

GWRA Global Live-Stranded and Distressed Cetacean Response Protocol

Global Whale Rescue Alliance — a Stranded No More initiative. Edition 1.0, proposed alternative to the German stranding protocol

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How to read this protocol

This protocol tells responders what to do from the first report of a whale or dolphin in trouble until the animal is back at sea and tracked, or until its natural death has been fully investigated. It rests on eleven non-negotiable principles (Part 1). Every procedure that follows has been checked against them, and each part ends with that check.

What makes it different. GWRA never euthanises. It prevents the decline that is used to justify killing by detecting animals early (Parts 2–3), intervening while they still swim (Part 4), diagnosing without capture (Parts 5, 6, 11), treating remotely and on site (Parts 12, 15), and rehabilitating at low cost wherever needed (Parts 10, 19). In the hardest cases it gives comfort care, under safeguards that stop sedation from becoming hidden euthanasia. Every animal released is tagged, every death is investigated by an independent team, and everything is published.

Structure.

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Parts 2–3	Early detection with the public, drones, thermal imaging, acoustics, AI and satellites; individual history files
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Section	Content
	sampling
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Parts 16, 17	Post-release monitoring; necropsy
Annex A	Organisation, training, ethics agreement, public and media, revision
Annex B	Evidence register and corrections log

Evidence grades. Every source is graded A (peer-reviewed) to E (concept or R&D), as set out in Annex B. Conference presentations and personal communications are kept and labelled; an unpublished finding is not necessarily a false one.

Living document. Methods change with every case and every study (Principle IX) but the principles do not.

Part 1 — Core Philosophy and the Eleven Principles

GWRA, the Global Whale Rescue Alliance founded by Stranded No More (SNM), commits to eleven principles. Every procedure in this protocol must pass all eleven, and no local law, cost or convenience can set one aside.

This protocol covers live-stranded cetaceans and free-swimming cetaceans in distress: mass strandings, single strandings, large whales, orphans, and animals far outside their range. It is offered first as the alternative to the German stranding protocol now being drafted, and then for adoption worldwide.

The principles are the fixed core. Everything else in the protocol (methods, drugs, equipment, thresholds) is a living text that changes with each case and each new study, under Principle IX.

The eleven principles

The principles below are non-negotiable. Each states what GWRA does, what it requires in the field, and what it completely rules out.

I. No euthanasia

GWRA never euthanises a stranded or distressed cetacean, and its people never take part in a killing. The model is the practice of Asian stranding networks, where euthanasia is not used at all: in Thailand stranded cetaceans are treated until they recover or die. Asked about euthanasia at the 2022 Society for Marine Mammalogy conference, Dr. Nantarika Chansue (who was an esteemed keynote speaker) answered: “In Thailand, we do not do euthanasia... we believe that to switch off life is like playing God” (Chansue 2022), and Taiwan’s network has rehabilitated 52 live-stranded cetaceans and released 15, including Kogia (Chou et al. 2024; Taiwan network, pers. comm.).

Euthanasia is avoided in two ways:

- **Prevention.** Rapid deployment, early diagnosis and treatment stop an animal from reaching the deteriorated state used to justify killing.
- **Comfort care.** In the hardest cases, pain, fear and physical stress are actively relieved until rescue or natural death. Comfort care is medicine, not just waiting and doing nothing.

Contrarily to what many like to believe, euthanasia is not a universal norm. In a 2025 survey of stranding responders in 22 countries, respondents from Sri Lanka, Germany, Cambodia, Mexico and the United Arab Emirates reported no cetacean euthanasia cases, and in Cambodia it was not an option at all (Boys et al. 2026). The ethical frame GWRA adopts is the one medicine has always used: reduce suffering while preserving life. It also takes humility about predicting another being’s future. Every judgement about an animal’s future quality of life is a human projection made with incomplete information, and that is most true of young animals, whose capacity to recover is the hardest thing to predict (SNM open letter, 12 Oct 2026).

Two further facts shape the principle:

- **Euthanasia is often not even available for large whales.** Shooting is unreliable above about 7 m of length (NRE Tasmania 2022, Vol. 4). For example, euthanising one right whale took 2 hours 2 minutes with “suboptimal” sedation (Moore 2010). In the 2026 Baltic case, the German experts themselves said there was “no reliable method that can quickly and painlessly euthanize this animal” (SNM Hope brief). A system built around euthanasia therefore abandons large whales in practice.
- **The published euthanasia literature asks how to kill, not whether to.** Methods papers on rifles, explosives and chemicals dominate (Coughran et al. 2012; Hampton et al. 2014; Harms et al. 2014), and Boys et al. (2026) themselves note that research “has predominantly focused on euthanasia methods and technical guidance”. Not one source in that literature describes a stranded cetacean that was fully diagnosed, found to have a treatable condition, treated, and failed treatment before euthanasia was recommended (SNM, Euthanasia arguments and counter-evidence, 2026).

Rules out: euthanasia by any method; sedation without a working diagnosis; drug doses or combinations that suppress breathing (“soft euthanasia”); withdrawal of care to hasten death.

II. No abandonment

A living animal is never left alone, and every individual matters regardless of its species’ population status. Care continues until the animal is rescued or dies naturally.

Requires: continuous presence, day and night, with a named person responsible for the animal at all times; thermal drones and night shifts for animals at sea, tagging if possible.

Rules out: standing down a response while the animal lives; ranking individuals by population value (Ramp & Bekoff 2015; Wallach et al. 2018, 2020; Johnson et al. 2019); treating the individual as a unit of a recovering population whose fate does not matter. Compassionate conservation argues that individuals matter regardless of population status (Ramp & Bekoff 2015), and that conservation should minimise harm, including natural harms where people can relieve them (Katz 2024). Even its critics accept that individual welfare matters (Hayward et al. 2019). On land, injured and orphaned elephants, wolves, storks and many other species are treated and released as a matter of course; cetaceans are the exception (SNM Hartwin brief).

III. Immediate care

Life-supporting care starts the moment GWRA commits to a case, before a full diagnosis. First aid, shade, wetting, body support, breathing protection and stress reduction begin at once; medical treatment follows as soon as a veterinarian is on site or on the phone.

Rules out: waiting for permits, experts or consensus before basic care starts. That is why every permit is in place before GWRA deploys (No agreements, no deployment, read more below).

IV. Post-release monitoring

Every released animal is tagged and tracked, and the team keeps the capacity to intervene again. Survival is judged against the 6-week benchmark of Wells et al. (2013), with longer tracking wherever tags allow.

Requires: a tag (non-invasive medical glue-on or suction first, Part 6), a re-intervention plan, and public reporting of tracks.

Rules out: declaring a rescue a success at the moment of release.

V. Total transparency

Every case is documented and published: decisions, drugs and doses, video, outcomes and necropsy results. There are no confidential failures.

Rules out: “quiet” procedures (Boys et al. 2026 record that euthanasia is “sometimes ... performed quietly to minimise public backlash”); unpublished deaths; withheld necropsies; unpublished assessments and logs. The same study found responders reluctant “to share mistakes or adverse outcomes”, and identified that reluctance as a barrier to improvement. GWRA publishes its failures for exactly that reason.

VI. Speed

GWRA deploys within 24 hours or less, and aims to reach the animal while it is still strong. The response clock starts with the first public report, not with an official decision. Delay is never held against the animal: “to treat human failure as evidence of an animal’s non-viability is to punish the patient because the ambulance arrived late”, and “if certainty of survival were the entry requirement for care there would be very little emergency medicine left” (SNM open letter to the VetLine editors, 12 Oct 2026).

Requires: a pre-positioned elite team, certified local partners, a signed MOA and standing permits before any deployment, and equipment caches (Annex A).

VII. Comprehensive investigation

Every death gets a full necropsy by an independent team, and every response is analysed for what worked and what failed. Findings are compared with the public’s video and observations of the living animal (Part 17) in order to better understand observable symptoms for further diagnosis.

Requires: pre-registered necropsy questions, findings sorted into pre-existing disease, stranding-caused damage and damage from care decisions, and publication.

Rules out: using a necropsy as a substitute for diagnosis in life. “Let it strand and collect samples” is not investigation: in the Hartwin case the brain, lungs and kidneys could no longer be sampled after death, while blow samples in life could have identified the infection much earlier and would have allowed the intervention (SNM Hartwin brief).

VIII. Strong scientific basis

GWRA measures; it does not guess. Body condition is measured from drone photogrammetry (Christiansen et al. 2019, 2020) and compared with published values for the same species, sex, age and reproductive state. For example, lactating beaked whales are naturally thin, so thinness alone is never grounds to deny rescue.

Rules out: “looks emaciated” or “poor prognosis” judgements without measurement; one-hour visual assessments used to end a rescue (as in the 2026 Baltic humpback case, where the assessors themselves wrote that “only an external inspection and no further examinations were performed”); conclusions stronger than the findings. A recommendation may never be more certain than the evidence under it: hedged findings (“likely”, “possibly”, “cannot be ruled out”) cannot support a categorical “do not rescue”

(SNM statement on the DMM/ITAW expert report, 11 Apr 2026). When a full work-up cannot find a cause, the honest finding is “undetermined”, as in the NOAA case of a juvenile humpback stranded for three days at East Hampton, New York, in 2010 (NOAA case NY4236-10).

No precondition for the rescue is set that the animal cannot meet. Asking a juvenile female humpback to sing before rescue (SNM Hope Brief), when only mature males sing (Payne & McVay 1971; Darling & Bérubé 2001), is not a clinical test.

IX. Constant evaluation and improvement

The protocol is a living document. It is revised after every case debrief, after every relevant new study, and at least once a year, with a public change log. The NRE Tasmania manual is reviewed every five years (NRE Tasmania 2022, Vol. 1); GWRA does not wait that long. A case that does not fit the prevailing model, such as a whale that lives for weeks after being declared hopeless, is treated as an anomaly that tests the model, not as noise (SNM Hope brief).

X. Public involvement and media

The public is a partner: in early detection (photos, drones, acoustic and thermal observations, the Whale Detective platform), in trained hands-on help, and in oversight. The media is a channel for transparency, not a threat to be managed.

Rules out: excluding trained volunteers by default; decisions shielded from public scrutiny. The public’s role is supported by evidence: 68.6% of 118 people interviewed at an Italian sperm whale mass stranding expressed compassion for the animals (Bearzi et al. 2010). GWRA rejects the strategy of pre-approved messaging that prioritises “welfare over hope” (Boys et al. 2026).

XI. Human and animal safety

Every intervention is designed with the safety of people and animals in mind: preventing zoonotic disease, injury, drowning, hypothermia and exhaustion, and preventing harm to the animal from handling. Safety decides **how** GWRA helps, never **whether** it helps, this is a very important distinction. A risk is answered by changing the method, equipment or timing, not by abandoning the animal (Principle II).

Requires: a safety officer on every response, PPE, zoonosis precautions, and the operating rules in the Human and animal safety section below.

Principle-check

Every procedure, drug, device and decision rule in this protocol is tested against eleven questions before it is adopted. A single “no” sends it back for redesign. Each later part of the protocol ends with this check filled in.

Principle	Test question	Fails if
I. No euthanasia	Does it avoid killing, and avoid drugs or actions that hasten death?	It includes euthanasia, sedation without diagnosis, or respiratory depression
II. No abandonment	Does the animal stay under continuous care until rescue or natural end?	It allows stand-down while the animal lives
III. Immediate care	Does supportive care start at commitment, before full diagnosis?	Care waits for permits, experts or consensus
IV. Post-release monitoring	Is a tag and a re-intervention plan part of every release?	Release is the end point
V. Total transparency	Will every decision, drug, dose and outcome be published?	Any part is confidential or “quiet”
VI. Speed	Can it be started within 24 hours or less of the first report?	It depends on equipment or permits not pre-positioned
VII. Investigation	Does every death get an independent full necropsy and a case review?	Necropsy is optional or unpublished
VIII. Scientific basis	Is each decision based on measurement compared with species literature?	Decisions rest on visual impressions or assumed prognosis
IX. Improvement	Does the case feed back into the protocol, with a public change log?	No debrief or no revision path
X. Public and media	Is there a role for trained public, and open media access?	The public is excluded by default
XI. Human and animal safety	Are zoonoses, injury, drowning and handling harm controlled, without abandoning the animal?	People or animals are put at avoidable risk, or risk is used as a reason to abandon

No euthanasia in practice

Principle I has three working parts: comfort care for the hardest cases, safeguards so that comfort care can never become hidden euthanasia, and a fixed response when an authority orders an animal killed.

Comfort care

Comfort care treats suffering directly while life continues. It is given alongside rescue efforts, not instead of them, and is never a reason to stop trying to save the animal. It includes:

1. **Physical support:** water depth or flotation that takes weight off the chest, padding, shade, wetting, and temperature control. Rocking a beached whale gently to relieve pressure on one side (Part 8).
2. **Breathing protection:** blowhole kept clear of water, sand and surf; head position watched continuously.
3. **Pain relief:** analgesics chosen for the species and size, at doses that do not suppress breathing (Part 15 formulary).
4. **Fear and stress reduction:** quiet, few people, no crowding at the head, eyes shaded, low light at night, familiar water contact. Light anxiolysis only under the safeguards below.
5. **Supportive medicine:** fluids, vitamin E and selenium, calcium, anti-inflammatory and antimicrobial cover where a working diagnosis supports them.
6. **Company and continuity:** the same trained people where possible, and never an animal left alone (Principle II).
7. **Airway watch through every tide.** A sedated or weak animal is never left on a tidal flat or sandbar without a person watching its blowhole and a plan for the rising tide. A sedated whale left overnight on a sandbar can drown as the water rises, and without a full necropsy nobody will know (SNM Dolly/Stormy brief, 2026).
8. **Confirming natural death.** Death is confirmed only by combined signs: no heartbeat (by ECG where available), fixed and dilated pupils, no blink reflex when the eye is touched, and a slack jaw (NRE Tasmania 2022, Vol. 4). Large whales can hold their breath for 30 minutes or more, so absence of breathing alone is not death (NRE Tasmania 2022, Vol. 2).

Safeguards against “soft euthanasia”

Sedation can end a life without being called euthanasia. The Dolly/Stormy case (Western Australia, 2026) raised this concern when sedation was given before a diagnosis. GWRA therefore binds every sedative or analgesic use to seven rules:

1. A working diagnosis is recorded first. No sedation is given “to calm” an animal of unknown condition.

2. Doses start at the low end of the published range for the species and are calculated from a measured or photogrammetric weight, never a guess.
3. Agents are reversible where possible, and reversal drugs are on site and drawn up before the first dose.
4. A dedicated breathing observer records the breathing interval before and after dosing, with authority to stop any procedure.
5. A second veterinarian, on site or by video, signs off each dose.
6. Every drug, dose in mg/kg, time, route, clinical indication and intended effect is logged and published within 48 hours (Principle V). Without these facts, nobody can tell comfort care from a hidden killing (SNM Dolly/Stormy brief, 2026).
7. If the animal dies, the independent necropsy includes toxicology to confirm the drugs given did not cause death (Principle VII).

When an authority orders euthanasia

In some countries the authorities can order a stranded animal killed, and in Germany veterinary commentators argue that animal-welfare law requires it when recovery is judged impossible (Karbe et al. 2026). GWRA's response is fixed in advance, and comfort care continues at every step:

1. **Ask for the order in writing**, with its grounds and the evidence used provided and clearly explained.
2. **Get an independent second veterinary opinion** at once, on site or by video, based on measurements (Part 5), not a visual impression.
3. **Submit a counter-assessment and treatment plan**, and offer to take over care under the applicable conservation-law exemption for nursing an animal back to health (in Germany, BNatSchG §45(5)).
4. **Object formally and seek urgent legal review** through counsel arranged in advance (Annex A).
5. **Publish** the order, the counter-assessment and the timeline (Principle V).
6. **If the killing goes ahead anyway**, GWRA personnel do not take part. They stay (if allowed) to document, request an independent necropsy with toxicology, and publish the full record.

This response does not obstruct officials by force. Instead, it answers an order with evidence, law and public record.

No agreements, no deployment

GWRA deploys only where everything it needs to keep its principles has been agreed in writing **before** any animal is in trouble:

- a signed memorandum of agreement (MOA) with the competent authority (Annex A);

- standing permits for diagnostics, medication including controlled drugs, darting, tagging, handling and lifting equipment, transport and rehabilitation;
- veterinary licensing for GWRA veterinarians in that country;
- operational authority in the field for the GWRA veterinarian in charge, so that clinical decisions are made by the people who examine the animal;
- agreements with neighbouring states wherever a whale may cross a border.

None of this is negotiated on the beach. Where it is not in place, GWRA does not deploy. It publishes the offer it made and the terms on which it would have deployed (Principle V).

Obstruction during a response. Once GWRA has deployed, an authority that withholds what the MOA allows is in breach of it. Examples are forbidding medication or agreed equipment, making every visit to the animal subject to approval, or overriding the agreed plan. The GWRA incident commander records the breach in writing to the authority and asks for the agreed conditions to be restored at once. If they are not restored, GWRA hands formal responsibility for the animal back to the authority in writing, stands down its operational team and publishes the full record. Where the authority allows it, GWRA observers stay on site to document (Principle V).

Why. In the Baltic humpback case (Hope/Timmy, 2026), the private rescue team worked under conditions it did not set and that interfered with the responses and interventions. The state ministry prohibited all medication and injections. It also prohibited straps for moving the whale, refused changes to the approved plan, and required approval for every visit to the animal (Focus Online and NDR, 21 Apr 2026, documented in the SNM Hope Brief). When the whale died, the blame fell on the rescuers and their advisers, including SNM. Responders who are denied the means of care cannot answer for its result. GWRA will not put its name to a response it has no ability to control.

How this fits Principles II, III and XI. No abandonment (II) binds GWRA to every animal it commits to, and a commitment is only real if GWRA has the means to keep it. Immediate care (III) needs permits in hand before the call comes, not during or after. A team working under rules that change by the hour is not a safe team and the team safety is one of the core, non-negotiable core principles of this protocol (XI). The answer to an authority that will not agree in advance is to sign agreements before the season, not to accept obstruction. Concluding MOAs is therefore GWRA's first task in every country (Annex A). Where an authority refuses or obstructs, responsibility for an animal left without care rests with that authority, and the record says so publicly.

Injuries called fatal: cetaceans that live without flukes

The flukes drive a cetacean through the water, so losing them, or suffering a severe injury to the tail stock, is widely assumed to be fatal. Euthanasia frameworks treat it that way. NRE Tasmania lists a disabling injury or a broken tail stock among its grounds for euthanasia (NRE Tasmania 2022, Vol. 4), and WHOI places traumatic injuries of this kind in

its category 3 (WHOI 2024-05). Under these rules a stranded dolphin without flukes qualifies for euthanasia on sight, before anyone has asked whether it could live.

Field observation contradicts the assumption, and the evidence comes from several species and oceans.

Dolphins. Five bottlenose dolphins, belonging to three species and living in Korea, Uruguay, Spain and the United States, have been followed after losing their flukes, most likely to fishing gear (Fazioli et al. 2026). The longest records are a female off Jeju Island, seen regularly since 2019, and an adult male off Uruguay, seen since 2021. Both live in groups, feed, socialise and travel over long stretches of coast (Kim et al. 2022; Fazioli et al. 2026). A calf off South Carolina, sighted more than a hundred times since 2025, is still with its mother. A Spanish male lived at least two and a half years after the injury (Gozalbes Aparicio et al. 2026). Each animal learned a new way to swim, combining side-to-side movements of the tail stock with up-and-down strokes, usually within months, and group members swam close to them and foraged alongside them.

Large whales. The record is shorter and harder, and GWRA states it as it is:

- A Mediterranean fin whale, known since 1996 with most of her left fluke gone, was resighted for 23 years with that injury. After losing the rest of her flukes in 2019, she swam by sculling with her pectoral fins, dived for normal lengths of time, and travelled at least 7,000 km around the Mediterranean over about ten months, at times more than 100 km a day. She stayed close inshore, lost condition steadily, and was last seen exhausted in July 2020. The authors judge starvation the most likely cause of death (Jahoda et al. 2025).
- Gray whales without flukes have been seen migrating along the Pacific coast of North America for years, among them a female seen more than once, sometimes with a calf (National Geographic 2018). A gray whale filmed off Newport Beach, California, in 2023 had an injury estimated to be several years old and was swimming at close to normal migration speed (CBS News; KSHB, Mar 2023). Gray whales may depend less on their flukes than other species (National Geographic 2018).
- A humpback seen off Washington State in July 2024 had lost its flukes to entanglement. It was travelling, but its outcome is unknown (Live Science, Aug 2024). A humpback that lost its flukes in the Gulf of Maine became emaciated and died (WDC 2024).

The large-whale cases show both sides. These animals can live, move and migrate for months to years, but they may starve, because feeding becomes hard. That danger can be monitored, and it can be met with support, but it is not a reason to kill on sight.

GWRA draws five rules from this record.

1. **An injury is a finding, not a verdict.** Loss of the flukes or a flipper, or a damaged tail stock, is examined and treated like any other condition (Principles I and VIII).
2. **Care is built around the injury.** That means wound care and antibiotics (Part 15), buoyancy support (Part 19), and enough time in rehabilitation for the animal to learn to swim again. Cetacean skin and blubber regenerate after deep wounds instead of scarring permanently (Su et al. 2022, 2023).
3. **Social animals go back to their group.** Released dolphins go out beside a group of their species (Parts 10 and 14B), because companions appear to help them survive.
4. **Large whales without flukes are monitored, not written off.** A free-swimming large whale with this injury is identified and given a history file (Part 3). It is followed by photo-ID and drone photogrammetry, so that any loss of condition is measured early. If it strands, enters unsuitable habitat or declines, GWRA moves to Workflow D or W. Supplemental feeding in place is an R&D item (Part 10).
5. **Every case is published** with its outcome, whether the animal lives or dies, so that the evidence keeps growing (Principle V).

Human and animal safety (Principle XI)

Every response names a safety officer with authority to pause any task. They change the method, never the commitment to the animal. The rules below apply to every part of the protocol.

Zoonoses

Stranded cetaceans can carry infections that reach people through breath, body fluids, wounds and carcasses (Hunt et al. 2008). In one Thai case, about 20 people fell ill after smelling the breath of a false killer whale later found to carry *Pseudomonas aeruginosa* in its lungs (Chansue 2022).

Hazard	Known agents	Control
Breath and blow (aerosol)	<i>Pseudomonas</i> , <i>Brucella ceti</i> , avian influenza H5N1 (found in a Florida bottlenose dolphin, Murawski et al. 2024)	Stay out of the blow cone; FFP2/N95 mask and eye protection when working at the head; never smell the breath
Skin contact, cuts, bites	<i>Erysipelothrix rhusiopathiae</i> , <i>Mycobacterium marinum</i> , <i>Vibrio</i> spp.	Gloves always; cover cuts; wash and disinfect after contact; report any skin lesion or fever after contact
Body fluids, faeces, carcasses	<i>Brucella</i> , <i>Salmonella</i> , <i>Leptospira</i> (shared sites with pinnipeds)	Gloves, eye protection, apron at necropsy; no eating or drinking on site
Needles and darts	Injury, self-injection of	Sharps containers; only

Hazard	Known agents	Control
	drugs	trained staff handle darts and syringes; reversal agents for opioids on site

Every volunteer is told what to report to a doctor, and the case record lists everyone who had close contact, for follow-up if a pathogen is found.

People: injury, cold, water and fatigue

- **Danger zones:** nobody stands within reach of the flukes or in front of the head of a moving animal. Approach only from the side, behind the pectoral fin.
- **Water work:** buddy system, personal flotation, wetsuits or drysuits; in cold water (for example the Baltic), timed rotations and a warm-up station.
- **Tide and surf:** a watcher tracks tide, swell and the escape route.
- **Vessels and machinery:** trained skippers only; no one under a suspended load; straps rated for the load with a release that works in under 30 seconds (Part 14).
- **Drones:** licensed pilots, minimum altitudes by species, and no flights over crowds.
- **Fatigue and stress:** shifts of fixed length, food and water, and psychological support after every response, especially after a death.
- **Shift limit:** no worker, staff or volunteer, works more than 12 hours after the initial response; the safety officer watches fatigue and stress (NRE Tasmania 2022, Vol. 1).
- **Around the whale:** approach from where the animal can see you; stay forward of the dorsal fin; never alone, always with a spotter watching the animal; plan an escape route; move away at once from a thrashing animal; watch for the trough of deeper water that forms beside a whale in the surf, which can trap a leg (WHOI 2024-05). Even an animal that seems exhausted or near death can suddenly move (NRE Tasmania 2022).
- **Sheets and covers:** whoever places a wet sheet is responsible for checking it never slips over the blowhole (WHOI 2024-05).
- **Independent safety officer:** in large operations, a safety officer from outside the technical team, such as emergency medical services, is not absorbed in the rescue details and sees risks others miss (WHOI 2024-05).
- **Training:** swift-water rescue, first aid and CPR for field teams (WHOI 2024-05).
- **Helicopters are never used to lift a live whale.** Heavy-lift pilots are trained to drop a load that starts to oscillate (WHOI 2024-05).
- **Responder wellbeing:** structured debriefs, peer support and access to professional counselling after every response. Compassion fatigue is real and must be supported, but it must never be turned into policy (Boys et al. 2026; SNM open letter, 12 Oct 2026).

Animals: handling harm

- Never pull a whale or dolphin by the tail, flukes, flippers or head. Never tow by the tail stock (NRE Tasmania 2022).
- Never pour water into or over the blowhole, and never cover it.
- Never use human sunscreen or lotions; use veterinary-approved skin protection only (Chansue 2022).
- Keep noise, crowding and handling to the minimum care requires, especially for fragile species (Part 7). If possible, strive to keep animals in water at least partially submerged.
- Use separate equipment for each animal where disease is suspected, and disinfect between animals.

How GWRA differs from the frameworks it replaces

The prevailing European, American and Australasian frameworks start from triage and treat euthanasia as a welfare tool. GWRA starts from the individual animal and treats every case as treatable until proven otherwise by measurement.

Question	Prevailing frameworks	GWRA
What ends a response?	Poor prognosis, often judged visually; euthanasia as a “proactive welfare tool” (Boys et al. 2026)	Only rescue or natural death; comfort care in the hardest cases
Who decides?	An expert commission, shielded from public and media (Karbe et al. 2026)	Accountable experts, with a mandatory independent second opinion and every decision published
How is condition judged?	Visual assessment, sometimes within just an hour on site	Drone morphometrics, thermal and blow diagnostics compared with species literature
Medication	Often not given, or banned (SNM Hope Brief, 2026)	Early remote treatment by dart where a working diagnosis supports it (Gulland et al. 2008)
Rehabilitation	Not an option in many countries (NRE Tasmania 2022; UK practice)	Low-cost rehabilitation in sea pens, ponds and pools (Liu et al. 2026; Thai practice)
Dependent calves	Euthanasia if no mother is found (NRE Tasmania	Rehabilitation and release near a conspecific group,

Question	Prevailing frameworks	GWRA
	2022)	tagged (Part 10)
The public	Kept away, “amateur refloats” discouraged (Simmonds 2001)	Trained partners in detection, care and oversight
After release	Often not monitored	Tagged and tracked, with capacity to re-intervene
After death	Necropsy if resources allow; euthanasia performed “quietly”	Independent full necropsy, compared with the video record, and published

GWRA keeps what these frameworks do well and adopts it: incident command, volunteer registration, net and sling techniques, debriefs (NRE Tasmania 2022; WHOI 2024-05), as it rejects only what fails the principle-check.

What the prevailing frameworks record about themselves

The case for GWRA does not rest only on SNM’s critique. The frameworks it replaces document their own limits:

- **Decisions follow capacity, not welfare.** Responders from 22 countries reported that what could be done “was constrained more by legal, logistical, and organisational factors than by what would be optimal for animal welfare”, and that in resource-limited settings decisions “may be driven by logistical feasibility rather than welfare-based best practice” (Boys et al. 2026).
- **Public sentiment can outrank welfare.** In New Zealand, 27% of Department of Conservation respondents said public sentiment takes precedence over animal welfare in euthanasia decisions, 15% of all respondents ranked managing human expectations as the highest priority, and the national procedure excluded euthanasia where “significant antagonism” with the public or Māori communities was likely (Stockin et al. 2022; Donoghue 2006).
- **Rehabilitation is refused, then its absence is cited.** Tasmania’s manual states that taking a cetacean of any size into rehabilitation “is NOT an option”, because facilities and expertise are lacking and success “is not well established” (NRE Tasmania 2022, Vol. 2). The UK coalition decided in 1996 to focus on beach rescue rather than rehabilitation, and in 1999 cited “the lack of suitable facilities” among its reasons (Simmonds 2001).
- **Survival after release is not measured, then assumed poor.** Of 64 live large whale strandings in the US between 2008 and 2016, six whales were last seen swimming; none was tracked, and the workshop called their survival “highly suspect” (WHOI 2024-05). The UK coalition’s own veterinary review urged post-release monitoring as “essential” in 1999 (Simmonds 2001).

- **Many mass stranded animals are healthy.** The UK strandings programme found that two-thirds to three-quarters of stranded pelagic dolphins “appeared to be healthy (and died because they stranded)” (Simmonds 2001). Part 8 sets out the wider evidence.
- **Cetacean medicine is young.** “The field of cetacean medicine is still developing and there are few established protocols to address the health needs of large whales” (NRE Tasmania 2022, Vol. 4). That is a reason to develop treatment, not to stop treating.
- **Even euthanasia guidance says each case is individual.** The IWC workshop on euthanasia stated that “each case needs to be treated on an individual basis” (IWC 2014), so automatic rules by size, species or time ashore contradict it.

Legal position

GWRA works inside the law in every country. In Germany the law already permits what this protocol does. Where the law or an official order requires killing, GWRA uses the response set out above and does not take part.

Germany

- **Strict protection.** All cetaceans are strictly protected under EU Habitats Directive Annex IV, implemented by Federal Nature Conservation Act (BNatSchG) §44.
- **Permission to help.** BNatSchG §45(5) allows injured, helpless or sick strictly protected animals to be taken up to nurse them back to health and release them. The VetLine authors agree this pathway exists (Karbe et al. 2026). Their condition is a “good chance” of independent survival; GWRA meets it with measured evidence, not hope.
- **Animal Welfare Act (TierSchG).** §1 forbids causing pain, suffering or harm without reasonable cause. Once an animal is in human care, the carer must prevent avoidable suffering. GWRA’s position is that diagnosis, treatment and comfort care meet that duty. Killing is one way to end suffering, not the only lawful one. A formal legal opinion on this point is commissioned under Annex A.
- **Constitution.** Article 20a of the Basic Law makes animal protection a state objective, which supports active rescue capacity.
- **Research and public-interest exemptions.** BNatSchG §45(7) allows further exceptions, including for research and for overriding public interest; GWRA’s diagnostic and tagging work is designed to qualify (SNM Hartwin brief; to be confirmed by counsel).
- **“Not required” is not “not permitted”.** The Mecklenburg-Vorpommern ministry argued in 2026 that because the law imposes no duty to rescue, a rescue without a realistic prospect would be impermissible (press release 105/2026). The first point does not lead to the second: absence of a duty to act leaves both action and inaction lawful, and the judgement then rests on the evidence (SNM statement, 11 Apr 2026).

European neighbours

Denmark's 2024 marine mammal contingency plan (Miljøstyrelsen, *Beredskabsplan for Havpattedyr*) allows euthanasia of animals under 4 m. It says large whales over 4 m should be neither euthanised nor rescued, but left alone, and in 2026 the ministry stated that "stranded marine mammals are not rescued in Denmark". Yet a stranded killer whale survived a very long stranding in the Limfjord in 2022 and was seen a year later in good condition (Alstrup et al, 2023). The study authors stated unequivocally that euthanizing this whale would have been wrong. GWRA proposes replacing size thresholds with clinical and logistical feasibility (SNM Hartwin brief). GWRA proposes cross-border agreements so that a case like the 2026 Baltic humpback is not abandoned at a national boundary (Principle II).

International

The Bern Convention, the Convention on Migratory Species, the EU Habitats Directive (Annex IV), ASCOBANS and the IWC all create obligations to protect cetaceans. None requires euthanasia of stranded animals. GWRA operates under memoranda of agreement with national authorities, with an escalation trigger if official response stalls (Annex A).

What good legislation already provides

Tasmania's Whales Protection Act 1988 shows that the powers a rescue needs can be written into law (NRE Tasmania 2022, Vol. 1). Authorised persons, including any registered veterinarian, may carry out "such acts as he believes are necessary for the purposes of rescue, administration of veterinary treatment ... or research" (s. 12); may enter any land to reach a stranded whale, with refusal an offence (s. 13); may direct volunteers "in person or by telephone" (s. 15); and obstructing them is an offence (s. 16). Tasmania also lists strandings as emergency events, which opens state emergency resources to the response. GWRA asks each partner country for equivalent powers (Annex A), without the euthanasia provisions.

This section states GWRA's policy position. It is not legal advice; each national annex is reviewed by counsel in that country.

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Parts 2–3 — Early Detection, Public Role and Individual History

The best rescue is the one that happens before the animal strands. GWRA’s first line of response is a detection network of trained public observers, drones, thermal cameras, hydrophones, AI and satellites. It finds a whale or pod in trouble while the animals are still swimming and strong.

This part sets out that network (Part 2) and the individual history file kept for every animal it finds (Part 3). Together they turn scattered sightings into early warnings, and early warnings into deployments inside the 24-hour or less standard (Principle VI).

Why detection comes first

Most strandings are preceded by a window of hours to months in which the animal is visible, swimming and still treatable. Every case below had such a window, and in every one it was used to watch rather than act.

Case	Window before the outcome	What was visible	What early detection allows
Hope/Timmy, humpback, Baltic, 2025–26	At least 15 months: entangled off Poland in Feb 2025, near Wismar on 3 Mar 2026, entangled again 9 and 19 Mar, stranded 23 Mar (SNM case brief; Timmy (whale))	A large whale in a sea unsuitable for it, repeatedly in nets and shallows	Detection at the Danish Straits on entry; escort out while healthy (ECHO)
Hartwin, humpback, eight countries, 2026	About 7 months, Jan–Aug 2026, more than 6,200 km between sightings; died of sepsis from spinal abscesses (Deutsches Meeresmuseum, preliminary necropsy, 15 Aug 2026)	A visibly sick juvenile photographed in all eight countries	Blow sampling to identify the infection (O’Mahony et al. 2024) and darted antibiotics (Gulland et al. 2008)
Gray whales, San Francisco Bay, 2018–present	Some individuals stay more than 90 days (Lonati, presentation 2026)	Whales in a busy bay, measurable by drone	Repeated body-condition measurement, ship-strike warnings
Pilot whale pods, Golden Bay and Tasmania	Hours of milling in shallow bays before mass strandings (NRE Tasmania 2022; UIA Encyclopedia)	Pods close inshore at known stranding sites	Boats and barriers keep the pod offshore (Part 8)

Case	Window before the outcome	What was visible	What early detection allows
Dolphins in fish-weir enclosures, Thailand	One tide cycle	Dolphins feeding inside weirs as the tide falls	Volunteers watch weirs on the falling tide and move trapped dolphins to the sea by mud sledge (Chansue 2022)
Dolly/Stormy, juvenile humpback, Western Australia, 2026	90 minutes: citizen drone footage showed the whale listing and struggling for balance in deep water before a storm and the stranding (SNM Dolly/Stormy brief)	A balance problem in a well-nourished juvenile	Veterinary review of the footage; escort away from the sandbar; diagnosis of the balance problem (Part 5)
Toa and his mother, humpbacks, Tahiti, 2026	At least four days in the Maraa lagoon, known to whale-watching operators (SNM letter, 4 Sep 2026)	A mother and calf in a lagoon	Monitoring; help for the mother when she became trapped on the reef (Part 10)
Risso's dolphins, Italy	Two weeks: one animal "patrolled" a short stretch of coast, confirmed by photo-ID, before it died (Zucca et al. 2005)	A lone animal repeatedly close to shore	Remote assessment and treatment while it swam

The conclusion is simple: time spent watching a distressed animal is time it loses strength, hence GWRA treats the first credible report as the start of the response clock.

The public is trained, not excluded. In 1994 the UK's Marine Animal Rescue Coalition ran a "Stopping Amateur Refloats" poster campaign, and its founder wrote that speed of response "helps to stop others ... intervening" (Simmonds 2001). GWRA takes the opposite course: people on the beach are the first responders in almost every stranding, so they are trained, registered, guided by phone and given roles (Part 8; Annex A).

Minimum standard for a visibly sick large whale. When citizens report a large whale that looks sick, a non-invasive diagnostic assessment (drone photogrammetry, thermal imaging and a blow sample) is carried out within 24 hours (or less) of the first confirmed sighting (SNM Hartwin brief). Equipment for this (a drone, sterile cups on a pole, petri dishes) costs less than one necropsy.

The detection network

The network has eight layers. No single layer sees everything; together they cover day and night, surface and underwater, and shore to open sea. All feed one record, managed through ECHO (Early Cetacean Hazard Observation) and its public channel, Whale Detective.

Layer	What it detects	Strength	Limits	Evidence
1. Public reports via Whale Detective and a 24-hour hotline	Any sighting, especially recognisable individuals, animals in the wrong place, entanglement, thin or injured animals	Coverage no sensor network can match; Thailand's volunteer network has more than 20,000 members	Variable quality; needs fast verification	Whale Detective brief (SNM); Chansue 2022; NRE Tasmania 2022 hotline
2. Citizen-science photo-ID	Who the animal is, from flukes, fins and scars	AI matching cuts missed matches from about 6–9% to 1–3% and saves at least 98% of matching time	Needs good photos and an existing catalogue	Cheeseman et al. 2022
3. Drones, public and partner (RGB)	Identity, behaviour, body length and width, wounds, entanglement, calves	Measures body condition to species standards; minutes to launch	Weather, wind, permits; disturbance if flown too low	Christiansen et al. 2019, 2020; Torres & Bierlich 2020
4. Thermal imaging: blows	Warm exhaled blow against cooler air and sea, by day and night	Automated detection already used to protect whales from ships	Range falls with distance and humidity; thermal radiation does not pass	Zitterbart et al. 2013, 2020; Lonati 2026

Layer	What it detects	Strength	Limits	Evidence
			through water	
5. Thermal imaging: wakes and fluke prints	Heat and surface disturbance left by a swimming or diving whale (the “fluke print”)	Detects animals between breaths and at night; machine-learning detection automates it	New method, not yet published; high false-alarm rate while training data are few	DeBossu, SMM 2026 AI workshop (grade D)
6. Passive acoustic monitoring	Calls, whistles and clicks; pod presence and activity	Works in darkness, fog and rough seas; low-cost recorders exist	Silent animals missed; needs species call libraries	HydroMoth, Remote Sensing in Ecology and Conservation 2022
7. AI triage and detection	Whales, blows, heads and bodies in drone and camera video; duplicate reports	Screens thousands of images in minutes; flags priority cases	Needs training data per species and region	Palmer & Irani 2024; WhaleSpotter thermal AI
8. Very-high-resolution satellite imagery	Large whales at the surface over wide or remote areas	Covers areas no boat or drone reaches; can follow a large whale after release	Large species only; calm, clear water; imagery must be ordered	Fretwell et al. 2014; Cubaynes et al. 2019 (WorldView-3, 31 cm)

Fixed stations at bottlenecks (ECHO)

Where whales repeatedly enter unsuitable waters, GWRA places fixed stations combining optical cameras, thermal cameras and hydrophones. In the Baltic every documented large whale entered through the Øresund, the Great Belt or the Little Belt, so these are the planned “outer gate”, with the Wismar Bay entrance as the “inner gate” (ECHO roadmap). The same model fits the Sacramento River delta, the Thames and similar sites.

