



An Ethogram for the New Guinea Singing (Wild) Dog (*Canis hallstromi*)

Janice Koler-Matznick, I. Lehr Brisbin, Jr. and Mark Feinstein



Adult female NGSD perching.

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Note: This is a work in progress, versions are dated.

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Introduction

This paper describes the behavioral repertoire of captive New Guinea Singing (Wild) Dogs [NGSDs] in the form of an ethogram (Goodman and Klinghammer 1990; Lehner 1979; Schleidt 1984). It also establishes a letter code for the 252 described behaviors suitable for use in future studies of this canid and for comparative studies of other canids. Behavior naming and description are based on empirically derived definitions (Fentress 1977; Moran 1987) except when the goal of the behavior is intuitively obvious (i.e. a threat, etc.) and the behavior involves both relatively stereotyped motor patterns and an orientation with respect to the environment. In this case a description by operation and consequence is given (Purton 1978). Behavioral units are grouped by functional type into larger general categories and classified according to the authors' working definitions, based on the context in which they are most frequently seen. NGSDs are a form of small dingo that has never been studied in the wild by trained observers. Basically nothing is known about their behavior in the wild except for the observations of Tim Flannery that they are "preternaturally canny" and extremely shy (Flannery, 1998) and observations by Robert Bino on their feeding (by scat analysis and local informant reports) and temporary den use (Bino, 1996). Until recently, NGSDs in the Highland mountains of New Guinea have been isolated from all other canids. This isolation is assumed to have been continuous since the introduction of ancestral NGSDs to the area, perhaps 4 – 6,000 years ago. The beginning of air travel into the Highlands in the 1950's and the subsequent importation of modern domestic dogs ended this isolation. Today, some remnant populations of wild NGSDs and one captive breeding group, including the subjects of this study, are assumed to represent genetically pure forms. As far as is known, the NGSD has never been subjected to any human-directed artificial selection, so any differences in morphology or behavior from their ancestral canid would be due solely to genetic drift and natural selection in the Highland environment. The NGSD captive history, a NGSD taxonomic designation discussion and recent population status of the NGSD are in Brisbin, et al. (1996), Koler-Matznick, et al. (1998), Koler-Matznick et al. (2003). Further NGSD background information can be found in Titcomb (1969) and Throughton (1971).

Study Group History and Management

The animals held at the senior author's facility included five NGSDs obtained from other facilities and their subsequent offspring. Two littermate females were obtained at eight weeks of age from the second author in December 1994. A male, unrelated to the original females for at least two generations, was obtained in January 1995 at twelve weeks of age through an exotic animal broker. This male's female littermate was added to the holdings eight months later, along with their four-year old parents. The female of this older pair produced two female puppies in October 1995, two months after arriving at the facility. Breedings of the original male and one of the original females produced three male puppies in November 1995, four male and two female puppies in January 1998. The female sibling of the original male, one male from the November 1995 litter and one female from the Oct 1995 litter were placed in other facilities. The older pair was euthanized when no appropriate placement could be found for them. The 1998 litter was kept with both parents and observed until all but one female were placed in new homes at eight weeks of age. The remaining female was kept kenneled with her parents. Thus, the core study group for the major portion of the observations consisted of six animals, three males and three females. In 1998 and 1999, subsequent to the major period of observation, two additional litters of five puppies each were whelped at the facility and observed to eight weeks of age. Thus, a total of seven animals were observed beyond sexual maturity and 21 puppies from birth to eight weeks of age.

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These subjects were kept in small groups of three to six animals until physical attacks between same-sex adults during breeding seasons necessitated their separation into opposite-sex pairs, although the retained 1995 male and the 1998 female remained with their parents until their second breeding season before being separated. Except for the pair that reproduced each year, the sexes were separated during estrus season.

The senior author's kennel facilities are described in detail below. The subjects' diet during the main observation period consisted of commercial dog kibble supplemented with a small amount of either boiled turkey or chicken. They were fed all they would eat once daily in the evenings in the warm seasons and twice daily during the winter. In 1999 the subjects were given a raw chicken neck each morning, and the kibble/cooked meat meal in the evening. Twice a week they received pieces of beef leg bones, and once a week fresh cut green grass during the seasons it was available.

The second author obtained his first pair of NGSDs in 1987 from the Sedgwick County Zoo, Kansas. Between 1987 and 1994 he received 11 NGSDs from various zoos and eight litters (38 puppies total) were whelped at his facility in New Ellington, SC, USA. His NGSDs are maintained year-round in 43m by 75m enclosures of semi-natural old-field grassy woodlands of uneven-aged pine-hardwood vegetation with openings of grasses and vegetation. These larger enclosures enabled the observation of more natural higher speed locomotion and of hunting behavior. The main diet was commercial dog kibble fed once daily.

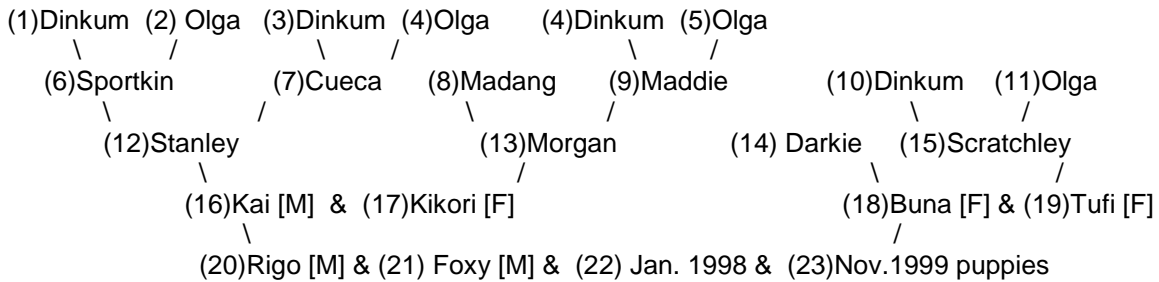
The third author obtained his first two subjects, an opposite-sex pair, from the second author in 1989. In March 1995 he obtained another opposite-sex pair of puppies from the senior author. The older male and the younger female produced four puppies in 1996. All of these subjects were maintained in indoor/outdoor concrete floored chain link kennel runs with occasional access to a larger enclosed grassy exercise area. The diet was commercial dog kibble.

The Main Facility

The senior author's study site in Oregon is in a temperate climate zone, with daytime summer temperatures averaging 80 degrees F and winter 40 degrees F, with an annual range from 15 to 100 degrees F. Rainfall averages approximately 22 – 24 inches annually and falls mainly in the winter and spring. The kennel consists of four 1.83m X 3.66m wire runs built off of the end of a large barn with 1.83m high plywood dividers, necessary because of fence fighting. There are 0.25m wide wooden shelves attached to one side of each run, approximately one meter off the ground. Three runs are supplied with 0.61m wide X 0.61m high X 0.76m long wooden sleeping boxes. The fourth run has a lockable dog door to an indoor plywood enclosure 1.22m wide X 1.83m long X 1.22m. This run was used by dams with nursing litters. The runs have a pea gravel substratum underlain by wire fencing to prevent digging. The runs are fronted by a 1.22m wide walkway enclosed by a board and lattice fence with a gate to the exercise yard, and the runs and walkway are roofed. One section of the fence dividing the walkway from the exercise yard has an observation/photography port cut out at eye level for an observer seated on a stool, from which the entire exercise yard is visible.

The exercise yard, where the subjects were routinely placed for observation, is a chain link enclosure 9.14m X 12.19m, furnished with two 0.46m X 1.22m cement pipes, a heavy 0.91m high wooden table, and a sloping 0.25m wide wood plank running from a log stump 0.46m high to the roof of a 1.22m high wooden shelter. The 1.83m high chain link perimeter fence is topped by a 0.31m 45 degree incline of chicken wire on metal arms and footed by 0.31m of wire fence buried under a layer of soil. The yard's substratum is dirt. Grass, clover and wild ground-cover plants are growing in approximately 50% of the pen area.

Main Subject Pedigree



Rigo X Kikori = (24) Nov. 1998 puppies

Subject Pedigree Information

- 1,3,4,10 - Dinkum - ISIS SCZ 571 - DOB 4/16/80 Taronga Zoo, Australia: Imported 9/16/80
2,4,5,11 - Olga - ISIS SCZ 2599 - DOB 11/15/83 Keil University: Imported 1/6/87 from Germany.
Descended from NGSD brought out of Irian Jaya 1976.
6 - Sportkin - ISIS SCZ 3249 - DOB 6/26/88 Sedgwick County Zoo
7 - Cueca - ISIS SCZ 3250 - DOB 6/26/88 Sedgwick County Zoo
8 - Madang - ISIS SCZ 4035 - DOB 4/7/88 Taronga Zoo, Australia: Imported 2/7/90.
9 - Maddie - ISIS SCZ 3765 - DOB 6/22/89 Sedgwick County Zoo
12 - Stanley - ISIS WWZ 3526 - DOB 10/30/91 World Wildlife Zoo
13 - Morgan - ISIS SCZ 4731 - DOB Sedgwick County Zoo
14 - Darkie - ISIS SFS 100147 - DOB ~ 1980, Baiyer River Sanctuary, Papua New Guinea
15 - Scratchley - ISIS SFS 100102 - DOB 6/25/87 Sedgwick County Zoo
16 - Kai - ISIS SFS 100152 - DOB 10/19/94 - Songdog Sanctuary
17 - Kikori - ISIS SFS 100166 - DOB 10/16/95 - Songdog Sanctuary
18 - Buna - ISIS SFS 100149 - DOB 10/20/94 Swamp Fox Sanctuary
19 - Tufi - ISIS SFS 100148 - DOB 10/20/94 Swamp Fox Sanctuary
20 - Rigo - ISIS 100167 - DOB 11/7/95 - Songdog Sanctuary: Monorchid
21 - Foxy - ISIS SFS 100168 - DOB 11/7/95 - Songdog Sancturay
22 - 24 - puppies registered with ISIS on SFS account; DOB 1/98, 11/98. 11/99 - Songdog Sanctuary

Key

ISIS = International Species Inventory System, Minn. Zoological Gardens, Minneapolis, MN 55417
SCZ = Sedgwick County Zoo, 5555 Zoo Blvd., Wichita, KS 67212
SFS = Swamp Fox Sanctuary, Dr. I. Lehr Brisbin, Jr., PO Drawer E, Aiken, SC 29802
WWZ = World Wildlife Zoo, 16501 W. Northern Ave., Litchfield Park, AZ 85340

Materials and Methods

The information base presented here was primarily collected by the senior author during a four-year period of unstructured observation (Altmann 1974, Dunbar 1976) and general familiarization with the subjects at the Oregon facility, during an estimated minimum of 2,000 hours of direct observation. These observations were made at varied time periods, from dawn to dusk, and at night under artificial light. A total 23 subjects were observed: fifteen from birth to eight weeks of age, two from birth to four months of age, six from birth to two or more years of age and three from eight or twelve weeks to five years of age.

Additional general behavior observations of both adults and puppies were made by the second author, and of vocalizations by the third author.

Because the Oregon study location has only 0.91 - 1.22m high field fence around the perimeter, which NGSD could easily go through or over, hunting behavior was observed there only while walking the animals on 7.93m Flexi-leads (retractable cord leads) around the four acres of fields, trees and brush. As this method was practical only with one or two subjects at a time, no group hunting behavior could be observed. Interactions with live prey were observed only on two occasions. The first was when a yearling female while walking on lead used a leap-stab to capture an adult meadow vole (*Microtis* sp.) that was concealed under a covering of dry leaf litter. As she was six weeks pregnant at the time, she was not allowed to eat the vole due to fear of possible communicable disease, but she crushed it and was apparently ready to swallow it

when it was removed from her mouth. On the second occasion a live-trapped meadow vole was introduced to the study group in the exercise yard. Further interactions with live wild-caught prey were planned, but deleted from the program when the subject who ate this vole subsequently developed tape worms indigenous to rodents.

Observations of sexual behavior were limited in this study due to the need to prevent pregnancies. Except for the four planned copulations males were allowed to interact with estrus females only on lead, and reunited with them only after the possible fertility period had passed.

Further observations of hunting and sexual behaviors are needed.

Discussion

In general, New Guinea Singing Dogs show all the categories and types of behavior noted by other researchers for the *Canis* group (Bekoff 1974; Bradshaw and Nott, 1995; Cohen and Fox, 1976; Fagen, 1981; Fox 1969, 1971 a & b, 1972, 1975, 1978; Goodman and Klinghammer 1990; Kleiman, 1967; Schenkel 1967; Serpell and Jagoe, 1995; Scott and Fuller, 1965). However, their behavior often has a lower threshold (i.e. scent rolling when compared to domestic dogs [DDs]), a developmentally earlier appearance (i.e. hackle biting at three weeks compared to wolves and DD at six weeks), or a quantitative difference (i.e. reduced expression of intraspecific affiliative behaviors compared to wolves and DD).

The NGSD behaviors that appear to be unique in the *Canis* genus are: the head toss; the cheek rub; tooth gnashing; auto erotic stimulation; the playful forward summersault, hind foot kick wrestling often seen in puppies (may be similar to fox play behavior [Fagen 1981, Fox 1969]); the inability to lay their ears flat back against the sides of the skull; the genitally-oriented bite; sheath cleaning; and several of their vocalizations. The "open mouth play bite" frequently used by NGSDs has been observed in coyotes (Fox 1971a), but not reported for wolves or DDs.

There are also some common *Canis* behaviors that seem to be absent from the NGSD repertoire. The NGSDs observed by the authors were never seen soliciting play by performing the stereotyped canid "play bow," as defined by Bekoff (1977). Voth (1988) included a "play bow" in her observed NGSD behaviors, and Walters (1996) reported a 9 year old male acquired from the Taronga Zoo by the Australian Native Dog Conservation Society in Bargo, NSW, solicited play by bowing. However, a preliminary or partial stalking posture in which the rump was not lowered completely or a jump-toward-and-away action may have been mistaken for the more ritualized and extended play-bow invitation. NGSDs also have not been observed using the "pacing" gait, in which both legs on one side move in unison, opposite to the other side. Lastly, as also noted by Voth (1988), NGSDs pull the corners of their lips back only slightly during submissive behavior. Therefore, they do not have the full "submissive grin" as described by Fox (1969) and Schenkel (1967).

NGSD tails are very expressive and distinctive, facilitating long distance identification of individuals and providing information about the internal state of the individual and the behavior it is engaged in. NGSD tails have distinguishing characteristics. They vary in length, fullness of brush, extent of white tip, amount of forward curve when held above the back, and the presence/absence of sideways or spiral curves. These tail characteristics, combined with the NGSD's variable white markings, permit a visual identification of individuals by a human with normal vision from an unobstructed distance of 40 meters or more. If free-ranging NGSDs live as singles or territorial pairs, as is assumed because of the extreme within-sex aggression expressed by adults, such long-distance visual identification may have biological significance. The ethogram describes several tail carriages and movements that clearly signal the animal's internal state.

The combinations of NGSD facial expressions, ear positions and head movements, convey clear, though sometimes subtle information. The eyes are set obliquely, and the lids are dark-pigmented and almond shaped. The oblique angle of the orbits (averaging 47 degrees) and the elongated eye openings permit a wide field of view. This eye shape and placement also facilitates subtle "out-of-the-corner-of-the-eye" side glances, which are accentuated by the sclera that becomes visible in both the outer and inner corners of the lids as the eyes are turned back and forth. The visible sclera accentuates the submissive behavior of looking away without head turning, which is advantageous when there is imminent danger of an attack being triggered by any movement of the submitting animal. NGSDs are acutely observant of eye and head movements, and will emulate an intent gaze of both humans and canids, especially if accompanied by slight motions of the head in the same direction.

Puppy and young adult NGSDs have age-specific markings that may serve communication functions. When the dark sable neonatal coat color changes to tan puppy coat the dorsal side of the lower two thirds of the tail, down to the white tip, remains dark and a patch

of coarse black hair appears over the caudal gland. The dark tail hair and the caudal patch are gradually replaced by red or brown (depending on the shade of the adult coat), leaving only a slightly darker band just distal to the white tip by six months of age. As the neonatal coat changes to tan, the muzzle remains dark. The underside of the NGSD jaw usually has a white marking that varies from a narrow stripe down the center to covering almost the entire lower jaw back to the corners of the lips. This white contrasts with the dark muzzle visible on each side when the ventral side is visible and may serve to accent head movements, especially submissive head turning and the unique HEAD TOSS (Attention Soliciting category). The dark muzzle fades out and grays with age, and by about five years of age it has mostly disappeared.

Because the total observation time was extensive and circumstances so variable it was assumed that all but the most rare behaviors would have been observed. Therefore, no attempt was made to statistically estimate the completeness of this ethogram, as recommended by Fagen and Goldman (1977). It is to be expected that NGSD behavior, like that of many mammals, will vary somewhat with the make up of the social group they are part of and with the environment they reside in (Fox 1969). Hopefully others will verify and expand the authors' observations.



