TOPIC 2. COMMUNICATIONS

Wild ruminants communicate, though they do not speak. They communicate with visual signals, sounds, scents, and touch. Sometimes these exchanges draw the animals closer together, and sometimes they drive them farther apart. Sounds by females attract their young. Sounds by males may space the males out more.

There are seasonal differences in the forms and strengths of communications. The breeding season is characterized by communications that are different from those at other times of the year. There is a great deal of chemical communication going on; females in heat attract males. Whitetail bucks emit a deep, throaty sound during the rut. Elk "bugle," and "Elk calls reach their finest development in the bugling of the old bulls in the rutting period" (Murie 1951; 117). Bugling may be heard throughout the year, however, and both males and females "bugle."

Resource conditions also affect the meanings of different signals. Subordinate animals have different interpretations and responses to signals in times of plenty than in times of want. An abundance of forage and a low population density results in well-spaced individuals, with little need for overlaps in home ranges, and less communiction between individuals and little potential for strife. A scarcity of forage and a high population density results in crowded and overlapping home ranges, with more communication and higher potential for strife.

Some species are inherently more gregarious than others. Caribou and bison tend to gather in larger herds and for more time through the year than white-tailed or mule deer. Herds of gregarious animals have structure and organization that is a result of communications between members of the herd.

The UNITS that follow include descriptions of various forms and circumstances for communications. The effects of these communications on the use of space are discussed in the UNITS in TOPIC 3.

LITERATURE CITED

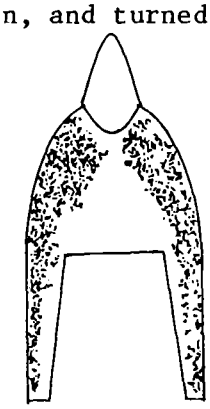
Murie, O. J. 1951. The Elk of North America. The Stackpole Company, Harrisburg, PA. 376 p.

UNIT 2.1: VISUAL COMMUNICATIONS

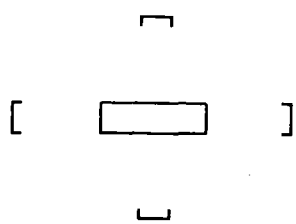
Visual communications between wild ruminants involve stance, posture, styles of movements, alertness, head and tail configurations, and other body geometries and movements. The attention posture assumed by one bighorn sheep alerts others to do the same (Geist 1971; 133). Horn displays are given by one or exchanged by two males.

The raised tail of white-tailed deer is a visual signal of danger, although deer in groups will raise the tail without triggering a general alarm. If one animal runs, others will follow, a response that is generally true of all groups of animals. An interesting use of the visual communications of white-tailed deer has been tried in Pennsylvania. Flagging behavior models have been placed along deer trails within 75 feet of roadways to redirect the movement of deer and reduce crossings in that area (Bashore 1975). Significant reductions in crossings were reported, which may be useful in reducing the number of deer-vehicle collisions.

Similar experiments have been tried at the Wildlife Ecology Laboratory, Cornell University. Silhouettes were made with tails that could be placed in the up or down position, and turned for white or brown colors.



Four silhouettes were placed around the feed trough of the captive herd in the pattern shown below. An adult female came over to feed, approached the silhouettes, stopped, stamped a front hoof, and after a short period of time dashed in to the feeder, ate briefly, and dashed out again. Within a day all of the deer were quite accustomed to the silhouettes and fed without hesitation.



Silhouettes were also placed around houses with shrubbery that was vulnerable to winter browsing in the Ithaca, N.Y. area. They also proved to be ineffective. The visual communications between deer, whether in a

captive herd or in the wild, and the silhouettes was not sufficient to overcome feeding desires. I had thought that regular reinforcement of the raised-tail signal by wild deer might be enough to make the silhouettes effective, but this was apparently not so. Further, the tails on the silhouette did not move. This may render them less effective. The stationery silhuettes provided no additional stimuli such as sounds or odors, either; only the visual senses were employed in this communication.

LITERATURE CITED

Bashore, T. C. 1975. Redirecting deer movement by use of flagging behavior models. Proc. Penn. Acad. Sci. 49(1):96.

