RESCUE AND REHABILITATION PROTOCOL FOR NEONATAL FRANCISCANA DOLPHINS

Pontoporia blainvillei

J. Meegan, F. Gomez, A. Barratclough, C. Smith, J. Sweeney,
V. Ruoppolo, C. Kolesnikovas, R. Pinho da Silva Filho, P. Lima Canabarro, P. Laporta,
J. P. Loureiro, K. Alvarez, S. A. Rodriguez Heredia, A. Cabrera, A. Faiella, A. Saubidet
& L. von Fersen

Alliance for Franciscana-Dolphin
Conservation Research, Rescue and Rehabilitation AFCR3

Integrated Conservation Planning for Cetaceans
IUCN SSC Species Survival Commission

AFCR3 - Publication Nr. 01 - 2022

Coordination

Partners

RESCUE AND REHABILITATION PROTOCOL FOR
NEONATAL FRANCISCANA DOLPHINS

J. Meegan, F. Gomez, A. Barratclough, C. Smith, J. Sweeney,
V. Ruoppolo, C. Kolesnikovas, R. Pinho da Silva Filho, P. Lima Canabarro, P. Laporta,
J. P. Loureiro, K. Alvarez, S. A. Rodriguez Heredia, A. Cabrera, A. Faiella, A. Saubidet
& L. von Fersen

This protocol was developed and implemented by veterinarians, technicians, biologists, and animal care and rehabilitation specialists. This protocol has been gradually applied for the past two stranding seasons. It is intended to be a living document, with modifications made as new knowledge is gained with each case, ultimately bringing us closer to the overall goal of successfully rehabilitating Franciscana dolphins.

The protocol in its final version was submitted to 5 additional experts in rehabilitation / veterinary medicine for review. These reviewers were:

Dr. Katrin Baumgartner (Nuremberg Zoo, Germany)

Dr. Paulien Bunskoek (Dolphinarium Harderwijk, Netherlands)

Dr. Manuel Garcia Hartmann (Marlab, France)

Dr. Kerstin Ternes (Duisburg Zoo)

Dr. Niels van Elk (Van Elk Consultancy, Netherlands)

The authors would like to thank these five reviewers who made excellent comments and suggestions enabling improvement of the protocol.

Additional acknowledgments: Veronica Cendejas, Amanda Ardente, Julieta Olocco, Elaine Reiter, Forrest Townsend, Eric Franks, Rae Stone, Adriana Negron-Olivo, Brenda Bauer, Kristina Martz, Jason Morales, Emanuel Carvalho Ferreira, Carolina Milanesi, Lauro Barcelos (director Museu Oceanografico Prof. Eliézer de C. Rios), the entire technical team of CRAM-FURG, the Federal University of Rio Grande (FURG), the Superintendence of Ports RS, Alejandro Fallabrino, Gabriela Vélez Rubio, Virginia Ferrando, Gloria Mendez de Cabrera (President FMM), Julio Loureiro (Scientific Director FMM), Gaston Delgado and the Technical Staff of the Rescue and Rehabilitation Centre FMM.

This publication was made possible in part by funding from the Organization for the Conservation of Latin American Aquatic Mammals - YAQU PACHA e.V., Nuremberg Zoo, the Association Friends of Nuremberg Zoo (Verein der Tiergartenfreunde Nürnberg e.V.) and NMMF Board of Directors Grants Program, as part of Operation GRACE, Global Rescue of At-Risk Cetaceans and Ecosystems.

Citation: J. Meegan, F. Gomez, A. Barratclough, C. Smith, J. Sweeney, V. Ruoppolo, C. Kolesnikovas, R. Pinho da Silva Filho, P. Lima Canabarro, P. Laporta, J. P. Loureiro, K. Alvarez, S. A. Rodriguez Heredia, A. Cabrera, A. Faiella, A. Saubidet & L. von Fersen – AFCR3, 01-2022

Published by: Alliance for Franciscana Dolphin Conservation Research, Rescue and Rehabilitation (AFCR3)

Cover photo: Federico Sucunza – GEMARS, Brazil

Back cover photo: CRAM - FURG, Brazil

Publication layout by: Imre Sebestyén jr / Unit Graphics

Nuremberg, 2022

Table of Contents

Introduction

The Franciscana or La Plata Dolphin (*Pontoporia blainvillei*) is one of the smallest dolphin species. It is endemic to the western South Atlantic Ocean, ranging from Espirito Santo State, Brazil in the north to Golfo San Matías, Province Rio Negro, Argentina in the south (Crespo, 2009; Secchi, 2014). Based on genetics and morphometry and for conservation reasons, the range was divided into five management areas (Secchi, et al. 2003, Secchi, et al. 2021). Though the reasons are unknown the distribution range is not continuous as there are two hiatuses, in other words two "Franciscana-free" areas in the northern range of the distribution.

Due to its preference for coastal waters this species is particularly vulnerable to anthropogenic influences, especially to incidental mortality mainly in gillnet fisheries. Even if exact numbers of Franciscana bycatch for the whole distribution area are still unknown, the high annual mortality estimates that have been calculated for some areas, suggest that bycatch levels are unsustainable (Crespo et al. 2010, Zerbini et al. 2010, Prado et al. 2013). Although other threats exist, potentially compromising the survival of this species, such as habitat degradation, chemical pollution, ingestion of plastic debris and contamination, overfishing and depletion of fish stocks, and climate change, incidental mortality in gillnets is currently the greatest threat to Franciscanas (Secchi, et al. 2021). This dangerous scenario leads to the conclusion that the Franciscana is currently considered the most threatened small cetacean species in marine waters of South America (Secchi, et al. 2003, Secchi, et al. 2021). As the Franciscana dolphin faces a high risk of extinction it is listed as "Vulnerable" on a global scale by IUCN (Zerbini et al., 2017). Whereas at a regional level, like in Brazil, it is listed as "Critically Endangered" (MMA, 2014).

Due to its status as a threatened species, high unsustainable bycatch rates over the last 40 years and the bleak outlook for its conservation in the future, the Franciscana was selected as one of the focus species in the ESOCC (Ex Situ Options for Cetacean Conservation) Workshop held in Nuremberg, Germany in December 2018 (Taylor, et. al, 2020). The main goal of this meeting was to initiate discussions concerning if, when, and how *ex situ* options might contribute to conservation strategies for a representative set of small cetaceans. One major recommendation was to apply a more holistic framework for species conservation planning called the One Plan Approach (Byers, et al., 2013). According to this approach species conservation comprises conservation measures in the natural habitat (in situ) as well as in protected or controlled environments (ex situ). The One Plan Approach includes a variety of actions like for example safeguarding animals in protected environments such as semi-natural reserves to prevent species extinction; initiating research programs to fill gaps in our understanding of a species' biology and threats to its survival; rescue and release of stranded individuals; and public engagement programs to promote understanding and support of species conservation.

It is generally agreed that especially in the case of the Franciscana there are still many information gaps that need to be filled in and many open questions that need to be answered. By incorporating methodologies and tools developed and used in ex situ circumstances, many of these unknowns could be clarified.

Live stranded Franciscana dolphins deserve special attention especially in the case of young calves that have evaded the nets and usually die within the first hours or days. The following graph (Fig. 1) illustrates the extent of the problem; since 1991, a total of 140 Franciscana dolphins stranded alive have been registered. Of these, only four animals were adults, one was juvenile and the rest were neonates (135 animals, data from Fundación Mundo Marino, Argentina; CRAM-FURG, AIUKA and 3R from Brazil, 2021). However, these figures do not refer to the entire distribution range of the species but only to certain restricted coastal areas in Argentina, Uruguay and Brazil. It can be assumed that the number of stranded animals may well be higher if the entire distribution area is considered. However, such a calculation is not possible due to a lack of data.

Live stranded calves require extensive supportive care in order to survive. To date, rehabilitation success of orphaned Franciscana neonates is minimal and there is a critical need for enhancement of current conventions.

The main goal of this protocol is the development of a well-planned and scientifically based rehabilitation routine to increase individual animal survival. When individuals of endangered species are in need of help, returning just one individual to a population can make a difference.

Rehabilitation also offers the opportunity to access previously unknown aspects of the biology through research and proper data collection. It is therefore equally important to outline through this protocol the framework for good scientific work. When rehabilitation is combined with research the conditions are in place to improve our understanding on the ecology, behavior, management, handling and health of this species. Finally, it is also important to note that animals who are undergoing a rehabilitation process can be used as drivers for education and outreach programs, highlighting conservation needs. A live animal in rehabilitation due to environmental issues or other threats can serve to draw attention to conservation problems for their species as a whole. From rehabilitated animals, in turn, we can examine individual variability

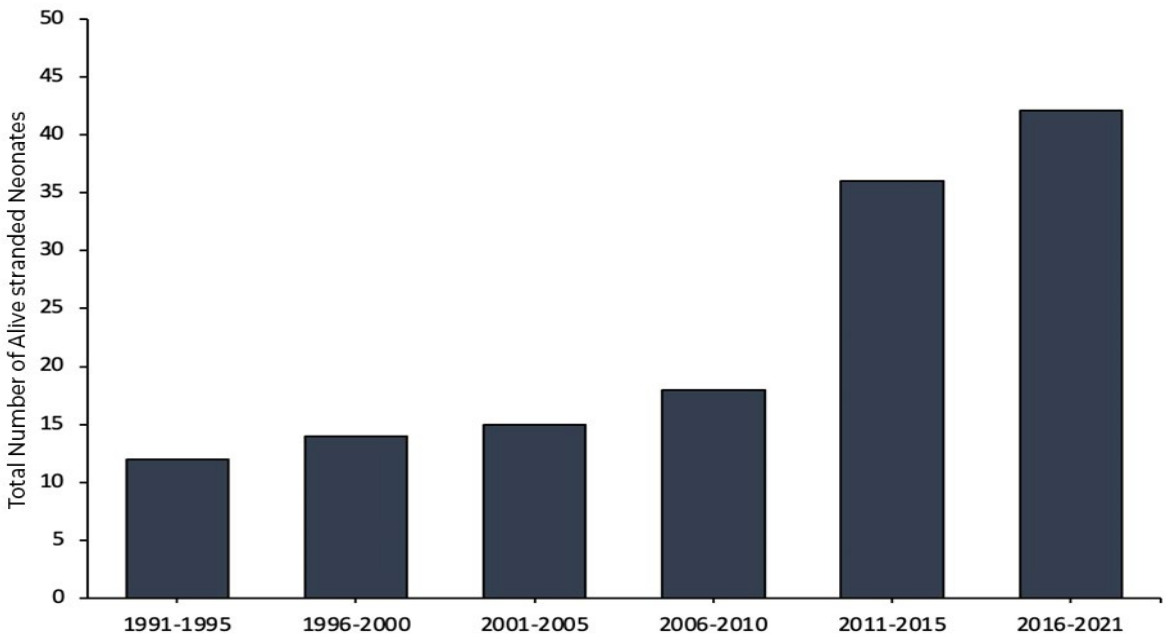


Figure 1: Number of live stranded Franciscana dolphins found in some areas of Argentina, Uruguay and Brazil since 1991. (Source: Fundación Mundo Marino, Argentina; CRAM-FURG, AIUKA and 3R, Brazil)

in response to handling. This information is particularly useful to minimise stress response and handling of stranded adults, or even in situations where relocation has been necessary due to disasters. In summary, we hope that these protocols will primarily serve to increase the likelihood of successful rehabilitation of threatened Franciscanas, providing a good basis for knowledge enhancement and education.

An important aspect to mention is that these protocols were developed with the participation of numerous specialists in the field of marine mammal science, medicine, rehabilitation and behavior. Our South American coauthors and colleagues have worked in centers in their home countries and have been involved with the rehabilitation of Franciscana for many years. Protocol development followed a gradual, collaborative process pulling on local and species expertise, as well as expertise developed working with other small cetaceans. These protocols were partially applied during the stranding season of 2020 and 2021, when seven Franciscanas were found stranded in Argentina and Brazil. This practical application during protocol development helped not only to test the protocol for its applicability, but also to refine it. Protocol development also included the standardization of live and dead animal data collection, allowing for data gaps to be filled through each stranded animal. Moving forward these protocols will serve as "living documents" to be updated regularly as lessons are learned through each rehabilitation experience.

Future considerations for the successful reintroduction of rehabilitated franciscana dolphins

Recovering and rehabilitating small cetacean neonates from a stranding event has limited success historically. To the best of our current knowledge, this protocol describes an attempt to triage and rehabilitate neonate franciscana dolphins during various stages of rehabilitation. If all goes well and the measures taken are effective, it is expected that individuals will be alive and medically healthy. Determining fitness for release back to the sea would require a separate decision-making process and guidance from additional resources such as the Guidelines for the Safe and Humane Handling and Release of Bycaught Small Cetaceans from Fishing Gear - https://www.cms.int/en/publication/guidelines-safe-and-humane-handling-and-release-bycaught-small-cetaceans-fishing-gear.

For many other species where individuals have received rehabilitation under similar circumstances, reintroduction to the wild, is the ultimate goal. There are examples of successful reintroductions of rehabilitated birds and mammals. Particularly interesting in this context is the "Surrogate Project" of Monterey Bay Aquarium. Since 2002, 37 rehabilitated sea otters pups raised by surrogate mothers from the aquarium have been successfully reintroduced. Another interesting approach to integrating orphans into wild families comes from Kenya with elephants. Here, the orphan elephants are taken to watering holes where wild adults are also present. Often the orphans move on with the group. In toothed whales, there are examples of stranded adults and sub-adults being reintroduced at the stranding site or after a short treatment period. Unfortunately, due to a lack of follow-up, it is not possible to fully evaluate whether all reintroductions were successful. Only tracking the animals by means of transmitters can show whether reintroduction has been successful.

Especially in the context of the One Plan Approach and in line with the International Union for Conservation of Nature's (IUCN) Integrated Conservation Planning for Cetaceans (ICPC) group, who advocate an integrated conservation approach for cetacean species, it is essential to leave all options open regarding the future of successfully rehabilitated Franciscana dolphins.

