2.4. Capture of wild and orphaned lynx and transport for release

2.4.1. Captures of wild and orphaned lynx

2.4.1.1 General principles

The handling of the lynx must respect all legal requirements and best practice experience. The animals have to be surveyed during capture, quarantine and transport, and receive medical treatment whenever required by experienced veterinarians. The whole capture team should strive to update their skills by regular exchange with other experts or further training. Reasonable precautions for possible emergency cases have to be established. Any of the below mentioned lynx trapping methods should be implemented only after consultation and approval from the appropriate authorities.

2.4.1.2. Season for captures in the wild

The appropriate time window for indiscriminate lynx captures for translocations is February to March of the year. This ensures that pregnant females are not put in danger of abort and that family groups are not disrupted before the juveniles are old enough to survive independently. If it is possible to ensure a selective capturing of males or subadults, the season for captures can be the whole year. Female lynx without cubs may also be caught in winter, if enough data from camera trapping is available to ensure that they have not reproduced or lost their cubs early during the year.

2.4.1.3 Capture systems and equipment

Fig. 2.4.1.1 A Foot snares, B tele-guided dart gun, C box traps installed on forest roads (Signer et al. 2021).

Kommentar [KV1]: Figure will be redesigned

Box traps

Box traps are the oldest live-trapping method for lynx. Captures with box traps are generally maintenance-intensive and indiscriminate, although males are more likely to be caught with box traps than females: 70% of all captured lynx in Switzerland (Breitenmoser & Breitenmoser-Würsten 2008) and 77% of all lynx caught in the Carpathians (Kubala et al. in prep.) are males. For historical reintroduction projects, captures using box traps were already carried out from the second half of October (Zatroch 2014). However, lynx trapping has been historically realized as a management tool of the lynx population (in the Slovak Carpathians) along with legal hunting of this species and the potential breaking of family groups was not sensitively considered (Hell & Slamečka 1996).

The boxes are typically set on forest roads, paths or wildlife walkways in places where a forced passage can be created. The passage around the boxes is blocked from both sides by natural vegetation from the capture site or camouflage nets (Figure 2.4.1.1 C). Traps are most often made from a waterproof plywood and a steel frame (for box parameters and further info on materials used see LIFELynx 2018a, b, Breitenmoser et al. 2020, and Signer et al. 2021). The use of metal bars or wire mesh is not recommended for the risk of injuries (especially the risk of breaking canines). Paddle doors move within metal rails and provide fast closure of boxes and are generally light-tight with sufficient air ventilation. The doors have to be cushioned to prevent injuries to animals getting under them. Olfactory attractants e.g., lynx scat and urine or valeriana (*Valeriana officinalis*), catnip (*Nepeta cataria*) and castoreum may increase the likelihood of lynx capture. Boxes are triggered/activated by a nylon string that is stretched in the middle of the inner part of the trap. The string is connected with a latch lock that holds the paddle doors and releases them when triggered. Small lockable windows are left in both paddle doors for visual inspection. When captured, lynx are immobilized through these holes with a blow pipe.

Box traps are constantly monitored with GSM transmitters (see Breitenmoser et al. 2020, and Signer et al. 2021) and tested daily for its functionality via a control message. Triggering the system will send an info SMS to the capture team and local contacts (ranger, hunter or forester) who will check the trap as quickly as possible and release any non-target species. When lynx are captured, the capture team will be informed as soon as possible. Depending on the site and accessibility, the capture team has to be in place within 2-4 hours (LIFELynx 2018a, b, Breitenmoser et al. 2020, Signer et al. 2021). This process can be accelerated with species identification using MMS or cloud camera traps. Boxes are often monitored by radio cameras to record the behaviour of lynx and of other animal species in the immediate vicinity to the traps. Box traps are regularly checked once every 5-7 days. Nevertheless, after snowfall and freezing rain the traps are checked daily or as soon as possible to maintain their functionality.

Kommentar [KV2]: Reviewers have identified the need for a broader discussion on the maximum time a lynx can stay in a box trap. This discussion should weigh animal welfare arguments against logistic constraints and safety issues in the Carpathian source countries, where road access is very restricted and there is the risk of running into bears when checking box traps during the night.

