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Primitive and Aboriginal Dog Society

Dear members of the Russian Branch of Primitive Aboriginal Dogs Society!

In this issue we publish the next four articles intended for the Proceedings of the first international cynological conference "Aboriginal Breeds of Dogs as Elements of Biodiversity and the Cultural Heritage of Mankind". Janice Koler-Matznick describes international effort to preserve the New Guinea Singing Dog. Adrian Mifsud described difficulties with preservation of the Dingo in Australia. Werner Roeder and Elizabeth Naumann share with us the results of their studies on the Azawakh and the problems associated with the preservation of this remarkable breed in its country of origin and in the possession of dog show fanciers.

Sincerely yours,
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THE NEW GUINEA SINGING DOG: ITS STATUS AND IMPORTANCE

Janice Koler-Matznick and Bonnie Yates
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Time is running out for the opportunity to study the New Guinea singing dog (Canis hallstromi Troughton 1957) to determine if they are a unique taxon. These wild canids are being threatened with hybridization from increasing numbers of imported domestic dogs (Canis familiaris). The controversies over their taxonomy and its status in New Guinea exist because they live in areas infrequently visited even by local residents. Thus, evidence concerning its origins, behaviour, anatomy, and phylogenetics is inadequate. The morphological, physiological, and DNA data we currently have available are from the few remaining captive representatives held in zoos and private facilities. The singing dog may be an important evolutionary link to humankind's most ancient domesticated mammal, C. familiaris, and to the Australian dingo (Canis dingo). We refute the allegation that the singing dog originated as a feral modern C. familiaris, or as hybrids of C. dingo with C. familiaris, by recounting their known history within the cultural context of New Guinea. We point out some of their distinctive characteristics, including their unique estrus cycles, and outline their potential scientific merit. We conclude by offering an alternative taxonomic hypothesis.

The Australian dingo (Canis dingo) is well known, and its genetic extinction due to hybridization with imported domestic dogs (Canis familiaris) seems inevitable (Corbett 1994). There is, however, another dingo-like canid that is also found free-ranging in the Australian region, one whose characteristics suggest that it may offer the best chance to study what canids in the ancestral pre-domestication dog population may have been like. With modern C. familiaris now being imported even into some remote villages of the New Guinea Highlands, this canid, popularly known as the New Guinea dingo or singing dog, is becoming increasingly threatened by the potential for hybridization. In addition to C. hallstromi and C. familiaris, singing dogs have been called C. familiaris hallstromi (Manwell and Baker 1983), C. lupus f. familiaris (Voth 1988), and C. lupus dingo (Brisbin et al. 1994). Only a few of the local New Guinea language names for the wild dogs have been recorded: German zoos call them urwald dingoes or "jungle dingoes."

The captive singing dog population has recently been the subject of a number of studies. These studies include genetics (Savolainen et al. 2004), behavior (Koler-Matznick et al. 2004), and physiology (Simonsen 1976; Koler-Matznick et al. 2003; C Asa and J Bauman pers. comm. 2005). Based on these interdisciplinary studies, the captive population apparently represents a relatively pure genetic line of ancient primitive dog, closely related to C. dingo, but adapted behaviorally and morphologically to the New Guinea mountain habitat. According to ethnographic accounts these dogs were commonly tamed by hunters, but they do not really fit the usual concepts of domestication (Meggitt 1958, 1965; R Bulmer 1968; Clutton-Brock 1992; S Bulmer 2001; Majnep and R Bulmer 2005).

The number of possibly unique attributes documented in the captive singing dog population, as compared to C. familiaris and wild canid species, suggests that they have either undergone significant evolution since their arrival on the island, or they were well differentiated from other canids when they arrived there. Today, the singing dog appears to be a product of at least several thousand years of natural selection. It is, at minimum, an evolutionarily significant unit, and, at maximum, could be its own distinct species (Simonsen 1976; Gollan 1982; S Bulmer 2001; Bininda-Emonds 2002; Koler-Matznick et al. 2002; Clark et al. 2004; Savolainen et al. 2004). Therefore, for conservation purposes, the wild singing dog should be considered a unique taxon until the contrary is clearly demonstrated.

NEW GUINEA SINGING DOG BACKGROUND

Whether the singing dog is just another population of C. familiaris is a serious question deserving careful consideration. Because C. familiaris varies greatly in morphology due to artificial selection, unlike most species, the description of C. familiaris is not based on diagnostic morphological characters, except for the consistently curved tail that Linnaeus (1758) used as his main defining trait compared to gray wolves (Canis lupus). Rather, the usual working definition of C. familiaris is functional and niche-based, meaning roughly dogs that live near or with humans symbiotically as commensals or as exploitive parasites. This concept is relevant only to the last few thousand years of dog history and singing dogs have not been part of such anthropocentric relationships. They have a pre-domestication relationship with humans (discussion below), but there is no evidence that, except in the one reported case of captive breeding with artificial selection, it involved attempts at domestication (R Bulmer 1968; Majnep and R Bulmer 1977; S Bulmer 2001; Majnep and R Bulmer 2005).

The most important reason to question assertions that singing dogs are merely C. dingo/C. familiaris hybrids (Corbett 2004) or feral C. familiaris (Schultz 1969) is that there is no direct evidence to support these claims. For instance, no identified C. dingo remains have ever been found in New Guinea. Although their opinions of the singing dog's phylogenetic relationship to other canids varied, even from the earliest accounts, observers of the wild mountain singing dogs commented that these dogs appeared to be a separate type from the New Guinea village dog C. familiaris (DeVis 1911; Longman 1928; Wood-Jones 1929; Tate 1944). Wood Jones (1929) was the first to suggest that the singing dog could be the ancestor of C. dingo. He further concluded that the Mount Scratchley specimen, the first specimen available for examination, differed significantly from the C. familiaris of other Pacific islands. DeVis (1911) collected the Mount Scratchley specimen at about 2,400m in 1897 and described it. Every subsequent researcher, with the exception of Schultz (1969), whether they considered behaviour, DNA, morphology, or physiology, has come to the same conclusion: in the trait each investigated, the singing dog differed to some degree from the generally accepted standards for modern C. familiaris (i.e., Simonsen 1977; Ortolani 1990; Koler-Matznick et al. 2003, 2004; Savolainen et al. 2004).

