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BEST HANDLING AND RELEASE PRACTICES FOR SEA TURTLES CAPTURED IN IATTC FISHERIES

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This document was prepared in response to a potential update of Resolution C-19-04 that also included a request for best handling and release practice guidelines (BHRP). This document has undergone review and consultation with CPCs and external experts identified by CPCs in response to Memorandum 0601-410.

CONTENTS

SUMMARY

Reducing mortality of incidentally captured sea turtles in tuna fisheries is a conservation priority. Best handling and release practices (BHRP) offer an effective and low-cost solution to improve post-release survival (PRS) of animals, but their success depends on fisher training, outreach, and the practicality of implementation. This document supports the development and refinement of existing BHRP guidelines for sea turtles under the Inter-American Tropical Tuna Commission (IATTC), in accordance with Resolutions C-04-07 and C-19-04, and the FAO Code of Conduct for Responsible Fisheries. Building on mandates from the Ecosystems and Bycatch Working Group (EBWG-2), SAC-15, and inputs from CPCs in response to Memorandum 0601-410, this draft consolidates national guidelines, scientific literature, expert feedback, and industry perspectives. It identifies harmful practices, highlights gear-specific considerations, and offers improved recommendations for purse seine, longline, and gillnet fisheries.

1. BACKGROUND

One of the most effective and cost-efficient ways of reducing mortality to incidentally caught vulnerable[1] species is to ensure that fishing fleets adopt and utilize best handling and release practices (BHRP) to minimize harm and improve post-release survival (PRS) rates. BHRP are usually common-sense and may only require small behavioral changes that fishers can employ with measurable improvements in survival rates. But efficacy and implementation are dependent on education, training and outreach capacity to ensure fishers are aware of both the adopted practices and those that should be avoided when releasing non-target vulnerable species. Proper handling techniques, particularly for sea turtles, can significantly enhance survival outcomes for discarded animals (see review in EB-01-01) because they are often alive when the gear is retrieved across fishing sectors (Andraka et al. 2013, EB-03-01) .

In line with the mandates of the Antigua Convention and the FAO Code of Conduct for Responsible Fisheries, the Inter-American Tropical Tuna Commission (IATTC) has adopted several resolutions to mitigate the impacts of tuna fisheries on sea turtles, with Resolutions C-04-07 and C-19-04 remaining active to date, and containing content relevant to BHRP. Among other requirements, Resolution C-19-04 requires IATTC Members and Cooperating Non-Members (CPCs) to:

1.a. Require owners/operators/vessel crew on vessels targeting species covered by the Convention to promptly release, in a manner that causes the least harm to the extent practicable, all sea turtles, without compromising the safety of any persons.

With specific requirements for both purse seine and longline fishing vessels to:

'carry on board, and employ when appropriate, safe-handling tools for the release of sea turtles (e.g. dip nets)' and to '*take all reasonable steps, as appropriate, to ensure the safe release of any incidentally-caught sea turtles by following handling and release guidelines in the Appendix, and consistent with the FAO "Best practices for sea turtle handling and release."* '

Recommendations specific to BHRP guidelines and sea turtles also came from the 2nd Ecosytems and Bycatch Working Group (EBWG) in 2024 when the following was requested:

'A second circle hook workshop be conducted that will fulfill the mandate of paragraph 3(d)(i) of Res. C-19-04.' And that *'the workshop include development of a third mitigation measure as described in Paragraph 3(d)(iii) of C-19-04 for small coastal multi-species vessel fleets as well as best handling and release practices'*

The second circle hook workshop took place from April 28-30, 2025 and a background document with a section focused on improving the BHRP guidelines for the shallow-set longline fisheries was posted on the meeting website (HKS-02-01). Because the BHRP guidelines available in C-19-04 for longline fisheries was under review and potential updating, this document is meant to support this effort for all fisheries under the IATTC purview, advancing the workplan towards BHRP (EB-02-03) adoption for all vulnerable taxa presented at, and endorsed by, the EBWG-2 in 2024.

[1] Unless specified otherwise, including but not limited to citations to vulnerability assessments and any qualitative/quantitative scores (e.g. BYC-10 INF-B; SAC-13-11), the staff's definition of "vulnerable species" refers to the species that, in the *sensu latu*, and due to their low-productivity and life-history traits (i.e. K species in r/K selection theory), are more vulnerable to the impacts of fisheries and other anthropogenic activities on these species or their habitat and ecosystem. This includes marine mammals, seabirds, sea turtles and elasmobranchs.

Further pursuant to the development and adoption of BHRP for vulnerable taxa the SAC-15 requested,

'That a program of dialogue be established between scientific staff, managers, fleet managers, and captains of the tuna fleets of the CPCs, with respect to: … (b) Implementation of new methods on best practices for release of bycatch species…'.

Following these discussions, in November 2024, the IATTC Secretariat issued Memorandum 0601-410, inviting CPCs to contribute to the development of comprehensive BHRP guidelines by providing:

1. Existing national regulations or guidelines on BHRP for sea turtles, sharks, seabirds, and rays,
2. Data on post-release fate and survivability of these species,
3. Subject matter experts for technical input,
4. Industry representatives to ensure that BHRP guidelines are both effective and practical for fisheries operations.

Several CPCs—including Canada, Chile, China, Costa Rica, El Salvador, the European Union, France, Mexico, and Peru—submitted content and identified subject matter experts (SME) and industry personnel to assist in this process. The CPC content has been synthesized and integrated into this document to update and improve the BHRP guidelines currently available in the Appendix of Resolution C-19-04. The BHRP guidelines in this document also integrates; the *2009 FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations;* updated published scientific evidence identifying both beneficial and harmful practices; the results of consultation with wildlife veterinarians specializing in sea turtle interactions in fisheries; and utilizes industry perspectives to generate the present sea turtle BHRP guidelines for purse seine, longline and gillnet fisheries under the IATTC purview. The Appendix of this document also contains the BHRP guidelines from C-19-04 Annex 1, the FAO (2009) guidelines and BHRP tool lists to enable side-by-side comparison and facilitate the identification of key differences and consistencies across guidelines, as the Commission considers updating the guidance in the Resolution.

This document follows the framework for the generation and implementation of BHRP guidelines for all vulnerable species presented in EB-02-02 and endorsed by the EBWG-2. Importantly, practices that are known to be deleterious to PRS are identified and listed in the 'do not' category for each fishing gear below, as recommended by SAC-14. This document has been circulated for review by CPCs, industry stakeholders, and experts. Additionally, these guidelines were partly discussed during the Second Circle Hook and Sea Turtle Bycatch Mitigation Workshop, with a particular focus on their application in shallow-set longline fisheries. This final version, incorporating all reviews, feedback and any recommendations made during the Second Circle Hook Workshop, will be presented to the EBWG-3.

2. DRAFT BEST HANDLING AND RELEASE PRACTICE GUIDELINES FOR SEA TURTLES

Effective implementation of BHRP depends not only on the availability of clear guidelines, but also on adequate training and outreach that ensures fishers understand both the recommended practices and the biological and physiological rationale behind them. For sea turtles in particular, appropriate handling is critical, as many injuries that lead to mortality occur not during capture, but during the retrieval, onboard handling, or gear removal processes.

Fishers must be made aware of several important considerations before interacting with sea turtles. Notably, the bones and ligaments in a sea turtle's flippers are fragile and not designed to support the animal's weight out of water. Lifting or maneuvering turtles by their flippers can result in severe injury. Therefore, sea turtles should never be handled by their flippers or flippers. When gear must be removed on board, the turtle's body should be fully supported—ideally by lifting the animal using the carapace (shell) or with a dip net, especially in vessels with high freeboards or when the animal is too heavy to be

safely lifted by hand.

In addition, sea turtles are inquisitive and highly prone to entanglement in a wide range of gear types, including nets, buoys, derelict or discarded fishing gear (e.g. hook and line, gillnets), and rarely, fish aggregating devices (FADs). Entanglement presents multiple risks, the most immediate being drowning, as sea turtles are air-breathing animals. Other consequences include infection around the entanglement location, disfigurement, or even amputation of limbs. Particularly harmful is the ingestion of trailing gear left on hooked or entangled turtles, which can lead to internal injuries such as intestinal plication and eventual death. It is therefore essential to remove as much trailing gear as possible from all bycaught turtles before release to give them the best chances to survive post release.

Moreover, some turtles may be found in an exhausted or comatose state. These individuals require immediate resuscitation and sufficient recovery time on board to prevent post release drowning. Resuscitation and release procedures—applicable across all gear types—are provided in Section 2.4, "All Fisheries," of this document.

Finally, the development and refinement of BHRP must be treated as an ongoing, iterative process. As new scientific evidence emerges and implementation experience grows, updates may be required to improve PRS outcomes and/or to refine practicality and safety of the adopted procedures. It is therefore recommended that BHRP guidelines be periodically reviewed for effectiveness, operational feasibility and safety, as outlined in the BHRP Workplan (EB-02-02).

2.1. Purse Seine Fisheries

Resolution C-19-04 Paragraph 2.b. requires:

> *.. in the event a sea turtle is sighted in a purse seine net, that owners/operators/vessel crew of purse seine vessels take all reasonable steps, as appropriate, to ensure its safe release by following handling and release guidelines in the Appendix 1, and consistent with the "Best practices for sea turtle handling and release" of the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations (2009)*

For purse seine fisheries, the FAO "Best practices for sea turtle handling and release" guidelines (FAO 2009) states:

> *The following specific measures are recommended in cases when a sea turtle is caught (1) whenever a sea turtle is sighted in the purse seine, all reasonable efforts should be made to rescue the turtle before it becomes entangled in the net, including, if necessary, the deployment of a speedboat; (2) If a turtle is entangled in the net, hauling should stop as soon as the turtle comes out of the water and should not start again until the turtle has been disentangled and released; and (3) if a turtle is brought aboard the vessel, all appropriate efforts to assist in the recovery of the turtle should be made before returning it to the water.*

The updated BHRP recommendations below integrates both the text from FAO (2009) and Resolution C-19-04 Annex 1. Because in purse seine fisheries sea turtles may be encountered at different stages of the fishing operation, where they may be entangled in a drifting FAD (rarely) or other derelict fishing gear, they may be seen free swimming while encircled by the purse seine net, they may come up entangled in the purse seine during net hauling or they can be brought up with the catch via the brailing operations, the draft guidelines below follow the stages of the purse seine fishing operation. Regardless of when sea turtles are first detected they may require time on the vessel to rest and recover (resuscitation). The resuscitation and release guidelines are applicable across fisheries, so these instructions are provided in the 'All Fisheries' section (2.4). Section 2.4 also contains practices that must be avoided (e.g., handling sea turtles by the flippers, placing them upside down).