Four-year-old pair, male in rear.

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New Guinea Singing Dog Ethogram and Behavior Code

Behaviors within a category are alphabetized for ease of reference and are not in order of frequency of expression or significance. If the description of one behavior references another listed behavior, the latter is in all capitals. Behaviors that are unique to NGSDs, are expressed differently than similar behavior in domestic dogs (DDs) and wolves, or whose descriptions were not found in the literature, are emphasized with asterisks and in **bold type**. In this ethogram the animal performing the indicated behavior is called the "actor," and the animal toward which the actor's behavior is assumed to be directed is the "receiver." Many behaviors are not exclusive to the category in which they appear. In these cases, the behaviors are listed under the context(s) in which they have been most frequently observed. Further comments, as "Notes," are appended at the end of the listing of behaviors. Specific behaviors that were described by Goodman and Klinghammer (1990) and Goodman et al (2002) for gray wolves (*Canis lupus*), and that are identical or very similar in NGSDs, have been called by the same name (unless otherwise noted) in this ethogram for ease of comparison and continuity. These behaviors are followed by a GK designation.

Alphabetical Listing of Described Behaviors

The behavior name is followed by its letter code and then the code of the lead category under which it is listed. The secondary category codes under which the behavior is also listed are in brackets [].

Categories and Codes

Affiliative/Greeting = a/g	Predation = pred
Attention Soliciting = asol	Resting = rest
Care Giving = cg	Self Care - sc
Dominance/Aggression = d/a	Sexual - sex
Elimination = elim	Social Play - spla
Feeding – feed	Solitary Play = solp
Locomotion = loc	Submission/Defence = s/d
Miscellaneous = misc	Vocalizations = voc

Behaviors

Active Defense – ADEF – d/a	Bump-Sidle – BMPS - spla
Active Submission – ASUB – a/g	Cache – CACHE – feed [sol]
Agonistic Pucker – AP – d/a	Canter – CNTR – loc
Airplane Ears – AE – s/d	Carry Object – COB – solpl
Air Scent – ASNT – pred	Cat Rest – CAT – rest
*Ak-Ak – AK - voc	Charge – CRG – d/a [pred]
Ambush – AM – spla	Chase – CHS – d/a
Anal Sniff – ASN – a/g	Chase leaves – CHLV – solpl
Attack – ATT – d/a	Chase Prey – CHSP – pred
*Auto Erotic Stimulation – AES - sex	Chase Tail – CHST - solpl
Avert Gaze – AVGZ – s/d	Chew – CHW – feed [solpl]
Avoid – AV – s/d	Chest Press – CPRS – spla [a/d]
Bark – BK – voc	Chin Rest – CHR – spla [sex, a/g]
Bank – BNK - loc	*Cheek Rub – CRUB – a/g
*Barrier Lick – BLK – misc	*Chorus Howl – CHWL – voc
Bed Making – BDMK – rcst	Circle – CIR – d/a
Belly Up – BUP – s/d	Clean Genitals – CLNGN – sc
Besnuffle – BESNUF – a/g	Climb – CLI – loc [pred]
Bite – B – d/a [pred]	*Copulation Contractions – CCTR – sex
Bounce – BNC – spla	*Copulation Scream – CSCR - sex
Bow Stretch – BWSTR – rest	*Counterpoint Howl – CPHWL – voc
Buck Off – BOFF – spla [d/a]	Crawl – CRL – loc [pred]
Bump – BMP - spla	Creep – CRP – s/d

Crouch – CRCH – s/d
Crouch Walk – CRWK – s/d
***Crow-Howl** – CRHWL – voc
***Crow-Howl-Purr** – CRWLP - voc
Crowding – CRD – a/d [spla]
Crumple – CRM – s/d
Crush Bite – CRBT – pred
Curl Around Puppies – CRLP – cg
Curl Rest – CRST – rest

Defecate – DEF – elim
Defend – DFND – cg
Defend Food – DFF – feed
Defensive Agonistic Pucker – DAP – s/d
Defensive Bite – DB – s/d
Defensive Gape – DGP – s/d
Dig – DIG – pred
Displace From Food – DISF – feed
Dominance Mount – DM – d/a
Dominant Approach – DAPR – d/a
Drink – DRNK – feed

Eat – EAT – feed
Ear Nuzzle – ENUZ – a/g
Ears Forward – EF – s/d [a/g, asol]
Ears Turned Back – EB – s/d
Ears Turned Sideways – ETS – s/d
Ears Up – EU – d/a
Eliminative Paw Scrape – EPSC - elim
Escape – ESC – s/d
Escort – ESCT – sex

Face-Off – FO – d/a
Face Wipe – FACE – sc
Fall Down – FD - spla
Fence Fight – FF – d/a
Fight – FT – d/a
Flag – FLG – sex
Follow – FOL – d/a
Food Beg – FBG – asol
Food Mouth – FDMO - feed
Foreleg Stab – FLST - pred

Gallop – GAL – loc
***Genital Bite** – GENB – d/a
Gnaw – GNW – feed
Grab – GRAB – pred
***Grin** – GRN – a/g [s/d]
Growl – GR – voc [d/a]
Growl-Bark – GRBK – voc [d/a]
Growl-Scream – GRSC – voc [d/a]
Guard Food – GRDF – feed

Hackle Bite – HB – d/a [sex]
Hackle Lick – HL – d/a [sex]
Hackles Up (Full) – HUF – d/a [s/d]
Hackles Up (Partial) – HUP – d/a [s/d]
Harass – HAR – spla
Head Shake – HSH – pred
***Head Toss** – HTSS – asol
Head Turned Away – HTA – s/d

Head Turned Toward – HTT – s/d
Hide Head – HHD – s/d
Hide & Seek – H/S – spla
High Stand-Off – HSOF – d/a
High Wag – HWG – d/a
High Wrestle – HWR – spla
***Hind Paw Groom** – HPGR – sc
Hind Paw Scrape – HPS – elim
Hip Slam – HPSL – spla
Hold Off With Legs – HOL – spla
***Howl** – HWL – voc [asol]
Huff-Sniff – HUSN – pred
Hug – HUG – d/a [spla]
Humpback Stretch – HBSTR – rest
Hunt – HUNT – pred

Inguinal Presentation – ING – s/d [a/g]
Inhibited Bite – IB – d/a
Intromission – INT – sex

Jaw Spar – JS – spla
Jump On – JPON – loc

Kick – KICK – spla
Kill – KILL – pred
Knock Down – KD – spla

Lateral Display – LDIS – d/a
Leap – LP – loc [solp]
Leap Over – LO – spla
Leap Stab – LPST – pred
Lick – LK – a/g [cg, sc]
Lick Food – LKFD – feed
Lick Genitals – LKGN – sex
Lick Intention – LKI – s/d [a/g]
Lifted Lips – LL – d/a
Listen – LISN – pred [misc]
Look Toward – LT – d/a
Lunge At – LUN – d/a

Mark – MK – d/a [sex]
Mark Over – MKO – d/a [sex]
Measuring – MSR – spla [d/a]
Mew – MEW – voc [asol]
Moan – MOAN - voc
Moan-Growl – MGR – voc
Mob – MOB – d/a
Molest – MOL – sex
Mount – M – sex
Mouth – MTH – spla
Mouth Wipe – MTHW - sc
Muzzle Bite – MZBT – d/a
Muzzle Lick – MLK – a/g

Nibble Groom Other – NGO – a/g [cg]
Nibble Groom Self – NGS – sc
Nose Nudge – NN – a/g
***Nose Scrape** – NSC – elim
Nose Jab – NJ – d/a [spla]
Nose Stab – NSTB – pred
Nurse – NURSE – cg

Nuzzle – NZL - a/g

Object Play – OBPLA – spla

Object Play – Individual – OPLAI - solp

Observation Jump – OBJP – pred

***Observation Stand** – OBST – pred

***Open Mouth Bite** – OMB – spla [d/a]

Open Mouth Play Face – OMPF - spla

***Open Mouth Whine** – OMW – asol [voc]

Orient – OR – pred

Pace – PACE – loc

Paw Grab – PWGB – asol

Paw Jab – PJ – d/a [spla, sex]

Paw Lift – PL – s/d [spla, asol]

Pawing At – PAW – a/g [asol, spla]

***Peacock Call** – PCK - voc

Peek-A-Boo – PAB – spla

Pelvic Thrust – PTHR – sex

Penis Extruded – PE – s/d

***Perch** – PRCH – rest

Pin – PIN – pred

***Place Food** – PF – feed

Play Bite – PLBT - spla

Play Run – PLRN – spla [solp]

Play Solicit Stalk – PSS – spla

Play Solicit Stomp – PST – spla

Pluck – PLK – feed [solp]

Pose – POSE – sex

Present Rear – PR – a/g [splay]

Present Rear (sexual) – PRS - sex

Prone – PRO – s/d

Puppy Guard – PGRD – cg

Purr – PUR - voc

Raised Leg Display – RLD – d/a

Raised Leg Urination – RLU – d/a [elim]

Rebuff – RBF – sex [sopla]

Regurgitate – REGUR – cg

Relaxation Reflex – RRX – misc

Rest – RST – rest

Ride Up – RU – d/a [sex]

Roll Over – RO – s/d

Roll In Front – ROLF – spla [a/g]

Rub On – RUB – a/g

Rump Lowered – RLOW – s/d

Running Leap – RLP – loc

Scent Chomp – SCMP - sex

***Scent Rub** – SR – misc

Scratch – SCR – sc

Scream – SCRUM – voc [s/d]

Sexual Guarding – SGRD – sex

Sexual Solicitation – SXSL – sex

Shake – SHK - sc

***Sheath Clean** – SCLN – sc

Shiver – SHV – misc

Side Rest – SRST – rest

Sit – SIT – rest

Snap – SN – d/a [s/d]

***Sneeze** – SNZ – misc

Sniff Genitals – SNG – d/a [a/g]

Snore – SNR – rest

Snort-Huff – s/h – voc

Stalk – STLK – pred [loc]

Stand – STD – rest

Stand Over – STDO – d/a

Stare At – STA – d/a

Stiff Walk – SWK – d/a

Stiff-Legged Jump – SLJ – spla

Stretch Fore-and-Aft – STFRA - rest

Submissive Approach – SAPP – s/d

Submissive Tail Wag – STW – s/d

Squash – SQ – spla

Squirm – SQM – spla

Tail Down – TD – s/d

***Tail Flag** – TFLG – loc

***Tail Flag: Hunting** – TFLGH - pred

***Tail Grab** – TG – spla

Tail High – TH – d/a

Tail Tucked – TTK – s/d

Tail Up – TU – d/a

Tail Wag – TW – s/d [a/g, asol]

Tear – TEAR – Feed [solpla]

Test Prey – TEST – pred

Threat – THRT – d/a

Tie – TIE – sex

***Tooth Gnashing** – TGN – d/a [misc]

Toss Prey – TOSS – pred

Trail – TRAIL – pred

***Trill** – TRL – voc

Trot – TRT – loc

Upright Posture: Relaxed – UPR – spla [sex]

Upright Posture: Stiff

Wander – WAN – loc

Whimper – WHM – voc [asol]

Whine – WH – voc [a/g, asol]

Whirl – WRL – d/a

Urinate – UR – elim

Yawn – YN – misc

Yelp – YLP – voc [s/d]

Non-social Behaviors

I. Locomotion

Bank – BNK = A TROTGING or RUNNING actor LEAPS against an object and pushes off from it. When the actor is being CHASED, this behavior allows it to LEAP back over its pursuer. Banks performed against a fence may be 1.5 meters or more from the ground.

Canter - CNTR = A three-beat gait in which two legs move separately and two as a diagonal pair. Slower than the GALLOP. GK



Climb - CLIMB = Pulling and pushing with all four feet to ascend/descend an obstacle. NGSD feet are extremely flexible and curve to grasp objects. This adult female frequently climbs the trees in her yard.

Crawl - CRL = A very slow four beat gait performed with the body low, the chest touching or almost touching the ground. Used to move under or through obstacles, brush, etc., and during STALKING. GK

Gallop - GAL = A four beat gait, often with an extra period of suspension during which all four feet are off the ground. The hind feet strike almost in unison. The NGSD is capable of a double-suspension Gallop, in which all four feet are off of the ground at two different points in one footfall sequence. (ILB 1998) The fastest gait. "Run" in GK.

Jump On - JPON = To leap up on something with all four feet.

Leap - LP = To jump into the air. NGSDs easily leap 1.5m high or 1.5m forward from a standing position. When hunting birds, NGSDs Leap up after them when they take off.

Pace - PACE = To WALK or TROT back and forth at a barrier in a stereotypical manner. The authors have never observed a NGSD using the "pacing" gait common in dogs and wolves, usually seen during a transition from the walk to the trot or used by a tired animal, in which the same-side legs move in unison promoting a rolling action of the body. GK (but description also includes the lateral gait)



Running Leap - RLP = NGSDs easily leap forward 2.13 m from a canter and 3 m from a gallop, although average Running Leaps are somewhat shorter. The Running Leap is usually about 0.61 m high. When GALLOPING, even on smooth ground, NGSDs Running Leap intermittently in a gazelle-like manner (forelegs folded, hind legs extended slightly to the rear), especially if they are coursing prey. The leaps observed have been singles, not multiples. See associated behavior "LEAP OVER" under Social Play. Height and width of leaps were estimated by viewing against the background of a fence with posts every 2.13m and cross-bars at 0.91 and 1.83m.

Stalk - STLK = See Predation category and illustration of AMBUSH in Social Play.



*Tail Flag – TFLG_ = Often when TROTting or CANTERING in natural cover, the tail is held above the level of the back waving passively with the motion of the footfalls. This has the effect of prominently displaying the pale brush of the underside of the tail and may help individual NGSDs keep visual contact with each other. Needs more study. See also TAIL FLAG -HUNTING in Predation category.

Trot - TRT = A rhythmic two-beat gait in which the diagonally opposite feet strike the ground together. The most common gait, used for general purpose and over long distances. GK

Walk - WLK = The slowest upright gait, in which three feet are supporting the body at all times, each paw lifting from the ground one at a time in a regular sequence. GK

Wander - WAN = To meander about, sniffing and observing the environment in a casual manner, without an apparent goal. GK

II. Predation

Air Scent - ASNT = To sniff the air. During hunting performed in order to detect or confirm the presence of prey, but may be performed when any air-borne scent is detected, especially when facing into a breeze, or when trying to identify an object from some distance before it is approached.

Ambush – AMB = See Social Play Category



A NGSD lying in leaves under a tree or in medium-tall grass is well camouflaged for Ambush.

Bite - B = See Dominance/ Aggression category.

Charge - CRG= See Dominance /Aggression category.

Chase Prey - CHSP = To CHARGE at and/or run after prey.

Climb - CLIMB = See Locomotion category. NGSDs seem to be especially attracted to bushes when hunting and climb up into any large enough to hold their weight if they spot prey in them.

- Crawl - CRAWL = See Locomotion category. NGSDs crawl under and through thickets and hedges, and under objects when searching for prey.
- Crush Bite - CRBT = HOLDING and BITING hard enough to crack the bones of small prey. In this process the prey is systematically worked back and forth until all parts have been crushed and "softened." In many cases the prey's skin remains essentially intact. Two study subjects crushed voles in this manner before swallowing them whole.
- Dig - DIG = To break up and move ground with the front paws. NGSDs are strongly attracted to holes in the ground. If they scent prey in a hole, or detect prey in an underground burrow by LISTENING, they will dig for extended periods trying to reach it. Logs sheltering prey are torn apart by digging motions. NGSDs urine MARK the holes and/or the loose dirt around holes recently dug up by conspecifics. GK
- Foreleg Stab - FLST = Using a stiff foreleg to poke an object or individual. In predation, this behavior is used to TEST PREY for possible aggression and for animation level. Similar behavior PAWING AT in Affiliative/Greeting category, is done with a more flexed leg posture.
- Grab - GRAB = To bite an object or another individual and not immediately release it. The receiver may be held for one to several seconds. In predation the actor usually HEAD SHAKES, MOUTHS, CRUSH BITES, etc., after Grabbing the prey. GK
- Head Shake – HSH = After GRABBING the prey (play object, opponent) the actor holds it while rapidly oscillating its head from side to side. Depending on the size of the prey, whether only hide or a body part is being held, the pressure of the bite, and the violence of the shaking, the receiver may suffer no injury, minor injuries, serious injuries, or even be KILLED. GK
- *Huff-Sniff - HUSN** = When seeking prey in a hole, heavy grass or other vegetative cover, NGSD blow forcefully through their nose and then sniff deeply several times. This behavior may be repeated many times, interspersed with DIGGING.
- Hunt - HUNT = A general term that includes: seeking, CHASING, attempting to GRAB, TESTING and KILLING prey. GK
- Kill - KILL = To cause death.
- Leap Stab – LPST = When prey (or possible prey) is detected the actor swiftly rises on its hind legs and brings the stiffened forelegs down in unison, paws side-by-side, on the prey (or the place where the possible prey was detected). Often, especially in tall or thick grass cover, the rearing becomes a leap, with the actor's hind feet leaving the ground and the profile of the back remaining essentially horizontal during the descent. This behavior is equivalent to "mausensprugen" described in the German literature for foxes. Called "Stiff Leg Jump" in GK.
- Listen - LISN = When seeking prey in heavy ground vegetation the NGSD uses its hearing as much, or perhaps even more than, its sight or scenting ability. The actor will, without an apparent target, LEAP STAB into tall grass, leaf litter, etc., and then remain still, ears cupped forward or rotating (often independently), tipping and turning its head slightly back and forth, listening for movement. If any sounds are detected, the actor immediately NOSE STABS, FORLEG STABS or LEAP STABS at the source of the sound. When NGSDs hear prey in an underground burrow they Listen and then begin Digging.
- Nose Stab – NSTB = When hunting small prey in heavy grass or other dense cover the actor may stop, head cocked toward a point where a sound was detected, EARS Up or FORWARD, often rotating independently. Then the nose is suddenly thrust forcefully downward into the vegetation. If prey is not captured HUFF-SNIFFING into the vegetation may then take place. Similar behavior NOSE JAB (Dominance/Aggression category) is much less forceful.

