TOPIC 3. GENETIC CHARACTERISTICS

Biological inheritance depends on chemical messengers called genes which are arranged on chromosomes, with the hereditary information in the deoxyribonucleic acids (DNA) of the genes (Hoar 1966; 663). Thus genetic characteristics are chemical characteristics with the unique role of transferring information from one individual to its offspring, from one generation to the next.

Each species has a given number of pairs of chromosomes, and genetic information is transmitted from both male and female when the sperm and egg unite in fertilization. The new individual is similar but not identical to its parents, with many, but not all, of the characteristics inherited by the offspring in ways suggesting Mendelian ratios (Pantelouris 1967; 423).

The spectrum of individual genetic characteristics comprises the genetic characteristics of populations. Some of the characteristics of populations that have been isolated for some time are visible and obvious (Svalbard reindeer, for example), and there is growing evidence that there are more subtle differences present too, differences which affect basic physiological functions that are of importance ecologically. It is very difficult, of course, to attribute such differences in wild ruminant populations to genetics or environment since controlled experiments are very difficult and expensive. Well-prepared physiologists interested in free-ranging animals have many interesting problems to investigate, but only with considerable expense and difficulty.

LITERATURE CITED

Hoar, W. S. 1966. General and comparative physisology. Prentice-Hall, Inc., Englewood Cliffs, N.J. 815 p.

Pantelouris, E. M. 1967. Introduction to animal physiology and physiological genetics. Pergamon Press, Oxford. 497 p.

REFERENCES, TOPIC 3

GENETIC CHARACTERISTICS

BOOKS

type	publ	city	page	anim	kewo	auth	year
edbo	haro	nyny	397		readings, ecologi genetics	connell,jh; mert/	1970

SERIALS

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
EVOLA	24--1	220	229	odvi	anal div skull morph, mich	rees,jw	1970
PCGFA	29---	392	403	odvi	starch gel, popul genetics	manlove,mn; avis/	1975

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
GENTA	83---	s12	s12	ceel	genetic studi, yellowstone	cameron,dg; vyse,	1976

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
IZYBA	17---	77	81	obmo	gene pool conserva, analys	flesness,nr	1977

UNIT 3.1: INDIVIDUAL CHARACTERISTICS

Individual wild ruminants inherit genetic potentials for growth, maximum body sizes, antler and horn development, and other physical characteristics, and likely behavioral characteristics as well. The physical characteristics actually attained are dependent on range characteristics, including nutrient abundance and chemical quality, and on factors influencing productivity, such as weather and thermal exchange.

The role of the range in determining body size was demonstrated experimentally for white-tailed deer by Severinghaus (1964) when deer from the Adirondacks, small in size and with low reproductive rates were held in captivity and fed adequate diets. They then attained large body sizes and reproductive rates characteristic of deer on good range.

Experiments at Penn State University have demonstrated that antler patterns of white-tailed deer are inherited, but antler size is determined by the quality of diet (French et al. 1955 and Magruder et al. 1957). This seems biologically reasonable, and is likely to be true for other species of wild ruminants as well. The effects of range quality are especially evident in yearly differences in antler growth, and annual increments to horns are also related to range conditions.

LITERATURE CITED

French, C. E., L. C. McEwen, N. D. Magruder, R. H. Ingram, and R. W. Swift. 1955. Nutritional requirements of white-tailed deer for growth and antler development. Pennsylvania Agricultural Experiment Station Bulletin 600.

Magruder, N. D., C. E. French, L. C. McEwen, and R. W. Swift. 1957. Nutritional requirements of white-tailed deer for growth and antler development II. Pennsylvania Agricultural Experiment Station Bulletin 628.

Severinghaus, C. W. 1964. Productivity and growth of white-tailed deer from the Adirondack region of New York. New York Fish and Game Journal. 11(1):13-27.

REFERENCES, UNIT 3.1

INDIVIDUAL CHARACTERISTICS

SERIALS

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
BLOOA	29--6	867	877	odvi	hemmoglobin polymorphism	kitchen,h; putna/	1967
CBCPA	30--4	695	713	odvi	hemat,bld chem,prot polymo	seal,us; erickson	1969
JBCHA	247--	7320	7324	odvi	heterogen hemoglob-a chain	taylor,wj; easle/	1972
JOMAA	38-3	421	422	odvi	possible identical twins	mccullough,ra	1957
JWMAA	34--3	642	644	odvi	studies, the sex chromatin	crispens,cg jr; d	1970
JWMMA	37--3	422	423	odvi	sex chrom in antlered fema	crispens,cg,jr; d	1973
NFGJA	11-1	13	27	odvi	product, growth, adirondac	severinghaus,cw;	1964
PAABA	600--	1	50	odvi	nutrit req, grow, antl dev	french,ce; mcewa/	1955
PAABA	628--	1	21	odvi	nutr req, growth, antl dev	magruder,nd; fre/	1957