2.1.1. Entangled in FADs

FAD designs improved in 2015 (C-16-01) and 2025 (C-23-04) to reduce, and even eliminate, entanglement in drifting FADs. Therefore, sea turtles are almost never observed entangled in FADs and this is expected to decrease to zero in the region. However, in the rare event that a sea turtle is observed entangled in a FAD, they must be rescued/released as required by Resolution C-19-04 which states, in paragraph 2:

c. Require owners/operators/vessel crew of purse seine vessels to promptly release unharmed, to the extent practicable, all sea turtles observed entangled in fish-aggregating devices (FADs).

If a sea turtle is seen entangled in a drifting FAD-

Do:

- Endeavor to free the sea turtle from the FAD. This may require purse seine vessels to launch a small boat or speed boat to facilitate the rescue (as recommended by the FAO (2009) guidelines).
- Fishers should carefully cut any entangling gear, netting, or other fishing gears off the animal and carefully return them to the sea, supporting the weight of the animal from the carapace (not manipulating the sea turtle using the flippers).
- If the sea turtle is comatose, it should be brought aboard the purse seine vessel for resuscitation (see section 2.4).

Do not:

- Maneuver or manipulate sea turtles by the flippers, head or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

2.1.2. Sea turtles observed encircled by the purse seine

If sea turtles are seen swimming inside the net post encirclement, C-19-04 Appendix 1.a. recommends,

> *"whenever a sea turtle is sighted in the net, all reasonable efforts should be made to rescue the turtle before it becomes entangled in the net."*

The FAO guidelines further state that these efforts may *include, 'if necessary, the deployment of a speedboat'.*

Thus, the updated recommended language for these scenarios is:

If sea turtles are sighted in the net-

Do:

- All reasonable efforts should be made to facilitate the rescue and release of encircled sea turtles prior to them becoming entangled in the net and to sacking up, including if necessary, launching small boats[2].
- If the sea turtle is comatose, it should be brought aboard the purse seine vessel for resuscitation

[2] This text is taken directly from Resolution C-19-04. The conservation benefits of this provision may be should be reviewed however, because it has been reported during skipper workshops that sea turtles often actively evade rescue, diving deeper into the net and consequently become entangled deeper in the net, rendering this action potentially more dangerous for their survival (Pers comm J. Murua).

(see section 2.4).

Do not:

- Maneuver or manipulate sea turtles by the flippers, head or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

2.1.3. Sea turtles entangled in the net during haul back

Some sea turtles may become entangled in the net during retrieval. These individuals are almost always alive at the vessel, and over 90% are released alive (EB-02-01). Although, it is possible that a turtle lifted out of the water while entangled in the net could fall out of the net and be injured or killed by passing through the power block (FAO 2009) thus, the following guidance derived from C-19-04 Appendix 1 should be maintained:

> *b. If a turtle is entangled during net roll, the net should be hauled over the turntable to a height of about 2 meters, the main boom should be moved to starboard or to port (depending on the vessel's direction) and the net should be rolled back, so that the crew can release the turtle from the netting as soon as possible, and return it to the sea over the starboard or port side if it is active. Net roll should not start again until the turtle has been disentangled and released.*
>
> *c. If, in spite of the measures taken under paragraphs a and b of this section, a sea turtle is accidentally brought on board the vessel and is alive and active, or dead, the sea turtle should be released as quickly as practicable.*
>
> *d. If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (section 2.4).*

In addition, a ban on rolling sea turtles through the power block should be considered, as this is a harmful and deadly practice.

Thus, the updated recommended language for these scenarios is:

If sea turtles become entangled in the net during net haul-

Do:

- If a turtle is entangled during net roll, the net should be hauled over the turntable to a height of about 2 meters, the main boom should be moved to starboard or to port (depending on the vessel's direction) and the net should be rolled back, so that the crew can release the turtle from the netting as soon as possible, and return it to the sea over the starboard or port side if it is active.
- If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (section 2.4).
- Net roll should not start again until the turtle has been disentangled and released.
- Release the sea turtle as soon as possible according to the guidelines in section 2.4.2

Do not:

- Allow sea turtles to be rolled through the power block.

- Manipulate or maneuver sea turtles with the flippers, head, neck or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

2.1.4. Sea turtles brought onboard via brailing

The guidance derived from C-19-04 Appendix 1 c and d (listed in 2.1.3 above) is also applicable in these situations, when sea turtles are brailed onboard, and should be maintained. In addition, it is essential that sea turtles are sorted from the catch on the main working deck and do not go down the hatch to the wet/well decks to reduce injury and mortality.

If sea turtles are brought onboard during brailing operations

Do:

- Ensure sea turtles are sorted from the catch on the main/working deck.
- If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (section 2.4).
- Brailing should not start again until the turtle has been released.
- Release the sea turtle as soon as possible according to the guidelines in section 2.4.2

Do not:

- Allow sea turtles to go down the hatch to the wet/well decks.
- Manipulate or maneuver sea turtles with the flippers, head, neck or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

2.1.5. Purse seine BHRP tools:

- Net for lifting and lowering sea turtles to and from the small/speed/work boats.
- Brail or other device for lifting and lowering sea turtles to and from the purse seine vessel.
- Line clippers capable of cutting through any of the netting that may entangle a sea turtle.
- Old tire, block or similar object for elevating the tail of sea turtles during resuscitation (see section 2.4.1 below).
- Towel for keeping sea turtles shaded and moist during resuscitation.

2.2. Longline Fisheries

If vessels cannot safely bring the turtle on board (either the animal is too large, there is no net or the vessel free board is too high to bring turtles up manually), fishers must ensure that the line is cut at the hook at the mouth and this is advised over removing the hook (Parga 2012; Barria and Valerio in press; Andraka and Parga pers comm). Additionally, if hooks have been ingested and are not visible, hook removal is not recommended. There are several structures in the esophagus (gullet) of a sea turtle that are fragile, are highly vascularized, and severe damage to the area is likely during removal of ingested hooks.

Poor handling practices can also lead to or increase the severity of injuries, mostly occurring when fishers retrieve the animals towards the vessel, haul the animals on board without using a net (i.e. by the line and/or by the flippers), or during gear removal (see Table 7). If the operation is not conducted in a careful way, tension on the line can embed the hook deeper and cause extensive lesions and even long tears at the point where it is lodged (Parga 2012). Animal handling and gear removal all carry different risks to the post release condition of the animals, and they vary across hook types (see the review in Table 7; Stacy & Parga 2024). Thus, fishers must be made aware of the risks present across all scenarios and informed on the decision criteria for when to bring an animal on board or when to leave it in the water and when to remove a hook or when it should be left in place.

Animals that are in good condition at the vessel and handled in the appropriate manner, with all gear removed and no internal injuries, have demonstrated high PRS rates (100%) for longline fisheries Swimmer et al. 2006).

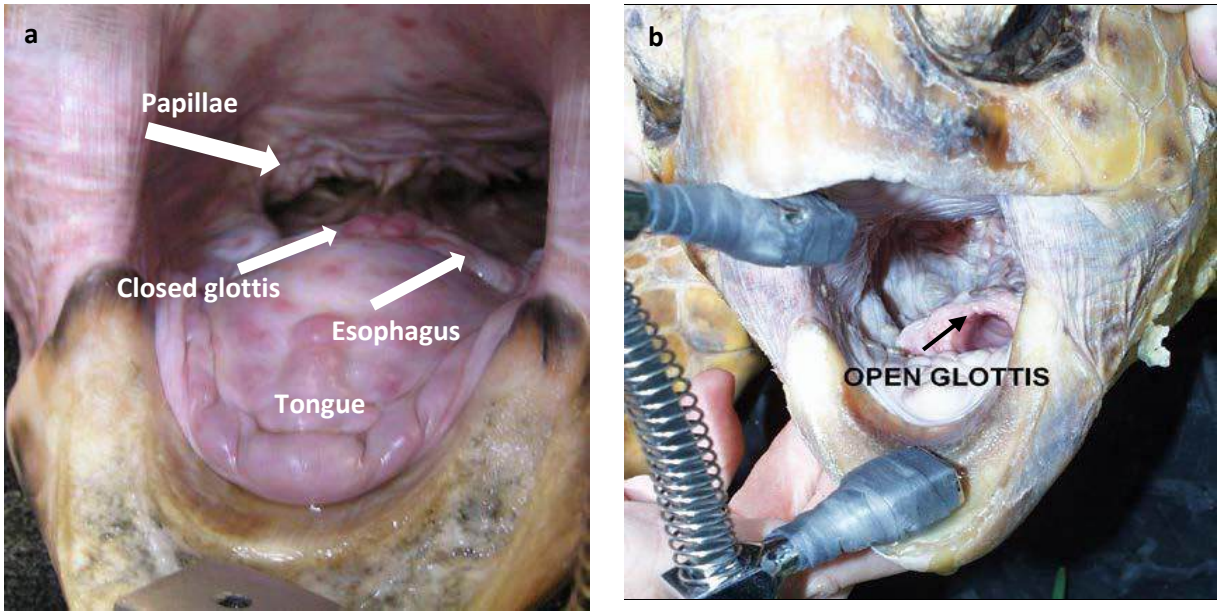

FIGURE 1 a and b. Sea turtle oral cavity anatomy (a) closed glottis (entrance into the trachea or windpipe), tongue, esophagus (gullet) and papillae; (b) open glottis (Taken from Stokes and Bergmann (eds) 2019. NMFS/ Southeast Fishery Science Center photos).