Rehabilitated neonates are certainly the biggest challenge for first responders, because the first stages of rehabilitation are complicated and because these animals rarely have contact with conspecifics and may become habituated to human care. Despite these difficulties, the final goal for these rehabilitated animals should be a life in a natural or semi-natural habitat. Like those used in China for the government's Yangtze finless porpoise (*Neophocoena asiaeorientalis asiaeorientalis*) conservation program, semi-natural ex situ reserves offer one possibility. Investigations are continuing into local areas adjacent to the franciscana habitat where wild conspecifics are present. Opportunities for long-term care of rehabilitated neonates in semi-natural reserves may emerge with the ultimate goal of reintroduction to the wild. These areas offer potential habitat where the rehabilitated neonates acclimate to the natural soundscape, hunt prey fish, and experience the climatic conditions and challenges of the wild. This type of gradual acclimatization and soft-release measures have been used for many species and it is conceivable that rehabilitated franciscana dolphins may be excellent candidates for such a program. Although this option presents many hurdles, it should be considered as the ultimate goal.

References:

1. Byers, O., Lees, C., Wilcken, J. and Schwitzer, C. (2013). The One Plan approach: the philosophy and implementation of CBSG's approach to integrated species conservation planning. WAZA Magazine 14:2-5.
2. Crespo, E.A. 2009. Franciscana Pontoporia blainvillei. In: W.F. Perrin, B. Würsig and J.G.M. Thewissen (eds), Encyclopedia of Marine Mammals, Second edition, pp. 466-469. Elsevier, Amsterdam.
3. Crespo, E.A., Pedraza, S.N., Grandi, M.F., Dans, S.L. and Graffo, G.V. 2010. Abundance and distribution of endangered Franciscana dolphins (Pontoporia blainvillei) in Argentine waters and conservation implications. Marine Mammal Science 26: 17-35.
4. Prado, J.H.F., Kinas, P.G. and Secchi, E.R. 2013. Mark-recapture of the endangered franciscana dolphin (Pontoporia blainvillei) killed in gillnet fisheries to estimate past bycatch from time series of stranded carcasses in southern Brazil. Ecological Indicators 32: 35-41.
5. Secchi, E.R., Danilewicz, D. and Ott, P.H. 2003a. Applying the phylogeographic concept to identify franciscana dolphin stocks: implications to meet management objectives. Journal of Cetacean Research and Management 5(1): 61-68.
6. Secchi, E.R. 2014. Family Pontoporiidae (Franciscana). In: Wilson, D.E. and Mittermeier, R.A. (eds), Handbook of the Mammals of the World. Vol. 4. Sea Mammal, pp. 386-393. Lynx Edicions, Barcelona.
7. Secchi, E. R., Cremer, M. J., Danilewicz, D., and Lailson-Brito, J. 2021. A Synthesis of the Ecology, Human-Related Threats and Conservation Perspectives for the Endangered Franciscana Dolphin. Frontiers in Marine Science 8:617956. doi: 10.3389/fmars.2021.617956.
8. Taylor, B.L., Abel, G., Miller, P., Gomez, F., von Fersen, L., DeMaster, D.P., Reeves, R.R., Rojas-Bracho, L., Wang, D., Cipriano, F. eds. (2020). Ex situ options for cetacean conservation: December 2018 workshop, Nuremberg, Germany. IUCN. Gland, Switzerland. https://doi.org/10.2305/IUCN.CH.2020.SSC-OP.66.en
9. Zerbini, A.N., Secchi, E.R., Danilewicz, D., Andriolo, A., Laake, J.L. and Azevedo, A. 2010. Abundance and distribution of the franciscana (Pontoporia blainvillei) in the Franciscana Management Area II (southeastern and southern Brazil). Paper SC/62/SM7 presented to the 62nd meeting of the IWC Scientific Committee, Agadir, Morocco, June 2010.
10. Zerbini, A.N., Secchi, E., Crespo, E., Danilewicz, D. & Reeves, R. 2017. Pontoporia blainvillei (errata version published in 2018). The IUCN Red List of Threatened Species 2017: e.T17978A123792204. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T17978A50371075.en

Neonatal Care and Hand-rearing

In the event that a neonate Franciscana dolphin is recovered/stranded alive and orphaned from the dam, the following protocol may be applied:

INITIAL ANIMAL ASSESSMENT AT STRANDING LOCATION

- The time between the stranding and the arrival of the rescue team can be critical to relieve distress and improve the animal's chance of recovery

- It is important to educate the local public (personnel on-site) who may be waiting with the animal before the rescue team arrives of some basic tips to care for the neonate dolphin:
  - Do NOT attempt to send the animal back to the ocean
  - Do NOT lift the animal out of the water unless absolutely necessary
  - Keep the blow hole above the water at all times
  - Minimize handling
  - Reduce the noise and physical contact with the animal to reduce stress
  - Protect eyes from debris (e.g. sand)
  - Animals on the beach must be protected from harsh weather:
    - Cover skin with wet towels to prevent skin damage and exposure dermatitis, never cover the blowhole
    - Hyperthermia can occur with prolonged exposure to warm temperatures and hypothermia can occur with cold temperatures
    - Provide shade from the sun to protect the skin from solar dermatitis
  - Avoid maneuvering pectoral fins or flukes to prevent bone fractures or joint damage
  - It also important to educate the public or any personnel on-site about the importance of zoonotic diseases in order to ensure that the humans are protected because this could potentially be a sick animal that could spread illness

- When the rescue team arrives, the veterinarian/rescue team lead will make an initial assessment:
  - The most appropriate location to perform the initial assessment and supportive care treatments should be determined by the rescue team on site
  - Ideally perform the initial assessment *prior* to moving or transporting the animal, in order to establish a baseline before moving the animal, however it may be more practical to first remove the animal from a crowded or unsafe location and make the initial assessment during the transport
  - Note vitals: respiratory rate, heart rate, temperature

Figure 1. Example of a helpful option to provide the calf a shallow area of water while waiting for the rescue team to arrive (Photo credit Fundación Mundo Marino)

- Assess behavioral responses:
  - Alert: aware, responsive to stimuli
  - Weak: minimally responsive only after stimuli
  - Non-responsive: not responding to touch or noise
- Measure body length to determine age class. *Method*: A standard straight length is defined as the measurement of the straight-line distance from the tip of the rostrum to the notch of the flukes (Appendix 1):
- Carefully check for the presence of an umbilical cord (typically lost within 48-72 hrs) (Loureiro et al., 1996)
- Examine for external injuries that may need immediate attention
- The veterinarian/rescue team will have medical supplies to intervene if an emergency should arise

POSSIBLE STRANDING SCENARIOS

During the initial assessment determine if the neonate dolphin is a candidate for rehabilitation and assess the situation for the following scenarios:

Scenario #1: Calf is alone, no other animals are observed in the area

- It is strongly recommended NOT to release any calves less than < 90 cm in length; as they may not be completely weaned and may still be partially dependent on milk
- Determine if the neonate is a candidate for rehabilitation, ensure the calf is stable (may need immediate supportive care), and transport to rescue facility
- If severely ill/injured consider immediate supportive care prior to transporting to the rescue facility or euthanasia (if permitted in your country)

Scenario #2: Calf and dam are both present

- Consider immediate release if both are healthy or after receiving supportive care
- If both dam and calf are candidates for rehabilitation, transport to rehabilitation facility
    - Determine if they need supportive care before transporting to rescue facility

Scenario #3: Dam is also present, but dam is severely injured warranting euthanasia (if permitted in your country)

- Prior to euthanasia of the dam consider the following:
    - Collect milk/colostrum from the dam
    - Collect blood from the dam to potentially give to calf (IgG/serum/plasma)

Scenario #4: Animal is recently deceased

- Transfer to rehabilitation facility for full necropsy examination and sample collection

TRANSPORTING THE NEONATE BACK TO THE RESCUE FACILITY

It is important to transport the animal to a rehabilitation facility as quickly as possible.

- If the animal appears extremely weak or non-responsive consider providing supportive care prior to transport or during the transport, especially if the duration of the trip is long (> 60 mins)
- Neonates can be susceptible to *hypoglycemia*, so it may be necessary to check blood glucose *prior* to or during transport, especially if the transport duration will be long
    - Blood glucose can be easily collected with just a few drops of blood and using an over-the-counter handheld rapid blood glucose meter
    - Hypoglycemia is present if the blood glucose is < 60 mg/dl
        - ****If the glucose is <60, treat before transporting the animal to the rescue facility. Please refer to the "Treatments and Medications" section for details on intervention

- Neonates can also be susceptible to *dehydration*, so it may also be necessary to administer fluids *prior* to or *during* transport. Please refer to the "Treatments and Medications" section for details on intervention
- If the decision is made to bring the dolphin back to the rescue facility for medical care, the stranding response team/crew will have means to transport the dolphin

- The preferred method for transport is in water in a transport container (Figure 2):
    - The transport container should have a fleece-lined stretcher with soft padded foam on the bottom
        - Fill the transport box with a small amount of water to keep the eyes submerged below the water level and float the animal to aid in buoyancy. Keep the water level well below the blowhole due to risk of aspiration during transport.

- If a transport container is not available, the animal can be placed on wet soft foam padding or an air mattress

- Keep the animal wet at all times during transport, being careful to avoid water in the blowhole

- Monitor the animal very closely at all times during transport

Figure 2: Transport container designed for a small cetacean (Photo credit NMMF/VaquitaCPR, AIUKÁ)

- Please refer to **Appendix 2. Animal Monitoring Sheet During Rescue and Transport** to record the data

- Record respiratory rate and breath quality during transport (# of breaths per 5 minutes)
  - Normal respiratory rate:
    5-25 breaths per 5 minutes
  - Abnormal respiratory rate:
    < 5 breaths per 5 minutes *OR*
    > 25 breaths per 5 minutes
  - Ideally record the respiratory rate *continuously* during the transport
  - How often to record will depend on the duration of the transport and if the respiratory rate is normal or abnormal

- Record heart rates during the transport (# of beats per minute)
  - Normal heart rate:
    80-140 beats per minute (bpm)
  - Abnormal heart rate range:
    <70 bpm or >150 bpm
  - The heart rate can be measured by gently palpating the heart beating near the ventral surface of the chest near the axillary region or by auscultation using a stethoscope (Linnehan, et al. 2020)
  - If measuring the heart rate is causing too much stress to the animal during the transport then please obtain a heart rate when safely possible and continue to closely monitor the respiratory rate

- Record behavior and activity continuously during the transport

- Monitor ambient air temperature during the transport to prevent hypothermia or hyperthermia
  - Adjust the ambient temperature during transport or provide warm or cold wet towels if the temperature too warm: > 80F (> 27 Celsius); or too cold < 60 F (< 15 Celsius)

- If the animal is being transported in water, record water temperatures and maintain between (20-25C)
  - Salt water is preferred but fresh water may be used for short periods of exposure (<12 hrs)
    - Comfort can be provided to the neonate during transport using undulating movements and by keeping its eyes below the water surface at all times
    - If the neonate is transporting with multiple animals, keep them in close proximity whenever possible in an attempt to keep animals communicating (both with visual and auditory senses) and more comfortable.
    - Sedation prior to departure from the capture site to aid in safe transport of the animal may be administered at the discretion of the attending veterinarian

- Sedation for a neonate calf is not typically recommended as it can mask symptoms of weakness/hypoglycemia. However, if efforts to reduce stress and anxiety have been unsuccessful, and if everything else has been corrected and the calf is still displaying signs of distress, sedation may be warranted.

- Diazepam (0.05-0.1 mg/kg) or midazolam (0.04 - 0.08 mg/kg) can be administered at IV or IM to reduce anxiety and provide muscle relaxation, unless the cetacean is already very depressed or is a very young calf in which case this would be contraindicated

- these sedative drugs haven't been administered in Franciscana and should be used with extreme caution, need emergency supplies. oxygen

- If sedation with diazepam/midazolam is used, be sure to also have the reversal drug (flumazenil) on hand should complications arise and the sedation needs to be reversed

ARRIVAL TO THE RESCUE/ REHABILITATION FACILITY

Upon arrival to the rescue facility, place the calf immediately in a small round or oval shaped nursery pool, volume (approximately 3,000 Liters). Once the calf demonstrates the ability to swim, transfer the calf to a larger round or oval shaped pool. Please refer to the Water Quality section below for more details.

