

Red-flanked Duiker Husbandry Best Practices

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The following information was gathered from current holders of Red-flanked Duiker (*Cephalophus rufilatus*) through an SSP survey. The goal was to gain and share knowledge of current practices regarding management and care of Red-flanked duikers, hereafter abbreviated to RFD, within AZA. This manual is to serve as a husbandry guide for current holders or those institutions looking to potentially acquire these duikers in the future. Each individual animal may have their own unique characteristics to base husbandry around, so what may work for one institution may not work for another. This information is specific to what institutions are doing with RFD, though the care of other duiker species may be similar and provide additional insight. The SSP would like to thank the Birmingham Zoo, Brookfield Zoo, Gladys Porter Zoo, Idaho Falls Zoo, San Diego Wild Animal Park and Zoo Miami for providing their insight.

Environment

Temperatures

Exhibition temperatures appear to vary based on the region of the country they are housed. The most common, and probably a starting point to consider is: <35°F locked in, 35-45°F access to an indoor stall, >45°F and dry locked out. However, in warmer climates these numbers seem to shift about 5-10 degrees warmer, while in the colder climates this range drop by 10-15 degrees. The institution themselves should monitor how their RFDs react to the temperatures of their environment and determine what works best for them, i.e. are they open-mouth breathing because of being overheated or are they shivering because of the cold? Overall, RFD are hardy for a small antelope and seem to tolerate a range in temperatures. One institution reported not locking their duikers inside until it goes below 10°F. Heaters across the board seem to be made available for the duikers when temperatures drop into the 40's.

Reactions to Loud Noises & Vibrations

Noise tolerance seems to be based specifically on the individual animal. Most institutions report a greater reaction to sudden noises as opposed to prolonged, or their duikers overall don't seem to react to noises. A couple of institutions reported that, even with construction around the exhibit, the duikers appeared to have no reaction. More commonly noted is that the duikers respond more to visual cues, such as large crowds or machinery in the area, rather than noise levels itself. This can be mitigated by providing hiding spots or places where the duikers can feel secure from the foreign object in the area.

Holding/Exhibit Information

Outdoor Environment

Of the reporting institutions, almost all use standard 2"x2" chain link as the primary containment feature for their exhibit. The exact material that is used won't make too much difference, as historically a variety of material has been used. Choice of material will be more based on the visual impact that an institution wants based on design. Most importantly is the size of opening of whatever type of material is chosen, which should be close to that 2"x2" size. The opening size can be larger for adult animals, but breeding pairs should be kept towards the 2"x2" opening size to prevent any issue with calves. The material that ends up being used should at a minimum be at least 6 feet in height if the exhibit is open topped. Though small in size, RFDs have jumped fences that are about 4 feet in height as a reference. You should also be aware of any features that could act as steps for the duikers to climb out of the exhibit. Some have been willing to climb up rockwork in the past, though is not typical.

The overall size of exhibits vary greatly, there are advantages to smaller exhibits, but also advantages to having large exhibits. Exhibits have been as small as 500 square feet, but have also been as large as 15,000 square feet. Even at that smaller size, pairs of animals have done well. At a minimum, the SSP would suggest an exhibit around 1000-2000 square feet, as long as there is also off exhibit holding.

Most exhibits tend to have a dirt or grass base substrate, many with trees to help with shade. It is also important to have additional "hiding" areas for the duikers to feel comfortable. This comes in the form of bushes, tall grasses, bamboo or some sort of structure to provide the cover.

Indoor Environment

Indoor stalls are important to provide cover during various parts of the day or year, or to help with management, though not all current holders report having an indoor stall available directly off an exhibit. As with exhibit sizes, stall size can vary. Most institutions report having multiple stalls available that can be connected when needed and that are anywhere from 50-100 square feet each. Most of these stalls typically have a concrete base where institutions provide rubber mats, shavings, mulch, hay or sand for some softer substrate in the stall (though doesn't need to cover the whole floor). Some institutions have a dirt floor instead, so options exist. Wall construction varies but facilities are reported to use wood or concrete block most often.

As with the exhibit, "hiding" areas are also important for when inside with often take the form of crates, dog igloos, or potted plants. One institution also suggest the use of hay bales for this purpose. In these stalls, for more northern climates, are heaters for when temperatures drop.

Best "positive" tips:

- They love bedding and most often are seen nesting within it,
- Give them space to get away from you if they want to,
- Provide hiding spots
- Calm movements when working around them,
- Provide training sessions and continued desensitization.

Key "negative" things to watch out for:

- make sure that gaps between fence lines and the ground are covered as they can squeeze through smaller gaps
- no quick movements while around them and avoid sudden noises
- don't put them in situations where they can't hide.

Keepers Also Take Care Of ...

The keepers that take care of RFD as part of their daily routine most often take care of other hoofstock. However, it is very common that these keepers also take care of a variety of birds, probably because this species can do well in aviaries. Some places also have them on routines with other small mammals/primates or marsupials.

Other Species Housed Directly with RFD's

Hoofstock: female blue duiker and male or female yellow backed duikers, female steenbok, female sitatunga, female gerenuk.

Birds: secretary bird, kori bustard, black crowned crane, blue crane, red crowned crane, demoiselle cranes, Abyssinian ground hornbill, silvery cheeked hornbills, helmeted guineafowl, various waterfowl.

Primates: BeBrazza monkeys, guenons

RFDs have in some cases been noted to not work well with male steenbok or male gerenuk, as well as male duikers of different species, especially if females are present. There can also be issues with cranes during breeding season if the duikers do not avoid the nesting area.

Transportation

Transporting RFDs between institutions can successfully be done via land or by air. For ground transport, more often the duikers are crated before going onto a trailer. This helps them feel like they are in a dark safe space. Ground transports have lasted up to 3 days without issue when crated. However, depending on the length of the journey, they can also be placed in a stall of the trailer with lots of bedding. If the journey will be longer than 24hours, food should be made available, as well as water. If under 24hours it is up to the institution, but they seem to travel fine without food though still should be given alfalfa in the crate. Water should always be provided.

If flying by air, the institution should follow the IATA regulations Container Requirement 73. When flying, plastic kennels are technically not IATA approved though it has been done in the past. Though plastic kennels are a safe mode to transport, the SSP would not suggest trying to use it during flights to avoid any delays it could cause.

Tips For a Successful Transport

Crate train the duikers and give them time to adjust to the crate itself. Openings/air holes of a crate should be covered with a breathable material to help them feel more secure. Bed down the crate heavily which will help with traction as well as a secure place to lay down. Oral haloperidol has been given in the past up to 72hours prior to departure; this seems more valuable during flights then a land based transport.

Tips When Building a Crate

The crate should be nice and dark with good airflow, while being big enough for the duiker to stand/sit and turn around if they choose, but not to big that they might be able to hurt themselves (i.e. jump). Cover any air holes with shade cloth or similar to help with the darkness effect. To help with traction, secure carpet or a rubber mat to the base; you can also add foam padding to the top of the crate to help prevent injury if they decide to jump. Make sure that a door is present on each end of the crate to help with the crate training, guillotine doors seem to be more useful than swing doors.

Social Structure

How Managed

Currently, most RFDs are managed in breeding pairs based on the need of the SSP. However, RFDs can do fine independently as they are naturally a solitary species. Female pairs have done well in the past, but male pairs have not been reported to be successful at this time. Breeding pairs seem to be fine with their offspring for a period of time, so institutions don't need to separate a male during a birth period (though your male may show you a different behavior that would require it). Female offspring tend to be separated from their father by around 8-10 months to ensure that they do not breed, as females have gotten pregnant at about 1 year old. Reports for male offspring vary, where some institutions have to separate when 5-7 months old where others have successfully housed a male offspring with the dam/sire for 2 years.

What Makes Them Successful

Overall, groups of duikers are easy to manage, and don't take too much time or energy to maintain. To aide with these pairings, simple tricks like giving different places to naturally separate from each other adds great

value. Having separate feeding stations for each animal helps, which is also useful if managed with another species. This can take the form of simply separate bowls or placing the bowls in hiding areas such as crates. When managing offspring, it is better not to separate young for long periods of time, families should remain as a group as much as possible, unless they want to freely separate themselves. Training sessions with keepers also allow for RFDs to remain calmer and adapt more quickly to changes. It also has been shown that seeing another duiker participate in a training session helps some to be more confident and can eventually lead more standoffish duiker to start participating in training.

Tips for Successful Introductions

Putting breeding pairs together for the first time normally goes very smoothly with little or no preparation. However, that doesn't mean that you shouldn't monitor initial interactions as well as having the ability to easily separate them if things go wrong. If an institution chooses to take a slower route to introductions, that is fine, and may be needed based on the general behavior of the duikers.

If you choose to hand-rear a RFD calf, this can be done in visual contact with other RFD, or they can be maintained with other smaller ungulates. This longer term has been said to help with behavior and integration within a pair in the future.

Diet

Diets in general for all duiker species vary greatly between institutions and is no different for RFD. In general, like other hoofstock, diets should as much as possible be focused around a high browse and hay diet whenever possible. All institutions report using alfalfa for hay in an ab lib presentation. All reporting institutions said they give some sort of grain, the most common being Mazuri Wild Herbivore (5ZF1). However, some use Mazuri Wild Herb Plus (5Z8W), Mazuri Wild Herb Hi-Cu (5Z1G), or ADF-16 and may also supplement grain with beet pulp. Most also report giving some sort of produce which could include a variety of greens, vegetables, or fruits.

One thing to consider when developing a diet for your RFD is the amount of sugar present. There is a belief amongst many that a diet higher in sugar may increase the chance of rumen acidosis, which is a common health concern with duikers. Though this may be true there are institutions that feed high levels of sugary fruits and don't report any health concerns.

Things to Avoid

As mentioned above, the most common thing mentioned to avoid is too much sugar coming from fruits, some vegetables and treat items. Reducing starchy items may also be useful to help with rumen health. To help mitigate this fact some institutions rotate diet items throughout the week, as not to concentrate the items of concern too much on a single day.

Supplements

Supplements are rare outside allowing free access to a plain salt lick or a trace mineral block. One institution did mention giving yeast in their diet to help with rumen health, though this cannot be confirmed or denied as helping.

Methods to Monitor Body Condition

The physical health of RFDs seem to be monitored a few different ways. Some institutions report using a scale trained behavior to monitor their weight, as well as taking a body condition score during an immobilization or when an animal is in hand. One institutions mentioned taking yearly photos of their duikers so they can compare how the duikers are visually doing over the years.

Health

Most Common Health Issues

Most institutions report that their RFDs are healthy and don't see much in the way of health concerns. The most common thing mentioned is seeing clumpy stools which likely is related to something they have been eating. Though not reported here, duikers in general are known to be prone to lumpy jaw so keepers should pay attention to jaw abscesses that may become present.

Most Common Method for Capture and Restraint

Several different techniques are used currently while trying to capture or restrain RFDs, which all come with their pluses and minuses. When deciding, an institution should consider the set-up of your facility as well as the skills of those doing the capture. If a duiker is able to be trained to go into a crate or squeeze area, some institutions will use this method. Duikers have also been trained for hand injections. Some institutions prefer to dart animals while others will hand grab the duikers (sometimes using a net to aid the capture). However, using this method comes with risk if staff is not competent at hoofstock capture and restraint; but if done well comes with the benefit of typically less time in a procedure and less risk associated with drugs and recovery from drugs used in immobilization.

What to Avoid if Restraining

Though it has been historically used, some institutions will not hand-grab their RFDs because of the risk associated with it. RFDs are a small powerful animal, but if not handled correctly, it is easy to cause injury. If utilizing hand-grabs, keepers need to make sure they are not being overzealous in their attitude or restraint technique. Regardless of the method of restraint it has been recommended that people in the area should be kept to a minimum as the duiker may cue into something being different so end up "being on alert".

When Giving Vaccines, What Method is Used

To avoid restraining RFD, most institutions give vaccines two different ways. If the duiker is able to be trained for a squeeze cage or hand injection, then injections will be given that way. Otherwise most institutions seem to wait for a time that the duiker has to be immobilized, most commonly for a welfare check that seems to happen about every 2-3 years.

Pregnancy/Birth

Anything Special Done For a Pregnant Female or Changes to Routine

Most institutions do not report making changes when they know a female is pregnant. Some will try to monitor weight changes (though females do not gain much weight during this period, typically around 1-2kg), while others will just do incremental increases to the diet. As for the holding area setup, the only changes noted were giving extra bedding or something extra on the floor for better traction, and potentially adding some more visual barriers. One institution mentioned locking the female inside for a couple weeks prior. Most institutions do not separate males during this period.

A hand-rearing plan should be in place just in case a mother rejects their offspring, but overall maternal rejection is not common for the species. It has happened, and is more likely to occur with hand-reared females, however, it is noted that many hand-reared females will raise their calves without intervention as well.

How Quickly Do You Examine a Neonate?

After a birth, the most important thing is to allow for a maternal bond to form between the dam and calf. For newer mothers, the suggestion would be to wait a little longer for the bond to form and initially visually

monitor for the health of the calf. Experienced mothers need less bonding time so neonates can be examined sooner. The current ranges of neonate exams mentioned included: within 24 hours, 24-48hours, 2-5 days, and wait on the status of the mother. The SSP would suggest doing neonates within 2-5 days of birth; though you should monitor the calf to make sure it remains alert and its energy levels are not dropping thus becoming weak. Do not be surprised if you visually do not see any nursing occurring, they are good at masking that behavior, so don't assume dam neglect if you don't see nursing.

Training/Enrichment

Type of Training Done

Once a relationship has been built with a duiker, they are easily trainable animals and can learn a variety of behaviors. However, tractability in RFDs like other small hoofstock is easily lost if you neglect the time with them. The most common behaviors mentioned include: hand feeding, target, touch, scale, crate, and a recall behavior. Though with time a variety of other behaviors are possible.

Type of Rewards

When deciding on a food reward for your duiker, you should test a variety of items to see what gets the best response. The common items used are: produce that is part of their daily diet, romaine lettuce, mini leaf eater biscuit, peanut butter or peanuts. All items come with their advantages and disadvantages, and it will be up to you to determine what works best without straying too far from a healthy diet. Depending on your relationship with the duiker, tactile reinforcement such as scratches have also worked as a good reinforcer.

Most Successful Enrichment Used

As with any animal receiving an enrichment item, it is up to the team to decide what is safe and doable for the duikers under your care. The most successful items for RFDs tend to involve the use of a food item and its presentation. After that, RFDs seem not to pay too much attention to other objects or forms of enrichment, though that doesn't mean that they shouldn't be offered a variety of items to make their welfare as best as you are able to make it.

If future questions arise, please reach out to the SSP coordinator for more information.