Observation Jump - OBJP = A jump straight up, forelegs folded, body perpendicular to the ground. A hunting actor will often observation jump when in tall grass, when trying to see potential prey some distance away, or in a bush or tree. May be repeated several times. The term "spy hopping" has been used for a similar behavior in other canid species. GK

***Observation Stand - OBST** = When prey is detected in a tree or bush more than eye level off of the ground, or their view is obstructed by tall grass, etc., NGSDs sometime stand upright, balanced on the hind legs, front legs folded or hanging down, body perpendicular to the ground in order to better observe. Also used when approaching a human about whom they are uncertain.

Orient - OR = To direct eyes, ears and nose (the head) toward a specific object, such as prey. GK

Pin - PIN = To hold down prey, preventing it from moving away. May be done with the mouth, the paws, or both. In GK this tern is used for pinning another wolf.

Stalk - STK = To move toward prey (or suspected location of prey/play partner) in a slow, controlled manner. The body is lowered (from a couple of inches to where the belly almost touches the ground), head up or lowered and extended forward, EARS UP, TAIL DOWN. Forward motion can be almost imperceptible, with each foot moved individually only an inch or two each step, or can be a slow-to-medium fast (walking speed) CREEP, often interspersed with pausing in the AMBUSH position. The hunting STALK usually ends in a CHARGE with LEAP STAB or FRELEG STAB at grounded prey or a LEAP up after birds. GK



***Tail Flag, Hunting – TFLGH** = When hunting, NGSDs may, upon sensing prey, arch the tail upwards and forwards over the back either holding it still or HIGH WAGGING, thus prominently displaying the light colored fluffy brush on the underside of the tail. In heavy grass cover usually seen in conjunction with NOSE STABS, LEAP STABS and HUFF-SNIFFS. In response to this signal of excitement other NGSDs within sight similarly display and approach the actor.

Test Prey - TEST = The actor Tests unfamiliar potential prey for reactions. This testing may be from a short distance, when the actor makes an abbreviated CHARGE toward the prey, apparently to gauge its ability to escape, or it may be done after the prey has been cornered, by CIRCLING, AIR SCENTING, and FORELEG STABBING at it, while making BITE INTENTION movements. If the prey remains passive the actor may then tap it with a paw, NOSE NUDGE it, etc., and finally GRAB and BITE. Movements are usually tentative at first, and the actor may LEAP back and forth until it is reassured the prey is not aggressive, and often makes head flicks to the side after touching, or almost touching, the prey with their mouth/muzzle. The same behaviors are observed when NGSDs are presented with an unfamiliar object. See Note 1.

Toss Prey - TOSS = After GRABBING the prey, usually while HEAD SHAKING but occasionally in a discrete action, the actor flicks its head to one side as it opens its mouth, flinging the prey some distance away. It then rushes over and again PINS and/or GRABS the prey. May sometimes be performed in response to the prey biting the actor. Tossing may be repeated one to several times.

Trail - TRAIL = To follow a ground scent, sniffing the ground, bushes and other vegetation, usually at a WALK or slow TROT with TAIL FLAGGING.

III. Self Care

Clean Genitals – CLNGN = To LICK and NIBBLE GROOM the external parts of the genitals. Dams do this for nursing puppies. Female NGSDs frequently walk a few steps after URINATING, than SIT and briefly LICK their vulva. Males normally Clean Genitals only after URINATING as a submissive response. At other times, especially during estrus, females may spend three of four minutes LICKING their vulva and males SHEATH CLEAN. "Lick Genitals" in GK.

Face Wipe - FACE = The front paw and lower leg are brought up to the forehead, then drawn down over the eye and muzzle. May be repeated several times in succession. Frequently seen when the actor has just risen from an extended rest or when the eyes have been irritated by dust, etc. Often after a Face Wipe the actor sniffs its wiping paw and licks it briefly before repeating the behavior.

Front Paw Groom – FPGR = Front paws are groomed, usually from a recumbent position so the paw can be turned over and pressed against the ground or the opposite foreleg to facilitate cleaning between the pads. The whole foot may be placed in the mouth and GNAWED, but not with the toe spreading and intensity of the HIND PAW GROOM. The nails, including the dew claws, are NIBBLE GROOMED and LICKED.



***Hind Paw Groom - HPGR** = A seated or recumbent actor holds a hind paw near its muzzle, spreads the toes, and LICKS and NIBBLE GROOMS the foot. Sometimes a foreleg is crooked around the hind leg to hold it in place during the grooming. The entire paw may be placed in the mouth. The toes are individually scraped with the teeth and the nails nibbled. The area between the pads on the bottom of the paw is also LICKED and NIBBLE GROOMED while the toes are spread. This behavior is sometimes continued for two or three minutes.

Lick - LK = See Affiliative/Greeting category.



Mouth Wipe – MTHW = The actor presses and wipes the inside of the front paw, from the dew claw to the toes, against the side of a slightly opened mouth from the corners of the lips downward. The nails scrape against the teeth. To date seen only in males. The dominant male Kai does this frequently and the others only rarely.

Nibble Groom Self - NGS = The actor grooms its fur or other body part by nibbling gently with the incisors. Usually interspersed with LICKING. Differs from the similar nibbling performed to eliminate a flea or other cause of sudden irritation in that it is less intense and not preceded by a sudden jerking of the head toward the spot to be nibbled. See related NIBBLE GROOM OTHER in Affiliative/Greeting category. "Nibble" in GK.

Scratch - SCR = To rake the fur and/or skin repeatedly with a hind foot. GK

Shake - SHK = To rock the head and/or body very rapidly back and forth, in a standing position, usually in an attempt to clear the fur of debris or moisture. Commonly a full body shake will end with the tail being whipped back and forth. Often followed or preceded by a SHIVER that has higher frequency and lower amplitude than a full shake and is therefore

not effective at clearing the fur. After a bath with a cleansing agent the SHAKE is commonly followed by repeated neck/shoulder rubbing and rolling on grass, carpet or other soft substrates when available.



***Sheath Clean - SCLN** = The male actor LICKS and NIBBLE-GROOMS the outside of his sheath, then using his incisors, pushes it back behind the bulbis glandis and licks the penis until the sheath slides back down. May be repeated many times over a period up to three or four minute's duration.

IV. Resting



Bed Making - BDMK = In addition to using DIGGING motions of the front paws, NGSD tamp with all four feet and shove bedding material around with their noses. Folded blankets, and loose bedding such as straw, are usually manipulated into a cup shape. Bed Making was first observed at 12 weeks of age.

Bow Stretch - BWSTR = Upon arising from an extended rest, the actor combines a stretch with a bow, lowering the forehead and extending the forelegs, usually with toes fanned. GK

Curl Rest - CRST = Lying in a curled posture, legs tucked in close, often with the tail covering the nose. GK

Humpback Stretch - HBSTR = Upon arising from a rest the actor stretches its head and neck upward, simultaneously arching the back up. GK

Rest - RST = A general, inclusive term for SITTING and lying down in a relaxed manner.

Side Rest - SR = Lying flat-out on one side. Occurs frequently when resting in sunlight or near an heat source. GK

Sit - SIT = The NGSD rarely sits with its weight resting mainly on its hocks as DDs and wolves most frequently do. In sitting NGSDs the back is rounded as in felines and the ischia are placed in contact with the ground. The anus may either rest against the ground, or be a slight distance above it. In this position the body weight is distributed between four rear contact points (hocks, ischia) rather than just two (hocks). GK

Snore - SNR = Deeply relaxed, resting NGSDs often make light snoring sounds during inspiration. In this relaxed state the eyes may remain slightly open with the nictitating membrane partially covering the eye. Determining if a NGSD is "asleep" when it Snores is problematical from only visual observation, as they remain reactive to the environment and rouse at the slightest sound or touch. SNORES are performed frequently when the NGSD is being held or resting in contact with a human.

Sphinx Rest - XR = Lying on the belly with forelegs extended to the front, hind legs bent and resting close to the body on each respective side, or with the body twisted and both hind legs to one side. Head is up but may be lowered to rest on the forelegs or the ground between them. GK



***Sphinx Rest (Cat) – XRC** = Sometimes when lying in the SPHINX position NGSDs rotate the forelegs, turning the front paws in, pads toward the chest, and fold them back against the chest in a cat-like manner.

Stretch Fore and Aft - STRF-A = A BOW STRETCH followed by alternately extending the hind legs. Usually accompanied by an upward arching of the tail. GK



***Perch - PRCH** = NGSDs habitually rest on elevated objects. Sometimes they sit/stand/lie on a perch for up to an hour or more at a stretch, apparently observing the surrounding environment. If the perch surface is flat they will often nap there. The high frequency with which this behavior is exhibited may be an adaptation to the most common wild habitats of this canid: areas of high rocky outcrops above the timberline and forest areas with thick, sodden undergrowth. In both environments, Perching NGSDs can more easily view the area and remain dry and/or warm. Perches used in this study included: the peaked top of a dog shelter about 1.22m high (on which four subjects often perched simultaneously) and the 0.25m wide slanted wooden plank attached to the edge

of the dog shelter roof and to a log stump 0.31m high; a 0.30m wide X 1.22m high shelf attached to the side of one run; the flat tops of the kennel run dog houses; the wooden table in the play yard; the backs of chairs and couches; and the 0.25m to 0.30m diameter X 0.31m to 0.61m high log stumps present in each run and in the exercise yard.



***Wide Sit – WSIT** = In SITTING NGSDs, the hocks are often placed out from under the folded legs by flexing the stifle joint in toward the midline of the body. See Note 2.

V. Feeding

Cache - CACHE = To hide or bury objects, usually food items. After choosing a spot, the actor digs a hole (may merely perform digging motions if on a hard surface), places the item carefully, then uses its nose to push debris over the item (or to make covering motions) until it is satisfied. If digging is not possible, such as indoors, the item is often placed under a piece of furniture or in a corner. Dishes containing food the actor does not wish to eat immediately are often pushed around with the nose in burying motions and frequently flipped over. GK

Chew - CHW = NGSD chew their food thoroughly. Even very small pieces less than the size of a green pea are masticated before they are swallowed. The only item ever swallowed whole during this study was an adult vole (*Microtus* sp.) that a four-month-old puppy was trying to keep away from the rest of the group, which were MOBBING him. It was swallowed in one gulp (it had been crushed by the adults before the actor had secured it).

Defend Food - DFF = While in possession of a food item, the actor responds to the approach of the receiver by GROWLING or GROWL-BARKING. If the receiver continues toward the actor, the actor may escalate into DEFENSIVE PUCKER, SNAPPING, and, in extreme cases, to INHIBITED BITING. See Note 3.



Displace From Food - DISF = The actor approaches the feeding receiver and through submissive behavior (FOOD BEGGING, TAIL WAGGING, PAW LIFTING, etc.), or (rarely) by aggressive behavior (GROWLING, CROWDING, SAPPING, etc), motivates the receiver to give up its food. Adults (with the exceptions in Note 22) request access to each other's food by approaching the feeder with a relaxed UPRIGHT POSTURE and slowly WAGGING TAIL. The responding feeding individual leaves its food, allowing the actor to take possession. If the receiver does not abandon its food, the actor waits calmly, as in the illustration. See Note 4.

Drink - DRNK = To lap up liquid with the tongue. GK

***Drink Water – DRW** = To lap up water with the tongue. During lapping, all NGSDs appear to watch the surface of the water to a much greater degree than they scan the surrounding environment - a seemingly appropriate behavior for an animal that has evolved in an environment that included crocodiles and large pythons. See Note 5.

Eat - EAT = To ingest food items.

Food Mouthing – FDMO = A novel food item is TESTED before it is ingested. The item, or a piece of it, is picked up in the mouth and "chomping" motions are made. It cannot be determined from external observations whether the item is being "rolled around" in the mouth, or whether the chomping motion merely serves to increase the air-flow around the food item, enhancing the sense of taste/smell. The item is usually set down, SNIFFED, and mouthed again, perhaps for several repetitions, before it is either EATEN or discarded. This FOOD MOUTHING is done with delicacy, and even items such as small pieces of bread or cake are frequently still intact after FOOD MOUTHING has been repeated several times.

Gnaw - GNW = To repeatedly CHEW and NIBBLE a food item or object. During GNAWING the carnassial and molar teeth are used to shear off pieces of the item and crush them. GK

Guard Food - GRDF = The actor rests a short distance away from a food item and GROWLS/rushes at any individual that comes near the item. Guard Food differs from DEFEND FOOD in that the actor is not chewing on or eating the food. May continue for an extended period.

Lick Food - LKFD = To wipe a food item with the tongue before or during ingestion.

Nibble – NBL = Using a scissors action of the incisor teeth to work at the surface of a food item or object. NIBBLE GROOM SELF and NIBBLE GROOM OTHER are behaviors performed using the incisors in a similar manner.



***Place Food - PFD** = If they are on dirt or gravel substratum, and are given bones, moist chunks of food (like meat) or hard, crumbly food items (like dog biscuits), NGSDs regularly place them on hard surfaces to manipulate and CHEW them. They will CARRY the item several yards to do this. This behavior is first expressed by puppies at about 8 weeks of age but seems to be much more frequent in mature animals, and therefore may be learned behavior or reinforced by learning.

This sub-adult male, PERCHING on a roof and plank, has placed his fresh bone there to chew it.

Pluck - PLK = The actor uses its incisor and premolar teeth to pull the fur/feathers from prey, usually holding it down with their forepaws. This behavior is also expressed during play with cloth or furred leather items. GK

Tear - TEAR = To hold prey or other object with the front paws and rip off pieces, usually using the incisors.

***Testing Food – TSTF** = Novel food items are tested by LICKING and FOOD MOUTHING before they are ingested for the first time, sometimes repeatedly. Often NGSDs will not even TEST FOOD until they have observed a conspecific or human eating it. Frequently the actor engages in TESTING PREY behaviors when Testing Food.

VI. Solitary Play

Carry Object - COB = Holding an object in the mouth while standing or moving around. GK

Chase Leaves - CHLV = ORIENTING toward, RUNNING after, FORELEG STABBING and PAWING AT blowing leaves. GK

Chase Tail - CHST = An uncommon behavior of NGSD puppies, in which the individual notices and tries to GRAB its own tail in its mouth by circling around. Occasionally the actor succeeds in taking hold of the tail hair, either while CIRCLING or after SITTING. Has not been observed in NGSDs over three months old.

Chew - CHW = See Feeding category.

Leap - LP = See Locomotion category. Lone puppies frequently leap during RUNNING PLAY and OBJECT PLAY. Often the LEAP appears to have no discernible target or external trigger.

Object Play: Individual – OBPLAI = A single actor Interacting with an inanimate object. May include but is not limited to: all predation behaviors except KILL; ROLLING; SCENT RUBBING; CARRYING; NIBBLING; CHEWING; LICKING.

Pawing At - PAW = See Affiliative/Greeting category. In solitary play Pawing At is directed at both animate and inanimate objects. This play/exploratory behavior closely resembles the equivalent "patting" or "slapping" at objects performed by playful cats.

Play Run - PLRN = See Social Play category. In solitary play the Play Run is directed toward an inanimate object and the puppy will CHARGE the object, turn and run, dashing around, JUMPING ON and off nearby objects. Ears are frequently AIRPLANE, although other positions are displayed, and often the actor has an OPEN MOUTH PLAY FACE.

Tear - TEAR = See Feeding category.