- Try to maintain low/dim lighting and a quiet environment to minimize stress
- The dolphin may need to be assisted until the animal is demonstrating it can support itself and swim in an upright position
- It is very important to attempt to keep the eyes under the water as much as possible
- Clockwise and anti-clockwise movement should be encouraged to reduce the risk of muscle damage, contractions, spasms, or spinal curvature

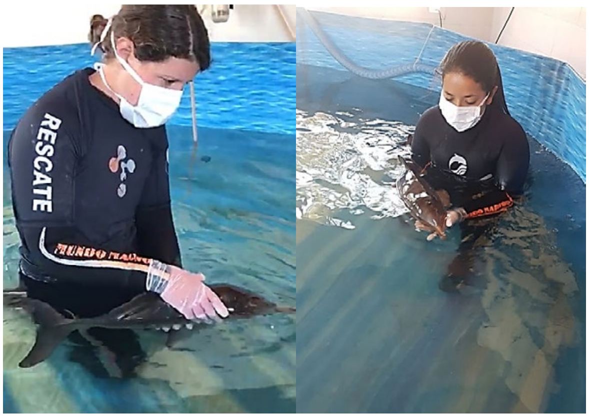


Figure 3. Examples of rescue staff members guiding the dolphin calves around the pool, gently supporting the animal's weight, with the eyes below the water and the blowhole above the water surface (Photo credit Fundación Mundo Marino)

- Custom flotation devices/stretcher or neoprene float jackets can be used to aid in buoyancy
- It is important to (Figure 4) monitor closely for pressure wounds on the skin that may be caused by the stretcher/ flotation device

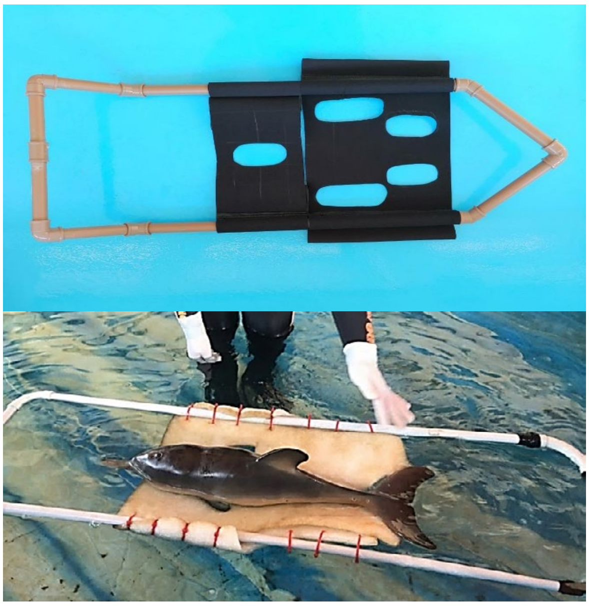


Figure 4. Franciscana calf shown in a custom stretcher made of soft fabric with holes for the pectoral fins and the tail, and eyes are effectively under the water. It is important to keep the exposed skin wet/moist at all times. [Photo credit Aiuká / CRAM-FURG (Top image); Fundación Mundo Marino (bottom image)]

- The flotation device/stretcher should allow the calf to lower its head and eyes under the water while keeping its blowhole above the water, the body should appear relaxed and as low in the water column as possible. Monitor the behavior to ensure that the animal seems calm while in the stretcher.
- If a flotation device/stretcher is used, please use for short periods of time during the day if possible, and remove the calf from the flotation device regularly to prevent skin damage, muscular curvature and scoliosis
- Keep exposed areas of skin wet at ALL times, apply ointments such as lanolin or Vaseline (petroleum jelly) to the skin to keep the skin from drying/cracking

IMPORTANT CONSIDERATIONS FOR HANDLING NEONATAL DOLPHINS

- The first few examinations or medical procedures are often very brief (< 10 mins), until the neonate is acclimated to handling
- Avoid excitement, loud noises, and struggling when handling neonates
- Comfort can be provided to the restrained neonate using undulating movements and by keeping its eyes below the water surface
- IMPORTANT: Avoid removing the neonate from the water unless absolutely necessary
- ALL feedings, treatments, medications, and blood collections should ideally be performed in the water
- Any out of water procedure should be as brief as possible
- If you need to remove the neonate from the water, continuously monitor vital signs (HR and RR) and return animal immediately to the water if these become abnormal
- Take the time to plan any out of water procedure with the team in advance to create familiarity with it
- Signs of neonatal stress during handling include: tachycardia (persistently >150bpm) or bradycardia (<70 bpm), arching of the body, extreme struggling, fluke slapping, irregular, shallow, or rapid breathing, holding blow hole open, opening mouth and regurgitation, sudden weakness or loss or responsiveness, poor muscle tone, cessation of vocalizations
- At any time during an intervention procedure with a neonate, personnel must be willing and ready to abort the procedure if concerns for the status of the neonate are observed.
- The handling must be stopped if these signs of distress are observed during any procedure
- It is recommended that, especially in the first weeks, only experienced staff in neonatal cetacean handling and rehabilitation care for the animal
- Furthermore, it is important that the same staff takes care of the animal during the first phase of rehabilitation, if possible. Experience has shown that a constant change in the care team causes stress for the animal.

PHYSICAL EXAMINATION (*AFTER ARRIVING TO RESCUE FACILITY*)

- Once the dolphin calf has arrived at the rescue facility, and is determined to be calm and not demonstrating signs of distress, a physical examination can be made by the attending veterinarian
- A medical examination should be performed as soon as possible after the animal arrives at the facility so that therapy can begin
- The animal will likely need immediate supportive care to include oral fluids, medications, etc. Please refer to the "Treatments and Medications" sections below for more details
- Initial exam on Day 1: this examination may need to be brief, but should *at a minimum* include:

- Vitals, blood sample, body weight, and a brief examination
- Please refer to **Appendix 7. Physical Examination Form** to record the physical examination data
- How to collect a body weight
  - Removing the calf from the water to collect a body weight should be very brief
  - Helpful tips for collecting the weight: Ideally, place the scale immediately adjacent to the pool. A person stands/sits on the scale and people in the water gently lift and transfer the calf to the person standing/sitting on the scale. The weight is quickly obtained and the calf is then immediately returned to the water. Always hold the calf cradled closely to the body in your arms with the pectoral fins carefully tucked. This process should take only 1 minute
  - The calf can also be gently placed onto a small food/animal scale to collect the weight
- Girth: axial girth taken behind the pectoral flippers
  - Length: Measure body length to determine age class. A standard straight length is defined as the measurement of the straight-line distance from the tip of the rostrum to the notch of the flukes
  - See additional **Appendix 1: Growth Curve-Age Estimation for Franciscana dolphins**
- Vitals
  - Respiration rate:
    record # of breaths/5 mins
    - Normal respiratory rate:
      5-25 breaths per 5 minutes
    - Abnormal respiratory rate:
      < 5 breaths per 5 minutes *OR*
      > 25 breaths per 5 minutes
    - Reported Franciscana respiratory rate: 5-9 per minute (Baldassin, et al. 2007)
    - Please record once for the physical exam form (**Appendix 7**)
    - For further details on daily frequency refer to the daily monitoring section
- Heart rate:
  - Normal heart rate:
    80-140 beats per minute (bpm)
  - Abnormal heart rate range:
    <70 bpm or >150 bpm


Figure 5. Collecting a body weight: A person stands/sits on the scale and gently holds the calf (left) or place the calf on a small scale (right). Removing the dolphin from the water to collect a body weight should be very brief. [Photo credit Fundación Mundo Marino (right); AIUKÁ / CRAM-FURG (left)]

  - Reported Franciscana heart rate has been reported to range from 99 to 139 beats per minute (Baldassin, et al. 2007)
  - Please record once for the physical exam form (**Appendix 7**)
  - For further details on daily frequency refer to the daily monitoring section

- Temperature:
  - Collect a rectal body temperature for the physical examination form (**Appendix 7**)
  - Only temperature reported for Franciscana was 36.4 C (97.5 F) (Baldassin, et al. 2007)
  - Normal temperature range for *Tursiops truncatus*: 36-38 C (96-100F)

- Blood sampling
  - Collection method:
    - Blood can be collected from the periarterial venous rete (PAVR) from either the fluke blade or from the caudal peduncle using a 21-25 gauge butterfly and a 3-6 cc syringe (Figure 6)
    - Clean the blood collection site (using dilute betadine or chlorhexidine and alcohol) prior to collection, then immediately cover the site with antibiotic ointment and a gauze after removing the needle until a clot (hemostasis) is achieved
    - It is strongly recommended that the calf remain in the water for the blood collection. This can be accomplished by one handler supporting the body and head of the calf, and a second handler gently lifting the tail out of the water for the third person who is collecting the blood sample
    - During the blood collection monitor the respiratory rate and heart rate very closely, and abort the procedure if the calf shows any signs of distress or if the parameters become abnormal

- Blood tests to measure:
    - It is critical that the turn-around time for blood results be as fast as possible
    - Ideally all of these tests should be performed *on-site* at the rehabilitation facility. If this is not possible, then ideally identify a laboratory that can ensure rapid test results any day of the week.
  - Tests to perform *on-site at rescue facility for immediate results*:
    - Blood glucose using a hand-held glucometer (normal > 60)
    - Blood smear to perform a differential
    - Hematocrit and total protein
    - Estimated white blood cell count
    - Erythrocyte sedimentation rate (if available)
    - Blood gas: if available
  - *Tests to send to the laboratory:*
    - Complete blood count (CBC): WBC, Hct, RBC, Hct, Hgb, etc
    - Chemistry panel: glucose, electrolytes, BUN/Creatinine, minerals, iron, albumin, globulin, alkaline phosphatase, transaminases, bilirubin, fibrinogen, etc
    - Protein electrophoresis
  - Archive (freeze) serum if possible
  - IgG tests:
    - Performed to assess presence of immunoglobulins to determine if maternal antibody passive transfer occurred and if colostrum was ingested
    - Newborn dolphins are immune incompetent at birth, depending entirely upon mother's milk (colostrum) as their sole source of immunity

Fig. 6. Blood collection from the superficial vessels of the ventral fluke blade (top) and from the central caudal peduncle (bottom) (Photo credit Fundación Mundo Marino)

Table 1. Proposed Blood Collection schedule

Day 1: Collect the first blood sample to establish baseline data and to help determine the most appropriate medications and treatments
Week 1: During this first week, be prepared to collect blood daily if needed*** At a minimum, collect blood on: Day 1, Day 3, Day 7
Week 2: collect a minimum of one follow-up blood sample, more may be indicated
Week 3: collect a minimum of one follow-up blood sample, more may be indicated
Week 4: collect a minimum of one follow-up blood sample, more may be indicated
Month 2: collect a follow-up blood sample weekly, more may be indicated
Month 3-4: collect a follow-up blood sample every 2 weeks if the animals is doing well
Months 5-8: collected a blood sample once per month if the animal is doing well
If the outside laboratories are closed for any reason, at a minimum, be prepared to collect blood and perform the on-site blood tests described above if the animal is sick or a blood sample is warranted

        - Rapid pool-side tests can be used to quickly measure for the presence or absence of immunoglobulins. These tests are:
        - Glutaraldehyde test (see instructions below on **Appendix 3**)
        - Immunocrit test (see instructions below on **Appendix 3**)
    - Additional blood tubes may include but not limited to: DNA, Cortisol, aldosterone, etc. Refer to **Table 1. Proposed blood collection schedule** for the preferred blood collection frequency.

- Full body ultrasound:
    - May need to be abbreviated for neonates, focusing on lungs and gastrointestinal tract
    - Careful examination of the lungs should be performed to evaluate for pneumonia, pulmonary edema, pleural effusion, or other abnormalities
    - Careful examination of the gastrointestinal tract should be performed to evaluate gut motility, obstructive patterns, intestinal gas, gastroenteritis, etc

- Photographs (minimum L/R of dorsal fin and other distinguishing features)

- Additional biological samples (e.g., saliva, sputum, feces, urine)
    - These samples can wait until a later date, once the animal has been stabilized and received supportive care

Disclaimer: Sampling decisions will be made by the veterinarian based on animal stability throughout the exam. With the exception of weighing, all other procedures should be undertaken while the animal is supported in the water. The examination will be aborted if the animal is deemed unstable at any point. Any additional sampling will be done at later physical exams once animal acclimation and stability has improved.

FEEDING AND NUTRITION

- Determine the best estimate of the age of the neonate to help determine the most appropriate diet and feeding frequency (Appendix 1)

- Calculating the caloric requirements:
  - Franciscana dolphin proposed formula feeding strategy
    - Neonate: Body weight: 4 kg
    - Kcal goal: 150-200 kcal/kg/day = 600-800 kcal/day
    - Expected weight gain per day: 0.125 kg/day (0.25 lb/day)

- Formula recipes:
  - Refer to **Appendix 4. Recipes for artificial milk formulas** for detailed instructions on preparing the formula
  - Prepare the formula fresh daily, and store in the refrigerator until use
  - Carefully warm the formula to body temperature prior to feeding
  - Discard any unused formula after 24 hours

- Formula feeding schedule: (**refer to Table 2. Proposed feeding schedule**)
  - During the first day (Day #1):
    - Initially hydrate the animal with oral electrolyte and 5-25% glucose water solution
    - Calculating stomach volume: 2 ml/kg
    - Administer oral fluids every hour
    - Initially start with small volumes (~ 8-10 mL) to avoid risk of aspiration
      - Slowly increase the volume as the animal grows and becomes more acclimated to tube feeding; being careful to avoid vomiting or aspiration
      - If available provide oral colostrum/milk/serum (from frozen banked samples if available) or could provide milk from surrogate
    - Initially provide formula in lower concentrations, diluting with electrolytes or water
    - Steadily increase the concentration of the formula/ water ratio
    - We recommend leaving out the fish component for the first week or more, and then slowly introducing it into the formula recipe

- Formula feeding delivery methods:
  - Formula or other liquid solutions can be administered via orogastric tube attached to a feeding syringe or with a bottle
  - Use a small flexible rubber/silicone stomach tube with a smooth rounded tip
    - Size of the tube will initially be small, but consider increasing tube size as animal grows and becomes more acclimated to tube feedings
    - Preferred tube size: ~ 6 mm diameter (18 French); Length: 16 inches (41 cm)
    - Select a tube material that is flexible, but rigid enough to pass easily into the stomach without kinking or bending
  - Determine appropriate tube length by measuring the distance from the end of the rostrum to the anterior insertion of the dorsal fin and marking the tube with tape or a permanent marker
  - Insert the lubricated tube into the stomach (using the marked length)
  - Make sure the calf is breathing comfortably before passing formula through the tube
  - Administer the formula very slowly to avoid vomiting or aspiration

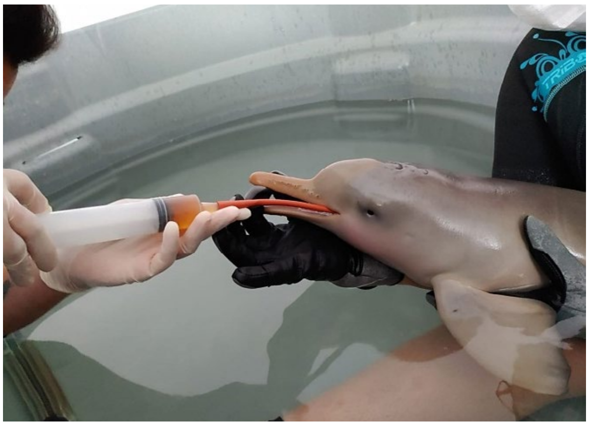


Figure 7. Tube feeding a neonate Franciscana. (Photo credit CRAM-FURG)

