WILDLIFE REHABILITATION BULLETIN

ARTICLE

Rehabilitation and release of orphan golden jackal pups (*Canis aureus*)

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Abstract

Hand-raising wildlife orphans require expertise and knowledge of the species concerned. In this paper, we describe the successful hand-raising of three golden jackal pups subsequently released back to the wild. The pups were nursed using a commercial canine milk replacer for puppies. The average weight gain of the jackal pups was 3.96 g (±0.32) per day during the milk feeding period and 22.71 g (±1.03) per day after they were weaned and solid food was given. They were housed in a medium-sized cage (48 × 36 × 36 in) with a refuge den until they were 3–4 months old and then moved to a larger outdoor enclosure (22 × 10 × 10 ft). To create fidelity to the release site, they were held in a transit cage (8 × 6 × 6 ft) for 36 days at the release site. They were about a year old at the time of release. Two of them (male and female) were radio-collared, but the collars failed the day after release. The females moved away from the male four days post-release, as evidenced by the camera trap images. The male was sighted two months post-release with the damaged collar on, but the fate of the two females could not be ascertained. Data on the post-release survival and ranging pattern could not be established due to the compromised radio collars.

Keywords

Golden jackal; *Canis aureus*; nursing; wildlife rehabilitation; post-release monitoring

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Abbreviations

IFAW-WTI,	International Fund for Animal Welfare-Wildlife Trust of India
CWRC,	Centre for Wildlife Rehabilitation and Conservation
PVC,	polyvinyl chloride

Introduction

The golden jackal (*Canis aureus*, Linneaus 1758) is one of the most common carnivore species found throughout most of its range in all climatic zones and vegetation types, including those that have been altered by humans. Their distribution ranges eastwards through Iran, Central Asia and the entire Indian subcontinent east and south to Sri Lanka, Myanmar and parts of Indo-China (Jhala & Moehlman 2004). They are opportunistic and frequently enter human settlements at night to feed at garbage dumps or scavenge on livestock or carcasses (Joshi et al. 2015). The species is not threatened or near to threatened, and it is classified as Least Concern on the IUCN Red List of Threatened Species (Hoffmann et al. 2018). In the southern parts of Western Ghats, Pillay et al. (2011) reported localized declines in population and range, resulting from agricultural expansion and human settlements. However, they can survive in an altered habitant, such as those with large human population densities and extensive cultivation (Jaeger et al. 2007). They are also seen outskirt of some of the major cities in India (Ojha et al. 2017; Debata 2021; Gonji et al. 2024).

On 28 March 2021, a team from Assam State Zoo, Guwahati, Assam, admitted four orphan golden jackal pups to IFAW-WTI-operated Mobile Veterinary Service, a satellite station of CWRC, Kaziranga, station at Wildlife Transit Home, Choraikhola, Kokrajhar, for rehabilitation. The mother was killed, and the pups were reportedly transported to the market for sale from Garbhanga Reserve Forest in Assam. A local resident later handed over the pups to the Assam State Zoo. The centre receives injured, orphan and displaced animals to provide necessary care due to a variety of causes. The rehabilitation of such orphan pups addresses both the individual's welfare and the conservation of the species. A suitable nursing milk formula, husbandry protocol and rehabilitation method are key to the successful release of rehabilitated animals back into the wild (Trendler 2005).

Nursing and veterinary care

The pups, two male and two female, were less than a week old at the time of admission to the centre. Their eyes opened six days post admission. Jackal pups are known to open their eyes at about 10 days post-parturition (Moehlman 1987; Negi 2014). Soon after their arrival, they were placed inside a plastic crate (24 × 16 × 14 in) with a soft blanket to keep them warm. All pups were raised with canid milk replacer for newborn puppies (Absolute

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Milk, Drools, IN). They were initially fed six times per day at 20% of their body weight until their eyes opened. The feeding frequency was gradually reduced to four times per day, which continued until four weeks of age. After this, the pups were fed once daily until about eight weeks of age as shown in the Table 1. Puppies were encouraged to urinate and defecate by gently massaging the anogenital region with a moistened cotton ball or washcloth. They were fed in a sternal position (Fig. 1) to avoid the risk of aspirating the formula (Gage 2002). Lactobacillus oral suspension (Hatvet Pharma, IN) was prescribed for the first two weeks of admission, followed by a multivitamin and amino acid drop, ZipVit drop (Intas Pharmaceuticals Ltd, IN) twice per day as required. At the age of eight weeks, they were introduced to minced meat and chicken liver. Jackal pups are normally weaned at the age of 8–9 weeks (Moehlman 1987). Milk replacer was gradually discontinued, and solid food was introduced. At two months of age, all pups received the Canigen® DHPPi vaccine (Virbac, IN), followed by a booster shot after one month. Mite infestation was noticed at the age of about 2.5 months. The condition was treated with Neomac Inj (Intas Pharmaceuticals

Table 1 Nursing schedule and veterinary care.

Day of admission	Quantity of reconstituted milk	Frequency of feeding reconstituted milk per day	Quantity of meat	Frequency of feeding dressed meat/entire carcass/ live prey per day	Medical issues and treatment followed
0th day	8 mL	6 times	-	-	Lactobacillus oral suspension (Hatvet Pharma, IN) administered from day 2 of admission
6th day	10 mL	6 times	-	-	Two pups (male and female) eyes opened
7th day	10 mL	6 times	-	-	Two pups (male and female) eyes opened
14th day	12 mL	5 times	-	-	Administration of ZipVit syrup (Intas, IN)
30th day	15 mL	4 times	-	-	-
45th day	20 mL	2 time	Minced meat/piece of liver	Once	Administration of Digyton syrup (Himalayan, IN)
60th day	20 mL	Once	Minced meat/piece of liver	Twice	Inject Canigen® DHPPi vaccine (Virbac, IN), repeated a month later
66th day	-	-	Meat at the rate of 15% of body weight	Twice	Developed mite infestation over the forehead. Inject Neomac (Intas, IN) subcutaneously; single dose
75th Day	-	-	Meat at the rate of 15% of body weight	Once	-
90th day	-	-	Meat at the rate of 15% of body weight	Once	-
154th day	-	-	Meat at the rate of 15% of body weight	Once	*Presence of Ancylostoma spp. and Dipylidium spp. ova in the scats of all pups (+ to ++) and deworming*
179th day	-	-	Meat at the rate of 15% of body weight	Once	Surgical intervention of olecranon bursitis
226th to 345th day or day of release	-	-	Meat at the rate of 20% of body weight	On alternate days	-
345th to 350th day (supplementary food inside the transit cage after release)	-	-	One kg	Daily for five days	-
351st to 356th day (supplementary food inside the transit cage after release)	-	-	One kg	On alternate days	-

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Ltd, IN). Deworming was done with Eazypet (Intas Pharmaceuticals Ltd, IN) tabs at frequent intervals after examining the stool. All of them suffered due to olecranon bursitis at about 5–6 months of age. The predisposing factor could have been the hard wooden floor of the refuge den. The condition required surgical intervention, and recovery took one month (Baro et al. 2022).

Housing and enrichment

Once solely dependent on solid food, they were moved to a medium-sized cage (48 × 36 × 36 in) with a refuge den. At the age of 3–4 months, they were shifted to an outdoor large enclosure (22 × 10 × 10 ft) where human contact was reduced to a minimum. For the development of their hunting abilities, they were given a dead and live prey once per week like chicken and pigeon. The outdoor enclosure, which was remotely located, was furnished with tree stalks and branches as well as a wooden hideout. Since there must be as little visual contact as possible with the animal keepers, a system of remote feeding through a PVC pipe that was strategically adapted from behind a screen or hide cover to ensure minimum contact with animal caretakers was followed (Fig. 2).

Fig. 1 Feeding of jackal pup.

Acclimatization and release

The three healthy pups that survived (one male and two female) were moved to the appropriately surveyed release site in Raimona National Park, Assam, at the age of 10 months for acclimatization. For hand-raised orphan animals, a soft-release approach is preferred, where the animals are held in confinement, provided food and acclimatized to the release site (Trendler 2005). On 30 January 2022, they were moved to a temporarily built medium-sized iron mesh cage/transit cage (8 × 6 × 6 ft) along with a refuge den. To protect the cage from wild elephants, the cage was surrounded by a solar fence. Two of the jackals (female and male) were fitted with ArcTrack Radio Collars (ArcTrack, www.arcturus-telemetry.in) before release. On 8th March 2022, the acclimatized jackals were released by opening the cage door. Supplementary food was provided in the cage for 10 days post-release to help until they managed to find food in the wild on their own. In case the jackals returned to the area after being released, camera traps were also put in place.

Results

One of the most demanding and specialized areas of wildlife rehabilitation is hand-raising of orphan wild animals (Trendler 2005). One male jackal pup died during the stage of nursing due to a debilitated condition, but three of the four jackals survived until the time

Fig. 2 Transit cage with provision for remote feeding and watering.

of release. Selecting an appropriate milk replacer is necessary for hand-raising wild orphans. Published reports reveal successful hand-raising of jackal pups with cow's milk and Royal Canin milk formula (Dhoot et al. 2003; Mohapatra et al. 2019). The average weight gain of jackal pups when on milk was 3.96 gm (±0.32) per day and 22.71 gm (±1.03) per day when fed on solids. The canid milk replacer (Absolute Milk, Drools, IN) was not seen to cause any digestive problems. The pups were slightly underfed initially to reduce the likelihood of the artificial formula causing any digestive upset. The admitted jackal pups showed elimination reflex within one week of admission, whilst this happens at three weeks of age in orphan dogs (Gage 2002). Since orphan pups are vulnerable to mortality within the first 14 weeks (Moehlman 1987), it is critical to closely monitor their health throughout the nursing process. Surviving pups spent 345 days in captivity, including 36 days of acclimatization at the release site. All released jackals showed site fidelity to the acclimatized area. After release, they continued to visit the cage and eat the food placed inside. As mentioned earlier, supplementary feeding was done until they settled into the new area to find food on their own. Food provision progressively decreased over time and stopped after 10 days of release. Whilst the two females stopped visiting the cage four days after release, the male kept coming to the cage for up to 18th days post-release. The team had difficulty collaring the jackals as they enjoyed playing with the collars and ended up chewing the leather belt whilst they were inside the refuge den. Before they were set free, the collar dropped on its own once, inside the cage. The animals were recollared and released after refabricating the collars using a rexine belt with a weak link in between (Fig. 3). However, that also did not work, as both animal's collars failed to signal after release the following day. The authors were unable to determine the reason for the collar malfunction. The two females stayed away from the male after four days, whilst the male was seen alone up to 18th days after release. The last direct sighting of the collared male was after two months of release, next to the forest antipoaching camp about one km from the release site.

Fig. 3 Released jackals captured in camera trap.

Conclusion

Ideal milk replacer and good husbandry practices are the key to successful hand-raising of orphan pups. The risks of getting an infectious disease begin during the solid feeding stage through sources like food, water and interaction with caretakers. As far as rehabilitation in the wild is concerned, the success of an individual establishing itself in the wild can be determined only through radio/satellite tracking. Camera traps are of limited help in the case of small carnivores and species that do not have distinct pelage markings. Camera traps were used in this study only to determine the extent of site fidelity to the acclimatized enclosure. The continued survival of the two females could not be ascertained due to the failure of the collar. The survival of the male jackal also could not be confirmed beyond the two months of its survival in the wild.

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Disclosure statement

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