Schultz (1969) studied captive singing dogs and concluded they were domesticated because they were morphologically more variable than a population of a wild species would have been (mainly in leg length), they had white markings, and they were friendly with their keepers. However, Schultz (1969) was mistaken in his assumption of morphological uniformity in wild canids. There is considerable morphological variation in many populations of wild canids. For instance, within one pack of wolves there may be significant non-age and non-sex-related size variation, and coat color can vary from cream to gray to black (Mech 1970). The white markings on the underside of the singing dog's chin and the white tail tip may have adaptive value, serving important intraspecific signaling functions (Koler-Matznick et al. 2004). White markings on the ventral body, toes, and tail tip, are fairly common occurrences in many solid-colored mammal species. These white areas are due to the failure of embryonic melanocyte migration to reach those areas. This trait has undoubtedly been exaggerated in the inbred captive singing dog population, but in any case, variable markings should not be used as evidence for or against the singing dog being formerly domesticated. As for captive singing dogs socialized to humans and acting "friendly" to familiar people, one has only to look at other captive-born and socialized mammals of many species to see this is a common behavior and should not be used as evidence they are feral domesticants, contrary to Schultz (1969).

Flannery (1995) and others contend that the singing dog is a feral domesticant, apparently because it was introduced to the island by human transport. However, New Guinea was populated by humans by about 45,000 years ago (O'Connell and Allen 2003), and wild animals were being transported between Pacific islands by at least 20,000 years ago (Flannery and White 1991). Thus, the founders could have arrived before dogs are believed to have been fully domesticated (i.e., 12,000 yrs BP [Davis and Valla 1978] to 15,000 yrs BP [Savolainen 2004]). Wild dogs had only to be tamed to be transported. "Tamed" is used here instead of "domesticated" because the usual definition of the latter term includes the conditions that the population's freedom of movement and reproduction are under human influence, with on-going artificial selection for traits useful to humans (Zeuner 1963; Clutton-Brock 1992). These conditions are not met with the signing dog and neither is there any evidence that they were met with their ancestor. Recently, Iyengar et al. (2005) suggested that certain populations of Southeast Asian dhole (Cuon alpinus) probably descended from specimens transported by man from India (or vice versa). Another example of a prehistorically translocated canid is the Channel Island fox (Urocyon littoralis). Now listed by the IUCN as an endangered species, U. littoralis was similarly transported by humans and artificially dispersed within the California Channel Islands several thousand years ago (Collins 1991). Yet these canid populations with transported ancestors have never been labeled feral domesticants as has the singing dog. In another survey, 18 mammal species were considered introduced to Southeast Asian Islands, including the Philippines and Indonesia, by the Late Pleistocene. These were all wild species, including several forms of deer and primates (Meijaard 2003).

Origin of the captive population

As Corbett (2004) rightly points out, the current captive singing dog population is descended from eight specimens reportedly kept by Highland people, and not directly caught in the wild by the explorers who brought them out (Schultz 1978; Koler-Matznick et al. 2003). This does not mean, however, that these specimens were village C. familiaris. The remoteness of the primary source villages of the first captive specimens, the former and continuing geographic isolation of the singing dogs from other canids in the high elevation New Guinea Mountains, and the Highlander's particular knowledge of and regard for these distinctive canids must be considered when contemplating the origin of the captive population.

According to Titcomb (1969), Troughton, who described them in 1957 as Canis hallstromi, asserted that the first pair of singing dogs brought out in 1956 was secured by Papua New Guinea District Officer J.P. Sinclair and Medical Assistant Albert Speer while they were on government patrol in the previously unvisited Levani

Valley, which was in the then uncontrolled Huri-Duna country of the Southern Highland Province. Sinclair and Speer sent this pair as a gift to Sir Edward Hallstrom's Fauna Station at Nondugal in the Western Highlands. Hallstrom subsequently donated them to the Taronga Zoo. Titcomb (1960: 65) also relates that "In October 1960, Sir Edward Hallstrom kindly wrote to the author about Canis hallstromi, found and reared at Nondugal, New Guinea . . . , "a confirmation of this origin for the first captive pair. In contrast, Titcomb (1969: 65) also quotes Clyde A. Hill, Associate Curator at the San Diego Zoo (which received singing dogs from the Taronga Zoo about 1958), as saying on 2 March 1965 that, "The original pair was captured and raised by native tribesmen in the remote Shangra-La [sic] Valley, an area first entered by white men in 1956." Perhaps Hill was merely mistaken in his recollection of the name of the valley, as no "Shangri-La" of any spelling is found referenced in any publication concerning the area.

Although these three accounts of the original pair differ in details, it should be noted that none of them described the specimens as "village dogs." A previous attempt by Hallstrom to bring out a pair of singing dogs 1954 had failed when the specimens escaped confinement, killed "highly prized poultry," and were "consigned to the local natives for food" (Titcomb 1969: 64). Five additional captive population founding specimens were obtained by the 1976 German-sponsored expedition to the remote Eipomek Valley, Irian Jaya, West Papua (Schultz 1978; Voth 1988). These specimens had reportedly been bred by the locals, apparently one of the few traditional people who actually allowed their captive singing dogs to breed. However, the villagers indicated that their original dogs came from the wild (Voth 1988). The eighth captive founder was a female, reported to be "wild caught" and kept at the Baiyer River Sanctuary, Papua New Guinea, (L. Lim pers. comm. to I. L. Brisbin, Jr. 1988).