Partners who are already on the water

Ferry operators, fishers, sailing clubs, whale-watching companies, coast guards, surf lifesaving clubs and wind-farm operators are enrolled as routine reporters. Each partner gets the reporting guide below and a direct alert line. Whale-watching operators who see an animal in an unusual place (a lagoon, a harbour, a river) report it the same day: Toa and his mother were known to tour operators for days before the mother died unnoticed on the

reef (SNM letter, 4 Sep 2026). French Polynesia already requires notification of whales inside lagoons; GWRA asks every partner country for a similar duty.

Indigenous and local communities

Indigenous communities and traditional owners are notified of strandings, offered a role in the response, and consulted on the site and on what happens to remains, as Tasmania does through an Aboriginal engagement officer (NRE Tasmania 2022). At Port Kennedy in 2026, Aboriginal elders held a ceremony for the stranded humpback and named her Stormy (SNM Dolly/Stormy brief).

Forecasting high-risk periods

Strandings cluster in time and place. GWRA keeps a regional alert raised for several days after any stranding, because further strandings often follow nearby. Weather and ocean conditions can forecast risk for some species. In New Zealand, a global stranding hotspot, 384 common dolphin strandings from 1978 to 2021 clustered in space within the same year, and warmer sea-surface temperature and an east-coast position were the best predictors, with ENSO and current speed also tested; persistent local hotspots point to social, coastal or human factors not yet measured (Saltr   et al. 2026). GWRA uses such models to pre-position teams and caches at hotspots during high-risk seasons. Elsewhere, pygmy sperm whale strandings in the south-eastern US followed low pressure, onshore wind, long-period waves and El Ni  o conditions in the preceding week (Berini 2009). ECHO plans entry-window models built on Copernicus Marine and EMODnet ocean data (ECHO roadmap; R&D).

AI detection: what the field is learning

At the SMM 2026 workshop on AI in marine mammal science, DeBossu (BIRD Lab, US Navy) presented a machine-learning model (YOLOv11) that detects whales and their thermal fluke prints in drone and camera video. It was trained “human-in-the-loop”: people label a small set of images, the model runs on new video, and people verify its detections and add them to the training set. Its main weakness was a high false-alarm rate, which the presenter attributed to limited training data. Other talks addressed synthetic images to augment training data (Sun, Duke Marine Lab), community AI tools for passive acoustic monitoring (Baumann-Pickering, Scripps), an onboard detector for Rice’s whale calls (Currier, Texas A&M), and rapid detection of rare killer whale calls from minimal data with Google’s Perch2 acoustic embeddings (Cline, MBARI) (SMM 2026 AI workshop programme). GWRA adopts three rules:

- **A person confirms every AI detection** before it raises an alert above level 1.
- **GWRA shares its labelled data.** Every thermal, drone and acoustic record from GWRA cases, labelled and checked, is offered as training data, because the shortage of training data is what limits these models.

- **Rare-call detection with little data** (Cline) is the model for detecting the calls of a lost calf, a distressed animal or a rare species at stranding hotspots.

Warning signs and alert levels

Observers and sensors watch for four kinds of warning sign. The number and progression of signs sets one of four alert levels, and each level has a fixed response.

Warning signs

- **Place:** outside the species' normal range (Hartwin; the narwhal among St. Lawrence belugas); in a river, estuary or enclosed sea (Humphrey, Delta & Dawn, Hope); in a shallow bay at a known mass-stranding site; repeatedly close to shore.
- **Behaviour:** milling or circling in shallows; repeated approaches to the beach; patrolling a short stretch of coast for days (Zucca et al. 2005); logging at the surface; listing, loss of balance or abnormal posture (Dolly/Stormy, 2026); unable or unwilling to dive; breathing faster or slower than the species norm; a calf or a member of a social species alone; unusual vocal activity from a pod near shore.
- **Body:** thinness measured by drone (in the field: a "peanut head", visible vertebrae, a hollow behind the dorsal fin; Chansue 2022); grey, peeling or blistered skin, as seen in whales in fresh water (Gulland et al. 2008); entanglement; wounds, propeller cuts or heavy parasite loads such as whale lice (cyamids); a hunched back or a spine that curves or protrudes, as Hartwin's did in the weeks before his death from spinal abscesses (SNM Hartwin brief); abnormal blow colour or thermal hot spots.
- **Environment:** a storm, an extreme tide, a harmful algal bloom, low salinity or a new noise source in the area.

Thinness is never judged alone. Lactating females and some species, such as beaked whales, are naturally thin, so body condition is always compared with the norm for the species, sex, age and reproductive state (Principle VIII; Part 5).

Alert levels

Level	Trigger	Response
0. Watch	Animal in an unusual place, no distress signs	Log, identify, open a history file; public and partners keep reporting
1. Concern	One distress sign; or a lone calf or lone animal of a social species; or a large whale entering enclosed waters	GWRA notified; remote veterinary review of photos and video, including all public footage; drone health assessment arranged the same day where possible, and within 24 hours (or less) at most for a visibly

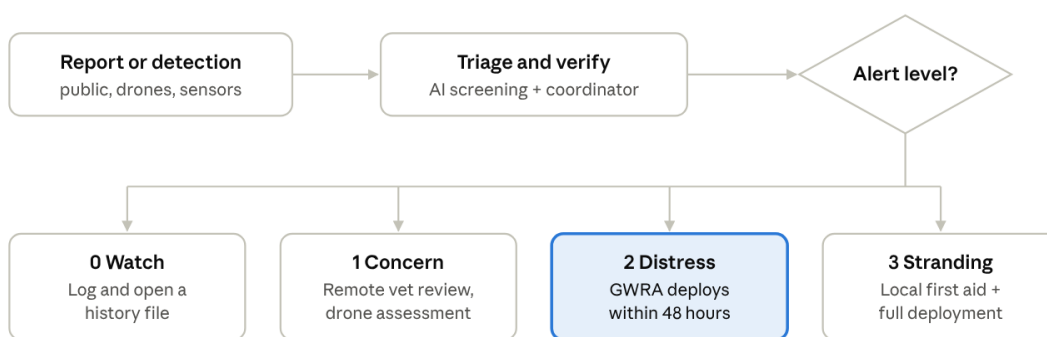
Level	Trigger	Response
2. Distress	Signs getting worse, several signs together, entanglement, or a pod near the shore at a stranding site	sick large whale; local partners on standby GWRA team deploys within 24 hours (or less), sooner where possible; non-invasive diagnostics (Part 5); escort or herding (ECHO, Part 8); treatment by dart if a working diagnosis supports it (Part 15)
3. Stranding	Animal ashore, trapped in shallows or unable to leave	Immediate local first aid by certified partners; full GWRA deployment; stranding workflows (Part 14)

An alert is never lowered while the cause is unknown. It is lowered only when the animal has returned to suitable habitat and normal behaviour, confirmed by tracking or repeat sightings (Principle IV).

Across borders. Whales do not stop at national boundaries. Hartwin was photographed in eight countries over seven months and no country contacted its neighbour (SNM Hartwin brief). An alert raised in one country is passed automatically to the GWRA partners and authorities of every country the animal may enter, with its history file.

From report to deployment

Detection turns a sighting into a deployment before the stranding



New reports go back through triage; an alert is never lowered while the cause is unknown.

Alert chain: report to response

Every credible report passes through one triage step, AI screening plus a human coordinator, and lands on a fixed response. The aim is level 2: a team on the water while the animal is still swimming.

A report with photos from a reporter who stays on site is treated as verified: no one is sent to confirm it before the response starts (NRE Tasmania 2022). The reporter is asked to keep watching from a safe distance and to send updates until the team arrives. Where trained people are not yet on site, the coordinator guides the people who are there by phone or video call, a practice Tasmanian law explicitly allows (Whales Protection Act 1988, s. 15).

Public guide: reporting, filming and drones

A good public report is worth more than any sensor, because it arrives first. This guide is published on the Whale Detective page, printed for coastal partners, and taught in every volunteer course.

What to report

- ☐ Date, time and exact location (phone GPS or a map pin)
- ☐ Species if known, otherwise size, colour, fin shape and blow shape
- ☐ Number of animals, and whether any calf is present
- ☐ Behaviour: travelling, milling, resting at the surface, approaching shore, stranded
- ☐ Breathing: count breaths for 5 minutes if you can. As a guide, more than 20 breaths in 5 minutes for a dolphin, more than 8 for a pilot whale or more than 5 for a large whale is abnormal (NRE Tasmania 2022)
- ☐ Visible problems: ropes or nets, wounds, thinness, skin changes, blood
- ☐ Photos of both sides of the dorsal fin and the underside of the tail if it shows; video of breathing and swimming
- ☐ Water depth, tide state and weather
- ☐ Beach type (sand, rock, mud, slope, sandbars), nearest vehicle access and nearest boat launch
- ☐ Any other animals: ashore, in the shallows, or swimming offshore

How to film well

- Hold the phone sideways and keep filming for at least a minute; breathing patterns and posture need continuous video.
- Photograph every scar, notch and marking: this is how the individual is identified (Part 3).
- Keep the original files with their time and location data, and do not crop them. GWRA keeps the originals for the case record. On the public map, reporters' personal details and photo metadata are removed, and the exact positions of live

animals may be shown with a delay or generalised so that crowds do not gather around a distressed animal.

Drones flown by the public

Public drone footage is valuable. It can also disturb a distressed animal, so these rules apply:

- Follow national drone law and any marine-mammal approach rules.
- Never hover low over the blowhole or the head, and climb away if the animal changes behaviour.
- Fly straight down over the animal (nadir) at a steady height when filming for measurement, and record the height.
- Never fly over people working with a stranded animal unless the GWRA coordinator asks.
- Upload footage to Whale Detective with flight height and time.

Safety and the animal

- Keep your distance, and keep dogs on a lead.
- Do not push, pull or ride a stranded animal, and never pour water into its blowhole (Part 1, Principle XI).
- If an animal is stranded, call the hotline first, then keep its skin wet and shaded, without covering the blowhole, until trained people arrive.
- Avoid breathing in the animal's blow, and wear gloves if you must touch it.

Every report gets an answer. Reporters see what happened to “their” animal on the case page (Principle V) and can join the trained volunteer pathway (Annex A).

Part 3 — Individual history

Every animal GWRA watches or treats gets a history file from the first report. A single snapshot can make a healthy animal look doomed or a sick one look fine; a history shows the trend, and the trend is what decides care.

Why history matters: four cases

- **Humphrey** entered San Francisco Bay twice, in 1985 and 1990. Knowing the first event meant the 1990 team already had a proven method: humpback feeding-sound playback combined with boats ([Humphrey the Whale](#)).
- **Hope/Timmy** was entangled off Poland in February 2025, more than a year before stranding in Germany (SNM case brief). A linked history would have shown a whale trapped in the Baltic for over a year and justified action long before the strandings.
- **Alonso**, a common dolphin calf rescued from a gillnet in 2013, was released near a local group. Photo-ID later confirmed that the female who took him in was his

mother (Andalucía Información, 28 Aug 2013). That was possible only because the local dolphins were catalogued.

- **The St. Lawrence narwhal** was identified from its markings in 2016, 2017 and three times in 2018, living among belugas (CBC News, 13 Sep 2018). Repeat identification turned a curiosity into evidence of long-term survival outside its range.
- **Hartwin** was photographed by citizens across eight countries. Their pictures record the course of his illness: a dorsal mark, then heavy whale-lice infestation, then whitening and sloughing skin over half his back, then a hunched and protruding spine (SNM Hartwin brief). Read as one file, they show a treatable infection progressing for months.

What the history file holds

Section	Contents	Main sources
Identity	Photo-ID matches, catalogue numbers, name, species, sex, age class	Whale Detective; regional catalogues; Happywhale (Cheeseman et al. 2022)
Movements	Every sighting with time and place; tag tracks	Public reports, ECHO stations, tags, satellite imagery
Body condition over time	Drone length, width and volume measurements, each with date and reproductive state	Drone photogrammetry (Christiansen et al. 2019, 2020)
Reproduction	Calves, pregnancy signs, lactation	Photo-ID, thermal imaging (Lonati 2026), hormones from blow (Part 5)
Health and injuries	Entanglements, wounds, scars, skin changes, earlier strandings, samples taken, treatments and drug reactions	Photos, blow and faecal samples, veterinary records
Social life	Group, associates, mother or offspring	Photo-ID, genetics, drone video
Behavioural baseline	Breathing interval, dive times, swimming style when healthy	Earlier video, tag data, species literature
Individual temperament	How this animal reacts to boats, people and noise; when it moves on its own	Livestreams, drone footage, observers' logs

How the history is used

1. **Body condition is read as a trend.** A thin animal that has been thin for years, or a lactating female, is judged against its own record and species norms. Body condition in baleen whales rises and falls with season, reproduction and food supply (Christiansen et al. 2020; the evidence is set out in full in Part 5). Thinness alone is never grounds to refuse rescue.
2. **Prognosis uses the animal's own record.** An animal that has survived earlier injuries or entanglements is evidence that recovery is possible.
3. **Treatment uses known drug history.** Earlier drugs, doses and reactions guide new treatment.
4. **Release is planned around the animal's group.** Known associates, mother or home range decide where and when to release (Parts 10 and 16).
5. **Post-release behaviour is compared with the baseline.** Normal breathing, diving and travel compared with the animal's own earlier data are stronger evidence than species averages.
6. **Necropsy findings are compared with the living record.** Video and measurements from life show when problems began (Part 17).
7. **Public footage and livestreams are clinical data.** Breathing intervals timed from a livestream over several days, vocalisation heard from the shore, drone footage of the jaw, flukes and blow: all are examined by the veterinary team and recorded by date. In the 2026 Baltic case, members of the public watching a livestream with a stopwatch produced a longer breathing record than the official one-hour assessment (SNM statement, 11 Apr 2026). At Port Kennedy, the citizen drone footage of a listing whale was the most important clinical evidence and was not used (SNM Dolly/Stormy brief).
8. **The animal's temperament shapes the plan.** The Baltic humpback's breathing intervals shortened to 47% of his resting value when boats approached, and he moved mostly at night when unobserved (SNM breathing analysis; SNM Kirchsee plan). Stranded sperm whales breathed every 97 ± 33 s at rest and every 19 ± 17 s when boats were active around them (Thalmann et al. 2008). A boat-averse animal is escorted with "gentle firmness": gentleness from distance, firmness from continuity. It is never rushed, and never left alone (Part 14B).

Data rules

History files are open by default (Principle V): the animal's record is published on its case page. Reporters' personal details are kept private unless they choose to be credited, and data protection law is followed for every report. Every record is shared with the regional catalogue and stranding database for that species.

Records must be easy to keep. In 1997 a veterinary database was set up for UK strandings, but its data sheets were so detailed that nobody could complete them during a rescue, and

it stayed empty (Simmonds 2001). GWRA's field record is short, phone-based and photo-driven, and a scribe is named for every response.

Principle-check for Parts 2-3

Parts 2 and 3 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: early detection prevents the decline used to justify killing
II. No abandonment	Pass: every report opens a case; alerts are never lowered while the cause is unknown
III. Immediate care	Pass: remote veterinary review starts at alert level 1
IV. Post-release monitoring	Pass: the same network and history file continue after release
V. Transparency	Pass: history files and case pages are public; reporters see outcomes
VI. Speed	Pass: the response clock starts with the first credible report
VII. Investigation	Pass: history files are compared with necropsy findings
VIII. Scientific basis	Pass: condition measured by drone and judged against species norms and the animal's own trend
IX. Improvement	Pass: each layer's detection record is reviewed after every case
X. Public and media	Pass: the public is the first detection layer and gets feedback
XI. Safety	Pass: the public guide sets distance, drone and zoonosis rules

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Parts 4, 13 and 14A — Early Intervention, Response Types and the Master Decision Graph

GWRA intervenes at the earliest stage it can reach, to stop distress turning into a stranding and a stranding turning into a death. This part sets out the interventions available at each stage (Part 4), the seven response types the protocol distinguishes (Part 13), and the master decision graph that routes every case to its workflow (Part 14A). The detailed workflows follow in Part 14B.

Part 4 — Early intervention

Early intervention means acting at the first stage the team can reach, with the least invasive method that will work. Four stages are distinguished; at each one, the goal is to stop the animal moving to the next.

Stage 1: free-swimming animal in distress

The animal is still swimming but sick, injured, entangled or in the wrong place. This is the stage at which treatment is easiest and most effective.

- **Diagnose remotely:** drone photogrammetry, thermal imaging, blow sampling and faecal sampling (Parts 5 and 11). Hartwin's spinal infection could have been

identified from blow samples months before death (SNM Hartwin brief; O'Mahony et al. 2024).

- **The 48-hour diagnostic standard** (Part 2) applies: a visibly sick large whale is assessed by drone, thermal camera and blow sample within 48 hours of the first confirmed sighting. Hartwin tolerated boats at close range for months, yet was never sampled (SNM Hartwin brief).
- **Helping without touching.** Treating a free-swimming whale is neither “rescue” nor “letting nature take its course”. It is the third option, diagnosis and treatment at sea, and the one that most often prevents a stranding. Hartwin travelled 1,125 km in the 50 days after an expert said he had “no chance” (SNM Hartwin brief): those were 50 days in which he could have been treated.
- **Treat remotely:** long-acting antibiotics, vitamin E and selenium, anti-inflammatories and fluids support given by dart. A cow-calf humpback pair in the Sacramento River received ceftiofur by Paxarms dart with a 30 cm needle, without adverse reaction (Gulland et al. 2008).
- **Disentangle, and persist until all gear is off:** remove fishing gear, with sedation at sea only where needed and under the Part 1 safeguards (Moore et al. 2010). Disentangled bottlenose dolphins were tracked for one to four years after release (Wells et al. 2013). In February 2025 the Polish search-and-rescue service and WWF Poland freed a humpback in the Gulf of Gdańsk in about an hour, using boathooks on poles rather than knives (AP News, 26 Feb 2025). A partial disentanglement is a stage, not an outcome: the Baltic humpback’s 2026 disentanglement stopped with gear still attached because nobody had a mandate to continue (SNM Hope brief). Gear lodged in the mouth or baleen is not gear in the gut, and baleen whales do not swallow rope (Cassoff et al. 2011; Moore et al. 2006); trailing gear is cut short, and residual oral gear is compatible with survival (Robbins et al. 2015). A juvenile humpback freed off Maui in 2017 still had coaxial cable embedded in its mouth that could not safely be removed. About seven years later a member of the public uploaded a fluke photo to Happywhale, and it was identified as a healthy adult with no visible gear or wounds (NOAA Sanctuaries 2025).
- **Guide out of unsuitable habitat:** escort with boats and, where playback is effective for the species, with feeding-sound lures. Humphrey was led 69 miles back to sea in 1985 by humpback feeding-sound playback after orca sounds and pipe-banging failed. With Delta and Dawn in 2007, no deterrent or lure gave consistent results (Gulland et al. 2008). The difference is an R&D priority (Part 9).

Stage 2: near-stranding

A pod or individual is milling close to shore, often at a known stranding site, hours before stranding.

- **Hold the animals offshore:** boats in a line, people in the water where safe, and barriers (Part 8).

- **Find the animal in distress:** a sick or injured individual can lead a pod ashore. Identify it by drone and thermal imaging, separate it, and treat it (Part 8).
- **Herd the pod away** from the site toward deep water, with acoustic monitoring throughout.

Stage 3: just stranded

The animal is ashore or trapped in shallows but has been there only a short time.

- **Immediate first aid** by certified local partners: upright position, shade, wetting, digging trenches for pectoral fins, and protecting the blowhole (Principle III).
- **Rapid assessment** of breathing, injuries and condition, with drone measurement where possible.
- **Classify the stranded animal at once into one of three categories** (SNM Hope brief, recommendation 10-A), because each needs a different response:
 - (a) a serious pre-existing condition, which needs the full diagnostic work-up and treatment;
 - (b) distress caused by the stranding itself, with no pre-existing condition, which needs fast operational rescue;
 - (c) able to free itself given water depth, tide and orientation, which needs supportive care and a measured tide plan. The category is provisional, recorded with its evidence, and changed as findings come in. Categories (b) and (c) are not held back by a disease work-up.
- **Measure whether the tide can float the animal.** Self-rescue can happen as late as the third or fourth high tide (WHOI 2024-05), and GWRA uses the highest tide windows. Waiting is never passive: supportive care and diagnostics run throughout. If the measured depth cannot float the animal, waiting is not a plan. The official Kirchsee assessment recorded 1.40 m of water, estimated that self-refloating needed 1.90–2.00 m, and forecast a rise of only 0.05–0.15 m, yet still recommended waiting (SNM Hope brief; SNM statement on the Gutachten, 11 Apr 2026).
- **A refloat attempt comes before any sedation.** Sedation is never used in place of an attempt to float the animal (SNM Dolly/Stormy brief).
- **Move the animal quickly**, by sling, stretcher, sledge or mat, to water where it can float. Where the site traps animals, move it to a different release site rather than refloating on the same beach (Part 8). The Tasmanian sling-loading method beside jet boats saved 114 pilot whales in 2020 (NRE Tasmania 2022). In 2010 a pilot whale was trucked to another site, tagged and released, and resumed normal movements (IFAW; SNM case list).

Stage 4: prolonged stranding or illness

The animal has been ashore for many hours, or is too sick or weak to release.

- **Stabilise** with fluids, medication and comfort care (Part 15).
- **Move to a sea pen, pond or rehabilitation facility** rather than release an animal that cannot yet swim (Part 19). Haitang, a stranded pilot whale unable to keep himself afloat, was treated in a small pool, then an outdoor pond, and released after about four months (Liu et al. 2026).
- **Hold and maintain when that is better than rushing.** NRE Tasmania names this as a key lesson: “stabilising and maintaining animals for a period prior to release can result in an improved outcome”, and small odontocetes can be held for days (NRE Tasmania 2022, Vol. 2).
- **Never give up on time alone.** Sperm whales survived 96 hours in about 1 m of water before seven of twelve were returned to sea (Thalmann et al. 2008), and NRE Tasmania records sperm whales surviving 5–6 days semi-submerged before rescue. An Angolan humpback was refloated after 58 hours ashore in 2025 (SNM Hope brief). Time ashore is a risk factor to be measured, not a cut-off.
- **Failed attempts and restranding are not verdicts.** “Failing to re-float an otherwise ‘healthy’ cetacean ... is not in itself a valid reason to euthanase,” and animals have been “successfully re-floated following multiple failed attempts or following a period of rest” (NRE Tasmania 2022, Vol. 4). Lingering or restranding after release “is not unusual and should not immediately be interpreted as a sign” that an animal is unsuitable (NRE Tasmania 2022, Vol. 2).
- **Most mass stranded animals are not sick.** Of 106 mass-stranded animals necropsied on Cape Cod, 97 (92%) had no significant pathological findings (Bogomolni et al. 2010). In the UK, 2/3 to 3/4 of stranded pelagic dolphins “appeared to be healthy (and died because they stranded)” (Simmonds 2001), and 318 of 654 cetaceans that stranded alive (48%) had no significant pathology that could explain the stranding (Barnett et al. 2011). A juvenile humpback that stranded for about three days at East Hampton, New York, in 2010 received a full work-up (blood count and chemistry, urinalysis including myoglobin, CT, cultures, morbillivirus PCR, biotoxins and histology of all organs): its muscle damage was confined to the weight-bearing side and its lung inflammation was a consequence of stranding; no underlying disease, no starvation, no myoglobinuria and no biotoxins were found, and the cause of stranding was “undetermined” (NOAA case report NY4236-10). Stranding is not evidence of illness.
- **Large whales have been saved with modest means.** A juvenile humpback trapped in the Rance estuary in Brittany in 2023, emaciated and with skin lesions, was freed within about two days by non-invasive methods (Olhasque et al. 2025); its poor condition was a reason to move faster, not to stop. Twin humpbacks stranded in Argentina in 2021 were refloated by a team of about 30 local people with a backhoe

and cables (AFP, 6 Oct 2021). Community teams in Namibia have repeatedly pushed juvenile humpbacks out on incoming waves (Ocean Conservation Namibia). A humpback was refloated with straps at Forster, New South Wales, in April 2026 (ORRCA and NSW NPWS; Sea World Foundation, 17 Apr 2026). These are grade C reports; each is a reason to attempt, and to document properly.

Part 13 — The seven response types

The protocol distinguishes seven response types because each needs different people, equipment and decisions. A case can belong to more than one type, for example a stranded calf of a fragile species. The fragile-species rules (Part 7) then apply on top of the workflow.

“Large” here means an animal too heavy to be carried by hand, generally over about 4 m. Size alone never decides whether an animal is helped.

Type	Typical species	Defining problem	Main methods	Main risks	Workflow
S. Single small cetacean stranding	Dolphins, porpoises, Kogia, beaked whales, small pilot whales	One animal ashore, often sick	Stretcher or sledge; diagnosis; transport; pool, pen or facility	Hidden disease; capture myopathy; restranding	14B-S
M. Mass stranding of small and medium odontocetes	Pilot whales, false killer whales, melon-headed whales, dolphins	A socially bonded group ashore or about to strand	Hold offshore; find and treat the lead animal; relocate; group release	Restranding; separating groups; overwhelming numbers	14B-M (Part 8)
L. Single large whale stranding	Humpback, minke, fin, sperm whales	Weight affecting organs; cannot be carried	Water-jet strap tunnelling, wide straps, pontoons, lift bags, barge or pen transport	Rescuer injury; pressure injury; drowning during moves	14B-L
LM. Mass stranding of large whales	Sperm whales	Several large animals ashore at	Net and jet-boat refloating	Long duration; scale of	14B-LM (Part 8)

Type	Typical species	Defining problem	Main methods	Main risks	Workflow
		once	(Thalmann et al. 2008); triage by order of release, never by abandonment	equipment	
D. Free-swimming animal in distress	Any	Sick, injured, entangled or exhausted, but not ashore	Remote diagnosis; darted treatment; disentanglement; escort	Delay while “watching”; disturbance	14B-D
W. Wayward animal	Large whales in rivers or enclosed seas; animals far outside their range	In habitat that cannot sustain it (fresh water, the Baltic, harbours)	Detection at bottlenecks; escort and lures; pen transport	Skin breakdown in fresh water; entanglement; shipping	14B-W (ECHO)
O. Dependent calf or orphan	Any species	Calf without a mother, or separated from its group	Rehabilitation; milk formula; release near a conspecific group; tag	Feeding difficulty; aspiration; dependency	Part 10

For wayward animals, WHOI distinguishes short “explorations” lasting days from “stays” lasting weeks (WHOI 2024-05), and out-of-habitat marine mammals are increasingly reported worldwide (Nunny et al. 2025). GWRA uses the distinction for monitoring intensity only. The test for intervention is the animal’s condition and the habitat’s capacity to sustain it (Workflow W), not how long it has been there.

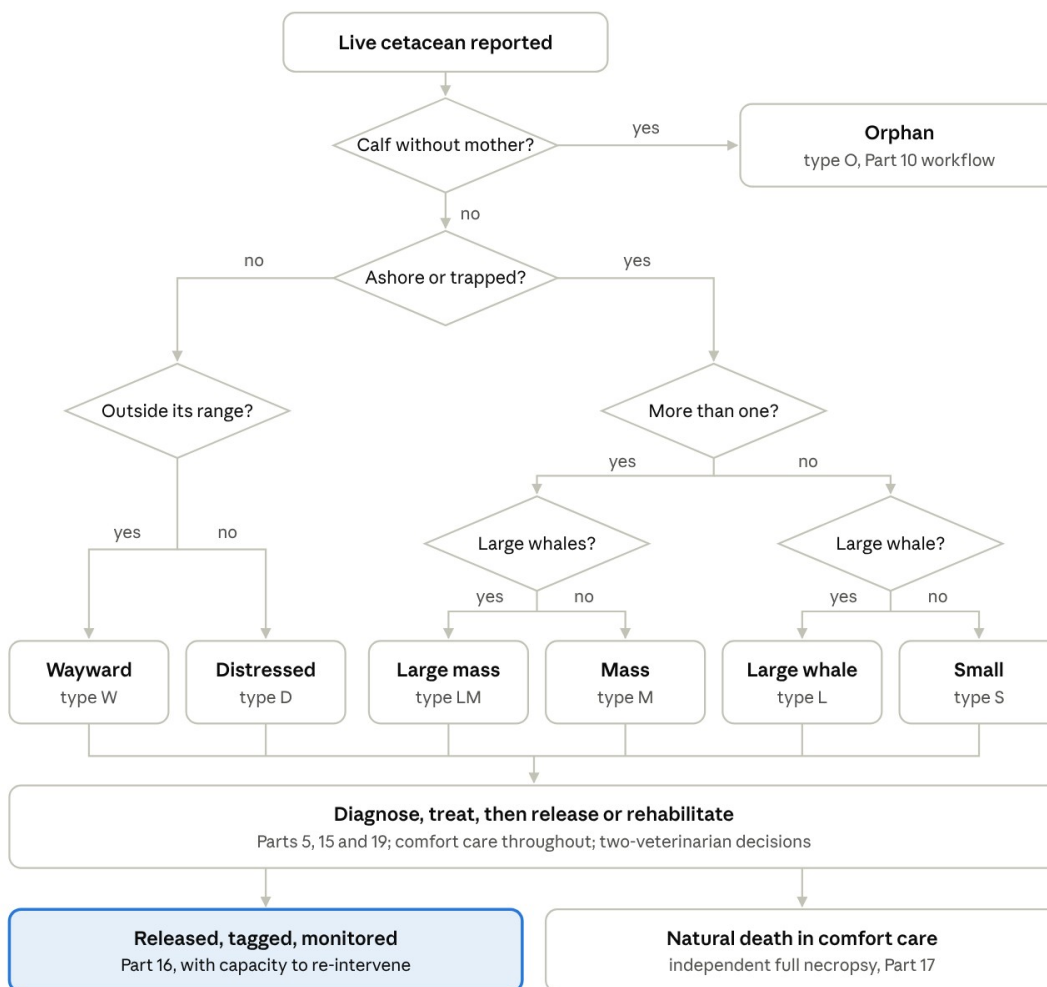
Entangled animals are type D. Entanglement drains energy through drag, worsens body condition, raises stress hormones and reduces reproduction (NRE Tasmania 2022, Vol. 3). Only trained disentanglement teams act, and “operations should not be pressured by daylight, weather, onlookers or the perceived need to act” (NRE Tasmania 2022, Vol. 3).

GWRA's answer to that tension with Principle VI is preparation: trained teams on standby, so that speed comes from readiness rather than improvisation.

Two overlays apply to any type: **fragile species** (Kogia, beaked whales and others prone to stress cardiomyopathy; Part 7) and **suspected zoonosis** (Principle XI).

Part 14A — The master decision graph

Every case reaches a workflow; every workflow ends in release or care



There is no euthanasia branch. Cases move between branches as the animal changes; the orphan workflow joins the same pipeline.

Master decision graph

Six questions route every live case to one of seven response types. Every type then runs through the same pipeline of diagnosis, treatment, and release or rehabilitation, and ends

in one of two outcomes. There is no euthanasia branch. The fragile-species and zoonosis overlays apply on any branch, and the detailed workflows are in Part 14B.

Rules on every branch

Thirteen rules apply wherever a case sits on the decision graph.

1. **No euthanasia exit.** Every branch ends in release, rehabilitation, or comfort care to natural death. There is no fourth outcome.
2. **Comfort care runs alongside rescue.** Pain relief, support and stress reduction start at once and never mean the rescue has stopped.
3. **Re-assess in a loop.** Breathing, behaviour and condition are re-measured at set intervals, and a case can move to any branch, including back to release, as the animal improves.
4. **Two veterinarians decide.** Every major decision (sedation, transport, rehabilitation, release) needs a second veterinary opinion, on site or by video.
5. **A breathing observer with halt authority** is present whenever an animal is handled, moved or medicated.
6. **Measure, then decide.** Condition is judged by drone measurement against species norms and the animal's history (Parts 3 and 5), never by appearance alone.
7. **Every released animal is tagged** (Parts 6 and 16).
8. **Every death gets an independent full necropsy** (Part 17).
9. **Every case is published** with its decisions, drugs, doses and outcome (Principle V), and debriefed into the next protocol revision (Principle IX).
10. **No conclusion stronger than its findings.** An operational recommendation can never be more certain than the findings it rests on. A one-hour visual inspection from about 5 m, with breathing “checked from a distance” and no blood, ultrasound or biopsy, cannot support a categorical recommendation to stop (SNM statement on the Gutachten, 11 Apr 2026). Where only visual data exist, the record says so explicitly.
11. **No preconditions the animal cannot meet.** Behavioural tests for rescue must be possible for the species, age and sex. Only mature male humpbacks sing (Payne & McVay 1971; Darling & Bérubé 2001), so a demand that a juvenile female “sing” before help is offered is not a criterion (Part 1).
12. **Record every option, including the ones rejected.** The decision log lists each option considered, the evidence for and against, and the reason it was chosen or rejected, and is published (Principle V).
13. **Inability to deploy is never abandonment.** If GWRA cannot send a team safely, it still provides remote veterinary guidance by phone and video, documentation and analysis of public footage, and publishes why it could not deploy (Principle II).

Principle-check

Parts 4, 13 and 14A pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: the decision graph has no euthanasia branch; comfort care is an end point only when death comes naturally
II. No abandonment	Pass: every branch keeps the animal under care; large mass strandings are triaged by order of help, never by abandonment
III. Immediate care	Pass: first aid starts at stage 3 before diagnosis; remote treatment starts at stage 1
IV. Post-release monitoring	Pass: every release branch passes through tagging
V. Transparency	Pass: rule 9
VI. Speed	Pass: intervention starts at the earliest reachable stage
VII. Investigation	Pass: rule 8
VIII. Scientific basis	Pass: rules 6, 10 and 11; time ashore is measured as a risk factor, not used as a cut-off; the 92% no-pathology finding in mass strandings (Bogomolni et al. 2010) is the baseline expectation
IX. Improvement	Pass: the lure results that conflict (Humphrey vs Delta and Dawn) are turned into R&D (Part 9)
X. Public and media	Pass: certified local partners give first aid; cases are published
XI. Safety	Pass: large-whale methods are assigned to trained teams; zoonosis overlay on every type

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Parts 5, 6 and 11 — Non-invasive Diagnostics, Tags and Fecal Sampling

GWRA diagnoses without capture wherever it can, and carefully measures instead of guessing. Drones, thermal cameras, blow and fecal samples, and medical glue-on tags let a team learn an animal's condition, infections, hormones and movements while it swims freely. Every result is compared with published norms for the species, sex, age and reproductive state (Principle VIII).

Body condition by drone photogrammetry

Body condition is measured, not eyeballed. A drone photographs the animal from directly above at a known height, a grid of width lines is laid over the image, and the widths are compared with published values for the same species and life stage (Torres & Bierlich 2020; Christiansen et al. 2019, 2020).

Method

1. **Equipment:** a drone with a laser altimeter for exact height, such as a DJI Mavic 3T or a Matrice 210 with a Zenmuse XT2, which records visible and thermal images together (Lonati 2026).
2. **Flight:** straight down over the animal (nadir), at a steady height that does not disturb it, with height and camera settings recorded.

3. **Frame selection:** frames where the animal is flat, straight and at the surface. Where no ideal frame exists, a 3D body model is scaled to the best available photo (Lonati et al., in prep.).
4. **Grid measurement:** total length, then body width at every 5% of length from snout to tail notch.
5. **Index:** width-to-length ratios and estimated body volume give a body condition index: how much fatter or thinner the animal is than expected for its length (Christiansen et al. 2020).
6. **Comparison:** the index is compared with published values for the species, sex, age class and reproductive state, and with the animal's own history file (Part 3).
7. **Report:** the result, the reference used and its uncertainty go into the case record and are published.

Reading the result

- **Reproductive state changes everything.** Lactating humpback whales lose about 17% of their body volume over the breeding season while their calves grow almost 395% (van Aswegen et al., *Journal of Physiology*). A thin nursing mother is normal, not dying. Lactating beaked whales are likewise very thin. Thinness must therefore be read against the right reference, and is never on its own a reason to deny rescue.
- **Whole populations differ.** North Atlantic right whale juveniles, adults and lactating females are all in poorer condition than southern right whales, yet they still survive and reproduce (Christiansen et al. 2020). A reference must come from the right population.
- **Condition recovers.** Baleen whales lose and regain large amounts of body volume in yearly feeding and fasting cycles. Low condition is a state to be treated with time, food and care, not a terminal finding.
- **Age matters.** Young animals are growing, and GWRA treats youth as a factor in favour of recovery when weighing prognosis. Calves and juveniles grow fast once fed (van Aswegen et al.), and the documented orphan and juvenile rehabilitation successes (Parts 10 and 19) support it. Measuring age-related resilience is a GWRA R&D item.
- **Beaked whale mothers are measurably thin, and that is normal.** Drone photogrammetry of 25 known Blainville's beaked whales in the Bahamas (45 flights, 2,318 images) showed that nursing mothers lose condition steadily: as their calves grew, the body area index of lactating females fell by about 19% on average. Pregnancy was predicted from body-width profiles and confirmed when the females were later seen with calves. Neonates measured about 1.96 m, 48% of their mother's length, rising to 69% at one year; calves were weaned at 3.2–4.2 years (Dunn & Claridge 2026). This is the reference that turns "this beaked whale looks emaciated" into a measurement: a thin beaked whale with a calf, or one recently weaned, is within the normal range of her species.