FIGURA 1 a y b. Anatomía de la cavidad oral de las tortugas marinas: (a) glotis cerrada (entrada a la tráquea), lengua, esófago (garganta) y papilas; (b) glotis abierta (Tomada de Stokes y Bergmann (eds) 2019. Fotos del NMFS/ Centro de Ciencias Pesqueras del Sudeste).

However, hook position, trailing gear and improper handling effects can significantly reduce PRS rates of sea turtles, where animals that are hooked deeper in the esophagus or gut often have higher mortality rates (34-65%) than those hooked in the upper esophagus or mouth (8-18%) (Casale et al. 2008; Chaloupka et al. 2004; Sasso & Epperly 2007; Swimmer et al. 2014). The highest probability of acute mortality is believed to occur when hooks are ingested (as often occurs with J hooks) and puncture the stomach, lower esophagus, heart, or lung. Moreover, lines left trailing on embedded hooks are especially dangerous and can kill or disable turtles weeks to months after release. Data from stranding centers and postmortem examinations (necropsies) confirm that the presence of trailing gear on hooks actually has the largest impact on PRS rates (e.g. Parga, 2012; Vannucci et al. 2024). Trailing line can entangle the flippers or

flippers leading to infection or amputation. If the line is ingested, it severely injures or obstructs the gut over time (Lucchetti and Sala 2010; Di Bello et al. 2013; Lima et al. 2022; Parga 2012; Swimmer & Gilman 2012, Vanucci et al. 2024). Even short lengths of ingested or external line can be lethal. Therefore, removing all fishing line is essential and should be done whenever possible, even when the hook cannot be removed safely (Stokes and Bergmann 2019).

Deciding whether to remove a hook is a critical step that can significantly influence a turtle's likelihood of survival. In general, externally embedded hooks should be removed carefully, avoiding excessive force that could break bones or cause excessive damage to soft tissues. Hooks located in the mouth may be removed if the point of insertion is clearly visible; however, caution is warranted due to the presence of highly vascularized and specialized anatomical structures that can lead to fatality if damaged (see Figure 1). The glottis, situated in the middle of the tongue (Fig. 1b), is a valve at the entrance of the trachea or windpipe that serves to open and close the airway during breathing and diving. Hooks lodged in this area should be left in place, as damaging the glottis could allow water or microbes to enter the lungs, potentially leading to pneumonia or death (Parga 2012; Stokes & Bergmann 2019). Similarly, hooks in the roof of the mouth may damage the eyes, nerves or even the brain leading to dead or severe debilitation. The esophagus or gullet, located at the rear of the mouth and lined with conical pointed shaped structures (papillae; Figure 1a), is relatively tough and flexible (Díaz-Figueroa & Mitchell 2006). However, only superficially embedded hooks with visible entry points should be removed, and with extreme care because rough handling or forceful removal can lethally damage the esophagus or surrounding structures or result in infection (Orós et al. 2004), or fatal bleeding (Ryder et al. 2006; Casale et al. 2008). Hooks deeply embedded in the esophagus, particularly when the entry point is not visible, should never be removed. The guidance below can assist with assessing whether removal of a hook is appropriate. In situations where removal is unsafe, monofilament cutters should be used to cut the line as close to the hook eye as possible. If part of the hook is exposed but cannot be extracted, bolt cutters may be used to remove the visible portion.

The relative risks of injury leading to mortality in sea turtle bycatch under various longline fishery scenarios were evaluated by two veterinarians specializing in wildlife and fisheries interactions (Dr. Parga and Dr. Stacy) in Table 1. They review the injuries that may occur during retrieval to the vessel, during gear removal, and when different lengths of trailing gear are left on the animals. The table shows that hooking location, handling (when hauling to vessel and during gear removal) and trailing gear are the most influential factors affecting post release survival rates, and the importance of safe handling practices in minimizing risk of severe injuries. Updated BHRP guidelines in longline fisheries as outlined below are critical to implementing safe animnal handling and gear removal as a key mitigation measure.

TABLE A.1. This table is intended as a tool to aid evaluation and discussion of different fisheries interaction scenarios involving sea turtles. It is based on veterinary opinion and compares the relative risk of circle hooks with J-hook and tuna (T) hooks associated with three key aspects of incidental capture, A) retrieval of bycaught turtles to the fishing vessel, B) removal of the gear, and C) and D) release of turtles with various amounts of gear remaining on them. A core assumption in these comparisons is that circle hooks used in longline fisheries include those of larger sizes or shapes that are less likely to be swallowed (please see footnote related to smaller circle hooks). Relative risk (column 2) is assigned a score of low (1), medium (2), or high (3) by hook type and an additional score of low, medium, high (same scale) to express degree of confidence (column 4) based on supportive evidence. A subtracting score of low (-1), medium (-2), or high (-3) is applied for any mitigation measures with an additional subtracting score applied (same scale) reflecting the degree of confidence in the efficacy of the stated mitigation measure. For example, high relative risk that is highly mitigatable with high degrees of confidence would have a total score of 0. The difference in the sum of all scores (Δ) by hook type is provided in column 9 as an absolute value indicating a lower relative risk of injury (and resulting mortality) for the hook type shown in parentheses: somewhat lower (1); moderately lower (2); much lower (3). For example, "2 (Circle)" indicates that circle hooks have a moderately lower risk for the given action/circumstance. A non-difference of zero reflects a similar degree of perceived risk based on available information. This table was prepared by Brian Stacy, DVM, PhD, DACVP (NOAA Fisheries) and Mariluz Parga, DVM, MSc (SUBMON), 2024.

TABLA A.1. Esta tabla pretende ser una herramienta para ayudar a evaluar y discutir diferentes escenarios de interacción de la pesca con tortugas marinas. Se basa en la opinión de veterinarios y compara el riesgo relativo de los anzuelos circulares con los anzuelos J y los anzuelos de atún (T) en relación con tres aspectos clave de la captura accidental: A) recuperación de las tortugas capturadas incidentalmente hacia el buque pesquero, B) retirada de las artes de pesca, C) y D) liberación de tortugas con diversas cantidades de arte de pesca en ellas. Un supuesto básico en estas comparaciones es que los anzuelos circulares utilizados en la pesquería palangrera incluyen los de mayor tamaño o forma, que tienen menos probabilidades de ser ingeridos (ver la nota a pie de página relativa a los anzuelos circulares más pequeños). Al riesgo relativo (columna 2) se le asigna una puntuación de bajo (1), medio (2) o alto (3) por tipo de anzuelo y una puntuación adicional de bajo, medio, alto (misma escala) para expresar el grado de confianza (columna 4) basado en pruebas de respaldo. Se aplica una puntuación de sustracción baja (-1), media (-2) o alta (-3) para cualquier medida de mitigación con una puntuación de sustracción adicional aplicada (misma escala) que refleja el grado de confianza en la eficacia de la medida de mitigación. Por ejemplo, un riesgo relativo alto que es altamente mitigable con altos grados de confianza tendría una puntuación total de 0. La diferencia en la suma de todas las puntuaciones (Δ) por tipo de anzuelo se proporciona en la columna 9 como un valor absoluto que indica un menor riesgo relativo de lesión (y mortalidad resultante) para el tipo de anzuelo mostrado entre paréntesis: algo menor (1); moderadamente menor (2); mucho menor (3). Por ejemplo, "2 (Circular)" indica que los anzuelos circulares tienen un riesgo moderadamente inferior para la acción/circunstancia dada. Una no diferencia de cero refleja un grado similar de riesgo percibido basado en la información disponible. Preparado por Brian Stacy, DVM, PhD, DACVP (NOAA Fisheries) y Mariluz Parga, DVM, MSc (SUBMON), 2024.

1. Action/ hook type	2. Relative risk	3. Benefit/risk assessment rationale	4. Confidence in relative risk assessment	5. The degree to which risk is affected by mitigation action?	6. Mitigation assessment rationale	7. Confidence in mitigation efficacy	8. Life stage / taxa considerations	9. Score (Δ)
A. Retrieval to boat (injury primarily results from trauma caused by line tension and penetration or laceration of anatomical structures surrounding the hook location)								
Circle hook	Low	Hook locations involving the oral cavity[1] pose less risk of fatal injury because of relative resiliency of the associated anatomy.	High. Injury resulting from swallowed hooks under tension well-evidenced from necropsy data (e.g., from recreational fishing interactions).	Low (Safe handling)	Some benefit, but safety during retrieval is inherent to hook location.	High. Measure doesn't rely on additional mitigation.	Risks higher for larger, heavier turtles. Less disparity in risk between hook types for foul-hooked interactions (e.g., leatherbacks).	2 (Circle)[1]
J-hook	High	Greater risk of penetration or laceration of blood vessels or respiratory tract or major trauma to esophagus / stomach.		High (Safe handling)	Can reduce injurious actions, such as lifting animals by line, etc.	Low. Efficacy of implementation difficult to confirm, especially without concurrent robust observer programs.		
T-hook	High	Same as for J-hooks.		High (Safe handling)	Same as for J-hooks.	Low. Same as for J-hooks		
B. Gear removal – complete removal of both hook and line (injury primarily results from trauma caused by penetration or laceration of anatomical structures surrounding the hook location)								
Circle hook	Medium	Hooks that are not swallowed are more accessible and easier to remove without trauma to delicate or vital anatomy, but can injure the mouth or upper airway.	High. Injury resulting from traumatic removal of swallowed hooks well-evidenced from necropsy data (e.g.,	Medium (Safe handling)	Larger hooks are more difficult to cut and remove without injury, even with instruction.	Low· Efficacy of implementation difficult to confirm, especially without concurrent robust observer programs.	Less disparity in risk between hook types for foul-hooked interactions (e.g., leatherbacks).	0[2] (None) 1[3] (Circle)
J-hook	High	Greater risk of penetration or laceration of blood vessels or		High (Safe handling)	Improved safe handling can allow effective removal of non-			