Ethnography

The people of New Guinea are known for their detailed knowledge of the animals in their environment. Visiting biologists have reported that the locals recognized and had named essentially all of the species the biologists recognized (Mayr 1963; R Bulmer et al. 1975; Majnep and R Bulmer 2005). In all local informant reports to date, the New Guinea Highland wild dog has a different local name than the village C. familiaris (R Singadan pers. comm 2001; M Wilangue pers. comm. 2003; W Waringi pers. comm. 2005). Some local myths include origin stories that indicate that the wild dogs brought fire or language, or even that they are spirits of deceased ancestors and so must not be disturbed, perhaps indications of the antiquity of the wild dog/human relationship in New Guinea (Titcomb 1969; R Singadan pers. comm. 2002). In general, canids did not fit within the Highlander's traditional way of home life. Most Highlanders usually did not, and still do not, keep C. familiaris as companion animals, although small numbers were occasionally kept for their teeth (taken for use as valuable ornaments after death of the animal). The original practice of many of the Highland peoples was to capture wild singing dog puppies (most often only males) and raise them as hunting aids (R Bulmer 1968, 1976; S Bulmer 2001; Majnep and R Bulmer 2005). Even today, many elders can remember the use of tamed singing dogs as hunting aids. These hunting dogs were kept at the men's communal houses and were personally cared for by the male hunter-partner. One of the singing dog's forelegs was often tied up to the neck to prevent roaming (Schultz 1978; Majnep and R Bulmer 2005). Some Highlanders have in recent times started keeping C. familiaris, both native village C. familiaris from the Lowlands, where dogs are integrated into human society as companion animals and hunting aids, and imported non-native dogs. However, the local Highland informants are quite aware of which dogs were obtained from the wild, if the ancestors of their present dogs had been crossed with the captive wild dogs, and how many generations ago that occurred (Wilangue 2002).

The archaeological record

New Guinea has been relatively little explored archaeologically. While there are many districts that have archaeological sites where bones of other animals are present, there are few sites with dog bones (S Bulmer 2001). This, it is argued, is because most Highland sites reflect traditional hunting and dogs were never hunted or eaten by most Highland societies. This is because many Highland societies, like a very large number of societies elsewhere in the world, believe that the dog is a dirty animal (e.g., because of their coprophagy and scavenging on decayed carcasses), and its meat therefore is not eaten. Archaeological evidence reflects this in the absence of dog bone in bone middens. However, some Highlands sites contain small numbers of dog canine teeth, which indicates they may have been used as personal ornaments by the Highlanders. Although Savolainen et al. (2004) reported that the oldest dog find in the Pacific Islands near Australia was on Timor, dated 3,500 BP. However, there are earlier dog finds in New Guinea from Lowland Ramu sites, dated to ca. 5,500 years ago (S Bulmer 2001). These predate the oldest C. dingo remains, which are dated to 3,450± 95 BP (Corbett 1995), and offer another indication that C. dingo could, as Longman (1928) suggested, be a descendant of the singing dog.

Singing dogs were highly valued by Highland hunters because they helped to increase the products of the hunt several times over (Majnep and R Bulmer 2005). Those hunting dogs that excelled in their services to their human partner were treated as an honorary human in their final burial rites, and their bones were placed in branches of a forest tree, while the jaws of their kills decorated the human hunter's house.

SCIENTIFIC SIGNIFCANCE OF THE SINGING DOG

Bearing in mind that nearly all investigations have so far been of captive specimens, and that most are still preliminary, several inferences can be drawn, and a few tentative conclusions made, about the potential scientific value of the singing dog. The arguments for singing dog significance include its apparent antiquity and purity as an evolutionary unit, along with its several unique genetic, behavioral, ecological, reproductive, and morphological traits. The cold, damp weather of the wild singing dog range, and the extremely remote and steep terrain of its habitat, are probably the factors which have kept them an isolated genetic line. These environmental factors, however, also make field studies demanding and daunting. Even for those who argue that this dog is merely a long-term isolate of C. familiaris, it would nevertheless be of value as a research subject (Brisbin and Risch 1977) and would have conservation value as a distinct race or subspecies.

The singing dog as a natural form of dog

There is no definitive DNA evidence yet of a direct C. lupus ancestor for C. familiaris, only that C. lupus and C. familiaris are more closely related to each other than either is to other species of Canis, and this could simply be an indication they had a recent common ancestor (Vila et al. 1997; Wayne and Ostrander 1999). It is possible that the main C. familiaris ancestor was a heretofore unknown or unrecognized species of medium-size generalist scavenger and small-game predator, similar in ecology to a golden jackal (Canis aureus) or coyote (Canis latrans) (Dahr 1941; Manwell and Baker 1980; Koler-Matznick 2002). Unlike the large C. lupus, these smaller, less specialized canids easily adapt to surviving in anthropocentric environments (Gier 1975; Poché et al. 1987; Bekoff 2001). If this hypothesis is supported by further research, the singing dog and C. dingo would be the best living representatives of the C. familiaris ancestral type. In any case, recent preliminary estimates from captive singing dog mtDNA suggest that their population could have, like C. dingo, been a separate evolutionary line from modern C. familiaris for at least 4,600 to 10,800 years (Savolainen et al. 2004). The genetic integrity of C. dingo is now highly compromised by introgression from imported C. familiaris (Corbett 1995). Unless politically unrealistic and economically expensive measures are implemented soon, the word “dingo” will come to mean “just a mixed breed feral dog.” If the singing dog proves to be the only other remnant of a separate evolutionary line of dog from C. familiaris, then they would be invaluable for studies of speciation processes (Coyne and Orr 2004). Lastly, the singing dog could be a relict sister species to the ancestor of C. familiaris, one of the numerous Canis species that arose during the Early Pleistocene canid radiation in Asia and have been presumed to be extinct (Pei 1936; Olsen 1985; Sotnikova 2001).

The acceptance of C. dingo and the singing dog as unique taxa is complicated by the fact that few data are available on the evolutionary rates and speciation process(es) in canids. It is impossible to use reproductive isolation alone to define a species in the genus Canis because even species that have been documented through the paleontological record as separate evolutionary lines for more than a million years can produce fertile hybrids, and mating systems have been highly conserved so that natural hybrids are occasionally produced (Gier 1975; Lehman et al. 1991; Gottelli et al. 2004; Sillero-Zubiri et al. 2004; Verginelli et al. 2005).