- **Thin whales recover in the wild.** Western gray whales that arrive at their Sakhalin feeding grounds underweight, and occasionally emaciated, generally regain condition over the summer: in 2009 the body condition of 21 whales improved to optimal classes during the season, and all three cows that had been thin with calves in 2008 were back at optimal weight in 2009 (Tyurneva et al. 2010). Smaller and younger stranded animals also improve more with care than large adults (NRE Tasmania 2022, Vol. 2).
- **Poor condition is a reason to move faster.** The Rance estuary humpback of 2023 was emaciated and had skin lesions, and was freed within about two days (Olhasque et al. 2025). Low condition shortens the time available; it does not remove the case.
- **Normalise before judging.** WHOI's health working group calls body condition "incredibly important" but says it must be normalised for time of year, prey and age class, with local biologists (WHOI 2024-05). That is Principle VIII in the words of the agency workshop.
- **Measure at first contact, and keep the record.** In the Baltic humpback case, the same institution described the whale as "well-nourished, has reserves" and in "good" nutritional condition in late March, and later as emaciated, without a measurement in either case (SNM Hope brief). The Danish necropsy then found the whale not emaciated, with a blubber layer present. A drone measurement on day one would have settled the question. Ground truth for drone indices comes from necropsy blubber depths and girths at standard sites (NRE Tasmania 2022, Vol. 5; Part 17).

In the field without a drone

When no drone is available, the visual signs of poor condition are recorded with photos and repeated by drone as soon as possible: a "peanut head" (head wide relative to the body), visible vertebrae or ribs, and a hollow behind the dorsal fin (Chansue 2022). They prompt measurement; they never replace it.

Thermal imaging

A thermal camera reads heat radiated from the animal's skin and breath without touching it, day or night. Thermal radiation does not pass through water, so readings are taken only from parts at the surface and from the blow (Lonati 2026).

Measure	What it shows	Evidence	Status
Blowhole and blow temperature	A window on core temperature; fever or low body temperature	Average blowhole temperature 26.9 ± 1.7 °C in 21 North Atlantic right whales (Lonati et al. 2024); 37.1 °C at	Usable now; species norms still being built

Measure	What it shows	Evidence	Status
		a bottlenose dolphin blowhole (Melero et al. 2015)	
Heart rate	Rhythmic heat pulses at the skin surface and blowhole	Drone thermal imaging of humpback whales (Horton et al. 2019)	Proven in research; field protocol to standardise
Infection and inflammation	Local hot spots over wounds, abscesses or inflamed tissue	Heat anomalies on a humpback whale's back; inflammation listed as a target (Lonati 2026)	R&D: validate against necropsy findings
Pregnancy	A warm area over the abdomen	"Anomalous heat" in a pregnant right whale (Lonati et al. 2022; Lonati 2026)	R&D: combine with blow progesterone
Cranial heat loss and thermal physiology	How the animal regulates heat	Lonati et al. 2022	Reference data
Detection at night	Blows, bodies, wakes and fluke prints	Zitterbart et al. 2013, 2020; machine-learning detection of thermal fluke prints (DeBossu 2026)	Used in Part 2

Field rules

- Record emissivity, air temperature, humidity, distance and drone height with every image; radiometric values are only comparable when these are known.
- Calibrate the camera on site against a known target, as in Lonati's "whale simulation experiment" with thermos flasks on a raft.
- Film several breaths in a row; one frame is not a measurement.
- On a stranded animal, compare a hot spot with the same spot on the opposite side, and repeat over time.

WHOI's health working group lists validation of thermal blowhole temperature in large whales as an open need (WHOI 2024-05); GWRA takes it on with paired rectal or deep-muscle temperatures from every stranded large whale. GWRA will build a shared library of

thermal images from every case, matched to blood results and necropsy findings. That library is how hot spots become diagnoses (Principles VII and IX).

Blow sampling

A whale's exhaled breath carries cells, microbes, viruses and hormones from its airways. Blow can be collected without touching the animal, by a drone carrying sterile petri dishes through the blow or by a sterile collector on a long pole from a boat.

What blow can show

Target	What it tells the team	Evidence	Status
Bacteria and fungi (microbiome)	Respiratory infection; the organism to treat; antibiotic choice	Humpback whale blow microbiome (Apprill et al. 2017); drone sampling of dolphins (Centelleghé et al. 2020); bacteria, fungi and cellular material in blow (O'Mahony et al. 2024)	Usable now
Viruses	Viral infection, new or known pathogens	Six new virus species identified from humpback whale blow collected by drone (Geoghegan et al. 2018)	Usable now
Reproductive hormones	Pregnancy (progesterone), maturity (testosterone)	Blow progesterone matched faecal progesterone in a pregnant right whale (Burgess et al. 2018)	Usable now
Stress hormones	Acute and chronic stress (cortisol)	Measured in right whale blow (Burgess et al. 2018); cortisol, progesterone, testosterone and	Usable; needs repeated samples

Target	What it tells the team	Evidence	Status
		oestradiol measured in bottlenose dolphin blow (Mingramm et al. 2019)	
Blow metabolome, including catecholamines	Acute stress (adrenaline-type compounds), energy and fat metabolism, oxidative stress	78 metabolites identified by LC-MS in 63 drone-collected humpback blow samples, including cortisol, epinephrine, dopamine, DL-DOPA and 3-methoxytyramine, in pathways of energy metabolism, fat use, stress response and oxidative stress (Hoffman et al. 2026)	R&D, promising: catecholamines drive stress cardiomyopathy (Part 7)
Aldosterone	Stress response and salt–water balance; a candidate marker of stranding stress	Not yet reported in blow. In dolphins aldosterone rises with acute stress and may be a more sensitive stress indicator than cortisol (St. Aubin 2002; Champagne et al. 2018, from serum, blubber and faeces)	GWRA R&D priority
Cytokines and inflammatory markers	Inflammation, immune response	Listed in exhaled breath condensate (O'Mahony et al. 2024)	R&D
Urea	Corrects for dilution	Burgess et al. 2018	Usable now

Target	What it tells the team	Evidence	Status
	by seawater		
Creatinine and other kidney markers	Kidney function and dehydration	Not yet validated in blow	GWRA R&D priority
Lung condition	Pneumonia, lungworm, aspiration	Inferred from microbes, cells and inflammation markers	R&D (Part 12)
DNA	Species, sex, individual identity	Genetic material in blow (O'Mahony et al. 2024)	Usable now

Protocol

1. Use sterile collectors: petri dishes on the drone, or a pole collector. Wear gloves and stay out of the blow cone (Principle XI).
2. Collect several blows and a seawater control sample from the same spot.
3. Freeze at once; split samples for microbiology, virology, endocrinology and genetics.
4. Send microbiology for culture and antibiotic sensitivity when infection is suspected, so treatment by dart can be targeted (Part 15).
5. Repeat sampling after treatment to measure response.

In the Hartwin case, blow samples could have identified the infection that killed him months before his death (SNM Hartwin brief). For every free-swimming animal at alert level 1 or above, GWRA's default is to sample the blow.

Can aldosterone be measured in blow? Not yet, as far as the published record shows; it was not among the 78 metabolites found in humpback blow (Hoffman et al. 2026). Blow has yielded cortisol, progesterone, testosterone and oestradiol (Burgess et al. 2018; Mingramm et al. 2019), and steroid hormones of the same family should in principle be detectable. In bottlenose dolphins, aldosterone in serum rose within 45 minutes of capture to about 238 pg/ml, against about 28 pg/ml in resting animals, and appears to be part of the stress response in these species (St. Aubin 2002, citing Ortiz & Worthy 2000 and St. Aubin et al. 1996). A controlled stress study in bottlenose dolphins tracked aldosterone with cortisol in serum, blubber and faeces (Champagne et al. 2018). Validating aldosterone in blow, against paired blood samples from animals in rehabilitation, is a GWRA R&D item: it would give a non-invasive measure of stranding stress and of the salt-water balance that dehydration and freshwater exposure disturb.

Stress baselines differ by age and status. In humpback whales across the North Pacific (2013–2025), compromised whales (entangled, struck, stranded or otherwise affected) had 4.6 times more cortisol in their blubber than uncompromised whales, and calves, juveniles

and subadults 3.4 times more than adults; stress hormones peaked in the breeding and fasting season (Hoffman et al. 2026). A stress reading is interpreted against the right age class and season, and a high value in a compromised whale is a reason to treat, not a verdict.

Part 11 — Faecal sampling

Faeces are collected whenever possible, from free-swimming and stranded animals alike. They reveal hormones, diet, parasites, gut health and toxins without touching the animal.

What faeces can show

- **Stress hormones:** faecal glucocorticoid metabolites track chronic stress. In right whales they fell when ship noise dropped after 11 September 2001 (Rolland et al. 2012).
- **Reproductive hormones:** progesterone confirms pregnancy, matching blow results (Burgess et al. 2018).
- **Identity and diet:** DNA for individual identity, sex and recent prey.
- **Parasites:** gut parasites and their eggs, common in stranded animals (Chansue 2022).
- **Gut health:** consistency, blood, mucus and foreign material such as plastic; the gut microbiome (Part 12).
- **Toxins:** algal biotoxins, which are a cause of some strandings.

How to collect

Situation	Method
Free-swimming large whale	Fine-mesh net from a small boat, scooping floating faeces after a defecation is seen. Detection dogs on boats can find floating faeces by scent (Rolland et al. 2006). Drones can spot faecal plumes and guide the boat; automated detection is in development (Lonati 2026)
Free-swimming small cetacean	Opportunistic net collection; most faeces sink fast, so collection is rare
Stranded animal	Freshly passed faeces from the mat or sand; a gentle rectal swab by a veterinarian if none is passed
Pool, pond or sea pen	Routine collection at every feeding day; trend over time

Handling

Wear gloves (Principle XI). Split the sample: freeze for hormones and toxins, ethanol for DNA, formalin for parasites. Record time, location and the animal's ID with every sample.

Close-range diagnostics for a stranded or held animal

When the animal is ashore, in a pool or in a sea pen, hands-on examination adds to the remote methods. Two traditions are combined: the conventional veterinary work-up, and the integrative “empty-hand” examination used by Thai marine mammal veterinarians when no equipment is available (Chansue 2022). Both are recorded and published.

Conventional work-up

Test	What it shows
Breathing interval and pattern, timed over several minutes and repeated	Stress, pain, exhaustion; compare with species norms, e.g. 97 ± 33 s resting interval in stranded sperm whales (Thalmann et al. 2008)
Field ECG: suction-cup electrodes on the skin, no needles (Torrente 2026), or stick-on electrodes; ultrasound or thermal imaging where ECG is not possible	Heart rate, rhythm and conduction; shock, stress, pain, arrhythmia, heart injury; response to handling, treatment and comfort care, read against species norms
Blood: count, chemistry, blood gases	Infection, dehydration, kidney function (urea, creatinine), muscle damage (creatine kinase), heart damage (troponin) (Câmara et al. 2019)
Ultrasound	Lungs, heart, abdomen, pregnancy, blubber thickness
Blowhole swab: cytology and culture	Respiratory infection and antibiotic sensitivity
Skin and blubber biopsy	Genetics, toxins, hormones, skin disease
Urine and faeces	Kidney function, parasites, hormones
Weight estimate	From photogrammetry or the WhaleScale app (Harms et al.), never from a rough length–weight graph, for drug doses

Minimum diagnostic standard before any prognosis

No prognosis is published, and no decision to stop active rescue is considered, until at least the following have been done and recorded (if possible, of course): breathing timed over at least one hour against the species' norm; blood (count, chemistry, and creatine kinase, urea, creatinine, packed cell volume, total protein and white cells at minimum, as listed

even in NRE Tasmania 2022, Vol. 4); ultrasound where the animal's size allows; a blow sample; drone photogrammetry; a ventral and lateral examination, including the parts below the waterline; and a second veterinary opinion. A one-hour visual inspection from about 5 m, with no blood, ultrasound or biopsy, as in the official assessment of the Kirchsee humpback, does not meet it (SNM statement on the Gutachten, 11 Apr 2026). Neither does a visual-only assessment such as the one that preceded sedation of the Dolly/Stormy humpback in Western Australia in August 2026 (SNM Dolly/Stormy brief).

Examination sequence for a stranded large whale

The sequence follows the WHOI workshop (WHOI 2024-05) and NRE Tasmania (2022), and is done from positions that keep people out of reach of flukes, flippers and head (Principle XI).

1. **Look before touching:** degree of submersion and support; blistering; scavenger damage; trauma; a hollow behind the head or along the back; lip laxity (muscle tone); activity; and breathing rate and quality (“snappy” or drawn out and shallow).
2. **Responsiveness:** whether the eyes follow movement, are fixed, or show nystagmus.
3. **Reflexes, least invasive first:** skin touch, then 1–2 cm around the blowhole, then around the eye, then the palpebral reflex. The corneal reflex is the last to go and is tested only if the others are absent (WHOI 2024-05; NRE Tasmania 2022, Vol. 2).
4. **Signs of life:** large whales can hold their breath for more than 30 minutes and often keep their eyes shut (NRE Tasmania 2022, Vol. 2). Jaw tone, tongue retraction and gum refill are checked before anyone concludes an animal is near death, and an animal is never declared dead without the confirmation criteria in Part 1.
5. **Heart:** portable ECG with stick-on or suction electrodes; heart rate felt at the pectoral junction in small cetaceans; thermal heart rate (above). Suction-cup ECG now works on free-swimming large whales (below).
6. **Blood (if possible):** from the pectoral flipper vessels, which is safer for people than the flukes (WHOI 2024-05), run on a point-of-care analyser (for example iSTAT, VetScan or HM2, with a manual haematocrit). Local veterinary clinics with analysers are identified in advance (Part 2). Large-whale blood is a rare sample, so surplus is archived.
7. **Below the waterline:** an underwater camera on a pole shows lesions on the submerged side (WHOI 2024-05).
8. **Sex:** a photograph of the genital slit, by drone, pole camera or underwater camera. The Baltic humpback was described as male for five weeks; a ventral check would have shown a female, which changes how song, pregnancy and behaviour are read (SNM Hope brief).
9. **Samples:** sloughed skin (genetics), faeces (biotoxins), blow (hormones), and swabs, archived under the Part 17 labelling rule (WHOI 2024-05).

Field ECG: reading the heart without a needle

An ECG can now be recorded from a cetacean in the field without any needle or restraint. A suction-cup electrode, developed and tested on dolphins, belugas and killer whales in care, has been mounted on a standard suction-cup camera tag and used to record a free-swimming fin whale (Torrente 2026). For GWRA this places the heart beside breathing, body condition and blow as a routine non-invasive measure, at every stage of a case.

What the first wild recordings teach. Interpreted for rescue work, the fin whale data give four lessons (Torrente 2026):

- **A slow heart is not a failing heart.** Heart rate followed the dive cycle, from single figures per minute at depth to several times that at the surface. A rate that would signal collapse in a dolphin or a person is normal in a large whale, so readings are always judged against the species and against what the animal is doing.
- **Long conduction times are expected in a very large heart.** The interval between atrial and ventricular activation was about twice the value previously reported for large whales, and it fits the size of the heart. On its own it is not evidence of heart block.
- **Disturbance shows on the ECG within seconds.** A motorboat approach roughly doubled the diving whale's heart rate in well under a minute, with more movement. This confirms with the heart what the breathing data show (Part 7): boats stress whales.
- **The method is ready to be adapted to strandings.** The presenter names stranded animals, for prognosis and follow-up, as a next application.

How GWRA uses field ECG:

Situation	Use
Free-swimming animal in distress (Workflow D)	A suction-cup ECG tag placed by pole from a slow, quiet boat, together with the blow sample, records heart rate and rhythm through several dive cycles before and after darted treatment
Stranded animal	Electrodes on clean, wet skin behind the pectoral fin, with a continuous trace from the first hour. The baseline comes from a quiet period, and every procedure is compared with it
Handling, lifting and towing	The breathing observer also watches the heart rate. A sustained rise above the animal's own quiet baseline means a pause (Part 14B)

Situation	Use
Comfort care	Heart rate and rhythm give an objective measure of pain and distress, so analgesia and stress reduction are adjusted to the animal rather than guessed. ECG also confirms natural death (Part 1)
Rehabilitation and release	Serial ECGs track recovery from stress cardiomyopathy (Part 7); ECG-capable tags follow the animal after release (Part 6)

Every trace is archived with the case and fed into a shared library of species norms (Part 18). An ECG reading is interpreted only against the norms for its species, size and activity, never against a dolphin or human reference.

Measured thresholds and positive signs

Thresholds come from published manuals. GWRA reads them as triggers for treatment, never as grounds to stop.

Measure	Value	Source	GWRA reading
Breathing, dolphins	Abnormal above 20 breaths per 5 min	NRE Tasmania 2022, Vol. 2	Stress or pain: reduce stimulation; examine
Breathing, pilot whales	Abnormal above 8 per 5 min	Same	Same
Breathing, large whales	Abnormal above 5 per 5 min; normal rest interval 2–5 min	Same; SNM statement on the Gutachten	Same; compare with the animal's own baseline
Expiration–inspiration	Under 4 s, “snappy”	WHOI 2024-05, category 1	A good sign
Rectal temperature	36–39 °C good; below 35 or above 40 °C needs action; 42 °C critical	WHOI 2024-05; NRE Tasmania 2022	Cool or warm actively; treat the cause
Heart rate, pilot whales	60–100 bpm normal	NRE Tasmania 2022, Vol. 2	Outside range: ECG, fluids, quiet
Heart rhythm	Regular, with sinus arrhythmia that follows breathing	WHOI 2024-05, category 1	A good sign
Dehydration	Under 5%	WHOI 2024-05,	Above 5%: fluids

Measure	Value	Source	GWRA reading
		category 1	(Part 15)
Clear froth at the blowhole	Normal	NRE Tasmania 2022	No action
Reddish-brown fluid from the anus in Kogia	Normal stress response	NRE Tasmania 2022, Vols 2 and 4	Must not influence triage (Part 7)

Positive signs are recorded with the same care as negative ones: flukes and pectoral fins moving freely; no sagging jaw, since loss of jaw tone is a late sign (NRE Tasmania 2022, Vol. 4); a strong spout; eyes open and responsive to touch; motivation to move; and vocalising, which requires a working larynx and respiratory tract (Elemans et al. 2024). The Kirchsee humpback was recorded with eyes open, vocalising, responding to touch and motivated (SNM Hope brief). **Violent arching and thrashing** often come just before death and must not be read as strength (NRE Tasmania 2022, Vol. 2); they call for the veterinarian at once.

Blood values set the intensity of treatment

In common dolphins on Cape Cod that were satellite-tagged after release, values linked with poorer survival included haemoglobin below 13.9 g/dl, creatine kinase above 400 U/l, ALT above 500 U/l, base excess below 8, lactate above 4.5 mmol/l, total CO2 below 34, a length-to-girth ratio above 2.04 and heart rate above 119 per minute (Sharp et al. 2014, as summarised in WHOI 2024-05). WHOI places such animals in its euthanasia category. GWRA uses the same values to decide how much treatment an animal needs, how soon, and whether it goes to holding or rehabilitation rather than straight to sea. Capture myopathy is therefore measured, not assumed: creatine kinase, AST, myoglobin in urine and urine colour are repeated through the case. The 1999 UK view that capture myopathy “may be undetectable during clinical assessment” (Simmonds 2001) is answered by testing for it.

Differential diagnosis for listing and loss of balance

An animal that lists, circles or cannot hold itself upright has a neurological or vestibular problem until shown otherwise, and many causes are treatable. The Dolly/Stormy humpback was filmed listing 90 minutes before it stranded; nobody examined it for these causes (SNM Dolly/Stormy brief).

Possible cause	How to look for it	Source
Vestibular disease or otitis media/interna	Head tilt, circling, nystagmus; ear examination at necropsy if the animal dies	SNM Dolly/Stormy brief
Parasitic encephalitis or meningitis	Blood and faecal parasites; cerebrospinal signs; history	Dailey 2001

Possible cause	How to look for it	Source
Acoustic or other trauma	Nearby sonar, seismic, piling or explosions in the days before, boat strikes	Weilgart 2007
Toxicosis from algal blooms	Bloom reports; blood and faecal biotoxins	Gulland & Hall 2007
Storm disorientation or exhaustion	Weather history; improvement with rest	NRE Tasmania 2022

A vigorous animal with strong fluke and pectoral movement and a single deficit such as listing has a focal problem, not a dying body. It is supported, kept upright and treated.

Growths and skin lesions

A growth seen in a photo may be barnacles, a fibroma, an abscess, a granuloma, a scar, a papilloma or a tumour. Nothing is inferred until a biopsy, by remote dart if needed, has been examined (SNM Dolly/Stormy brief). Skin damage after time in fresh or brackish water reverses once the animal is back in full-strength seawater (Gulland et al. 2008; Su et al. 2022; Zasloff 2011): moving the animal to salt water is the treatment.

Integrative examination

The Thai method uses the clinician's senses as a full diagnostic instrument (Chansue 2022). It is used alongside the conventional work-up, and is the main tool where there is no electricity or equipment.

- **Looking:** body condition (peanut head, visible vertebrae, hollow behind the dorsal fin); dehydration (sunken eyes); wounds, separated into fresh, old and infected; skin colour (dark when stressed, pale, pink); eyes (cloudiness, ulcers, corneal opacity, injuries).
- **Tongue evaluation:** colour (pale suggests anaemia; deep red suggests inflammation), movement (energy), shape and size (swelling or wasting), surface (cracks, spots, ulcers), and coating (a clean, pink, smooth tongue is healthy; a white or greasy coating indicates disease). A tongue map adapted from human traditional medicine links regions of the tongue to organs. The presenter reports it to be right more than half the time in her experience.
- **Listening:** wheezes, coarse breath sounds, any vocalisation.
- **Smell:** breath and body odour (rotten, foul, acidic, fishy). Because of zoonosis risk, odour is noted only when evident at a distance, wearing a mask; the blow is never deliberately inhaled (Principle XI).
- **Touch:** skin heat, muscle tone (tense or slack). Pulse-reading techniques from Chinese medicine, including “surrogate pulsing”, are described by the presenter as requiring long practice.

Integrative findings that have limited published validation are labelled as such in the case record. Each one is compared with blood results and necropsy findings so that its accuracy is measured, case by case (Principles VIII and IX).

Diagnostic panel by situation

The panel grows with access to the animal. Every case starts with the left-hand column, and adds the next as the animal comes closer to the team.

Item	Free-swimming (alert 1–2)	Near-stranding pod	Stranded, pool or pen
Photo-ID and history file	Yes	Every animal	Yes
Drone photogrammetry	Yes	Every animal, to find the weakest	Yes, plus tape measurements
Thermal imaging	Yes	Yes, to find hot spots and the animal in distress	Yes
Breathing interval	From video	Per animal	Continuous, by the breathing observer
Blow sample	Yes, by drone or pole	Target animals	Yes, by collector held over the blowhole
Faecal sample	When seen	When seen	Yes
Field ECG (suction cup)	Yes, on approachable large whales, with the electrode placed by pole from a boat as for suction-cup tags	Target animals	Yes, continuous during handling, transport and comfort care
Passive acoustic recording	Yes	Continuous	Yes, in pens
Blood, ultrasound, swabs	No	Only animals that strand	Yes
Integrative examination	Visual signs only	Visual signs only	Full
Skin biopsy	By remote biopsy dart if needed	Target animals	Yes

Results are shared with the second veterinarian in real time, and every result goes into the history file (Part 3).

Part 6 — Non-invasive tags

Every released animal is tagged (Principle IV). GWRA's preferred tag is glued to the skin with the special medical glue and falls off as the skin renews, leaving no wound. Because glue-on attachments for cetaceans are not yet proven for the six weeks of tracking that release monitoring needs (Wells et al. 2013), GWRA uses a hierarchy: the least invasive tag that can meet the monitoring goal, while funding glue-on tags to replace the rest.

Attachment hierarchy

Rank	Attachment	Typical duration	Invasiveness	Evidence	GWRA use
1	Glue-on tag that sheds with the skin	Target: weeks	None: no penetration	Biocompatible cyanoacrylate (Vetbond) bonded to micro-textured urethane resists shear well but fails under pull; a hybrid glue-and-suction design is in development (Moore et al., WHOI/ONR, c. 2015)	Preferred; R&D priority
2	Suction-cup tag, placed by pole or dropped by drone	Hours to days	None	Drone-dropped tags on blue whales (Wiley et al. 2023)	Short-term behaviour after release, and in pens
3	Fin-mounted tag, small odontocetes	Weeks to months	Low: two small holes in the dorsal fin under local anaesthetic	Haitang: two 8 mm holes, 15-minute procedure, 52 days of tracking (Liu	When release survival must be confirmed and no glue-

Rank	Attachment	Typical duration	Invasiveness	Evidence	GWRA use
				et al. 2026)	on option lasts long enough
4	LIMPET dart tag in the dorsal fin or ridge	Weeks to months	Low to moderate: short darts into the skin	Andrews et al. 2008, 2019	Large and medium species when rank 1–3 cannot work
5	Implanted anchored satellite tag	Months	Moderate: anchors into blubber and fascia	Long-term tag-site effects “minimal”, with more swelling when placed low on the body (Gulland et al. 2024)	Only if no lower rank can track the animal

Rules

- Follow the IWC best-practice tagging guidelines (Andrews et al. 2019).
- Fit the tag before release, while the animal is held and examined, never as a separate capture. For a large whale that will be lifted or towed, the satellite tag goes on while the whale is in the sling, before the tow begins, not at the moment of release (SNM Kirchsee plan): if the tow fails or the whale breaks away, it can still be found. Projectile tags fired into Humphrey in 1985 pierced the skin and were shed; a suction-cup tag placed before the first movement is the minimum (SNM Acoustic Lure Brief).
- **Every line attached to an animal starts with a biodegradable section** (hemp or similar), so that if the animal escapes with a line, buoy or telemetry float attached, the gear falls away (NRE Tasmania 2022, Vol. 3). This applies to kegger buoys, tow lines, harnesses and strops.
- **Visual marks on every released animal**, in addition to any electronic tag: a Floy (spaghetti) tag on the right flank, posterior and ventral to the dorsal fin (NRE Tasmania 2022, Vol. 2; about 200 mm behind the fin in sperm whales, Thalmann et al. 2008); a uniquely numbered cattle ear tag in the dorsal fin of small odontocetes, as used on Cape Cod for a decade (Wiley et al. 2001); and paint-stick marks for the

first hours or days (WHOI 2024-05). Visual marks are fitted before the animal is moved (NRE Tasmania 2022).

- **Tags are ready before they are needed.** Lithium batteries have a shelf life of about two years and are checked every six months; a typical transmitter runs about 140 days in continuous mode (NRE Tasmania 2022, Vol. 3). GWRA keeps tags in regional caches with the four types WHOI lists (single-pin dorsal fin, LIMPET, transdermal and suction-cup), with trained applicators and standing permits (WHOI 2024-05), so that a missing tag, applicator, permit or budget never decides whether an animal is tracked.
- Photograph the tag site at fitting and at every resighting, and publish the photos.
- Pair every tag with photo-ID, so the animal can still be followed when the tag stops (Part 3).

Glue-on R&D programme

GWRA funds a dedicated programme to make rank 1 the standard:

1. Biocompatible adhesives that bond to skin that renews quickly, and release as it does.
2. Low-drag housings with micro-textured bases, combining glue for shear and suction for pull.
3. Trials first on animals already in rehabilitation, with consent of the veterinary team, so that attachment and skin response are watched daily before any wild deployment.
4. Published results, positive or negative (Principle V).
5. ECG-capable suction-cup and glue-on tags, so that heart rate and rhythm can be followed after release (Torrente 2026).
6. Drag and attachment trials in flumes and on held animals, answering the concern that delayed release tagging in the UK from 1994 onward (Simmonds 2001). The UK veterinary review of 1999 called post-release monitoring “essential”, yet it was never delivered (Simmonds 2001). A low-drag glue-on tag removes the stated reason for delay.

Principle-check

Parts 5, 6 and 11 pass all eleven tests. One tension is managed openly: fin-mounted and dart tags are minimally invasive, and are used only until glue-on tags meet the six-week standard.

Principle	Result
I. No euthanasia	Pass: thinness and time ashore are never used as grounds to refuse treatment; published euthanasia thresholds (Sharp et

Principle	Result
	al. 2014; NRE Tasmania 2022) are re-read as treatment triggers; a minimum diagnostic standard precedes any prognosis
II. No abandonment	Pass: diagnostics are repeated through the whole case
III. Immediate care	Pass: remote diagnostics start at alert level 1, without capture
IV. Post-release monitoring	Pass: every release is tagged; the tag hierarchy picks the least invasive option that works
V. Transparency	Pass: methods, references and results are published, including tag-site photos
VI. Speed	Pass: drone, thermal and blow sampling can be done on the first day
VII. Investigation	Pass: thermal and integrative findings are validated against necropsy
VIII. Scientific basis	Pass: every measure is compared with species and population norms; evidence status is labelled
IX. Improvement	Pass: thermal library, blowhole thermal validation for large whales, blow creatinine, blow aldosterone and glue-on tags are R&D items
X. Public and media	Pass: public drone footage feeds photogrammetry and ID
XI. Safety	Pass: blow and faecal sampling with PPE; odour noted without inhaling the blow

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Parts 7 and 18 — Fragile Species, Stress Reduction, and Beaked Whale and Kogia R&D

Some species die of the stranding itself: stress damages the heart and muscles within hours. For them, speed and stress reduction are the treatment, and every minute of noise, handling and delay counts against survival. This part sets the extra rules that apply to these species on every branch of the decision graph (Part 7). It also sets the research programme for the two groups with the poorest rescue record: beaked whales and Kogia (Part 18).

Taiwan shows the rules work. With about 5–6 live *Kogia* strandings a year, its network rescues 1–2 (Taiwan stranding network, pers. Comm.), but many other countries lose them all.

Which species are fragile, and why

Fragile species are those in which stranding stress itself damages the heart and skeletal muscle. In GWRA practice this means pygmy and dwarf sperm whales (*Kogia* spp.), all beaked whales (Ziphiidae), and neonates and calves of any species. Other species are added when a case shows the same signs.

Three mechanisms

1. **Stress cardiomyopathy and capture myopathy.** Stranding, handling and transport trigger a surge of stress hormones that injures heart and skeletal muscle. This is the same process as capture myopathy in other wildlife (Herráez et al. 2013). Cowan and Curry (2008) described the “alarm reaction” of small odontocetes: the diving and escape reflexes driven to a pathological extreme, with contraction-band necrosis of heart and smooth muscle, ischaemic injury to the gut lining, acute tubular necrosis in the kidneys and spasm of the terminal airways, consistent with a massive release of catecholamines followed by reperfusion injury. In 64 cetaceans of 16 species that stranded alive in the Canary Islands, heart lesions of the same kind were found and interpreted as stress from stranding and transport (Sacchini et al. 2011). A striped dolphin that stranded alive and was transported died 48 hours later of rhabdomyolysis of heart and skeletal muscle with myoglobinuric nephrosis, the first described case of capture myopathy in a stranded cetacean (Herráez et al. 2007). In a live-stranded neonatal Bryde’s whale, heart and muscle damage was dated to 6–12 hours before death, coinciding with the stranding (Cámara et al. 2019). Cardiac troponin I in the blood rises in live-stranded cetaceans with acute heart injury (Cámara et al. 2020).
2. **Possible pre-existing heart disease.** Cardiomyopathy was found in 31 of 45 (68.9%) *Kogia* necropsied in the Canary Islands (Díaz-Santana et al. 2026), and is well documented in US *Kogia* (Bossart et al. 2007). A heart that is already weak tolerates less stress, however it was not possible to distinguish between pre-existing heart issues and the heart issues brought by the stranding event itself. .
3. **Deep-diver physiology.** Beaked whales and *Kogia* are deep divers with specialised circulation and gas handling. Beaked whales stranded after naval sonar exercises had gas and fat emboli consistent with decompression-like injury (Fernández et al. 2005).

What this means for rescue

Cowan and Curry (2008) and Sacchini et al. (2011) offer their findings as an explanation of why “the mortality of highly stressed beach-stranded animals is very high”. GWRA reads the same findings as a map of what to prevent: the injury is driven by catecholamines,

ischaemia and reperfusion, so every minute of fear, struggle and transport adds to it, and every measure that shortens time out of water, reduces stimulation and supports perfusion subtracts from it. WHOI lists the cascade of a stranding (overheating, dehydration, electrolyte imbalance, blistering and fluid loss, scavenger damage, respiratory exhaustion, cardiovascular shock, catecholamine and glucocorticoid release, poor perfusion, contraction-band necrosis of the heart, and rhabdomyolysis leading to kidney failure) (WHOI 2024-05). GWRA treats each item as a treatment target, in that order of urgency.

NOAA’s Kogia best practices call rehabilitation of some age classes “extremely difficult” because of these diseases (NOAA 2022). GWRA draws the opposite conclusion from the same facts. Heart disease and stress injury are reasons to respond faster, reduce stress harder and monitor the heart. They are not reasons to stop (Principle I).

Signs of stress

A dedicated stress observer watches fragile species from the first minute, separate from the breathing observer. Any rising sign means stimulation is cut at once.

Sign	What it means	Response
Red or flushed belly in Kogia	High arousal and emotional stress; a visible, non-invasive stress gauge (SNM observation; grade D, to be validated)	Stop handling; quiet; cover eyes; reduce people; record time and intensity with photos, keep in water
Release of reddish-brown fluid (“ink”) in Kogia	Normal stress response (NRE Tasmania 2022)	Note it; not a sign of dying; keep the area clean
Breathing faster, slower or irregular for the species	Stress, pain, fatigue	Pause, compare with the baseline, call the veterinarian, keep in water
Trembling, rigid body, thrashing	Acute stress, muscle injury	Stop handling; support in water; check muscle enzymes
Vocalising, jaw clapping, eyes rolling	Alarm	Reduce noise and visual stimulation, keep in water
Rising creatine kinase or troponin I in blood	Muscle or heart injury (Câmara et al. 2020)	Vitamin E and selenium; less handling; repeat tests
Dark or red-brown urine	Myoglobin from muscle breakdown; risk to the kidneys (Herráez et al. 2007)	Fluids; stop handling; measure creatine kinase and kidney values
Breathing interval shortens when boats or people	Disturbance stress. A motorboat approach	Fewer, larger, quieter vessels, farther away; keep

Sign	What it means	Response
approach	doubled a diving fin whale's heart rate within about 40 seconds (Torrente 2026). Resting sperm whales breathed every 97 ± 33 s, but every 19 ± 17 s during boat operations (Thalmann et al. 2008); the Kirchsee humpback's interval fell to 47% of its alone value with boats nearby (SNM analysis of livestream data)	in water; halt at a rise of more than about 50% in breathing rate (Part 14B)
Irregular heart rhythm on ECG or thermal imaging	Cardiac stress	Veterinary review; quiet; consider anxiolysis under Part 1 safeguards

The red-belly sign is a GWRA research priority: photographs from every Kogia case, scored for colour and matched to heart rate, troponin and outcome, will show whether it predicts heart injury.

The fragile-species protocol

These rules are added to the normal workflow for any fragile species. Where they conflict with a general rule, the fragile-species rule wins.

1. Speed above everything

- Fragile-species cases go straight to alert level 3 response on the first report, with the nearest certified partner dispatched at once.
- The animal goes into water deep enough to float it as soon as possible: a pool, a sheltered pen, shallow lagoon or sheltered area or a lined beach pool (Part 19). Every hour on sand adds muscle and heart injury.
- Transport is in water-filled containers or stretchers kept wet, never dry.

2. Stress reduction without drugs

1. **Few people:** the smallest team that can do the job; nobody else within sight of the animal.
2. **Quiet:** no shouting, engines, music or radios near the animal; phones silent; no flash photography.
3. **Eyes covered or shaded** with a soft wet cloth, never covering the blowhole.
4. **No crowding at the head;** one person speaks; the same handlers throughout where possible.

5. **Short handling bouts:** every procedure planned in advance, done in one go, then a rest period with no contact.
6. **Water contact and buoyancy:** support in water, padded slings or the neoprene life vest (Part 19), never restraint on hard ground.
7. **Stable temperature,** shade and wetting.
8. **Low light at night** and visual screens around pens.
9. **Acoustic calm:** hydrophones check that pumps, generators and boats are not loud underwater.

3. Medical stress reduction and heart protection

- Vitamin E and selenium on arrival to protect muscle (WHOI 2024-05).
- Fluids for dehydration and to protect the kidneys from muscle breakdown products.
- Pain relief with butorphanol or meloxicam once a working diagnosis exists (Part 15).
- Light anxiolysis with midazolam only under all seven Part 1 safeguards. WHOI notes that light midazolam sedation may reduce cardiac and muscle damage in stranded large whales, with doses drawn from at-sea disentanglement work (WHOI 2024-05; Moore et al. 2010). Whether it protects the hearts of fragile species is part of the Part 18 programme.
- Heart monitoring: ECG where available (suction-cup electrodes for large whales; Part 5), heart rate by thermal imaging, troponin I and creatine kinase repeated over time. Catecholamines measured in blow (Hoffman et al. 2026) may become a non-invasive gauge of the stress that injures the heart.
- Drugs that protect the heart under stress (for example beta-blockers used in human stress cardiomyopathy) are a research question, not routine use (Part 18).

4. Rehabilitation

Fragile species go to rehabilitation, not straight back to sea, whenever they cannot swim strongly and dive normally. Mei-Mei, a weak, wounded pygmy sperm whale with parasites and a high white-cell count, was released in Taiwan after 58 days in care: about three weeks of medical recovery, then a month of foraging training, with some 700 volunteers taking shifts. She was the first survivor among 13 cetaceans brought to the Taijiang centre in ten years (China Post and CNA reports, 2010; SNM case list). Gut parasites, ulcers and swallowed plastic are common in *Kogia* and are treated as in Part 12.

Kogia in care: what Mote Marine Laboratory learned

The Dolphin and Whale Hospital at Mote Marine Laboratory rehabilitated 13 live-stranded *Kogia*, including five calves, over about a decade. A pygmy sperm whale calf survived almost 21 months and a dwarf sperm whale more than 15 months in care, both apparent world records (Manire et al. 2004). GWRA adopts their practical lessons:

- **Fluids as well as food.** Supplemental fluids, given by stomach tube by trained staff only, keep the gut moving; gastric and intestinal stasis was a leading cause of death in care. Oral medication waits until gastric contents are moving, often two to three days after arrival.
- **Water.** About 27 °C for sick animals; ozone or UV treatment in preference to chlorine, which should be kept below 0.5 ppm free chlorine and was linked with constipation; a round pool of at least 6–9 m diameter for a calf and about 15 m for an adult.
- **Drugs.** *Kogia* are prone to adverse reactions to many common drugs, including several fluoroquinolones, cephalosporins and atropine, and itraconazole caused liver toxicity in some. Enrofloxacin by injection (2.5–5 mg/kg twice daily) caused few reactions. Every drug given to a *Kogia* is recorded with any reaction and published, to build the evidence base.
- **Ulcers.** Gastric and oesophageal ulcers are common; acid suppression and sucralfate, with a short tube to reach the oesophagus.
- **Diet.** Coastal squid is poorly digested; deep-water cephalopods are their natural prey (Wang et al. 2002; West et al. 2009). Calves need an artificial formula; Mote's, based on the SeaWorld dolphin formula, is the starting point.
- **Parasites.** Almost every stranded *Kogia* carries them; reduce the burden only where parasites contribute to disease, rather than trying to eliminate them in an animal that will be released.