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JOMAA	40--1	96	108	odhe	antler anomalies of mule d	robinette,wl; jon	1959

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
ZEJAA	2---3	142	148	ceel	[biostatist stud, breedng]	bubenik,a; lochm/	1956

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
RIJUA	7	52	59	alal	moose popu palmated, type	voipio,p	1952

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
AVCSA	10--1	44	47	rata	somatic y chromosome, rein	gustavsson,i; sun	1969
EXPEA	33--7	875	876	rata	rate,sister chromat exchng	pathak,s; ward,o/	1977
GNKAA	7---2	171	173	rata	alleles, transferrin locus	turabanov,mn; shu	1971
HEREA	88--1	113	115	rata	genetic markers, spitzberg	storset,a; olais/	1978
TGANA	7---4	303	305	rata	[polymorph, liver esteras]	shubin,pn; mongal	1973

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				anam			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JANSA	43--1	219	219	bovi	g, c bandng char, 4 specie	kieffer,nm; patha	1976

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
CJZOA	55-10	1759	1762	bibi	chrom homol wood,plain bis	ying,kl; peden,dg	1977

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JOHEA	69--2	77	80	ov	fundamn karyotyp, wild,dom	bunch,td	1978

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
CBCPA	40b-2	567	570	ovca	ovda,ovmu,transferrin,hemo	nadler,cf; woolf/	1971

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JOMAA	52--2	461	463	ovda	chromosomes,the dall sheep	nadler,cf	1971

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				obmo			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				oram			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
ZEJAA	3---2	53	63	caca	[heterogeneity, europe]	lehmann,e	1957

UNIT 3.2: POPULATION CHARACTERISTICS

Genetic differences between populations have been recognized for some time, and external characteristics of isolated populations may be quite different from those of populations that have no natural barriers to immigration and emigration. The Svalbard reindeer population, isolated on Svalbard Island, is a striking example of external differences compared to continental populations of reindeer and caribou. Their legs are shorter, bodies more compact, hair is longer, etc. than other populations of Rangifer tarandus.

Research on genetic characteristics of populations has begun recently, especially on caribou and reindeer. Several studies were published in the 1970's, and more research is in progress. Reindeer are good subjects for such studies because of husbandry that has identified more or less discrete herded populations, with the wild caribou also divided into more or less distinct herds due to its behavior and natural barriers.

REFERENCES, UNIT 3.2

POPULATION CHARACTERISTICS

BOOKS

type	publ	city	page	anim	kewo	auth	year
edbo	acpr	nyny	105	many	population genetics,ecolog	karlin,s; eviatar	1976

SERIALS

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
CAFGA	22--3	155	246	od	distr,var, pacif coast reg	cowan,i mct	1936
JOMAA	39--3	347	367	od	mammals, guerrero, mexico	davis,wb; lukens,	1958
JWMAA	43--1	136	142	od	biochem var, heterog,s car	ramsey,pr; avise/	1979

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
ABBIA	127--	711	717	odvi	hemoglob hetergeneity, w-t	huisman,thj; doz/	1968
JOMOA	128--	95	112	odvi	morph var, cranium, mandib	rees,jw	1969
JOMOA	128--	113	130	odvi	morph var, mandibl, skelet	rees,jw	1969
JWMAA	34--3	642	644	odvi	studies, the sex chromatin	crispens,cg jr; d	1970
PCGFA	25---	65	69	odvi	blk-t, crossbrd study tenn	whitehead,cj,jr	1971
PCGFA	29---	392	403	odvi	strch gel eletroph,pop gen	manlove,mn; avis/	1975

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JOMMA	43--4	539	541	odhe	black-tail,wt-tail hybrids	cowan,imt	1962
NOSCA	48--1	66	71	odhe	subsp overlap, north washi	nellis,ch; fairb/	1974

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
IRFOA	30	64	78	ceel	hybrd amng deer,impl for c	harrington,r	1973
JZOOA	174-2	185	201	ceel	reexam of subsp, red deer	lowe,vpw; gardine	1974
JZOOA	177-4	553	566	ceel	hybrid, red deer,sika deer	lowe,vpw; gardine	1975
SWNAA	23--1	63	70	ceel	taxonomi status, merriam's	anderson,s; barlo	1978
ZEJAA	2---3	142	148	ceel	[biostatist stud, breedng]	bubenik,a; lochm/	1956

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
RIJUA	7	52	59	alal	moose popu palmated, type	voipio,p	1952