VII. Elimination

Defecate - DEF = To evacuate solid waste. Just before defecating, NGSDs habitually PACE and

walk in tight circles, sometimes a dozen or more, then swing their rears around in a circle, turning in place one to several times while keeping their paws close together. Defecation is done from a posture similar to the SIT, with the hocks spread out from the body and the anus close to the ground. GK

Eliminative Paw Scrape - EPSC = Frequently all four paws are scraped backwards on the ground after eliminations, with the hind paw motion being much more forceful and vigorous. Nail marks several centimeters long are often impressed into bare ground and ground-covering vegetation damaged. The subjects highest in social standing seem to perform this behavior more frequently. See Note 6. "Scrape" in GK

Feces Placing – FPL = Singers often carefully place their feces, near or on bushes, grass clumps, in water buckets, on elevated objects such as low stumps, or curbs, or next to large vertical objects such as trees or walls. Many will defecate or urinate in/on the empty food dish of their pen mate.



Hind Paw Scrape - HPS = Like the ELEMINTATIVE PAW SCRAPE, except only the hind feet are scraped. First observed in both sexes at 10 weeks.

***Nose Scrape** – NSC = The actor uses its nose, as in CACHE, to push sand or loose debris over a fresh defecation. Resulting covering of the feces may be extensive or merely a light dusting. Feces may be rolled from its original position during the process. Only observed so far in males when nearby females are in heat and in a dam covering the feces of a three month old puppy.

Raised Leg Urination - RLU = Flexing and/or lifting a hind leg while urinating, males from a standing position, females from a squatting position. Performed by both sexes when MARKING or MARKING OVER (Aggression/Dominance Category). First seen in males at 13 weeks of age. GK

Urinate - UR = To evacuate urine. Also see Submission/Defense category. GK

VIII. Miscellaneous

Relaxation Reflex - RRX = Like cats, NGSD Puppies, even those three (or more - further observation needed) months old, normally become passive and limp when picked up by the back of the neck or by the skin in that area. Usually, there are no associated vocalizations.



Scent Rub - SR = An object or place is sniffed, and then the sides of the face and neck are rubbed on the odor. Usually the forequarters are lowered and the shoulders are also rubbed on the scent. The actor may then roll onto its back and twist around so the scent is spread to the back and flanks. May be repeated several times. Differs from that of the DD and wolf, mainly in having a lower threshold. Subjects Scent Rubbed on objects as diverse as raisins, beetles, fox (but not DD) feces, cigarette butts, hard candy, human bed pillows, and many spots with nothing detectable to a human nose or eye. This behavior may function as a social investigation facilitator/aggression reducer in this highly aggressive dog as suggested by Fox (1971). However, the proximate "reward" to the actor appears to be an intrinsic pleasure response, similar to a cat's

response to catnip. Similar behavior CHEEK RUB in Affiliative/greeting category differs in that it is much briefer, involves only the muzzle and/or cheek. The CHEEK RUB is often expressed in a greeting context but the Scent Rub is not. "Scent Rub" in GK

Shiver – SHVR = The skin and muscles are vibrated rapidly with high frequency and low amplitude. Expressed during intense excitement, especially when the actor is ORIENTED toward prey it is prevented from obtaining, and in response to low external temperatures.

***Sneeze - SNZ** = If a NGSD's head is positioned with the muzzle pointing vertically straight up for more than one or two seconds, they invariably begin to SNEEZE, often several consecutive times. They also SNEEZE repeatedly and forcefully after sniffing any beverage containing alcohol or other aromatic or volatile substances, including the orange juice, deodorizers and perfumes.

Startle Response – SRSP = NGSDs are very sensitive to sounds and movement and frequently respond to unexpected noises, touches or fast movements with an exaggerated but very brief Startle Response. Usually the whole body jerks as the head quickly orients to the stimulus. One subject was observed "ducking" in a Startle Response when a songbird flew low overhead.

***Tooth Gnashing - TGN** = see Aggression/Dominance category.



Yawn - YN = NGSDs have an extremely wide gape. The Yawn is expressed as a tension/stress releaser and is often seen during greetings. When in a stressful situation, and in greetings, yawns may be accompanied by a low volume yowling sound that rises in pitch. This accompanying vocalization has enough volume to be heard several yards away. Phonetically: EEE - YOW. GK (without any vocalization described)

Social Behaviors

I. Agonistic Behavior: Any behavior associated with conflict, including fighting, escaping and submitting.

A. Aggression / Dominance - The actor is attempting to establish or reinforce an elevated social standing in relation to the receiver.

Agonistic Pucker - AP = The mouth is opened, the corners pulled slightly forward of their resting position, the skin on top of the muzzle is wrinkled and the lips lifted to expose some portion of the upper tooth row. In the mildest Agonistic Pucker only the first few millimeters of the canines are visible, and in the most extreme the entire canines and the incisors are exposed. In aggressive actors the Agonistic Pucker is normally associated with a GROWL or GROWL-BARK, and in submissive/defensive actors with a GROWL or GROWL-SCREAM. See similar expression OPEN MOUTH PLAY FACE under Social Play category. GK

Attack - ATT = Initiating a physical contact FIGHT by LUNGING AT, CHARGING and STANDING OVER, or BITING, etc., the receiver. Accompanied by loud SCREAMS and GROWLS. See Note 7. "All-Out Attack" in GK.

Bite - B = A hard bite, often resulting in tooth marks or broken skin on the receiver. See Note 8. GK

Charge - CRG = A running approach toward the receiver from more than two body lengths away. Similar behavior LUNGE incorporates jumping toward the receiver and is performed from a closer distance (one to two body lengths). A Charge may end with a LUNGE. "Rush" in GK.

Chase - CHS = Running in pursuit of another. Differs from ESCORT (Sexual category) and FOLLOW in that rather than moving in tandem with the receiver the actor attempts to overtake it.

Chest Press – CPRS = The actor presses its chest against the receiver. May be followed by a HACKLE BITE or LICK, a DOMINANCE MOUNT, or if the receiver CRUMPLES, goes PRONE or BELLY UP, by a STAND OVER.

Circle - CIR = To move around an object or another individual in a tight circle. Actor's attention is ORIENTED toward the circled object/individual. A dominant actor, usually showing EARS UP, HEAD UP, TAIL UP or HIGH, sometimes Circles a passively submitting receiver. GK

Crowding – CRD = The actor moves within inches of the recipient, or actually touches it with some part of its body, usually with EARS UP or SIDEWAYS and TAIL UP. If the recipient moves away, the actor moves to maintain the close proximity. Often followed by CHEST PRESSES if the recipient is SITTING or STANDING or STANDING OVER (frequently head-to-tail) if the recipient is reclining.

Dominance Mount - DM = Non-estrus clasping with the front legs, usually around the flanks. Regularly includes PELVIC THRUSTING. First observed at 8 weeks of age. Subordinate receiver usually has EARS FORWARD or TURNED BACK, TAIL DOWN and sometimes performs a PRONE or ROLL-OVER, in which case the actor will often STAND OVER. Receivers of equal social status, and females being mounted by males, usually respond with GROWLING, PARTIAL HACKLES UP, EARS FORWARD or TURNED SIDEWAYS, tail in variable positions but never TAIL DOWN.

Dominant Approach - DAPR = Moving toward the receiver at the WALK or slow TROT while STARING AT it. Actor has TAIL-, EARS- and sometimes HACKLES UP. A more rapid approach would be a CHARGE.



Ears Up - EU = Ears fully upright when viewed from the side, with the inner surfaces turned forward. Approximate angles formed when lines are drawn level with the top-skull and through the center of the ear (hereafter labeled "Angles formed"): from the front, 95 -100 degrees; from the side, 80 - 85 degrees. See Note 9. "Ears Pricked" in GK.



Follow - FOL = To match speed and direction while Following behind another, usually within two to three body lengths. Differs from ESCORT (Sexual category) in that ESCORT is not restricted to moving behind the receiver, can include remaining still next to the receiver, and is usually performed at a closer range of about one to two body lengths.

Fence Fight - FFT = Aggression directed at receiver through a fence or other barrier. Always includes vocalizations (GROWL, SCREAM, GROWL-BARK) by both participants and mutual clawing/biting of the barrier.

Face-Off - F-O = Two animals stand facing each other in UPRIGHT POSTURE, HACKLES UP, and customarily with AGONISTIC PUCKER and GROWLING. Usually ended by one animal breaking eye contact and turning slightly away. May escalate into a HIGH STAND OFF.

Fight - FT = A generalized term for behavior involving aggressive physical contact interactions between two animals when one is not clearly acting submissive. In aggressive physical contact involving a dominant actor and a submissive receiver, the socially inferior party normally immediately goes PRONE or BELLY UP, SCREAMING and remains that way until the dominant ATTACKING animal turns away or there is a chance for ESCAPE. During Fighting between social equals or those who have not established a relationship, the individuals commonly exchange positions. Fighting may include: AGONISTIC PUCKER, BITE, BUCK OFF, BITE, INHIBITED BITE, GENITAL BITE, WRESTLE (see Social Play), GROWL, SCREAM, HEAD SHAKE, HIP SLAM, KICK, SNAP, TOOTH GNASHING, WIRL. Ear and tail positions are variable depending on the action and the individuals involved.



***Genital Bite - GENB** = When play WRESTLING and FIGHTING, NGSDs frequently assume tail to head standing over/lying belly up positions and direct INHIBITED BITES and, more rarely, BITES to the opponent's genital area, including the genitals themselves and the upper thighs and belly adjacent to them. During FIGHTS usually accompanied by SCREAMING and YELPING by the receiver and GROWLING by the actor. Dominant males also frequently give a rapid series of INHIBITED BITES to the penis of a recumbent, passively INGUINAL PRESENTING subordinate male. If the actor's body posture signals non-aggressive intent (EARS TURNED SIDEWAYS, HIGH WAG, hackles down) the receiver remains passive rather than making defensive

motions and its vocalizations are subdued YELPS and WHIMPERS rather than SCREAMS. (Fig. 2a)

Growl - GR = See description under the Vocalizations category. During physical contact agonistic exchanges, the Growl frequently grades from a deep rumble to higher frequency vocalizations such as the SCREAM.

***Growl Scream - GRS** = See description under the Vocalizations category. Expressed during physical contact aggressive behaviors.

Hackle Bite - HB = An INHIBITED BITE given to the receiver's back of the neck/shoulder area. Bites to the back of the neck were first recorded in this study between littermates at 2 weeks of age. Further description under the Sexual category.

***Hackle Lick - HLK** = Licking receiver's shoulder area. When associated with dominance behaviors, usually the licks are exaggerated, repetitive and vigorous. Hackle Licking is frequently interspersed with HACKLE BITING. Often seen during DOMINANCE MOUNTING and MOUNTING. See Note 10 and illustration of MOUNT in Sexual category.

Hackles Up Full - HUF = The actor's hair is raised the whole length of the center of the back from the base of the neck to the tail. The head, entire neck and tail hair may also be lifted. Occurs often during severe THREATS, aggressive ATTACKS and FIGHTS. See Note 11. Included under "Hackles" in GK.

Hackles Up Partial - HUP = The actor's hair is raised only on the shoulder and rump areas. Also seen in fear reactions in response to a more dominant animal's mild THREAT. Included under "Hackles" in GK.

Head Shake - HSH = While grasping an opponent, playmate, object or prey with the mouth, the head is rapidly oscillated back and forth. Sometimes the actor's whole body sways. Also see description under Predation category. GK

High Stand Off - HSOF = Two GROWLING actors stand on hind legs while pushing at each other with their forepaws. The more socially dominant individual normally has EARS UP, HACKLES UP (PARTIAL OR FULL), TAIL UP or TAIL HIGH, and an AGONISTIC PUCKER facial expression, while the less dominant usually has AIRPLANE EARS or EARS TURNED SIDEWAYS, HACKLES UP PARTIAL and a DEFENSIVE PUCKER that does not expose the canines. Ends when one turns its head away and both drop back to the ground. Described in Voth 1988.

High Wag - HWG = The tail, in the TAIL HIGH position, is slowly wagged side to side with low amplitude. Included under "Tail Wag" in GK.



Hug - HUG = Actor clasps its forelegs around the neck or shoulders of the receiver. Does not include PELVIC THRUSTING. The Hug illustrated is a "playful" Hug. During aggressive Hugs, the actor GROWLS, and has EARS UP or EARS TURNED SIDEWAYS, TAIL HIGH or UP. The Hug is often expressed during play and greeting, without the GROWLING and accompanied by AIRPLANE EARS or FORWARD EARS and TAIL WAG. GK

Inhibited Bite - IB = A bite that does not cause marks (loss of fur, scratches on skin, etc.) or injury to the receiver. See Note 12. GK

Lateral Display - LDIS = The actor stands broadside to the receiver, UPRIGHT POSTURE STIFF, EARS UP or TURNED SIDEWAYS, TAIL HIGH, HACKLES UP FULL or PARTIAL, while STARING AT the receiver. Sometimes the actor will STIFF WALK a few steps back and forth as part of a Lateral Display. GK

Lifted Lips - LL = Baring of the upper canine teeth by elevating the upper lips, usually in conjunction with an AGONISTIC PUCKER, GROWL, GROWL-BARK or GROWL-SCREAM.

Look Toward - LT = A brief STARE AT. Usually followed by immediate looking away when the receiver signals submission (AIRPLANE EARS, EARS BACK, TAIL DOWN, TAIL TUCKED, RUMP LOWERED, SUBMISSIVE TAIL WAG, etc.).

Lunge At - LUN = LEAPING or CHARGING toward the receiver from a short distance (less than one to two body lengths), usually with AGONISTIC PUCKER, GROWLING, HACKLES UP PARTIAL or FULL, TAIL HIGH. In GK "Lunge" described as "A directed jump at another wolf." (P. 16)

***Mark** - MK = To urinate on an object or place after investigating it. Males usually Mark objects elevated above ground level. NGSDs frequently mark other NGSD (and human) sleeping places and sometimes mark their own sleeping places after the bedding is changed. They also often Mark spots where another animal has been sitting or resting and dirt freshly dug up by another dog. Differs from the same behavior in other canids in increased average frequency and preferred targets.

Mark Over - MKO = To urinate on the same spot another has urinated on. Almost always this is a

RAISED LEG URINATION in adults of both sexes. See Note 13. "Over-Mark" in GK.

Measuring – MSR = see description under Social Play.

Mob - MOB = Two or more actors CHASING, WRESTLING with, LUNGING AT, attempting to STAND OVER, TAIL PULLING, etc., one receiver. Mobbing may be playful, especially in puppies and younger dogs, but generally has aggressive overtones in mature animals. GK

Muzzle Bite - MZBT = INHIBITED BITING (most commonly) or BITING (rarely) the muzzle of the receiver. See Note 14. GK

Nose Jab - NJ = A forceful punch with the nose, usually directed at the receiver's body or back. Most often performed during play solicitation and sexual solicitation. See Note 15. See similar behavior NOSE STAB in Predation category. "Jaw Punch" in GK.

Nose Jab Intention - NJI = A forward thrust of the nose toward the receiver that does not make contact. Often performed several centimeters away from the receiver.

Paw Jab - PJ = The actor rapidly extends a foreleg and pokes the receiver forcefully with the paw. Also see description under Social Play category and Note 16. "Foreleg Stab" in GK.

Quiver – QVR = During intensely arousing occasions, especially during LATERAL DISPLAYS and FACE OFFS, and while viewing unreachable prey, the actor sometimes exhibits body vibrations that are more subtle, less extensive than SHIVER. Quiver is most noticeable in the tail.

Raised Leg Display - RLD = A RAISED LEG URINATION motion performed when there is no urine expressed, usually after a series of RAISED LEG URINATIONS and/or MARK OVERS. GK

Raised Leg Urination – RLU = See description under Elimination category.

Ride Up - RU = The actor places its forepaws on the receiver, usually from the side on to the back, but the position varies with the ongoing action. This behavior is performed only toward social equals or subordinates except when it is part of play or courting. See Note 17. GK

Snap - SN = A biting motion that concludes in the air. During this study no expression of this behavior produced the audible click of the teeth heard in wolves and dogs (Fox 1969, Schenkel 1967). GK (described with the audible click)

Sniff Genitals - SNG = Dominating actors sniff the genitals of their submitting receiver. Often performed during an aggressive interaction, especially a STAND OVER, and just before the actor turns away to end the encounter. The submissive actor often tries to quickly sniff the genitals of a dominant animal but turns away when the dominant animal notices. Genital Sniffing is also a common greeting behavior, when it is associated with ANAL SNIFFING. GK

Stand Over - STDO = Standing stiff-legged over a recumbent receiver. This is most often done in the head - to - tail position, but may be crossways to the body. Actor's paws may be on the receiver or the ground. In aggressive interactions this behavior is accompanied by GROWLING and SCREAMING by both parties. See RIDE UP for comparison. GK

Stare At - STA = An intense gaze, with EARS UP, that is directed just past the receiver (lowest THREAT value) or toward its face (highest THREAT value). Often the actor adjusts the THREAT level by alternating these two behaviors. Unbroken Stare At behavior usually precedes an ATTACK or FACE-OFF. It is also seen in social play, but is then accompanied by postures and behaviors, such as EARS FORWARD or an UPRIGHT POSTURE RELAXED, that signal the actor's playful intent.