Canis dingo and the captive singing dog population are genetically distinct enough in mtDNA haplotypes and microsatillite markers to make a determination of whether or not a specimen is pure or a C. familiaris hybrid (Wilton et al. 1999; Wilton 2001; Savolainen et al. 2004). Therefore, these populations are not genetically equivalent to any other tested dogs. If molecular characteristics are accepted as equivalent to genetic differences, then there are also data showing that the singing dog is genetically unique compared to its nearest relatives. Simonsen (1977), in an electrophoretic molecular study, found that the singing dog had two of 18 blood enzymes that differed from the type shared by C. dingo, C. familiaris, and C. lupus, but co-occurred in C. latrans and red fox (Vulpes vulpes). In another study, Shaughnessy et al (1975) examined three blood proteins in C. dingo and C. familiaris and found no differences, suggesting that C. dingo could be genetically closer to C. familiaris than is the singing dog, perhaps due to recent hybridization.

The question of singing dog/C. familiaris hybridization

Although it is argued that C. familiaris has been in the Lowland and coastal areas of New Guinea for at least 3,300 years as part of the Lapita cultural complex (S Bulmer 2001), and for 5,500 years as part of the Sepik-Ramu trading set (Swadling et al. 1991), there are reasonable arguments against their extensive genetic

introgression into the wild singing dog population. Preliminary mtDNA results show that some of the few extant Highland village dogs sampled to date have singing dog/C. dingo haplotypes (P Savolainen pers. comm. 2005). However, the Highland people who owned the sampled dogs claimed they were wild dog X village dog hybrids, so this result was not unexpected (Wilangue 2002). Local Highland residents report that both in the past (R Bulmer 1976; Majnep and R Bulmer 2005) and recently (M Wilangue pers. comm. 2003), wild singing dog puppies have been captured for use as hunting partners. In some communities, the captured wild dogs are allowed to breed with the village C. familiaris in hopes the offspring will have increased hunting prowess while retaining the greater tractability of the domestic dog (R Bulmer 1976; Majnep and R Bulmer 2001). Thus, gene flow has taken place from the wild singing dog to the village C. familiaris. However, until further genetic testing proves otherwise, genetic introgression from the village C. familiaris into the wild singing dog population can be assumed to be nonexistent or exceptionally rare due to pre-zygotic behavioral isolation between village C. familiaris and wild singing dogs, and to the geographic isolation of the singing dogs.

When in its natural undisturbed Highland habitat, the singing dog would not be at all likely to mate with an encountered C. familiaris. The New Guinea village C. familiaris, the only domestic dog that has had a significant chance to hybridize with the singing dog, is adapted to a tropical climate and would therefore have a difficult time surviving for any significant period in a Highland village, let alone in the c. 2500–4700 m altitudes where wild singing dogs range. Therefore, it is highly unlikely that free-ranging or feral C. familiaris are resident in singing dog habitat. Locals report that C. familiaris specimens entering wild singing dog territory are attacked by the resident wild dogs (Wilangue 2002). Captive behavior studies (Koler-Matznick et al. 2004) support this observation and suggest that wild singing dogs likely have a bonded, territorial pair, rather than a wolf-like pack social structure. Given the scarcity of prey in the New Guinea mountain environment and the absence of large game (Flannery 1998), it seems ecologically appropriate for singing dog pairs to defend a territory. Therefore, the few C. familiaris that accompany humans into the remote Highland regions would be highly unlikely to breed during that journey, because if they were valued or useful enough to take along, their owners surely would exert control to keep them from potentially injurious encounters with aggressive wild dogs. In addition, even an un-paired estrus singing dog female would be extremely assertive toward a strange male. In captivity, introductions of a female to a strange male have to be done slowly, with both controlled, because if the male approaches too rapidly before the female has had sufficient time (at least several minutes) to become familiar and relaxed near him, she will react aggressively, with snarling and snapping, occasionally even biting him (Koler-Matznick et al 1994).

Possibly Unique Reproductive Pattern

Another at least partial barrier against domestic C. familiaris introgression into the wild singing dog population is the female singing dog's seasonal breeding pattern. Singing dogs have unusual estrus cycles compared to nearly all canid species. Records of 25 females kept by the authors from 1988 to 2000 and a two-year fecal hormone study of the cycles of eight captive females by C. Asa and J. Bauman, showed that the singing dog uniquely combines a strong annual seasonality, with the flexibility, if not impregnated the first cycle, to have a second estrus, and sometimes a third, within a few weeks after the end of the first (Brisbin and Risch 1997; Koler-Matznick et al. 2003; C Asa and J Bauman pers. comm. 2005). The captive singing dog annual mating season, which begins in late September, has not shifted in approximately 20 generations after translocation from New Guinea to higher northern latitudes, suggesting the seasonal rhythm is endogenous.

Singing Dog ecology

The singing dog is now New Guinea's top (non-human) mammalian predator, and has probably been so since the local extinction of the Thylacine some 2,000 - 5,000 yrs BP (Strahan 1983; Guiler 1998). The only field study of singing dog ecology to date was by Bino (1996), who briefly collected scats, observed secondary signs (beds, paw prints, etc.), and interviewed locals in the Mekil reservation area. Bino (1996) concluded that the wild singing dog is a formidable predator, even attempting to attack cassowaries (Casuarius bennet) several times their body mass, and kleptoparasitizing New Guinea Harpy eagle (Harpyopsis novaeguineae) kills. He reports that the Mian people of the Mekil area say wild singing dogs are often sighted around Pandanus spp. and Elaeocarpus spp. trees during the fruiting season, eating the fallen fruit and most likely also attempting to ambush prey that come to feed. Bino (1996) also reports that the singing dog beds he located seemed to be used infrequently, even perhaps on a seasonal basis, and so in the Mekil area they may be transient, hunting over a larger territory.

The fact that the singing dog, like C. dingo, is a self-sustaining wild population, one apparently in ecological balance with its prey (i.e., no local extinctions of prey species by singing dogs have been confirmed), is an indicator that they were not domesticated when first introduced to New Guinea. With one exception, the now extinct Galapagos Island Dog (Barnett and Rudd 1983), no extant feral C. familiaris population has ever been

reported to be self-sustaining demographically, without some degree of dependency upon humans (Scott and Causey 1973; Nesbitt 1975; Daniels and Bekoff 1989; Biotani et al. 1995). Feral C. familiaris, even in the absence of canid or large felid competitors, evidently do not become, like the singing dogs, an ecologically integrated predator. Field studies will be vital to further elucidate the singing dog's role in the New Guinea Highland's ecology, including their possible deleterious effects on rare prey species.