Geist, V. 1971. Mountain Sheep. The University of Chicago Press, Chicago. 383 p.

REFERENCES, UNIT 2.1

VISUAL COMMUNICATIONS

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	dodo	nyny	1220	----	lives of game animals	seton,et	1929
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953
aubo	wimi	wadc	238	anam	prnghrn antlp & its mngmnt	einarsen,as	1948
aubo	stac	hapa	225	anam	hunting pronghorn antelope	popowski,b	1959

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNTA	111--	31	42	odvi	evol, alarm signals, ungul	hirth,dh; mccullo	1977
PPASA	49--1	96	96	odvi	redrct movt,flag behav mod	bashore,tl	1975

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ZOBEA	12--2	219	250	ceel	odhe,alal, etholog obsrvat	geist,v	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	392	399	alal	observa in yellowstone prk	mcmillan,jf	1954
BEHAA	20--3	377	415	alal	behavr, n amer moose in bc	geist,v	1963

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CAFNA	81--1	63	66	rata	funct anatom, tail, behavr	lewin,v; stelfax;	1967

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
CGFPA	3---- 1		28	anam	literature review,behavior	prenzlow,ej	1965
WLMOA	38--- 1		9	anam	social behavior & ecology	kitchen,dw	1974

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				bibi			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ovca			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
IGWBA	2---- 1		142	oram	life history, manag, idaho	brandborg,sm	1955

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
APANE	1---2	167	176	dosh	sight, hear, locat, discrm	arnold,gw; bound/	1975
APANE	1---4	369	377	dosh	compr visn, hearing, lambs	shillito,ee	1975
APANE	3---1	65	81	dosh	audi & visual clues, recog	alexander,g	1977
APANE	3---2	127	136	dosh	import odor, apprnce, voic	alexander,g; shil	1977
APANE	3---2	137	144	dosh	impor, vis cl matern recog	alexander,g; shil	1977
APANE	4---1	71	80	dosh	vis, hrng, ewes fndg lambs	walser,ees	1978
APANE	4---1	81	85	dosh	vis discrm of ewes by lamb	alexander,g; wals	1978
APANE	5---3	215	232	dosh	discrim color, grey shades	alexander,g; stev	1979
APANE	6---3	221	231	dosh	maternl recog, breed ident	walser,ees	1980

CHAPTER 3, Worksheet 2.1a

Visual communications

Locate a group of animals and record every visual communication possible to identify. The format below may be useful.

Time	Stimulus	Response

Time	Stimulus	Response

UNIT 2.2: AUDITORY COMMUNICATIONS

Wild ruminants are quite capable of communicating by sound. Whitetail bucks make a low, deep-throated sound when accompnying a female in estrus. Fawns bleat, though not as often as lambs of domestic sheep. It is used sparingly as a distress call. Deer and pronghorn make a snort or blow sound when alarmed. This is not a vocalization, but a forced exhalation of air. It is often accompanied by audible stomping of a front hoof, providing both a visual signal and a sound signal. Waring (1969) describes the blow sound of a pronghorn, and presents a sound spectogram and amplitude display of the blow. He suggests that the blow sound facilitates investigative behavior in the presence of suspected but unidentified danger by arousing the curiosity of the suspect which may susequently expose itself. The blow sound also aids in alerting nearby individuals.

Murie (1951) has several pages of descriptions of elk calls. Elk calves emit a loud, high-pitched squeal when temporarily separated from their dams. If the calf is siezed, it may elmit a startling medley of squeals and prolonged screams which may bring its mother on the run. Low bleats are uttered when beside the mother and undisturbed. Cows will call to their young. A traveling band of cows and calves in summer maintain more or less continuous noisy squealing. If the group is disturbed, a confusion of excited sounds are emitted.

A call emitted as a result of a "mental disturbance" is described by Murie (1951) as a ". . . hint of squeal mingled with a loud, hoarse bark." He considered this call to be a spontaneous outburst expressing emotion, and it does not always mean danger. He believes that other elk interpret the meaning of this call, responding differently to subtle differences in the tone of the call.