GWRA does not adopt two lines of the same paper: that cardiomyopathy is “cause for euthanasia” (citing a personal communication), and the framing of release as a fallback because survival in captivity was poor. Heart disease in *Kogia* is a reason for heart monitoring and comfort care (Part 1), and release is the goal from day one (Part 19).

Pregnancy, birth and stranding in *Kogia*

Pregnancy and lactation overlap in *Kogia*: in the Canary Islands, two pygmy sperm whales with calves were also pregnant (Pérez-Gil et al. 2011). A thin female with a calf may be carrying another; her condition is read against that (Part 5). A pygmy sperm whale that stranded alive on Oahu was found at necropsy to carry a near-term fetus; the authors urged simultaneous video and audio recording of every stranded animal (Thomas et al. 1990), which GWRA requires. In Chile, a pregnant pygmy sperm whale stranded, gave birth on the beach, and both mother and calf re-stranded separately and died after repeated attempts to push them back to deeper water failed (Hückstädt & Antezana 2001). A *Kogia* that cannot stay off the beach is held in water and cared for, or moved to a pool, not pushed back again and again at the same site.

What success looks like

Kogia can be rescued, rehabilitated and released. The record is small because few teams try, not because it cannot be done.

Case	Outcome	Source
Taiwan, ongoing	About 5–6 live Kogia strandings a year; 1–2 rescued	Taiwan stranding network (pers. comm.)
Taiwan, 1994–2018	52 cetaceans rehabilitated, 15 released, Kogia among the most commonly stranded groups	Chou et al. 2024
Mei-Mei, Taiwan, 2010	Pygmy sperm whale released after 58 days in care (3 weeks of recovery, then a month of foraging training) with a satellite transmitter on the dorsal fin	China Post and CNA, 2010; SNM case list
Taiwan, 2013	Two pygmy sperm whales rehabilitated; the adult released 20 Oct 2013, the smaller one died	SNM case list
Florida, 1993–94	Juvenile pygmy sperm whale released after about 6 months; tracked 425 km over 4 days with regular dives	Scott et al. 2001
Clearwater, Florida, 1993–2001	Dwarf sperm whale treated for gastroenteritis for about 2 months, then died of suspected cardiomyopathy; shows why heart monitoring matters	Baran et al. (IAAAM)

GWRA's target for every fragile-species case is Taiwan's: reach the animal fast, get it into water, keep it calm, monitor the heart, and treat what is found.

Part 18 — Beaked whales and Kogia: the research programme

No beaked whale has a documented rescue: none has been rehabilitated, released and confirmed alive afterwards. Two neonatal *Mesoplodon* in care in California in 1989 died

after 16 and 25 days, with feeding problems, regurgitation through the blowhole and probable aspiration (Gage, IAAAM). A Cuvier's beaked whale calf was returned to sea on Pico, Azores, in February 2021, but was never tracked or resighted ([Whale Watching Azores 2021](#)).

Why beaked whales have not been saved

The reasons are partly biological and partly a failure of response:

- **Biology:** deep-diver physiology; gas and fat emboli after sonar exposure (Fernández et al. 2005); extreme stress sensitivity; suction feeding on deep-water squid, which is hard to replicate in care.
- **Late response:** animals are often found hours after stranding, when heart and muscle injury is already advanced.
- **Wrong criteria:** thinness is read as terminal, although lactating beaked whales are naturally very thin (Part 5); deep divers are assumed to have a poor prognosis (Boys et al. 2026).
- **No tracking:** the few animals returned to sea were not tagged, so success or failure is unknown.
- **Little shared data:** live cases are rare and scattered across countries, and failures are rarely published.

Prevention works: sonar and beaked whales

Many beaked whale mass strandings have coincided in time and place with naval exercises using mid-frequency sonar (D'Amico et al. 2009; Filadelfo et al. 2009). In the Canary Islands, four Cuvier's beaked whales stranded in July 2004 after an international naval exercise, with systemic fat embolism; it was the last "atypical" mass stranding there after a moratorium on sonar around the islands was established that year (Fernández et al. 2012). Prevention is part of rescue. GWRA supports sonar moratoria and exclusion zones in beaked whale habitat, and its alert network (Part 2) logs naval exercises and sonar notices as risk factors.

Deep-diver physiology and what it means for handling

Beaked whales appear to live with tissue nitrogen levels that would cause decompression sickness in a high proportion of land mammals (Hooker et al. 2009). The current hypothesis is that bubbles form when behaviour or physiology is disturbed: altered dive profiles, extended surface intervals, bursts of activity, or a stress response that changes how gas is exchanged (Rommel et al. 2006; Hooker et al. 2009; Fahlman et al. 2014). Whether stranded beaked whales suffer true decompression sickness is debated (Piantadosi & Thalmann 2004, and the reply by Fernández and colleagues), and in a sperm whale mass stranding in Italy in 2009 gas analysis excluded the gas and fat embolic syndrome as the cause (Bernaldo de Quirós et al. 2011).

GWRA draws three rules from this. Deep divers at sea are never chased or hard-herded: escort is slow, from a distance, with the way to deep water open. Stranded deep divers are examined by ultrasound for gas bubbles where equipment allows. And whether controlled recompression, for example by holding a whale at depth in a sea pen, could treat gas injury is a research question for the programme below, under veterinary and diving-medicine review.

Research programme

Area	Question	Method
Rapid necropsy	What kills live-stranded beaked whales and Kogia, and when?	Rapid necropsy teams within hours of death (Part 17); standard heart, muscle, gas-emboli and kidney panels; comparison with video of the living animal
Heart injury	Can troponin, creatine kinase and ECG predict which animals will die, and when to act?	Serial samples from every live case; shared database with Taiwan, the Canary Islands and other networks
Stress gauge	Does the red belly in Kogia track heart stress?	Scored photos matched to heart rate and troponin
Heart protection	Can drugs used for human stress cardiomyopathy protect stranded cetaceans?	Literature review, pharmacology, careful trials under veterinary ethics review
Holding design	What pool or pen keeps a deep diver calmest?	Depth, darkness, acoustic quiet, visual screens; behaviour and breathing compared between designs
Feeding	How can suction feeders and neonates be fed without aspiration?	Formulas and feeding devices, building on the 1989 neonate experience (Gage, IAAAM)
Decompression injury	Can gas-related injury be recognised and treated in the living animal?	Ultrasound for gas bubbles; gas sampling at necropsy by the Bernaldo de Quirós method (Part 17); collaboration with decompression medicine; recompression feasibility study

Area	Question	Method
Kogia drug safety	Which drugs are safe in <i>Kogia</i> ?	Published reaction log from every case, building on Manire et al. (2004)
Prevention	Do sonar moratoria prevent atypical strandings elsewhere, as in the Canaries?	Stranding records before and after exclusion zones (Fernández et al. 2012)
Release and tracking	Do released animals survive?	Tag every release (Part 6); glue-on tag trials in held animals first
Body condition norms	What is normal for each beaked whale species by sex and reproductive state?	Drone photogrammetry of free-ranging groups; the Bahamas Blainville's beaked whale baseline (Dunn & Claridge 2026) is the first
Heart norms	What are normal heart rate and conduction for each species at rest, diving and stranded?	Suction-cup ECG (Torrente 2026) on free-swimming, stranded and held animals
Blow catecholamines	Can adrenaline-type compounds in blow predict stress cardiomyopathy?	Blow metabolomics (Hoffman et al. 2026) paired with troponin and ECG

Every live beaked whale or *Kogia* case anywhere is treated as a research priority: GWRA offers its team, equipment and analysis to the responding network, and publishes the results jointly.

Principle-check

Parts 7 and 18 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: heart disease and stress injury are reasons to act faster, not to kill; the NOAA view that rehabilitation is “extremely difficult” is answered with method
II. No abandonment	Pass: every fragile-species case is treated as a priority, worldwide
III. Immediate care	Pass: straight to level 3 response; into

Principle	Result
	water at once
IV. Post-release monitoring	Pass: every release tagged, ending the “unknown outcome” problem for beaked whales
V. Transparency	Pass: joint publication of every live case, including failures
VI. Speed	Pass: speed is the first rule of the protocol
VII. Investigation	Pass: rapid necropsy with standard heart and muscle panels
VIII. Scientific basis	Pass: troponin, creatine kinase, ECG and photo-scored stress signs measured; beaked whale thinness judged against species norms
IX. Improvement	Pass: nine-area research programme
X. Public and media	Pass: public reports trigger immediate dispatch; the public is kept back from the animal for its sake
XI. Safety	Pass: small, trained teams; handling minimised for the animal’s safety

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Part 14B — Workflows for Single Strandings, Large Whales, Distressed and Wayward Animals

Each workflow follows the same six steps: stabilise, diagnose, treat, move, release and monitor. They differ in scale, equipment and risk. The nine rules in Part 14A and the fragile-species rules in Part 7 apply to every step. Mass strandings (types M and LM) are in Part 8; orphans (type O) are in Part 10.

Wherever a step says “rehabilitation”, the options and low-cost methods are in Part 19.

Clock targets for every stranding. A veterinarian assesses the animal within 60 minutes of notification (on site, or by video with a trained responder until arrival); the diagnostic work-up is under way within 120 minutes; and a treatment and refloat decision is made within 180 minutes (SNM Dolly/Stormy brief). Each target missed is recorded with its reason. The targets are met by pre-positioned partners and caches, not by haste on the day.

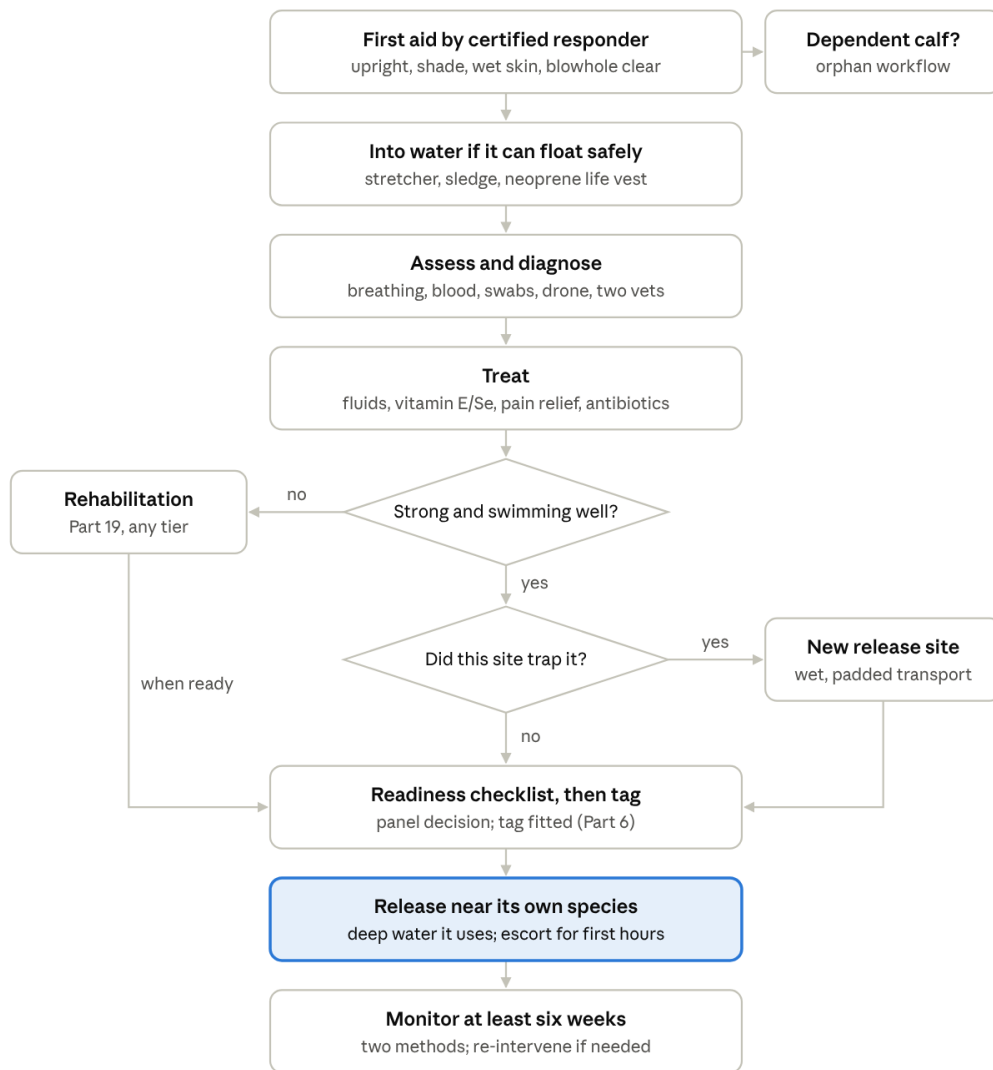
Before arrival. The first team on the road gathers access routes and aerial images, marine and weather forecasts, surf-camera views, tide tables with heights and sunrise and sunset times (WHOI 2024-05), and the location of the nearest veterinary clinic with a blood analyser. It checks the site for nesting birds, protected plants, heritage sites and seals near the planned release point (NRE Tasmania 2022, Vol. 1).

First-hour card. Report and secure the site; photograph; confirm species and number; look for a cause; stabilise and give first aid; record weather, tide, depth, slope, swell and rips; search nearby beaches and the water offshore for other animals and for sharks; update the hotline (NRE Tasmania 2022, Vol. 2).

Workflow S — single small cetacean stranding

Dolphins, porpoises, Kogia, beaked whales, small pilot whales and other animals that a team can carry. Single small strandings are often sick animals, so diagnosis matters more here than in any other workflow.

Single small cetacean: stabilise, diagnose, then release or rehabilitate



Throughout: comfort care, breathing observer, two-veterinarian decisions.
No euthanasia. A natural death leads to an independent full necropsy (Part 17).

Workflow S: single small cetacean stranding

1. First aid by the first certified responder (minutes).

- Keep the animal upright, on its belly; dig shallow trenches under the pectoral fins.
- Shade it and keep it wet, keeping water and sand away from the blowhole.
- Call the GWRA hotline; record time, place, photos and breathing interval.

- Clear the public back; start the case record.
- 2. **Move into water at once if it can float safely.** Rescue mats with drainage holes and colour-coded straps are placed by the concertina-fold method: fold the mat, roll the animal slightly, slide the folded mat under and unfold it on the other side. One coordinator calls every lift; equal numbers of people stand on each side, with more forward of the dorsal fin; pectoral fins lie flat; the body is not flexed; a mat is dragged only over smooth ground (NRE Tasmania 2022, Vol. 2). Alternatively use a stretcher, a canvas sling, or on mud a shellfish-collector's mud sledge; on sand a plastic sled, with a canvas or plastic sheet protecting the skin (Chansue 2022). Never drag by fins or tail. In water, support the animal upright until it can swim, using hands or the neoprene life vest (Part 19).
- 3. **Assess as soon as the animal is stable.** Breathing interval, heart rate, body condition, wounds, eyes, blood, blowhole swab, faeces, integrative examination; drone photogrammetry where possible (Part 5). Two veterinarians agree on a working diagnosis.
- 4. **Treat.** Fluids, vitamin E and selenium, pain relief and antibiotics as the diagnosis supports (Part 15), with integrative remedies as adjuncts.
- 5. **Decide where the animal goes next.**

If the animal...	Then
Swims strongly, breathes normally, has no serious findings, and the site is not a trap	Release at the nearest suitable deep water, tagged; or relocate and release (step 6)
Is healthy but stranded at a site that traps animals	Transport to a different release site (step 6)
Is sick, injured, weak, cannot keep itself afloat, or is a fragile species not yet strong	Rehabilitation (Part 19)
Is a dependent calf	Orphan workflow (Part 10)

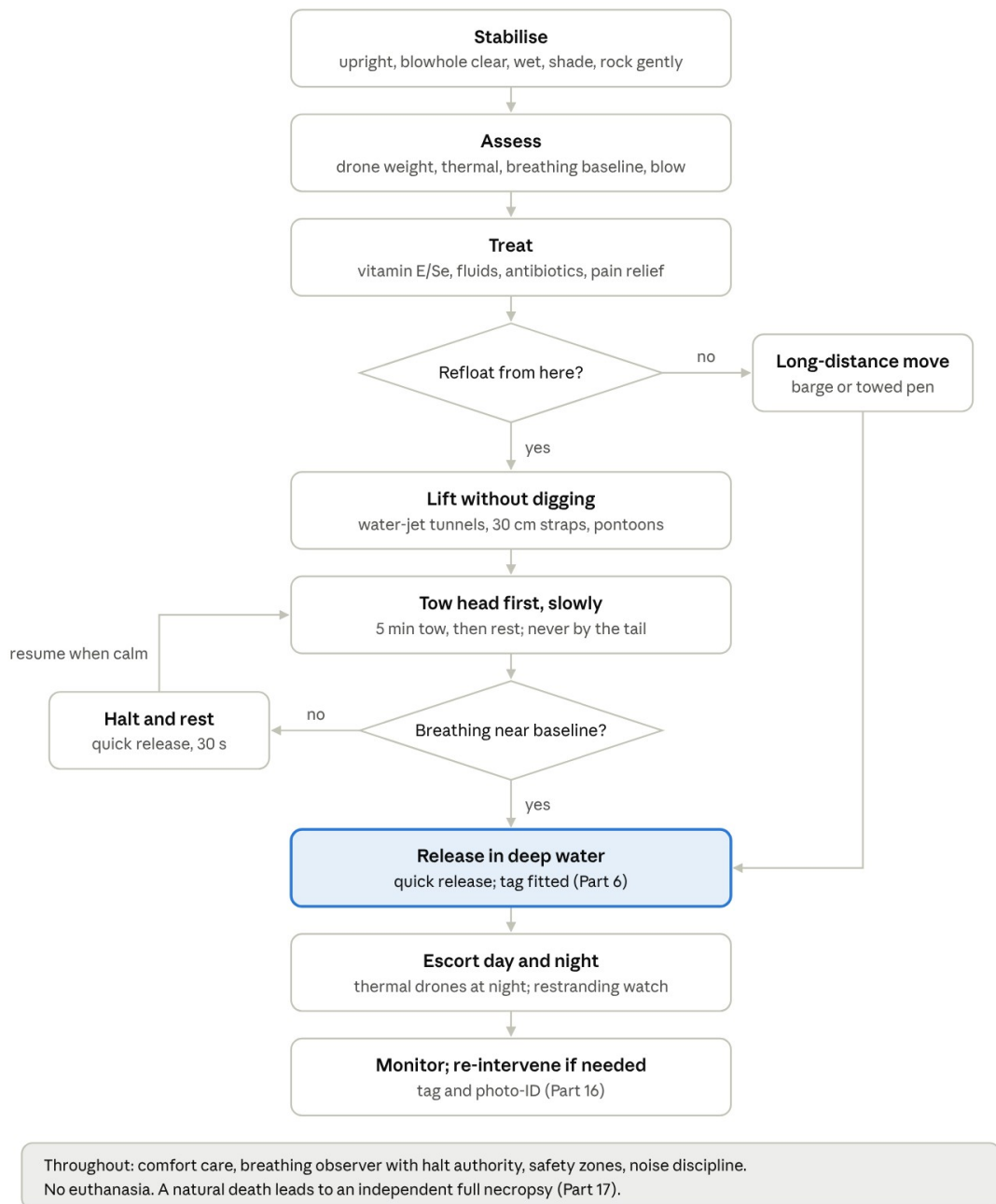
- 6. **Transport.** Wet, padded stretcher in a vehicle or boat; foam pads or a soft mattress; continuous wetting; shade; little noise, no exhaust fumes, and jolts buffered; a veterinarian with the animal (NRE Tasmania 2022, Vol. 2). Animals under about 7 m can go on custom trailers. On Cape Cod, 90% of mass-stranded dolphins and pilot whales transported up to 40 km to better release sites survived transport (37 of 41), and 82% of those released were not seen to restrand (Wiley et al. 2001). In 2010 a pilot whale was trucked to a better site, tagged and released, and resumed normal movements (IFAW; SNM case list). Haitang travelled 16 hours by truck and ship to a deep-water release site (Liu et al. 2026).
- 7. **Release** following the readiness checklist below, near a group of the same species when possible.

8. **Monitor** by tag and photo-ID (Part 16).

Workflow L — single large whale stranding

Humpback, minke, fin, sperm and other whales too heavy to carry. The animal's own weight crushes its muscles and organs when it is out of water, so getting weight off the body is the first medical act (although the damage might not be catastrophic right away and could be localized, at least in the beginning, as the East Hampton humpback whale necropsy shows). Large whales can survive long strandings when partly afloat: the WHOI time guide for prolonged stranding is “variable depending on size, exposure, and stranding effects” (WHOI 2024-05), and sperm whales semi-submerged have survived 5–6 days before rescue (NRE Tasmania 2022). WHOI lists what speeds decline: larger size, less buoyant support, longer time out of water, and hot, sunny weather (WHOI 2024-05). Each is something the team can act on. A soft, wet substrate acts like a “water mattress” and reduces muscle damage; partial submersion reduces compression, and in the East Hampton humpback of 2010 muscle damage was confined to the weight-bearing side (NOAA NY4236-10).

Single large whale: lift without digging, tow head first, escort



Workflow L: single large whale stranding

Phase 1 — Stabilise

1. Keep the whale upright and its blowhole clear; protect it from surf.

2. Reduce weight on the chest: deepen water around it if the tide allows, and use pumps and wetting to keep skin cool. Overheating, not cold, is the usual killer (WHOI 2024-05).
3. Rock the whale gently from side to side at intervals, where safe, to shift pressure and restore balance (Part 8).
4. Set up the safety zone: nobody within reach of the flukes or head (Principle XI).
5. Start comfort care at once (Part 1).
6. **Supportive care, per WHOI 2024-05:** keep the whale on its belly (sternal), which protects the lungs, eyes and cranial nerves; dig holes for the pectoral flippers; wash debris from the eyes; shade the body with sheets and tarps and protect sun-exposed skin with zinc oxide, keeping it away from the eyes; set up wind blocks; pour water slowly and gently, since sudden pours startle; keep scavenging birds away; hold briefings away from the animal; keep a wide perimeter and coordinate tasks so that the whale is disturbed as few times as possible.
7. **Nothing that can entangle or burn.** No garden or sprinkler hoses lying around the whale, which entangled and injured the Kirchsee humpback; no salt thrown on cloths; no improvised oral fluids by watering can (SNM Hope brief). Oral fluids are given only by a trained veterinarian with a stomach tube (Manire et al. 2004).
8. **Never left alone.** At least one trained person stays with the whale through every tide and every night (Part 1, comfort care).

Phase 2 — Assess

Drone photogrammetry for length, width and weight; thermal imaging; breathing interval against the animal's own baseline; blow sample; blood from the pectoral flipper vessel where safe (Part 5). The animal's individual history file guides interpretation (Part 3).

Phase 3 — Treat

Vitamin E and selenium, fluids where practical, long-acting antibiotics, pain relief and calcium as indicated, using long needles into the epaxial muscles behind the skull or by dart (Part 15).

Phase 4 — Lift without digging

Do not excavate around the whale. Digging can leave it balanced on a hard peak under the chest ("tabling"), or let it sink into fluidised sand (WHOI 2024-05).

1. **Break the suction:** propeller wash from a jet boat on one side, and a curved water-jet tube to cut a narrow tunnel under the body just behind the pectoral fins (WHOI 2024-05; NRE Tasmania 2022).
2. **Tunnel the straps:** lifting straps at least 30 cm wide, each rated to at least 30 tonnes; one forward, one at the tail stock in front of the flukes. Divers only guide the straps, from the side, tethered, with a dedicated safety observer.

- **Configuration A:** one strap under the belly behind the pectoral fins, 6–12 m long, ends rising on both sides. Preferred when the back skin is damaged.
 - **Configuration B:** two straps over the back, each looped under one pectoral fin, 4.6–7.6 m long.
3. **Attach pontoons:** tubular lift bags along both flanks, never under the chin or tail, with rapid inflation and purge. Nothing encircles the whale, so deflating the pontoons releases everything.
 4. **Lift gradually** after veterinary clearance, so the whale adjusts to the change in load.

Straps and pontoon specifications are from the SNM rescue plan for the Kirchsee humpback (2026), built on WHOI 2024-05 and NRE Tasmania 2022. Straps 80 cm to 1 m wide were planned for the catamaran lift in the same case (NDR, 6 Apr 2026). Fire hoses are not lifting straps; commercial straps at least 30 cm wide are (WHOI 2024-05).

Other lift and haul methods that have worked:

- **Lift bags towed sideways first.** In a parking-lot drill with an inflatable right whale model, TowBoat US at Morehead City, North Carolina, slung tubular lift bags along the whale and towed it sideways first, so the sling did not pull out, then head first; the bags purged in under a minute. A 10,000 lb lift bag costs about US\$3,000 and has a five-year shelf life (WHOI 2024-05). Commercial salvage operators, at about US\$10,000 a job, can supply gear and skills a stranding network need not own.
- **Pontoons and mat.** The Marine Animal Response Society in Nova Scotia refloated a 35-ft fin whale with a Project Jonah pontoon and mat system. Lessons: bind the mats together so they do not separate, and keep the caudal pontoon clear of the flukes (WHOI 2024-05).
- **Harness and pulley from shore.** At Olympic National Park in August 2017, a gray whale that had not freed itself over rising tides was hauled off on day 3 with a harness, a 2:1 pulley anchor system, about 15 people pulling and a spun marlinspike quick release. Lessons: soft-shackle quick releases; pull straight, never obliquely (WHOI 2024-05).
- **Rope harness under the flippers.** In Brazil, a juvenile southern right whale (2003), a sei whale (2004), a juvenile right whale (2011), a right whale cow and calf (2014) and a humpback (2017) were fitted with a rope harness passed under the flippers by jet ski and towed head first by tug or Navy vessel. The sei whale died and the humpback restranded; the others were refloated, untagged. Some whales rolled through 360° once afloat and then recovered: a roll after refloating is not a sign of failure. In one case the line was cut at the boat and left on the whale, a new entanglement. GWRA uses only harnesses that release completely, knotless where possible, with a pole knife or buoy knife ready (WHOI 2024-05). Humpbacks can be towed with a rope under the body looped around both pectoral fins, with no knot on top (WHOI 2024-05, towing working group).

- **Channel digging by excavator, on sand only.** In the Baltic in March 2026 excavators dug a channel about 50 m long and 1.2 m deep, marked with buoys, and the whale freed itself overnight (SNM Hope brief). Excavation carries the risks above. A humpback on Cape Cod in 2002 is suspected to have died of “tabling” after digging, and a lateral roll can cause aspiration. Excavation is therefore used only on sand, with one experienced lead who alone speaks to the machine operator, non-essential people kept away, and permits and land access settled in advance (WHOI 2024-05). Heavy-equipment relationships are built at necropsies (Part 17).
- **Test on carcasses first.** New methods are tried on dead whales before live ones (WHOI 2024-05).

Equipment the rest of the world already uses. The WHOI workshop observed that “rescue efforts ramp up nearly from scratch with each event” (WHOI 2024-05). GWRA’s answer is pre-positioned caches, partner agreements with salvage, towing and heavy-vehicle recovery companies, and regular drills (Annex A).

Phase 5 — Tow

1. **Head first only.** Never tow by the tail stock (NRE Tasmania 2022; WHOI 2024-05).
2. **Very slowly:** the minimum speed that keeps control.
3. **Five minutes of towing, then rest** so the whale can breathe; rests are lengthened if needed (NRE Tasmania 2022).
4. **Breathing observer with absolute authority to halt.** Where a suction-cup ECG is fitted (field ECG, Part 5), the observer also watches heart rate, and a sustained rise above the animal’s own resting baseline is a reason to pause. Stop if breath intervals shorten by more than about 50% from the animal’s resting baseline, if breathing becomes rapid and shallow, or if breathing stops for longer than its normal maximum (SNM Kirchsee plan).
5. **Noise discipline:** low engine revolutions, radios not shouting, nothing dropped or banged.
6. **Maximum distance:** after the lift, vessels and people stay as far away as control allows.
7. **Quick release in under 30 seconds** at the end of the tow, or at any time the observer calls it.
8. **Rigging:** Dyneema or Amsteel line, which stretches little and is best for beach hauling; soft shackles and eye splices instead of heavy metal; deep-draft tugs need long lines; everyone stays out of the recoil zone of every loaded line. Friction is far lower on wet cobble than on sand; a plastic sheet with a little mild dish detergent along the path reduces it further (WHOI 2024-05).
9. **Minimum fleet of three vessels:** a tow vessel; a jet-boat support vessel to break suction with its wash and carry divers; and an observation vessel with the breathing observer, veterinarian and safety officer (SNM Kirchsee plan). Aquaculture jet boats

have “sufficient power, shallow draft and lack of a spinning propeller” (NRE Tasmania 2022, Vol. 2). All three can usually be assembled within 24–48 hours.

10. **Tow as long as the whale tolerates it.** For a boat-averse animal, one longer tow with rests can be gentler than days of herding (SNM Kirchsee plan).
11. **Never by the flukes.** Towing by the tail has caused lumbocaudal subluxation, and towing a humpback backwards damages the flippers and makes them act as anchors (WHOI 2024-05). Helicopters are not used to lift live whales: heavy-lift pilots drop oscillating loads (WHOI 2024-05; Principle XI).

Phase 6 — Long-distance transport, when release nearby is impossible

- **Barge:** a whale can be floated into a flooded barge and towed. The Baltic humpback swam about 110 m into a 50 × 13 m floodable barge and was carried to the North Sea in 2026, and left the barge alive (SNM Hope brief). The transit also caused injuries that set the GWRA standard for any transport vessel:
 - smooth, padded walls with no exposed bolts (head lacerations); straps and sandbags kept away from the blowhole (abrasion); room to turn (a 2-ft fluke scrape and a 1 × 0.5 m flank abrasion);
 - openings at both ends, with a net rather than a metal hatch at the entrance, for water flow and emergency escape;
 - acoustic damping or lining, because a steel hull reflects sound and may harm hearing (Deutsches Meeresmuseum, cited in SNM Hope brief);
 - 24-hour attendance by a veterinarian and a breathing observer; the whale was left unattended overnight;
 - a vessel certified in advance for the expected sea state;
 - a written release plan **before loading**, matched to how the whale will face. The whale was loaded head first without a plan for releasing it that way, and was finally released with tail lines pulled by opposing vessels, which is never acceptable;
 - one named decision-maker for the whole operation; in the Baltic case the chain of command collapsed. The whale’s skin improved as salinity rose, and it vocalised more (SNM Hope brief): getting a whale out of brackish water is itself treatment.
- **Towed soft-mesh sea pen:** a large netted pen with a continuous bubble curtain along the bottom and sides is the GWRA concept for moving whales out of the Baltic, rivers and estuaries while they swim freely. In 1965 a killer whale was moved 450 miles over 19 days in a slow-towed floating pen, which shows the method is physically possible. This is R&D, not yet field practice.

Phase 7 — After release

Escort the whale continuously, day and night, at a distance, with thermal drones at night, until it is in safe water. Whales left alone after refloating often restrand (SNM Kirchsee plan). Tag before release (Part 6).

- **Refloat without herding is displacement, not rescue.** The herding flotilla is in position before the refloat, so there is no gap (SNM herding brief).
- **Night is part of the plan, not the end of the day.** The minimum night deployment is a thermal-drone operator, radio contact and at least three fast boats on standby, able to move within 15–30 minutes. At dusk the whale is guided to the deepest open water nearby. The early warning is a change of course toward a bay or sandbank, not an entry into it (SNM herding brief). In the Baltic in March 2026, the escort was called off at nightfall twice, and the whale was lost and restranded both times (SNM Hope brief).
- **Release from escort** follows self-directed behaviour (steady travel toward open water, normal dives and breathing), not reaching a line on a map (SNM herding brief).

What the timeline could have been. For the Baltic humpback, SNM set out a counterfactual: darted medication on day 1, strap refloat on days 2–3, acoustic herding on days 3–5, open sea by day 8 (SNM Hope brief). GWRA uses this as the planning target for a single large whale in enclosed water.

What not to do

These errors were recorded in the Baltic humpback response of 2026, by official teams and by a private initiative alike (SNM Hope brief). Each is excluded by a GWRA rule:

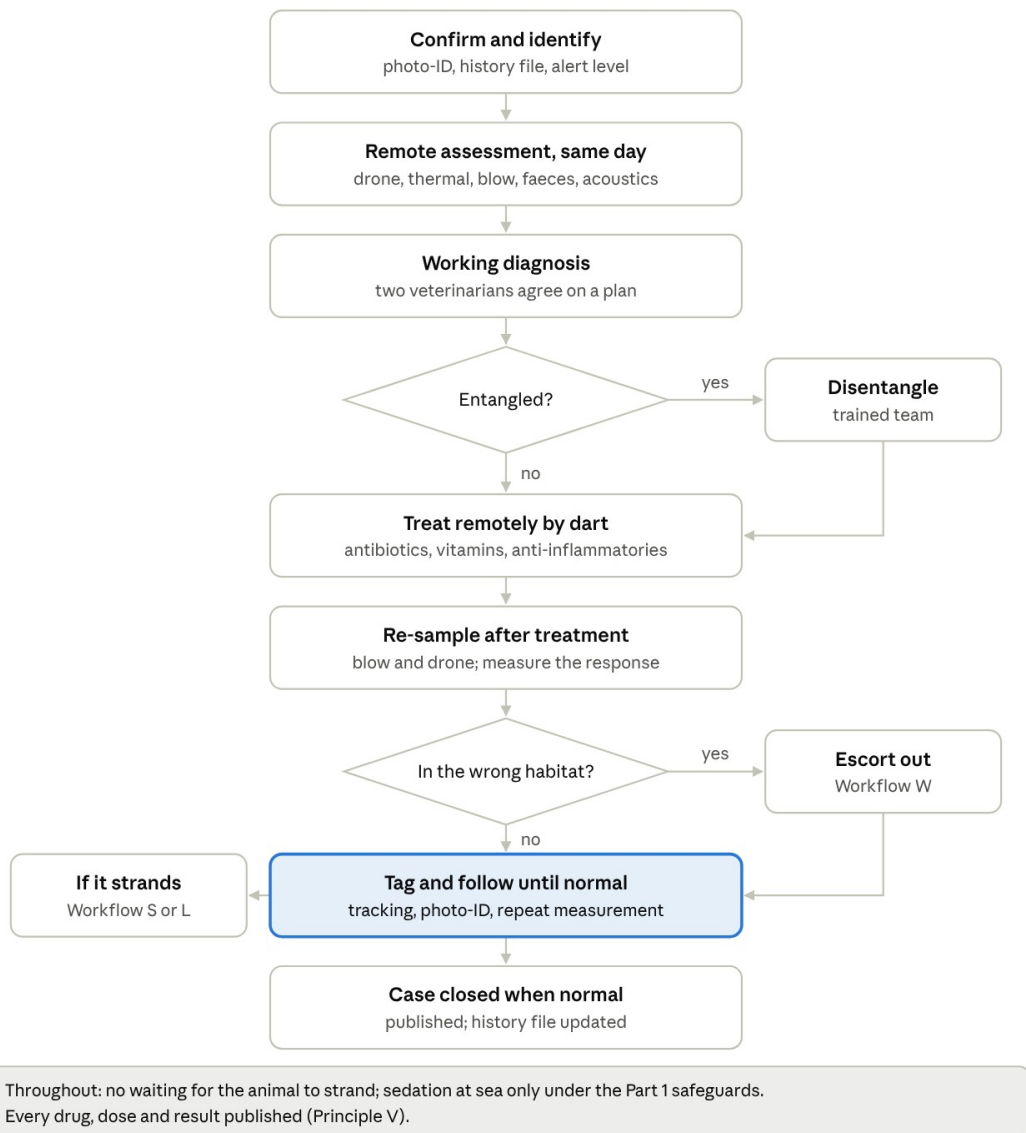
Error	GWRA rule
Escort stopped at nightfall; whale left alone at night	Continuous 24-hour escort and attendance (above)
Uncoordinated boats; open dispute between two-sided flanking and a one-sided barrier	One incident command; the herding formation agreed before boats move (Part 8)
Four jet skis herding in zigzags without a protocol; restranding followed	Herding only by trained crews under the protocol (Part 8)
Three different plans in eight days	One plan, revised only on new findings, with every revision published
Capture preferred over herding while the tide was rising by 70 cm	Use the tide first; capture is the fallback
Pontoons brought in head-on; the whale was frightened	Approach from the side, slowly, in the whale's view (Principle XI)

Error	GWRA rule
Daily public promises of success	Facts, not adjectives; no prognosis without diagnostics (Annex A)
A foreign veterinarian could only advise for lack of a local licence	Veterinarians licensed in each country in advance under the MOA (Annex A)
Only one small boat at the entrance of a known dead-end lagoon	Pre-mapped dead-end bays; a screening line of several vessels at the mouth (Workflow W)
Fire hoses instead of lifting straps; watering-can oral fluids	Proper straps in caches; oral fluids by stomach tube only
Release by tail lines	Release plan before loading; never tail-tow

Workflow D — free-swimming animal in distress

An animal that is sick, injured, entangled or exhausted but still at sea. This is where GWRA can do the most good at the least risk, and where current practice most often does nothing. Hartwin was photographed in eight countries over seven months and examined in none (SNM Hartwin brief).