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
EXPEA	33--7	875	876	rata	sister chromatid exchnges	pathak,s; ward,o/	1977
GNKAA	7---2	171	173	rata	alleles, transferrin locus	turubanov,mn; shu	1971
HEREA	88--1	113	115	rata	genetic markers, spitzberg	storset,a; olais/	1978

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				anam			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				bibi			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				ovca			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				ovda			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				obmo			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
				oram			

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
ZEJAA	3---2	53	63	caca	[heterogeneity, europe]	lehmann,ev	1957

CODEN	vo-nu	bepa	enpa	anim	kewo	auth	year
JANSA	40--5	1009	1015	many	wild, domes,dev new genoty	spillett,jj; bun/	1975

CLOSING COMMENTS

Characteristics of organs and glands, chemical composition, and genetic characteristics have been introduced in CHAPTER 2. Characteristics of organs and glands are used in analyses of metabolic and behavioral functions in later CHAPTERS. Chemical compositions of the body and of milk are especially important in PART III. PHYSIOLOGY and METABOLISM OF WILD RUMINANTS.

All of the remaining CHAPTERS include direct or indirect references to CHAPTERS 1 and 2. The interdependence of material in all CHAPTERS will become more clear as the comprehensive concept of carrying capacity is evaluated.

Users of these CHAPTERS are urged to add WORKSHEETS on specific biological functions of different species. The design of this publication lends itself to such additions as both problem-solving examples and lists of published literature on other species are included. The ecological picture will become more complete in direct proportion to the number of analyses completed and biological functions related.

GLOSSARY OF SYMBOLS USED - CHAPTER TWO

AGDA = Age in days
AGYE = Age class in years
ANWG = Antler weight in gms
ANWK = Antler weight in kg
ASHK = Ash content in kg
ASHR = Fraction of ash

CLWK = Calculated live weight in kg

DILA = Days into lactation

EBWG = Eyeball weight in gms
ECPK = Energy content per kg
ELWG = Eye lens weight in gms

FAGD = Fetal age in days
FAT- = Fat
FATF = Fat fraction
FATK = Fat content in kg
FATP = Fat percent
FRCT = Fraction
FRLP = Fraction of the lactation period

HAWG = Hair weight in gms
HIWK = Hide weight in kg
HLLK = Heart, lung, liver weights in kg

IFWK = Ingesta-free weight in kg

JDAY = Julian day

LAPE = Lactation period
LBLC = Left beam length in cm
LCTS = Lactose
LIWK = Live weight in kg
LWMG = Lens weight in milligrams

MBLC = Main beam length in cm
MNRL = Mineral

PROF = Protein fraction
PRTK = Protein content in kg
PRTN = Protein

RBLC = Right beam length in cm

THWG = Thyroid weight in gms

WATF = Water fraction
WATK = Water content in kg
WATR = Water

GLOSSARY OF CODE NAMES - CHAPTER TWO

CODEN	
ACATA	Acta Anatomica
AIPAD	Anales del Instituto de la Patagonia
AJANA	American Journal of Anatomy
AJBSA	Australian Journal of Biological Sciences
AJPHA	American Journal of Physiology
AJVRA	American Journal of Veterinary Research
AMZOA	American Zoologist
ANANA	Anatomischer Anzieger
ANBEA	Animal Behaviour
ANREA	Anatomical Record
ATRLA	Acta Theriologica
AVCSA	Acta Veterinaria Scandinavica
AZOFA	Annales Zoologici Fennici
AZOSA	Acta Zoologica
BAPBA	Bulletin de l'Academie Polonaise des Sciences Serie de Sciences Biologiques
BECTA	Bulletin of Environmental Contamination and Toxicology
BGTEA	Bulletin de Groupe de Travail pour l'Etude de l'Equilibre Foret-Gibier
BIJOA	Biochemical Journal
BJLSB	Biological Journal of the Linnean Society
BJNUA	British Journal of Nutrition
BLOOA	Blood
CAFGA	California Fish and Game
CAFNA	Canadian Field Naturalist
CATRB	Calcified Tissue Research
CBCPA	Comparative Biochemistry and Physiology
CBPAB	Comparative Biochemistry and Physiology - A comparative physiology
CJPPA	Canadian Journal of Physiology and Pharmacology
CJZOA	Canadian Journal of Zoology
CPSCA	Chesapeake Science
EVOLA	Evolution
EXPEA	Experientia
FEPRA	Federation Proceedings
FMFUB	Forma et Functio
FOBGA	Folia Biologica
FUNAA	Fauna
GCENA	General and Comparative Endocrinology
GENTA	Genetics
GNKAA	Genetika
HEREA	Hereditas