Bugling by elk includes several modifications of the call that is usually associated with the rutting behavior of the bulls. Cows are said to bugle also (Murie 1951; 117), and bugling may be heard throughout the year. Bugling during the rut is also called "roaring," especially in reference to the European red deer (also Cervus elaphus). The sequence of sounds produced when bugling, described by Murie (1951; 118), includes a beginning on a low note, increasing frequencies to high, clear, prolonged bugle-like notes, followed by a quick drop to a series of grunts. Variations in the pitch and character of the bugling are especially noticeable when three or four bulls are in the same area and their calls are heard in close succession. Reproductive behavior associated with bugling is described in CHAPTER 5.

LITERATURE CITED

Murie, O. J. 1951. The Elk of North America. The Stackpole Company, Harrisburg, PA. 376 p.

Waring, G. H. 1969. The blow sound of pronghorns (Antilocapra americana). J. Mammal. 50(3):647-648.

REFERENCES, UNIT 2.2

AUDITORY COMMUNICATIONS

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	stac	hapa	238	anam	prnghrn antlp & its mngmnt	einarsen,as	1948

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	34--2	407	419	odvi	study, social organization	hawkins,re; klims	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CAFGA	20--3	181	282	odhe	life history, california	dixon,js	1934
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966
JOMAA	42--4	522	526	odhe	aggressive behavio in deer	cowan,imct; geist	1961
WLSBA	6---2	169	170	odhe	respon,fawn distress calls	arthur,wj,III; h/	1978

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BEHAA	69--3	145	170	ceel	roaring of red deer, hones	clutton-brock,th/	1979
EKIAA	6---1	100	102	ceel	char,biol signl field,roar	nikol'skii,aa; n/	1975
JBLPA	6....	83	95	ceel	[kinetics, stag roaring]	bubenik,a; brna,j	1967
JOMAA	13--4	331	336	ceel	elk calls	murie,a	1932

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	392	399	alal	observa in yellowstone prk	mcmillan,jf	1954
JOMAA	39--1	128	139	alal	summr obsrvtns, behv,ontar	de vos, a	1958
MUZPA	25---	1	44	alal	moose of isle royale	murie,a	1934
ZOBEA	12--2	219	250	alal	ethol oservatn n amer cerv	geist,v	1966
ZOOLA	41-14	105	118	alal	ecol, behav, pop dynam, wy	denniston,rh II	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMZOA	10--4	481	481	rata	vocalization, behavior	ericson,ca	1970
BEHAA	40--3	295	301	rata	recognitn voice, moth, yng	espmark,y	1971
BEHAA	54--1	50	59	rata	indivi char, calls, calves	espmark,y	1975
BPURD	1----	387	397	rata	intrasp commun, mother-clf	ericson,ca	1975
BPURD	1----	398	408	rata	acoustic communicatn, revi	lent,pc	1975
BPURD	1----	423	435	rata	socializatn, calvin ground	Bmiller,fl; ander/	1975
XIWFA	54---	1	93	rata	alaska-yukon caribou	murie,a	1935
ZETIA	29--1	42	81	rata	mother-young, ontog, behav	espmark,y	1975

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	43--2	257	354	anam	life hist,rng use,ecol,tex	buechner,hk	1950
CAFGA	30--4	221	241	anam	pronghorn antelope, calif	mclean,dd	1944
CGFPA	3----	1	28	anam	literature review,behavior	prenzlow,ej	1965
JOMAA	50--3	647	648	anam	the blow sound of pronghns	waring,gh	1969
WLMOA	38---	1	9	anam	social behavior & ecology	kitchen,dw	1974

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
					bibi		

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
JOMAA	18--2	205	212	ovca	prelim study, yllwstn n pk	mills,hb	1937

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
CAFNA	81--1	1	22	oram	obsrvtns,kootenay nt pk,bc	holroyd,jc	1967
CGFPA	8----	1	23	oram	literature review, ecology	hibbs,ld	1966
IGWBA	2----	1	142	oram	life history, manag, idaho	brandborg,sm	1955