Stiff Walk - SWK = A slow, deliberate walk toward or past the receiver, usually with a slight hesitation between steps and with: STARING AT, HACKLES UP (PARTIAL or FULL), EARS UP, TAIL UP or TAIL HIGH (tail does not wag). Often interspersed with LATERAL DISPLAYS and frequently expressed just prior to LUNGING AT or CHARGING the receiver.

Tail High - TH = The tail is held rigid, high above the level of the back, so that the base and at least the first third of the tail is near a vertical line drawn from the ground through the point of the rump. In some animals the tail in this position is curved over, so that the tip touches the back. Corresponds to Goodman and Klinghammer's (1990) T1 position.

Tail Up - TU = The tail base extends out about level with the back. This is the neutral position, Goodman and Klinghammer's (1990) T2-T3 designations.

Threat - THRT = An all-inclusive term for designation of aggressive dominance behaviors (except MARK OVER, FOLLOW, BITE and FIGHT) during observation notation when the action is so fast that details become lost. GK

***Tooth Gnashing - TGN** = The mouth is opened slightly and snapped closed in a sequence averaging 4 to 6 cycles per second producing a soft "chomping-chattering" sound. It is almost identical to FLEHMEN (Sexual category), but has fewer cycles per second and is not accompanied by salivation. Further observations are needed to quantify the frequency differences. Seen during highly stimulating events in which overt aggression is controlled.

Whirl - WRL = To spin around rapidly, usually to challenge or ward off another. GK

Upright Posture Stiff - UPS = The head (EARS UP) and tail are held high (TAIL HIGH) and all movements are slow and deliberate. Often accompanied by HACKLES UP (FULL or PARTIAL). This is the posture assumed by the actor during a LATERAL DISPLAY. When this behavior is playful or sexually motivated these intentions are signaled by HIGH WAGGING.

B. Defense / Submission - The actor is attempting to signal acceptance of the receiver's higher social status (by subordinating itself) and thereby avoid an attack by the more dominant animal. When these signals fail to appease the dominant animal and it attacks, the subordinate attempts to defend itself or tries to withdraw.

Active Defense - ADEF = A general term for behavior sequences that incorporate some or all of the following behaviors: BELLY UP, DEFENSIVE PUCKER, DEFENSIVE BITE, ESCAPE, GROWL, INHIBITEDBITE, HACKLES UP (FULL or PARTIAL), HOLD OFF WITH LEGS, KICKING, SNAP, SQUIRM, SCREAM, YELP.



***Airplane Ears** - AE = The outside rear edge of the ear is folded about 1/3 up from the base of the ear and the ears flattened and rotated to extend stiffly out from the sides of the head. When viewed from the front the ears form an angle of about 180 - 185 degrees from each other (no visible angle from the side view as ears are below topskull). Seen during submission, ACTIVE SUBMISSION (greeting), play, and begging. See Note 18. GK

Avert Gaze - AVGZ = An extended "looking away" in which the actor avoids looking directly at the more dominant animal (or a play partner), but may keep it in peripheral vision. GK

Avoid - AV = To actively keep away from another animal or situation, usually by walking, but sometimes by CROUCH-WALKING or CREEPING. GK

Belly Up - BUP = To lie on the back. In defense this is usually accompanied by loud GROWL-

SCREAMS while HOLDING OFF the superior animal with braced legs and hind foot KICKS.

Creep - CRP = To locomote slowly, usually at less than average walking speed, with bent legs, the body lowered close to the ground. Differs from CROUCH WALK in that the back is not arched, so the rump is not lower than the shoulders and from the CRAWL and the STALK in that the TAIL is Down and the ears are AIRPLANE or TURNED BACK rather than FORWARD or UP.



Crouch - CRCH = The legs are bent and the back arched so the actor appears "hunched over," with the rump lower than the shoulders and the actor is stationary. TAIL is DOWN or TUCKED and the EARS AIRPLANE or TURNED BACK. GK

Subject on right, an adolescent male, is Crouching with HEAD TURNED TOWARD in response to a LOOK AT from his sire, the center subject.

Crouch Walk - CRWK = A four-beat gait with the body in the CROUCH position. Usually seen in an AVOID response to a dominant receiver's STARE AT or APPROACH. "Creep" in GK.

Crumple – CRPL = The actor folds its legs under its body and quickly drops into a downed position. The forelegs are characteristically retracted under the body. The head is usually lowered near the ground, the ears AIRPLANE and the TAIL TUCKED or DOWN, often WAGGING. May be followed by a BELLY UP. Most frequently shown on approach of a familiar dominant human.

Defensive Agonistic Pucker - DAP = Same as AGONISTIC PUCKER but the upper canine teeth are usually not bared, or bared only partially, and the corners of the mouth are pushed slightly forward rather than pulled slightly back. Usually accompanied by GROWLING or SCREAMING. Often seen during play or low level agonistic interactions between two socially equal animals. Differs from the similar OPEN MOUTH PLAY FACE, in that the upper canines are exposed and the body postures of the defensive actor are submissive.

Defensive Bite -DB = An INHIBITED BITE in response to an ATTACK.

Defensive Gape - DGP = The corners of the lips are pulled back very slightly and the mouth is briefly held open (though usually not as widely as in the coyote [Fox, 1971]). If the dominant receiver makes aggressive physical contact with or ATTACKS the actor, the upper canine teeth are bared by LIFTED LIPS. First observed in puppies at 2 1/2 weeks of age. Usually accompanied by a YELP or SCREAM. "Gape" in GK.



Ears Forward- EF = Ears are relaxed forward and lowered downward on the sides of the skull, accenting their cupped shape. A slight wrinkle usually forms above and down past the outside corners of the eyes. Angles formed: from the front view the ears are about 125 -130 degrees apart; side view angle (only tips visible) about 65 - 70 degrees elevated from the bridge of the nose. This ear position is a signal of mild submission or tolerance, occurring during greetings, sexual MOUNTING, FOOD BEGGING, and in response to human petting. When the animal is enjoying pleasurable contact such as petting their eyes also partially close. Ears Forward may also be an indication of uncertainty as it is seen when a NGSD is introduced to unfamiliar environments. The position is much more pronounced in puppies up to about 12 weeks of age due to their looser skin.

Ears Turned Back - EB = An extension of AIRPLANE EARS. The ears are folded near the base and pulled back so they look like the wings of a swept-wing jet, the tips sticking slightly above the rear of the top skull when the muzzle is pointed downward. Angles formed by the ears: front view about 130 degrees apart, profile view (only tips visible) about 65- 70 degrees above a line drawn from the bridge of the nose. This is the most extreme submissive ear signal.



Ears Turned Sideways - ETS = The ears are fully upright, turned so the inner surfaces face outward. Angles formed by the ears: front view about 90 degrees from a line drawn across the topskull; side view about 90 degrees upright from a line drawn from the bridge of the nose. Often seen during PLAY SOLICITATION, mild dominance/subordination behaviors and sexual POSING. "Ears Pricked, Turned Sideways" in GK.

Here illustrated combined with a yawn, which pulls the ear bases slightly downward thus the ears form more than a 90-degree angle to the top skull.

Escape - ESC = To actively and rapidly avoid an ATTACK, HARRASMENT or MOBBING. Differs from AVIOD because it is performed at a fast trot or gallop rather than a walk or slow trot, and because it can include shelter seeking.

Hackles Up (Full) - HUF = See Dominance/Aggression category. Seen in actively defensive individuals responding to a serious THREAT (CHARGE, STAND OVER, ATTACK, etc.). Included under "Hackles" in GK.

Hackles Up (Partial) - HUP = See Dominance/Aggression category. The actor may be responding to a more dominant animal's mild THREAT (LOOK AT or STARE AT from a distance, or slow APPROACH, etc.) or to an object or event that arouses moderate fear. In this context this behavior occurs in combination with submissive body, head and tail postures. Included under "Hackles" in GK.

Head Turned Away - HTA = The actor bends its neck, turning its lowered head away from the receiver without turning the body. EARS are AIRPLANE, BACK, or TURNED SIDEWAYS. May be alternated with HEAD TURNED TOWARD.

Head Turned Toward - HTT = The actor lowers its head and turns it toward the receiver, often from a CROUCHED posture, with AIRPLANE EARS or EARS BACK, often with LICK INTENTIONS and sometimes with SUBMISSIVE TAIL WAGGING. This behavior is often incorporated into ACTIVE SUBMISSION (greeting). See illustration for CROUCH.

Hide Head -HHD = The actor, usually in a CROUCHED body posture, attempts to hide its head by pressing it into a corner, etc., or, if it is being held, into the human holding it.

Hold Off With Legs - HOL = A BELLY-UP or recumbent actor attempts to hold off another's STAND OVER or ATTACK by pushing with stiff legs.

Inguinal Presentation - ING = The actor lifts the hind leg on the side closest to the receiver. In mildest form, usually in response to a LOOKING TOWARD by a more dominant animal, the leg is flexed only slightly. In the most extreme display, usually in response to a DOMINANT APPROACH, STARE AT or CHARGE, the submissive actor goes PRONE and the leg is held stiffly up and out from the body, in males often with PENIS EXTRUDED. GK (without PENIS EXTRUDED)

Lick Intention - LI = With the mouth closed, or nearly so, the tip of the tongue is extended slightly beyond the front of the lips, making licking motions in the air toward the receiver. Sometimes the actor licks its own nose or muzzle. Accompanied by AIRPLANE EARS or EARS BACK and TAIL DOWN. Also frequently expressed during greetings of dominant conspecifics or humans.



Paw Lift - PL = A front paw, most commonly on the side closest to the dominant receiver is lifted from the ground with the pastern bent. Varies from a slight lift just clearing the ground (for example, in response to a LOOK AT) to raising the paw to chest level (for example, in response to a DOMINANT APPROACH), depending on the receiver's posture/actions. Also frequently seen in food, play and care solicitation

Here illustrated in exaggerated play solicitation, with the receiver expressing PLAY FACE.



***Penis Extruded - PE** = The tip of the penis is extended from the sheath so that an inch or so is visible. Often associated with the CROUCH, CROUCH WALK, ROLL OVER, or PRONE. Also occasionally observed in non-displaying animals during any increased level of general excitement and during estrus periods. First noted in this study at 8 weeks of age. Different from domestic dogs in the frequency of the expression and the low threshold.

Prone - PRO = The actor lies down on its belly, and most often then rolls onto its side, usually from a CROUCHED position, and remains motionless. Often accompanied by WHINES, SCREAMS, LICK INTENTIONS, INGUINAL PRESENTATION, and in males, PENIS EXTRUDED. "Submissive-Passive" in GK.

Rump Lowered - RLOW = The rump is lowered by bending the hind legs, TAIL DOWN or TUCKED. The actor often simultaneously turns slightly away from the receiver. Frequently his behavior consists of just a slight "courtesy dip" in which the hind legs are only slightly flexed for less than a second. See illustration of CROUCH, which differs from Rump Lowered only in that the forelegs are more flexed.

Roll Over - RO = The PRONE actor rolls over, twisting its torso and folding the front legs, exposing its belly and genitals. Also seen in greetings, especially toward humans. See similar behavior, ROLL IN FRONT, Social Play category.

***Scream - SCRM** = See Vocalizations category. Voiced by both actor and receiver in overt aggression and defense. The threshold for Screaming is much lower in NGSDs than in wolves or DDs and is therefore frequently expressed by submissive actors during even mild conflicts that do not involve physical contact. May be equivalent to GK "Shriek."

Snap - SN = See Dominance/Aggression category. When physically attacked, the submitting actor goes into ACTIVE DEFENSE, including snapping in the air toward the dominating animal. GK

Submissive Approach -SAPP = Actor approaches the receiver at the WALK or TROT with AIRPLANE EARS or EARS FORWARD with TAIL WAGGING or SUBMISSIVE WAG. Commonly, the head is slightly lowered and extended toward the receiver. When within a few feet of the receiver, the actor often gives LICK INTENTIONS, and upon reaching the receiver, usually goes into ACTIVE SUBMISSION.

Submissive Tail Wag - STW = With the TAIL DOWN or TUCKED the tip is wagged with low frequency and amplitude from side to side. Usually seen during greetings of more dominant conspecifics or humans or as a response to mild THREATS. As the THREAT escalates, the submissive actor stops wagging and becomes very still until it goes into ACTIVE DEFENSE.

Tail Down - TD = The base of the tail covers the anus and the lower portion is hanging down, normally the distal half curved slightly, like an up-side-down question mark. Goodman and Klinghammer's (1990) T3.5 position.

Tail Tucked – TT = The tail is drawn up between the hind legs. Goodman and Klinghammer's (1990) T4 position.

Tail Wag - TW = The tail is wagged in the TAIL UP position with high frequency and amplitude in a random pattern of vertical, horizontal and circular motions. Seen in greetings, especially toward familiar humans. GK

Urinate - UR = The evacuation of urine. Often the submitting actor Urinates a small amount during CROUCH, PRONE, and ROLL OVER behaviors, and always when an ATTACK occurs.

Yelp - YLP = See Vocalization category.

II. Social Play

All of the Agonistic behaviors listed are seen in social play except the following: ATT, B, UR, PE, RLU, RLD, FF. In addition, all predatory behaviors except B, CRBT, DIG, HUSN, KILL, LPST, and TEST are included in NGSD social play. These behaviors described in other categories will not be repeated here. Because the play bout usually ends when one of the players displays overt aggression, Lifted Lips and Growls are rare within a play bout.



Ambush - AM = Standing, usually with head at the same level or lower than the back, EARS FORWARD or UP, the actor stares intently at the receiver, rushing at it when it comes within some arbitrary threshold distance. Sometimes the actor lies down in a SPHINX posture, head raised or extended out and tucks its hind paws under its body, shifting its weight back and forth, settling the hind paws like a cat displaying similar Ambush behavior. Occasionally the Ambushing actor hides behind an object. GK

Bounce - BNC = The play soliciting actor jumps up and down in place. Frequently only the front feet are lifted off the ground. Differs from the FORELEG STAB and LEAP STAB (Predation category) in that the posture is more relaxed, the forelegs may not be close together, and they are not directed at a specific target. Differs from the STIFF LEG JUMP (this category) in that the legs are not held stiff. GK

Buck Off - BOFF = The actor makes a low jump up while arching its spine, attempting to dislodge the receiver who has MOUNTED or is RIDING UP. Often the front paws are braced and only the rear is lifted. May be accompanied by attempts to turn, WHIRL, or reach the receiver with an INHIBITED BITE. GK

Bump – BMP = The actor WALKS, TROTS or RUNS toward the receiver and Bumps into it with its chest and/or side. The force of the Bump depends on the angle of approach, the speed of the actor, and whether the receiver is stationary or in motion. Often, especially when performed by puppies, the receiver is Bumped hard enough so that it loses its

balance. This is a common PLAY SOLICITING behavior of puppies and adolescents. See related behavior KNOCK DOWN.

Bump-Sidle – BMPS = The actor BUMPS the receiver, then swings its rear around so its body is pressed more or less full length against the receiver. Sometimes the actor pushes against the receiver, moving sideways. May end with a HIP SLAM and/or the receiver going down and the actor lying on top of it.

Chest Press – CPRS = The actor presses its chest against the receiver. May be followed by a HACKLE BITE or LICK, a DOMINANCE MOUNT, or if the receiver CRUMPLES, goes PRONE or BELLY UP, by a STAND OVER.

Chin Rest – CHR = See Social Play category. A brief Chin Rest sometimes accompanies playful CROWDING.

Crowding – CRWD = Performed as described under Aggression/Dominance category, but with a relaxed posture, often accompanied by AIRPLANE EARS or EARS TURNED SIDEWAYS.

Fall Down – FD = The actor relaxes suddenly and allows itself to fall to the ground, usually on one side. Can be separated from a 'push down' by the lack of, or the abrupt end of, resistance from the actor against the grab-push of the other subject. Care must be taken to discern the Fall Down from the 'actor' (if it is a FD) being tripped by the other subject, which would then make the pup that falls the receiver.

Harass - HAR = The actor makes repeated friendly THREATS or mock ATTACKS toward the receiver, who usually tries to ESCAPE or ACTIVELY DEFEND itself. GK

Hide and Seek - H&S = PEEK-A-BOO played around an object, with AMBUSHING and role reversal. GK

High Wrestle - HWR = Two actors rear up on their hind legs, bracing, pushing or HUGGING with the forelegs and giving INHIBITED BITES or SNAPS, which often turn into JAW SPARRING. Accompanied by WHINES and MOAN-GROWLS. TAILS are usually UP and ears are TURNED SIDEWAYS or AIRPLANE. Described also in Voth 1988.