Corbett (2004) stated that "... there are … few ecological data mainly because no wild singing dogs have been captured or validly seen for several decades." If we assume by "validly seen" Corbett means by non-native scientifically trained observers (there are numerous reports from locals), this is a misstatement. In Flannery (1995) there is a photo of a wild singing dog taken by the author at the remote New Guinea Star Mountain location of Dokfuma – translated as the Place of the Dog – in 1989. Flannery (1998: 174) states in reference to the howling of the singing dogs that, "For me, it [what he terms "the haunting call"] is always evocative of the highlands." So, while uncommon, the dogs were present during Flannery's Highlands research. Recent reports from some local Highlands people indicate the singing dog is now absent from many parts of its former range, but it is still being reported from the more remote, high altitude areas (R Singadan pers. comm 2001; M Wilangue pers. comm. 2003; W Waringi pers. comm. 2005). We therefore submit there are few ecological data available only because little effort has been made by non-local scientists to observe the wild singing dogs.

CONCLUSION

It is obvious from behavioral, morphological, and genetic characters that the singing dog is a dog, not a wolf or jackal. The question that remains to be answered is "What dog?" We are convinced the answer is that the singing dog, and pure C. dingo, are incipient sibling taxa, and their order of derivation will likely be resolved by further research. Whenever and wherever the singing dog originated, today there can be no doubt that it is at minimum an evolutionarily significant unit (Moritz 1994; Bininda-Emonds 2002) and deserves the same thorough and objective study that would be applied to distinctive populations of other taxonomic groups. The final determination of the species status of C. dingo and the singing dog will be reached through an interdisciplinary examination of genetic, morphological, demographic, physiological, and behavioral evidence. Until such definitive information is available, it is premature to arbitrarily dismiss the singing dog as nothing more than a feral C. familiaris or a C. dingo/C. familiaris hybrid. The information presented in this paper, and in Koler-Matznick, et al. (2003), is intended to encourage targeted investigation of the singing dog as a significant evolutionary unit within the genus Canis.

The people of Papua New Guinea recognize the singing dog as a unique endemic that is also an important part of their living cultural heritage. A not-for-profit group to promote wild singing dog study and conservation, the New Guinea Singing Dog Conservation Society, Papua New Guinea Division, has recently been formed (M Wilangue and K Mondiai pers. comm. 2006). Having an in-country source of support and information will facilitate field research and, ultimately, singing dog conservation.

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PLIGHT OF THE DINGO

Presented by Adrian Mifsud for the Australian Dingo Conservation Association

The Australian Dingo Conservation Association (ADCA) is a scientific based, non-profit organization dedicated to the breeding of pure-bred dingoes. ADCA is heavily involved with Dr. Alan Wilton who can genetically identify pure dingoes both in captivity and in the wild. This work has given ADCA recognition by ARAZPA, whereby ADCA has been placed in charge of the dingo studbook to also supply dingoes to zoos and fauna parks.

As ADCA learns more about this very misunderstood animal, we can educate the public about the "Plight of the dingo" regarding the threat of extinction due to the hybridization with feral dogs.

YELLOW DOG DINGO. How old are you,
Where do you come from? What do you do?
(Larry King, Australian Composer) (Corbett, 1995)

Surrounded by controversy, the dingo has had a colourful history, baffling the likes of scientists, environmentalists, pastoralists and the Government. Descendant of the Arabian or Pale-footed wolf, the dingo Canis lupus dingo, arrived in Australia approx. 5,000 years ago. Living in isolation from other canid species, this primitive wolf has the traits of a survivor, not only physically but mentally. Shaped by the Australian environment, the Australian dingo evolved true to type.

The dingo became accustomed to the life of feast or famine, only to be greeted with a banquet on the arrival of European settlement. Like many top-order predators around the world, the dingo soon became an outlaw due to its superior predatory skills. Many thousands of dingoes were and are still being culled, breaking down pack bonds and territories. The break down of both packs and territories allowed for the infiltration of feral dogs. Once killed by dingoes upon confrontation, the feral dog now became a substitute for what was once a pure dingo. Like a drop of ink in a glass of water, the feral dog genes commenced polluting the pure dingo gene pool.

ADCA's co-operation with scientists dates many years, exploring the realms of dingo behaviour and ecology. Today the main focus has turned towards maintaining the dingo as a pure bred species. Breeding animals are selected based on genetic diversity. Selectively breeding for desirable traits is discouraged as the goal is to retain not only genetics but typical dingo behaviour.

Initially Dr. Laurie Corbett author of 'The dingo in Australia and Asia', refined skull morphology testing, allowing ADCA to determine the likelihood of their dingoes being pure, with a 95% level of probability (Corbett, 1995). Unfortunately skull morphology tests could only be conducted on deceased specimens.

Geneticist, Dr. Alan Wilton (Senior Lecturer of Biotechnology for the University of NSW) commenced a study of recognizing differences between specific loci amongst dog and dingo genes. Based on DNA testing used in forensic science, Dr. Wilton found that 18-20 certain genetic markers were present in the dingo, yet absent in the dog.

With a 99% level of probability, the test can be performed on live specimens. (pers.coms. 2005). This technology allows ADCA to be more confident in the keeping and breeding of their dingoes.

The ADCA's dedication and participation in the quest to recognize and maintain pure populations of captive dingoes, has been recognized by the ARAZPA Carnivore TAG.

In late 2002, the ARAZPA Carnivore TAG made the collective decision of transferring the dingo studbook over to ADCA. In acceptance of this responsibility, ADCA can further develop its role of maintaining pure bred dingoes. This recognition increases the credibility of ADCA, allowing ADCA to broaden their knowledge and co-operatively work and contribute to further dingo research.