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
APANE	1---2	167	176	dosh	sight,hearng,locat,discrim	arnold,gw; bound/	1975
APANE	3---2	127	136	dosh	import odor,apprnce, voice	alexander,g; shil	1977
APANE	3---1	65	81	dosh	auditory, vis clues recogn	alexander,g	1977
APANE	4---1	71	80	dosh	vis, hrng ewes findg lambs	walser,ees	1978
APANE	6---3	221	231	dosh	maternl recog, breed ident	walser,es	1980
BEHAA	75--1	21	35	dosh	var, struc, bleats, 4 bree	walser,es; hague,	1980
JANSA	34--6	994	998	dosh	physiol respns auditr stim	ames,dr; arehart,	1972
JAURA	3----	121	132	dosh	auditory activity of sheep	wollack,ch	1963

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
STKMB	20--1	169	170	many	unusual vocl beh,antel,dee	dobroruka,lj	1972

CHAPTER 3, Worksheet 2.2a

Auditory communications

Locate a group of animals and record every auditory communication possible to identify. The format below may be useful.

Time	Stimulus	Response

Time	Stimulus	Response

UNIT 2.3: CHEMICAL COMMUNICATIONS

The role of chemicals in communications between animals is probably underestimated by humans because we cannot detect the low levels which animals are able to respond to. Rather specialized and sensitive chemical tests are needed to identify the presence of chemicals, with even more difficulties involved in identifying their physiological and behavioral roles. There are surely many unidentified chemicals that are part of the physiology and behavior of wild ruminants.

Hormones are chemical messengers within the body of a single individual that trigger responses of different tissues and organs. Some of these were discussed in CHAPTER 2, UNIT 1.7: ENDOCRINE GLANDS, and a distinction was made between those that had an effect on specific target organs (testosterone on male reproduction behavior, for example) and those that had a more diffuse effect (thyroxin on metabolism, for example).

Pheromones are chemical messengers that convey information between different members of a species (Dewsbury 1978; 184). These messengers may be signalling pheromones that have an immediate effect on the receiving animal, or primary pheromones that trigger hormone secretions that, in turn, affect overt behavior. Dewsbury briefly reviews the pheromone literature, pointing out that pheremones may be released by a variety of glands or different parts of the body, and in the feces and urine. Pheromones may convey information on a variety of individual characteristics, such as species, individual identity, and sexual identity, reproductive state, age, and others. Pheromones affect social behavior, and seem particularly important in their effects on reproductive behavior.

Pheromones of black-tailed deer are described by Muller-Schwarze (1971), who used encounter experiments in which a strange individual was introduced into a pen with an established group of deer. Metatarsal (See PART I, CHAPTER 2, UNIT 1.6) scent was discharged in fear-inducing situations. Males were attracted to female urine, and males marked their home ranges by rubbing the forehead against dry branch tips. Rub-urinating served as a distress signal in fawns, and as a threat in adults.

Scents emitted were also analyzed chemically in the above study with gas liquid chromatography techniques. Chemical analyses of scents emitted enables one to evaluate, document, and experimentally "play back" odors in experimental situations. These scents are generally highly volatile--a prerequisite for an effective pheromone--which makes isolation and identification very difficult.

There is another kind of chemical signals, allomones, that has been given little attention in wild ruminants. These are chemical messengers between species, and are very likely of importance in prey selection and avoidance. Their presence represents an unseen and largely ignored (by man) environment in the natural world that may well hold some clues to interspecies interactions. Young black-tailed deer avoided bowls of food containing vials of predator feces which would give off odors in an experiment

by Müller-Schwarze (1972). None of the captive deer tested had any experience with the predators, so the avoidance appeared to be a genetically-determined chemical communication. The coyote and mountain lion (both native predators) tests revealed complete avoidance by the deer, while African lion, snow leopard and Bengal tiger tests showed strong but not complete avoidance. The differences in avoidance of native compared to exotic predator feces may be partially due to the difference in ages of the deer when the tests were made. Exotic predator tests were made when the deer were 8 weeks and 5 months old, whereas native predator tests were made when the deer were 9 month old. While no association and therefore no learning had occurred as a result of direct experience, it may be that age is an important factor in the development of genetically-determined behavior.

Interspecies reactions also occur between closely related species, such as mule deer and whitetails, living in the same habitat. Continued reproductive separation of these species is likely based, in part at least, on chemical communications between individuals.

LITERATURE CITED

Dewsbury, D. A. 1978. Comparative Animal Behavior. McGraw-Hill Book Company, New York. 452 p.

Müller-Schwarze, D. 1971. Pheromones in black-tailed deer (Odocoileus hemionus columbianus). Anim. Behav. 19(1):141-152.

Muller-Schwarze, D. 1972. Responses of young black-tailed deer to predator odors. J. Mammal. 53(2):393-394.

REFERENCES, UNIT 2.3

CHEMICAL COMMUNICATIONS

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	hill	loen	760	----	the chemical senses	moncrieff,rw	1967
aubo	ccth	spil	200	----	molecular basis of odor	amoore,je	1970
edbo	apcc	nyny	412	----	comm by chem signals: adva	johnston,jwr,jr;/	1970
edbo	acpr	nyny	344	----	olfactn,reprod, & behavior	doty,rl	1976
edbo	plpc	nyny	609	----	chemical signals, vertebra	muller-schwarze,/	1977
edbo	acpr	nyny	540	----	biochemistry taste, olfctn	cagan,rh; kare,mr	1980
proc	acpr	nyny	231	rata	ecochemi studies, reindeer	bertmar,g	1975
edbo	iucn	mosw	940	many	behav and its relat to mgt	geist,v,ed; walth	1974

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	97--2	257	266	odvi	sptl,tmprl,phys char, rubs	kile,tl; marchint	1977

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMZOA	7---4	807	807	odhe	social odors, young mule d	muller-schwarze,d	1967
AMZOA	9---3	570	570	odhe	pheromn functn, deer urine	muller-schwarze,d	1967
ANBEA	19--1	141	152	odhe	pheromones in black-t deer	mueller-schwarze,	1971
JCECD	1---1	125	131	odhe	subsp specif rspns,soc odr	muller-schwarze,/	1975
JCECD	4---2	247	256	odhe	deer "lactone" source resp	mueller-schwarze/	1978
JOMAA	53--2	393	394	odhe	respon, youn btd pred odor	mueller-schwarze,	1972
JULRA	59--3	223	230	odhe	specialized scent hair	mueller-schwarze/	1977
NATUA	221--	284	285	odhe	isolatn,id,fnctn tarsal sc	brownlee,rg; sil/	1969
NATUA	229--	55	56	odhe	olfctry imprntng,precoc ma	muller-schwarze,/	1971
NATUA	229--	525	526	odhe	complex, rel specif, phero	muller-schwarze,d	1969
PVPCB	5----	56	63	odhe	evaluatng repellents,b-t d	campbell,dl; bull	1972
TETRA	34-10	1449	1452	odhe	synthesis of enantiomers	ravid,u; silvers/	1978

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
BEHAA	20--3	377	416	alal	behavr no amer moose in bc	geist,v	1963

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
APANE	3---4	351	365	rata	hindleg-head contact behav	espmark,y	1977
AZOSA	58--2	65	68	rata	sudorifr glnds, hairy skin	kallquist,l; moss	1977
JCECD	1---2	275	281	rata	volat comp, tarsal scnt gl	andersson,g; and/	1975
JCECD	3---5	591	602	rata	caudal gland, histol, chem	mueller-schwarze/	1977
JCECD	4---3	325	336	rata	resp to interdig secretion	mueller-schwarze/	1978
KPSUA	5....	654	655	rata	chem comp, interdigi gland	sokolov,ve; brun/	1974

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
MAMLA	37--1	25	33	anam	scent mark, territor, wyom	gilbert,bk	1973
SCIEA	183--	860	862	anam	pher, subauric scent, male	mueller-schwarze/	1974
VDZGA	66...	146	150	anam	factrs influen scent mrkng	mueller-schwarze/	1972
ZSAEA	35...	353	356	anam	lip smacking in the prnghr	muller-schwarze,d	1971
ZOOAA	7---1	257	271	anam	social scents, hand reared	mueller-schwarze/	1972