Compared to mesh wire traps that were used historically, closed, plywood boxes with smooth walls are much safer. No broken teeth or other injuries were recorded except of a few broken claws and scratches, and the animals are protected against cold or rain (Signer et al. 2021). However, portable metal mesh box traps typically used for live-trapping foxes can be practical for capturing orphaned or injured lynx. These devices are not demanding on logistics and can be placed directly in places where these animals appear (mostly on the periphery of settlements, in gardens, barns or chicken coops). If the traps can be continuously monitored with VHF transmitters or a GSM system (see above) and the capture team reaches the lynx within a few minutes, the risk of injuries using this method for catching young lynx and animals in bad body condition is low.

Foot snares

Foot snares placed around fresh lynx kills are very species-specific and non-target captures are very rare (Breitenmoser et al. 2020, Signer et al. 2021). They are also more effective for capturing female lynx than box traps. If a camera trap can be installed before the capture, information on sex and identity of the lynx can already be taken into consideration. Foot snares are considered an efficient and generally safe capture method (LIFELynx 2018a, b, Breitenmoser et al. 2020, Signer et al. 2021). Due to the quick reaction of the capture team, which is at the lynx within a few minutes, this method generally causes no or only minor injuries.

This trapping device consists of several parts (Figure 2.4.1.1 A). The lynx is captured by stainless steel cable, which is placed in the groove on the jaws (for further info on its parameters, installation and use see Breitenmoser et al. 2020 and Signer et al. 2021), which serve as a throwing mechanism. The wire is thrown over the animal´s foot after the trigger mechanism was initiated (by stepping on it). The spring in the bar part accelerates the pull effect of the wire, but acts also as a shock absorber when the captured lynx tries to escape, and prevents immediate foot injuries. Wires used to capture are replaced by new ones after each capture. Overall, two to four camouflaged foot snares are set near the lynx kill (Figure 2.4.1.1 A). The bars are fixed according to the capture site´s conditions with steel wire to the trees or ground screws. During the placement of foot snares, the capture team should consider the extent of lynx movement so that the animal cannot maneuver itself into a dangerous position while in the snares (i.e. jump over a fence or into a water body). The traps are continuously monitored with VHF transmitter or a GSM system (see Breitenmoser et al. 2020, Signer et al. 2021), similar as for the boxtraps. The capture team waits at a sufficient distance to reach the capture site within 5-15 minutes, and immediately responds to the alarm. The captured lynx is either immobilized by the catch net and narcotized by syringe, or directly by the blow pipe. Foot snares are often monitored by infra-black/infra-red video cameras to record the behaviour of lynx before and during the capture.

Tele-guided dart gun - MICS (Minimally invasive capture system)

In order to catch trap-shy lynx, KORA has developed a new selective capture system, the MICS – a remote-controlled blowpipe (MICS = Minimally Invasive Capture System; Figure 2.4.1.1 B; Ryser et al. 2005, Breitenmoser et al. 2020, Signer et al. 2021). This tele-guided dart gun can be remotely controlled from a distance of up to 800 meters via a screen and is used for the lynx tranquilization on an actual lynx kill. Using a built-in camera on the shooting device and a screen on the control device, precise shots with tranquilizer darts are possible up to a distance of 25 meters. Moreover, an infrared camera and an infrared spotlight are included as well. A laser pointer is used to calibrate the shot and must be readjusted to the selected shooting distance for each capture attempt. The motion detector alerts the on-site capture team when an animal approaches the kill. An automatic heater prevents the anesthetic from freezing to a temperature of -25°C.

Since the MICS has to be controlled by hand - albeit over a long distance - the device is constantly monitored. A motion detector monitors the area around the lynx kill and alerts the capture team either acoustically or visually. The dart is fired in the rear flank of the animal and it allows the targeted tranquilization of a single lynx, for example from a family group. The distance for shooting is determined to be as small as possible, preferably 4-10 meters. The narcotic Dart has a built-in mini VHF transmitter (for further info see Breitenmoser et al. 2020, and Signer et al. 2021) that allows it to be tracked as it moves away from the kill. After the shot, it is necessary to wait at least 20 minutes, before the capture team starts looking for the animal to give the anesthetic enough time to take its effect.

The advantage of MICS is that no change needs to be made to the prey (or any other spot where an animal to be captured lingers for a moment). However, since the animal is not physically restrained when it is caught with the MICS, the device is not used if there are dangerous terrain structures in the immediate vicinity (+/- 200 meters), such as strongly frequented roads, watercourses or steep rocky outcrops. However, MICS is also an extremely stress-free capture method. Since the animals hardly realize what is actually happening, the stress level is very low (Ryser et al. 2005).