Distressed at sea: diagnose and treat before it strands



Workflow D: free-swimming animal in distress

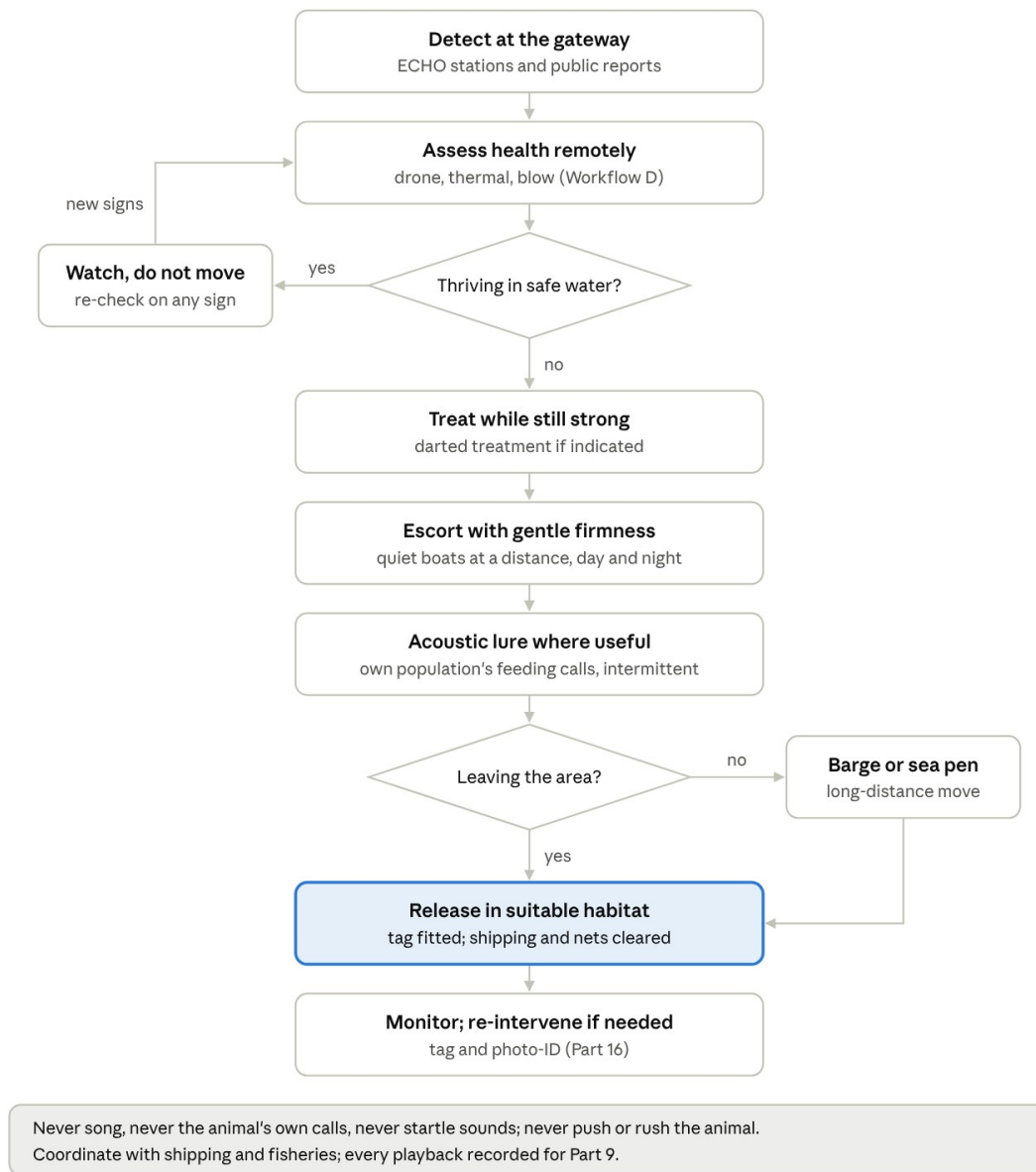
1. **Confirm and identify.** Match photos to the history file (Part 3); set alert level 1 or 2 (Part 2).
2. **Assess remotely, the same day where possible.** Drone photogrammetry, thermal imaging, breathing pattern from video, blow sample, field ECG by suction-cup tag where the animal can be approached, faecal sample if seen, acoustic recording (Part 5).

3. **Decide with two veterinarians** on a working diagnosis and a plan. If the diagnosis is uncertain, keep sampling; do not wait for the animal to strand.
4. **Treat remotely.** Dated long-acting antibiotic, vitamins and anti-inflammatories as indicated (Gulland et al. 2008; Part 15). Re-sample the blow after treatment to measure response.
5. **Disentangle** if gear is present, using trained disentanglement teams and methods such as keggings (NRE Tasmania 2022). Sedation at sea only under the Part 1 safeguards (Moore et al. 2010).
6. **Tag for follow-up:** a suction-cup or drone-dropped tag for short-term follow-up; a longer-term tag if repeated treatment is likely (Part 6).
7. **Escort** the animal toward suitable habitat if it is in the wrong place (Workflow W).
8. **Stay with the case** until the animal is back to normal behaviour and condition, confirmed by tracking, photo-ID and repeat measurement. If it strands, switch to Workflow S or L with its history already known.

Workflow W — wayward animal

A cetacean in habitat that cannot sustain it: a large whale in a river, harbour or the Baltic, or an animal far outside its range. Time in the wrong habitat wears the animal down: fresh water damages whale skin within weeks (Gulland et al. 2008), and an enclosed sea brings nets, shallows and shipping (Hope/Timmy, 2025–26).

Wayward animal: detect early, treat while strong, escort out gently



Workflow W: wayward animal

When to intervene

A wayward animal that is feeding, behaving normally and, in a social species, has companions may be watched rather than moved. The narwhal living with St. Lawrence belugas since 2016 is an example (CBC 2018). GWRA intervenes when:

- the habitat cannot sustain the species (fresh water, an enclosed sea without its prey), or
- any distress sign appears (Part 2), or
- the animal is in repeated danger from nets, vessels or shallows.

Steps

1. **Detect early**, ideally at the bottleneck where the animal enters (ECHO; Part 2). In the Baltic, salinity of 7–15 PSU against about 35 in the open sea damages skin (Gulland et al. 2008); a 17 m fin whale stranded alive near Wismar in 2006 and died of heart failure, while a juvenile humpback that stayed near Greifswald for months in 2016 left on its own (SNM Hope brief). Incursions are becoming more frequent.
2. **Map the traps in advance**. Every partner region keeps a map of dead-end bays, lagoons, canals and sandbanks, with herding routes and urgent extraction routes agreed with the maritime traffic authority (ECHO). A whale near a trap is met with a screening line of several vessels at its mouth before it enters.
3. **Assess health remotely** (Workflow D, steps 2–4), and treat while the animal is still strong.
4. **Escort out with “gentle firmness”** (SNM Kirchsee plan): slow, quiet boats at a distance; never pushing, never aggressive engine use; continuous through the night with crew rotation, thermal drones and minimal lights. A whale left alone after an escort often turns back or restrands.
5. **Use an acoustic lure where it has a chance of working**: recorded feeding calls from the animal’s own population, played intermittently from a speaker ahead of the whale; never song and never the animal’s own calls (SNM Kirchsee plan). Humphrey followed humpback feeding sounds 69 miles to sea in 1985; Delta and Dawn did not respond consistently to anything in 2007 (Gulland et al. 2008). Results feed the playback research in Part 9.
6. **Coordinate with shipping and fisheries authorities** for safe passage and to remove nets ahead of the route.
7. **If escort fails or the animal is too weak**, move it: barge or towed sea pen (Workflow L, phase 6).
8. **Tag before or during release** into suitable habitat, and monitor (Part 16).
9. **Respect weather limits**. In the Baltic, wind chop of 1.5–2 m is dangerous for small boats. Boats under 12 m stay out of open stretches in swell over 1 m; the escort is staged between sheltered waypoints, and holds position with the lure when swell exceeds the limits. Swell surge can open shallow bays, so bay-blockers stay in place (SNM Acoustic Lure Brief).

Deterrents that frighten animals, such as loud startle sounds, are not used on wayward animals. They add stress and can drive an animal into worse places (Part 9).

Release readiness and release rules

The checklist follows the release assessment used for Haitang (Liu et al. 2026) and the readiness signs in NRE Tasmania (2022). A release decision is taken by a panel, not one person: Haitang's had five veterinarians, two researchers, two NGO staff and two government officers.

Readiness checklist

- ☐ Swims upright and balanced, controls direction, dives
- ☐ Breathing interval normal for the species and for this animal
- ☐ Wounds healed or healing without infection
- ☐ Body mass-to-length ratio normal for the species and life stage (drone or tape)
- ☐ Eating well, for animals in rehabilitation (Haitang: 10–15 kg squid or herring a day)
- ☐ Blood values within the normal range
- ☐ Alert and responsive; vocalising where the species normally does
- ☐ Rights itself and breathes unaided, strongly and regularly
- ☐ Swims strongly in a straight line without tilting; hard to hold
- ☐ Eyes open while submerged; avoids obstacles and people
- ☐ Attempts shallow dives (NRE Tasmania 2022, Vol. 2)
- ☐ Tag fitted and transmitting (Part 6)
- ☐ Release site, escort and monitoring team confirmed

Release rules

1. **Site:** deep water that the species is known to use, near groups of the same species where possible. Never the site that trapped the animal. Haitang was released in about 500 m of water, 60 nautical miles from the coast, in an area where short-finned pilot whales are regularly seen (Liu et al. 2026).
2. **Social species** are released together, or near a group of their species (Parts 8 and 10).
3. **Timing:** early in the day and in calm weather, so the first hours can be watched; at high tide, ideally just as it begins to ebb; with attention to currents, a depth profile without sudden drop-offs, minimal waves and wind; away from vessel traffic and known predators such as killer whales and sharks (NRE Tasmania 2022, Vol. 2). Shipping, naval exercises, sonar and ordnance clearance are checked first (Part 16).
4. **Exercise before letting go.** A refloated small cetacean is first held in standing-depth water to rest and be reassessed. Refloated animals are often lethargic and unbalanced and may roll; this is “typical and should not be interpreted” as a sign that the animal is unsuitable for release (NRE Tasmania 2022, Vol. 2). Experienced handlers help it breathe, face it to sea, and exercise it: push forward, ease the head

under, let it roll and self-right, move the flukes. A support vessel stays between swimmers and open water because of sharks; swimmers stay at standing depth and are rotated for cold and fatigue.

5. **Mothers and calves are floated together**, and the cow is released first so the calf swims to her (NRE Tasmania 2022, Vol. 2).
6. **Escort and watch**: a boat or drone stays with the animal for the first hours, and the team is ready to intervene again (Principle IV).
7. **Publish** the release, the tag track and the outcome (Principle V).

Measures of success

A response is judged against measures set before it starts. WHOI proposes four: no people injured; the animal refloated without significant injury or undue stress; the animal surviving for a defined period; and equipment not destroyed (WHOI 2024-05). GWRA adds two: the clock targets above, and confirmed survival at six weeks by tag or photo-ID (Part 16). Every case reports against all six.

Equipment caches

Caches are pre-positioned with certified partners so that any response can start within the 24-hour (or less) standard (Principle VI). Low-cost items are listed first because they work anywhere. Caches are tiered (local, regional and national, as the UK planned in the 1990s; Simmonds 2001), audited every year, and used for nothing else (NRE Tasmania 2022, Vol. 1). Where possible they are co-located with oil-spill response kits, as in New Zealand and Australia, and drugs are rotated before they expire (WHOI 2024-05).

The Tasmanian whale-rescue trailer is the model for a local cache: at least 4 rescue mats, about 10 shovels, about 25 buckets, about 40 cotton sheets, flagging tape in consistent colours, a gazebo and shade cloth, about 12 plastic star pickets, cable ties, 2 soft waterproof mattresses, a necropsy kit, 2 personal flotation devices and the manual (NRE Tasmania 2022, Vol. 2). GWRA adds the diagnostic, tagging and treatment items below.

Category	Workflow S (small)	Workflow L (large)	Workflows D and W (at sea)
Handling and moving	Stretchers, canvas and plastic sheets, mud sledge, plastic sled, foam pads, neoprene life vests with bottle pockets	Lifting straps at least 30 cm wide rated to 30 t; tubular lift bags with rapid purge; water-jet tubes and pumps; tow lines with quick release	Small, quiet boats; tow-free escort only
Holding	Portable plastic	Barge access	—

Category	Workflow S (small)	Workflow L (large)	Workflows D and W (at sea)
	pools, liners for beach pools, bamboo and shade netting	agreement; towed sea pen (R&D)	
Care	Buckets, sprayers, shade, sheets	High-volume pumps, shade, sheets	—
Diagnostics	Stethoscope, thermometer, blood kit, swabs, portable ultrasound, field blood analyser	Same, with long needles; drone with laser altimeter and thermal camera	Drone with laser altimeter and thermal camera; blow-sampling petri dishes and pole; faecal net; hydrophone
Treatment	First-line formulary (Part 15); herbal kit	Same, in large volumes; IVF-type long needles to 58.5 cm; PVC sharps tubes	Dart projector (Paxarms type), sterile darts, long-acting drugs
Tags	Fin-mount and suction tags; glue-on prototypes	LIMPET and glue-on prototypes	Drone-drop suction tags
Safety	Gloves, masks, eye protection, first aid	Same, plus diver tethers, wetsuits or drysuits, helmets with face shields and chin straps	Personal flotation devices, radios, EPIRB, safety knives
Disentanglement	—	Pole knives and buoy knives	Grapples, keggings buoys, telemetry buoys (Argos or Iridium, VHF and GPS) on lines with a biodegradable first section, Hoffman knives, extendable poles with knife heads, flying knives, underwater viewer, action camera (NRE

Category	Workflow S (small)	Workflow L (large)	Workflows D and W (at sea)
			Tasmania 2022, Vol. 3)
Records	Camera, waterproof notebook, case forms	Same, plus livestream kit	Same

Principle-check

The four workflows pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: every workflow ends in release, rehabilitation, or care to natural death
II. No abandonment	Pass: continuous escort and attendance after refloating, day and night; Workflow D stays with the case until it resolves; the “what not to do” list closes the gaps of the 2026 Baltic case
III. Immediate care	Pass: first aid in minutes by certified responders
IV. Post-release monitoring	Pass: tag before every release; escort and watch afterwards
V. Transparency	Pass: release decisions, tracks and outcomes published
VI. Speed	Pass: pre-positioned caches; same-day remote assessment
VII. Investigation	Pass: case records feed necropsy and debrief
VIII. Scientific basis	Pass: halt criteria from the animal’s own breathing baseline; readiness from measured values
IX. Improvement	Pass: lure results and pen transport feed R&D
X. Public and media	Pass: certified local responders; livestreams for transparency
XI. Safety	Pass: no digging under whales, divers tethered and never under the animal, head-first towing, quick release, noise discipline,

Principle	Result
	recoil zones, no helicopters, weather limits for small boats

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Parts 8 and 9 — Mass Strandings and Acoustic Lure R&D

In a mass stranding the goal is first to stop the pod coming ashore. If it does strand, the team moves it to a different place and keeps the group together. There is usually a window

of hours between a pod entering shallow water and the stranding, and that window is where most lives can be saved.

Why mass-stranded animals must be rescued. Research shows that most of them are healthy. On Cape Cod, 97 of 106 mass-stranded animals necropsied between 2000 and 2006 (92%) had no significant pathological findings (Bogomolni et al. 2010). In the UK, 318 of 654 cetaceans known or suspected to have stranded alive (48%) had no significant pathology that could explain the stranding, most of them pelagic species (Barnett et al. 2011), and 2/3 to 3/4 of stranded pelagic dolphins “appeared to be healthy (and died because they stranded)” (Simmonds 2001). There is “no cause or explanation universal to all cetacean stranding events” (NRE Tasmania 2022, Vol. 2): navigational error over gently sloping bottoms, predator avoidance, chasing prey and the strong bonds of a pod can all bring healthy animals ashore, and many stranding sites act as topographical traps (UIA Encyclopedia). When the animals are healthy, the stranding is what kills them, and rescue is the treatment.

Rescue also works. On Cape Cod from 1990 to 1999, 299 of 376 mass-stranded animals were euthanised or died without any rescue attempt. Of the 77 for which a concerted rescue was made, 90% survived transport to release sites up to 40 km away, 82% were not seen to restrand, and 78% overall survived transport and were released without restranding. The authors concluded that “rapid intervention by well-trained and equipped response personnel can increase the chance that animals will survive the stranding event” (Wiley et al. 2001). Pushing individual animals back to sea while the group stayed ashore was found unsuccessful and stopped (Wiley et al. 2001).

The methods work at scale. In September 2020, 114 of 470 stranded long-finned pilot whales in Macquarie Harbour, Tasmania, were saved by moving them in slings alongside jet boats (NRE Tasmania 2022). In 2024, 102 of 146 common dolphins survived a mass stranding at Wellfleet, Massachusetts, with herding on foot, attraction by underwater pingers, transport to a different beach and satellite tags (WBUR, 15 Jul 2024).

Phase A — Near-stranding

A near-stranding is a pod milling, travelling or resting in shallow water close to shore, often at a known stranding site. The trigger is the first report from the public, a fixed acoustic station or a drone (Part 2).

1. **Raise the alert to level 2** and dispatch boats, drones, the acoustic team and certified local volunteers at once.
2. **Hold the pod offshore.** Boats form a line on the shore side of the pod, leaving the way to open water clear. People stand in the water in a line where it is safe and shallow enough. Use the quietest method that works: boat presence and positioning, splashing and slapping the water. Engine revving, hull banging and acoustic crackers (NRE Tasmania 2022) are used only if nothing else works, and never near fragile species (Part 7).

- **Formation:** a semicircle or line behind and beside the pod, with the seaward side open, kept tight enough that animals cannot dive under it. The formation and the single command are agreed before boats move (SNM herding brief).
 - **Numbers:** about 10–15 boats for a pod or a single large whale. At Gare Loch, Scotland, in 2020, about six boats using engine noise alone had to reset repeatedly and achieved only partial success (SNM herding brief, from BDMLR reports).
 - **Tools:** oikomi pipes as the primary deterrent on the shore side; engine noise; bubble curtains where available (SNM herding brief).
 - **Public boats are part of the barrier**, under command, not sent away. In September 2026, during pilot whale strandings in Northumberland and the Thames, members of the public with boats were excluded (SNM MARC investigation).
 - **Shore and aerial observers** from the public relay positions by radio (Part 2).
3. **Find the animal in distress.** A sick, injured or calving animal can lead a closely bonded pod ashore. Its companions stay with it (UIA Encyclopedia; SNM). Drones and thermal cameras look for the animal that is slow, listing, breathing abnormally, showing thermal hot spots or being supported by others. A pod's leader is hard to identify and may not be at the front, so watch behaviour rather than position (UIA Encyclopedia). Identifying the animal in distress and the leader is itself a research priority (drones, thermal imaging and acoustic localisation; Part 9).
 4. **Isolate and treat it.** Gently guide or carry the distressed animal away from the pod's path, to a sheltered holding spot or pen. There it is examined and treated (Parts 5 and 15) while the pod is kept offshore. A human chain between the sick animal and the pod has prevented restranding after refloats; it is easier to set up when the team is already on site (UIA Encyclopedia).
 5. **Herd the pod well away** from the site, toward deep water, with boats in a slow, wide formation and continuous acoustic monitoring. Attractive sounds (feeding or social calls of the species, or pingers) can lead the pod: at Wellfleet in 2024, small boats with pingers drew dolphins away from shore (WBUR 2024). Results feed Part 9.
 6. **Stay with the pod** until it is in deep water and travelling normally. Keep boats on watch through the next tide and night, because pods often return.

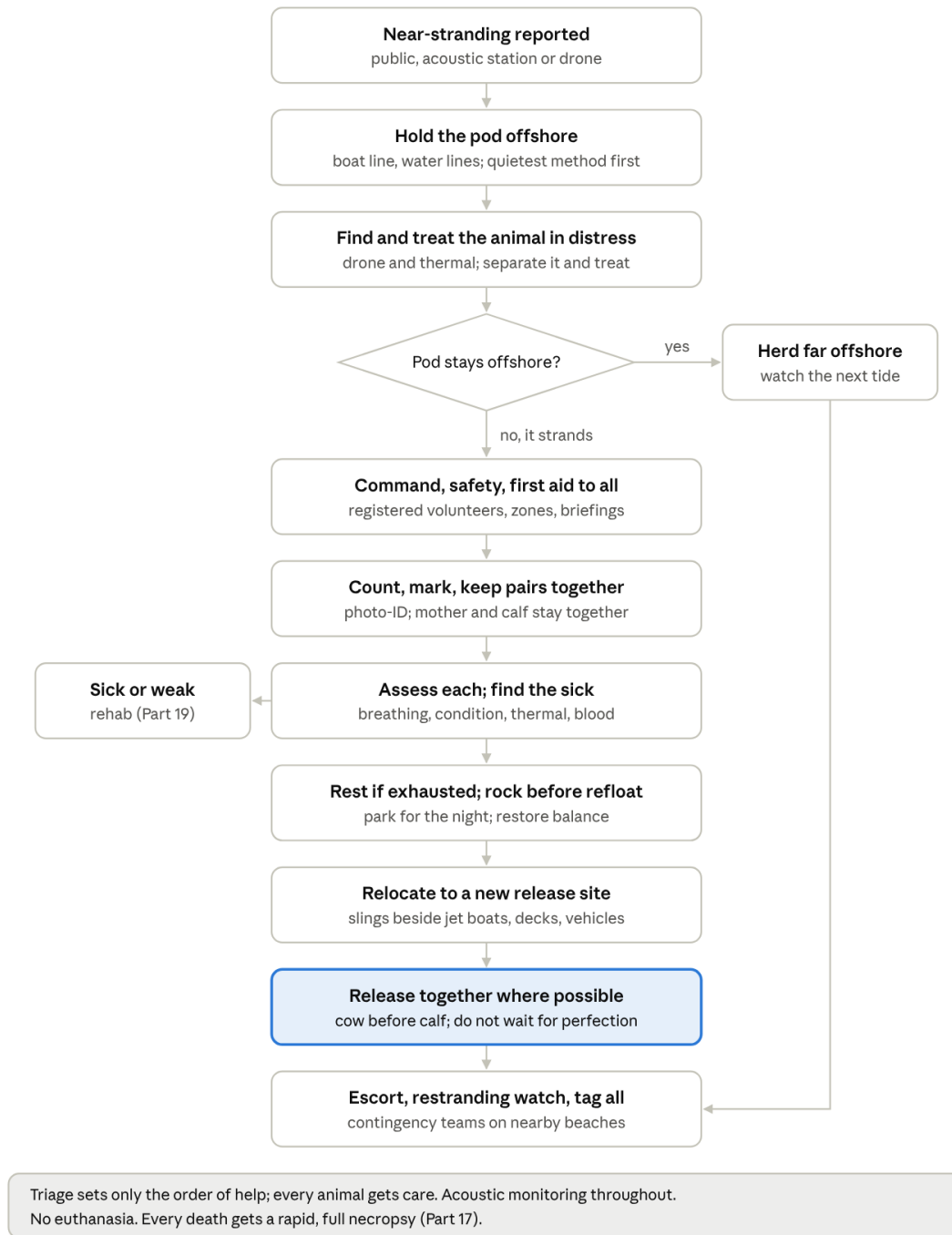
The public's role

Near-strandings are usually seen first by people on the shore, and in mass strandings the number of trained hands decides how many animals live. Certified volunteers are called out at alert level 2, before the stranding, briefed on site, and given roles: shore watch, water lines, carrying, and first aid. Untrained people are welcomed, registered and given safe tasks such as water carrying and crowd control (NRE Tasmania 2022; Chansue 2022).

Workflow M — mass stranding of small and medium odontocetes

Pilot whales, false killer whales, melon-headed whales, pygmy killer whales and dolphins. In a mass stranding, triage decides only the **order** in which animals are helped. It never decides which animals are abandoned (Principle II).

Mass stranding: keep the pod offshore, or move it and keep it together



Workflow M: mass stranding

1. **Set up command and safety.** Incident command with named roles (NRE Tasmania 2022); a safety officer; zones for animals, responders, the public and media; registration and briefing of every volunteer.
2. **First aid to every animal at once.** Upright on the belly, trenches under the pectoral fins, shade, wet sheets, water kept away from the blowhole, no loud noise. Small odontocetes can be kept stable this way for days (NRE Tasmania 2022).
3. **Keep the rest of the pod offshore.** Boats continue Phase A so that animals still at sea do not join the stranding.
4. **Count, identify and mark** every animal: photos for photo-ID, flagging tape or biodegradable twine around the tail stock of every live animal, a Floy tag, and a drone survey of the whole site (NRE Tasmania 2022, Vol. 2). Search neighbouring beaches and islands, by aircraft or drone where needed, for more animals; watch animals still offshore; and watch for sharks, which endanger people in the water and refloated animals (NRE Tasmania 2022, Vol. 2). Find mother–calf pairs, checking for lactation where possible, and keep each pair together (NRE Tasmania 2022).
5. **Assess each animal and find the sick ones.** Breathing, body condition, wounds, thermal imaging and blood where possible (Part 5). Rapid, qualitative triage works: on Cape Cod, 91% of animals chosen this way survived transport, were released and did not restrand (Wiley et al. 2001). A sick animal that led the pod is separated, treated and, if needed, rehabilitated, so it cannot lead the others back (Phase A step 4).
6. **Hold and rest when that is better than rushing.** Exhausted animals do better after rest: pilot whales and dolphins “parked for the night” in cool, quiet, dark conditions are often stronger next morning (NRE Tasmania 2022). Hold in water where possible, watching animals at the tideline so waves do not roll them.
7. **Rock before refloating.** Before each animal is floated, rock it gently from side to side to restore its balance after hours on its side or belly (Project Jonah, New Zealand), then support it upright in the water until it swims steadily.
8. **Relocate rather than refloat at the same site.** A beach that trapped the pod once will trap it again. Move animals to a deep-water release site:
 - in mats slung alongside jet boats, head first, with an emergency release ready (NRE Tasmania 2022);
 - on boat decks, or by jet-ski with a mat or strop under the belly, head first only (NRE Tasmania 2022);
 - by vehicle in a mobile rescue clinic, with fluids given on the way (Wellfleet 2024, WBUR).
 - Move a cow first and her calf next to her or straight after, so the calf has its mother to swim to (NRE Tasmania 2022).
9. **Release together where possible, but do not wait for perfection.** Eleven pilot whales released at Stanley, Tasmania, in 2012, five of them with satellite tags,

reunited within four hours although they were not released as a group (Gales et al. 2012). Healthy animals are released as soon as they are ready.

10. **Guard against restranding.** Boats escort the released group; contingency teams watch neighbouring beaches through the next tides. At Farewell Spit in December 2024, refloated whales restranded twice within two days (NZ Department of Conservation 2024).
11. **Animals that cannot yet be released** go to holding pens or rehabilitation (Part 19). Calves without mothers follow Part 10. None is euthanised.
12. **Tag every released animal.** Satellite or glue-on tags go on as many animals as stock allows; every other animal gets a visual tag and full photo-ID. Satellite-tag stock for mass strandings is a procurement target (Annex A; Parts 6 and 16).
13. **Every death gets a rapid, full necropsy** (Part 17), freshest carcasses first, not the most convenient (NRE Tasmania 2022, Vol. 5).

Mass-stranding responses on record

Event	What was done	Outcome	Source
Panadura, Sri Lanka, 2–3 Nov 2020	About 100–120 short-finned pilot whales; Navy, Coast Guard and volunteers worked 16 hours through the night under vehicle floodlights, during a COVID curfew; jet skis towed animals across the reef on ropes	About 120 returned to sea; 4–5 died	Mongabay (5 Nov 2020); Al Jazeera. Grade C
Linhai, Zhejiang, China, Jul 2021	12 melon-headed whales; local people and fishers refloated them, livestreamed	9 returned to sea	SNM MARC investigation, from Chinese media. Grade C
Everglades, Florida, Dec 2013	51 short-finned pilot whales in shallow water; about 15 boats and 30 people, oikomi pipes and engines, a Coast Guard helicopter	About 35 reached deep water, some by themselves; 11 died, 5 missing, 4 euthanised	CNN, NPR, National Geographic (Dec 2013). Grade C

Event	What was done	Outcome	Source
Gare Loch, Scotland, 2020	About six boats herding with engine noise only	Partial success; repeated resets; animals not resighted	SNM herding brief. Grade C
Cape Cod, 1990–1999	17 events; transport to better release sites, ear-tagging	60 of 77 rescued animals survived transport and were released without restranding	Wiley et al. 2001
Macquarie Harbour, Tasmania, Sept 2020	About 470 long-finned pilot whales; sling-loading beside jet boats	114 released	NRE Tasmania 2022
Wellfleet, Massachusetts, Jul 2024	146 common dolphins; herding, pingers, transport, satellite tags	102 survived the event	WBUR 2024

The pattern is clear: numbers of trained hands and boats, work through the night, and relocation decide outcomes. Night work is possible with lights and a safety officer (Panadura); a few boats with engine noise are not enough (Gare Loch).

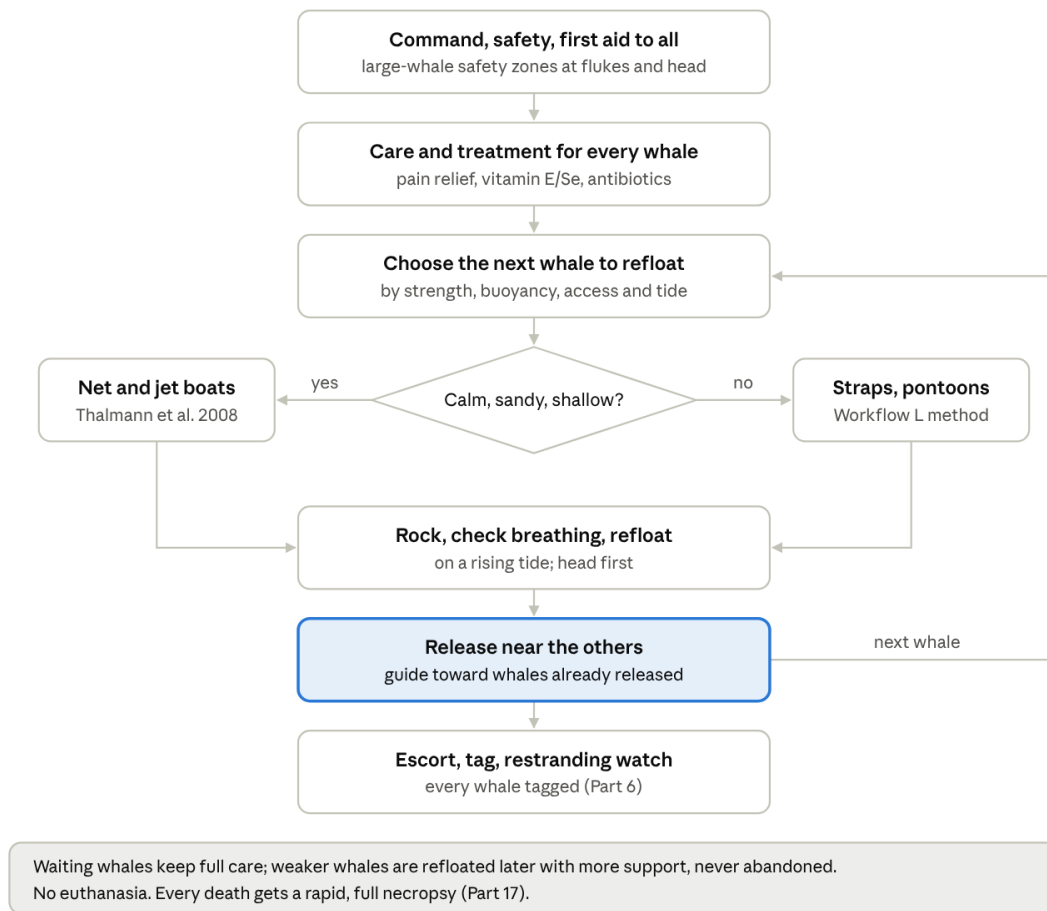
Readiness for the large event

In 2001 the founder of the UK’s Marine Animal Rescue Coalition wrote: “I still do not believe that the UK is ready to deal with a large mass stranding,” noting that there was no central emergency fund (Simmonds 2001). GWRA keeps a standing emergency fund and pre-signed agreements for boats, vehicles, lights and accommodation in every partner region, so that a large event is met on its first night, not after a funding decision. Cost is not an argument against rescue: a rescue operation probably costs less than disposing of a hundred carcasses (UIA Encyclopedia).

Workflow LM — mass stranding of large whales

Usually sperm whales; sometimes other large odontocetes or baleen whales. Every animal gets continuous care; the only choice is the order of refloating.

Large-whale mass stranding: care for all, refloat one by one



Workflow LM: mass stranding of large whales

The model is Ocean Beach, Macquarie Harbour, Tasmania, March 2007. Twelve sperm whales stranded; seven were returned to sea over four days, the last 96 hours after stranding (Thalmann et al. 2008). Conditions helped: whales lay in about 1 m of still water, partly afloat, on a sandy bottom, with calm seas.

1. **Command, safety and first aid** as in Workflow M, with large-whale safety zones around flukes and heads (Workflow L, phase 1).
2. **Comfort care and treatment for all** while they wait: water and wetting, shade, pain relief, vitamin E and selenium, antibiotics by injection or dart (Part 15).
3. **Decide the order of refloating** by which animals are most likely to move successfully now: strength, buoyancy, access and tide. Weaker animals are not abandoned; they are refloated later with more support, or moved to holding.

4. **Choose the method for each whale:**

- **Net and jet boats** (Thalmann et al. 2008): a modified aquaculture net is placed around the whale and two jet boats pull it from its position, then guide it to deep water. The 2007 net was a salmon aquaculture net 20 × 4.5 m of braided nylon with 150 mm mesh, a 20 mm polypropylene frame, a lead-core bottom line, 125 mm buoys, 2.5 m “butterfly wings” and three bridles to a single tow point; the whale’s head lay just inside the wings, so the net acted as a panel, not a bag that compresses the body. Two 10 m aluminium jet skiffs of 350 hp, with a draught under 1 m and no cutting surfaces, towed from at least 10 m off the head or tail at about 45° to the heading. Tows lasted 5–23 minutes; longer tows paused every 5 minutes, releasing tension for 1–2 minutes and resuming after at least 4–6 breaths, with every breath recorded. Jet wash alone, directed toward the tail from about 3 m, freed two partly grounded whales that faced deep water. When a whale became entangled in a single wrap, the tail section was cut free under a pre-agreed cutting plan and a second attempt succeeded. Whales were taken in order of tractability: location, health and size (Thalmann et al. 2008). Earlier net attempts in Tasmania saved 1 of 10 whales at Flinders Island in 2003 and 1 of 5 at Ocean Beach in 2004; the 2007 result of 7 of 12 came from that learning (Thalmann et al. 2008). The net is weighted with care (too light and it bounces, too heavy and it bogs), jet wash on the opposite side breaks suction, and a sperm whale’s tail is protected from rope rub (NRE Tasmania 2022, Vol. 2). Tasmania keeps a dedicated rescue net that can be taken anywhere in the state (NRE Tasmania 2022, Vol. 2), and its author has confirmed that net towing is “fundamentally suitable” and standard practice in Australia, while every case is individual (Thalmann, pers. comm., 10 Apr 2026). Best on sandy bottoms in calm, shallow water. WHOI (2024-05) judges nets unsuitable for single large whales because of entanglement of appendages and the risk of towing the animal upside down. The net method is therefore used only by experienced crews, in conditions like Macquarie Harbour, with a cutting plan.
 - **Straps and pontoons** (Workflow L, phase 4): water-jet tunnelling, wide straps, lift bags, head-first tow with rest every 5 minutes.
5. **Rock gently before each move** to restore balance where size and safety allow, and check breathing against the whale’s own baseline.
 6. **Refloat on rising tides** and in daylight where possible; hold and care through the night where not.
 7. **Release near the other whales.** Sperm whales are highly social: refloated whales are guided toward animals already released, or held until others are ready.
 8. **Escort, monitor and tag** every whale (Parts 6 and 16); keep boats on watch for restranding.

9. **Rapid necropsy** of every whale that dies, with special attention to heart, muscle and the pressure injuries of prolonged stranding (Part 17).

Acoustic monitoring and data during every mass stranding

The acoustic record runs from the first report to the last release. Hydrophones are placed at the stranding site, along the herding route and at the release site, and recordings continue throughout.

- **During near-stranding:** record pod vocalisations to find calling animals, track the pod at night, and detect distress calls that may draw others ashore.
- **During the stranding:** record calls from stranded animals and from the pod offshore. Stranded animals and those still at sea are often in contact.
- **During release:** track the released group's contact calls and reunion; NRE Tasmania lists vocalising as a sign of release readiness.
- **During herding with lures:** record what was played, when, and how the animals moved (Part 9).

Data collected from every animal

Photos for ID, drone measurements, breathing intervals, thermal images, blow and faecal samples, blood where taken, sex and age class, mother–calf links, treatments, time of release, tag numbers and outcome. All data go into history files (Part 3) and the GWRA case database, and are published (Principle V).

Part 9 — Acoustic lure R&D

Sound is the most powerful way to guide a cetacean without touching it, and the least understood. GWRA's position: attract rather than frighten, and invest in controlled playback studies so that lures move from luck to method.

What has worked, and what has not

Event	Sound used	Result	Source
Humphrey, Sacramento River, 1985	Killer whale sounds	Signs of distress, no directed movement	SNM Acoustic Lure Brief; Humphrey the Whale
Humphrey, 1985	Oikomi pipe-banging from a line of boats	5–10 miles a day with overnight retreats; net about 14 miles in 10 days	SNM Acoustic Lure Brief
Humphrey, 1985	Seal bombs (underwater)	Immediate beaching	SNM Acoustic Lure Brief

Event	Sound used	Result	Source
	explosive deterrents)		
Humphrey, 1985	Recorded Alaskan humpback feeding sounds, played intermittently from a boat ahead of him	Followed voluntarily, about 50 miles in 7 hours, completing the 69-mile journey to the Pacific	SNM Acoustic Lure Brief; Wikipedia summary
Humphrey, San Francisco Bay, 1990	Oikomi plus feeding-sound playback	Guided out, about 50 miles	Same
Delta and Dawn, Sacramento River, 2007	Feeding and social playbacks; oikomi pipes; killer whale and tonal alarms; fire hose	No consistent downstream movement from any	Gulland et al. 2008
Golden Bay, New Zealand, 1995	Static bubble curtain	Turned pilot whales briefly, then lost effect once the whales learned it was not solid	UIA Encyclopedia
Orca playback as a deterrent, various	Predator sounds	“Largely unsuccessful worldwide”; risk of panic	UIA Encyclopedia
Wellfleet common dolphins, 2024	Underwater pingers on small boats	Drew dolphins away from shore during herding	WBUR 2024
“Petaluma Pete”, gray whale, California, 1994	Lure playback	Followed at first, then reversed and was later found dead; noise from a metal observation barge and spectators disrupted the lure	Deseret News (19 May 2007). Grade C
Norway, pilot whales and sperm whales (research)	Killer whale playbacks	Pilot whales were attracted toward the speaker in 4 of 5	Curé et al. 2011

Event	Sound used	Result	Source
		trials; sperm whales broke off dives and surfaced	
Kirchsee humpback, Germany, 2026	Recorded whale song played into the water	No effect	Mecklenburg-Vorpommern press release 106/2026

The pattern: attraction with meaningful sounds of the animal's own kind has worked; fear-based deterrents have mostly failed or habituated. Lure means cooperation; repulsion means evasion, and an animal evading may go anywhere, including ashore. Repulsion is used only to block escape routes into danger (SNM Acoustic Lure Brief). Species respond differently to the same sound: killer whale calls repelled sperm whales but attracted pilot whales (Curé et al. 2011), so a sound that works on one species is never assumed to work on another. Why Humphrey responded and Delta and Dawn did not is unknown. Possible reasons include the recordings, the animals' condition, the timing, or the presence of a calf, and this question is the core of the programme.