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				bibi			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ovca			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
CGFPA	8----	1	23	oram	literature review, ecology	hibbs,ld	1966
IGWBA	2----	1	142	oram	life history, manag, idaho	brandborg,sm	1955

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
LLOYA	38--6	532	532	many	insect & mammal pheromones	wheeler,jw	1975
LLOYA	39--1	53	59	many	insect, mammalian pheromon	wheeler,jw	1976
PSUBA	83--4	505	539	many	scent gland mrkng, soc beh	thiessen,d; rice,	1976

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
ZETIA	23--5	588	592	dogo	matern imprint, role chemi	klopfer,ph; gambl	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
APANE	3---2	151	162	dosh	ablatn olfctr bulbs,feedng	baldwin,ba; mcla/	1977
APANE	4---2	153	158	dosh	odour & recog lambs by ewe	alexanderr,g	1978

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
PZSLA	1910-	840	986	rumi	specialized subcutan glnds	pocock,ri	1910

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
AMZOA	7---3	421	429	----	olfaction in mammals	moulton,dg	1967
JANSA	25--S	83	87	----	smell, exteroceptiv factor	bruce,hm	1966
MAMLA	36--3	315	341	----	role,vomeronasl orgn,repro	estes,rd	1972
RPHRA	19...	673	716	----	chem communi among animals	wilson,eo; bosser	1963
SCIEA	171--	443	49	----	mammlian scent marking	ralls,k	1971

UNIT 2.4: OTHER FORMS OF COMMUNICATION

No immediate and direct communications can occur unless there are stimulus-response combinations. These are dependent on the emission or display of cues or stimuli, and on the sensory capabilities of the animals in a position to detect them.

Some mother-young interactions are based on a sense of touch. The licking of the neonate by the mother just after parturition is very likely an important part of mother-young bond formation. Nursing young are often licked by their dams in their anal regions, stimulating urination and defacation. Bottle-fed fawns at Cornell's Wildlife Ecology Laboratory are routinely stroked in their hind quarters while drinking to stimulate elimination.

Genetically-determined behavior may be thought of as a form of communications or "instructions" that are passed from one generation to the next. Maternal behavior is a very important behavioral trait under genetic and hormonal control, resulting in the successful breeding of inexperienced individuals. The success rate apparently increases with experience. Ozoga et al. (1982) studied maternal behavior in white-tailed deer in a 252 ha yard (about one sq. mile) and noted an increase in neonatal losses from zero at low population density to an average of 23% at peak density. An adequate supply of nutrients was provided throughout the study. The difference in survival of fawns born to does of different ages is of particular interest. Does four years and older lost 9% of their fawns, 3-year-olds lost 22%, and 2-year-olds lost an average of 33% of their fawns. Under excessive herd density, however, 2-year-olds lost 63% of their fawns. This suggests that some learning occurred, and the importance of that learning is related to population density. The provision of ample nutrients was thought to render nutritional effects unimportant. Ozoga et al. mention aggressiveness as a characteristic of an experienced matriarch as she withdrew from the herd to raise triplets.

While it is not traditional to think of communications in genetic terms, it is important to consider the time dimension in ecological analyses, and the transmission of information by genetic means is the only way in which many ecologically important communications can occur. Reproductive behavior, for example, simply cannot be taught by mothers to their offspring for they are separated when the young become mothers. Think concepts rather than facts, and some academic traditions may be vulnerable to breakdown.

LITERATURE CITED

Ozoga, J. J., L. J. Verme, and C. S. Bienz. 1982. Parturition behavior and territoriality in white-tailed deer: impact on neonatal mortality. J. Wildl. Manage. 46(1):1-11.

REFERENCES, UNIT 2.4

OTHER FORMS OF COMMUNICATION

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
JWMAA	46--1	1	11	odvi	maternal behavior, w-t dee	ozoga,jj; verme,/	1982

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				odhe			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				ceel			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				alal			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				rata			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				anam			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS	AUTHORS	YEAR
				bibi			

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

ovca

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

ovda

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

obmo

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

oram