- Keep the neonate in the water at ALL times during the feedings:
    - Ideally feed the calf in waist-deep (shallow) water, with one handler gently holding the calf and another handler placing a hand under the calf's lower jaw for support. Lift the rostrum slightly out of the water allowing only formula to be ingested and not seawater. Restrain with only light pressure to avoid pressing on the stomach and causing vomiting or regurgitation (Figure 7).
- Bottle feeding: if the calf is demonstrating a suckling behavior attempt to see if the calf will accept a bottle to nurse on its own
    - Use a soft squeezable bottle with an attached nipple (Figure 8) or a modified piece of feeding tube
    - Bottle feeding is the preferred method, reducing risk of vomiting and aspiration pneumonia, however, bottle feeding is a behavior that can take time to train and acclimate, so it is often not possible with a neonate, requiring that the formula initially be administered via stomach tube
    - During initial adaption to the nipple, try to lift the calf's rostrum out of the water to decrease saltwater ingestion

Figure 8. Bottle feeding a neonate Franciscana. (Photo credit Fundación Mundo Marino)

- Weaning should begin at around 5-6 months of age by placing fish pieces in the oropharynx and encouraging swallowing, increasing to whole fish over time. In the wild, Franciscana dolphins are weaned at approximately 8 months to 1 year of age

Table 2. Feeding schedule

Date	Formula recipe	Formula volume (ml)	Feed frequency
Day 1	*Initially hydrate with electrolyte and glucose water, if tolerating well begin formula at 25% concentration	Volume/feed: 2 ml/kg Initially start with small volume and give very slowly (8-10 mL)	Hourly *may need to go to every 1.5 hours if animal isn't tolerating handling
Day 2	Increase formula concentration to 25-50%	Volume/feed: 2 ml/kg	Hourly*
Day 3	Increase formula to 75% concentration	Volume/feed: 2 ml/kg	Hourly*

Day 4	Increase formula to 100% concentration	Volume/feed: 2 ml/kg	Hourly*
Day 5-7	100% formula concentration	Volume/feed: 2 ml/kg	Hourly*
Week 2	100% formula concentration **begin to add fish into formula recipe*	Volume/feed: 2 ml/kg	Hourly*
Week 3	100% formula concentration	Volume/feed: 2 ml/kg	Hourly*
Week 4	100% formula concentration	Volume/feed: 2 ml/kg	Hourly*
Month 2	100% formula concentration Begin offering pieces of fish	Slowly increase volume and record volume per feed	Every 2 hours
Month 3	Continue to increase the ratio of whole fish in the diet	Slowly increase volume and record volume per feed	Every 3 hours
Month 4	Continue to increase the ratio of whole fish in the diet	Slowly increase volume and record volume per feed	Every 3-4 hours plus supplemental whole fish
Month 5	Attempt to wean off formula to a diet of 100% fish	Slowly increase volume and record volume per feed	Every 3-4 hours plus supplemental whole fish
Month 6-8	Weaned off formula, whole fish diet	Whole fish diet	Feedings every 4-6 hours

TREATMENTS AND MEDICATIONS

- Please refer to **Appendix 5. Drug Formulary** for a detailed list of drugs, doses, and routes

- Upon arrival to the rescue facility, administration of a **broad-spectrum antibiotic** is recommended
    - Long-acting alternatives including EXCEDE/Convenia may also be used

- Glucose therapy:
    - Neonates can be susceptible to hypoglycemia, so it is important to monitor blood glucose closely
    - Blood glucose can be easily collected with just a few drops of drop of blood and using an over-the-counter handheld rapid blood glucose meter
    - Hypoglycemia is present if the blood glucose is < 60 mg/dl
        - ***If the glucose is < 60, administer a glucose solution described here, then repeat the test.
        - Continue administering glucose until the glucose level normalizes
    - Oral route:
        - Administer a 5-25% glucose solution orally
        - Dose: 2 ml/kg
        - The concentration of glucose is dependent on the blood glucose level
    - Subcutaneous route:
        - Use a 2.5% glucose solution
        - Dose: 10 ml/kg
    - Intravenous route:
        - Use a 2.5-5% glucose solution
        - Dose: 10 ml/kg
    - How to make dextrose solutions:
        - To make a 2.5% solution: add 50mL of 50% dextrose (or 25g dextrose) to a 1L bag of fluids (NaCl or LRS)

- To make a 5.0% solution: add 100mL of 50% dextrose (or 50g dextrose) to a 1L bag of fluids (NaCl or LRS)
- To make a 25 % solution: add 500mL of 50% dextrose (or 250g dextrose) to a 1L bag of fluids (NaCl or LRS)

- Hydration therapy:
  - Neonates can also be susceptible to dehydration, so it may also be necessary to administer fluids in addition to formula feedings to maintain adequate hydration status
  - Fluid type: use a balanced electrolyte crystalloid solution such as Lactated ringer's (LRS), 0.9% saline
  - Fluids can be administered either subcutaneously, orally, or intravenously
    - Any combination of these routes is also acceptable
  - Total daily hydration requirement is 40-50 ml/kg/day*
    - Example: 4 kg neonate = 160-200 ml/day
  - most of the the neonate's daily hydration requirements can be achieved through the oral formula feedings, however supplemental hydration may be necessary if this isn't achieved or if the animal has ongoing losses (i.e. diarrhea, vomiting, etc)
  - If the daily hydration requirement cannot be achieved through the oral feedings, supplemental hydration can be administered at 10 ml/kg IV/SQ once per day to prevent dehydration

- Injection techniques:
  - Clean the IM/SQ injection site (using dilute betadine or chlorhexidine and alcohol), then immediately cover the site with antibiotic ointment and a gauze after removing the needle until a clot (hemostasis) is achieved and to prevent the medication from leaking out of the site
  - Intramuscular and subcutaneous injections can be given at the following sites

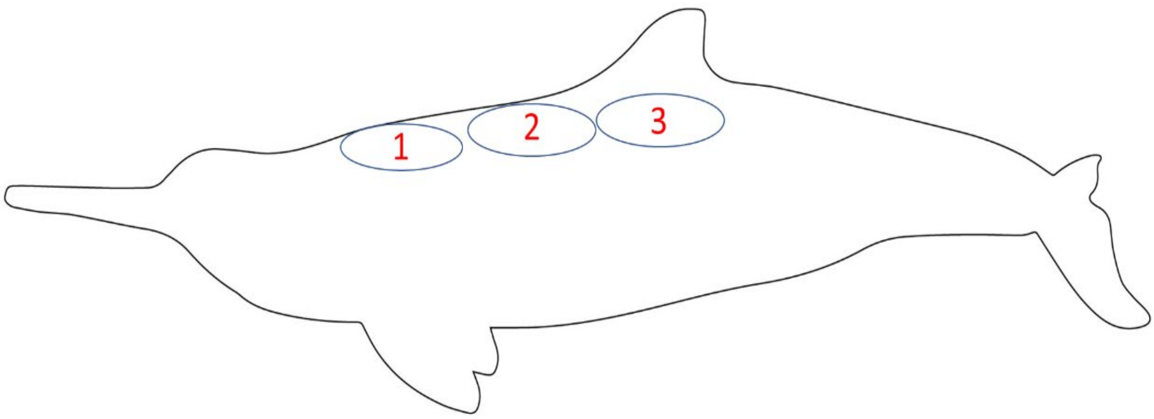
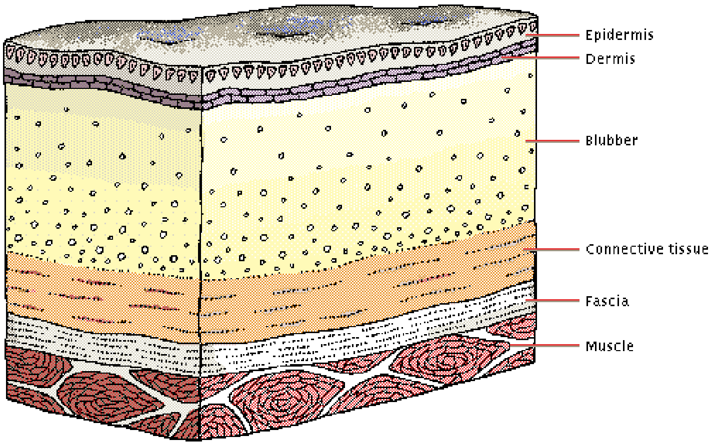


Figure 9. Injection sites for the Franciscana dolphin
Site 1- cranial subcutaneous space and cranial epaxial muscle***
Site 2- middle epaxial muscle and subcutaneous space***
Site 3- caudal epaxial muscle
***IMPORTANT: ideally use ultrasound to first measure the depth of the subcutaneous space and the muscle layer to determine the most appropriate needle length to avoid injuring deeper organs (lung)
Subcutaneous space blubber depths for neonate Franciscana calves range from: 0.9-1.1 cm (0.35-0.45 inch)
Muscle layer depth for neonate Franciscana calves range from: 1.4- 2 cm (0.5-0.7 inches)



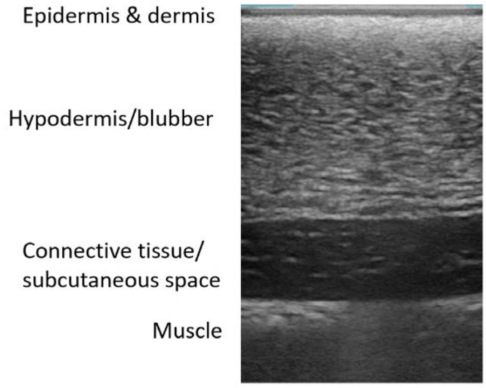


Figure 10. Schematic and ultrasound cross sectional images of a small cetacean depicting the skin, subcutaneous, and muscle layers.

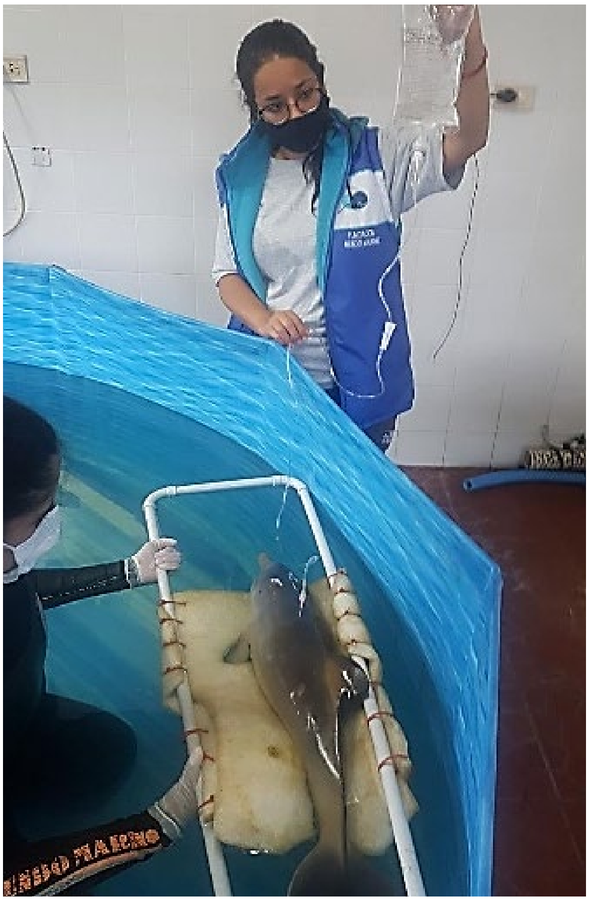


Figure 11. Photo of administration of subcutaneous fluids to a Franciscana calf. (Photo credit Fundación Mundo Marino)

- Additional medications may also be warranted:
  - Gastrointestinal medications such as anti-gas, antacid or anti-nausea medications may also be required
  - Antifungal medications may be warranted if a primary fungal infection is suspected or for prophylaxis for long-term antibiotic use
  - Furosemide (diuretic)
    - Potential indicators: Froth/fluid exiting the blowhole; tachypnea, pulmonary edema seen on ultrasound/xray
    - Use with caution if the patient is dehydrated and avoid multiple doses as diuretics can lead to severe dehydration and electrolyte derangements
  - Steroids:
    - Low-dose, single dose administration may be warranted for emergencies, post-stranding distress, other
    - Use with extreme caution and avoid multiple doses as immunosuppression can occur with overuse

MEDICAL RECORD KEEPING

- **Please refer to Appendix 6. Daily monitoring data sheet**

- Once animals are under human care, animal care staff will observe and monitor their behavior 24 hours/day. Record keeping will be implemented immediately in all areas of animal care, to include but not limited to, behavioral and physiological response, vital signs, feeding, medical care, and social behavior.