Rules for field use now

1. Use recordings of the species' own feeding or social calls, ideally from the same population.
2. Never song, and never the animal's own calls played back to it (SNM Kirchsee plan).
3. Play intermittently, from a speaker ahead of the animal, moving toward safe water.
4. Keep levels moderate and well below injury thresholds; no startle sounds on fragile species, calves or exhausted animals.
5. Record every playback: stimulus, level, timing, and the animal's response from drone tracks and acoustic recordings.
6. **No explosives, seal bombs or startle devices**, ever. Seal bombs drove Humphrey straight onto the shore (SNM Acoustic Lure Brief).
7. **Never distress calls**, and never the animal's own stranding calls played back to it while it is confined. New Zealand once planned to record pilot whale distress calls to lead refloated whales away (UIA Encyclopedia); GWRA does not adopt it.
8. **On-off playback by a person with line of sight** (Joe Mobley's protocol for Humphrey): sound on when the whale is distracted, veers or stops following; off while it follows. Continuous loops lead to habituation and reversal (Delta and Dawn). Playback cannot be automated.
9. **The lead boat**: a stable, heavy-displacement, quiet vessel at minimum revolutions; it starts 200–400 m ahead and lets the whale close the distance; dead slow at first, then up to about 6 knots for an adult (Humphrey) and 2–4 knots for a juvenile. Humphrey's first rush toward the lead boat made it list (SNM Acoustic Lure Brief).

10. **Acoustic corridor:** the lure ahead, and mild deterrent sound on the flanks from small speakers playing recorded pipe noise, which is safer than hammering in a sea over 1 m and allows precise levels. A weighted curtain closes behind the whale as a one-way gate once it has passed, as at the Liberty Island bridge in 1985 (SNM Acoustic Lure Brief).
11. **Verify the sound arrives.** A hydrophone boat checks that the signal reaches the whale at the intended level.
12. **Silence everything else.** Spectator boats, observation barges and generators are kept away and quiet; noise ruined the lure for Petaluma Pete.

Research programme

Study	Design
Playback library	Feeding, social and contact calls by species and population, collected from free-ranging animals with partners
Recording preparation standard	Humphrey's lure began as a 55-second 1984 cassette of Alaskan feeding calls with engine noise (recorded by C.S. Baker). About 40 hours of studio work removed the noise and used a sampler to vary duration, pitch, reverberation, envelope and timbre, giving a 15–20 minute tape that did not repeat (SNM Acoustic Lure Brief). GWRA adopts this as the preparation standard, with multiple backup copies
Playback kit	Humphrey's speaker was a US Navy J-11 transducer of about 54 kg, lowered to 3 m, rated 200 W and run at 168 W (a larger amplifier would have destroyed it), on 120 V AC with a davit or winch. GWRA kits carry a transducer of this class, a matched amplifier, redundant generator and playback, and a calibrated hydrophone
Controlled playback experiments	Free-swimming animals not in distress; randomised order of stimuli and silent controls; response measured by drone track, heading change and approach
Lure trials during real escorts	Pre-registered protocol; each playback compared with the periods without sound

Study	Design
Habituation	Repeated exposure tests; how variation in stimulus delays habituation
Dynamic barriers (R&D only)	Variable bubble curtains and changing sound fields to hold pods offshore without fear: physics and behaviour to be tested before any field use (SNM technology proposal). The Golden Bay curtain of 1995 was penetrated after about 20 minutes. The proposal argues that bubbles larger than about 2 mm in radius resonate below 1.5 kHz and are acoustically transparent to pilot whale clicks of 6–11 kHz, so that micro-bubbles of about 0.3–0.55 mm radius would be needed (grade E, to be tested)
Distressed-animal and leader identification	Drone, thermal and acoustic localisation to find the animal leading a pod ashore (Phase A)
Startle sounds (excluded from field use)	Startle-type pulses (“targeted acoustic startle technology”, 185–195 dB, rise faster than 10 dB/ms) are proposed in the SNM technology material. GWRA does not use them in strandings: startle is acute stress, risks heart injury in fragile species (Part 7) and can drive animals into shallows. Any study is laboratory or controlled-field only, under hearing-safety limits and veterinary ethics review
Low-cost listening buoys	AudioMoth/HydroMoth hydrophones on buoys with on-board detection and satellite alerts at stranding hotspots (Part 2)

All results are published, including lures that did not work (Principle V).

Principle-check

Parts 8 and 9 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: animals that cannot be released go to

Principle	Result
	holding or rehabilitation
II. No abandonment	Pass: triage sets only the order of help; every animal gets care
III. Immediate care	Pass: first aid to every animal at once
IV. Post-release monitoring	Pass: every released animal tagged or visually marked and photo-identified; escort and restranding watch
V. Transparency	Pass: all acoustic and animal data published, including failed lures
VI. Speed	Pass: dispatch at the near-stranding stage, before animals are ashore
VII. Investigation	Pass: rapid necropsy of every death
VIII. Scientific basis	Pass: rescue justified by necropsy data (92% without significant pathology, Bogomolni et al. 2010; 48%, Barnett et al. 2011) and outcome data (Wiley et al. 2001); methods from documented events; lures tested by controlled playback
IX. Improvement	Pass: playback research programme
X. Public and media	Pass: certified volunteers called out at the near-stranding stage; public tasks for all
XI. Safety	Pass: water lines only where safe; quiet herding preferred; explosives and startle devices excluded; weather limits for small boats; sharks watched

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Parts 10 and 19 — Orphans and Rehabilitation Facilities

No orphaned or separated calf is written off. Calves are reunited with their mothers where possible, adopted by wild groups more often than is assumed, and can be raised and released. Rehabilitation, the step that makes this possible, does not need an expensive hospital. It can be done in a lined beach pool, a fish pond, a sea pen or an existing aquarium, as Thai and Chinese teams show.

This part answers two positions GWRA rejects. The first is that dependent calves without a mother should be euthanised: NRE Tasmania advises that “if no adults are observed ... consideration should be given to euthanasia of the stranded calf” (NRE Tasmania 2022, Vol. 2); Boys et al. (2026) list “animal independence could not be guaranteed” as a euthanasia criterion; and in 1996 the UK’s Marine Animal Rescue Coalition adopted the view that neonates “should not be rescued, unless their mother could be found” (Simmonds 2001). The second is that rehabilitation is impossible because facilities are lacking (British Divers Marine Life Rescue, public statement; Simmonds 2001; NRE Tasmania 2022, Vol. 2). Both make a missing service into a verdict on the animal.

Part 10 — Orphans: the evidence

Two kinds of evidence show that an orphan’s life is not over: wild cetaceans adopt calves that are not their own, including calves of other species, and rehabilitated calves have been released and survived.

Adoption in the wild

Case	What happened	Source
North Atlantic right whales, US Atlantic coast	Two mothers raised each other’s calves, confirmed by DNA; both calves grew up and had calves of their own	Frasier, in Canadian Geographic, Dec 2010
Southern right whale, South Africa, 2012	A mother with her own calf adopted a lone calf and nursed both	African Wings, reported by SNM (2015) and Merbabe (2012). Grade C
Common dolphin calf with oceanic bottlenose dolphins, New Zealand,	A bottlenose dolphin female appeared to have adopted a common dolphin calf	Orca Wild Adventures, 10 Jan 2019. Grade C

Case	What happened	Source
2019		
Bottlenose calf with a spotted dolphin mother, Bimini, Bahamas, 2019	A spotted dolphin mother cared for a bottlenose calf	A. Rosenfeld, photographs, 9 Apr 2019. Grade C
Melon-headed whale calf with Indo-Pacific bottlenose dolphins, Mikurajima, Japan, 2013	A lost melon-headed whale calf, or possibly a hybrid, was swimming with and nursed by a bottlenose dolphin group	Asahi Shimbun, 11 Sep 2013
Narwhal with belugas, St. Lawrence River, 2016–2018	A juvenile narwhal far outside its range was accepted into a beluga group and resighted over three years	GREMM, via CBC News, 13 Sep 2018

Reunion with the mother

Case	What happened	Source
Humpback calf, Manguinhos beach, Serra, Espírito Santo, Brazil, 18 Sep 2023	A newborn calf, umbilical cord still attached, was wedged between rocks and coral. Euthanasia had been discussed because of its wounds. The decision was reversed when the calf was judged healthy and an adult, taken to be its mother, was seen close by; the calf reacted when she moved her flipper. Local responders and volunteers kept it wet and shaded, gave pain relief and freed it on the rising tide after about six hours. It was seen with its mother two days later, identified by a half-moon scar on its fluke in drone images	Gusman-Cunha et al. (2025), <i>Aquatic Mammals</i> 51(3):197–203; O Antagonista (2023); Ambipar (2023)

The case carries three lessons that GWRA adopts. The mother is often close by, even when nobody has yet looked for her. A calf judged healthy has a future once it is back with her, whatever it looks like on the beach. And the decision belongs to the veterinarians and field team who examine the animal: after this case the Brazilian stranding network (REMANE) updated its guidance so that euthanasia decisions rest with them (O Antagonista 2023).

Rehabilitated and released calves

Case	Care	Outcome	Source
Springer (A73), orphaned killer whale, Puget Sound, 2002	Floating net pen for about a month; treated for worms and ketosis; gained 112 lb; minimal human contact	Moved to a second pen beside her pod in Johnstone Strait; released on 14 July 2002; rejoined her pod and had two calves; seen healthy in 2022	NOAA Fisheries
Alonso, common dolphin calf, Algeciras, 2013	Rescued from a gillnet, stabilised in rehabilitation	Released near local dolphins; photo-ID confirmed he rejoined his mother	Andalucía Información, 28 Aug 2013
JJ, gray whale calf, California, 1997–98	Found days old; about 14 months of care	Released March 1998; dived and spyhopped normally; both satellite tags fell off within two days, so the outcome is unknown	Hubbs–SeaWorld Research Institute
Two neonatal <i>Mesoplodon</i> , California, 1989	Formula, tube and bottle feeding	Both died, after 16 and 25 days, with feeding problems and aspiration	Gage, IAAAM
Franciscana calves, São Paulo, Brazil, 2022–2025	Live-stranded orphan calves, about 20% of some 1,100 strandings, in rehabilitation	Rehabilitation success was “extremely low”; necropsy findings (pneumonia, missing passive immunity) changed clinical management, and	Duarte-Benvenuto et al. 2026

Case	Care	Outcome	Source
		calves now survive for months, one for more than a year in rehabilitation	

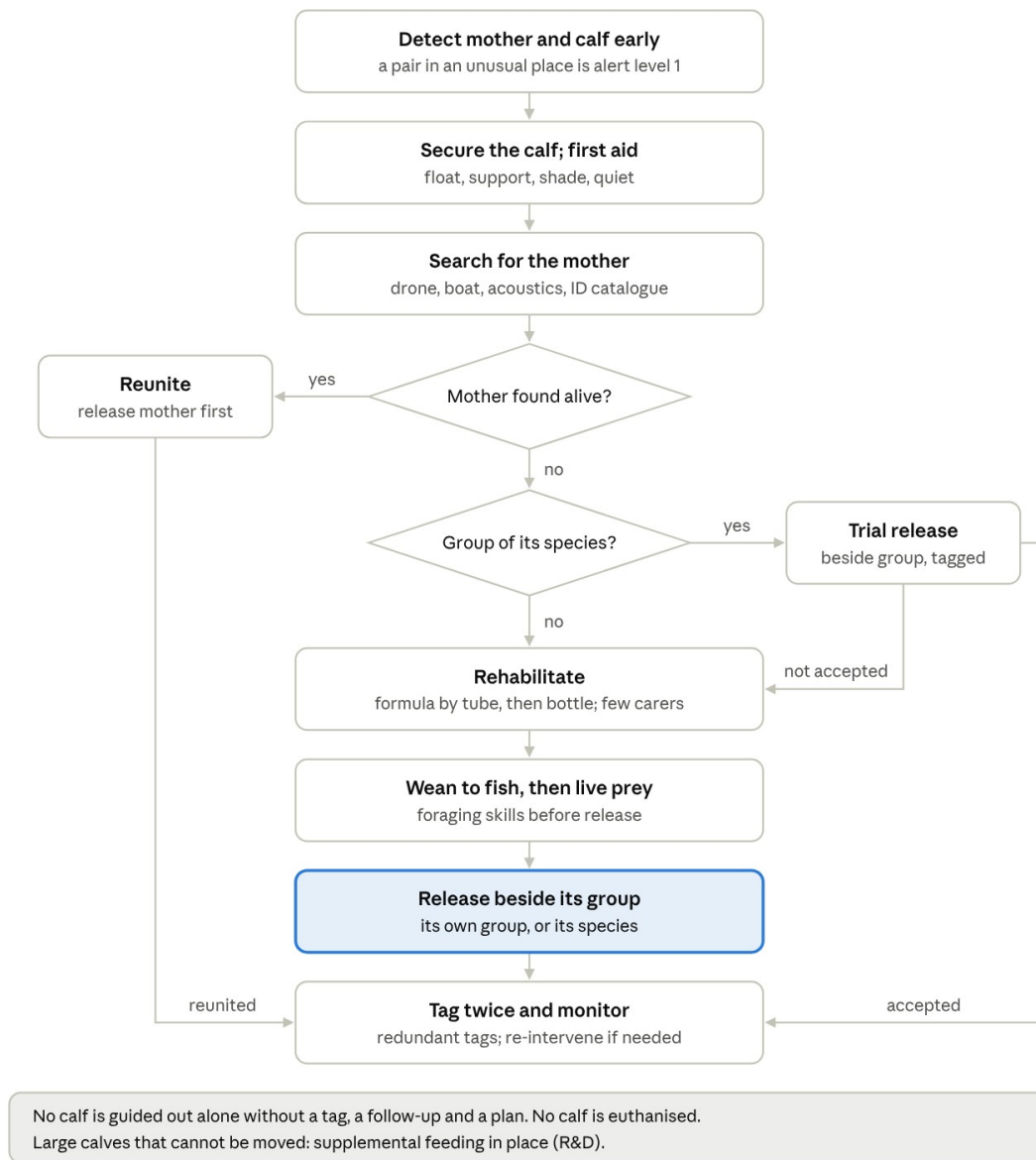
These cases set the method: find the mother or the group first, since the mother is often close (the Espírito Santo calf, above); if that fails, raise the calf with as little human contact as possible; release it next to its own or another group of its species; and tag it reliably. JJ's lost tags show why tag attachment is an R&D priority (Part 6).

Part 10 — The orphan workflow

The Baby Toa lesson

In August 2026 a humpback mother and calf stayed in the Maraa lagoon, Tahiti, for at least four days, known to whale-watching operators. The mother died trapped on the reef without anyone noticing her distress. On 31 August the calf, named Toa by the community, was guided out to open water alone, with no tag, no follow-up and no attempt at supplemental feeding. Toa died the next day (SNM letter to the French Polynesian authorities, 4 Sep 2026). Every step below answers a gap in that case.

Orphan calf: mother first, then a group, then rehabilitation



Workflow O: orphan or separated calf

Steps

1. **Detect the pair early.** A mother and calf in an unusual place, such as a lagoon or a harbour, is alert level 1 (Part 2). Watch both, and treat the mother if she is in distress.

2. **Secure the calf and give first aid.** Keep it in water deep enough to float, supported if needed (the life vest for small species, Part 19); shade, quiet, warmth or cooling as needed.
3. **Look for the mother at once.** Assume she is nearby until a documented search shows otherwise (Searching for the mother, below). If she is alive, reunite them. The Espírito Santo calf, first considered for euthanasia, was back with its mother within days (Gusman-Cunha et al. 2025).
4. **If the mother is dead or cannot be found, look for a group.** Find groups of the calf's species, or of related species known to adopt, nearby (the adoption cases above). For small odontocetes, a short trial release next to a group, with a tag and a boat standing by, is reasonable when the calf is strong and close to weaning.
5. **If no reunion or adoption is possible, rehabilitate** (Part 19):
 - **Feeding:** species-appropriate milk formula, by tube at first and by bottle and nipple as soon as possible. Formulas are built from published milk analyses for the species or its nearest relatives (Arvy 1974; Jenness & Odell 1978; Oftedal & Iverson 1995; Ohta et al. 1953; Urashima et al. 2007). *Kogia* milk has less fat and more lactose than most cetacean milks (Jenness & Odell 1978), and Mote's *Kogia* calf formula, based on the SeaWorld dolphin formula, is the starting point for that genus (Manire et al. 2004). The 1989 neonatal beaked whales only stopped regurgitating once a suitable bottle and nipple were found (Gage, IAAAM). Aspiration is the main danger.
 - **Immunity check on admission.** Cetaceans have an epitheliochorial placenta, so a calf gets its antibodies only from colostrum. Of five stranded franciscana calves tested, three had full passive immunity, one partial IgG and one none (Duarte-Benvenuto et al. 2026). Every calf is tested for IgG on admission; a calf without antibodies is managed as immunodeficient, with strict hygiene and early treatment of infection. Colostrum or plasma replacement for cetacean calves is a GWRA R&D item.
 - **Pneumonia watch.** Pneumonia was found in 26 of 30 stranded franciscana calves at necropsy, with evidence of fetal distress in 16 and prematurity in 4 (Duarte-Benvenuto et al. 2026). Every calf has its lungs checked by ultrasound and blowhole swab on admission and regularly after, and tube feeding is done with care to avoid aspiration (Part 12).
 - **Weight and blood checks** at fixed intervals; faecal checks for parasites.
 - **Minimal human contact:** remote video, few carers, no play, as for Springer (NOAA). Where possible, house the calf with other rehabilitating animals of its species.
 - **Weaning** to fish or squid, then live prey, to teach foraging.
6. **For large whale calves that cannot be moved,** supplemental feeding in place (a lagoon or sheltered bay) is a GWRA R&D priority: Toa's case shows the gap.

7. **Release when ready** (Part 14B checklist), next to the calf's own group if known, or a group of its species. Springer was moved to a pen beside her own pod before release (NOAA).
8. **Tag every orphan**, with redundant attachment so a single tag loss does not end monitoring (Part 6). Monitor and be ready to intervene again (Principle IV).

Searching for the mother

A calf found alone is not an orphan until a search has shown it.

Is it dependent? NRE Tasmania lists the markers of dependency: body length for the species, colouration, erupted teeth or baleen, foetal folds on the flanks, an umbilicus or its scar, hairs on the snout, and a fringed ("feathered") tongue edge used in suckling (NRE Tasmania 2022, Vol. 2). GWRA records all of them with photos. In a mass stranding, adult females are checked for lactation by gentle palpation of the mammary glands, and any adult not identifiable as a mature male is treated as a possible mother (NRE Tasmania 2022, Vol. 2). Dependency lasts a long time: humpback calves suckle for about 10½ months, from birth in mid-August to weaning at the end of the following June in the Southern Hemisphere population studied, and weaning is gradual (Chittleborough 1958). A calf several months old may be close to weaning; a newborn is not. The answer decides the plan. Beaked whale calves stay dependent far longer: Blainville's beaked whale calves in the Bahamas were weaned at 3.2–4.2 years (Dunn & Claridge 2026).

Age at a glance. In 30 stranded franciscana calves in Brazil, the presence of vibrissae (whiskers on the rostrum) marked neonates (18 of 30), an umbilical stump or healed umbilicus marked young calves (11 of 30), and erupting teeth marked older calves (1 of 30) (Duarte-Benvenuto et al. 2026). These markers are recorded with photos on admission. The Espírito Santo calf had its mother within sight of the beach (Gusman-Cunha et al. 2025). Toa's mother was trapped on the reef of the same lagoon, and nobody had looked (SNM letter, 4 Sep 2026). GWRA starts the search with the first report of a lone calf and keeps it going until the calf is reunited, adopted or released.

- **Assume the mother is nearby.** No decision on the calf's future (rehabilitation, transport, release elsewhere) is taken until the search has been done and documented.
- **Search from the air.** Drones with thermal cameras (Part 2) along the shore and offshore, by day and night; thermal blows and wakes show a whale the eye misses.
- **Search from the water.** Boats sweep outward from where the calf was found. Whale-watching operators, fishers and ferries are asked for sightings through the alert chain (Part 2).
- **Listen.** Hydrophones near the calf and offshore for the mother's contact calls; record the calf's own calls. Playing the calf's calls back to draw the mother in belongs to the acoustic research programme and follows its field rules (Part 9).

- **Read the behaviour.** An adult that stays close inshore near the calf, or a calf that orients to an adult, as in Espírito Santo, is treated as the likely mother and filmed.
- **Check the record.** The history file and photo-ID catalogues for a known mother (Part 3); recent strandings, carcasses and entanglement reports in the area.
- **If the mother is dead, keep looking for her group.** Other females, including females with calves, may be close (the adoption cases above).
- **Keep searching during care.** The calf stays as close to where it was found as is safe. If it has to be moved for care, the search continues and the calf is brought back when the mother is found.
- **Reunite with the mother leading.** If the mother is also stranded or held, release or guide her first so the calf has her to follow (NRE Tasmania 2022). If the calf is stranded and the mother free, release the calf toward her while she is in sight, with a tag on the calf (Part 6) and observers on the pair until they are seen together.
- **Confirm the reunion** by drone and photo-ID follow-up, as in Espírito Santo, where a fluke scar identified the calf two days later.

Part 19 — Rehabilitation facilities

Rehabilitation is possible in every country, because it does not have to start with a hospital.

The argument that it is impossible is circular: rehabilitation is ruled out because there are no facilities, and no facilities are built because rehabilitation is ruled out. The UK decided against rehabilitation in April 1996, and in 1999 its veterinarians gave five grounds, including “lack of suitable facilities” (Simmonds 2001). In 2002 a UK veterinary travel fellowship concluded that rehabilitation “warrants serious consideration” and recommended a minimum of a 9 m diameter pool, 24-hour observation and treated seawater (Barnett 2002). The question of temporary beach-head pools “still needs some resolution”, Simmonds wrote in 2001; Thai practice resolved it with lined beach pools (Chansue 2022). NRE Tasmania states that rehabilitation is “NOT an option” because facilities, expertise and established success are lacking (NRE Tasmania 2022, Vol. 2), and that transport to other states “will likely result in further unacceptable suffering”, without evidence. Haitang travelled 16 hours by truck and ship to his release site and survived (Liu et al. 2026). The captive-display industry moves killer whales of 3–6 tonnes between continents as routine logistics (SNM Dolly/Stormy brief); a rescued animal can be moved with at least the same care. GWRA uses five tiers, from a pool dug on the beach to a dedicated sea sanctuary. The right tier is the best one available within reach in the time the animal has. A tier is never rejected because a better one exists far away.

Tier	Facility	Best for	Strengths	Limits	Example
1. On the beach	Pool dug in the sand, lined with	Hours to a tide cycle; small	Built quickly with local materials;	Short-term only; needs constant	Thai practice when no stretcher or

Tier	Facility	Best for	Strengths	Limits	Example
	canvas or plastic sheet, shaded with bamboo and agricultural netting	cetaceans waiting for the tide or transport	keeps the animal wet and supported	watching	team was available (Chansue 2022)
2. Portable pools	Children's or family inflatable pools; larger portable tanks	Days; dolphins and porpoises in remote areas	Very cheap; carried in a vehicle; good for medical work	Filling needs a pump or buckets; punctures drain them	Thailand's mobile rescue kit, still used beside its hospital (Chansue 2022)
3. Ponds and enclosed waters	Fish or shrimp ponds, private ponds, lagoons, harbour basins	Days to weeks	Already exist; vets can stand in the water to give fluids	Turbid water, wrong salinity, shallow; short-term	Thai field cases (Chansue 2022); Toa's lagoon could have been used
4. Sea pens	Floating net pens in sheltered bays; a second pen at the release site	Weeks to months; all sizes, including large whales if scaled up	Natural water, sound and food; release straight from the pen	Weather, permits, security	Springer, 2002 (NOAA); San Paolo Dolphin Refuge, Taranto, Italy: 7 ha with 40 × 40 m pens and a veterinary pen (Il Sole 24 Ore, 7 Nov 2025)
5. Existing facilities	Aquaria, marine parks,	Weeks to months; animals	Pools, water treatment, labs,	Must not become permanent	Haitang: small pool with

Tier	Facility	Best for	Strengths	Limits	Example
	marine mammal hospitals, and closing or closed dolphinarium repurposed as rehabilitation centres (SNM Hope brief, recommendation 9), used under a release-first agreement	needing intensive care	endoscopy, trained staff	captivity; transport stress	flotation, then a 30 × 50 × 3 m outdoor pond at a theme park, about 4 months, released (Liu et al. 2026). Thailand's Phuket marine mammal hospital

Rules for every tier

- **Release is the goal from day one.** A facility partner signs a release-first agreement: no display, no shows, minimal human contact, and release as soon as the animal meets the checklist.
- **The tier changes as the animal changes.** Animals move up a tier when they need more care, and toward the sea, to a sea pen, as they recover.
- **GWRA builds a network** of pre-agreed sites in every partner country: ponds, sheltered bays for pens, and facilities. It also keeps portable pools and pen kits in its equipment caches (Part 14B).

Scaling up: sea pens for large whales

There is no facility today for a large whale that needs weeks of care. The GWRA concept is a floating soft-mesh pen in a sheltered bay, based on the Taranto model scaled up, with veterinary access and monitoring. A towed version with a bubble curtain along its walls could carry a whale out of the Baltic or a river (Part 14B). Building and testing a prototype is an R&D priority.

Low-cost equipment

Most of what rehabilitation needs can be made or bought locally for little money. The designs below come from Thai field practice (Chansue 2022) and are part of every GWRA equipment cache.

The neoprene dolphin life vest

Many sick cetaceans cannot keep themselves afloat and will drown if let go. Home-made stretchers immobilise and stress the animal, can cut it, and can entangle it overnight. Human life jackets rub the skin under the pectoral fins and belly. The Chulalongkorn University team designed a vest for small cetaceans that avoids both problems.

Feature	Design	Purpose
Material	Neoprene (wetsuit material) with soft edges	No rubbing or cuts
Fit	Velcro straps	Adjusts to the animal's size
Buoyancy	Pockets on both sides holding empty plastic drinking bottles	Lift adjusted by adding bottles; more on one side if the animal tilts, so the blowhole stays clear
Pectoral fins	Cut so it does not touch the armpits	No laceration under the fins
Dorsal fin	Left open	Heat loss and less sense of restriction
Head	One strap under the lower jaw	Stops the head dropping
Top fitting	A metal hook	Attaches a stabilising line or lifts the animal

The vest suits dolphins of roughly human size (50–60 kg); the designers note it may not work for larger animals. Scaled-up versions are an R&D item. For large whales, the equivalent is the strap-and-pontoon sling (Part 14B).

Moving animals over mud and sand

- **Mud sledge:** the wooden sledge local shellfish collectors use to cross mudflats carries a dolphin to distant water at low tide. Saves rescuers' strength and the animal's stress.
- **Plastic sled:** on sand, a few people can drag an animal on a plastic sled instead of lifting it.
- **Canvas or plastic sheet** under the animal on both sledges protects its skin and can be wrapped gently if it struggles.

Shade, water and pools

Bamboo frames with agricultural shade netting; canvas or plastic liners for beach pools; inflatable family pools; buckets and a pump with a generator for filling. Pool liners can be punctured, so spares and repair kits are carried.

Standards of care in rehabilitation

These standards apply in every tier. They are written to be met with simple equipment.

Area	Standard
Water	Seawater at the right salinity; clean enough to see the animal; temperature within the species' range (about 27 °C for sick <i>Kogia</i> ; Manire et al. 2004); depth for the animal to float and, as it recovers, to dive; pools at least 9 m across for small cetaceans (Barnett 2002), 6–9 m for a <i>Kogia</i> calf and about 15 m for an adult (Manire et al. 2004). Ozone or UV treatment preferred to chlorine. Pumps and filters checked for underwater noise
Support	Flotation (life vest, slings, hands) until the animal floats and swims unaided; never left unattended while it cannot keep its blowhole clear
Shade and shelter	Shade by day; low light at night; visual screens from the public
Feeding	Fluids and tube feeding first, by trained staff with a stomach tube; then whole fish or squid by hand; then live prey before release. Haitang ate 10–15 kg of squid or herring a day before release (Liu et al. 2026). Diets follow the species' natural prey; for <i>Kogia</i> , deep-water cephalopods, since coastal squid is poorly digested (Wang et al. 2002; West et al. 2009; Manire et al. 2004)
Medicine	Daily veterinary check; blood, ultrasound and faecal tests at set intervals; endoscopy where available; treatment from Part 15,

Area	Standard
Biosecurity	with integrative remedies as adjuncts Separate equipment per animal when infection is suspected; disinfection; staff protection (Principle XI)
Human contact	Only what care requires; remote video where possible; the same small team; no play, no training for display; 24-hour observation (Barnett 2002)
Company	Animals of the same species rehabilitated together when health allows
Records	Daily log of feeding, behaviour, breathing, weight and treatment, published in summary each week (Principle V)
Release decision	A panel of veterinarians, scientists, NGO and government members, as for Haitang; the Part 14B checklist; tag fitted before release

The length of rehabilitation follows the animal, not the calendar: up to 21 months for a *Kogia* calf at Mote (Manire et al. 2004), 58 days for Mei-Mei (China Post and CNA, 2010), a month for Springer (NOAA), about four months for Haitang (Liu et al. 2026), and fourteen months for the newborn JJ (Hubbs–SeaWorld Research Institute).

Principle-check

Parts 10 and 19 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: calves are never euthanised for lack of a mother; rehabilitation is available at every tier
II. No abandonment	Pass: no calf is guided out alone without a tag, a follow-up and a plan, as happened with Toa
III. Immediate care	Pass: tier 1 and 2 care can start on the beach within the first hours
IV. Post-release monitoring	Pass: every orphan and rehabilitated animal tagged, with redundant attachment
V. Transparency	Pass: daily logs and release decisions

Principle	Result
	published
VI. Speed	Pass: portable pools and pen kits in every cache; pre-agreed sites
VII. Investigation	Pass: deaths in rehabilitation get full necropsy
VIII. Scientific basis	Pass: methods from documented cases (Springer, Alonso, Haitang, JJ, the 1989 neonates, the Espíritu Santo calf)
IX. Improvement	Pass: large-whale sea pen, scaled-up life vest and in-place feeding of large calves are R&D items
X. Public and media	Pass: local materials and local knowledge (mud sledges) built into the method
XI. Safety	Pass: biosecurity and staff protection; animals never left unattended while unable to keep the blowhole clear

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Parts 15 and 12 — Treatment, Successful Cases, and Pneumonia and Gut Disease R&D

GWRA treats early, remotely where possible, and on a working diagnosis. Treatment draws on two traditions with equal standing: conventional veterinary medicine and the integrative medicine practised by Thai marine mammal veterinarians. Every drug, remedy, dose and route is recorded and published (Principle V).

Delivering treatment

Remote delivery by dart

Free-swimming whales can be treated without capture. In 2007 a humpback cow and calf in the Sacramento River received long-acting ceftiofur from a modified Paxarms projectile rifle with a 30 cm needle; no adverse reaction was seen (Gulland et al. 2008). A right whale calf was treated with 57 ml of cephalosporin by Paxarms MK24C in 2020 (NOAA; SNM Hartwin brief).

- **Volume per dart is limited**, so long-acting, concentrated drugs are preferred, and large doses are split across several darts.
- **Darts fall out** over hours to days; use sterile darts and record where each one hit.
- **Drones** are being developed to deliver darts and medication (Lonati 2026), a GWRA R&D item.

Injection sites on a stranded whale

These follow WHOI Technical Report 2024-05.

- **Intravenous:** vessels of the pectoral flipper, about one third of its length from the front insertion, between radius and ulna; or the central vein of the dorsal fin. Never the flukes or tail stock of a large whale (human safety).
- **Intramuscular:** the epaxial muscles behind the skull, using large-bore needles with a stylet. Minke whales need about 25 cm needles; larger whales up to 58.5 cm. Inject at several depths as the needle is withdrawn, and keep each site to about 20 ml to prevent pressure necrosis.
- **Asepsis:** sterile needles and prepared skin for any animal expected to be released; long sharps containers made from capped PVC pipe.

Weight and dose

Doses need a weight. GWRA uses drone photogrammetry or the WhaleScale app, never a rough length–weight graph. NRE Tasmania itself says its weight graph (after Geraci & Lounsbury 1993) “should not be used for medication dosage” and is inaccurate for emaciated or pregnant animals (NRE Tasmania 2022, Vol. 2). GWRA and corrects for body condition: equations from whaling data can overestimate thin animals (WHOI 2024-05). For large whales, doses are scaled to metabolic body weight ($\text{kg}^{0.75}$) rather than straight body weight, as in the Gulland et al. (2008) ceftiofur dosing.

Conventional formulary

The doses below are published starting points, not a substitute for the attending veterinarian’s judgement. Every use passes the Part 1 safeguards: a working diagnosis first, two veterinarians agreeing, weight measured, and the dose published.

Drug	Purpose	Published dose and route	Source	GWRA safeguards
Isotonic fluids (lactated Ringer’s, 0.9% saline)	Shock	20 ml/kg ($\frac{1}{4}$ shock dose) IV over 20 min, repeat up to 3–4 times a day if no response	WHOI 2024-05, after Sweeney 1990	Practical mainly for small and medium animals; volumes for large whales are huge (236 L for a 9 m humpback)
Fluids, maintenance	Dehydration in long strandings	40 ml/kg/day plus ongoing	Sweeney 1990, via WHOI	Oral or tube fluids in pools

Drug	Purpose	Published dose and route	Source	GWRA safeguards
	or rehabilitation	losses		and pens
Vitamin E and selenium	Antioxidant; reperfusion injury, muscle protection	0.06 mg Se/kg IM	WHOI 2024-05; IFAW practice after Walsh	About 20 ml per site
Calcium gluconate 23%	Heart protection when potassium is high	WHOI worked example: 935 ml for a 10,759 kg humpback (about 0.09 ml/kg) IM	WHOI 2024-05	The WHOI text says “20 ml/kg”, which conflicts with its own example; GWRA uses the example’s scale until confirmed
Vitamin B complex	Suspected B-vitamin deficiency	1–2 ml per 45 kg (cattle dose), allometric scaling advised for large whales	WHOI 2024-05	Low risk
Ceftiofur crystalline free acid (long-acting)	Bacterial infection, sepsis prevention	16 mg/Mkg (cow) and 19 mg/Mkg (calf), metabolic weight, by dart	Gulland et al. 2008; pharmacokinetics in sea lions, Meegan et al. 2013	First-line darted antibiotic; adjust to culture results from blow. Not first choice in <i>Kogia</i> (Manire et al. 2004)
Meloxicam	Pain and inflammation	Per bottlenose dolphin pharmacokinetic study	Simeone et al. 2014	Only once the animal is hydrated: not routine in a dehydrated animal, because of gut and kidney risk (SNM Kirchsee

Drug	Purpose	Published dose and route	Source	GWRA safeguards
Enrofloxacin	Pneumonia and other infection in <i>Kogia</i>	2.5–5 mg/kg IM twice daily	Manire et al. 2004	plan); gastroprotection in stressed or fasting animals (Part 12) Few reactions in <i>Kogia</i> , which react badly to several other fluoroquinolones, cephalosporins and atropine
Dexamethasone or other short-acting steroid	Inflammation, organ dysfunction	Low-dose burst at clinician's discretion	WHOI 2024-05	Avoid repeated high doses; check pregnancy status first (blow progesterone, ultrasound), since corticosteroids carry a risk to the fetus; caution in fungal disease. WHOI calls for a controlled study of corticosteroids in stranded whales
Midazolam	Light sedation and anxiolysis	0.02–0.05 mg/kg IM; reversed by flumazenil (shorter acting)	WHOI 2024-05; Moore et al. 2010	Only under all seven Part 1 safeguards; not analgesic

Drug	Purpose	Published dose and route	Source	GWRA safeguards
Butorphanol	Pain relief, light sedation	0.05–0.1 mg/kg; partly reversed by naltrexone or naloxone	WHOI 2024-05	Preferred comfort-care analgesic: less respiratory risk; responder safety with concentrated forms
Xylazine	Sedation, analgesia	Not as sole or first agent: excitatory responses in some cetaceans	WHOI 2024-05	Excluded as first agent
Acepromazine	Sedation	Not reversible	WHOI 2024-05	Excluded by GWRA

Doses that appear in sources only as part of “pre-euthanasia” drug combinations are never used (Principle I).

Practical limits. Intravenous fluids are rarely practical in a large whale; oral fluids are given only by a trained veterinarian with a stomach tube, never by pouring into the mouth (Manire et al. 2004; SNM Hope brief). Each intramuscular site takes no more than about 20 ml (WHOI 2024-05). Antibiotic resistance is a small concern with judicious, culture-guided use (WHOI 2024-05). In Italy, antibiotics cannot at present be given to cetaceans that will be released (WHOI 2024-05); GWRA’s MOA pre-authorises antimicrobials for release candidates, so that no animal goes untreated for regulatory reasons (Annex A).

Integrative medicine

Integrative medicine is part of GWRA treatment, not an afterthought. It comes from Thai marine mammal veterinary practice, presented in a plenary lecture at the 2022 Society for Marine Mammalogy conference by Dr. Nantarika Chansue of Chulalongkorn University, a veterinarian with 33 years in aquatic animal medicine (Chansue 2022). In remote places it may be the only medicine available. Elsewhere it supports conventional treatment, which the presenter advised for emergencies: adrenaline or dexamethasone for shock, antibiotics for pneumonia, and surgery or endoscopy for foreign bodies.

Use rules: a veterinarian directs every use; plants are identified correctly; preparations follow the presenter’s method; interactions with conventional drugs are checked; caution in pregnancy; every use is recorded and published.