1. Action/ hook type	2. Relative risk	3. Benefit/risk assessment rationale	4. Confidence in relative risk assessment	5. The degree to which risk is affected by mitigation action?	6. Mitigation assessment rationale	7. Confidence in mitigation efficacy	8. Life stage / taxa considerations	9. Score (Δ)
		respiratory tract or major trauma to esophagus / stomach during removal.	from recreational fishing interactions.		swallowed gear and help avoid further injury by swallowed gear.			
T-hook	High	Same as for J-hooks.		Medium (Safe handling)	Mitigation lower due to greater difficulty in safe removal associated with greater hook thickness and larger barbs.			
C. Gear left in place – hook only or with attached line ≤ carapace length (ongoing trauma, secondary infection, internal encapsulation, or shedding of the hook)								
Circle hook	Medium	The rate of hook degradation, even for ferrous materials, is slower than rate of injury, infection, healing of structures of the mouth required for feeding and respiration.	Low. Hooks within the oral cavity and swallowed have substantial, but somewhat different risks that are difficult to qualify based on available data. There is minimal data on long-term fate of oral hooks left in place.	Low (Safe handling)	There is no significant mitigation for hook ± short line left in place as risk largely occurs post-release.	High. No Post-release mitigation	Low risk with both hook types for foul-hooked interactions (e.g., leatherbacks).	0[2] (None) 1[3] (Circle)
J-hook	Medium	Some published observations in hooks naturally shed from the digestive tract and observations of encapsulated hooks without fatal complication in some proportion of cases.						
T-hook	High	Higher risk based on their larger barb size and potential injury when left in place.						
D. Gear left in place – hook with line ≥ carapace length (persistent risk of entanglement and ingestion resulting in Gastro-Intestinal injury/obstruction)								
All hook types	High	Higher frequency of delayed mortality attributed to fishing line as compared to hooks.	High. No obvious difference in hook type due to greater risk attributed to fishing line.	Low (Safe handling)	There is no significant mitigation for hook with lengthy line left in place as risk largely occurs post-release.	High. No post-release mitigation	None	0 (None)

[1]Risk during retrieval to the boat is considered greater for any hooks or shapes that can be swallowed and penetrate visceral anatomy, as determined by the specific hook characteristics and morphology of the turtle species and size caught. For swallowed circle hooks, relative risk and confidence would be the same as for J- and T-hooks (score (Δ) of zero).
relative risk and confidence may be amended to "medium" and would result in a score (Δ) of zero.
[2]Circle hook vs J-hook comparison.
[3]Circle hook vs T-hook comparison

2.2.1. Recommended BHRP Guidelines for longline fisheries (also applies to all hook and line fisheries)

When a sea turtle is seen entangled in fishing gear or hooked on a line:

Do:

- Bring the vessel to a stop and slow the hauling of the gear.
- Minimize tension on the line the turtle is captured on.
- Slowly manuever the vessel towards the animal. Put the vessel in neutral once the sea turtle is brought alongside.
- If all fishing gear is going to be removed, determine whether or not the animal can safely be brought onboard. Ideally hooked sea turtles will be brought onboard to remove all fishing gear.
    - A sea turtle can 'safely' be brought on board either by using a net or other approved lifting device to support its weight or manually by supporting its weight on the carapace.
    - If a sea turtle is too large or hooked in such a manner as to preclude safe boarding without causing further damage/injury to the turtle, leave the sea turtle in the water for gear removal.
    - If sea turtles are not hooked but are entangled, cut all gear away from the animal.

Do not:

- Haul animals onboard using the line they are hooked on or entangled in.
- Haul animals onboard using their head, tail, flippers or flippers.

For sea turtles safely brought on board:

Do:

- Determine whether or not the hook should be removed and remove as much gear as possible.
- If the hook point is visible:
    - Place a piece of wood or other mouth opener carried onboard in the turtle's mouth so that it cannot bite, then proceed with inspection and hook and line removal, as appropriate.
    - If the hook's point and barb are visible, use bolt cutters to cut the point of the hook and remove the hook. If the hook point cannot be cut, depress the barb prior to backing the hook out. Or use a dehooker or pliers to back the hook out without injuring the fragile tissues (I.e. glottis and papillae) in the mouth and esophagus.
    - If the hook cannot be removed, cut all trailing gear off the hook and cut any portion of the hook that can be cut off and removed from the animal.
- If the hook is inside the mouth or has been partially swallowed but the insertion point is visible:
    - Using the tools available to open the mouth (listed below), have one crew member hold the mouth open (using the tools described below) while another crew assesses whether the hook can be removed without further injury. If the insertion point of the hook is visible and is in the tongue or esophagus and can be backed out without tearing tissue, remove the hook.
    - If the hook is deeply embedded in the esophagus, in the glottis or in the papillae do not

remove the hook. If it cannot be removed, cut as much of the hook out as possible and ensure all line has been removed from the animal.

- Return the animal to the sea as soon as possible following the resuscitation and release guidelines in section 2.4.

Do not:

- Attempt to remove an embedded hook without first determining the point of insertion.
- Remove hooks that are embedded in the glottis or deeply within the esophagus, or if the point of insertion is not visible.
- Release turtles with more than 5 cm of fishing line still attached to the hook or entangling the turtle.
- Place upside down for extended periods of time.
- Leave in the sun or exposed to the elements during resuscitation.
- Return comatose sea turtles to the sea without following the resuscitation guidelines in section 2.4.1

For sea turtles that cannot safely be brought on board and must remain in the water:

This applies to sea turtles that are too large to bring onboard and those situations when vessels are not carrying the appropriate tools to bring smaller sea turtles onboard.

Do:

- If the hook is visible:
    - If the animal is entangled and hooked, remove the hook first. Then, after the hook is removed, proceed to remove all line.
    - Use a dehooker to remove externally embedded hooks from the animal.
    - If the hook cannot be removed using a dehooker, use longhandled line cutters to cut the line as close to the hook as possible, leaving no more than 5 cm of trailing gear on the hook.
- If the hook has been swallowed and is not visible:
    - Cut the line as close to the mouth as possible – leave no more than 5 cm of trailing gear.

Do Not:

- Haul animals out of the water using the line they are hooked on or entangled in.
- Haul animals out of the water using their head, tail, flippers or flippers.
- Do not attempt to remove hooks that are within the mouth or swallowed for turtles that are not boarded.
- Do not release turtles without cutting away and removing as much line as possible/ preferably 5 cm or less.

2.2.2. Longline BHRP Tools:

The FAO (2009) Guidelines recommend that all vessels be equipped with the necessary tools to implement best handling and release practices. In alignment with this, Resolution C-19-04 mandates that CPCs require owners and operators of longline vessels to carry on board, and use as appropriate, safe-handling tools for the effective release of sea turtles (e.g., de-hookers, line cutters, and dip nets). Accordingly, when a sea turtle is hooked or entangled in longline gear, vessel operators should utilize the appropriate mitigation tools to minimize injury and enhance post-release survival. The FAO (2009) Guidelines provide a comprehensive list of equipment essential for the safe handling of sea turtles, which is included in Annex (section 6.3), along with an illustrated guide for dehooking and resuscitating turtles. To support implementation in the eastern Pacific Ocean (EPO), IATTC staff have compiled a recommended list of handling tools specific to the region's fishing fleets. These tools are categorized based on vessel freeboard height, with a distinction made at one meter. For vessels with freeboards less than one meter, manual access to the water is possible, and long-handled devices may not be necessary for gear removal. Note that the names of some types of dehookers available from manufacturers and referenced in some protocols include the term "internal." *While these dehookers may be used to remove hooks from the mouth (as described above), they are not intended to be used to remove swallowed hooks or when the point of inserion is otherwise not visible.*

Vessels with freeboard[3] of 1 meter or less must carry:

- Line clippers capable of cutting fishing line or leaders within 5 cm of the eye of an embedded hook, and
- Wire or bolt cutters capable of cutting through any of the hooks on the vessel.
- Net
- At least two of the following mouth openers and gags:
    - Block of hard wood
    - Hank of rope
    - Two rope loops covered with hose
- Old tire, block or a suitable and safe platform or surface for elevating sea turtles during hook removal and resuscitation (see section 2.4 below). The tail should be elevated above the head by 6 inches or 20 cm to allow water to drain from the lungs. Larger sea turtles may require additional elevation to facilitate water draining from the lungs.

Vessels with freeboard more than 1 meter must have the following turtle handling/dehooking gear on board:

- Long-handled line clipper capable of cutting fishing line or leaders within 5 cm of the eye of an embedded hook, or as close to the mouth as possible if the hook was ingested.
- Long-handled net (equal or greater in length from the gunwale to the waterline). The diameter of the rim and depth of the net should be large enough to fit most adult turtles and the hoop and handle should be strong enough so as not to bend or break when attempting to pull up heavy turtles.

[3] Freeboard is the distance between the vessel's deck and the sea surface.

- Long-handled dehooker (equal or greater in length from the gunwale to the waterline)
- Short-handled dehooker
- Long-nose or needle-nose pliers
- Wire or bolt cutters capable of cutting through any of the hooks on the vessel
- At least two of the following mouth openers and gags:
    - Block of hard wood
    - Hank of rope
    - Two rope loops covered with hose
- Old tire or block or a suitable and safe platform or surface for elevating the tail of sea turtles during hook removal and resuscitation (see section 2.4.1 below). The tail should be elevated above the head by 6 inches or 20 cm to allow water to drain from the lungs and to immobilize the animal. Larger sea turtles may require additional elevation to facilitate water draining from the lungs.