- **Daily monitoring (Record the following data every day):**

- Respiration rate:
  - Record # of breaths/5 minutes
  - How often to record:
  - Day 1: record respirations hourly
  - Week 1: record respirations hourly
  - Week 2-4: record respirations a minimum of 3 times per day if normal
  - Month 2-8: record respirations a minimum of twice per day if normal
  - Normal respiratory rate: 5-25 breaths per 5 minutes
  - Abnormal respiratory rate: < 5 breaths per 5minutes OR > 25 breaths per 5 minutes
  - Reported Franciscana respiratory rate: 5-9/minute (Baldassin, et al. 2007)
- Heart rate:
  - Record the number of beats per minute
  - Normal heart rate: 80-140 beats per minute (bpm)
  - Abnormal heart rate range: <70 bpm and >150 bpm
  - Reported Franciscana heart rate has been reported to range from 99 to 139 beats per minute (Baldassin, et al. 2007)
  - How often to record heart rate:
    - Day 1: record heart rate a minimum of three times per day
    - Week 1: record heart rate a minimum of once per day if normal, more often if abnormal
    - Week 2-4: record heart rate a minimum of once per day if normal
    - Month 2-5: record heart rate once per day if animal is still being handled for feedings
    - Month 6-8: once weaned, record heart rates whenever the animal is handled
- Behavior monitoring (Refer to Appendix 8. Ethogram):
  - Describe behaviors: swim patterns, activity level, vomiting, crunching, arching, independence
- Defecation:
  - Note the frequency of defecation, color, and consistency are important to monitor. Fecal excretions should be observed by Day 3 and may be seen several times each hour. Feces should be a thick liquid, light green in color, and should not float or exhibit gas bubbles.
- Body weight:
  - Day 1: obtain an initial body weight when the animal arrives to the rehabilitation facility
  - Week 1: obtain a weight every other day
  - Week 2-4: obtain a weight once per week, more often if the animal is not gaining weight
  - Month 2-5: obtain a weight once per week, more often if animal is not gaining weight
  - Month 6-8: once weaned, record a body weight a minimum of once per month, more often if animal is not gaining weight

WATER QUALITY

- Please refer to **Appendix 9. Water Quality Monitoring Data Sheet** to record data

- When the calf first arrives to the rescue facility, place the calf in a small round or oval shaped nursery pool, volume (approximately 3,000 Liters)
    - Once the calf demonstrates the ability to swim, transfer the calf to a larger round or oval shaped pool with a preferred volume of 6,000 - 10,000 Liters (Figure 12)

- Maintain salinity in pool at 20 ppt or higher
    - 20 ppt = 20 grams salt per Liter

- Aim for a water temperature range at 25-27 Celsius (77-80 degrees Fahrenheit) and modify as needed based on the animal's response

- Please monitor the following water quality parameters **every day** and record on the form
    - Water temp: 25-27 Celsius
    - Salinity: 20-35 ppt
    - pH: 7.2-8.4
    - Ammonia < 2 ppm
    - If chemical filtration is used, these chemicals will need to measured daily as well (i.e. chlorine, ozone, etc)

- Please monitor the bacterial coliform count **once per week** and record on the form
    - coliform count must be < 1,000 MPN (most probable number)
    - **if the coliform count is > 1,000 = increased fecal bacteria in the water, this requires a pool cleaning and a water change of at least 25% then repeat the test

- We recommend 25% water changes every other day or as needed to keep the water clean and sanitary. **Please also siphon any debris/sediment on the bottom of the pool and the pool

Figure 12. Example of an above ground pool that has been used for rehabilitation of neonate Franciscana dolphins (Volume: 6,000 Liters; Diameter: 4 meters) (Photo credit CRAM-FURG)

walls may also need to occasionally be cleaned with a scrub brush

- Mechanical filtration:
    - Utilizing a mechanical filtration system is highly recommended, as it will help to remove any debris or solid waste from the water
    - Examples of mechanical filtration may include a cartridge filter, sand filter, etc
    - Please clean the filtration system regularly (the frequency will depend on the type of filter used and the water quality parameters).

- Chemical filtration (i.e. chlorine/ozone)
    - Please use chemical filtration with CAUTION and ONLY if your facility has previous experience with these chemicals
    - Do NOT use unless you have the ability to measure chlorine or ozone levels daily as exposure to elevated levels can be harmful/toxic
    - If using chlorine: a low range of 0.2-0.5 ppm could help to maintain water sanitation to reduce the frequency of water changes

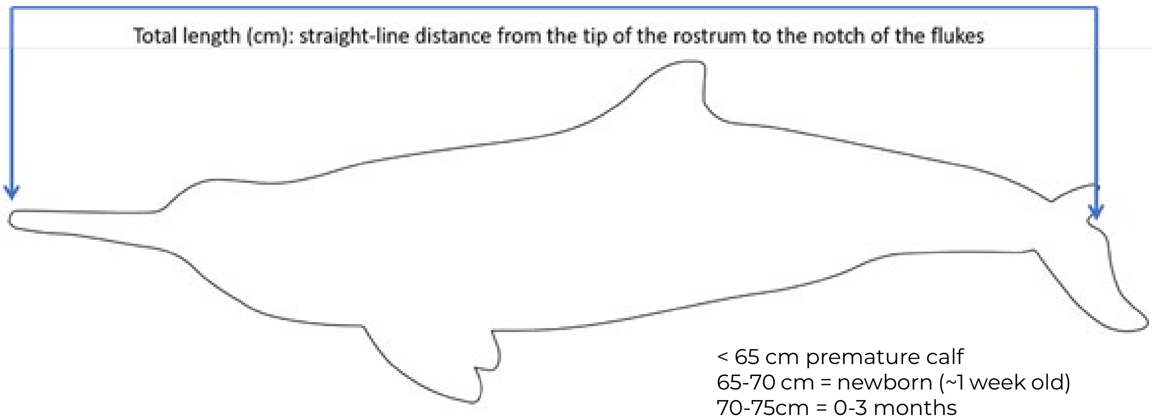
- There was one reported case of a hand-reared Franciscana calf: housed in sea water: 35ppm salinity; Water temp: 28 C (Baldassin, et al. 2007)

Resources:

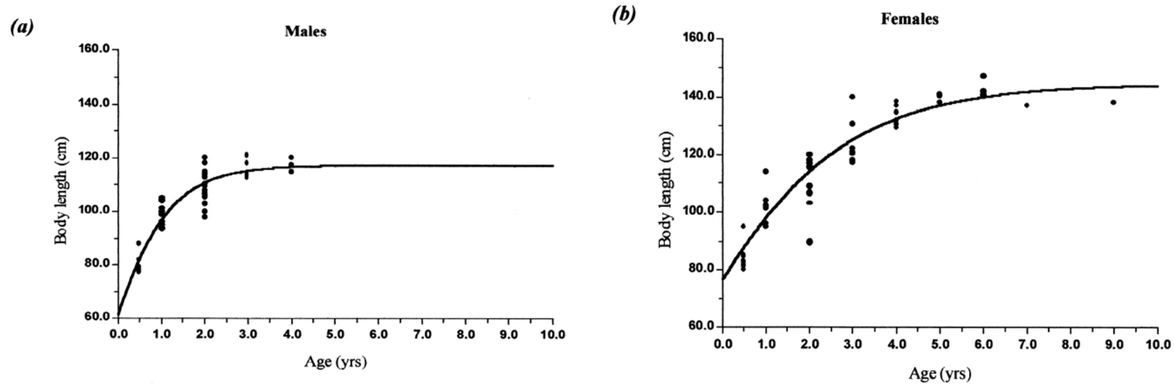
1. Baldassin P, Werneck MR, Barbosa CB, Gallo BMG, Gallo H, Walsh M. (2007). Veterinary treatment of an injured wild Franciscana dolphin calf (*Pontoporia blainvillei*, Gervais & d'Orbigny, 1844). LAJAM 6(2): 185-187.
2. Caon G, Secchi E, Capp E, Kucharski L. (2008). Milk composition of Franciscana dolphin (*Pontoporia blainvillei*) from Rio Grande do Sul, southern Brazil. Journal of the Marine Biological Association of the UK. 88. 1099 - 1101. 10.1017/S0025315408000283.
3. Denuncio PE, Bastida RO, Danilewicz D, Moron S, Rodriguez-Heredia S, Rodriguez DH. (2013). Calving chronology of the Franciscana dolphin (*Pontoporia blainvillei*): birth, lactation and first predatory feeding evidences in coastal waters of Argentina. Aquatic Mammals, 39(1): 22-28.
4. Flower JE, Langan JN, Nevitt BN, Chinnadurai SK, Stacey R, Ivančić M, Adkesson MJ. (2018). Neonatal Critical Care and Hand-Rearing of a Bottlenose Dolphin (*Tursiops truncatus*) Calf. Aquatic Mammals: 44(5), 482-490.
5. Gage LJ, Walsh MT. Hand-Rearing and Artificial Milk Formulas. In: Gulland FMD, Dierauf LA, Whitman KL, editors. 2018. CRC Handbook of Marine Mammal Medicine; 3rd edition. Boca Raton (FL): CRC Press. Pp. 739-755.
6. Geraci J, Lounsbury V. (2005). Marine Mammals Ashore, A Field Guide for Strandings, 2nd edition. Pp 75-112.
7. Kasamatsu M; Wakabayashi I, Seko A, Handa Y, Hasegawa K, Ishihara Y. (2018). The First Entire Hand-Rearing of Two Newborn Finless Porpoises (Neophocaena asiaeorientalis). Proceedings from the 49th Annual International Association of Aquatic Animal Medicine Conference. Long Beach, California, USA.
8. Linnehan BK, Hsu A, Gomez FM, Huston SM, Takeshita R, Colegrove KM, Rowles TK, Barratclough A, Musser WB, Harms CA, Cendejas V, Zolman ES, Balmer BC, Townsend FI, Wells RS, Jensen ED, Schwacke LH, Smith CR. (2020). Standardization of Dolphin Cardiac Auscultation and Characterization of Heart Murmurs in Managed and Free-Ranging Bottlenose Dolphins (*Tursiops truncatus*). Front Vet Sci. Oct 28;7:570055. doi: 10.3389/fvets.2020.570055. PMID: 33240948; PMCID: PMC7678442.
9. Ramos RMA, Di Beneditto APM, Lima NRW. (2000). Growth parameters of *Pontoporia blainvillei* and *Sotalia fluviatilis* (Cetacea) in northern Rio de Janeiro, Brazil. Aquatic Mammals, 26(1): 65–75.
10. Rodríguez D, Rivero L, Bastida R. (2002). Feeding ecology of the Franciscana (*Pontoporia blainvillei*) in marine and estuarine waters of Argentina. LAJAM 1(1): 77-94, Special Issue 1.
11. Sweeney J, Stone, R, Campbell M, McBain J, St. Leger J, Xitco M, Jensen E, Ridgway S. (2010). Comparative Survivability of Tursiops Neonates from Three U.S. Institutions for the Decades 1990-1999 and 2000-2009. Aquatic Mammals. 36. 248-261. 10.1578/AM.36.3.2010.248.
12. Smith CR, Solano M, Lutmerding BA, Johnson SP, Meegan JM, Le-Bert CR, Emory-Gomez F, Cassle S, Carlin K, Jensen ED. (2012). Pulmonary ultrasound findings in a bottlenose dolphin (*Tursiops truncatus*) population. Dis Aquat Organ. Nov 19;101(3):243-55. doi: 10.3354/dao02537. PMID: 23324421.
13. Townsend FI, Gage LJ. Hand-Rearing and Artificial Milk Formulas. In: Dierauf LA, Gulland FMD, editors. (2001). CRC Handbook of Marine Mammal Medicine; 2nd edition. Boca Raton (FL): CRC Press. Pp. 829-849.
14. West K, Oftedal O, Carpenter J, Krames B, Campbell M, Sweeney J. (2007). Effect of lactation stage and concurrent pregnancy on milk composition in the bottlenose dolphin. Journal of Zoology. 273. 148-160. .

Appendix 1. Growth Curve-Age estimation for Franciscana dolphins

Measure body length to determine age class. A standard straight length is defined as the measurement of the straight-line distance from the tip of the rostrum to the notch of the flukes.



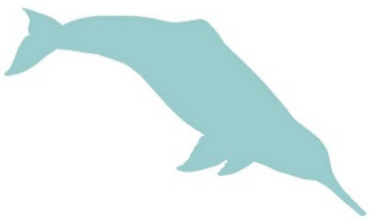
< 65 cm premature calf
65-70 cm = newborn (~1 week old)
70-75cm = 0-3 months
75-85 cm = 3-6 months
85-95 cm = 6-12 months
> 95cm = 1 year of age
> 115 cm: 2 year of age



Scatterplots of length-at-age for 39 males (figure a) and 43 females (figure b) of Pontoporia blainvillei accidentally captured in gillnets or stranded in northern Rio de Janeiro, Brazil, from 1989 to 1996. The solid line represents the predicted growth trajectory from the Gompertz model. Figures previously published by R. M. Arruda Ramos et al. Aquatic Mammals 2000, 26.1, 65–75.

Body length mean (minimum–maximum) for each age-class in males and females of *Pontoporia blainvillei* accidentally captured in gillnets or stranded in northern Rio de Janeiro, Brazil, from 1989 to 1996. Table previously published by R. M. Arruda Ramos et al. Aquatic Mammals 2000, 26.1, 65–75.

	Males		Females	
Age	*n*	Length range	*n*	Length range
P. blainvillei				
0	5	81.1 (78.0–88.0)	6	83.2 (74.0–95.0)
1	8	99.4 (94.0–105.0)	7	103.9 (95.0–114.0)
2	18	109.4 (98.0–120.0)	10	111.6 (90.0–120.0)
3	4	116.5 (113.0–121.0)	7	124.2 (117.5–140.0)
4	4	118.1 (115.0–120.0)	6	133.8 (129.5–138.5)
5	—		2	139.5 (138.0–141.0)
≥6	—		5	141.1 (137.0–147.5)
total	39		43	



	Male	Female	Calf
Maximum length	1.58m	1.77m	0.8m
Maximum weight	53kg	53kg	8.5kg

IUCN conservation status: **Vulnerable and declining**

Variation in the Maximum Blubber Thickness (cm) and Maximum Body Circumference (cm) during the first year of life in Franciscanas from Argentina. Values expressed as mean ± standard deviation (n=); differences analysed by one-factor ANOVA. Table previously published by Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002

Characteristic	Suckling Calves	Transition Calves	Weaned Calves	Differences
Maximum Blubber Thickness	1.53 ±0.47 (13)	2.75 ±0.35 (2)	2.53 ±0.38 (4)	** (F=12.15; df=2,16; p<0.01)
Maximum Body Circumference	37.52 ±5.85 (17)	56.20 ±2.63 (5)	62.78 ±1.86 (5)	** (F=64.11; df=2,24; p<0.01)

Appendix 2. Animal Monitoring Sheet During Rescue and Transport

ANIMAL MONITORING SHEET - DURING RESCUE AND TRANSPORT

ANIMAL ID/NAME:

DATE:

	On Beach	During transport											
Time													
Respiratory Rate (breaths per minute)													
Heart Rate (beats per minute)													
Behavioral Response (Alert, Weak, Non-responsive)													
Blood glucose													
Temperature													
Record any treatments given													

Note any comments/Events:

Appendix 3. Pool-side Tests for Passive Transfer Status in Neonate Bottlenose Dolphins

IgG Test #1: Glutaraldehyde Coagulation

Reagents & Supplies:

- 10% glutaraldehyde soln
  - 25% glutaraldehyde (Sigma-Aldrich)
  - Deionized water
  - Light-protected bottle
- Cryovials
- Micropipettes (100uL or 200uL) & tips

Instructions for making 10% glutaraldehyde soln:

1. Combine 4mL of 25% glutaraldehyde solution with 6mL DI water.
2. Store in brown bottle to protect from light.
3. Store remaining solution in refrigerator for 1 month.