Herbal medicine by problem (as presented)

Problem	Remedy	Preparation and use	Cautions
Sunburn, wounds	Aloe vera gel	Gel from old, thick leaves, washed; apply several times daily. Use instead of human sunscreen, which may be toxic if swallowed	Avoid the yellow latex: irritant
Sunburn, burns	Coconut oil with lime water	Equal parts; apply to the wound	Edible; water-resistant protective layer
Burns, skin soothing	Asiatic pennywort (<i>Centella asiatica</i>)	Pound or blend a handful, apply the juice	—
Skin wounds, sunburn	Tomato leaf	Crushed leaves applied directly	Leaf, not fruit
Wound healing, infection prevention	Garlic	Paste on the wound for 10–20 min then wash off, 2–3 times daily; or juice in gelatine or ointment	Do not leave on long
Rashes, blisters, inflamed wounds	Papaya leaf	Crushed leaf applied	Avoid latex; some people are allergic
Painful wounds, mouth pain	Clove oil	40% clove oil in glycerine as local anaesthetic	—
Toxins (algal, pesticide), liver damage	Laurel clock vine (<i>Thunbergia laurifolia</i>)	Capsules or crushed leaves, internal and external. A dolphin with very high liver enzymes and suspected toxicosis improved within days	—
Stings, biotoxins	Beach morning glory (<i>Ipomoea pes-caprae</i>)	Pounded leaf applied	—
Herpesvirus skin	Phaya yo	Pounded leaf	—

Problem	Remedy	Preparation and use	Cautions
lesions, wounds, rashes	(<i>Clinacanthus nutans</i>)	topically, or boiled in coconut or sesame oil. Lab work showed the virus inactivated without killing host cells; head lesions on an Indo-Pacific dolphin healed	
Nasal congestion	Shallot	Smashed bulbs in a cloth over the blowhole for a few minutes, several times a day	Irritates eyes and mucous membranes; never cover the blowhole for long
Respiratory soothing	Lime peel water with salt	Boil peel of 1–2 fruits	Irritant; slows liver metabolism of some antifungal drugs
Diarrhoea, fever, liver support	Andrographis (<i>Andrographis paniculata</i>)	Handful of leaves boiled, 3 times daily; or dry leaf with honey, one ball per meal per 10 kg	Long use (months) can cause weakness; interacts with anticoagulants and immunosuppressants
Kidney support, urinary stones	Pineapple stem (bromelain)	100–200 g fresh or 100 g dry stem boiled; added to tube feed	Low toxicity
Urinary problems	Celery; sugar cane stem; roselle; lemongrass	Boiled or as juice in feed	Celery interacts with levothyroxine and lithium; lemongrass can raise eye pressure
Bloat, indigestion, liver protection	Garlic	About 5 g fresh per 50 kg per day	—
Diarrhoea	Pomegranate peel or bark	One fruit's peel blended with lime water, boiled	—
Bloat, digestion; eye	Holy basil	Leaves for bloat;	—

Problem	Remedy	Preparation and use	Cautions
protection		soaked seeds make a mucilage that protects the cornea	
Gastric ulcer	Aloe vera gel (oral)	Twice daily; increased mucus and acid suppression reported to exceed cimetidine	—
Gut pain, hypermotility	Guava leaf and young fruit	Smashed or grilled	—
Diarrhoea, ulcer	Unripe banana powder	1–2 spoonfuls with honey, 2–3 times daily	—
Nausea, bloat, worms, pain	Ginger, galangal, turmeric	Rhizome boiled or in capsules	Turmeric is anticoagulant
Diarrhoea, stomach pain	Mangosteen rind	Boiled in lime water; a few spoons every 4 h for a 60 kg dolphin	Months of use may affect liver and kidneys
Constipation, worms	Tamarind	Pulp with water and salt, by mouth or enema	Safe in young animals
Gut worms	Pumpkin seed	60 g crushed with sugar in 500 ml water, in three feeds 2 h apart, then a laxative	—
External parasites	Custard apple leaf	Crushed with coconut oil, applied	—
Eye disease	Aloe vera (oral); garlic; holy basil mucilage	As above	Conventional eye medicine where available

Acupuncture

Acupuncture charts exist for bottlenose dolphins, with most points along the spine and flippers. It may help large whales that cannot be moved, and conditions such as breathing

arrest, liver disease, pain, nerve stimulation and muscle spasm. Needles stay in for 10–20 minutes, so it suits calm or trained animals in pools and pens (Chansue 2022).

Treatment by problem

The table lists the first-line approach for the problems most often found in live-stranded and distressed cetaceans. Conventional and integrative options are listed together.

Problem	First-line treatment	Supporting options
Shock	Fluids (20 ml/kg bolus), dexamethasone at clinician's discretion, adrenaline in emergencies	Shade, wetting, quiet
Dehydration and fasting	IV, oral or tube fluids; tube feeding of fish slurry in rehabilitation	Pineapple stem and other remedies added to tube feeds
Muscle damage and capture myopathy	Vitamin E and selenium; minimal handling; short, padded moves; buoyancy support (Herráez et al. 2013)	Rocking a beached whale to relieve one-sided pressure (Part 8)
Pressure and loss of buoyancy	Water depth or flotation that takes weight off the chest; the neoprene dolphin life vest with water-bottle buoyancy (Part 19); flotation devices as for Haitang (Liu et al. 2026)	Padding, mats, canvas sledges
Bacterial infection and sepsis	Long-acting ceftiofur by dart or injection; switch to a culture-guided antibiotic	Garlic, andrographis, laurel clock vine as adjuncts
Pneumonia and lungworm	See Part 12	Shallot inhalation for congestion
Gut problems: bloat, ulcer, diarrhoea, constipation, worms	See Part 12	The herbal remedies above
Wounds, sunburn, skin damage from fresh water	Cetacean full-thickness wounds pass through a temporary scar-like stage and are then remodelled	Aloe vera, coconut oil with lime water, Centella, phaya yo

Problem	First-line treatment	Supporting options
	into normal skin and blubber, a scar-resolving regenerative healing (Su et al. 2022, 2023; Su et al. 2026). Even the loss of the flukes is survivable (Part 1). Clean and protect wounds; move freshwater-exposed whales to salt water as soon as possible: Delta and Dawn's skin improved within about a day of leaving fresh water (Gulland et al. 2008)	
Pain and fear	Comfort care: butorphanol, meloxicam, low stimulation (Part 1)	Clove oil for local pain; acupuncture in pools
Toxins (algal blooms, pesticides)	Supportive care, fluids, liver support	Laurel clock vine; beach morning glory for stings
Hypothermia (cold seas) or hyperthermia (sun, warm air)	Water temperature control; shade and wetting without covering the blowhole	—
Eye injury	Protect eyes from sand and sun; ophthalmic medicine	Holy basil seed mucilage; oral aloe
Entanglement	Remove all gear, persisting until it is off; sedation at sea only under Part 1 safeguards (Moore et al. 2010); antibiotics for deep wounds. Gear lodged in the mouth or baleen can be shed later and is compatible with survival (Cassoff et al. 2011; Robbins et al. 2015)	Wound remedies above
Spinal or bone infection (osteomyelitis, discospondylitis, abscesses)	Early diagnosis and aggressive, long-term antibiotics guided by culture. The 1989 dolphin	Long-acting antibiotics by dart for free-swimming whales (Part 4); tag to relocate the animal for

Problem	First-line treatment	Supporting options
	regimen: flunixin with gentamicin and ampicillin for 7 days, then cephalexin for 30 days, then trimethoprim–sulfadiazine for 60 days; white cells were normal by about day 10 and activity by about 6 weeks (Alexander et al. 1989). <i>Brucella ceti</i> can cause such lesions without trauma, as in a minke whale with a throat abscess about 1 m across (Davison et al. 2017), so cultures include <i>Brucella</i> and staff use zoonosis precautions	repeat doses

Treated cases

The cases below show that sick and stranded cetaceans, including large whales, fragile species and calves, can be treated and returned to the sea. Outcomes are reported as they are, including uncertain ones (Principle V).

Case	Species	Treatment	Outcome	Source
Haitang, Hainan, 2024	Short-finned pilot whale, subadult male	Pool with flotation, then outdoor pond; about 4 months of care; gastroscopy, ultrasound, blood monitoring	Released 26 May 2024; tracked 52 days; dives to 621 m; normal travel	Liu et al. 2026
Delta and Dawn, Sacramento River, 2007	Humpback cow and calf	Ceftiofur by dart, 30 cm needle	Left fresh water; skin improved; reached the ocean after at least 20 days in	Gulland et al. 2008

Case	Species	Treatment	Outcome	Source
Derecha's calf, Georgia, 2020	North Atlantic right whale calf with propeller wounds	Long-acting cephalosporin, 57 ml, Paxarms MK24C dart	the delta Dosing succeeded; wounds worse than first thought; calf not resighted	IFAW 2020 ; RCI 2020
Bottlenose dolphin, USA, 1989	Atlantic bottlenose dolphin, vertebral osteomyelitis	Long-term antibiotics, no surgery (regimen above)	No progression at 4 months; free of signs 1.5 years later; the precedent for Hartwin's spinal infection	Alexander et al. 1989
Mote Marine Laboratory, Florida, 1990s–2003	13 <i>Kogia</i> , including 5 calves	Stomach-tube fluids, ozone-treated water at 27 °C, ulcer treatment, calf formula	A pygmy sperm whale calf lived almost 21 months and a dwarf sperm whale over 15 months in care, apparent world records; the methods are the basis for Part 7	Manire et al. 2004
Rance estuary, France, 2023	Juvenile humpback, emaciated, skin lesions, trapped behind a tidal power station	Non-invasive guidance out of the estuary over about two days	Returned to sea	Olhasque et al. 2025
Gulf of Gdańsk, Poland, Feb 2025	Entangled humpback	Disentangled in about an hour with boathooks on poles	Freed	AP News 2025
Cape Cod, 1990–1999	Mass-stranded pilot whales and dolphins	Transport up to 40 km, ear tags, release at	78% survived transport and were released	Wiley et al. 2001

Case	Species	Treatment	Outcome	Source
	(77 animals)	better sites	without restranding	
Mei-Mei, Taiwan, 2010	Pygmy sperm whale, weak, wounded, parasites, high white-cell count	58 days in care: 3 weeks of medical recovery, then a month of foraging training; about 700 volunteers	Released with a satellite transmitter on the dorsal fin; first survivor of 13 at the Taijiang centre	China Post and CNA, 2010; SNM case list; Taiwan network (pers. comm.)
Taiwan, 2013	Pygmy sperm whale adult	Rehabilitation	Released 20 Oct 2013	SNM case list
Florida, 1993–94	Pygmy sperm whale, 12–18 months old	Plastic removed from stomach; 6 months of care	Released 65 km offshore; tracked 425 km over 4 days with regular dives	Scott et al. 2001
Alonso, Algeciras, 2013	Common dolphin calf from a gillnet	Stabilised in rehabilitation	Released; photo-ID confirmed he rejoined his mother	Andalucía Información 2013
Fluke-less bottlenose dolphins, Korea, Uruguay, Spain, USA, 2019–2026	Bottlenose dolphins of three species	No treatment; wounds healed in the wild	Survived for years after losing their flukes; adapted their swimming; one calf still with its mother (Part 1)	Fazioli et al. 2026
Thailand, about 2001	Dolphin with suspected toxicosis, rigid body, very high liver enzymes	Laurel clock vine	Improved within days	Chansue 2022
Thailand	Indo-Pacific dolphin with herpesvirus	Phaya yo (<i>Clinacanthus nutans</i>)	Lesions healed over months; died later of	Chansue 2022

Case	Species	Treatment	Outcome	Source
	head lesions		liver and kidney disease	
US rehabilitation, 1986–2008	56 odontocetes, 10 species	Rehabilitation and release	About one third confirmed alive at 6 weeks with normal behaviour; most of the rest unknown, not failed	Wells et al. 2013

The Wells et al. (2013) figures show why Principle IV matters: most “unknown” outcomes come from releases that were not tracked, not from animals known to have died.

Part 12 — Pneumonia and gut disease

Pneumonia, lungworm and gut disease are found in almost every stranded dolphin the Thai team treats (Chansue 2022). In stranded franciscana calves in Brazil, pneumonia was found in 26 of 30 at necropsy, while PCR for morbillivirus, *Brucella*, *Toxoplasma* and *Sarcocystis* was negative and 14 of 30 carried a gammaherpesvirus (Duarte-Benvenuto et al. 2026). They are among the commonest reasons a rescued animal fails. GWRA treats them with current best practice and funds a research programme to do better.

Pneumonia and lungworm: current approach

1. **Find the organism:** blow sample or blowhole swab for culture and sensitivity (Part 5); ultrasound of the lungs; blood count and inflammatory markers.
2. **Start broad, then target:** long-acting ceftiofur at once, then switch to the antibiotic the culture supports.
3. **Treat lungworm** with antiparasitic drugs chosen and dosed by the veterinarian, watching for inflammation as worms die.
4. **Support breathing:** keep the blowhole clear, water at a depth that does not force effort to breathe, shallot inhalation for congestion in Thai practice.
5. **Prevent aspiration:** never pour water near the blowhole; tube-feed carefully. Neonatal beaked whales in care regurgitated feed through the blowhole and probably aspirated it (Gage, IAAAM).

Gut disease: current approach

- **Gastric ulcers** from stress and fasting: gastroprotection with any anti-inflammatory; oral aloe vera gel or unripe banana powder in Thai practice.

- **Parasites:** faecal examination (Part 11); antiparasitic drugs; pumpkin seed or tamarind in Thai practice.
- **Gut stasis and constipation,** a leading cause of death of *Kogia* in care: supplemental fluids by stomach tube, chlorine kept low or replaced by ozone or UV, and no oral drugs until the gut is moving (Manire et al. 2004).
- **Foreign bodies such as plastic:** endoscopic or surgical removal; no remedy dissolves them, and a laxative is used only if the blockage is partial (Chansue 2022). A pygmy sperm whale recovered after plastic was removed from its stomach (Scott et al. 2001).
- **Diarrhoea, bloat, constipation:** fluids, diet changes, and the Thai remedies listed above.

R&D programme

Question	Approach
Can pneumonia be diagnosed from blow alone?	Paired blow, swab and necropsy samples from every case; microbiome, virome and inflammation markers
Which long-acting antibiotics reach effective levels in large whales after one dart?	Pharmacokinetic sampling from blood and blow after darting, with metabolic weight scaling
Can one dart give weeks of therapy?	Sustained-release antibiotic microspheres and long-acting depot preparations, so a single dart treats a free-swimming whale for weeks; a satellite tag to relocate the animal for any repeat dose (SNM Hartwin brief). A candidate for Horizon Europe and similar research funding
Can nebulised antibiotics work in pools and sea pens?	Trials in rehabilitation animals
Can missing passive immunity be replaced in orphan calves?	IgG testing on admission; colostrum or plasma replacement trials (Duarte-Benvenuto et al. 2026)
How should lungworm be treated safely?	Drug choice, dosing and inflammation control, recorded case by case
How can gut stasis be prevented in held <i>Kogia</i> and other deep divers?	Stomach-tube fluid schedules, water treatment without chlorine, diet digestibility trials (Manire et al. 2004)
How can stress ulcers be prevented in stranded and held animals?	Routine gastroprotection, with endoscopy where available, as for Haitang

Question	Approach
How effective are the Thai herbal remedies, alone and with drugs?	Standardised preparations, dosing records, blood and faecal markers, comparison with matched cases
What gut microbiome changes predict recovery?	Faecal and blow microbiome over time in rehabilitation
How can blow creatinine and urea show kidney function and hydration?	Validation against blood in held animals

Results are published after each case and pooled across the GWRA network once a year (Principle IX).

Principle-check

Parts 15 and 12 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: pre-euthanasia doses and irreversible sedatives excluded; comfort-care analgesia defined
II. No abandonment	Pass: treatment continues through rehabilitation
III. Immediate care	Pass: darted treatment starts while the animal swims; fluids and vitamins on the beach
IV. Post-release monitoring	Pass: treated animals are tagged; outcomes reported even when uncertain
V. Transparency	Pass: every drug, remedy, dose and route published
VI. Speed	Pass: first-line drugs and darts carried by every team
VII. Investigation	Pass: pharmacokinetic and outcome data feed the R&D programme
VIII. Scientific basis	Pass: doses from published sources; integrative remedies recorded with their evidence and compared case by case
IX. Improvement	Pass: Part 12 R&D programme
X. Public and media	Pass: treated cases published
XI. Safety	Pass: concentrated opioids handled by

Principle	Result
	trained staff with reversal on site; dangerous injection sites excluded

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Parts 16 and 17 — Post-release Monitoring and Necropsy

A rescue is a success only when the animal is shown to be alive and behaving normally weeks after release, and every death must be explained. Without tracking, most release outcomes are simply unknown: in US rehabilitation from 1986 to 2008, about a third of released small cetaceans were confirmed alive at six weeks, and most of the rest were not

followed (Wells et al. 2013). GWRA closes that gap (Part 16) and investigates every death fully and independently (Part 17).

Part 16 — Why “never seen again” proves nothing

Most dead whales are never found, since the carcass detection rates have been estimated at 3.4% for sperm whales, under 5% for gray whales and 17–36% for North Atlantic right whales (Pace et al. 2021; Rockwood et al. 2017; as summarised in WHOI 2024-05). An untracked whale that is “never seen again” may have lived or died: the absence of a carcass proves neither.

The US record shows what follows when animals are not tracked. Of 64 live large-whale strandings from 2008 to 2016, 36 died, 22 were euthanised and 6 were last seen swimming, 3 of them refloated by responders and 3 self-rescued. None of the six was tracked, and the workshop judged their survival “highly suspect” (WHOI 2024-05). A practice that does not track its releases cannot then cite their supposed deaths as evidence that rescue fails. The 2017 IFAW minke whales show the opposite: one tagged whale travelled more than 11,000 km over 83 days, the first documented survival of a tagged, refloated large whale; the second went into a marsh 25 km away within 16 hours and was found dead. Without the tag, WHOI notes, its fate “would never have been known” (WHOI 2024-05). Both results are knowledge; neither would exist without telemetry.

Part 16 — Monitoring methods

Every released animal is followed by at least two methods, so that losing one, such as a tag that falls off, does not end monitoring. JJ the gray whale lost both satellite tags within two days of release and was never seen again (Hubbs–SeaWorld Research Institute).

Method	What it gives	Duration	Notes
Satellite tag (glue-on, suction, fin-mount, LIMPET; Part 6)	Position, dives, temperature	Days (suction) to months (fin-mount, LIMPET)	Haitang: 52 days, 335 positions, dives to 621 m (Liu et al. 2026)
Escort boat and drone	Behaviour, breathing, swimming in the first hours	Hours to days	Mandatory for the first hours after every release
Photo-ID and public resightings (Whale Detective, Happywhale)	Survival years later	Years	A humpback rescued at Ubatuba, Brazil, in 2000 was biopsied 8 years later and matched genetically (Neves

Method	What it gives	Duration	Notes
			et al. 2020). Springer was resighted with her calves up to 2022 (NOAA)
Passive acoustic recorders	Presence of a calling group at release sites	Weeks to months	Useful for social species released together
Very-high-resolution satellite imagery	Large whales in remote areas after tags stop	Ordered as needed	Possible for large whales at the surface in calm water (Cubaynes et al. 2019)
Resighting expeditions	Direct observation of the animal and its group	Days	Haitang's 3-day expedition found 10 pilot whale groups near his positions but could not pick him out from 12,491 photos; a clear marker on the tag helps (Liu et al. 2026)

The GWRA global release registry

Every released animal receives a GWRA release number, recorded with its photos, natural marks, visual tags, electronic tag IDs, release place and time, and the case it came from. The registry is public, is shared with photo-ID catalogues (Happywhale and regional catalogues, with the stranding history noted), and answers the WHOI workshop's call for a global numbering system and a tag repository for released large whales (WHOI 2024-05). It is how a whale released in one country is recognised in another.

Tracking is published in real time

Tag positions are published as they arrive, with a short delay where crowding could disturb the animal (Principle V; Part 2 data rules). After the Baltic humpback left the barge in May 2026, tracking data were released only on 12 June, after the whale was dead (SNM Hope brief). A track that is published only afterwards cannot trigger re-intervention, and cannot be checked by anyone outside.

Choosing where and when to release

The release site is chosen against traffic and hazard maps, not only depth. The Baltic humpback was released into an area with 1,706 vessel movements between 2 and 7 May 2026, and its speed fell from 5 May; during the same days the Danish Navy detonated old munitions in Aarhus Bay (TV2 Østjylland, 12 May 2026; SNM Hope brief). Before every release GWRA checks shipping density, notices to mariners, naval exercises and sonar, ordnance clearance, seismic surveys and piling, and chooses a site and time away from them.

How long

- **At least six weeks**, the survival benchmark of Wells et al. (2013), for every release.
- **Longer for animals that were seriously ill, orphaned or rehabilitated for long periods**, through tag life and then by photo-ID.
- **Large whales** are followed by tag for as long as it lasts, then by photo-ID and satellite imagery where possible.

Part 16 — Success, re-intervention triggers and the plan

Signs of a successful release

These are the signs reported for rehabilitated pilot whales and other odontocetes (Wells et al. 2013; Liu et al. 2026; Gales et al. 2012):

- Alive and moving normally at six weeks or more.
- Daily travel and speed within the range of healthy animals of the species (Haitang: 0.6–5.9 km/h daily average; 6.2–145.9 km a day).
- Diving recovers: deep dives return within the first weeks (Haitang: under 100 m in week 1, about 400–620 m from week 2).
- Normal day–night patterns, such as deeper night dives in pilot whales.
- Use of the species' normal habitat.
- Reunion with others: the 2012 Stanley pilot whales regrouped within four hours (Gales et al. 2012); marked Wellfleet dolphins were later seen with large groups (WBUR 2024).

Re-intervention triggers

Trigger	Response
Restranding or approach to shore	Restart the stranding workflow, with the history already known
Tag stationary at the surface, or no dives	Drone or boat check within hours
Movement into unsuitable habitat (river,	Workflow W escort

Trigger	Response
enclosed sea)	
Weight loss or skin change seen in photos or drone images	Remote assessment and darted treatment (Workflow D)
Calf seen alone	Orphan workflow (Part 10)
Tag stops early	Search by boat, drone, photo-ID appeals to the public, satellite imagery for large whales
Tag shows death (no movement, surface drift)	Carcass recovery within 24–48 hours and a rapid necropsy (Part 17); cross-border necropsy agreements are in place in advance, since the Baltic humpback lay for about three weeks before its necropsy, by when decomposition left cause and time of death undetermined (SNM Hope brief)

The re-intervention plan

Every release has a written plan before the animal goes: who watches the tag data and how often; which boat and team can reach the animal, and how fast; and what equipment and drugs are kept ready. A release without a plan is not a GWRA release (Principle IV).

Tracking does not stop at a border. NRE Tasmania advises that a telemetry buoy should not be attached to an entangled whale likely to move beyond Tasmanian waters (NRE Tasmania 2022, Vol. 3). GWRA rejects that reasoning: an animal’s need for monitoring does not end where a jurisdiction does (Principle II). Cross-border alert hand-over (Part 2) carries the tag data with it.

Part 16 — Tracked releases to date

Published and documented tracking shows that rescued and rehabilitated cetaceans survive, including species often said to be hopeless.

Animal	Event	Tracking result	Source
Haitang, short-finned pilot whale	Rehabilitated about 4 months, Hainan, 2024	52 days, 2,758 km, dives to 621 m	Liu et al. 2026
11 long-finned pilot whales, 5 tagged	Mass stranding, Stanley, Tasmania, 2012	Reunited within 4 hours; together at least a month	Gales et al. 2012; SNM case list
Minke whale	Refloated and	83 days, more than	WHOI 2024-05

Animal	Event	Tracking result	Source
	satellite-tagged by IFAW, US east coast	11,000 km, to minke habitat near the Turks and Caicos and back; the first documented survival of a tagged, refloated large whale. A second tagged minke went into a marsh 25 km away within 16 hours, which shows why re-intervention plans matter	
Pilot whale	Single stranding, Wellfleet, 2010; trucked and released elsewhere	At least 6 days, normal movements to pilot whale areas	SNM case list (IFAW)
24 common dolphins, 6 tagged	Mass stranding, Massachusetts, 2012	Travelled nearly 200 miles, used offshore habitat	SNM case list (IFAW)
Common dolphins	Mass stranding, Wellfleet, 2024	102 of 146 survived the event; marked animals later seen with large groups	WBUR 2024
Springer, killer whale orphan	Sea pen, 2002	Rejoined her pod; two calves; seen in 2022	NOAA
Pygmy sperm whale	Rehabilitated 1993–94, Florida	425 km in 4 days with regular dives	Scott et al. 2001
Humpback whale	Ubatuba, Brazil, 2000	Re-identified 8 years later by biopsy and genetic match	Neves et al. 2020

Part 17 — The GWRA necropsy standard

A full necropsy shows what was wrong with the animal, what the stranding did to it, and whether care helped or harmed. Compared with what the public filmed while the animal lived, it also teaches future teams to read the signs earlier (Principle VII).

The standard has four parts, developed by SNM in April 2026 for the Kirchsee humpback while the animal was still alive (SNM pre-registered necropsy standard). The field method follows the WHOI necropsy guide for stranding responders (Pugliares et al. 2007, WHOI-2007-06): a fixed routine for every examination, conservative and objective reading, everything documented, and a tag and scale in every photograph. Its warning applies throughout: a sign of human interaction on a carcass “does not necessarily mean the interaction caused the stranding or the death of the animal” (Pugliares et al. 2007).

What necropsies of live-stranded animals have shown. The same Cape Cod team found that 92% of mass-stranded animals necropsied (97 of 106) had no significant pathological findings (Bogomolni et al. 2010). In the UK, 48% of 654 cetaceans that stranded alive had no pathology that explained the stranding (Barnett et al. 2011). The East Hampton humpback of 2010, euthanised after about three days, received the fullest work-up on record: blood count and chemistry, urinalysis including myoglobin, culture, morbillivirus PCR, a full biotoxin panel (okadaic acid, saxitoxin, brevetoxin, domoic acid), CT, 89 tissue samples and review by two board-certified pathologists. It found no underlying disease and concluded that the cause of stranding was undetermined (NOAA NY4236-10). GWRA takes this case as the documentation standard, and as the model of an honest “undetermined”. Necropsy data of this kind are the evidence that most live-stranded animals can be rescued; they are also why the necropsy is not a substitute for diagnosis while the animal lives (Principle VII).

1. Independence

The necropsy is performed or supervised by a pathology team with no role in the case’s management or prognosis, and no close professional ties to those who made the decisions. Where the veterinarians who decided on sedation or euthanasia also take and hold the samples, as in the Dolly/Stormy case, the necropsy cannot be independent (SNM Dolly/Stormy brief). In the Baltic case the Deutsches Meeresmuseum itself declared that it could not perform the necropsy because of a conflict of interest (SNM Hope brief). The reviewer of an outcome cannot be the author of the decision that produced it. Tissue samples are archived and available to qualified external researchers on request.

2. Pre-registration

Before the necropsy, and where possible while the animal lives, the questions the necropsy must answer are published: the working diagnosis, the prognosis claims made by any

party, and the specific findings that would confirm or refute them. The report is then judged against them.

3. Three categories of findings, never merged

Category	Meaning	Examples
(a) Pre-existing conditions	Present before the stranding; may or may not have been treatable	Chronic infection, heart disease, parasites, old injuries
(b) Stranding effects	Caused by the stranding itself	Pressure injury, rhabdomyolysis, stress cardiomyopathy, overheating
(c) Effects of care decisions	Caused or worsened by what was done, or not done	Dehydration or skin breakdown from interrupted care; injury from handling; drug effects (toxicology)

A finding in (b) or (c) is not evidence that the animal was beyond help. The report must say which category each finding belongs to and why. The East Hampton humpback shows the distinction: muscle damage only on the weight-bearing side and lung inflammation were consequences of stranding, category (b), not evidence of prior disease (NOAA NY4236-10).

Two further questions in every report. The report includes the animal's ante-mortem history from its history file (Part 3), and it states when, on the evidence, the condition became untreatable. For Hartwin, four spinal abscesses and chronic osteomyelitis developed over months while he was feeding and mobile (Deutsches Meeresmuseum, 15 Aug 2026): the report should say whether, and until when, long-term antibiotics could have cured him (Alexander et al. 1989).

4. Consistency with the living record

The report is compared with video, drone, thermal and acoustic records of the living animal, including public footage. Findings must be reconcilable with what the animal was seen to do, by date. Where a prediction was made during the case (for example, a claim of fluid in the lungs), the report states whether the necropsy confirms it, contradicts it, or cannot tell.

Publication

Preliminary findings are published promptly and the full report when histology and laboratory tests are complete. Every report states its prognosis claims as predictions and whether they were borne out. GWRA also publishes its own prognosis, with reasoning, at

each decision point during a case, and later scores it against the outcome; no outlet revisited the failed predictions made during the Baltic case (SNM Hope brief), and GWRA does not exempt itself. Timing follows the Hartwin example: his body was recovered on 13 August 2026 and preliminary findings were released on 18 August (Deutsches Meeresmuseum; Nordkurier, 18 Aug 2026). GWRA publishes its own evaluation against the pre-registered questions, whatever the result (Principle V).

Part 17 — Rapid necropsy teams and the sample panel

Tissue decays within hours, and heart, muscle and brain findings are the first lost. Carcasses are graded by freshness: code 1 alive; code 2 fresh, under about 24 hours post-mortem, when histopathology and virology are most informative (Pugliares et al. 2007). NRE Tasmania’s category A, a carcass under 7 hours dead suitable for full necropsy, archive samples and pathology (NRE Tasmania 2022, Vol. 5, after Geraci & Lounsbury 1993), sets GWRA’s target: a rapid necropsy team on site within 7 hours of death. Hartwin’s brain, lungs and kidneys could not be sampled because autolysis in warm water had gone too far within about a day (SNM Hartwin brief); cooling the carcass with ice or water buys time until the team arrives. GWRA keeps regional rapid necropsy teams on call, separate from the rescue team, with pathologists, a trained assistant, a sampling kit, cold storage and transport arranged in advance. The team is alerted when an animal’s condition worsens, not after it dies.

Sample panel

The panel extends the routine samples in NRE Tasmania (2022) with what GWRA needs to answer its research questions (Parts 7, 12 and 18).

System	Samples	Questions answered
Identity	Skin (ethanol and frozen), photos, measurements, teeth or baleen	Species, sex, age, individual identity, link to the history file
Body condition	Full-thickness blubber block; girth and blubber depth at standard sites	Nutrition; compared with drone measurements in life
Heart and muscle	Heart (several regions), skeletal muscle from several sites; histology and immunohistochemistry	Stress cardiomyopathy, capture myopathy, pre-existing heart disease (Bossart et al. 2007; Câmara et al. 2019)
Lungs and airways	Lung, airway swabs, lungworm count	Pneumonia, aspiration, oedema; tests any pre-mortem lung claim

System	Samples	Questions answered
Gut	Stomach contents, gut sections, faeces	Diet, ulcers, parasites, plastic and foreign bodies
Infection	Swabs and tissue for bacteria, viruses and fungi; <i>Brucella</i> testing	Cause of infection; compared with blow samples taken in life (Part 5)
Gas and pressure	Gas sampling from veins with an insulin syringe into an additive-free vacutainer, analysed by gas chromatography to distinguish emboli from putrefaction gas (Bernaldo de Quirós et al. 2011); imaging where available	Gas and fat emboli in deep divers (Fernández et al. 2005)
Entanglement	All gear removed and kept, photographed in place	Gear type and origin, for fisheries follow-up (NRE Tasmania 2022, Vol. 3)
Archive	Faeces (at least 100 g), heart-blood serum, parasites, frozen tissue for future work	Prey, pathogens, biotoxins, serology (NRE Tasmania 2022, Vol. 5)
Toxicology	Liver, kidney, blubber, blood; drug residues	Biotoxins, pollutants, and confirmation that drugs given did not cause death (Part 1 safeguard 7)
Brain and ears	Brain, ears	Neurological disease, hearing damage
Reproduction	Ovaries, uterus, mammary glands, testes	Pregnancy, lactation; tests thermal and hormone findings in life

Rules

- **Label every sample** with species, place, date and individual ID, following the NRE Tasmania convention (e.g. PMAC_SCA_201019_ID).
- **Fixation and transport:** histology samples no thicker than 1 cm in 10% neutral buffered formalin at 1:10; fresh chilled samples for culture, submitted the same or the next day (NRE Tasmania 2022, Vol. 5).

- **Mass strandings:** necropsy the freshest carcasses first, not the most convenient, and mark each carcass by protocol stage (NRE Tasmania 2022, Vol. 5).
- **Secure valuable parts:** sperm whale teeth are removed and logged, because of illegal trade (NRE Tasmania 2022, Vol. 2).
- **No barbiturate-contaminated carcasses.** Because GWRA never euthanises, its carcasses carry no barbiturate residues and pose no secondary-poisoning risk to scavengers, a problem that euthanasia protocols must manage (NRE Tasmania 2022, Vols 2 and 4).
- **Carcasses as training rigs.** Lift, tow and excavation methods are tested on carcasses before use on live whales, and heavy-equipment operators who help at necropsies become partners for live rescues (WHOI 2024-05).
- **Annual performance data.** Each year GWRA publishes, by region: the number of live strandings, diagnostic work-ups, animals treated, refloated or rehabilitated, survivors confirmed at six weeks, deaths and necropsies (SNM Dolly/Stormy brief, recommendation 9). The data also answer WHOI's open questions on prognostic indicators, the effect of size and time ashore on survival, tide timing and the necropsy of restrandings (WHOI 2024-05).
- **Zoonosis precautions** for the team: gloves, eye protection, aprons, masks; *Brucella* and *Erysipelothrix* risk (Principle XI).
- **Respect for the animal and the place:** consultation with Indigenous and local communities about the site and the remains, where relevant.
- **Feed the results back:** in Brazil, necropsies of franciscana calves (pneumonia in 26 of 30; missing passive immunity) changed clinical management, and calves now survive for months in rehabilitation, one for more than a year (Duarte-Benvenuto et al. 2026). That loop is the purpose of Principle VII. Every necropsy is compared with the case record in the debrief, and findings that change practice go into the next protocol revision (Principle IX).

Principle-check

Parts 16 and 17 pass all eleven tests.

Principle	Result
I. No euthanasia	Pass: toxicology confirms that comfort-care drugs did not cause death
II. No abandonment	Pass: a written re-intervention plan for every release
III. Immediate care	Pass: re-intervention triggers lead straight back into care
IV. Post-release monitoring	Pass: at least two monitoring methods, at

Principle	Result
	least six weeks; a global release registry; tags fitted before any tow; tracking across borders
V. Transparency	Pass: tracks, preliminary and full necropsy reports, and GWRA's evaluation published
VI. Speed	Pass: rapid necropsy teams alerted before death; re-intervention within hours
VII. Investigation	Pass: independent, pre-registered, three-category necropsy; rapid teams on site within 7 hours of death; annual performance data
VIII. Scientific basis	Pass: success measured against published benchmarks; necropsy compared with the living record
IX. Improvement	Pass: debrief feeds every finding into the next revision
X. Public and media	Pass: public resightings extend monitoring for years; public footage used in necropsy review
XI. Safety	Pass: zoonosis precautions for necropsy teams

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Annex A — Organisation, Training, Ethics, Public and Media, and Revision

The protocol works only if trained people, agreements with authorities and equipment are in place before the first call. This annex sets out how GWRA is organised, how people are trained and bound to the principles, how the public and media are involved, and how the protocol keeps improving.

Organisation

GWRA has two elements bound by the same principles: a worldwide federation of trained local teams, and a small rapid-deployment team for the hardest cases (GWRA brief and roadmap).

Element	Who	Role
Certified Partners	Independent local organisations trained and certified by GWRA; they hold their own national permits and insurance	First response: stabilise, first aid, local knowledge, public presence. Most cases are handled by them alone
Rapid-deployment team	Large-cetacean veterinarians, disentanglement and acoustic specialists, handlers and logistics staff, who keep their regular jobs and deploy when activated	Hardest cases: large whales, mass strandings, fragile species; regions without a partner; trains and assesses partners
Regional rapid necropsy teams	Independent pathologists on call	Necropsy under the Part 17 standard
ECHO	Detection stations, the Whale Detective public network, escort teams	Prevention and early warning (Part 2)

Working with authorities

GWRA supplements official stranding networks; it does not bypass them. The model is that of private search-and-rescue and lifeboat organisations working alongside state services (GWRA brief). In the UK, the RNLI, a charity, provides most maritime search and rescue under a declared service to HM Coastguard, and independent lifeboats are integrated through the UK SAR Operators Group; under mutual-aid arrangements, volunteers become temporary authorised personnel of the requesting agency (ECHO/GWRA amended sections; GWRA brief).

- **Memorandum of agreement (MOA)** with each national or regional authority, setting out legal footing, liability, veterinary licensing and operational authority in advance.
- **No MOA, no deployment.** GWRA deploys only where the MOA, all permits, veterinary licences and any cross-border agreements are signed and in force before the event (Part 1, No agreements, no deployment). Nothing is negotiated on site. Where they are missing, GWRA does not deploy and publishes why.
- **Pre-authorised scope.** The MOA lists, in advance, the drugs (including controlled drugs and analgesics), equipment (straps, slings, mats, pontoons, barges, lifting gear), diagnostics, tags and transport routes GWRA may use. Anything on the list needs no further approval during a response.
- **Clinical authority in the field.** Clinical decisions rest with the GWRA veterinarian in charge and the field team who examine the animal, within the agreed plan. After the Espírito Santo calf, the Brazilian stranding network moved euthanasia decisions to veterinarians and field teams on site (O Antagonista 2023).
- **Obstruction clause.** Withholding pre-authorised tools, adding approvals for access to the animal, or overriding the agreed plan during a response is a breach of the MOA. The incident commander notifies the authority in writing and asks for the agreed conditions to be restored. If they are not, GWRA hands responsibility for the animal back to the authority in writing, stands down, keeps observers on site where allowed, and publishes the full record. This clause exists because of the Baltic humpback case of 2026 (Part 1).
- **Escalation trigger:** under the MOA, the official network has a defined window (5–6 hours from a confirmed stranding) to commit to active rescue. If it decides on euthanasia or palliative care only, or does not commit, the authority engages the GWRA Certified Partner as the alternative responder (GWRA page).
- **Independent veterinary second opinion:** where an official assessment concludes rescue is futile, the GWRA partner may request an assessment by an independent GWRA-affiliated veterinarian. Independence means no institutional, employment or co-authorship link with those who made the first assessment; in the Baltic case, a

local responder also sat as a reviewer on the expert panel that advised the authority (SNM Hope brief).

- **Veterinarians licensed in advance.** Every GWRA veterinarian who may deploy to a country holds a licence or temporary authorisation there before any event. In the Baltic case a foreign veterinarian with relevant experience could only advise, for lack of a local licence (SNM Hope brief).
- **Independent advisory capacity for ministries.** GWRA recommends that each authority keep an advisory panel that includes practitioners with documented successful rescues, separate from institutions whose main role is research on dead specimens, and that the panel's membership and advice be published (SNM Hope brief; SNM open letter to the VetLine editors, 12 Oct 2026).
- **Why the MOA serves the authority.** A pre-agreed partner gives an authority a defensible course of action in a public emergency: a documented, evidence-based plan, delivered by trained people, at a cost far below the political and financial cost of an improvised one (SNM Hope brief).
- **Unified command:** when GWRA deploys, it works within a single incident command structure with the local partner and authorities.
- **When euthanasia is ordered anyway,** GWRA follows the fixed response in Part 1.