Hip Slam - HPSL = In NGSD this discrete behavior, common in wolves and dogs, in which the actor pivots on its forepaws and forcefully slams its side/hip into the receiver (as opposed to incidental body contact made during wrestling or fighting movements) was observed mainly in play interactions of puppies under about 7 months of age, at which time WRESTLING play begins to decrease, or between older and younger specimens interacting. See also PRESENT REAR, Affiliative/Greeting category. GK

Hug – HUG = Described under Dominance/Aggression.

Invite Chase - ICHS = The actor runs toward and then away, or past the receiver, sometimes BOUNCING and TAIL WAGGING. An actor passing close to the receiver sometimes will PAW AT it or PAW JAB, then turn and run away, looking back to see if it is being followed. See similar behavior PLAY RUN.



Jaw Spar - JS = Two actors "fence" with open jaws, attempting to block each other's movements and occasionally giving INHIBITED BITES to each other's muzzles or heads. Usually accompanied by EARS TURNED SIDEWAYS, AIRPLANE EARS or EARS FORWARD and MOAN-GROWLS or WHINES. GK

Here a yearling male NGSD jaw spars with a female Rhodesian Ridgeback. Note EARS TURNED SIDEWAYS and lips pulled back in a PLAY FACE that includes bared canines.

***Kick - KCK** = During WRESTLING play, the inferior actor, lying on its back or side and WRIGGLING around, Kicks at the superior receiver with both hind paws, while either HUGGING or HOLDING OFF the receiver with the front paws. Occasionally, if both parties are on their sides, they will do simultaneous Kicking. Very similar in form to the equivalent behavior in cats and foxes. Illustrated at WRESTLE under Social Play. GK (no context given)

Knock Down - KD = The actor runs into the receiver, most often hitting it with the chest or shoulders, but sometimes doing a HIP SLAM or JUMPING ON it with the whole body. The receiver falls to the ground, but it is difficult to determine if the action is voluntary or forced. In NGSDs, the Knock Down is normally performed only by puppies and young adolescents. Mature NGSDs normally do not behave in such a physical manner toward each other. See related behavior BUMP. GK

Leap Over - LO = The actor leaps over the back of another dog or an object. Frequent when a group is running together, or when a hurrying actor takes the direct route, going over rather than around a conspecific or object.

Measuring – MSR = An inhibited bite during which the actor places its opened mouth on the receiver as if the jaws are calipers “measuring” the receiver. After Measuring one or more times the actor may close the jaws sharply, pinching the receiver. Sometimes a NOSE PUSH accompanies Measuring. Measuring is usually seen between familiar specimens and has playful overtones. Measuring most frequently occurs when the receiver has ignored prior more subtle solicitations. GK

Mouth - MTH = To manipulate an object with the mouth, including conspecific and human body parts, repeatedly changing the grip. Mouthing differs from CHEWING, in that the mouth pressure is carefully controlled, and rarely is the Mouthed object damaged.

Nose Jab - NJ = See Dominance/ Aggression category. Frequently seen when the actor's more subtle play soliciting has been ignored.

Object Play – OBPLA = Two or more actors simultaneously CARRY, CHEW, TOSS, etc., an object. If one obtains sole possession, the other makes attempts to take it away, which may lead to CHASEING and WRESTLING.

***Open Mouth Bite - OMB** = The mouth is opened wide and pressed down over a body part of closed and are frequently withdrawn fully opened. No MOUTHING is involved. NGSD often use this Open Mouth Bite during play and in greeting puppies, familiar humans and canids with which the actor has close bonds. In this study first observed being performed by puppies at 11 weeks of age.



Same-sex female MOUNT with OMB.



Dam OMBs her 4 mo. old pup



Open Mouth Play Face - OMPF = The actor's mouth is slightly opened with the upper canines covered. A signal of friendly intent, the actor's ears are AIRPLANE, FORWARD or occasionally BACK, and the TAIL UP, usually WAGGING. Almost always accompanied by WHINES and PAWING AT or PAW LIFTING toward the recipient. Also seen in imperative "demand" begging during which the WHINE escalates into a plaintive OPEN MOUTH WHINE accompanied by PAWING or GRABBING the recipient. (Fig. 1d) Wolf "Play Face" in GK is different as includes horizontal retraction of the corners of the lips and ears flat back.

Paw Jab - PJ = See Dominance /Aggression category. Appears to be a protest against a rebuffed play solicitation or an imperative for attention.

Paw Lift - PL = See Submission/Defense category.

Peek -A-Boo - PAB = The actor initiates this behavior by repeatedly glancing at the receiver from behind an obstacle, and the receiver responds by approaching the obstacle and peeking around to see the actor. Usually a brief series of glance - and - change position is followed by one of the pair CHARGING at the other, often leading to WRESTLING or a PLAY RUN. In NGSDs observed only in puppies and young adolescents.

Play Bite - PLBT = GRABBING and HOLDING the receiver with an INHIBITED BITE during a play bout. NGSD puppies under 12 weeks of age have very loose skin and the actor usually holds a fold of skin rather than a body part, but legs are a common target. Often includes HEAD SHAKING.

Play Predation - PLPRED = All of the behaviors listed in the Predation category, except BT, CRBT, KILL, TOSS, may be performed toward a conspecific receiver during social play.

Play Run - PLRN = The initiating actor invites CHASE by CANTERING or GALLOPING past the receiver, HEAD UP, often briefly displaying AIRPLANE EARS as it passes the receiver. Alternatively, the actor jumps toward the receiver from a standing start, often momentarily (less than .30 seconds) lowering the forehead in a motion continuous with the jump away [This soliciting behavior may have been mistaken by other observers as a "play bow."] or runs toward the receiver, then reverses rapidly to run away when the receiver directs attention toward the actor. The receiver usually follows the actor, often passing it so the original "actor" is in the rear and roles are reversed. Participants frequently make gazelle-like RUNNING LEAPS forward and also LEAP OVER sidewise across each other. Often the follower begins to CHASE the forerunner in an attempt to catch it, sometimes with a TAIL GRAB. Between young animals, and young animals and adults, other types of social play, such as WRESTLING, are often interspersed with Play Runs. Play Running is the major form of play between adults and rarely is combined with any physical contact forms of play behavior. Play Run is a combination of GK's "Invite Chase" and "Play Run." However, the GK description includes "bowing" and "paws flung side to side" which were not observed for NGSDs

Play Solicit Stomp - PST = With EARS and TAIL UP (usually WAGGING) the actor struts toward and/or around the receiver, and suddenly stiffens its legs, simultaneously pushing the front paws slightly forward and the back paws slightly backward. On gravel or dried leaf substratum this creates an audible rustling/rattling noise. In the attenuated form the actor scuffs only its hind paws backward in short, jerky movements. Distinguished from ELIMINATIVE PAW SCRAPING by context and by the more abbreviated nature of the scraping motions. "Play Solicit" in GK includes bowing and ears flat back.



Play Solicit Stalk - PSS = The actor concentrates its attention on the receiver, EARS UP or FORWARD, and lowers its body, head extended forward and lowered to about back level, usually with TAIL DOWN. Generally the actor moves toward the receiver in slow motion, one or two steps at a time, often interspersed with lying down in the AMBUSH position. When the receiver makes eye contact with the actor, the actor often folds its EARS into the AIRPLANE position, putting them back UP when eye contact is broken. Usually ends in a CHARGE toward the receiver and PLAY RUNNING or WRESTLING then takes place.

Present Rear – PR = See Affiliative/Greeting category

Rebuff - RBF = The actor actively rejects the receiver's play solicitation. Further description under Sexual category.

Roll in Front - Rol-F = During PLAY RUNNING and WRESTLING the actor (running in front of or standing next to the receiver) drops one shoulder and somersaults in front of the receiver, ending in a belly-up position with the anterior-posterior reversed. Role reversal then often takes place for the subsequent play bout. May also be expressed during ACTIVE SUBMISSION. See similar behavior ROLL OVER Submission/Defense category. GK's "Roll In Front" includes kicking and squealing and was said to occur as sexual behavior as well as play.

Stiff-Legged Jump – SLJ = With EARS UP and TAIL UP, the actor raises its forehead, straightens its forelegs and brings its paws down with moderate force in the direction of the receiver. This is a play-soliciting behavior. Differs from the LEAP-STAB (Predation category) in that the rearing-up is lower, the hind paws do not leave the ground, and the front paws are not usually brought down together. Differs from the BOUNCE because the front legs are held rigid.

Squirm - SQM = An actor being held down by another wriggles around in an effort to free itself. GK

Squash - SQ = The actor (sometimes more than one) lies on or pins a receiver with part(s) of its body. GK

***Tail Grab - TG** = In play, NGSDs frequently grab their playmate's tail. During running play the following animal grabs the forerunner's tail. If the grab is brief, both continue to run, but often the actor will hold the tail and the receiver will stop forward motion. In puppies, WRESTLING play often ensues but in older animals the most frequent response is role reversal and more PLAY RUNNING. Differs from same behavior in dogs and wolves only in increased frequency (Fox 1971).

Upright Posture (Relaxed) - UPR = The actor's head and usually the tail are up above back level and the EARS UP, FORWARD or TURNED SIDEWAYS positions. The tail is usually WAGGING slightly and the hackles are down.



Wrestle - WR = Two playmates roll about, clasping and/or holding-off each other with the front paws and KICKING with the hind paws in a cat-like manner. Often performed in reciprocal head-to-tail positions. Usually accompanied by INHIBITED BITES, often to the genital area. Sometimes includes HEAD SHAKING, WHINES and WHIMPERS. EARS are usually AIRPLANE or BACK.

The bottom "receiver" in the illustration is also KICKING.

III. Sexual

Note: Observations of sexual behavior were limited due to the need to prevent pregnancies. Except for the four planned breedings, during which the pairs were left together, males were usually allowed to interact with estrus females only on lead, and reunited with them after the fertility period had passed. Further observations are needed.

***Auto Erotic Stimulation – AES** = During estrus season, when separated from potential mates, NGSDs often engage in bouts of self-stimulation of the external sexual organs. Male puppies occasionally perform AES starting at about 4 months of age. Male adults infrequently perform AES outside of the female estrus periods. This behavior has not been recorded for females outside of estrus periods. Bouts may last up to 15 minutes. Male: The male actor, usually in a seated or SPHINX REST position, grasps the bulbous gland of the penis with his incisors and applies pressure while pushing against it. The actor, bracing with one front leg for leverage while bending the body to reach the gland, alternates grasping and pushing against the gland with licking of the external genitals and surrounding areas. The actor's body frequently is pushed around in a circle by the pressure from the bracing front leg, pivoting around the hip resting on the ground. Vigorous expression may include intermittent PELVIC THRUSTING. The hind foot and leg may also be MOUTHED and LICKED intermittently. Males sometimes develop red irritated areas on either side of the gland from tooth abrasion. Female: In females, AES has been observed only during the peak of the estrus cycle, during the ovulation period. Females perform AES from a SITTING position. The rump lies flat against the ground, so that the hind legs are extended out away from the body horizontal to the ground, the back curved and the inguinal area facing upward toward the actor's head. This position is also often used during GENITAL LICKING and is similar to the position assumed by grooming cats. In AES the female actor vigorously licks the vulva, intermittently grasping it with the incisors and pushing against it. The vulva may be MOUTHED. Females rarely perform PELVIC THRUSTS during AES. In both sexes AES is frequently accompanied by panting. See similar behaviors SHEATH CLEANING and GENITAL LICK under Self Care.

Chest Press - CPRS = The actor, most often a soliciting male, but occasionally a soliciting female, presses its chest against the receiver. Accompanied by: low amplitude tail wag, usually with tail in TAIL UP position, EARS FORWARD or TURNED SIDEWAYS. Often the actor NOSE NUDGES the receiver and sometimes HACKLE LICKS, CHIN RESTS and/or makes INHIBITED BITES or OPEN MOUTH PLAY BITES to the receiver's body while Chest Pressing.

Chin Rest - CHR = The actor rests its chin on the receiver's back or neck. Often a prelude to SEXUAL MOUNTING or MOUNTING. First observed in this context at 9 weeks of age. GK

***Copulation Contractions - CCTR** = Starting at the tie, the female begins a series of abdominal contractions. The contractions increase in strength until they appear to be equivalent to late-stage labor contractions, and the skin on the female's back and sides is pulled backward with each one. The female groans near the end of each strong contraction. The contractions continue until the tie is broken.

***Copulation Scream - CSCR** = At intromission, the female NGSD emits a repetitive series of loud, protracted "YELP/SCREAMS". The screams continue for about one to two minutes, or until strong COPULATION CONTRACTIONS begin. The female NGSD's vulva does not enlarge as much during estrus as those of domestic dogs, so these screams may be pain-related. The biological reason for having painful copulations might be that it inhibits the female from breeding repeatedly, allowing the first male's sperm time to fertilize the eggs.

Escort - ESCT = During estrus the male moves about with the female, staying within one to two body lengths of her whether moving or resting. "Attend" in GK.

Flag - FLG = The female, when ready to breed, lifts her tail and holds it to the side, either in response to the male's touch on her rump, or, more often, to his licking of her vulva. Females will solicit males through a fence by pressing the vulva up against the fence while WHINING and FLAGGING.

Hackle Bite - HB = See Dominance /Aggression category. During SEXUAL SOLICITATION and SEXUAL MOUNTING the actor holds onto the receiver's hackle area or the back immediately behind it (depending on where it can reach). This differs from the OPEN MOUTH BITE (Social Play category) in that the mouth is closed sufficiently to hold onto skin folds, although the bite is inhibited. Often interspersed with HACKLE LICKING.

Hackle Lick - HL = See Dominance /Aggression category. Sexually motivated bouts of HACKLE LICKING are sometimes fairly long, perhaps 10 to 30 seconds, and the receiver's fur often becomes wet with saliva. This behavior usually precedes or accompanies the actor MOUNTING the receiver, and is performed by males toward females and by females toward both male and female partners. Often interspersed with HACKLE BITES or OPEN MOUTH BITES to the back or neck of the receiver. See illustration of MOUNT.

Intromission - INT = The male's penis is inserted into the female's vulva. Intromission is invariably accompanied by female COPULATION SCREAMS. GK (screams not mentioned)

Lick Genital - LKGN = The genitals of the opposite sex are licked. Estrus females will lick each other's vulvas and the male's sheath. Males licking an estrus female's vulva will invariably perform SCENT CHOMPING, and females licking an estrus female's vulva often do so.

Mark - MK = See Dominance /Aggression category. Marking behavior increases considerably during breeding season in both sexes.

Mark Over - MKO = See Aggression/Dominance category.

Molest - MOL = HARASSMENT by SEXUAL SOLICITATION. Males often continue attempted MOUNTINGS even after repeated REBUFFS, and sometimes engage in almost continual CHEST PRESSING, HACKLE LICKING and CROWDING of the female. The females respond with GROWLS, THREAT GAPES, INHIBITED BITES, WHIRLING and CHARGING toward the male.

Mount - M = The actor clasps the receiver with its forelegs around the flanks, or sometimes the



head or back. Always includes PELVIC THRUSTING, and frequently is accompanied by HACKLE LICKING and HACKLE BITING. Estrus females isolated from males sometimes MOUNT each other several times in a row, with OPEN MOUTH BITES, and HACKLE LICKS and HACKLE BITES, despite the receiver's GROWLS and attempts to REBUFF and ESCAPE. These bouts of reciprocal female Mounting (illustrated with a HACKLE LICK) may continue for several minutes. Same-sex male Mounting is limited to the subordinate Mounting the dominant male, as subordinate males usually interpret Mounting by a

dominant male as a THREAT and react with fearful SCREAMING or YELPING and CRUMPLE, CROUCH or go PRONE. Often the actor NOSE JABS or PAW JABS the recipient before or after Mounting. See non-estrus DOMINANCE MOUNT in Dominance /Aggression category for comparison. GK

Paw Jab - PJ = See Social Play category. In SEXUAL SOLICITATION may be a "testing" of receptivity for MOUNTING.