2.3. Gillnet Fisheries

There is growing evidence that small-scale, coastal, passive net fisheries may have the largest impact on some sea turtle populations (Gilman et al. 2010). In the Indian Ocean, the World Wildlife Fund (WWF-Pakistan) initiated a fisher-based observer program, inviting skippers of gillnet vessels to record data on the handling and releases of vulnerable species. These data revealed the challenges associated with releasing sea turtles and other vulnerable taxa captured in gillnets. During the consultation with fishers, the typical entanglement patterns were identified and the steps to disentangle these were created for sea turtles, large rays and whale sharks (Razzaque et al. 2020). The following BHRP recommendations for EPO gillnet fisheries are largely based on the recommendations developed for the Indian Ocean gillnet fishery by fishers participating in the program.

2.3.1. Recommended BHRP Guidelines for gillnet fisheries

When a sea turtle is encountered in the net

Do:

- Stop the hauling operation and determine the degree of entanglement, the turtles position in the net and the size of the individual.
    - If the animal is alive and partially entangled, lessening the tension on the rope and net may allow the animal to disentangle itself.
    - If this does not work, determine whether or not the animal can be brought onboard safely.

Sea turtle is too large and cannot be hauled on board safely

Do:

- Cut the fishing gear/ropes from mid-part of the turtle towards its head. Make sure the flippers of the turtle are also free from the fishing net/ropes.
- Support the weight of the net and the catch below the turtle during disentanglement and gear removal.
- Cut the fishing gear/lines from the turtle working from the mid-part of the shell towards its head.

Make sure the flippers are also free from the fishing net/ropes.

- Leave as much of the net and lines intact as possible and avoid cutting in a manner where the turtle may be prematurely freed with gear still remaining on it.

2.3.2. Sea turtle that can be hauled on board safely

Do:

- Manually haul the sea turtle and fishing net onto the boat carefully. Make sure the turtle is not heaved through the net hauler.
- Handle the turtle by the edges of its shell (carapace).
- Disentangle the sea turtle by cutting net/line working from the mid-part of the shell moving towards the head of sea turtle.
- Return the animal to the sea as soon as possible following the resuscitation and release guidelines in section 2.4.

Do not:

- Allow turtle to reach the mechanical net hauler.
- Handle, manipulate, maneuver or pick the sea turtle up by the head, tail, flippers or flippers.
- Place sea turtle upside down
- Leave sea turtles on deck in the sun – they must be kept shaded and moist with a wet cloth or towel

2.4. All Fisheries

The FAO guidelines for resuscitating sea turtles notes that sea turtles caught in nets, hooked in longlines or entangled in other gear may be stressed, tired and appear lifeless. If they are returned to the water before they recover, they will often drown. Turtles that appear lifeless or unresponsive are not necessarily dead but may be comatose, and can recover if allowed to do so. A comatose turtle may recover on board once its lungs have drained of water which can take up to 24 hours or longer in some cases. The steps below described the proper technique for handling and positioning turtles in a manner that encourages recovery, often referred to as resuscitation.

Sea turtles should never be placed upside down during resuscitation or to immobilize them during transport -- as they cannot breathe in this position.

To improve a turtle's chance of recovery after gear is removed, the turtle should be released in waters of a similar temperature to where it was captured, if possible. A coldstunned animal or one that was caught in waters too cold for its survival (< 60° F/16° C) would need to be released in warmer waters (Zolette and Swimmer 2019).

2.4.1. Resuscitating a sea turtle:

Do:

If a sea turtle appears dead, comatose, or otherwise inactive, take the following actions:

- Bring the animal onboard safely by supporting its weight manually on the carapace or by using a net.
- Place the turtle on its belly and elevate its hindend at least 6 inches (15 - 20 cm). Elevation of hindquarter of the sea turtle allows for water in the lungs to drain.
- Occasionally rock the turtle gently side to side by holding the outer edge of the shell and lifting

one side about 3" (~8 cm) , then alternate to the other side.

- Administer a reflex test at least once every 3 hours or until the turtle is moving. The reflex test is performed by gently touching the eye and pinching the tail of the turtle to determine if it is responsive and potentially recovering.
- Keep the turtle shaded and in warm weather over 24°C keep the turtle moist with a wet towel on the shell and flippers. In cold weather (below 10°C), keep recovering turtles in an ambient temperature above 14°C.
- Attempt resuscitation for at least 4 hours. Effort can be stopped it there are no signs of life after 24 hours on deck, or if the muscles are stiff and/or the flesh has begun to rot. If there is an eye reflex, give it more time.
- Return a revived turtle to the sea after it becomes active. Turtles that fail to revive must also be returned to the sea in the same manner as if they were alive. Turtles that appear alive or active when captured should be released as soon as it is safe to do so after fishing gear has been removed.

Do not:

- Handle, manipulate, maneuver or pick the sea turtle up by its head, tail, flippers or flippers.
- Leave recovering (resting) sea turtles exposed to the sun or elements – they must be kept shaded and moist with a wet cloth or towel
- Place turtles upside down (on its back) during resuscitation– this inhibits breathing capacity.

2.4.2. Releasing a sea turtle:

After removal of fishing gear and resuscitation (if necessary), unless national regulations require the retention of seriously injured individuals to be transported to rehabilitation centers, sea turtles shall be promptly returned to the sea. Fishers must ensure that the animal is released in the same location where it was initially captured, or at the very least in a location where the sea surface temperature is the same as in the location where it was captured. Generally, water temperatures >16° C are suitable for release. Sea turtles become lethargic or unresponse (referred to as coldstunning) in water temperatures at or below 10°C).

When a sea turtle is released into the ocean:

Do:

- Place the vessel engine in neutral gear so that the propeller is disengaged, and the vessel is stopped.
- Release the turtle away from any deployed fishing gear, at a location on the vessel closest to the water line.
- Place the animal's head at a 45-degree angle towards the water and release gently.
- Observe that the turtle is safely away from the vessel before engaging the propeller and continuing operations.

3. TRAINING

For BHRPs to serve as an effective tool for mitigating mortality of vulnerable species, they must be fully integrated into standard fishing operations. This requires not only that fishers are aware of the preferred practices, but that they are also trained in their correct application. Equally important is educating fishers on practices that are prohibited or should be avoided due to their potential to cause harm.

Several IATTC Resolutions—including C-04-05 Rev 2, C-04-07 [C], and C-19-04—emphasize the importance of education and training in BHRPs. Resolution C-04-05 Rev 2 (paragraphs 8.b. and 8.c.) directs the IATTC staff to: "*educate fishermen through information dissemination activities, including distributing informational materials and organizing seminars on, inter alia, reducing bycatches of sea turtles and safe handling of incidentally caught sea turtles to improve their survivability*."

Similarly, Resolution C-04-07 includes provisions that focus on industry education regarding proper handling techniques:

- ***C.1. Preparation and distribution of informational materials:*** *CPCs and the IATTC should continue to widely distribute materials to fishers operating in the EPO to support the safe handling of incidentally caught sea turtles and improve their survivability.*
- ***C.2. Convening meetings for fishers:*** *CPCs and the IATTC should continue and expand the organization of seminars to train fishers in appropriate handling techniques for incidentally caught sea turtles.*

In addition, Resolution C-19-04 requires that:

1.b. "*Vessel operators and/or at least one crew member on board vessels targeting species covered by the Convention, in fisheries that have reported sea turtle interactions—and particularly those without observers—must be trained in techniques for handling and releasing sea turtles to improve post-release survival."*

These provisions collectively underscore the importance of widespread, ongoing training and outreach as essential components for the successful implementation of BHRPs in IATTC-managed fisheries. To address these requirements, the IATTC staff proposes to generate standardized, official, outreach, education, and training materials. This will include the creation of infographics to accompany adopted practices and the formulation of BHRP guideline 'posters' that can be posted visibly on all vessels in areas where crew are able to review them and short videos that can be distributed to fishers directly, for all vulnerable taxa in all fisheries (where appropriate). The timeline for development of these materials is proposed to begin immediately after the adoption of official BHRP guidelines. The timeframe for content creation is estimated to be one year from BHRP guideline adoption to posting and circulation. Training of the fishing crew will need to be continuous, with updated training material created as needed. IATTC staff can support CPCs with fisher or CPC training by creating training materials and by supporting, coordinating, (co)organizing and participating in training workshops, as required. These workshops are also an excellent opportunity to learn from fishers on potential techniques and strategies for either mitigating interactions or devising new BHRPs. This activity will require dedicated funding for infographics, content creation and training workshops.

4. RECOMMENDATIONS

Currently there are no single mitigation measures that are 100% effective in eliminating sea turtle bycatch in purse seine, longline or gillnet fisheries. Therefore, on those occasions when sea turtles are captured it is important that crews are aware of, and correctly implement, the approved BHRP guidelines to improve the post release survival outcomes of sea turtle bycatch. As the guidelines available in the Annex of Resolution C-19-04 are based on the outdated FAO (2009) Best Practices document, the staff believes that

an update to the BHRP guidelines in Resolution C-19-04 is needed. This document, prepared by the IATTC staff in consultation with CPCs, wildlife veterinarians, industry personnel and external experts has compiled BHRP guidance and the required tools for safely removing sea turtles from fishing gears used under the purview of the IATTC. Therefore, the IATTC staff recommends:

Consider updating Resolution C-19-04 with the inclusion of the BHRP guidelines outlined herein (EB-03-05) for all IATTC fisheries.