ADCA and Dr. Alan Wilton are working in conjunction with Dr. David Jenkins (Parasitologist and Wild dog Research Co-ordinator) studying the wild dog population within and around Kosciuszko National Park. DNA samples collected from wild dogs/dingoes captured by Dr. David Jenkins, have been analysed by Dr. Alan Wilton. Dr. David Jenkins has found that an extremely high percentage of feral dogs and dingo/dog hybrids reside within the study area. With this in mind, further tests were performed testing tissue samples supplied by professional dog trappers, giving representation of dingo populations around Australia. Results were alarming. The research shows that approx. 80% of wild canids right along the south east coast of Australia are in fact feral dogs and or dingo/dog hybrids. Feral dogs and dingo/dog hybrids are being found right across the country. The severity of hybridization will fluctuate depending on the isolation of the existing dingo populations. With increased levels of tourism, remote

areas are becoming more accessible. Inevitably domestic dogs will then easier access into remote areas, increasing the intensity of hybridization.

Adding insult to injury, the dingo is declared a pest in Western Australia, South Australia and Queensland sanctioning the shooting of dingoes on site. The Northern Territory and Australian Capital Territory list the dingo is a native animal, while New South Wales regards the dingo as a dog, despite it being a wolf. The state of Victoria regards the dingo as vermin who can be housed in captivity under permit conditions, while Tasmania remains free of both wild and captive dingoes. Such confusion regarding the status of the dingo, prevents this species from being recognized as endangered by the IUCN. ADCA has and will continue to lobby the Government regarding the status of the dingo.

The dingo always appears as the centre of controversy. Unfortunately for the dingo, scenarios are often created by humans. History boasts on the collection of dingo scalps, while the country takes pride in building and maintaining one of the worlds largests man-made structures; the dingo fence. Humans have and will continue to invade dingo territory, at the expense of the dingo. World heritage listed Fraser Island, is potentially the last strong hold for the pure bred dingo. The dingo is one of the draw cards to the island, yet one third of the population has been culled, due to the potential threat they may pose towards the thousands of tourists who visit the island each year.

We need to educate the public about the demise of the dingo. As a non-profit organization, ADCA is managed and funded by a small network of members. I wish to encourage zoological organizations in their assistance towards keeping the pure dingo alive. At Healesville Sanctuary, our three pairs of dingoes are walked around the park regularly. Visitors have the opportunity to view the dingoes up close under the supervision of the keepers. As the dingoes are on a lead, the keepers discuss the difference in behavior between dingoes and dogs. Visitors are constantly reminded that our dingoes are tame as they are all captive bred, tolerating moderate levels of handling, and at no point should they be considered domesticated. The dingoes portray their strong will and aloofness by ignoring visitors, showing a great deal of interest in their surrounding environment. An analogy often used is 'a dingo is a cat in wolf's clothing'. Visitors can relate to the aloofness and independence of the domestic cat, and after their dingo encounter they can see the similarities between the cat and the differences to the domestic dog.

Periodically the dingoes are walked within our Bird of Prey arena before the bird show. Here visitors can experience a dingo close up (while on lead) while keepers have the opportunity to discuss the plight of the dingo and the effects of hybridization to a large audience. Healesville Sanctuary is currently working on new dingo graphics discussing the effects hybridization depicting the plight of the dingo and recognizing the work of ADCA. In addition educating visitors about responsible pet ownership will hopefully reduce the number of stray and unwanted dogs which will hopefully reduce the number of replenished stray and feral dogs.

Zoological organizations have the power to influence and educate. I believe it is our responsibility to make a meaningful contribution towards preserving Australia's native dog, the dingo. Extinction as forever.

"In the end we will conserve only what we love. We will love only what we understand. We will understand only what we have been taught." (Baba Dioum- African Ecologist)

Acknowledgments

I would like to thank Barry Oakman (President ADCA) and Marg Oakman (Treasurer ADCA) for sharing their friendship and knowledge of dingoes over the past seven years.

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AZAWAKH IN ITS ANCIENT DISTRIBUTION RANGE

Werner Roeder
Germany

There is almost no scientific or critical literature regarding the historical, geographical and ethno-cultural origins of the Azawakh and their life-circumstances. Professional research is also practically non-existent. In anthropological publications and in innumerable photographic and travel volumes covering the culture of the Sahelian nomads, the dogs are completely ignored or at most considered only peripherally. The majority of literary

contributions to sighthound books or sighthound association magazines regarding the Azawakh in their region of origin have relied primarily on second or third hand information. Correct information is frequently mixed with unacceptable generalizations, hearsay, misunderstandings, speculations and calculated misinformation.

My personal observations have been gained over the course of 17 expeditions into the original habitats of the Azawakh. Since the mid-1980's, in numerous west-African regions, I have crossed and re-crossed "the traces of the Azawakh": in the Algerian, Libyan, and Malian reaches of the Sahara; the Tenere and Mauritania; and also those regions which lie outside the traditional Azawakh habitat [knowledge found therein is necessary in order to determine the boundary lines and transitional zones of the Azawakh population]. Annual expeditions to the Sahel zones of Mali, Niger and Burkina Faso by the Association Burkinabe Idi du Sahel over the past fifteen years provided data central to my research.

Normally, the dogs move freely in and around the camps and at local markets and well sites. As they observe individual distances in the face of strange persons and objects, a leash might be required to present them to unknown visitors. Tuareg, Niger (2007).

The information included in the FCI standard demarcating the traditional habitat of the Azawakh is partially correct but also misleading. The 1984 version of the standard designates "the Niger basin in the Republic of Mali". This rather vague geo-political phrase excludes identical landscapes of neighboring countries. In 1994 the text was revised to read "the central Niger basin including the Azawakh Valley" but again identified only Mali in the heading as the country of origin.

It makes little sense to give special emphasis to the Azawakh Valley. The ABIS expedition of 2003 crossed the entire former river bed of the Azawakh Valley for the first time and drove along the base of the Sakarazou mountain range. Along this course one finds only a few wells with water of poor quality. Only during the rainy season sufficient pasturage and water supplies is provided for large herds of livestock, the nomads and their dogs. During the rest of the year the watering holes and wells of the southern, western and eastern savannahs of Mali and Niger provide sustenance. We explored these regions on previous expeditions and it was in these places where we met the nomads of "the Azawakh Valley" and their dogs.