- Pelvic Thrust - PTHR = While MOUNTED, the actor's hips are oscillated forward and backward. In male actors MOUNTING estrus females it is accompanied by an attempt at intromission. Both estrus and non-estrus MOUNTING in NGSDs, between all ages and between both opposite sex and same sex pairs, usually includes Pelvic Thrusting. First observed in this study between female littermates at 8 weeks of age. Illustrated under MOUNT. "Thrust" in GK.
- Pose - POSE = During estrus season when NGSDs are in close proximity to and within sight of their chosen receiver they often assume an UPRIGHT POSTURE -RELAXED, with HIGH WAGGING and EARS UP or TURNED SIDEWAYS. The HACKLES may be UP (PARTIAL) due to the high arousal level, but not as prominently as in agonistic conflicts. Movements during Posing are jerky. Often a few small prancing steps are taken and the Pose resumed, sometimes from a different angle to the receiver. Males most often Pose broadside next to or in front of the female receiver, and females most often Pose in front of males, rear toward the receiver, looking back toward him. GK
- Rebuff - RBF = The actor actively rejects the receiver's SEXUAL (or PLAY) SOLICITATION by moving away, ignoring, THREATENING with GROWLS, THREAT GAPES, SNAPPING and WHIRLING, HIP SLAM, etc. Females often Rebuff MOUNTING attempts by sitting down. GK
- Ride Up - RDUP = See Dominance /Aggression category. Potential sexual partners use this behavior to test each other's receptivity.
- Present Rear (sexual) – PRS = The estrus female actor turns when approaching or being approached by a male so that her rear is toward the male. Often the tail is lifted or held to one side, unlike PRESENT REAR under Affiliative/Greeting category in which the tail is normally down.
- Scent Chomp – SCHMP = When the male sniffs and/or licks an estrus female's urine or vulva, he chomps his jaws by repeatedly slightly opening and rapidly closing his mouth about 6 TO 8 times per second. Often accompanied by salivation. Females at the peak of their estrus cycle may also exhibit Scent Chomping after licking another estrus female's vulva or urine. Both sexes, especially during estrus season, Scent Chomp when human body secretions are scented. This behavior seems to be functionally equivalent to flehmen in hoofed mammals and cats. See similar behavior TOOTH GNASHING in Dominance /Aggression Category.
- Sexual Guarding - SGRD = During estrus season both sexes attempt to prevent the close approach of others of their sex toward their chosen mate. The actor places itself between the mate and third party. It then performs LATERAL DISPLAYS and frontal POSING oriented toward the third party, GROWLS and, if the "interloper" comes too close despite the warnings, the actor may give it INHIBITED BITES or may ATTACK. Males are very aggressive in their Sexual Guarding and their threshold for all-out ATTACKS is extremely low during this period. They will CHARGE and STAND OVER another male if it even walks casually between them and the estrus female (who may be visible several feet away on the opposite side of a fence), and they often inflict puncture wounds. Sexually Guarding females usually demonstrate controlled aggression (does not result in wounds) toward familiar, bonded, subordinate younger females but uninhibited aggression and ATTACK toward unfamiliar or socially equal females. Included under "Guard" in GK.
- Sexual Solicitation - SXSL = A generalized notational term that incorporates two or more of the following behaviors: CHEST PRESS, CHIN REST, ESCORT, FLAG, HACKLE LICK, HACKLE BITE, LICK GENITALS, MOUNT, PAW JAB, PRESENT REAR, NOSE JAB, NOSE NUDGE, POSE, RIDE UP, UPRIGHT POSTURE RELAXED. GK
- Tie - Tie = After INTROMISSION the male's *bulbus glandis* swells and locks the pair together until the gland shrinks. NGSD ties average about 15 minutes. GK
- Upright Posture (Relaxed) - UPR = See Social Play category. This is the alert but neutral body

stance of NGSDs when they are in the presence of a receiver of the opposite sex during breeding season and they are not directly SEXUAL SOLICITING or GUARDING.

IV. Affiliative/Greeting

Active Submission - ASUB = A greeting or appeasement behavior in which the actor approaches (or is responding to an approached by) the receiver with head lowered, usually to back level or below, AIREPLANE EARS, TAIL WAGGING. Usually accompanied by WHINES, LICK INTENTIONS, and PAW LIFTING. When close to the receiver, the actor lowers its body, sometimes swinging its head back and forth in a sinuous manner, and attempts to MUZZLE TOUCH, MUZZLE LICK, PAW, and EAR NUZZLE the receiver. The receiver may give a negative response (HACKLES UP PARTIAL, EARS UP, GROWLING, TAIL HIGH, etc.) to REBUFF the actor, or a positive response (EARS FORWARD or SIDEWAYS, TAIL WAG, hackles down, OPEN MOUTH PLAY FACE, etc.) accepting the attention. Depending on the receiver's response, the actor may then CROUCH, INGUINAL RESENT, ROLL OVER to a negative response or HUG, NOSE NUDGE, OPEN MOUTH BITE in response to a neutral or positive response. These are only the most common included behaviors. Other submissive or play behaviors may be performed. Combination of "Greet" and "Submission-Active" in GK.

Anal Sniff - ASN = The actor smells the anal area of the receiver. Almost always occurs during greeting both strange canids and familiar ones who have been separated for some time.

***Barrier Lick** - BLK = All of the NGSDs in this study, when confined behind a barrier keeping them from a desired stimulus (in this study usually a human or release from the kennel run), licked the barrier in a rhythmic, repetitive manner. A bout of licking may continue for several minutes if the stimulus remains in view. Often interspersed with WHINING, PACING and HEAD TOSSES.

Besnuffle - BESNUF = The actor sniffs the receiver in a slow and exaggerated manner, usually pushing its nose into the receiver's fur. Often includes rooting movements (NUZZLING). Usually this is part of the routine when casually greeting a well-known receiver. On rare occasions an actor STANDING OVER a submitting receiver will Besnuffle it before giving INHIBITED BITES. GK



***Cheek Rub - CRUB** = The chin and/or cheek is pressed against an object in a brief swiping motion, usually in only one direction. May occasionally include the sides of the upper neck. Often repeated two or more times in quick succession and sometimes interspersed with sniffing the object. NGSDs have been observed Cheek Rubbing on objects as diverse as a visiting human's face and foot, a water bucket, and new toys. A male Cheek Rubbed on his mate (a cheek to cheek swipe during greeting) after a separation and a dam on her 13 day old pup. Differs from the SCENT ROLL in that it never includes any part of the body other than the chin, cheek and sometimes the uppermost portion of the neck. The NGSD cheek area between the corner of the mouth

and the eye has a distinctive sweet musk odor and, if scent glands are present in this area, this may be a MARKING behavior.

Chin Rest - CHR = See Sexual category.

***Crow - CROW** = Expressed during excited greeting, especially toward familiar humans, and during play solicitations. More guttural than a true HOWL, this vocalization has two forms: (1) a rhythmic, repetitive pattern of short segments usually repeated two to four times and (2) one long call that includes a "purring" sound similar to the sound produced by vibrating the tongue on the roof of the mouth (rolling an R). Although differing in structure, the two forms are considered equivalent because they both occur only in the context of greeting. Further observations may define their use more specifically.

Phonetically: ROO-ROO-ROO and ARRRRROO. May be functionally equivalent to GK's "Moan-Howl" which is given in the same context.

Ear Nuzzle - ENZ = The actor sniffs at and NUZZLES the ear opening of the receiver.

***Grin** - GRN = In the NGSD this submissive mouth configuration consists of only a slight backward retraction of the corners of the lips, as opposed to the greater retraction seen in wolves and DDs. The skin folds in that area are then accented in such a way that shadows often create the appearance that the corners of the lips are turned up like a human smile. The mouth may be closed or very slightly open. Always accompanied by EARS FORWARD, AIRPLANE EARS or EARS TURNED SIDEWAYS. In agonistic interactions the Grin becomes the DEFENSIVE GAPE. GK

Inguinal Presentation - ING = See Defense/Submission category.

Lick - LK = To wipe with the tongue. In greeting another canid the actor usually licks the receiver's mouth and ears; in greeting a human, the face, hands, or any available bare skin (or occasionally clothed areas) are Licked. GK

Lick Intention - LKI = See Defense/Submission category.

Muzzle Lick - MLK = LICKING the receiver's muzzle. May be continued up to the eyes and ears, where it often ends with NUZZLING.

Muzzle Touch - MT = The actor gently touches its muzzle/nose to the receiver. May be interspersed with an EAR NUZZLE or NOSE NUDGE.

Nibble Groom Other - NGO = The actor uses its incisors to nibble the fur/skin of the receiver. Adult NGSDs frequently Nibble Groom puppies but between adult NGSDs this is a rare behavior, usually expressed only between bonded pairs. Similar behavior NIBBLE GROOM SELF in Self Care category. GK

Nose Nudge - NN = The actor gently pushes its nose against the receiver, which may be an inanimate object. Often part of greeting and play, the Nose Nudge seems to be a mild imperative for attention (like a human tapping on another's shoulder) or an expression of affiliation (like a human patting another on the shoulder). Mildly dominating actors frequently use their nose to nudge the receiver. When performed toward an inanimate object this is a TESTING behavior (Predation category) usually followed by further exploration or play. In its more forceful form of this behavior becomes the NOSE JAB (Dominance/Aggression category). GK

Nuzzle - NZL = The actor pushes its nose against the receiver's fur and then rubs it back and forth or in circles, ruffling the receiver's fur. See similar behavior BESNUFFLE above.

***Open Mouth Bite** - OMB = See Social Play category.

Pawing At - PAW = The actor raises its paw, often to chest level or higher, and extends it toward the receiver. If the receiver comes within reach, this action may end with a touch. "Paw" in GK.

Present Rear - PR = The actor, after approaching to within one body length of another canid, pivots on the front legs, swinging its rear around in an arc so that its rump is facing the receiver's head. Observed frequently in juvenile females. Usually accompanied by AIRPLANE EARS or EARS TURNED SIDEWAYS and TAIL DOWN. Frequent in rough play. Also performed by estrus females, in which case the tail is lifted away from the vulva and sometimes flexed to one side.

Roll in Front - Rol-F = See Social Play category.

Rub On - RUB = The actor presses against and slides along an object or individual. Often seen during greeting through a barrier and SEXUAL SOLICITATION. GK

Sniff Genitals - SNGN = See Dominance/Aggression category. When expressed during this behavior is accompanied by relaxed body postures, including TAIL WAGGING, and usually by ANAL SNIFFING.

Tail Wag - TW = See Defense/Submission category.

Whine - WH = See Vocalizations category.

V. Care Giving

Curl Around Puppies - CRLP = Dams resting with (not NURSING or LICKING) puppies under about two weeks of age curl their bodies around the nested puppies, bringing their tail around to help cover them. If there are four or fewer puppies they are then often not visible. This behavior is only possible while the puppies are small enough to be enclosed.

Defend - DFND = Dams defend their puppies up to about four or five months of age, from aggression and too rough inspection and play behavior by older individuals. She will intersperse herself between her pups and the receiver, NOSE NUDGE and WHINE. If the receiver does not cease, she escalates into AGONISTIC PUCKER, GROWLING and INHIBITED BITES. If her puppies YELP or SCREAM while she is away from them she runs to their location and inspects them, becoming defensive if she feels they are being THREATENED.

Puppy Guard - PGRD = When the puppies are under three months old, the captive sire and dam closely monitor them, staying close by while other adult individuals inspect and/or MOUTH the puppies. The dam sometimes keeps her muzzle lowered next to the puppy, EARS FORWARD when another adult is near the puppy. May escalate into DEFEND. See Sexual and Object Play categories for other guarding behaviors.

Lick - LK = See Affiliative/Greeting category. Dams "wash" their puppies and lick the genital and anal areas of neonates (to about three weeks of age) to stimulate their elimination reflex. Also see Sexual category.

Nibble Groom Other - NGO = See Affiliative/Greeting category.

Nurse - NURSE = Suckling puppies. See Note 19.



Regurgitate - REGUR = Unlike domestic dogs, NGSD dams, and most sires, Regurgitate for their pups, starting when the puppies are about 5 weeks old. See Note 20. GK

A paternal NGSD regurgitates for his pups, which appear to be only three to four weeks old (photo courtesy of the World Wildlife Zoo, 2002).

VI. Attention Soliciting

Food Beg - FBG = Puppies seeking to be fed rush up to older individuals (almost exclusively the dam in this study), ACTIVELY SUBMITTING and NUZZLING the receiver's mouth, asking for REGURGITATION. A begging adult actor stands or sits near the receiver, looking at the food, EARS UP or FORWARD, and slowly moves in toward the food item. If the receiver has a higher social standing (i.e. younger animal toward adult) the actor lowers its EARS to AIRPLANE position as it moves closer and when it LOOKS TOWARD

the receiver. Often combined with OPEN MOUTH WHINES, especially if the begging is directed toward a human. See Feeding category for related behavior, DISPLACE FROM FOOD. GK

Ears Forward - EF = See Defense/Submission category.

***Head Toss - HTSS** = When frustrated in an attempt to approach or solicit attention from another individual (canid or human) or to get at an object that is out of reach, etc., NGSDs frequently Toss their heads. In the complete expression of this behavior, the neck is first flexed as far as possible to one side, then the nose is swept in a 90-degree arc to the rear centerline, turned so it points (more or less) straight up and then rapidly brought forward so the muzzle is once again facing ahead. The entire sequence is performed in about one to two seconds. This behavior is expressed to varying degrees depending on the intensity of the stimulus and the internal state of the actor. The mildest expression is a slight sideways neck flexing with an abbreviated flick of the head to the side and back. First observed here at 6 weeks of age. Walters (1996) has reported observing apparently similar Head Tossing in Australian Dingoes but this has not been confirmed.



Start of Head Toss



Apex of Head Toss

Howl - HWL = See Vocalizations category.

Mew - MEW = See Vocalizations category.

***Open Mouth Whine - OMW** = A distinctive, loud whistling whine of one drawn out high-pitched tone, sometimes rising and/or falling slightly in pitch, expressed as an imperative for attention. Performed with an open mouth, it can be heard from many yards away. The subject illustrating AIRPLANE EARS is giving an Open Mouth Whine. See Note 21. Phonetically: EE-AA-UUU

Paw Grab - PWGB = A soliciting actor reaches out with a front paw, touches the receiver, curls its toes to grasp, and pulls back toward itself. Often expressed toward humans while soliciting petting, and in object play.

Paw Lift - PL = See Defense /Submission category.

Pawing At - PAW = See Affiliative/Greeting category.

Tail Wag - TW = See Affiliative/Greeting category.

Whimper - WHM = See Vocalizations category.

Whine - WH = See Vocalizations category.

Wriggle - WGL = The soliciting actor wreaths around in front of the receiver, usually PAW

LIFTING or PAWING AT. Often observed performed by estrus females toward males, by puppies begging food or toys and during appeasement toward humans, in which case it is sometimes accompanied by INGUINAL PRESENTATION.

Vocalizations

The vocal behavior of the NGSD is very complex. There are variations, intermediate vocalizations and overlaps between all categories listed below. Different combinations seem to indicate the changing and conflicting inner states of the individual animal. See Note 22.

***Ak-Ak** – AK = A rapid series of short, sharp, explosively breathy vocalizations made in the back of the mouth. This is a warning threat meaning “Do not touch me.”

Bark - BK = A short, explosive outburst with a tonal carrier of relatively low to medium frequency (200- 600 Hz), and generally some broadband noise throughout. Like that of the wolf, the NGSD bark differs significantly from that of the DD, being on average of lower intensity and produced in single pulses of temporally disorganized sequences rather than a well-defined rhythmic series, and exhibiting little if any frequency modulation. Usually observed in defensive threat/protest and intense play solicitation. As in the wolf, Barking is more common in juvenile NGSDs than in adults. There is considerable individual variation in frequency-of-use. Some individuals Bark very rarely. GK

***Chorus Howl** - CHWL = A session of polyphonic simultaneous HOWLING by two or more NGSDs. Length of bouts varies from about 0.5 to 10 minutes. During this study the mean duration of the Chorus Howls recorded was slightly less than one minute. In general frequency modulation is less pronounced than in solo HOWLS, except for the COUNTERPOINT HOWL. A single individual typically initiates the Chorus Howl, with other individuals joining in very quickly. While it is difficult to determine whether a single individual signals termination, all members of the chorus cease howling almost simultaneously. See Note 31. GK

***Counterpoint Howl** – CPHWL = Although CHORUS HOWLS are characteristically more steady-state than solo HOWLS, within a CHORUS HOWL one animals may HOWL in counterpoint to the others, giving a call that is more sharply modulated than that of the other participants. The Counterpoint Howl seems to stimulate the rest of the howlers, as howls begun during or immediately following the Counterpoint are increased in volume. The counterpoint has also been observed in chorus howling in the Australian dingo (Ortolani, 1990).

Crows - The NGSD exhibits two distinctive forms of vocalization during excited greetings, especially toward familiar humans, and during play solicitations. Both forms may in any case be considered equivalent because they both occur only in the context of greeting. Further observations may define their use more specifically. (May be functionally equivalent to GK’s “Moan-Howl” which is expressed in the same context.)

***Crow-Howl** – CRHWL = This vocalization is lower pitched than a true howl, and has a broader range of (non-harmonically related) resonances that give it a distinctive auditory effect. Crow-Howls involves a rhythmic, repetitive pattern of short segments usually repeated two to four times.

***Crow-Howl-Purr – CRHWLP** = This is a single long call, similar to a CROW-HOWL, that includes a period of ‘PURRING’ similar to the trill produced by vibrating the tongue on the roof of the mouth without vocal fold vibration.