Because training fishers and fisheries agents is an integral component to the effective implementation of BHRP across fleets, it is necessary to develop clear, accessible educational materials tailored to diverse audiences, including infographics, posters, and placards for display on vessels and in port facilities, as well as associated training activities. Thus, the IATTC staff believes that support to create and deliver standardized "train-the-trainer" curricula is desirable. These programs can empower regional trainers, fisheries observers, and enforcement personnel with the knowledge and tools to ensure proper training on sea turtle BHRP to fishing crews and vessel operators, further enhancing capacity building and promotes ownership and understanding of existing conservation measures. Therefore, the IATTC staff recommends that:

The Commission ensures the necessary funding to support capacity building, the development of training materials and a range of education and outreach activities (unfunded project Q.3a).

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7. APPENDIX

For ease of reference and comparison, the following relevant supporting materials have been consolidated and appended below;

6.1 Resolution C-19-04 Appendix 1. Safe Handling and Release Guidelines for Sea Turtles

6.2 FAO (2009) Guidelines to reduce sea turtle mortality in fishing operations

6.2.1 BHRP for purse seine fisheries

6.2.2 BHRP for longline fisheries

6.3 Lists of tools for BHRP

6.3.1 FAO (2009) Guidelines to reduce sea turtle mortality in fishing operations

6.3.2 United States National Oceanic and Atmospheric Administration's list of required tools for longline fishing vessels

6.4 IATTC staff recommendations for improving BHRP guidelines for fisheries under IATTC purview

7.1. Resolution C-19-04 Appendix 1. Safe Handling and Release Guidelines for Sea Turtles

1. PURSE SEINE SAFE HANDLING AND RELEASE

a. Whenever a sea turtle is sighted in the net, all reasonable efforts should be made to rescue the turtle before it becomes entangled in the net.

b. If a turtle is entangled during net roll, the net should be hauled over the turntable to a height of about 2 meters, the main boom should be moved to starboard or to port (depending on the vessel's direction) and the net should be rolled back, so that the crew can release the turtle from the netting as soon as possible, and return it to the sea over the starboard or port side if it is active. Net roll should not start again until the turtle has been disentangled and released.

c. If, in spite of the measures taken under paragraphs a and b of this section, a sea turtle is accidentally brought on board the vessel and is alive and active, or dead, the sea turtle should be released as quickly as practicable.

d. If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (paragraph 3).

2. LONGLINE SAFE HANDLING AND RELEASE

a. When practicable, and when operator or crew on board are trained, comatose sea turtles should be brought on board immediately.

b. If a sea turtle is too large or hooked in such a manner as to preclude safe boarding without causing further damage/injury to the turtle, line clippers should be used to clip the line and remove as much line as possible prior to releasing the turtle.

c. If a sea turtle is observed to be hooked or entangled by longline gear during hauling operations, the vessel operator should immediately cease hauling operations until the turtle has been removed from the longline gear or brought on board the vessel.

d. If hooked externally or hook is fully visible, hooks should be removed from sea turtles as quickly and carefully as possible. If a hook cannot be removed from a turtle (e.g., ingested or in roof of mouth), the line should be cut as close to the hook as possible.

e. Live turtles should be returned to the sea after handling: i. By putting the vessel engine in neutral gear so that the propeller is disengaged and the vessel is stopped, and releasing the turtle away from deployed gear; and
ii. Observing that the turtle is safely away from the vessel before engaging the propeller and continuing operations.
f. If the sea turtle brought aboard the vessel is comatose or inactive, resuscitation should be attempted (paragraph 3).

3. RESUSCITATION FOR A TURTLE ON BOARD

a. When handling a sea turtle, attempts should be made to hold the animal by the shell, avoiding the head and neck region, and flippers.

b. Strive to remove and/or disentangle any foreign items from the sea turtle, such as any plastic items, netting, or embedded hooks, etc.

c. Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15 cm) for a period of 4 up to 24 hours. The height of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (8 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.

d. Sea turtles being resuscitated should be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head (ensuring nostrils and mouth are clear), carapace, and flippers is the most effective method in keeping a turtle moist.

e. Sea turtles that revive and become active should be released over the stern of the boat only when fishing gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

f. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) should be returned to the water in the same manner as that for actively moving turtles.

7.2. FAO (2009)

7.2.1. Best practices for sea turtle handling and release in purse seine fisheries

If a turtle is caught, the following specific measures should be taken:
(i) Whenever a sea turtle is sighted in the purse seine, all reasonable efforts should be made to rescue the turtle before it becomes entangled in the net, including, if necessary, the deployment of a speedboat.
(ii) If a turtle is entangled in the net, hauling should stop as soon as the turtle comes out of the water and should not start again until the turtle has been disentangled and released.
(iii) If a turtle is brought aboard the vessel, all appropriate efforts to assist in the recovery of the turtle should be made before returning it to the water.

7.2.2. Best practices for sea turtle handling and release in longline fisheries

Fishers should implement best practices for the handling (including resuscitation) and release of sea turtles caught in fishing gear. They should also carry on board their vessels the equipment necessary for implementing handling and release practices.

Much progress has been made in identifying best practices for handling and releasing turtles captured in pelagic longline fisheries. Various tools and techniques are required to remove fishing gear from captured sea turtles, reduce sea turtle injury and promote post-release survival.

The United States Government protocol for handling and releasing sea turtles caught in pelagic longline gear protocols (https://www.fisheries.noaa.gov/resource/document/careful-release-protocols-sea-turtle-release-minimal-injury) is divided into three parts:
(i) Part 1: Vessel's responsibilities upon sighting a sea turtle;

(ii) Part 2: Sea turtles not boated; and

(iii) Part 3: Sea turtles boated.

The following is a summary of the United States turtle handling and release protocol.

Part 1: Vessel's responsibilities upon sighting a sea turtle

- Scan the line far ahead;
- avoid moving ahead of the mainline;
- upon sighting a turtle, slow vessel and line drum speed;
- if slow speed is not possible, stop the vessel;
- take engine out of gear;
- pull branch line slowly;
- do not use sharp objects to retrieve or control turtle;
- assess turtle's condition and size and whether it is hooked or entangled;
- there are three possible interactions: entangled but not hooked, hooked but not entangled, and hooked and entangled;
- if hooked, assess the location of the hook;
- vessel must be stopped for assessment and boating of turtle;
- turtles three feet (about 90 cm) in straight carapace length can be boated safely if sea conditions permit;
- larger turtles should be boated when conditions and equipment permit;
- if the turtle cannot be boated, follow Part 2 of the protocols;
- whenever possible, turtles should be boated and Part 3 of the protocols should be followed; and
- the vessel is responsible for the turtle's safety from the first sighting until release.

Part 2: Sea turtles not boated

- The turtle should be brought as close as possible, but it may need a short time to calm down;
- gear removal must be done quickly, however, careful removal to ensure no further injury is the top priority;
- a turtle control device or tether (a line on a pole that is looped over one flipper) can be used to help control the animal; it takes pressure off the branch line;
- long-handled line cutter is used to cut monofilament line from entangled turtles;
- monofilament cutter is used to cut line if the turtle is close to the boat;
- long-handled de-hooker for internal hooks is used to remove internal hooks from sea turtles that cannot be boated;
- long-handled de-hooker for external hooks is used to remove hooks from flippers; and
- long-handled device to pull an inverted V (a gaff or boat hook can be used for this during entanglement) is used to assist in cutting away line.

Part 3: Sea turtles boated

- It is important that the turtle is never pulled out of the water by using the branch line;
- If the turtle is small enough, a dip net can be used to carefully boat the turtle;
- For larger turtles, a hoist can be used;
- The hoist is a large basket-like device that is lowered and raised by a hydraulic crane or boom;
- While onboard, the turtle must be kept moist and in the shade, maintaining its body temperature above 60º F (15.5º C) or similar to the water temperature at capture;
- It must be isolated and immobilized on a cushioned surface; the hoist will do for larger turtles and an automobile tyre will do for smaller turtles;
- Comatose turtles should be revived before being released;
- They can be kept on deck for 24 hours without a permit for resuscitation purposes;
- A turtle kept on deck for 24 hours without sign of life may be considered dead and should be returned to the water;
- If it is uncertain whether hook removal will cause more damage, then the hook should not be removed;
- All external hooks should be removed;
- Hooks in the mouth should be removed;
- Hooks that have been swallowed should not be removed when the insertion point is not visible;
- When a hook cannot be removed, the line should be cut as close as possible to the eye of the hook;
- If part of the hook is visible, it should be cut with bolt cutters and removed;
- if the turtle is hooked internally, its mouth needs to be opened: block the nostrils, tickle the throat or cover the nostrils and apply light pressure to the front corner of the eye with one hand and firm pressure to the throat with the other;
- otherwise, use rope loops covered with protective tubing or the avian mouth speculum to open the mouth. Then use mouth gags (block of wood, canine mouth gags, hank of rope, PVC pipe couplings) to keep it open;
- to obtain a better view after the mouth is open, insert a pair of needle-nosed pliers (in the closed position) into the upper oesophagus and then open the pliers;
- use pliers, bolt cutters or short-handled de-hooker to remove internal hooks;
- use bolt cutters and pliers, or a short-handled de-hooker, to remove external hooks;
- once gear is removed and the turtle recovered, boated turtles should be released in water of similar temperature as at capture, preferably in a nonfishing area;
- release the turtle by lowering it over the aft portion of the vessel, close to the surface, when gear is not in use and the engine is in neutral; and
- the turtle's swimming behaviour and diving ability should be monitored after release and recorded in the daily logbook.