Procedures:

1. Combine 200uL (0.2mL) of animal serum with 20uL of 10% glutaraldehyde soln in a cryovial.
2. Gently agitate cryovial to combine.
3. Note time at clot formation by evaluating every minute for 10 minutes, then every 5 minutes up to one hour.
4. Record time and results as positive, negative, or incomplete. Clot formation is indicative of a positive result. A jelly-like substance at one hour is indicative of an incomplete result. No clot at one hour is consistent with a negative result.

**Recommend also running healthy adult animal sample (if available) as a positive control.*

Calf IgG Test Data Entry Form

Date	Animal Name	Animal ID	Vet Tech	Time	Sample Type	Hemolysis	Immunocrit 1 (%)	Immunocrit 2 (%)	Average 1&2 (%)	Time Clot Formed (minutes) (Glutaraldehyde) *

* Always run test on serum
* For the first 10 minutes of the reaction, check every minute for a clot and record that time. After 10 minutes, check reaction every 5 minutes, up to 60 mins .
* A solid clot by 10 minutes is a good sign. If you're still waiting on a clot after 30 minutes, likely the animal has very low IgG.

IgG Test #2: Immunocrit

Reagents & Supplies:

- 40% ammonium sulfate $(NH_4)_2SO_4$ soln
    - Ammonium sulfate, granular (Fisher, CAS 7783-20-2)
    - Deionized water

- Cryovials
- Micropipettes (200uL) & tips
- Centrifuge
- Plain microhematocrit tubes
- Clay
- PCV chart

Instructions for making 40% $(NH_4)_2SO_4$ soln:

1. Combine 40g of $(NH_4)_2SO_4$ with DI water.
2. Fill with DI water until 100mL total soln is measured.
3. Stir until dissolved.
4. Do not store. Discard after use.

Procedures:

1. Combine 100uL (0.1mL) of animal serum with 100uL (0.1mL) of 40% $(NH_4)_2SO_4$ soln in a cryovial.
2. Gently agitate cryovial to combine.
3. Using capillary action of microhematocrit tubes, fill 2 plain tubes with serum solution and occlude one end with clay (ie, like PCV protocol).
4. Place into centrifuge and spin at microhematocrit speed (12,600g) for 5 minutes.
5. Measure proportion of white precipitate to total solution against the PCV chart.
6. Report value in %.
7. Calculate the average of the 2 capillary tubes and record that number to the nearest half percent

**Recommend also running healthy adult animal sample (if available) as a positive control.*

Calf IgG Test Data Entry Form

Date	Animal Name	Animal ID	Vet Tech	Time	Sample Type	Hemolysis	Immunocrit 1 (%)	Immunocrit 2 (%)	Average 1&2 (%)	Time Clot Formed (minutes) (Glutaraldehyde) *

* Always run test on serum
* For the first 10 minutes of the reaction, check every minute for a clot and record that time. After 10 minutes, check reaction every 5 minutes, up to 60 mins .
* A solid clot by 10 minutes is a good sign. If you're still waiting on a clot after 30 minutes, likely the animal has very low IgG.

Appendix 4. Recipes for Artificial Milk Formulas

Recipe Tip: Blend fish in a commercial blender. Add bottled filtered water. Blend in milk substitute. Add fish oil, and other vitamins/supplements. Blend to mix well. Label the container with the date and time. Prepare the formula fresh daily, and store in the refrigerator until use. Carefully warm the formula to body temperature (36 C) prior to feeding. Discard any unused formula after 24 hours.

Most recent Franciscana formula recipe used during the 2020-2021 calf rehabilitation season

To make 400 mL of formula:
125 ml NaCl or LRS fluids
125 ml filtered water
3 mL glicopan
5 grams Glucose
20 ml fish oil = 20 capsules
15 ml heavy whipping cream without lactose (lactose-free)
100 grams of milk replacer (zoologic milk matrix is preferred)
100 mg taurine
Lecithin: 1 gram
1/16 tablet multivitamin
100 grams fish filets**
**we recommend waiting one week before adding fish

Baldassin, P. et al. "Veterinary treatment of an injured wild franciscana dolphin calf (*Pontoporia blainvillei*, Gervais & d'Orbigny, 1844)." *Latin American Journal of Aquatic Mammals* 6 (2007): 185-187.

Table 1. Milk formula administered to the franciscana dolphin from this study, adapted from formula used at Sea World California (Young and Dalton, 1994*) but modified based on the oil available.

MILK COMPOSITION (1 LITER)
280g fish fillet (*Sardina pilchardus*)
50g zoologic 30/55
90g zoologic 33/40
1/2 tablet soy lecithin
7.25g glucose
62mg taurine
4.5g NaCl
1.2g (18.75g) dicalcium phosphate
25ml cod liver oil
550ml filtered tap water/milk without lactose
50ml milk cream without lactose

* Young, W. G. and Dalton, L. M. (1994) *Treatment of a live stranded young Risso's dolphin* (Grampus griseus) Page 140 *in* Abstracts, International Association of Aquatic Animal Medicine Annual Conference. 11-14 May. Vallejo, CA, USA.

Sweeney, et al. Comparative Survivability of Tursiops Neonates from Three U.S. Institutions for the Decades 1990-1999 and 2000-2009. Aquatic Mammals 2010, 36(3), 248-261, DOI 10.1578/AM.36.3.2010.248.

Table 4. Calf milk formula composition (Courtesy of Dolphin Quest and Busch Entertainment Corp.)

Ingredients	Dolphin Quest	Busch Entertainment Corp.
Herring – Fish fillet (No skin, viscera [guts], spine, or head)	750 g	1,135 g
Zoologic Milk Matrix 30/55 (Milk powder)	450 g	200 g
Zoologic Milk Matrix 33/40 (Milk powder)	300 g	345 g
Salmon oil (Menhaden oil/Safflower oil)	100 ml	50 ml
Heavy whipping cream (Heavy cream/whipping cream)	100 ml	200 ml
Water/Pedialyte	1,600 ml	2,200 ml
Lecithin (Granules)	15 ml	8 g
Taurine	500 mg	500 mg
Lactobacillus (Acidophilus)	3 tabs	
$DiCaPO_4$ (DiCalcium Phosphate)	75 g (10 tabs)	5 g (10 tabs @500 mg/tab)
Multivitamin	$^1/_4$ to $^1/_2$ of tab	
Dextrose		30 g
Salt		18 g
Total volume (approx.)	3,300 ml	4,000 ml
Total calories (approx.)	2.21 kcal/ml 2,210 kcal/L	1.8 kcal/ml 1,800 kcal/L
Calf requirements @200 kcal/kg/d	3,000 Kcal/d Est. wt. = 15 kg	
Volume per feeding	1,357 ml/d 57 ml/feeding @24 feedings/d	

Jennifer E. Flower, et al. Neonatal Critical Care and Hand-Rearing of a Bottlenose Dolphin (*Tursiops truncatus)* Calf. Aquatic Mammals 2018, 44(5), 482-490, DOI 10.1578/AM.44.5.2018.482.

Table 4. Formula components utilized during period of neonatal critical care and hand-rearing of a male bottlenose dolphin calf

Formula ingredients	Quantity (grams or mL)	Caloric value (kcal)
Herring	1,135	1.5 kcal/g (1,702 kcals)
Milk matrix 30/52	200	5.78 kcal/g (1,156 kcals)
Milk matrix 33/40	345	5.38 kcal/g (1,856 kcals)
Water	2,426	--
Safflower oil	50 mL	9 kcal/g (450 kcals)
Whipping cream	200 mL	3.4 kcal/g (680 kcals)
Lactobacillus	3 tabs	--
Dicalcium phosphate	5	--
Dextrose	30	--
Salt	18	--
Taurine	500 mg	--
Lecithin	8 g	--

Franciscana dolphin milk composition (Caon, et al. Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1099–1101)

Table 1. Milk composition of the franciscana, *Pontoporia blainvillei*, in Rio Grande do Sul, Brazil.

Composition	Summer samples		Winter samples		
	CA05	CA010	CA338	GEMARS0547	GEMARS0828
Fat (g/100 g)	8.21	8.22	19.00	13.80	14.0
Protein (g/100 g)	13.70	14.43	11.50	9.50	9.80
Carbohydrates (g/100 g)	n.a.	n.a.	2.80	2.20	2.50
pH	6.80	6.70	n.a.	n.a.	n.a.
Cryoscopic index	$\Delta - 0.818°C$	$\Delta - 0.817°C$	n.a.	n.a.	n.a.

n.a., not analysed.

Summary of Table:

- Protein concentration was higher in summer (14.07%) than in winter (10.27%), with P = 0.021. We observed a variation of fat concentration in milk, being lower in summer (8.21%) and higher in winter (15.60%).
- In summer, the mean protein and fat concentrations in franciscana milk corresponded to 56.26 kcal/100 g and 73.85 kcal/100 g, respectively, totaling 130.11 kcal/100 g. The samples collected in winter corresponded to 181.47 kcal/100 g, a caloric value 1.9 folder higher than in summer, due to higher concentration of fat (140.40 kcal/100 g), while protein concentration corresponded to 41.07 kcal/100 g. Carbohydrates, possibly lactose, showed a mean value of 2.5% in franciscana milk during winter. Values for summer were not available for comparison.
- The concentrations of minerals and heavy metals analysed in sample CA338 were K = 1521.0 mg/l, P = 1454.0 mg/l, Na = 1054.0 mg/l, Mg = 89.20 mg/l and Fe = 10.20 mg/l. Calcium presented a concentration of 947.0 mg/l, while samples CA05 and CA10 resulted in concentrations of 1460.0 mg/l and 1440.0 mg/l, respectively. The metals found in sample CA338 were Zn = 4.46 mg/l, Cu = 0.63 mg/l and Hg = 0.22 mg/l.

West K, Oftedal O, Carpenter J, Krames B, Campbell M, Sweeney J. (2007). Effect of lactation stage and concurrent pregnancy on milk composition in the bottlenose dolphin. Journal of Zoology. 273. 148-160.

Table 2 Cetacean milk composition at early, mid- and late lactation

Species	Lactation stage and sampling method[a]	n^b	Water (%)	Fat (%)	Crude protein[c] (%)	Ash (%)	Sugar[d] (%)	Gross energy[e] (kcal g^{-1})	Protein: energy (%)	Source
Bottlenose dolphin *Tursiops truncatus*	1–6 months, man expr	14	75.3 ± 0.9	10.5 ± 0.7	8.5 ± 0.5	–	1.4n ± 0.5	1.53 ± 0.27	32.6 ± 1.0	This study
	7–12 months, man expr	17	73.0 ± 1.0	12.8 ± 1.0	8.9 ± 0.5	–	1.0n ± 0.1	1.76 ± 0.09	30.3 ± 1.3	This study
	13–29 months, man expr	32	70.0 ± 0.9	16.6 ± 0.7	10.5 ± 0.3	–	1.1n ± 0.1	2.20 ± 0.07	28.4 ± 1.1	This study
Spotted dolphin *Stenella attenuata*	Unknown, post-m.	8	–	25.3 ± 1.9	9.2 ± 0.3	–	1.1r ± 0.1	2.89 ± 0.18	19.2 ± 1.5	Pilson & Waller (1970)
Sperm whale *Physeter macrocephalus*	~1–3 months, post-m.	5	64.3 ± 2.1	23.6 ± 1.9	10.2u ± 0.4	0.8 ± 0.04	*1.2d ± 0.1*	2.79 ± 0.18	21.7 ± 1.2	Best *et al.* (1984)
	~3–5 months, post-m.	7	63.8 ± 1.7	25.7 ± 1.6	8.5u ± 0.3	0.6 ± 0.04	*1.4d ± 0.4*	2.90 ± 0.15	17.5 ± 0.8	Best *et al.* (1984)
Humpback whale *Megaptera novaeangliae*	~6–7 months, post-m.	3	40.1 ± 0.6	47.3 ± 1.2	9.10 ± 0.3	2.1 ± 0.19	0.66r ± 0.2	4.87 ± 0.12	10.9 ± 0.3	Symons & Weston (1958)
	~10 months, post-m.	5	49.8 ± 2.8	35.1 ± 2.8	12.3 ± 0.5	1.5 ± 0.04	*1.2d ± 0.3*	3.97 ± 0.26	18.5 ± 1.4	Chittleborough (1958)
Minke whale *Balaenoptera acutorostrata*	~2–4 months, post-m.	7	60.8 ± 4.7	20.3 ± 4.4	14.6u ± 0.8	1.7 ± 0.23	*2.5d ± 0.7*	2.81 ± 0.40	35.2 ± 5.8	Best (1982)
	~4–5 months, post-m.	16	51.9 ± 3.2	30.2 ± 3.2	13.6u ± 0.7	1.7 ± 0.11	*2.7d ± 0.3*	3.65 ± 0.29	23.7 ± 2.3	Best (1982)
Fin whale *Balaenoptera physalus*	~4–7 months, post-m.	9	51.5 ± 2.4	34.9 ± 2.7	11.4 ± 0.5	1.2 ± 0.17	1.4r ± 0.4	3.91 ± 0.23	17.7 ± 1.6	Takata (1922), White (1953), Ohta *et al.* (1955), Lauer & Baker (1969)
Blue whale *Balaenoptera musculus*	~5–7 months, post-m.	5	48.1 ± 3.8	36.7 ± 4.9	12.0 ± 0.5	1.4 ± 0.07	*1.7d ± 1.0*	4.12 ± 0.40	18.0 ± 2.4	Backhaus (1904), White (1953), Gregory *et al.* (1955)

[a]Exact lactation stage was known only for captive bottlenose dolphins; in other species, lactation stage was estimated by comparison with peak calving dates (if possible) and are approximate (see Oftedal, 1997). Methods of collection: Man expr, manual expression during voluntary restraint; post-m., postmortem collection from nipple after the animal drowned in a net (spotted dolphin) or from nipple or excised mammary gland after the animal was harpooned and hauled onto a flensing deck or platform (whales).