Growl – GR = A very low frequency, noisy vocalization of widely varying length. The Growl of an adult NGSD engaged in an aggressive encounter can be impressively loud and deep for a canid whose average weight is only about 11.5 kilos. Growling sends a message of aggressive warning, but often is superimposed upon or combined sequentially with other vocalizations that modify the message according to the internal state of the sender and the external circumstances. For the most part, NGSD puppies do not Growl during play, though Growling can signal the end of a play bout. (GK)

Growl-Bark – GRBK = GROWLS and BARKS that superimpose or closely follow each other without an intervening pause. Often expressed in ambivalent defensive/aggressive context. GK

***Growl-Scream – GRSC** = A vocalization that begins as a GROWL and then rises in frequency to become a broadband noisy SCREAM. Expressed in physical contact aggressive behaviors, the Growl-Scream indicates a very high arousal level.

***Howl – HWL** = A loud, tonal-harmonic, long vocalization. Usually the muzzle is lifted above the horizontal, as is typical of wild canid howling, though not as high as in the coyote. Ears are TURNED SIDEWAYS, and the eyes slightly narrowed during the Howl. The dramatic pitch changes of the NGSD Howl are not generally characteristic of any other canids (Brisbin et al., 1994; Cohen and Fox, 1976; Schassburger, 1987). “Modulation in the Singing Dog [howl] appears to occur over a wider frequency range and is certainly more robustly represented in the animal’s overall vocal behavior.” (Brisbin et al., 1994: 33) Detectable by a human listener 0.8 km away, the Howl has a typical starting frequency of 600 – 800 Hz and then may vary from 300 – 1700 Hz. Howl duration is 0.5 to 5 seconds with a mean of 3 s. Pitch invariably rises from the outset; the remainder of the event is occasionally fairly steady, but typically exhibits abrupt pitch changes up or down. This modulation may occur as rapidly as every 300 – 500 milliseconds, or as gradually as every second. Five to eight well-defined, intense harmonics can normally be discerned in spectrographic analyses of NGSD Howls. The Howls of young NGSDs are more modulated than those of adults. When isolated from their social group (human and/or canid) NGSDs engage in extended bouts of Howling, interspersed with WHINING. A series of isolation Howl bouts can last more than 20 minutes. The function of Howling is uncertain; it may play a role in territory maintenance (or spacing), or serve as a social contact call in an otherwise largely solitary animal.

Mew – MEW = A vocalization made only by puppies up to about 16 weeks of age. Puppies Mew when are disturbed, distressed or isolated. Mews may be steady in pitch and of relatively low amplitude, or involve a rapid rise-fall frequency modulation contour at high amplitude. The rise-fall version appears to occur under conditions of higher arousal or extreme distress. As in other canids, this call elicits maternal orientation and attention when given by pups up to about four weeks of age. If the caller is separated from its littermates, the call may elicit retrieval by the dam.

Moan – MOAN = A low-frequency low volume vocalization that is similar to the human “sigh” or “groan” in that it is an appetitive sound that may be an artifact of a physiological process or state-change (relaxation, change in respiratory pattern) rather than a communicative signal. Sometimes Moans are expressed just after the actor has laid down or in response to vigorous massage/petting by a human, in which case they may be given in a series.

Moan-Growl – MGR = A low-volume combination of a GROWL coincident with or followed by a MOAN. Frequently expressed during mild contact play, such as JAW SPAR.

***Open Mouth Whine – OMW** = A distinctive, loud whistling whine of one drawn out high-pitched tone around 1 KHz, sometimes rising and/or falling slightly in pitch. This call is apparently expressed as a plea for attention. Performed with an open mouth, it can be heard by a human many meters away. The subject illustrating AIRPLANE EARS in Submissive category is giving an Open Mouth Whine. See Note 21.

Peacock call – PCK = A juvenile only vocalization, expressed from about 4 weeks to 8 weeks of age, and not hear after that age. This vocalization is a long two-tone call that sounds to human ear exactly like a peacock call. Expressed when the subject wants attention, is feeling “abandoned.”

***Purr** – PUR = The Purr has the auditory character of a domestic cat purr, and can occur in isolation or in combination with other vocalizations. It should be noted that the actual physical mechanisms involved in felid purring are a matter of controversy. But there is evidence that it occurs as a by-product of blood flow changes associated with relaxation

and is not a true (laryngeal) vocalization with primary communicative function. The NGSD Purr may have a similar explanation.

***Scream – SCRM** = A piercing, predominantly tonal vocalization that might be also called a squeal or shriek. May be overlain with a period of broadband noise, especially toward the end of the signal. It is a one-second event with a loud, rapidly-rising onset (increasing from 100 to 1800 Hz) followed by a sustained 1200 Hz component. It has been observed being expressed in response to an apparent physical threat, on the approach of an unfamiliar animal, during very intense attention-soliciting toward humans, and by female NGSDs at the time of penetration and during the tie in copulation. May be functionally equivalent to “Squeal” in GK but appears to in general be more intense and harsher with a much lower threshold in the NGSD than in the wolf. See also COPULATION SCREAM, Sexual category.

Snort/Huff – S/H = A short, explosive blowing out through the nose, usually repeated. Characterized by very broadband noise that may be of relatively high amplitude. This is an alarm or defensive-threat sound, emitted at the arrival of strange individuals, especially human, and when a NGSD is surprised by the sudden appearance of novel objects in a familiar environment or the unusual motions of an individual or object. Often accompanied by GROWLING, some degree of HACKLE raising, and locomotion, with repeated ORIENTATION toward the eliciting stimulus.

***Trill – TRL** = A rare and apparently unique vocalization that has a distinctly “bird-like” auditory character. May be as long as 500 ms in duration. The Trill is characterized by an evenly timed series of one to two dozen extremely short (several ms) bursts at an average of 7540Hz. It has the spectral appearance of a short periodically interrupted HOWL or WHINE, although the articulatory mechanism is uncertain. It is sometimes produced abruptly in the middle of a solo HOWL, and occasionally as a distinct event within a CHORUS HOWL. It is (infrequently) expressed during a state of high arousal, e.g., when surprised by the approach of an unfamiliar human. It may also be produced when the actor is oriented toward a potential prey object but restrained, as on a lead.

Whimper – WMPR = A low-intensity, repeated WHINE is called a Whimper. Whimpering is characteristic of juveniles and pups, though it has also been observed in adults. Like the WHINE, it appears to have an attention-seeking function, but perhaps at a lower level of arousal.

Whine – WH = A brief to medium length (up to 500 ms), often repetitive high-pitched vocalization (500 Hz and above) with rising or falling frequency modulation, usually executed with a closed mouth. This appears to be an attention-seeking vocalization, common during social separation and begging.

Yelp – YLP = A sharp (abrupt onset) vocalization with a high, rising pitch, the Yelp is of very short duration (<100 ms) and high intensity. May resemble a small mammal “squeak,” with relatively few harmonic overtones. Performed with an open mouth and usually in response to an anticipated attack or to an unexpected touch or sudden pain.

NOTES

1. The only live prey caught during this study, voles (*Microtus* sp.), were not tested, but were GRABBED after PINNING and immediately given CRUSH BITES with HEAD SHAKING and TOSSING. Insects and tree frogs the NGSD captured were TESTED, MOUTHED, SCENT ROLLED on and manipulated with until they quit moving, but were not given hard BITES.

2. Like foxes, NGSDs are very limber. Subjectively, they seem to have greater joint elasticity than wolves and DDs, especially in the neck and spine, and relatively more motion, both rotational and abductional, in the hip joint. NGSDs can pass their bodies through any hole wide enough to admit their zygomatic arches, which are nearly as broad as those of the Australian Dingo, a canid twice the NGSD's average size. This flexibility may be an adaptation of the tendons and ligaments to locomotion through dense vegetation and/or to climbing steep, rugged terrain and trees in their native habitat. Combined with their considerable digging prowess this

flexibility makes this canid very difficult to keep penned. No internal anatomical studies have been done on the NGSD.

3. Unless the actor is the dam and the receiver her puppy, the receiver invariably backs off (usually at the GROWL stage) and waits attentively from a short distance for the actor to either finish or give up the item (see DISPLACE FROM FOOD). However, the expression of DEFEND FOOD varies widely between individuals. Two females in this study were very possessive over food, especially bones, and gathered up and vigorously defended all the items they could secure, or ran from bowl to bowl, repeatedly and aggressively displacing their male kennel mates.

4. Social stratification seems to break-down during feeding. All adult individuals become equals while they have possession of food. Although puppies were often displaced by adults, no adult was observed during this study forcefully taking a food item from any subject younger than a year old. Most NGSDs are extremely respectful of each other during feeding, at least in the captive situation here where they are fed in separate bowls and there is has never been a need to compete for food. If a feeding individual protests the approach of another by GROWLING or GROWL-BARKING, the latter will almost always stop its approach and wait alertly from a short distance until the feeder abandons its dish. This "politeness" also extends to interactions concerning fresh bones. Sires and dams will usually give way to puppies even several months of age during regular feedings (but not for juicy bones or treats) and, if they do not abandon the food, often allow puppies to eat with them from the same bowl.

5. About half of the study group puppies up to about one year of age were very hesitant when DRINKING from the 9.5 liter black plastic buckets in their kennels. They approached the bucket, EARS UP, TAIL DOWN, and stretched to look into the water before drinking. They stopped DRINKING when strong ripples appeared on the water's surface. They were much more relaxed when drinking from a lighter colored or more-shallow container. Drinking seems to be socially facilitated, in that often when one individual begins drinking, one or two others will cease ongoing behavior and join it.

6. Even to a human nose NGSD paws have a sweet musky odor and it is assumed that this foot scrape serves the purpose of scent marking near the elimination. The area around the mouth and chest has a honey-or-sweet musk-like scent. The rest of the body, with the exception of the ears, which have a very slight cerumen scent, is virtually odorless to a human. NGSDs need to be examined for the presence of scent glands.

7. ATTACKS are initiated only toward social equals, subordinates or strangers, never toward an individual with a higher social status. During this study no injuries were ever sustained by the adult male, Kai, when he initiated contact aggression toward his subordinate son, Rigo. However, serious injuries were sustained by both littermate females Buna and Tufi when they turned on each other at the end of their third breeding season. A yearling male at Swamp Fox Sanctuary attacked his sire, Darkie (who was 17 years old), when nearby females were in estrus. If these latter pairs had not been immediately separated by the keepers present these attacks would undoubtedly have ended in the death of one of the females and of the elderly male. Once socially equal adult females engage in a fight they develop an intense animosity toward each other that does not diminish with time. Thereafter, they must be kept separate by double fencing with at least 3m or greater space between wire fences or by solid barriers of wood or metal.

8. Severe injuries are common only in conflicts between social equals of the same sex, even though NGSDs have disproportionately strong biting power for their size. Their wide zygomatic flare accommodates very thick muscles. This may be an adaptation that enables this small non-pack canid to subdue prey larger than themselves.

9. Often ears are in intermediate positions during transitions from one state to another, or because the actor is experiencing conflicting states (i.e. flight vs. fight). Intermediate ear positions can be scored using both appropriate codes (ie. EU/EF = EARS UP/EARS FORWARD).

10. Sometimes NGSDs direct a series of repetitive and vigorous licks to a human in what appears to be a mild dominance behavior. Expressed mostly by sexually mature males toward unfamiliar human females, this behavior is often accompanied by CROWDING, CHEST

PRESSING, WHINING and GRASPING with a forepaw. If gently pushed away the male stiffens, increases its WHINE volume, and attempts to hold on.

11. The hair is often partially raised the entire length of the center back in response to a precipitous drop in environmental temperature, as, for example, when a subject moves from a shelter into an open area with an ambient temperature of 8 C. This should not be confused with a social signal.

12. If no injuries are visible, a manual injury determination must be made later by parting the fur and testing for tenderness in the area bitten.

13. The yearling male subject, Rigo, who was dominated intensely during the breeding season by his sire, Kai, was not observed MARKING OVER for several months after the end of the estrus period although he still did RAISED LEG URINATIONS. The other yearling male, Foxy, housed separately, marked all urine spots in the enclosure. Rigo resumed MARKING OVER at the following estrus season (his second) while kenneled with Kai.

14. The muzzle is not a common target for BITING in NGSDs. MUZZLE BITING is most often a brief behavior incorporated into playful JAW SPARING during which the sides or top of the head may also be held briefly in the opponent's open jaws. Rarely, during escalated dominance behavior, the actor will give an INHIBITED BITE to the muzzle of the submitting receiver as one of a series of INHIBITED or hard BITES to the rest of the receiver's head and body. Females will sometimes give quick MUZZLE BITES when REBUFFING a male.

15. Frequently, in association with a DOMINANCE MOUNT, the actor NOSE JABS the receiver before mounting or after dismounting, sometimes hard enough to cause the receiver to change position in order to maintain its balance. A less forceful NOSE JAB is used to discipline puppies that have failed to respond to milder signals to cease ongoing behavior. Also seen when a female is being mildly dominant toward a male receiver.

16. This appears to be an attention-demanding or mildly aggressive action, expressed toward a receiver that is a social equal or inferior. In play, this behavior is often observed when the recipient has failed to respond to more mild play solicitation, has stopped playing before the actor is satiated, or when the recipient has an object the actor desires. It is then performed to the rear portion of the recipient's body with a readiness to flee reprisal.

17. The adult male subject (Kai) attempts to RIDE UP on humans, especially female visitors. He stands with an UPRIGHT POSTURE (RELAXED or STIFF) next to the person, usually LICKS them vigorously on any bare skin within reach, and places his forepaws on them. He resists being removed, usually giving a short repeated WHINE, and often attempting to GRASP with a forepaw. None of the females have been observed expressing RIDE UP toward humans.

18. NGSD ears have only one fold crease that continues part way across the ear base, just above the cutaneous pouch, and no longitudinal creases, so their ears cannot be folded flat back against the skull, as is often seen in wolves and DDs.

19. Dams nurse their puppies several times daily, and rest nearby most of the day. Voth (1988) observed lactating females other than the dam nursing puppies in her extended family study group. During the Koler-Matznick observations the one dam kept with her three puppies beyond six weeks of age was making no attempt to wean them at 9 weeks of age and continued to let them nurse without serious protesting until they were about 12 weeks old. At that age she began GROWLING softly and moving away from the puppies attempting to nurse, often followed immediately by her play soliciting them. As they were well fed by both the dam's regurgitation and three other meals a day of commercial dog kibble, they stopped trying to nurse after a couple of weeks. With her second litter, which contained six puppies, this dam began protesting their vigorous nursing at about 5 weeks so the small number of puppies in the first litter and her own inexperience may have been factors of late weaning.

20. During this study, the one dam kept with her pups beyond 6 weeks of age continued to REGURGITATE for her puppies until they were 5 months old. Voth (1988) reported that all adolescents and adults of both sexes in the large (15 - 30 members) group she observed

REGURGITATED for puppies. One sire (Stanley) REGURGITATED once at the fence dividing him from his 5 week old puppies, but the other non-maternal NGSDs of the Koler-Matznick group (one adult male [older sibling], one adult female [aunt]) did not provide for the puppies. The sires were separated from the dams and puppies, because it was felt the relatively small pens available might promote dam defense or male aggression. As the aunt and sire were not introduced to the puppies until they were six weeks old, this delay may have resulted in the failure of bonding with the pups and later suppression of care giving behavior. Three correspondents (Bittner 1998, Bratton 1998, Stinner 2003) have reported their male NGSDs, kept in with their mates and their puppies from their birth, provided parental care and REGURGITATED.

21. A definite "I want!" Often expressed during FOOD BEGGING and attention soliciting, especially from humans, and when wanting to be released from confinement (including being held stationary on leash) to engage in social activities. During these observations, it seemed that the Open Mouth Whine was expressed significantly more often by females, but this awaits quantification. The two adult females (Buna and Tufi) used this Open Mouth Whine, in conjunction with an exaggerated directed gaze, to indicate they wanted an out-of-reach toy or food item.

22. Dr. Mark Feinstein, Hampshire College, Amherst, MA, provided the preliminary descriptions of several NGSD vocalizations (pers. Comm. 1997). More precise quantitative descriptions are needed to quantify the differences between NGSD and other canid vocalizations.

23. The study subjects only routinely engaged in CHORUS HOWLING soon after dawn, while others (Brisbin, et. al. 1994; Titcomb 1969) have reported that NGSDs also regularly HOWL at dusk. At other times during the day CHORUS HOWLS appear to function as stress relievers (for example, after visiting humans leave) and often have no discernible external stimulus. NGSDs occasionally HOWL in concert with familiar baying/yelping/barking DDs (but not with strange dogs, recorded wolf or coyote howls, or live coyote howls), and NGSD howling sometimes elicits a vocal response from familiar DDs. NGSD HOWLING is not accompanied by or followed by the "rally" or communal ACTIVE SUBMISSION and dominance behavior that has been frequently reported to occur between pack members during wolf and coyote pack howling sessions (Schassburger 1987).

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