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

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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 must 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 reduces the risk of abortion in pregnant females and ensures 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 throughout autumn and 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

Box traps

Box traps are the oldest live-trapping method for lynx and were used for historical reintroduction projects (Zatroch 2014). 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.

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 A). 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 due to 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.

Fig. 2.4.1. Capture systems. A) box traps installed on forest roads, B) Foot snares, C) tele-guided dart gun (MICS).

Box traps are constantly monitored with GSM transmitters (see Breitenmoser et al. 2020, and Signer et al. 2021) which are tested daily for functionality via a control message. In addition, box traps are physically checked once every 5–7 days. Nevertheless, after snowfall and freezing rain the traps have to be checked daily or as soon as possible to maintain their functionality. Triggering the system will send an info SMS to the capture team and/or local contacts (ranger, game warden, hunter or forester) who will check the trap as quickly as possible and release any non-target species. When a lynx is captured, the capture team will be informed immediately and should strive to limit the amount of time the lynx has to spend in the trap (and thereby its stress) as much as possible, while taking into account human safety (e.g., presence of bears) and national animal welfare legislation (for best practice examples see: LIFELynx 2018a, b, Breitenmoser et al. 2020, Signer et al. 2021). The process can be accelerated using species identification via MMS or cloud camera traps or by involving personnel close to the capture area. Boxes can also be monitored by radio cameras to record the behavior of lynx and of other animal species in the immediate vicinity to the traps.

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 for a few splintered claws and scratches. Animals generally remain quiet if they are in the dark and do not see an opening for escape. The plywood traps also provide shelter against cold or rain (Signer et al. 2021) but animals can overheat or dehydrate if outside temperatures are warm and they are left for hours inside the box trap. 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 more effective for capturing female lynx than box traps and non-target captures are very rare (Breitenmoser et al. 2020, Signer et al. 2021). 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 (LIFE-Lynx 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 (such as skin abrasions or superficial lesions in the oral mucosa).

This trapping device consists of several parts (Figure 2.4.1 B). The lynx is captured by a 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.B). 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 box traps. 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 with a net and narcotised by syringe, or directly by the blow pipe. Foot snares are often monitored by infra-black/infra-red video cameras to record the behavior 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 C; 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 m via a screen and is used for the chemical immobilisation of lynx on an actual lynx kill. Using a built-in camera on the shooting device and a screen on the control device, precise shots with blow darts are possible up to a distance of 25 m. For lynx, which are rather small targets with a fast reaction time, the device is usually used at distances between 3–10 m. 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 anaesthetic 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 immobilization of a single lynx, for example from a family group. 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 the lynx to be tracked as it moves away from the kill. After the shot, it is necessary to wait 7–10 minutes (see protocol *3.6 Anaesthesia*), before the capture team starts looking for the animal to give the anaesthetic 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 metres), such as strongly frequented roads, railways, watercourses or steep rocky outcrops. However, MICS is also a very low-stress capture method since the animals do not go through the stress of any physical immobilisation (Ryser et al. 2005).

For **chemical immobilisation** and **clinical examination** see protocols *3.6 Anaesthesia* and *3.7 Clinical examination.*

2.4.1.4 Prevention of capture-related problems

Emphasis is placed on good preparation and incident prevention. Therefore, thorough instruction of new team members and regular further education for all personnel engaged in lynx captures is essential. Everybody should be familiar with the used capture systems and equipment, the associated risks and the emergency measures. This also involves procedures on how to deal with a human emergency (e.g., bite wounds, accidents with narcotic drugs). All capture team members should be informed about the normal range of lynx vital rates under anaesthesia (see protocol *3.6 Anaesthesia*) so they can recognise potential problems.

If, despite prevention and attentiveness, a problem occurs, priority is given to the animal's health and other actions (e.g., sampling, collaring) are cancelled/discontinued. Various complications may potentially occur: lynx can be injured in a trap, the trapping procedure can take too long, weather conditions can be adverse or complications may arise in relation to anaesthesia (e.g., problems with thermoregulation, insufficient respiration, etc.; see protocols *3.6 Anaesthesia* and *3.7 Clinical examination*). Consideration of potential risks at the trapping site, a quick reaction once the lynx is in the trap and efforts to reduce stress (e.g., no talking, no unnecessary handling) can prevent many problems. Also, consideration of the weather conditions is essential. For example, shelter and a heat source (e.g., hot water bottles) may be needed during anaesthesia or box traps may have to be closed during periods with extremely low temperatures.

When the animal is to be released on site after a foot-snare or MICS capture, the release site should be safe (e.g., no strongly frequented roads, no cliffs, no water-bodies nearby) and allow discreet observation of the animal during the wake-up phase. It may be necessary to move the animal from the capture-site to a safer location which should already be chosen before the lynx enters the trap. In the case of box trap captures, the animal can spend the wake-up phase within the box trap and can be released once it is stable enough to safely navigate the surrounding terrain.

2.4.2 Transport

Transport is an extraordinary stress for any animal, but especially for wild animals, and can lead to stress-induced hyperthermia, cardiovascular problems or even death. As the possibilities for monitoring and intervention are limited during a transport, special attention must be paid to the transport infrastructure and the conditions during transport:

- Transports under anaesthesia should only be considered for very short transport times (<30 minutes) and require continuous anaesthesia monitoring (see protocol *3.6 Anaesthesia*). For longer transports it is highly recommended to wait until the lynx regained rightening reflexes and is able to sit up.
- 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; Live Animal Regulations (LAR) – IATA, Figure 2.4.2.)
- The application of short-acting tranquilizers such as acepromazine in a dosage of 0.1 mg/kg approximately 20 minutes before transport decreased incidents of self-inflicted claw and tooth injuries to zero and resulted in a much quieter behaviour (typically settling down in a sternal recumbency, placing the head in the air flow of the fan and keenly observing the environment; I. Marti, pers. Comm.).
- Adequate access to the box and the transport space itself is ensured.
- Fresh air supply is of major importance and can be achieved by a combination of open car windows, adjustable doors in the transport box (Fig. 2.4.2) and electric or external quiet fans (Fig. 2.4.3).
- The animal is kept in as much darkness as possible (but note the air supply!). Overnight transports are the most suitable for long distances.
- 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 minimised 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). 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. A healthy lynx does not need food during the transport. To compensate for possible fluid deficits during longer transports, a subcutaneous fluid depot of 10–20 ml/kg body weight might be placed during anaesthesia before transport. 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 2018a, b)
- 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. 2.4.2. Pictures of a transport box for lynx. Depending on the circumstances, to allow enough air to circulate in the box, the front and back door can be opened as much as necessary. Transports are usually conducted with the door in the mid-way position.

Fig. 2.4.3. Outside air is caught by an external quiet fan (see tube) to ventilate the transport box to prevent hyperthermia during transport.

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