[b]Numbers of samples for which fat, protein and sugar were assayed or (for sugar by difference) calculated. Any samples reported to be contaminated or derived from involuting mammary glands were excluded.

[c]Protein equals crude protein, that is, total nitrogen × 6.38 unless otherwise specified; u, unknown (analytical method not reported).

[d]Values in italics and followed by *d* were calculated by difference, that is, 100–(water%+fat%+protein%+ash%) and other values were obtained by the following methods: r, reducing sugar method; *n*, non-specific phenol–sulfuric acid method.

[e]Gross energy calculated per Oftedal (1984) as (fat% × 9.11+protein% × 5.86+sugar% × 3.95)/100. No correction was made for non-protein nitrogen.

Appendix 5. Drug Formulary

Formal pharmacokinetic studies have not yet been performed in Franciscana dolphins.

Drug Name	Dose	Route	Comments
Amikacin	5-10 mg/kg SID	IM/IV	
Amoxicillin	10-20 mg/kg BID	Oral	
Amoxicillin/Clavulanic Acid	10-15 mg/kg BID	Oral	
Ampicillin	10-20 mg/kg TID	Oral, IV	
Azithromycin	5-10 mg/kg SID	Oral, IV	
Cefpodoxime	5-10 mg/kg BID	Oral	
Ceftriaxone	15-20 mg/kg SID	IM/IV	
Cefovecin (Convenia)	8 mg/kg ONCE every 14 days	Subcutaneous (SQ)	
Ceftiofur (EXCEDE)	6.6 mg/kg ONCE every 5 days	Subcutaneous (SQ)	
Cimetidine	3 mg/kg SID-BID	Oral	
Ciprofloxacin	15 mg/kg BID	Oral	
Clindamycin	5-10 mg/kg BID	Oral	
Doxycycline	5 mg/kg SID 2.5 mg/kg BID	Oral	
Enrofloxacin	5 mg/kg BID	Oral, IV, IM*	*Repeated IM injections with fluoroquinolones can be irritating to the muscles
Fenbendazole	10 mg/kg SID for 3 consecutive days	Oral	
Famotidine	0.5 mg/kg BID	Oral, IV, SQ	
Fluconazole	4-6 mg/kg SID	Oral	
Itraconazole	2.5 mg/kg BID 5 mg/kg SID	Oral	
Levofloxacin	10 mg/kg SID	Oral, IV	
Metronidazole	5 mg/kg BID	Oral	
Ondansetron	0.1 mg/kg SID-BID	Oral, SQ, IM	
Omeprazole	0.2 mg/kg SID	Oral	
Simethicone	2 mg/kg SID-QID	Oral	Do NOT exceed 8 doses in 1 day
Sucralfate	5-10 mg/kg SID-TID	Oral	

Emergency drugs and sedation drugs to have available:

Franciscana Emergency Drug Doses						
Animal ID/Name		**Weight (kg):**	4	**Date:**		
Drug	**Route**	**Dosage (mg/kg)**	**Conc. (mg/ml)**	**Amount (mg)**	**Amount (mL)**	**Indications for use**
Midazolam	IM	0.06	5	0.2	**0.05**	Sedation, anxiety, seizures
Diazepam	PO, IM	0.1	5	0.4	**0.1**	Sedation, anxiety, seizures
Flumazenil	IM, IV	0.01	0.1	0.0	**0.4**	Reversal drug to reverse effects of diazepam or midazolam
Emergency Drugs	**Route**	**Dosage (mg/kg)**	**Conc. (mg/ ml)**	**Amount (mg)**	**Amount (mL)**	**Indications for use**
Atropine	IM, IV	0.02	0.4	0.1	**0.2**	Bradycardia
Calcium Gluconate	IM, or IV slowly	10	100	40.0	**0.4**	Hypocalcemia, muscle tremors/weakenss
Diphenhydramine	IV,IM	1	50	4.0	**0.1**	Allergic reaction
Doxapram	IM, IV, IT, sublingual	1	20	4.0	**0.2**	Respiratory stimulant
Epinephrine	IV, IT, IC	0.1	1	0.4	**0.4**	Cardiac resuscitation
Furosemide	IM, IV	1	10	4.0	**0.4**	Pulmonary edema
Lidocaine	IV slowly	2	20	8.0	**0.4**	Ventricular arrhythmia
Sodium Bicarb (mEq/ml)	IV	0.5	1	2.0	**2.0**	Acidosis/Hyperkalemia
Solu-Medrol (methylprednisolone sodium succinate)*	IM, SQ, IV	1	125	4.0	**0.03**	Shock, allergic reaction
Dexamethasone SP (sodium phosphate)*	IM, SQ, IV	0.5	4	2.00	**0.50**	Shock, allergic reaction
*These steroid doses are for emergency resuscitation. Give a lower dose if using as an anti-inflammatory (0.1-0.5 mg/kg)						

Appendix 6. Daily Monitoring Sheet

Date: ______________________ Animal ID: ________________________

Time	Respiratory Rate	Describe behavior (swim patterns, vomiting, crunching, arching, independence)	Formula concentration	Formula volume (ml)	Defecation: Describe feces frequency, color, consistency	Calories intake (total)	Calories intake (kcal/kg/ day)	Weight (kg)	Weight Gain (kg)	Length (cm)

Appendix 7. Franciscana Dolphin (*Pontoporia blainvillei)* Physical Exam Form

Animal Name/ID:

Date of Exam:

Weight (kg):

Length: (cm)

Axial Girth (cm):

Sex: ☐ Male ☐ Female

Age class based on length (cm):
☐ < 65 cm premature calf
☐ 65-70 cm = newborn (~1 week old)
☐ 70-75cm = 0-3 months
☐ 75-85 cm = 3-6 months
☐ 85-95 cm = 6-12 months
☐ > 95cm = 1 year of age
☐ > 115 cm: 2 year of age
☐ >130cm = adult male
☐ >140cm = adult female

Body Condition Score (1-5): _____
1 = emaciated
2 = underweight
3 = ideal
4 = robust
5= obese

Mucous membrane color: _____________

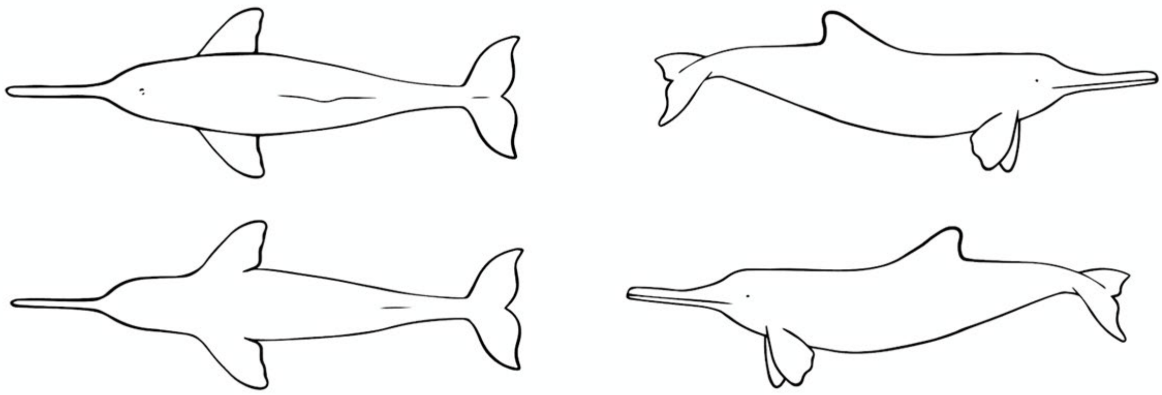
Capillary refill time: ___________ (seconds)

Temperature (°C):

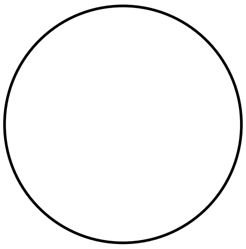
Respiratory Rate:
breaths/1 min: _____________
breaths/5 min: _____________

Heart Rate:
(beats/1 Min): ________ Brad ________Tach
________Mean

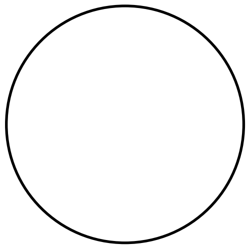
System	Abnormal/Normal/Not examined	
Neurological	A/N/NE	Mentation: ☐ Alert ☐ Dull ☐ Stuporous Describe any abnormal findings:
Ophthalmic OD (Right)	A/N/NE	Menace (+ / -) Palpebral (+ / -) Blepharospasm (+ / -) Visual Tracking (+ / -) Corneal lesions (+ / -) Describe any lesions here and draw on the diagram below:
Ophthalmic OS (Left)	A/N/NE	Menace (+ / -) Palpebral (+ / -) Blepharospasm (+ / -) Visual Tracking (A / N) Corneal lesions (+ / -) Describe any lesions here and draw on the diagram below:
Oral/Teeth	A/N/NE	Teeth erupted (+ / -) Gingival hyperplasia (+ / -) Tooth Wear (+ / -) Crown Fractures (+ / -) Describe any lesions:
Respiratory	A/N/NE	Breath quality: ☐ Normal ☐ Shallow ☐ Other: describe: Lung sounds (auscultation): ☐ Normal ☐ Crackles ☐ Wheezes ☐ Rales ☐ Other: describe: Respiratory Mucus: ☐ None ☐ Present; describe: Describe any abnormalities here:
Cardiovascular	A/N/NE	Rhythm: ☐ Normal Sinus Arrhythmia ☐ No Sinus Arrhythmia ☐ Other Arrhythmia Murmur (+ / -) describe any abnormalities here:
Musculoskeletal	A/N/NE	Describe any abnormalities:
Gastrointestinal	A/N/NE	Intestinal (gut) sounds ☐ Present ☐ Not Present Gastric fluid ☐ Normal ☐ Abnormal ☐ Not Collected pH: ______; cytology: ________ __________________________ Feces ☐ Normal ☐ Abnormal; ☐ Not collected; cytology: ____________________________ _____________________ Vomiting: (+/-); describe appearance and frequency:
Integument	A/N/NE	Describe any skin lesions, rake marks, scars; vibrissae present, etc and draw on the diagram below:
Reproductive	A/N/NE	Umbilicus: ☐ Normal ☐ Abnormal ☐ Open ☐ Healed ☐ Discharge present Genital slit ☐ WNL ☐ Abnormal Vagina/Penis ☐ WNL ☐ Abnormal Mammary (R/L): ☐ WNL ☐ Abnormal



Eyes: Ophthalmic OD (Right)



Ophthalmic OS (Left)



Comments:____
____
____
____
____
____
____

Veterinarian (Name/Signature): ______________________________________

Date: ________________________

Appendix 8. Ethogram Franciscana *(Pontoporia blainvillei)*

Rationale

In order to be able to assess the overall condition of an animal and its development in the context of rehabilitation, behavioural data are indispensable. Behavioural data can not only document progress in the rehabilitation process, more importantly, certain behaviours that indicate a change of the animal's health, e.g., that the animal is weakened, can be detected early, so that appropriate action can be taken. Also, well designed and conducted behavioural study can bring to light certain behaviours that are overlooked in everyday life.

The ethogram

In order to describe a behaviour pattern, it is recommended to distinguish between two important types of behavioural activity which lie at opposite ends of a continuum. On the one hand we have behavioural **events**, that are behaviour patterns of relatively short duration, such as breathing, vocalizations, etc. The salient feature of events is their frequency, i.e. how many times the animal breathes per minute. The second category comprises behavioural **states**, that are of relatively long duration. Their salient feature is duration, i.e. how many minutes is the animal swimming at relatively fast speed.

The ethogram contains codes and descriptions for activity states and for behavioural event types. This ethogram was created based on observations of single individuals and therefore only includes solitary behaviors.