2.4.2 Handling and clinical examination

2.4.2.1 Anesthesia

For lynx, anesthesia is conducted through a combination of sedatives and narcotics. Prior experience has shown that this combination leads to a reliable, low-risk anesthesia in all lynx age groups, including animals in poor health condition (Ryser-Degiorgis et al. 2021). Detailed protocols for anesthesia were developed in Switzerland (Breitenmoser et al. 2020, Ryser-Degiorgis et al. 2021) and used in a modified form in the Carpathian and Dinaric Mountains (LIFELynx 2018a, b). These anesthesia protocols are well established and have been safely used (e.g., Vogt et al. 2016, Ryser-Degiorgis et al. 2021). The entire process of lynx immobilization with the administration and monitoring phase as well as the termination of anesthesia is described in detail in LIFELynx (2018a, b), Breitenmoser et al. (2020), Ryser-Degiorgis et al. (2021) and Signer et al. (2021).

2.4.2.2 Clinical examination

During the immobilization, it is necessary to carry out all the examinations and procedures on the lynx for which they were captured. Captured animals are examined clinically by veterinarians, with particular attention to their general appearance, body condition, size and weight, tooth wear and genitals (see LIFELynx 2018a, b, Breitenmoser et al. 2020, Ryser-Degiorgis et al. 2021, Signer et al. 2021). Samples are taken for genetic and veterinary analyses. For details on clinical examination, sampling and lab analyses see chapter 3.5 Quarantine.

2.4.2.3 Treatments (vaccinations, antiparasitic treatment)

All lynx captured in the Slovak Carpathians as well as animals selected for translocation in/from Switzerland receive an antiparasitic treatment (for more info see LIFELynx 2018b, Ryser-Degiorgis et al. 2021, and Signer et al. 2021). Any necessary wound treatment is made at this time point. Other medication (including antibiotics) is not administrated unless it appears appropriate based on the clinical findings. Vaccination (e.g., rabies) is only foreseen if authorities of the recipient country require it. For details on treatments see chapter 3.5 Quarantine.

2.4.2.4 Aging and selection criteria

During anesthesia, lynx can be aged by their tooth development and wear (Figure 2.4.2.1). Lynx in a normal body condition (adult males may be thinner during the mating season), aged more than one year but no more than 13 years old, and without significant clinical abnormalities (see Ryser-Degiorgis et al. 2021), are considered as adequate for a transfer to quarantine facilities (Figure 2.4.2.2). The genetic profile of all animals is analyzed. In case of close relatedness (brother and sister; mother/father and offspring) with other lynx already translocated or simultaneously kept in quarantine for translocation, the animal is excluded from the programme and released at the capture site (see LIFELynx 2018a, b, Breitenmoser et al. 2020, Ryser-Degiorgis et al. 2021, Signer et al. 2021). If several translocation projects are ongoing at the same time, cooperation between projects offers the possibility to release closely related animals in different project sites. The Linking Lynx Sourcing Working Group provides coordination for the sourcing of wild and captive Carpathian lynx for reintroduction/reinforcement projects.

Kommentar [V3]: Figure 2.4.2.2 represents the state of the art at the time of the Bonn conference in 2019. Meanwhile, this selection scheme is already a bit outdated and needs an update. Collaboration between sourcing wg and health wg on this flow chart would be useful.

2.4.2.5 Handling problems

Each immobilization is associated with a risk of partly species-specific side effects and complications (for further details see Kreeger & Arnemo 2012). Emphasis is placed on animal monitoring and incident prevention. If, however, a problem occurs, priority is given to the animal´s health and other actions are cancelled/discontinued. Prior to the capture season, all capture team members are informed about the emergency measures and actions, as well as on the contents of the medical preparations and equipment. Various complications may potentially occur. Lynx can be injured in a trap or complications may arise in relation to anesthesia. The most common cases are associated with thermoregulation, insufficient respiration, or problems with the circulatory system. In addition, animals may vomit, inhale foreign objects, or have convulsions. Complications can generally be prevented by taking appropriate measures. These important emergency measures are summarized in the anesthesia protocols (see LIFELynx 2018a, b, Breitenmoser et al. 2020, Ryser-Degiorgis et al. 2021 and Signer et al. 2021). Many of the potential problems are due to excessive stress caused by capture, inappropriate placement or handling, and side effects of narcotics. Although stress cannot be completely eliminated, it is possible to minimize it by means of the appropriate approach and behaviour of the capture team and a proper placement of the animal.

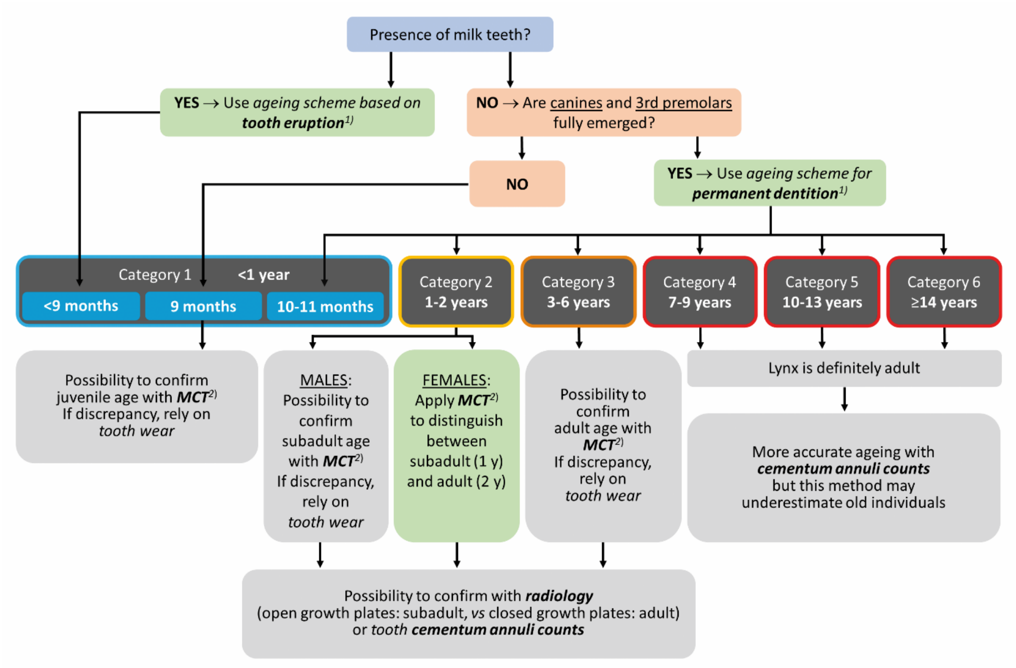

Fig. 2.4.2.1 Diagram for the aging of lynx according to Ryser-Degiorgis et al. (2021).