HLTPA	Health Physics
IZYBA	International Zoo Year Book
JAASA	Journal of the Alabama Academy of Science
JAECA	Journal of Animal Ecology
JANSA	Journal of Animal Science
JBCHA	Journal of Biological Chemistry
JBLPA	Jelen
JBOMA	Journal of the Bombay Natural History Society
JCECD	Journal of Chemical Ecology
JCOQA	Journal of the Colorado-Wyoming Academy of Sciences
JDSCA	Journal of Dairy Science
JDREA	Journal of Dental Research
JEEMA	Journal of Embryology and Experimental Morphology
JEZOA	Journal of Experimental Zoology
JOHEA	Journal of Heredity
JOMAA	Journal of Mammalogy
JOMOA	Journal of Morphology
JRPFA	Journal of Reproduction and Fertility
JSFAA	Journal of the Science of Food and Agricuture
JULRA	Journal of Ultrastructure Research
JWIDA	Journal of Wildlife Diseases
JWMAA	Journal of Wildlife Management
JZOAA	Journal of Zoology
KPSUA	Khimiya Prirodnykh Soedinii
MAMLA	Mammalia
MMRLA	Mammal Review
MRLTA	Murrelet, The
NATUA	Nature
NAWTA	North American Wildlife and Natural Resources Conference, Transactions of the,
NCANA	Naturaliste Canadien, Le
NYCOA	New York State Conservationist
NFGJA	New York Fish and Game Journal
NJZOA	Norwegian Journal of Zoology
NZJSA	New Zealand Journal of Science
OFWRA	Ontario Fish and Wildlife Review
PAABA	Pennsylvania Agricultural Experiment Station Bulletin
PAANA	Proceedings of the Australian Society of Animal Production
PAARA	Pennsylvania State University College of Agriculture Agricultural Experiment Station Progress Report
PASCC	Proceedings of the Alaskan Scientific Conference
PCGFA	Proceedings of the Southeastern Association of Game and Fish Commissioners
PCZOA	Proceedings of the International Congress of Zoology
PIAIA	Proceedings of the Iowa Academy of Science

PLNAA	Plains Anthropologist
PMACA	Papers of the Michigan Academy of Sciences, Arts and Letters
PMASA	Proceedings of the Montana Academy of Sciences
PNDAA	Proceedings of the North Dakota Academy of Science
POASA	Proceedings of the Oklahoma Academy of Science
PSEBA	Proceedings of the Society for Experimental Biology and Medicine
PZSLA	Proceedings of the Zoological Society of London
RIJUA	Riistatieteellisia Julkaisuja
SAGCA	Science in Agriculture
SCAMA	Scientific American
SCIEA	Science
SOVEA	Southwestern Veterinarian
SSBLA	Seliskokhozyaistvennaya Biologiya
SWNAA	Southwestern Naturalist
TGANA	Tsitologiya I Genetika
TISAA	Transactions of the Illinois State Academy of Science
TKASA	Transactions of the Kentucky Academy of Science
TNWSD	Transactions of the Northeast Section, The Wildlife Society
TRNZA	Transactions of the Royal Society of New Zealand
VCSZA	Vestnik Ceskoslovenske Spolecnosti Zoologicke
VESMA	Vesmir
VEZOA	Vestnik Zoologii
VILTA	Viltrevy
VIWIA	Virginia Wildlife
VJSCA	Virginia Journal of Science
WAEBA	Wyoming Agricultural Experiment Station Bulletin
WLMOA	Wildlife Monographs
WSCBA	Wisconsin Conservation Bulletin
ZASMA	Zoologisch Abbandlungen
ZEJAA	Zeitschrift fuer Jagdwissenschaft
ZETIA	Zeitschrift fuer TierpsychologieAe
ZOBIA	Zhurnal Obshchei Biologii
ZOLZA	Zoologicheskii Zhurnal
ZOOLA	Zoologica
ZSAEA	Zeitschrift fuer Saeugetierkunde
ZTTFA	Zeitschrift fuer Tierphysiologie Tierernaehrung und Futtermittelkunde
ZZAHA	Zeitschrift fuer Zellforschung und Mikroskopisch Anatomie

LIST OF PUBLISHERS - CHAPTER TWO

acpr	Academic Press	New York	nyny
butt	Butterworth	Washington, D.C.	wadc
edar	Edward Arnold	London	loen
haro	Harper and Row	New York	nyny
hutc	Hutchinson	London	loen
isup	Iowa State University Press	Ames, IO	amia
jblc	J. B. Lippincott Co.	Philadelphia, PA	phpa
nasc	National Academy of Science	Washington, D.C.	wadc
pepr	Pergamon Press	Oxford, England	oxen
saco	Saunders Publishing Co.	Philadelphia, PA	phpa
whfr	W. H. Freeman Co.	San Francisco, CA	sfca

LIST OF WORKSHEETS - CHAPTER TWO