did not check

New tag?

Left PIT tag ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ [Y] [N]

Right PIT tag ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ [Y] [N]

Left PIT tag sticker here

Right PIT tag sticker here

Tagged by _____ _____

CCLmin _ _ _ _ mm CCLmax _ _ _ _ mm Measured by _____ _____

CCWidth _ _ _ _ mm Weight _ _ _ _ kg

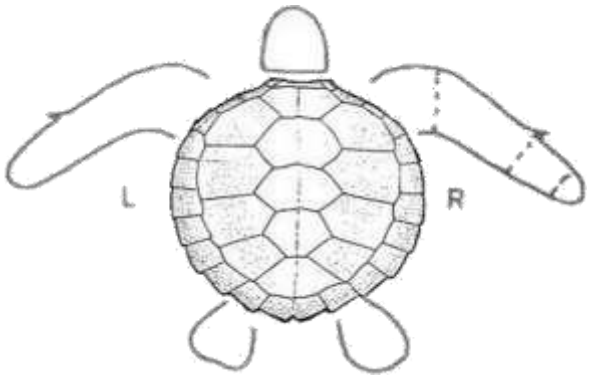
Was the nesting process interrupted? [_] yes [_] no Cause: _ _ _ _ _ _ _ _ Did turtle lay?

[_] Yes, saw eggs [_]Possible nest, didn't see eggs [_] No nest [_] Uncertain [_] Didn't check

Does turtle have damage/distinguishing features?
[_] yes [_] no [_] did not check

If yes - draw any damage on diagram

Description of damage:



Biopsy no _ _ _ _ _ _ _ _

Comments:

Did you take photos? [Y] [N] (photograph datasheet) Other sample(s)/tag(s):

Type: _ _ _ _ _ _ _ _ no: _ _ _ _ _ taken by: _ _ _ _ _ _ _

Type: _ _ _ _ _ _ _ _ no: _ _ _ _ _ taken by: _ _ _ _ _ _ _

Dud Tags: