

Table A2 Ethogram showing the behavioral events and their classification into categories. Descriptions partly based on Owen-Smith (1973), and Metrione et al. (2007)

Category	Behavior	Description
Alertness	Alert	Head lifted rapidly, ears scanning, body remains stationary
	Tail up	Tail is curled up without defecation or urination following
Disturbed by researcher	Defense formation	Rhinos stand with their rear ends together facing outwards in different directions
	Flee	Trot or run away after a disturbance. Tail curled up or not
Disturbed by others	Disturbed by researcher	A rhino discontinues the behavior it was performing when a person approached, moved or made a noise. It immediately looked in the direction of the person, adopted an alert posture, and may or may not have resumed its previous behavior
	Disturbed by others	A truck, a guard, a generator, a loud noise. Snorting and panting may happen while fleeing from the disturbance with or without tail up
Affiliative	Rub	Rhino rubs its head/body against other rhino. Rub is recorded whether the focal animal is the actor or the receptor of the behavior
	Follow surrogate	Walking behind a surrogate mother while she is walking. Both animals are in movement
	Follow orphan	Walking behind another orphan while the latter is walking. Both animals are in movement
	Follow group	Walking behind two or more rhinos while they walk
	Naso-nasal contact	Two rhinos move slowly towards each other, eventually allowing noses to meet. Movements slow and relaxed
	Head fling	Play invitation and indication of excitement. Head swung up and down rapidly in the vicinity of other rhino
Discomfort	Whine	A thin mewling tone that raises and falls in pitch
	Squeak	Calf distress signal. Abrupt and high pitch
Submission	Yield	Relinquishing of ground or food
	Presenting side	Turning the side of the body towards another rhino and the head away
Space maintenance	Snarl Chase	A gruff roar, brief or rumbling, made with the mouth open, head thrust back, and ears laid back. The vocalization is accompanied by a rapid movement by the actor where it turns around rapidly in the direction of the other rhino. The actor might move a few steps in the direction of the recipient
	Snort Charge	Mild “keep away” warning. Nasal ex- or inhalation Rapid advance against other rhino or person
Agonistic	Horn wrestle	Horn lowered parallel to the ground then hit sideways against horn of the recipient repeatedly
	Horn against horn stare	Horns of two bulls pressed together with heads raised and ears forward
	Attack	Horn jabbing movements directed toward body of recipient. Not reciprocal
	Fight	Two rhinos press horns to each other’s while advancing/retreating towards/from the adversary. Attack gestures made by both opponents while trying to drive each other away, including hitting the adversary with the horn. Fights are considered two independent events if separated by 5 minutes or more. Otherwise it is considered the same event
Pleasure-related	Scratch	Rhino rubs any part of its body but the horn against an object (e.g. post, tree stump or trunk) repetitively. Frequently preceded by mud wallowing.
	Horn rub	Horn rubbed against a hard object repetitively
Stereotypies	Backing	Walking, but instead of feet swinging forward in stride they swing backwards, motion must be sustained long enough so that it is not merely used to change the direction of an animal’s body, but without evident direction or purpose in the locomotion
	Bar biting	Biting of metal bars or boma poles

Pacing	Repetitive locomotion in a specific area without apparent purpose. It can be a repetitive path along the boma perimeter, a small circle, or just going back and forth along a wall
Foot dragging	While walking or standing, lifting feet and swinging either forward or from side to side; feet not fully clearing the ground so that they scrape across the ground with the motion. Animal walking with hind legs stiff and straight behind
Head swiping	Rhino has head to ground moving it laterally, rooting air with horn or horning air, dirt or ground
Mouthing	Rhino makes repeated chewing or gumming motion with open mouth, not associated with eating or flehmen

Rehabilitation method affects behavior, welfare, and adaptation potential for subsequent release of orphaned white rhinoceros

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Reference

Metrione LC, Penfold LM, Waring GH (2007) Social and spatial relationships in captive southern white rhinoceros (*Ceratotherium simum simum*). *Zoo Biol* 26(6):487–502