Litters are raised in sand caverns excavated by the mother dog. In general, culling is radical in order to control the dog population and the costs of feeding . In this case, the reconstruction of the regional population was in demand after several years of drought. The five puppies are already marked by collars for their future owners in neighbouring camps. Niger (2007).

The first expedition to the Sahel to study the Azawakh was undertaken by Francois Roussel in 1974 in preparation for a veterinary thesis. Roussel saw and described an Azawakh population which despite morphologic variability was extremely homogenous, not only in the area surrounding Menaka, but likewise in the Gourma savannah and in the region northeast of Gao. In spite of the consequences of long cycles of decimating droughts and a civil war in Mali, a quarter century later our research confirmed Roussel's findings and we expanded the area he described to include the Sahel zone of Niger and Burkina Faso.

Coat colours of Azawakhs comprise a wide variation from red (ca. 50 percent) to light sand (ca. 30 percent) and a minority of cream, white, “lilac” and black. Markings reach from brindle (ca. 12 percent) to particolour. The well-fed female on this pictures gives prove of a good rainy season with rich millet and milk rations. This might change extremely from year to year. Mali (2007).

Roussel pointed the way towards a meaningful definition of origin for the Azawakh: he characterized them as "the Sahelian nomads' sighthound", bred, raised and utilized by all cattle breeding peoples in the identified region; a dog belonging just as much to the Bella and the Peul tribes as to the Tuareg and their diverse confederations. One can only speculate why the crafters of the standard ignored this and other important data contained in Roussel's doctoral thesis published in 1975: The early French breeders and owners imported their dogs almost without exception from Tuareg clans in a relatively limited area in Mali. This and a romanticizing European notion of the "Blue Knights of the Desert" might have led them, probably not reluctantly, to an exclusive definition of the breed's geographic and ethnic origin.

An example of this mind-set can be found in the following absurd statements from Xavier Przezdziecki's Le Destin des Levries, published in 1984: "The sighthounds which one finds with the Tuareg in the Azawakh Valley represent a pure race numbering at most a few dozen. If there similar breeding populations exist elsewhere, they cannot be very numerous. The Tuareg call them eidi n'illeli, a designation which is reserved only for the most high-bred windhounds with well-known pedigrees." Prezezdziecki's speculation reflects European fantasies of nobility and is far removed, if not diametrically opposed, to African realities now and then.

In comparing the present indigenous Azawakh population (The large numbers documented on the ABIS homepage www.azawakhs.de) with the first Sahelian bred imports to Europe, one is unable to register any significant phenotypic difference. These are the same dogs, whether found today in the seasonal grazing lands of Mali, Burkina Faso or Niger; whether among the Tuareg, the Peul or the Bella. The hyper-stylized phenotype to be found among European Azawakhs represents in many ways a problematic deviation: Closely related specimens descending from a small number of ancestors and selected over several decades using arbitrary European criteria.

The origins of the Azawakh can be described as follows:

(1.) There is a high probability that the Azawakhs descend from eastern-Asiatic dogs that migrated into the African continent with Hamitic peoples, the ancestors of today's Tuareg. Reliable information may be provided by research currently being conducted using comparative DNA analysis. The Azawakh arose as the result of adjustments to landscape, climate and function within the culture of the people penetrating from the north and northeast into the Sahara.

(2.) Well into the past century the Tuareg confederation exercised martial, cultural and economic sovereignty within their areas of settlement and migratory routes extending to the southernmost edge of the Sahara. Within this region other nomadic peoples as well as the aboriginal Africans taken in raids were assimilated into Tuareg culture. Regardless of ethnicity, these diverse groups of people see themselves as members of the Kel Tamasheq, or "the culture of those who speak Tamasheq". Among all these peoples the Azawakh is an element of their lifestyle, primarily as a guardian of their herds and encampments and secondarily (and mostly in earlier times) as a hunter of the game of the savannahs.

(3.) The habitat of the Azawakhs shifts among the seasonally changing grazing grounds, watering holes and wells used by the various nomadic goat, sheep and cattle herders in the savannahs between the arid Sahara and the sub-Saharan agricultural zone. A minority can be found among the settled cattle breeders and millet farmers of the oases, among the Songhai fishermen on the banks of the Niger and in the Haussa villages found in the transitional zone between the regions traversed by the nomads and regions of permanent settlement and cultivation.

(4.) The Azawakh of the Kel Tamasheq display a distinct phenotype that is clearly different from the windhounds of other isolated regions either to the south, to the west in Mauritania, or to the east in Sudan. It is the only extant race of dog in a region roughly the size of western Europe. Some cross-breeding may occur at the southernmost boundary of the region but in the central proper region of their habitat conditions conducive for hybridizing do not yet exist.

(5.) It is therefore reasonable to conclude that the Azawakh of the Sahel is a unique pure-blooded landrace. Breeding is by and large free of human interference and is mainly subject to natural selection by environmental conditions with the resulting whelps being selected according to an assumed value corresponding to the current needs of the people.

Young Azawakh male ready to protect his camp and cattle after having undergone a traditional and rather strict socialization training. Dogs with unadaptive demeanour against family members and life stock have no chance to survive behavioral selection. Bella , Burkina Faso (2007).

Taking into account all our encounters with Azawakhs during the yearly ABIS expeditions, I venture an estimate of several thousand Azawakhs in the Sahel. This figure would be optimistic during years of crisis and especially after prolonged periods of severe drought which have the propensity to temporarily reduce the population to its lowest number. The Azawakhs reproduce themselves quickly within short generational spans. Supply is often dependant upon demand and unpredictable life spans. Over the years we observed fluctuations in the total number of specimens, in gender distribution and in the number of whelps culled from any given litter.

In 1989 Austrian nationals Elisabeth Eiles and Hans Juergen Strassner published their book (unfortunately now long out of print) >Der Azawakh: Windhund der Nomaden in Mali (The Azawakh: Windhound of the Nomads in Mali). This book was the result of research conducted during their travels in 1986 and 1987 in the region comprising the southern entrance to the Azawakh Valley. In this book living conditions, breeding, upbringing, race character and phenotypic features of the Azawakh are altogether appropriately described. Considering that this knowledge was acquired and disseminated during a relatively early period of European Azawakh breeding it is unfortunate that the crafters of the FCI standard chose to ignore it. Strassner and Eiles documented, among other things, the range of variation in typical coat colors and markings.