Incident command roles

Every response uses an incident command structure with named people in fixed roles, following the AIIMS model used in Tasmania (NRE Tasmania 2022) and the US Incident Command System. Roles can be combined in small responses, except the three marked as never combined.

Role	Responsibility
Incident controller	Overall command, liaison with authorities, decisions in line with the principles
Lead veterinarian	Diagnosis, treatment, all medical decisions, with a second veterinarian's agreement
Second veterinarian (on site or by video)	Independent check of every major decision
Breathing observer (never combined)	Times every breath; absolute authority to halt any action
Stress observer for fragile species (never combined)	Watches stress signs; can order stimulation cut (Part 7)
Safety officer (never combined)	People and animal safety; can pause any task; zoonosis controls
Operations lead	Handling, moving, refloating, boats

Role	Responsibility
Diagnostics and data lead	Drone, thermal, blow and faecal sampling, acoustics, records, history file
Volunteer coordinator	Registration, briefing, tasks, welfare and rotation of volunteers
Logistics	Equipment, transport, food, water, shelter
Public and media officer	Case page, livestream, statements, media access (below)
Community and Indigenous liaison	Two-way communication with local and Indigenous communities, community meetings, cultural protocols for the animal and the site (NRE Tasmania 2022, Vol. 1)
Scribe and decision log	Records every observation, option considered, decision, drug and time; the minimum data form (Part 3)

The safety officer comes, where possible, from an outside service such as an emergency medical service or park rangers, and takes no part in technical operations (WHOI 2024-05). In Tasmania a safety officer is appointed at every incident “regardless of scale” (NRE Tasmania 2022, Vol. 1).

Every responder is briefed on arrival: species and numbers, the plan, roles, communications, safety hazards including sharks and cold water, vessels, zoonosis rules, animal welfare, other site values, media and social media rules, and volunteer sign-up (NRE Tasmania 2022, Attachment 2).

Volunteers. In reality the first responders are the local people already on the beach (NRE Tasmania 2022, Vol. 1). Every volunteer is registered on site, inducted, given a safety briefing and an ID, and covered by insurance: GWRA asks partner governments to extend their own volunteer cover to registered stranding volunteers, as the Crown does in Tasmania, and carries its own cover where they do not. Untrained people on site can be directed by phone or video by experienced staff until a team arrives (NRE Tasmania 2022, Vol. 1; Whales Protection Act 1988 (Tas.), s. 15).

Training and certification

GWRA trains its own people rather than recruiting from networks whose training points the other way. It recruits transferable skill (maritime operations, veterinary medicine, acoustics, large-animal handling, logistics) and trains it in GWRA methods (GWRA brief).

Three levels

Level	For	Content	Model
Public first responder	Coastal residents, fishers, ferry crews, divers, students	Reporting, first aid, safety, zoonosis, what not to do (never water into the blowhole)	Thailand's marine environment volunteer network: more than 20,000 trained people along the coast (Chansue 2022)
Certified Partner team	Local organisations	All workflows, equipment, incident command, release, tagging, data; practical assessment	GWRA certification: expression of interest, gap assessment, training, practical assessment, time-limited certification with renewal
Rapid-deployment team	Specialists	Above-partner standard; large whales, mass strandings, fragile species; instructing	Joint training and full-scale exercises against the 24-hour (or less) target

Practice, not improvisation. The WHOI workshop's plenary concluded that response "should not be all improvised", and that "rescue efforts ramp up nearly from scratch with each event" (WHOI 2024-05). GWRA therefore requires:

- an annual stranding procedure exercise in every partner region, open to volunteers (NRE Tasmania 2022, Vol. 1);
- parking-lot drills with an inflatable whale model for lift bags, straps and towing, as TowBoat US ran at Morehead City (WHOI 2024-05);
- rigging, knot and splicing classes, swift-water rescue training, CPR and first aid for all field staff (WHOI 2024-05);
- trained and annually refreshed disentanglement crews, since "if not trained ... response should not be initiated" (NRE Tasmania 2022, Vol. 3);
- joint drills with disentanglement, herding and night-escort teams (SNM Hope brief, recommendations);
- training for call-handlers and crowd control as well as field roles, and mixed-experience teams, two points on which Boys et al. (2026) and GWRA agree.

Lack of previous experience does not stop someone from helping under supervision (NRE Tasmania 2022, Vol. 2).

The Marine Mammal Rescue Veterinary Course

Every fully certified team includes at least one veterinarian who has completed the course. Teams without one hold provisional certification for non-medical roles only. The course seeks recognised continuing-education accreditation: RACE approval in the US, with equivalents sought in the UK, Germany and Australasia (GWRA fund brief).

Module	Content
Anatomy and physiology	Why stranding causes thermoregulation failure, breathing problems from body weight, and organ damage
Field triage and stabilisation	Rapid assessment and first interventions; triage for the order of care, never for abandonment
Non-invasive diagnostics	Drone photogrammetry, thermal imaging, blow and faecal sampling (Part 5)
Fluid therapy and pharmacology	Doses, routes, metabolic scaling, darting (Part 15)
Sedation, pain and comfort care	Narrow margins between sedation and respiratory depression; the seven safeguards (Part 1)
Myopathy and stress cardiomyopathy	Prevention and management; fragile species (Part 7). The most important clinical module
Integrative medicine	Thai herbal and traditional methods, plant identification, preparation, interactions (Part 15)
Rehabilitation	Low-cost tiers, feeding, orphans (Parts 10 and 19)
Post-release monitoring	Reading tag data; re-intervention (Part 16)
Doctrine and ethics	The eleven principles; no euthanasia; responding to a euthanasia order; transparent documentation

The ethics agreement

Every person and organisation operating under the GWRA name signs this agreement before deployment. Breach ends certification.

I undertake that, in every response under the GWRA name:

1. I will never euthanise a cetacean or take part in a killing, and I will give comfort care to relieve suffering until rescue or natural death.
2. I will not abandon a living animal, and I will not judge an animal's worth by the status of its population.
3. I will start supportive care at once, and I will not delay it for permits, experts or consensus.
4. I will make sure every released animal is tagged and followed, and I will help re-intervene if needed.
5. I will record and allow publication of every decision, drug, dose and outcome, including failures.
6. I will act with speed, and I will keep equipment, skills and agreements ready in advance.
7. I will support a full, independent necropsy of every animal that dies, and an honest debrief of every response.
8. I will base decisions on measurement and evidence, and I will state clearly where evidence is limited.
9. I will share what I learn so the protocol improves.
10. I will treat the public and the media as partners, and I will tell the truth.
11. I will protect the safety of people and animals, and I will answer risks by changing the method, never by abandoning the animal.

I will follow the fixed response in Part 1 if any authority orders an animal killed, and I will never physically obstruct officials.

No one under the GWRA name is directed or pressured to carry out a procedure they believe will harm the animal or endanger people; they may stand down from a task, provided they hand it over safely. Even the Tasmanian euthanasia manual states that no personnel are to be "directed or pressured into carrying out or assisting" against their wishes (NRE Tasmania 2022, Vol. 4).

Signed Date

Public and media

Transparency is a principle, so communication is built into every response rather than managed around it (Principles V and X).

What is published, and when

Item	When
Case page with species, location, status and the plan	Within hours of deployment
Livestream or regular video updates where conditions allow	Throughout the response
Daily summary: condition, treatments, drugs and doses, decisions and who made them	Each day
Release record: time, place, tag numbers, track	At release and as tracking continues
Necropsy: pre-registered questions, preliminary findings, full report, GWRA evaluation	As each is available (Part 17)
Debrief summary and resulting protocol changes	After every response

Rules

- **One voice:** the public and media officer speaks for the response; others refer questions to them.
- **Facts, not adjectives:** say what was measured and what is not known.
- **Name decisions, not people:** communications describe what was decided and on what evidence. They do not attack named individuals; disagreements with other institutions are argued on evidence.
- **Media access** is arranged so that it does not disturb the animal: pool cameras, drone footage shared, a fixed viewing area.
- **Every public report gets an answer**, and reporters can follow “their” animal on the case page (Part 2).
- **Public feedback** on each case and on the protocol is invited and answered at each revision (Principle IX).
- **No terminal prognosis without diagnostics.** No GWRA statement calls an animal “dying”, “sick”, “beyond help” or “crushed internally”, or says rescue is “not feasible”, unless the claim rests on measurements that are published with it. Where an assessment is visual only, the statement says so. In the Baltic case a press invitation called the whale “dying” before any assessment had been presented (SNM Hope brief); in the Dolly/Stormy case, the same unsupported phrases ran ahead of any blood test (SNM Dolly/Stormy brief).

- **The decision log is public.** Observations, methods used and not used, and the reason each alternative was rejected are published with the case (SNM statement on the Gutachten).
- **Answer, do not shield.** Questions and challenges from the public, including demands for credentials, are answered with data. GWRA does not adopt the advice to “shield the vet from media”, to time updates “strategically”, or to “prepare the public” for a negative outcome before events unfold (Boys et al. 2026; NRE Tasmania 2022, Vol. 1). It does adopt the sound parts of the same advice: one named spokesperson, necropsy results shared with the public, reporters and responders, partners acknowledged, and vigilance against AI-generated misinformation (Boys et al. 2026).
- **Live updates, with care for the animal.** Live streams and posts continue throughout, with exact locations delayed where crowds would disturb the animal (Part 2).
- **Accountability through evidence.** Every statement in GWRA protocols and case reports traces to a cited, checkable source (Annex B), every revision carries a public change log, and every case record is published. The demand that drafters be named (SNM open letter to the VetLine editors, 12 Oct 2026) applies to panels that exercise public authority: a protocol that binds officials and decides whether animals live or die must have accountable authors. An independent proposal such as this one asks to be judged on its evidence, which anyone can verify.

Debriefs, R&D and revision

The protocol changes whenever a case or a study shows a better way (Principle IX). The core principles do not change.

Debriefs

- **Hot debrief** on site at the end of every response, recorded, before people stand down (NRE Tasmania 2022).
- **Formal debrief** within two months after every large or mass response (the Tasmanian level 3 standard), covering preparedness, timeliness, equipment, resources, skills, safety, animal welfare, external help, procedures, innovations and areas to improve (NRE Tasmania 2022). It includes the necropsy comparison (Part 17).
- **Published summary** with the changes it recommends.
- **Responder wellbeing.** Few organisations offer structured debriefs or mental-health support (Boys et al. 2026). GWRA provides psychological first aid on site, peer support and access to counselling after every response. Compassion fatigue is real, and it must not harden into policy (SNM open letter, 12 Oct 2026).

- **Annual workshop** with published proceedings, open to partners, authorities, external scientists and the public (GWRA roadmap).

The rescue database and success measures

GWRA keeps a public database of every live case it handles or learns of, with diagnostics, treatments, releases, tracking and outcomes, and of documented successful rescues worldwide. Teams and regions are evaluated by their outcomes: the share of cases with a diagnostic work-up, treated, released, and confirmed alive at six weeks (SNM Hope brief, recommendations; Part 17). Data feed the shared international resources the WHOI workshop called for: the IWC strandings initiative, decision trees and international data sheets (WHOI 2024-05).

R&D register

All research items from the protocol are kept in one public register, with an owner, partners and status for each:

Part	Research items
2	Thermal wake and fluke-print detection by machine learning, with shared labelled training data and synthetic augmentation; AI triage; rare-call acoustic detection; satellite imagery for large whales; risk forecasting from environmental data (sea temperature, ENSO)
5	Thermal library linked to necropsy; thermal blowhole temperature validated in large whales; suction-cup ECG norms for large whales; blow creatinine and urea; blow aldosterone; blow catecholamines and metabolomics; age and recovery
6	Glue-on tags that shed with the skin
7 and 18	Red-belly stress gauge in Kogia; cardiac biomarkers; heart-protective drugs; holding design; feeding of suction feeders and neonates; decompression injury; beaked whale body-condition norms
9	Playback library and controlled lure studies; dynamic barriers; startle sounds under restriction
12	Blow-based pneumonia diagnosis; darted

Part	Research items
	antibiotic levels; sustained-release single-dart antibiotics; nebulised antibiotics; lungworm; stress ulcers; gut stasis in <i>Kogia</i> ; herbal remedies; gut microbiome; controlled corticosteroid study
10 and 19	Large-whale sea pen; scaled-up life vest; in-place feeding of large calves
14B	Towed soft-mesh sea pen; inflatable “air-hockey” lift mats and rocky-substrate methods (WHOI 2024-05); low-tech strap placement
7 and 18 (added)	Recompression feasibility for gas injury; <i>Kogia</i> drug-safety log; sonar moratoria and strandings
8	Identifying the animal in distress and the pod leader
6 and 16	Drag trials for glue-on tags; ECG-capable tags for post-release follow-up; global release registry
10 and 12	IgG testing and colostrum or plasma replacement for orphan calves; pneumonia prevention in calves
1 and 15	Outcomes of fluke-less and flipper-less animals in care and in the wild

Revision cycle

- Review at least once a year, and at once after any case that shows a gap.
- Each version carries a public change log: what changed, why, and on what evidence.
- Public, partners and external scientists can submit evidence and comments before each revision.
- A change to any of the eleven principles is not possible.

Legal preparation and open items

Legal preparation

- **Formal legal opinion for Germany** on the Animal Welfare Act argument in Part 1: that diagnosis, treatment and comfort care meet the duty to prevent suffering, so killing is not legally required.

- **MOA template** with the escalation trigger, the second-opinion clause, the pre-authorised scope, field clinical authority and the obstruction clause, reviewed by counsel in each target country; Germany, Denmark and the Baltic states first.
- **Standing permits** for diagnostics, darting, tagging and rehabilitation of protected species, under BNatSchG §45(5) in Germany and equivalents elsewhere.
- **Cross-border agreements** so a whale moving between countries, as in the Baltic in 2026, is not abandoned at a border.
- **Controlled drug licences** for the formulary (Part 15) in each country of operation, and pre-authorised antimicrobials for animals that will be released, since some countries, such as Italy, at present bar antibiotics for released cetaceans (WHOI 2024-05).
- **Cross-border personnel and drugs.** Multilateral agreements that let licensed veterinarians and their drugs cross borders during a response; Boys et al. (2026) identify the same barrier.
- **Model legal clauses.** Tasmania's Whales Protection Act 1988 shows what good law contains (Part 1): authority for a registered veterinarian to carry out acts necessary for rescue and veterinary treatment (s. 12); a right of entry over any land to reach a stranding (s. 13); power to direct volunteers in person or by telephone (s. 15); an offence of obstructing a rescue (s. 16); and protection for acts done in good faith (s. 26). GWRA offers these, without the euthanasia power, as model clauses for MOA countries.
- **Strandings as emergency events.** Tasmania lists cetacean strandings as emergency events under its emergency management arrangements, which opens state emergency capabilities to the response (NRE Tasmania 2022, Vol. 1). GWRA asks partner governments to do the same.
- **Equipment held for rescue only**, with named responsible officers and contact directories updated every year (NRE Tasmania 2022, Vol. 1).
- **Counsel on retainer** for urgent legal review when euthanasia is ordered (Part 1).

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Annex B — Evidence Register and Corrections Log

Purpose and evidence standard

Every factual claim in the GWRA protocol traces to a source in this register, graded A to E. Principle VIII (strong scientific basis) and Principle V (total transparency) require that the reader can see how strong each claim is.

Grade	Source type	How the protocol uses it
A	Peer-reviewed papers, books, official necropsy reports	Stated as established fact
B	Government or agency manuals and technical memoranda (NOAA, WHOI, NRE Tasmania)	Stated as current practice; checked against the principles before adoption
C	Documented case records: news reports, NGO reports, photo-ID records, SNM case briefs	Stated as documented cases, with date and place
D	Conference presentations and personal communications from named experts	Stated as such, e.g. “(pers. comm.)” or “(presented at the Society for Marine Mammalogy conference, 2026)”
E	Concepts, proposals and R&D hypotheses (including SNM technology proposals)	Labelled as R&D, never as proven field practice

Rule on missing citations. A claim from a credible expert source that has not yet been published is kept, labelled D, and listed for follow-up. Absence of a published citation is not

evidence that a finding is false. This matters most for fast-moving work such as thermal detection of wakes, which was first presented at a 2026 conference.

Rule on contradicting evidence. Where published evidence contradicts an SNM or GWRA position, the protocol says so and turns the question into a funded R&D item. It does not drop the evidence. This protects the protocol against the criticism, made by Boys et al. (2026) and the VetLine authors (Karbe et al. 2026), that rescue advocacy is driven by hope rather than knowledge.

Corrections log (coming soon, after the publishing of the first protocol version)

Core references by protocol part

The register lists the core sources; those marked “Verified” are confirmed against the original, the publisher page or the full text in the GWRA library, and the rest come from SNM, GWRA or agency files and are confirmed as each part is written. Part numbers follow the protocol outline (1 Philosophy ... 19 Rehabilitation facilities).

Source	Grade	Parts	What it supports	Status
Liu et al. 2026 , Ecology and Evolution 16:e73174	A	10, 16, 19	Rehabilitated short-finned pilot whale “Haitang”: small pool with flotation, then outdoor pond, 11-member release panel, 52 days tracked, dives to 621 m	Verified
Gulland et al. 2008 , Aquatic Mammals 34(2):182–192	A	5, 9, 15	Remote antibiotic darting of large whales; herding and playback did not work	Verified
Thalmann et al. 2008, Marine Mammal Science	A	8, 14	Net and jet-boat refloating of sperm whales; 96 h survival	Verified

Source	Grade	Parts	What it supports	Status
24(4):949–955, doi:10.1111/j.1748-7692.2008.00223.x				
Wells et al. 2013, Marine Mammal Science 29:463–483	A	16	6-week post-release survival benchmark (69 cases)	Verified
Chou et al. 2024 , Animals 14(12):1823	A	7, 18	Taiwan 1994–2018: 390 live strandings, 52 rehabilitated, 15 released	Verified
Scott et al. 2001, J. Cetacean Res. Manage. 3:87–94	A	7, 16	Rehabilitated pygmy sperm whale released and tracked	Verified
Bossart et al. 2007, Aquatic Mammals 33(2):214–222	A	7, 18	Cardiomyopathy in stranded Kogia	Verified
Câmara et al. 2019, Frontiers in Veterinary Science, doi:10.3389/fvets.2019.00476	A	7	Stranding-related skeletal and cardiac rhabdomyolysis	Verified
Herráez et al. 2013, The Veterinary Journal 196:181–188	A	7	Capture myopathy in live-stranded cetaceans	To confirm
Lonati et	A	5	Aerial infrared	Verified

Source	Grade	Parts	What it supports	Status
al. 2022, Endangered Species Research 48:139–154			thermography of right whales	
Horton et al. 2019, Frontiers in Marine Science 6:466	A	5	Drone thermal imaging of humpback whales	Verified
Lonati et al. 2024, International Journal of Remote Sensing	A	5	Blowhole temperature 26.9 ± 1.7 °C (n = 21 right whales)	From conference slides; to confirm
Christiansen et al. 2019, 2020, 2023	A	5	Drone width:length body condition, 3D body volume	From slides; to confirm
Torres & Bierlich 2020	A	5	Drone photogrammetry method	From slides; to confirm
Apprill et al. 2017; Centellegher et al. 2020	A	5, 11	Drone blow sampling for microbiome, viruses, hormones	From slides; to confirm
Wiley et al. 2023	A	6	Drone-dropped suction tags on blue whales	From slides; to confirm
Palmer & Irani 2024	A	2	Machine-learning detection of whale head, body and blow in drone video	From slides; to confirm

Source	Grade	Parts	What it supports	Status
O'Mahony et al. 2024	A	5	Blow sampling for respiratory pathogens	From SNM brief; to confirm
Andrews et al. 2019, J. Cetacean Res. Manage. 20:27–66	A	6, 16	Best-practice cetacean tagging guidelines	Verified (via Liu 2026)
Gales et al. 2012	A	8, 16	Satellite-tagged pilot whales reunited after Tasmanian mass stranding	Via Liu 2026; to confirm full reference
Moore et al. 2020	A	16	Post-release tracking of a rehabilitated pilot whale	Via Liu 2026; to confirm
Boys et al. 2026, J. Cetacean Res. Manage. 27:71–93, doi:10.47536/jcrm.v27i1.1152	A	1	Euthanasia framework that GWRA rejects	Verified
Gage (IAAAM archive), two neonatal Mesoplodon	C	18	Neonate beaked whales died after 16 and 25 days in care	Verified
Moore et al. 2010	A	15	Sedation at sea of an entangled right whale	From SNM brief; to confirm
Casoff et al. 2011, Diseases of Aquatic Organisms 96:175–185	A	15, 17	Pathology of lethal entanglement	To confirm

Source	Grade	Parts	What it supports	Status
Zasloff 2011	A	15	Dolphin wound healing	From SNM brief; to confirm
Alexander et al. 1989; Davison et al. 2017	A	15	Osteomyelitis cured with antibiotics; Brucella in cetaceans	From Hartwin brief; to confirm
NOAA 2020 right whale calf	C	15	Darted cephalosporin (57 mL) by Paxarms MK24C	From Hartwin brief; to confirm
WHOI Technical Report 2024-05	B	5, 14, 15	Large-whale triage, doses, sling and pulley systems	In project files
NRE Tasmania Cetacean Incident Manual 2022	B	8, 13, 14	Incident command, volunteer registration, sling technique, release-readiness signs	In project files
Geraci & Lounsbury 2005, Marine Mammals Ashore	A	14, 15	Standard first aid and weight estimates	Standard text
Dierauf & Gulland (eds) 2001, CRC Handbook of Marine Mammal Medicine	A	15, 19	Clinical reference	Standard text
Barnett 2002	C	19	UK report recommending	From MARC investigation;

Source	Grade	Parts	What it supports	Status
			cetacean rehabilitation	to confirm
Ramp & Bekoff 2015; Wallach et al. 2018, 2020; Beausoleil 2020; Johnson et al. 2019; Katz 2024	A	1	Compassionate conservation: individuals matter	From SNM papers; to confirm
Elemans et al. 2024	A	9	Baleen whale sound production	From SNM brief; to confirm
Stockin et al. 2022	A	1, 17	Stranded cetacean welfare concepts	From SNM brief; to confirm
Frasier et al. (Canadian Geographic, Dec 2010)	C	10	North Atlantic right whale double calf adoption confirmed by DNA	Archived page in files
Alonso, Algeciras 2013 (andaluciainformacion.es)	C	10	Rehabilitated common dolphin calf rejoined mother, confirmed by photo-ID	Archived page in files
GREMM 2018 (CBC News, 13 Sep 2018)	C	10	Juvenile narwhal integrated into St. Lawrence beluga group	Archived page in files
Asahi Shimbun, 11 Sep 2013	C	10	Lost melon-headed whale calf with	Archived page in files

Source	Grade	Parts	What it supports	Status
Bogomolni et al. 2010, Diseases of Aquatic Organisms 88:143–155	A	1, 4, 8, 17	bottlenose dolphins, Mikurajima 92% (97/106) of mass-stranded animals necropsied had no significant pathology	Verified (abstract)
Wiley et al. 2001, Aquatic Mammals 27(2):162–171	A	8, 14B, 16	Cape Cod mass-stranding rescues: 90% survived transport up to 40 km; 82% not seen to restrand; push-backs discontinued	Verified (full text)
Pugliares et al. 2007, WHOI-2007-06	B	17	Field necropsy method; carcass codes	Verified (full text)
Barnett et al. 2011 (ECS abstract)	D	4, 8, 17	48% of 654 live-stranded UK cetaceans without explanatory pathology	Verified (abstract book)
Manire et al. 2004, Aquatic Mammals 30(2):257–270	A	7, 12, 15, 19	Rehabilitation of 13 <i>Kogia</i> ; fluids, water, drugs, formula	Verified (full text)
Cowan & Curry 2008, J Comp Pathol 139:24–33	A	7	Alarm reaction pathology in small odontocetes	Verified (full text)

Source	Grade	Parts	What it supports	Status
Herráez et al. 2007, J Wildl Dis 43(4):770–774	A	7	Capture myopathy with myoglobinuric nephrosis in a stranded striped dolphin	Verified (full text)
Sacchini et al. 2011 (ECS abstract)	D	7	Stress cardiomyopathy in 64 live-stranded cetaceans	Verified (abstract book)
St. Aubin 2002, NOAA SWFSC LJ-02-23C	B	5	Aldosterone as part of the dolphin stress response	Verified (full text)
Champagne et al. 2018, Gen Comp Endocrinol 266:178–193	A	5	Endocrine stress response in serum, blubber, faeces	From library; author list to confirm
Tyurneva et al. 2010, IWC SC/62/BRG9	B	5	Underweight gray whales regain condition	Verified (full text)
Sharp et al. 2014, Marine Mammal Science 30:864–887	A (thresholds used as treatment triggers)	5	Prognostic blood values in common dolphins	Verified
Pace et al. 2021; Rockwood et al. 2017	A	16	Low carcass detection rates	Via WHOI 2024-05
Fernández et al. 2012, J Marine Sci Res Dev 2:107	A	18	No atypical beaked whale mass strandings in the Canaries	Verified (full text)

Source	Grade	Parts	What it supports	Status
			after the 2004 sonar moratorium	
Hooker et al. 2009; Fahlman et al. 2014; Rommel et al. 2006	A	18	Gas exchange and bubble risk in deep divers	Verified (full text)
D'Amico et al. 2009; Filadelfo et al. 2009	A	18	Beaked whale strandings and naval sonar	From library
Thomas et al. 1990; Hückstädt & Antezana 2001; Pérez-Gil et al. 2011	A, A, D	7	<i>Kogia</i> pregnancy and stranding	Verified (full text or abstract)
Wang et al. 2002; West et al. 2009	A	7, 19	<i>Kogia</i> diet	Verified (full text)
Chittleborough 1958; Jenness & Odell 1978; Arvy 1974; Oftedal & Iverson 1995	A	10	Humpback lactation length; milk composition for formulas	From library
Curé et al. 2011 (ECS abstract)	D	9	Pilot whales attracted, sperm whales repelled, by killer whale playback	Verified (abstract book)
Jahoda et al. 2025, Ecology and Evolution	A	1	Flukeless fin whale: 23 years with a partial amputation; at	Verified (PMC full text)

Source	Grade	Parts	What it supports	Status
15(5):e71313			least 7,000 km in about ten months after complete loss; starvation the probable cause of death	
Neves et al. 2020, Aquatic Mammals 46(5):483–487	A	16	Ubatuba humpback resighted 8 years later	Via WHOI 2024-05
Olhasque et al. 2025, Animals 15:3503	A	4, 15	Rance estuary humpback rescue	From SNM brief
Elemans et al. 2024, Nature	A	5	Baleen whale larynx; vocalisation needs a working airway	From SNM brief
Weilgart 2007; Gulland & Hall 2007; Dailey 2001	A	5	Differential diagnosis of listing	From SNM brief
Gusman-Cunha et al. 2025 , Aquatic Mammals 51(3):197–203	A	10	Stranded newborn humpback calf, Espírito Santo, 2023: euthanasia reversed, mother nearby, calf reunited and resighted with her two days later	Bibliographic details confirmed (Aquatic Mammals 51.3 table of contents; news reports, 2023)

Personal communications and conference sources (grade D)

Six grade-D sources carry important, current knowledge and stay in the protocol as stated, each labelled and listed for follow-up publication.

Source	Content used	Parts	How it is cited
Taiwan stranding network (pers. comm. to SNM)	About 5–6 live Kogia strandings a year in Taiwan, with 1–2 successfully rescued; Mei-Mei (2010, 58 days in care, released with a satellite transmitter) and the 2013 adult released 20 Oct 2013	7, 18	“(Taiwan stranding network, pers. comm. to SNM, 2026)”. Context from Chou et al. 2024 (52 rehabilitated, 15 released, 1994–2018)
DeBossu (BIRD Lab, US Navy), AI in Marine Mammal Science workshop, 26th Biennial Conference on the Biology of Marine Mammals, San Juan, Puerto Rico, October 2026	Machine-learning (YOLOv11, human-in-the-loop) detection of whales and thermal fluke prints; high false-alarm rate with limited training data	2, 5	“(DeBossu 2026)”
Torrente, 26th Biennial Conference on the Biology of Marine Mammals, San Juan, Puerto Rico, October 2026	First ECG of a free-ranging fin whale by suction cup: 5–9 bpm diving, up to 24–34 bpm at the surface; PR about 780 ms; heart rate doubled within about 40 s of a motorboat approach; method proposed for stranded animals	5, 7, 14B, 16	“(Torrente 2026)”
Fazioli et al., poster,	Five bottlenose	1, 15	“(Fazioli et

Source	Content used	Parts	How it is cited
same conference	dolphins surviving without flukes, for up to seven years		al. 2026)”
Hoffman et al., poster, same conference	Blow metabolome (78 metabolites incl. catecholamines) and blubber cortisol in compromised humpback whales	5, 7	“(Hoffman et al. 2026)”
Duarte-Benvenuto et al., presentation, same conference	Franciscana calf necropsies: pneumonia 26/30; IgG 3/5 complete; age markers	10, 12, 17	“(Duarte-Benvenuto et al. 2026)”
Saltr� et al., poster, same conference	Spatiotemporal drivers of common dolphin strandings in New Zealand	2	“(Saltr� et al. 2026)”
Dunn & Claridge, poster, same conference	Drone body condition, pregnancy and weaning age in Blainville’s beaked whales	5, 10, 18	“(Dunn & Claridge 2026)”
Su et al., poster, same conference	Scar-resolving regenerative wound healing in Fraser’s dolphins	15	“(Su et al. 2026)”; published background Su et al. 2022, 2023
G. Lonati, The Marine Mammal Center (online talk, Aug 2026)	Drone thermography: blowhole temperature, heart rate (after Horton et al. 2019), pregnancy heat signature, inflammation; Blender 3D body-condition models;	2, 5, 11	“(Lonati, presentation, 2026)” alongside the published papers

Source	Content used	Parts	How it is cited
	gray whales staying more than 90 days in San Francisco Bay; ideas for drone darting and fecal sampling		
Dr. Nantarika Chansue, Chulalongkorn University: plenary lecture “Marine mammal rescue with limited resources”, Society for Marine Mammalogy Biennial Conference, Palm Beach, Florida, August 2022; veterinarian with 33 years in aquatic animal medicine	Low-cost rehabilitation: mud and plastic sleds, lined beach pools, portable pools, fish and shrimp ponds, bamboo shade, neoprene dolphin life vest with water-bottle buoyancy; integrative diagnosis (observation, listening, smell with zoonosis precautions, palpation, tongue evaluation) and treatment (herbal medicine, acupuncture); 20,000-strong Thai marine volunteer network; Thailand does not euthanise stranded cetaceans; zoonosis incident (about 20 people ill after exposure to a Pseudomonas-positive false killer whale)	13, 15, 19, Principle XI	“(Chansue 2022)”. Name and year confirmed from the SMM 2022 programme; the transcript recorded the name phonetically
SNM case documentation	Timelines, video record, intervention	1, 4, 14, 17	Cited as SNM case briefs (grade C),

Source	Content used	Parts	How it is cited
(Hope/Timmy, Hartwin, Dolly/Stormy, Baby Toa)	proposals		with corrections from this log
IWC Scientific Committee correspondence	Expert letters on the Baltic humpback	1, 14	Cited by date and author on publication
European Cetacean Society 2011 abstracts (Barnett et al.; Sacchini et al.; Bernaldo de Quirós et al.; Curé et al.; Pérez-Gil et al.)	Live-stranding pathology, stress cardiomyopathy, gas analysis, playback responses, <i>Kogia</i> reproduction	4, 7, 8, 9, 17	Cited as conference abstracts, grade D
S. Thalmann, email to J. Hennig (10 Apr 2026)	Net towing of large whales “fundamentally suitable”, standard practice in Australia	8	“(Thalmann, pers. comm., 2026)”

Opposing positions register

The sources below set out positions that GWRA’s protocol answers. Many are also cited for their data, which often support rescue. Each claim is answered in a named part of the protocol, on evidence rather than on the authors.

Position	Source	GWRA answer	Part
Euthanasia is a “proactive welfare tool”; “welfare over hope”	Boys et al. 2026	No euthanasia. Welfare is served by speed, diagnosis, treatment and comfort care, which keep animals from reaching the state that is used to justify killing	1, 4, 15
Deep divers and dependent calves have a poor prognosis, so	Boys et al. 2026	Prognosis is measured, not assumed. Orphan adoptions, <i>Kogia</i>	7, 10, 18

Position	Source	GWRA answer	Part
euthanise		releases in Taiwan and the US, and Haitang's 621 m dives after rehabilitation show recovery is possible	
Call staff "responders", not "rescuers"; perform euthanasia "quietly"	Boys et al. 2026	Every case, including deaths, is published with video, drugs, doses and necropsy	1, 17
Animal-welfare law protects well-being over life; one "no" to three questions obliges killing	Karbe et al. 2026 (VetLine)	GWRA does not kill and challenges orders through second opinions, legal objection and publication. The three questions are answered with data, not a visual assessment	1, 14
"Legally a humpback whale is no different from a pipistrelle bat"	Karbe et al. 2026	Each species needs species-specific assessment; Principle VIII requires body-condition and prognosis to be judged against that species' literature	1, 5
An expert commission should decide, insulated from the public and social media	Karbe et al. 2026	Expert review is welcome, but decisions are published and the public is a partner in detection and oversight (Principle X)	1, 2
No rehabilitation;	Simmonds 2001	Train and certify the	13, 19

Position	Source	GWRA answer	Part
stop “amateur refloats”	(MARC history)	public instead of excluding it. Low-cost rehabilitation is proven (Liu et al. 2026; Thai practice)	
Rehabilitated singletons are not releasable; facilities are closing	Public comment (in orphan files)	Release near a conspecific group with mandatory tagging; documented adoptions in five species	10
Neonates “should not be rescued, unless their mother could be found” (1996)	Simmonds 2001	Search for the mother and rehabilitate if she is not found	10
Large odontocetes such as sperm and northern bottlenose whales to be euthanised “at earliest opportunity”; one refloat attempt on one tide	MARC policy (SNM MARC investigation)	Time ashore and failed attempts are not verdicts; sperm whales refloated after 96 h (Thalmann et al. 2008)	4, 8
Rehabilitation of a cetacean of any size is “NOT an option”; calves without adults: consider euthanasia	NRE Tasmania 2022, Vol. 2	Five-tier rehabilitation; orphan workflow	10, 19
Telemetry buoy not attached if the whale may leave the jurisdiction	NRE Tasmania 2022, Vol. 3	Tracking across borders; cross-border hand-over	16
Prepare the public before a negative	NRE Tasmania 2022, Vols 1 and 4	Facts published with their data; no pre-	Annex A

Position	Source	GWRA answer	Part
outcome; explain multiple shots “to eliminate any suggestion of mistake”		scripted expectations	
Decisions “constrained more by legal, logistical and organisational factors than by what would be optimal for animal welfare”; returned animals “typically strand again”	Boys et al. 2026	The first is an admission that capacity, not welfare, decides; GWRA builds the capacity. The second is contradicted by Wiley et al. 2001 (82% not seen to restrand) and NRE Tasmania 2022	1, 8
Public sentiment can take precedence over welfare in euthanasia decisions (27% of DOC respondents); “significant antagonism” clause	Stockin et al. 2022	Decisions rest on published measurements, and the public is a partner, not a factor to be managed	1, Annex A
Category 2 (rehabilitation) is “exceedingly narrow” for large whales; category 3 signs as euthanasia triggers	WHOI 2024-05	Rehabilitation is the main path for animals not ready to release; category 3 signs are treatment flags (Part 5)	5, 19
Blood thresholds predict non-survival	Sharp et al. 2014, via WHOI 2024-05	Thresholds set treatment intensity, never exclusion	5
Cardiomyopathy in <i>Kogia</i> is “cause for euthanasia”; release as a fallback	Manire et al. 2004	Heart monitoring and comfort care; release-first rehabilitation	7
The alarm reaction	Cowan & Curry	The mechanism is a	7

Position	Source	GWRA answer	Part
explains why stranded odontocetes die	2008; Sacchini et al. 2011	map of what to prevent: speed and stress reduction	
Death is part of nature; humans should not intervene	UIA Encyclopedia (counter-claim)	Most stranded animals are healthy (Bogomolni et al. 2010), and stranding sites are often traps; GWRA intervenes for individuals (Principle II)	1, 8
Leave stranded whales alone; over 4 m neither rescued nor euthanised	Danish Ministry of Environment (2024, 2026)	The 2022 Limfjord killer whale, pulled to deeper water, was seen a year later in good condition	1
Methods for killing large whales (explosives, ballistic, intracardiac potassium chloride)	Coughran et al. 2012; Hampton et al. 2014; Harms et al. 2014; Moore et al. 2010 (IWC/A10/E1); Donoghue 2006	GWRA does not kill; these sources are cited only to show that killing a large whale is neither quick nor reliable	1
Loss of flukes or a disabling tail-stock injury is a criterion for euthanasia	NRE Tasmania 2022, Vol. 4; WHOI 2024-05, category 3	Bottlenose dolphins surviving without flukes for years, including a dependent calf (Fazioli et al. 2026); a fin whale living 23 years with a partly amputated fluke and travelling 7,000 km after losing both (Jahoda et al. 2025); gray whales migrating without	1

Position	Source	GWRA answer	Part
		flukes (National Geographic 2018). The risk in large whales is starvation, which is monitored and supported (Part 1)	
Euthanasia “for the people”, not the whale	Public statement by a southern African responder (SNM Hope brief)	Principle I	1

Sources used only with restrictions

Four sources need special handling to pass Principle VIII (strong scientific basis) and Principle XI (human and animal safety).

Source	Used	Not used, and why
SNM acoustic-deterrent case study and prevention graphics (uncited)	The detection-to-response chain: low-cost hydrophone buoys (AudioMoth/HydroMoth, about USD 800 a unit), on-board detection, satellite alert, drone verification, boat herding. Golden Bay 1995 bubble curtain history, confirmed by the UIA Encyclopedia entry	Startle pulses (185–195 dB) as field practice, because aversive stress conflicts with Part 7. Physics claims needing verification. “Whale tax” and carbon-credit financing, which are outside protocol scope
SNM pen-transport concept (Namu, 1965: 19 days, 450 miles)	Towed soft-mesh sea pen as R&D for moving large whales out of the Baltic, rivers and estuaries	Not field-ready until tested. Namu was a capture for captivity, so it is cited only to show a slow tow is physically possible
NRE Tasmania manual, Boys et al. 2026, WHOI 2024-05, Sharp et al. 2014, Manire et al. 2004, MARC history (Simmonds 2001)	Logistics, triage signs and thresholds, net and sling techniques, doses, incident command, debrief structure, rehabilitation methods, historical data	Every euthanasia pathway; thresholds used to exclude animals; the default that dependent calves without a mother are euthanised; the claim that rehabilitation is

Source	Used	Not used, and why
	showing most stranded animals are healthy	impossible