The activity states (salient feature duration) comprise:

Code	Name	Description	Interpretation regarding animals condition
SW	Swimming	Locomotion by up and down movement of the fluke	Neutral
SW-Sl	Swimming slowly	The animal moves slowly	Depends on the context / might signal weakness
SW-Fa	Swimming fast	The animal is moving fast	Indicates good condition
SW-UP	Swimming Upside Down	The animal is swimming belly up	Neutral
SW-SW	Swimming sideway	The animal swims slowly and sideways, the body is tilted sideways by approx. 45°.	Depends on the context / might signal weakness
SW-Dis	Discontinuous swimming	The animal swims erratically without an even rhythm	Depends on the context / might signal weakness
SW-Gr	Swimming on the ground	The animal swims submerged and touches with his body the ground of the pool	Neutral
BB	Bent Body	The animal's body is somehow bent upwards.	indicates weakness
Hd-SC	Head scanning	The animal moves the head from right to left on a horizontal plane, no object nearby	Indicates good condition
APP	Approach	The animal swims directly towards caretaker (e.g., as soon as he puts hand into the water)	Indicates good condition
REA	Rest active	The animal remains on the same place but shows some flukes strokes	Neutral
REP	Rest passive	The animal remains motionless on the same place for some time, lies on the floor or floats at the water surface	Neutral
EXP	Exploration	The animal swims slowly, moving its head from left to right in relation to an object in front of it.	Indicates good condition
TO	Touch object	The animal touches intentionally an object lying in the water with its beak	Indicates good condition
AO	Avoiding object	The animal avoids objects that are in its swimming lane	Indicates good condition
DI	Diving	The animal leaves the surface and dives down. No bubbles are visible	Neutral
Acc	Abrupt Acceleration	The animal shows an abrupt acceleration	Indicates good condition
SWCh	Change of swimming direction	The animal shows a fast change in swimming direction	Indicates good condition
BU	Bubble	The animal produces a considerable amount of bubbles under water	Neutral
RO	Rolling	The animal turns around its own longitudinal axis	Neutral

IMPORTANT: For the Category Swimming a modifier can be applied to distinguish Clockwise Swimming (CW) from Anticlockwise Swimming (ACW)

For example:
SW-CW
SW-ACW

Event types (salient feature frequency) comprise:

Code	Name	Description	Interpretation regarding animals condition
BR	Breathing	Animal comes to the surface and breathes in and out	Number of breaths/minute can give an indication of the animal's condition.
BU	Bumping	Animal swims headfirst into the pool wall	Depends on the context / might signal weakness
CH	Chuff	The animal expels air abruptly	Depends on the context / might signal weakness / repeated chuffs should be monitored.
HJ	Head jerking	The animal raises its head jerkily when breathing	Indicates weakness
MO	Mouth open	Upper and lower jaw separated in a non-feeding situation	Neutral
IN	Ingest	The animal takes a fish and swallows it	Indicates good condition
EX	Excretion	Defecating	Frequency of defecation, color, and consistency

Methods

Regarding sampling rules: in this special case (one individual) a focal sampling method and a continuous recording rule (or all-occurrences recording) is recommended. In practice: we suggest performing sessions of 30 Minutes duration three times a day.

Behavior Recording Sheet			
Start Time Hs/Min/Sec	**Behavior State**	**Behavior Events**	**Observations**

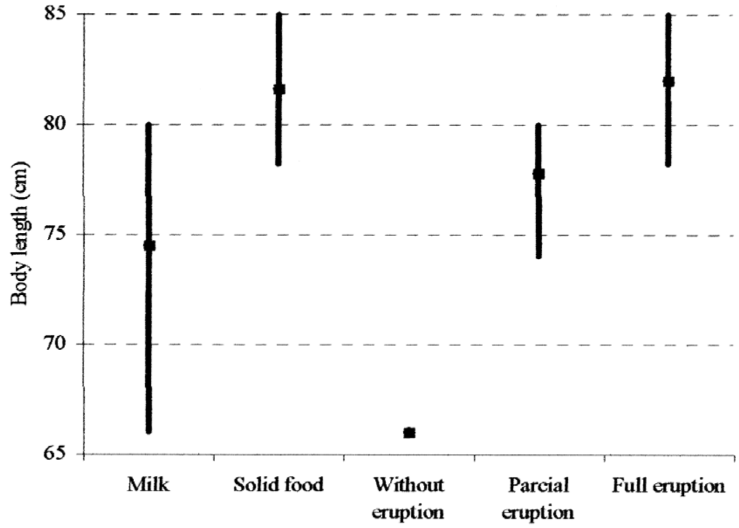
Appendix 9. Water Quality Monitoring Data Sheet

- Please monitor the following water quality parameters **every day** and record on the form
  - Water temp: 25-27 Celsius
  - Salinity: 20-35 ppt
  - pH: 7.2-8.4
  - Ammonia < 2 ppm
  - If chemical filtration is used, these chemicals will need to measured daily as well (i.e. chlorine, ozone, etc)

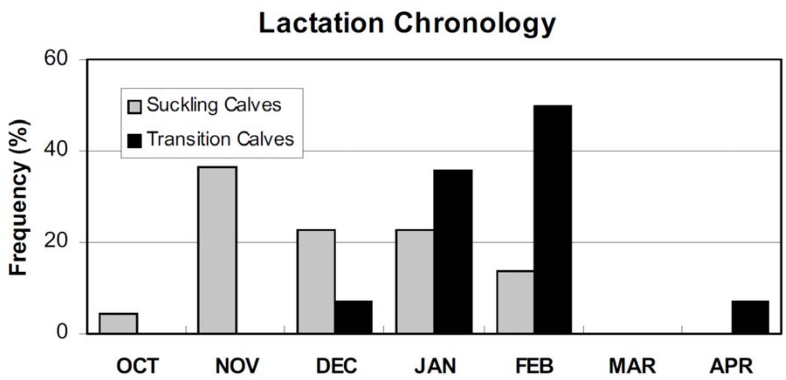
- Please monitor the bacterial coliform count **once per week** and record on the form
  - coliform count must be < 1,000 MPN (most probable number)
  - **if the coliform count is > 1,000 = increased fecal bacteria in the water, this requires a pool cleaning and a water change of at least 25% then repeat the test

Date	Time	Temperature (Celsius)	Salinity (ppt)	pH	Ammonia (ppm)	Coliform count	Comments

Appendix 10. Stomach contents and diet composition of free-ranging Franciscana dolphins – based on length and age



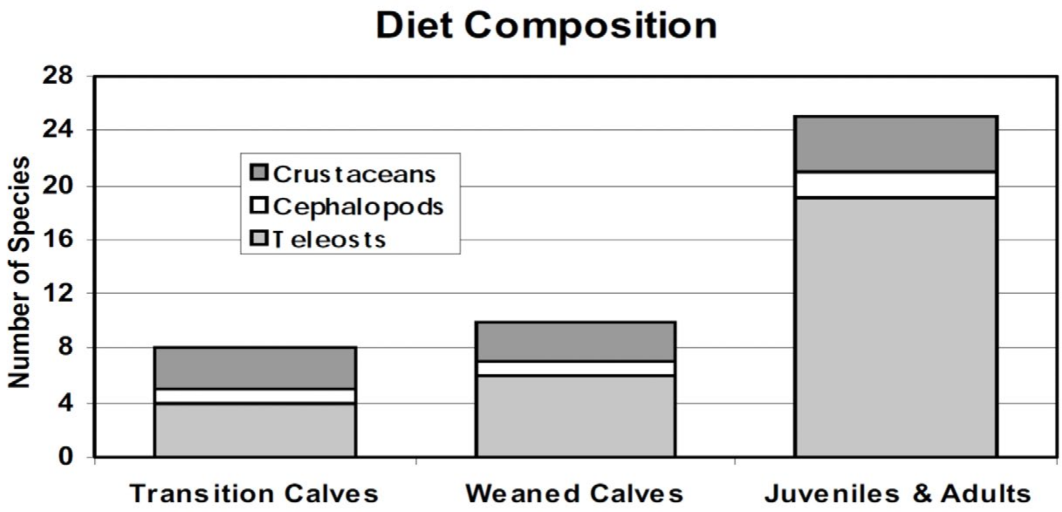
Analyses of stomach content (milk or solid food) and three tooth eruption stages (without, parcial and full eruption) to body length of calves (newborn and 0.5 GLG) of Pontoporia blainvillei accidentally captured in gillnets or stranded in northern Rio de Janeiro, Brazil, from 1989 to 1996. All calves over 80.0 cm presented some alimentary remains (i.e., fish otoliths) in the stomach. Calves between 78.0 and 80.0 cm length had milk (n=2) or food solid (n=2). Figure previously published by Ramos, et al. Aquatic Mammals 2000, 26.1, 65–75.



Monthly records of suckling and transition Franciscana calves.
Figure previously published by (Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002)

Lactation chronology and transition to solid feeding: Suckling calves were found from early October to early February, although they were more frequently found from November onwards (Figure 4). Mean record date was 12 December (± 34 days), ranging from 2 October to 7 February. Transition calves were recorded from December onwards, being more common in February (Figure 4); mean record date was 4 February (± 26 days), with a period extending from 18 December to 15 April, after which no franciscanas with traces of milk were recorded. (Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002)

Lactation and transition to solid diet: Calving season extends for approximately 4 months, from early October to February, with most occurrences in November. This period coincides with the proposed calving season in Uruguay and southern Brazil. Thus, we estimated that the *onset/beginning* of solid food intake is approximately between 2 and 3 months of age, when calves exceed 75cm in length and 8kg of weight, and coinciding with teeth eruption. Our results confirm a gradual weaning in Franciscana calves, with a suggested feeding independence when calves exceed 95cm in length and 13kg in weight. This could take place in April, when calves are about 7 months old. (Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002)



Number of prey species taken by Franciscanas of different ontogenic categories.
Figure previously published by D.RODRÍGUEZ, L.RIVERO and R.BASTIDA. LAJAM 1(1): 77-94, Special Issue 1, 2002

Absolute number (n=), numerical abundance (N%), frequency of occurrence (FO%), biomass (W%), absolute (IRI) and percentage Index of Relative Importance (IRI%) of prey of franciscanas from northern Argentina. Table previously published by D.RODRÍGUEZ, L.RIVERO and R.BASTIDA. LAJAM 1(1): 77-94, Special Issue 1, 2002

PREY ITEMS	'TRANSITION' CALVES (n=14)			WEANED CALVES (n=14)			POOLED JUVENILES & ADULTS (n=60)					
	n=	N%	FO%	n=	N%	FO%	n=	N%	FO%	W%	IRI	IRI%
TELEOSTS	**36**	**10.4**	**71.4**	**263**	**90.4**	**100.0**	**2844**	**80.5**	**96.9**	**72.0**	**14780.3**	**92.2**
Micropogonias furnieri	2	0.6	25.0	133	45.7	50.0	500	14.1	40.9	24.3	1574.3	20.4
Cynoscion guatucupa	29	8.4	50.0	69	23.7	83.3	1637	46.3	60.6	23.8	4250.8	55.2
Odonthestes argentinensis				37	12.7	16.7	198	5.6	13.6	6.7	167.5	2.2
Macrodon ancylodon							17	0.5	10.6	6.7	76.7	1.0
Paralonchurus brasiliensis	4	1.2	12.5	16	5.5	33.3	127	3.6	19.7	2.3	116.9	1.5
Urophycis brasiliensis				3	1.0	33.3	116	3.3	24.2	7.4	258.9	3.4
Mugil platana							9	0.3	7.6	0.1	2.5	0.0
Engraulis anchoita				5	1.7	33.3	28	0.8	24.2	0.4	29.8	0.4
Stromateus brasiliensis							7	0.2	3.0	0.2	1.1	0.0
Umbrina canosai							125	3.5	15.2			
Lycengraulis olidus							4	0.1	4.5			
Pomatomus saltatrix							2	0.1	3.0			
Ramnogaster arcuata							9	0.3	3.0			
Percophis brasiliensis							1	0.1	1.5			
Sparus pagrus							11	0.3	7.6			
Trachurus lathami							49	1.4	1.5			
Pogonias cromis							2	0.1	1.5			
Raneya fluminensis							1	0.1	1.5			
Anchoa marini							1	0.1	1.5			
Leptonotus blanvillanus	1	1.0										
CEPHALOPODS	**1**	**0.3**	**12.5**	**16**	**5.5**	**16.7**	**443**	**12.5**	**30.8**	**28.0**	**1248.3**	**7.8**
Loligo sanpaulensis	1	0.3	12.5	16	5.5	16.7	441	12.5	30.3	28.0	1227.5	15.9
Octopus tehuelchus							2	0.1	1.5			
CRUSTACEANS	**181**	**52.5**	**85.7**	**9**	**3.1**	**50.0**	**238**	**6.7**	**49.2**			
Artemesia longinaris	3	0.9	12.5	1	0.3	16.7	197	5.6	28.8			
Peisos petrunkievitchi	9	2.6	12.5	7	2.4	33.3	24	0.7	15.2			
Peneidae	4	1.2	25.0	1	0.3	16.7	7	0.2	10.6			
Neomysis americana	135	39.1	25.0				6	0.2	1.5			
Pleoticus muelleri							4	0.1	1.5			
Calanoid Copepods	30	8.7	25.0									
OTHERS	**128**	**37.1**	**25.0**	**3**			**8**					
Nereid Polychaetes	128	37.1	25.0	3	1.0	50.0	8	0.2	10.6			
TOTAL	**346**			**291**			**3533**					

Diet Composition: The diet of both transition and weaned calves was found to be less species rich than older animals. The solid diet of transition calves from both habitats was more similar to the diet of estuarine juveniles and adults, suggesting certain dependence of calves on brackish habitats during the transition to solid feeding. An important prey species during this period was the mysid *Neomysis americana* (opossum shrimp), which is very abundant in Bahía Samborombón and also a major constituent of other species' diet in the Rio de la Plata estuary, such as *Micropogonias furnieri* (white-mouthed croaker) (FO%=55%, Sánchez et al., 1991) and M. ancylodon (FO%=88.8%, Leta, 1987). The Argentine red shrimp, Pleoticus muelleri, and A. longinaris are also frequently eaten by juvenile franciscanas in southern Brazil (Bassoi, 1997; Bassoi et al., 2000) and a high incidence of euphausiids characterize the transition diet of harbor porpoises from the Gulf of Maine (Smith and Read, 1982; Gannon et al., 1998). Smith and Read (1992) suggested that these calves eat crustaceans while mothers are feeding on euphausiid predators, a strategy that is likely to occur with Pontoporia and Neomysis. In contrast, the prey species composition of post-weaning calves from both habitats resembles that of juvenile and adult franciscanas from marine habitats. (Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002).

Sexual differences in the frequency of occurrence (%) of selected prey species. Table previously published by Rodríguez, et al. LAJAM 1(1): 77-94, Special Issue 1, 2002

Prey Species	Marine		Estuarine	
	Males	Females	Males	Females
M.furnieri	15.4	16.7	63.2	69.2
C.guatucupa	76.9	83.3	52.6	30.8
P.brasiliensis	30.8	8.3	36.8	7.7
U.brasiliensis	23.1	41.7	21.1	30.8
U. canosai	7.7	8.3	10.5	46.2
L.sanpaulensis	76.9	50.0	0.0	0.0
A. longinaris	23.1	58.3	21.1	30.8