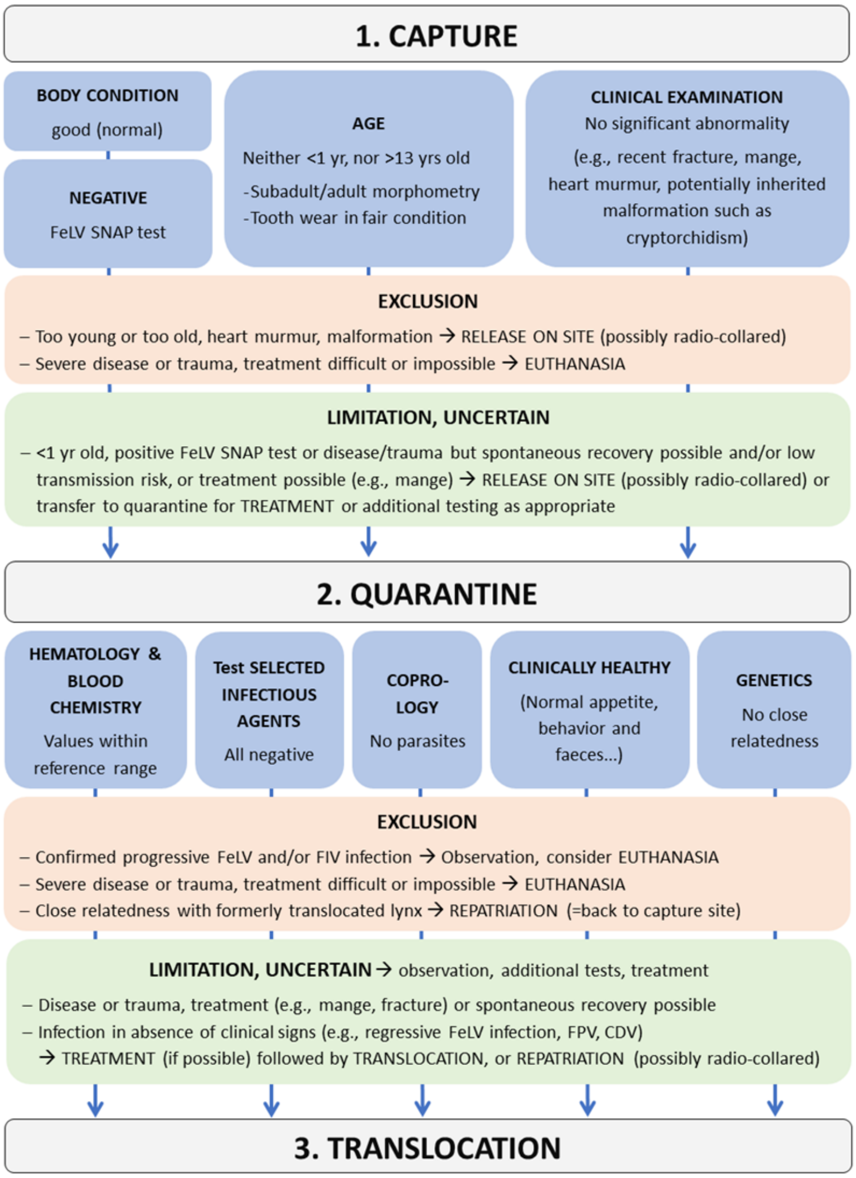

Fig. 2.4.2.2 Selection criteria currently applied for translocation of lynx from Switzerland. FIV: Feline Immunodeficiency Virus; FeLV: Feline Leukaemia Virus; FPV: Feline Parvovirus; CDV: Canine Distemper Virus (Ryser-Degiorgis et al. 2021).

2.4.3 Transport

Transport is always an extraordinary burden especially for wild animals and can lead to stress-related hyperthermia and, in the worst case, death. Since the possibilities for surveillance and intervention are limited during transport, attention must be paid to the transport infrastructure and the conditions during transport, especially:

- Lynx must not be transported in an anesthetized state. Before the transport starts the animal

must be able to sit and hold his head in an upright position.
- The transport box is constructed in a way to prevent tooth and claw injuries and is placed safely and fixed (for more info on transport box see LIFELynx 2018a, b, Breitenmoser et al. 2020, Ryser-Degiorgis et al. 2021, Signer et al. 2021; Figure 2.4.3.1.)
- adequate access to the box and the transport space itself is ensured
- fresh air supply is provided (electric fans or external quiet fans are very practical)
- The animal is kept in as much darkness as possible (but note the air supply!). Overnight transports are the most suitable for long distances, however, changing light conditions are not necessarily an advantage
- The lynx is not disturbed during the transport. The necessary supervision must be discreet and should only be done when necessary (use of infra black and thermographic cameras is recommended). The calmest and quietest environment possible is ensured. Noise (particularly human voices) in the hold should be avoided. If possible, external noises are also minimized (through effective route planning and selection).
- The transport is handled smoothly, transport time is minimized and the journey is interrupted only if absolutely necessary (several drivers during longer transports are available).

Even if all requirements are met, the animal must be observed regularly and, depending on its behaviour, one or the other measure must be taken. A conscious animal (in contrast to an animal under anaesthesia) has no problem with cool temperatures, but hyperthermia is a major risk. The interior of the vehicle should therefore be cool (no more than 15-20 °C; Figure 2.4.3.2). If the transport takes place when the outside temperature is high an air-conditioned vehicle must be used. If outside temperatures are low, car windows should be open to allow air circulation. Moreover, a healthy lynx does not need food during the transport and with a journey of 8–10 hours at a moderate temperature also does not have to drink (Signer et al. 2021). However, if the animal is hyperventilating and there is a risk of hyperthermia, there must be an opportunity to offer cold water. In this case, the journey must be interrupted, and the box removed from the car to a shady and cool place and ensure maximum ventilation.

Documents requested for transport of animals

- TRACES (LifeLynx 2018)
- CITES for transport between EU and non-EU country (Signer et al. 2021)
- For the transfer within the EU, CITES or other species protection documents may also be necessary. This is the responsibility of the respective state authorities.

Fig. 2.4.3.1 Pictures of a transport box for lynx. Depending on the circumstances, to allow enough air to circulate in the box, one door can be opened as much as necessary, as shown in the pictures.

Fig. 2.4.3.2 Outside air is caught to ventilate the transport box to prevent hyperthermia during transport.

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