7.3. Tools for BHRP

7.3.1. The list of tools required according to the FAO (2009) Guidelines

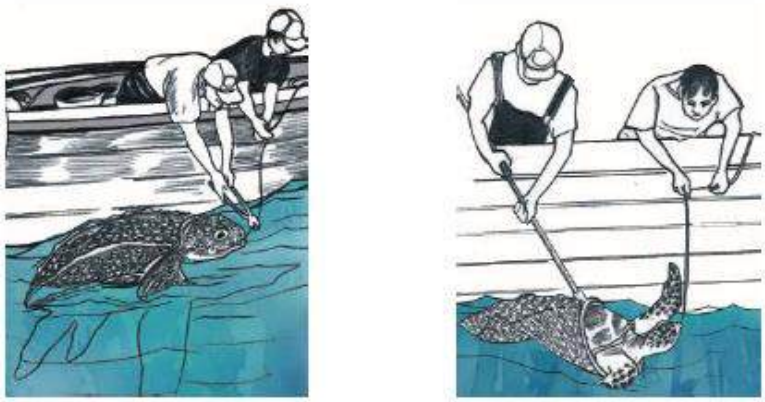
The FAO (2009) document suggests using the equipment required for Atlantic longline vessels by the Government of the United States of America. The listed tools in the FAO document includes the following:

[a] long-handled line cutter,

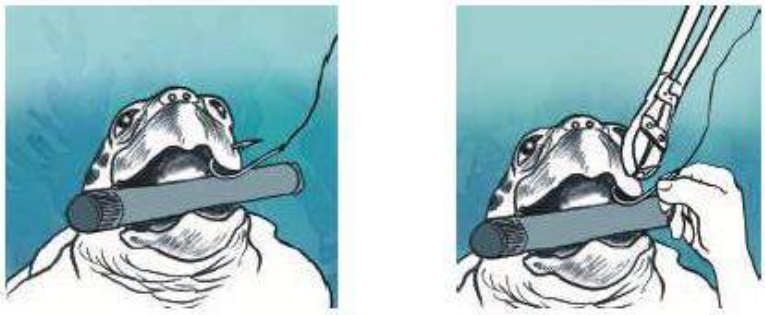
[b] long-handled de-hooker for ingested hooks,
[c] long-handled de-hooker for external hooks,
[c] long-handled device to pull an inverted V,
[d] dip net,
[e] standard automobile tyre,
[f] short-handled de-hooker for ingested hooks,
[g] short-handled de-hooker for external hooks,
[h] long-nose, needle-nose pliers,
[i] bolt cutter,
[j] monofilament line cutter, and
[k] different types of mouth openers and mouth gags (including either a block of wood or metal tube, a set of three canine mouth gags, a set of two sturdy dog chew bones, a set of two rope loops covered with hose, a hank of rope, a set of four PVC splice couplings, or a large avian oral speculum).

The list of United States Government-approved equipment for turtle handling and release can be found at https://www.fisheries.noaa.gov/resource/outreach-materials/atlantic-highly-migratory-species-safe-handling-release-and . This list has since been updated and the updated tool recommendations are provided below.

Figure 24. Best practices for (a) retrieving and (b) de-hooking turtles captured in pelagic longlines. (After Beverly, Chapman and Sokimi, 2003).



a) Retrieving a sea turtle
Assess the turtle's size, then release it or bring in on board. If the turtle is too large to bring on board, bring it as close to the boat as possible without putting too much strain on the line, then cut the line as close to the turtle as practical. If the turtle is small, use a dip net to lift the animal on board. DO NOT use a gaff and DO NOT pull on the line or grasp the eye sockets to bring the animal on board.



b) De-hooking a sea turtle
Place a piece of wood in the turtle's mouth so it cannot bite, then cut the hook or line.
If the hook's barb is visible, use bolt cutters to cut the hook in half, and remove the two parts separately.
If the hook is not visible, remove as much line as possible without pulling too hard on the line, and cut it as close to the turtle as practical.

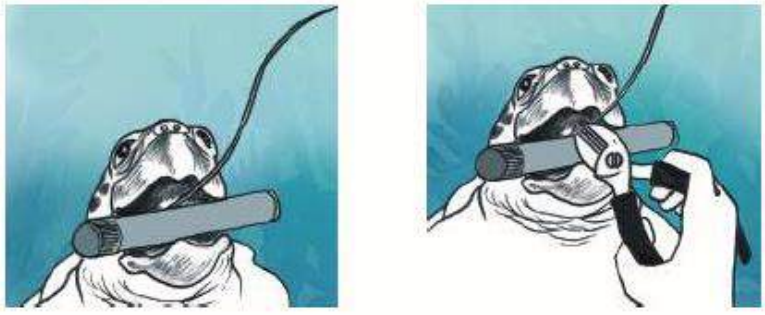


FIGURE A.1. FAO (2009), Figure 24. Illustrated guidelines for dehooking sea turtles.
FIGURA A.1. FAO (2009), Figura 24. Directrices ilustradas para el desenganche de tortugas marinas.

7.3.2. The list of tools required according to US NOAA

The list of United States Government-approved equipment for turtle handling and release:

LONGLINE REQUIRED EQUIPMENT LIST
REDUCTION OF SEA TURTLE BYCATCH AND BYCATCH MORTALITY IN THE ATLANTIC LONGLINE FISHERY

REQUIRED FOR TURTLES NOT BOATED:

A. (one) Long-handled line cutter.
B. (one) Long-handled dehooker for internal hooks.
C. (one) Long-handled dehooker for external hooks (the long-handled dehooker for internal hooks
used for Item B will also satisfy this requirement).
D. (one) Long-handled device to pull an "Inverted V" (if 6' J-style dehooker is used for Item C, it will also satisfy this requirement.

REQUIRED FOR TURTLES BOATED:

E. (one) Dip net.
F. (one) Standard automobile tire.
G. (one) Short-handled dehooker for internal hooks.
H. (one) Short-handled dehooker for removing external hooks (the short-handled dehooker for internal hooks use in Item G will also satisfy this requirement).
I. (one pair) Long-nose or needle-nose pliers.
J. (one) Bolt cutters.
K. (one) Monofilament line cutter.
L. (two) Mouth openers/mouth gags selected from the following list:
    1. Block of hard wood;
    2. A set of three (3) canine mouth gags;
    3. A set of two (2) sturdy dog chew bones;
    4. Two (2) rope loops covered with hose;
    5. A hank of rope;
    6. A set of four (4) PVC splice couplings;
    7. A large avian oral speculum.

RECOMMENDED EQUIPMENT:

M. (one) Turtle tether.
N. (one) Turtle hoist.

7.4. IATTC staff recommendations for improving BHRP guidelines for fisheries under IATTC purview

Purse seine fisheries

If a sea turtle is seen entangled in a drifting FAD

Do:

- Endeavor to free the sea turtle from the FAD. This may require purse seine vessels to launch a small boat or speed boat to facilitate the rescue (as recommended by the FAO (2009) guidelines).
- Fishers should carefully cut any entangling gear, netting, or other fishing gears off the animal and carefully return them to the sea, supporting the weight of the animal from the carapace (not manipulating the sea turtle using the flippers).
- If the sea turtle is comatose, it should be brought aboard the purse seine vessel for resuscitation (see section 2.4).

Do not:

- Maneuver or manipulate sea turtles by the flippers, head or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

If a sea turtle is observed encircled by the purse seine

Do:

- All reasonable efforts should be made to facilitate the rescue and release of encircled sea turtles prior to them becoming entangled in the net and to sacking up, including if necessary, launching small boats[4].
- If the sea turtle is comatose, it should be brought aboard the purse seine vessel for resuscitation (see section 2.4).

Do not:

- Maneuver or manipulate sea turtles by the flippers, head or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

If sea turtles become entangled in the net during net haul-

Do:

- If a turtle is entangled during net roll, the net should be hauled over the turntable to a height of about 2 meters, the main boom should be moved to starboard or to port (depending on the vessel's direction) and the net should be rolled back, so that the crew can release the turtle from the netting as soon as possible, and return it to the sea over the starboard or port side if it is

[4] This text is taken directly from Resolution C-19-04. The conservation benefits of this provision may be should be reviewed however, because it has been reported during skipper workshops that sea turtles often actively evade rescue, diving deeper into the net and consequently become entangled deeper in the net, rendering this action potentially more dangerous for their survival (Pers comm J. Murua).

active.

- If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (section 2.4).
- Net roll should not start again until the turtle has been disentangled and released.
- Release the sea turtle as soon as possible according to the guidelines in section 2.4.2

Do not:

- Allow sea turtles to be rolled through the power block.
- Manipulate or maneuver sea turtles with the flippers, head, neck or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

If sea turtles are brought onboard during brailing operations

Do:

- Ensure sea turtles are sorted from the catch on the main/working deck.
- If a turtle is brought aboard the vessel and is comatose or inactive, resuscitation should be attempted (section 2.4).
- Brailing should not start again until the turtle has been released.
- Release the sea turtle as soon as possible according to the guidelines in section 2.4.2

Do not:

- Allow sea turtles to go down the hatch to the wet/well decks.
- Manipulate or maneuver sea turtles with the flippers, head, neck or tail.
- Place turtles upside down on deck
- Leave the turtle on deck in the sun

Purse seine BHRP tools:

- Net for lifting and lowering sea turtles to and from the small/speed/work boats.
- Brail or other device for lifting and lowering sea turtles to and from the purse seine vessel.
- Line clippers capable of cutting through any of the netting that may entangle a sea turtle.
- Old tire, block or similar object for elevating the tail of sea turtles during resuscitation.
- Towel for keeping sea turtles shaded and moist during resuscitation.

Longline fisheries

When a sea turtle is seen entangled in fishing gear or hooked on a line

Do:

- Bring the vessel to a stop and slow the hauling of the gear.

- Minimize tension on the line the turtle is captured on.
- Slowly manuever the vessel towards the animal. Put the vessel in neutral once the sea turtle is brought alongside.
- If all fishing gear is going to be removed, determine whether or not the animal can safely be brought onboard. Ideally hooked sea turtles will be brought onboard to remove all fishing gear.
    - A sea turtle can 'safely' be brought on board either by using a net or other approved lifting device to support its weight or manually by supporting its weight on the carapace.
    - If a sea turtle is too large or hooked in such a manner as to preclude safe boarding without causing further damage/injury to the turtle, leave the sea turtle in the water for gear removal.
    - If sea turtles are not hooked but are entangled, cut all gear away from the animal.

Do not:

- Haul animals onboard using the line they are hooked on or entangled in.
- Haul animals onboard using their head, tail, flippers or flippers.

For sea turtles that can safely be brought on board

Do:

- Determine whether or not the hook should be removed and remove as much gear as possible.
- If the hook point is visible:
    - Place a piece of wood or other mouth opener carried onboard in the turtle's mouth so that it cannot bite, then proceed with inspection and hook and line removal, as appropriate.
    - If the hook's point and barb are visible, use bolt cutters to cut the point of the hook and remove the hook. If the hook point cannot be cut, depress the barb prior to backing the hook out. Or use a dehooker or pliers to back the hook out without injuring the fragile tissues (I.e. glottis and papillae) in the mouth and esophagus.
    - If the hook cannot be removed, cut all trailing gear off the hook and cut any portion of the hook that can be cut off and removed from the animal.
- If the hook is inside the mouth or has been partially swallowed but the insertion point is visible:
    - Using the tools available to open the mouth (listed below), have one crew member hold the mouth open (using the tools described below) while another crew assesses whether the hook can be removed without further injury. If the insertion point of the hook is visible and is in the tongue or esophagus and can be backed out without tearing tissue, remove the hook.
    - If the hook is deeply embedded in the esophagus, in the glottis or in the papillae do not remove the hook. If it cannot be removed, cut as much of the hook out as possible and ensure all line has been removed from the animal.
- Return the animal to the sea as soon as possible following the resuscitation and release guidelines in section 2.4.

Do not:

- Attempt to remove an embedded hook without first determining the point of insertion.

- Remove hooks that are embedded in the glottis or deeply within the esophagus, or if the point of insertion is not visible.
- Release turtles with more than 5 cm of fishing line still attached to the hook or entangling the turtle.
- Place upside down for extended periods of time.
- Leave in the sun or exposed to the elements during resuscitation.
- Return comatose sea turtles to the sea without following the resuscitation guidelines in section 2.4.1

For sea turtles that cannot safely be brought on board and must remain in the water

This applies to sea turtles that are too large to bring onboard and those situations when vessels are not carrying the appropriate tools to bring smaller sea turtles onboard.

Do:

- If the hook is visible:
    - If the animal is entangled and hooked, remove the hook first. Then, after the hook is removed, proceed to remove all line.
    - Use a dehooker to remove externally embedded hooks from the animal.
    - If the hook cannot be removed using a dehooker, use longhandled line cutters to cut the line as close to the hook as possible, leaving no more than 5 cm of trailing gear on the hook.
- If the hook has been swallowed and is not visible:
    - Cut the line as close to the mouth as possible – leave no more than 5 cm of trailing gear.

Do Not:

- Haul animals out of the water using the line they are hooked on or entangled in.
- Haul animals out of the water using their head, tail, flippers or flippers.
- Do not attempt to remove hooks that are within the mouth or swallowed for turtles that are not boarded.
- Do not release turtles without cutting away and removing as much line as possible, preferably 5 cm or less.

Longline BHRP Tools:

Vessels with freeboard[5] of 1 meter or less must carry:

- Line clippers capable of cutting fishing line or leaders within 5 cm of the eye of an embedded hook, and
- Wire or bolt cutters capable of cutting through any of the hooks on the vessel.
- Net
- At least two of the following mouth openers and gags:

[5] Freeboard is the distance between the vessel's deck and the sea surface.

- Block of hard wood
- Hank of rope
- Two rope loops covered with hose

- Old tire, block or a suitable and safe platform or surface for elevating sea turtles during hook removal and resuscitation (see resuscitation section). The tail should be elevated above the head by 6 inches or 20 cm to allow water to drain from the lungs. Larger sea turtles may require additional elevation to facilitate water draining from the lungs.

Vessels with freeboard more than 1 meter must have the following turtle handling/dehooking gear on board:

- Long-handled line clipper capable of cutting fishing line or leaders within 5 cm of the eye of an embedded hook, or as close to the mouth as possible if the hook was ingested.
- Long-handled net (equal or greater in length from the gunwale to the waterline). The diameter of the rim and depth of the net should be large enough to fit most adult turtles and the hoop and handle should be strong enough so as not to bend or break when attempting to pull up heavy turtles.
- Long-handled dehooker (equal or greater in length from the gunwale to the waterline)
- Short-handled dehooker
- Long-nose or needle-nose pliers
- Wire or bolt cutters capable of cutting through any of the hooks on the vessel
- At least two of the following mouth openers and gags:
    - Block of hard wood
    - Hank of rope
    - Two rope loops covered with hose
- Old tire or block or a suitable and safe platform or surface for elevating the tail of sea turtles during hook removal and resuscitation (see section 2.4.1 below). The tail should be elevated above the head by 6 inches or 20 cm to allow water to drain from the lungs and to immobilize the animal. Larger sea turtles may require additional elevation to facilitate water draining from the lungs.
- Towel

Gillnet fisheries

When a sea turtle is encountered in the net

Do:

- Stop the hauling operation and determine the degree of entanglement, the turtles position in the net and the size of the individual.
    - If the animal is alive and partially entangled, lessening the tension on the rope and net may allow the animal to disentangle itself.
    - If this does not work, determine whether or not the animal can be brought onboard safely.

Sea turtle is too large and cannot be hauled on board safely

Do:

- Cut the fishing gear/ropes from mid-part of the turtle towards its head. Make sure the flippers of the turtle are also free from the fishing net/ropes.
- Support the weight of the net and the catch below the turtle during disentanglement and gear removal.
- Cut the fishing gear/lines from the turtle working from the mid-part of the shell towards its head. Make sure the flippers are also free from the fishing net/ropes.
- Leave as much of the net and lines intact as possible and avoid cutting in a manner where the turtle may be prematurely freed with gear still remaining on it.

Sea turtle that can be hauled on board safely

Do:

- Manually haul the sea turtle and fishing net onto the boat carefully. Make sure the turtle is not heaved through the net hauler.
- Handle the turtle by the edges of its shell (carapace).
- Disentangle the sea turtle by cutting net/line working from the mid-part of the shell moving towards the head of sea turtle.
- Return the animal to the sea as soon as possible following the resuscitation and release guidelines in section 2.4.

Do not:

- Allow turtle to reach the mechanical net hauler.
- Handle, manipulate, maneuver or pick the sea turtle up by the head, tail, flippers or flippers.
- Place sea turtle upside down
- Leave sea turtles on deck in the sun – they must be kept shaded and moist with a wet cloth or towel.

Gillnet BHRP Tools:

- Long-handled line clipper capable of cutting all fishing line and netting used on the vessel.
- Long-handled net (equal or greater in length from the gunwale to the waterline). The diameter of the rim and depth of the net should be large enough to fit most adult turtles and the hoop and handle should be strong enough so as not to bend or break when attempting to pull up heavy turtles.
- At least two of the following mouth openers and gags:
    - Block of hard wood
    - Hank of rope
    - Two rope loops covered with hose
- Old tire, block or a suitable and safe platform or surface for elevating sea turtles during hook removal and resuscitation (see section 2.4 below). The tail should be elevated above the head by 6 inches or 20 cm to allow water to drain from the lungs. Larger sea turtles may require additional elevation to facilitate water draining from the lungs.
- Towel

All fisheries

Resuscitating a sea turtle:

Do:

If a sea turtle appears dead, comatose, or otherwise inactive, take the following actions:

- Bring the animal onboard safely by supporting its weight manually on the carapace or by using a net.
- Place the turtle on its belly and elevate its hindend at least 6 inches (15 - 20 cm). Elevation of hindquarter of the sea turtle allows for water in the lungs to drain.
- Occasionally rock the turtle gently side to side by holding the outer edge of the shell and lifting one side about 3" (~8 cm) , then alternate to the other side.
- Administer a reflex test at least once every 3 hours or until the turtle is moving. The reflex test is performed by gently touching the eye and pinching the tail of the turtle to determine if it is responsive and potentially recovering.
- Keep the turtle shaded and in warm weather over 24°C keep the turtle moist with a wet towel on the shell and flippers. In cold weather (below 10°C), keep recovering turtles in an ambient temperature above 14°C.
- Attempt resuscitation for at least 4 hours. Effort can be stopped it there are no signs of life after 24 hours on deck, or if the muscles are stiff and/or the flesh has begun to rot. If there is an eye reflex, give it more time.
- Return a revived turtle to the sea after it becomes active following the guidelines below. Turtles that fail to revive must also be returned to the sea in the same manner as if they were alive. Turtles that appear alive or active when captured should be released as soon as it is safe to do so after fishing gear has been removed.

Do not:

- Handle, manipulate, maneuver or pick the sea turtle up by its head, tail, or flippers.
- Leave recovering (resting) sea turtles exposed to the sun or elements – they must be kept shaded and moist with a wet cloth or towel
- Place turtles upside down (on its back) during resuscitation– this inhibits breathing capacity.

Releasing a sea turtle:

After removal of fishing gear and resuscitation (if necessary), unless national regulations require the retention of seriously injured individuals to be transported to rehabilitation centers, sea turtles shall be promptly returned to the sea. Fishers must ensure that the animal is released in the same location where it was initially captured, or at the very least in a location where the sea surface temperature is the same as in the location where it was captured. Generally, water temperatures >16° C are suitable for release. Sea turtles become lethargic or unresponse (referred to as coldstunning) in water temperatures at or below 10°C).

When a sea turtle is released into the ocean:

Do:

- Place the vessel engine in neutral gear so that the propeller is disengaged, and the vessel is

stopped.

- Release the turtle away from any deployed fishing gear, at a location on the vessel closest to the water line.
- Place the animal's head at a 45-degree angle towards the water and release gently.
- Observe that the turtle is safely away from the vessel before engaging the propeller and continuing operations.