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Azawakhs are keen to "work" in co-operation with their masters. Once a trustworthy relationship has been established, they will readily respond to verbal commands and gestures. Peul Wara Wara, Burkina Faso (2007).

Over the course of our expeditions we also documented our observations of coat colors and markings. As our findings were drawn from a substantially larger geographical context they greatly enlarged this database. The results from several expeditions covering different routes were statistically evaluated by Dr. Gabriele Meissen whose complete article "Zur gegenwdrtigen Azawakh population in den afrikanischen Ursprungsgebieten" (The Current Azawakh Population in their African Region of Origin), was first published in the ABIS Annual Report 2001. It has since been published in English, French and Italian cynological magazines and can currently be found on the ABIS homepage.

In 1989 Strassner and Eiles forecast the extinction of the Azawakh in Mali by the turn of the century. News of the civil war and ethnic cleansing in Mali prompted a pessimistic acceptance of such a probability. But in 1996 when ABIS was once again able to drive through eastern Mali and Niger we discovered that numerous Tuareg groups had survived the rebellion and were returning from temporary refugee camps, often accompanied by their idis.

White markings, mainly on the legs/toes, chest, nose and tips of the tails, are part of the genetic outfit. There is a broad variability, however, as to their individual manifestation and size. Burkina Faso (2007).

Events during this time of turmoil accelerated certain societal changes which in turn affected attitudes toward the dogs. A large number of Bella, emancipated from their former Tuareg masters and separated from them during the civil war, in some cases laid claim to the evicted Tuaregs' herds and lands. A similar development had already taken place in 1984 in northeast Burkina Faso as a result of a government-backed serf uprising. Many of the Tuareg ruling class were pushed into Mali and forced to abandon their pasturelands to the Peul and Bella. The Tuareg were separated from their traditional herd-based economy because of the progressive loss of their black servants, a trend which continues to this day. Today a generation of younger Tuareg looks for their future as migrant workers in North Africa or the Ivory Coast, in the transportation and tourist trade, as soldiers and mercenaries in both native and foreign armies, in the trade of traditional arts and crafts, or they seek help from developmental projects. Some Tares concentrate on less labor-personnel intensive camel breeding. Since camels no longer face the threat of lion

predation and do not require herding, these Tuareg do not need dogs. We observed such a situation for example in the area around Kidal.

The majority of the Azawakh owners in today's Sahel come from the former vassal caste of the Kel Tamasheq who still, in contrast to many of their former lords, continues the traditional industry of the Kel Ulli (the goat herders). Among these nomadic pastoralists the Azawakhs have retained their place as watchdogs. Ultimately their fate will be decided by whether the Kel Tamasheq is dependant on them for traditional purposes; their future in the Sahel is inextricably intertwined with that of their masters: nomadic herders of goat, sheep and cattle. Only as utilizable assets will the Azawakhs continue to justify their daily apportionment of the meager millet and milk rations of their owners.

Traditional nomadic economy in the Sahel faces multiple threats. Today it barely provides (and often fails to provide) for the self-sufficiency of the people. Eventually it must and will yield to the pressure of increasing economic, social and political change. Such change will spell the end of the Azawakh in its region of origin. However, given that Africa has become a continent of stagnation, I refrain from making any temporal prognosis.

The Azawakh of the Sahel arise as one of the world's last and rarest populations, an entire race of dogs which continues to be shaped by its historical purpose; an ancient organic form optimally adapted to its natural environment and surviving free of the genetic depletion brought about by selection according to aesthetic criteria. Those in Europe who love the race share a unique opportunity to heed the redeeming words of Xavier Przezdziecki: "The belief held by all breed associations in improvement should not apply to the windhound as it is almost perfectly formed by nature. Indeed, as they are a loan from nature, Man is charged with their conservation."

Werner Roeder, Dr.phil., b. 1938
Historian (contemporary history).
Author, research director, head of archives, Institute for Contemporary History, Munich, Germany (ret.)
Owner and breeder of Azawakhs since the Eighties.
Numerous expeditions to West Africa;
SInce1992 co-founder of the Association Burkinabe Idi du Sahel (A.B.I.S.)in Ouagadougou, Burkina Faso.
Co-ordinator for A.B.I.S. in Europe, publications and TV-productions (advisor) on indigenous dogs in West Africa .

GENETIC IMPOVERISHMENT OF THE AZAWAKH IN EUROPE?
Problems of preserving aboriginal breeds outside their region of origin

Elisabeth Naumann

One of the ways of safeguarding original dog breeds threatened by economic, social and ecological change in their native habitats is their transfer into the modern world of dog fanciers and a network of kennel clubs and international cynological organizations. It should be quite obvious that this possibility does not apply to aboriginal dogs existentially dependent upon living conditions which cannot be substituted anywhere else outside their region of origin. Other breeds seem to have been successfully integrated, like the Sahelian Azawakh, within the dog breeders' communities of Europe and America, enjoying FCI-approved "standards". However, serious doubts are in order whether these indigenous breeds will survive, in the long run, with their original appearance, character, functionality and health under the regime of European 19th century – based animal husbandry and its aim to produce homozygous specimens in accordance with the phenotypic mainstreams elaborated in the show-rings.

Selective breeding is the way to enhance or suppress traits and characteristics. The seemingly easy rule in breeding tells us that only those individuals should be bred, which combine the favorable traits and characteristics in a breed and which come as close as possible to fulfilling or even exaggerating the "standard"- rules imposed by Kennel Associations, very often without adequate knowledge of the breed in its indigenous habitat.

Usually breeders of a long established race comprising a numerous population have a vast pool of non-related specimens to choose from. This is especially important when genetic mistakes show within a homozygous selection and therefore need to be corrected. These possibilities can be applied to the Azawakh breed to a certain extent only, due to its limited numbers outside Africa and the very small basis of a dozen or so imports to Europe in the Seventies and Eighties of the last century. Homozygous breeding always means genetic losses. In the case of an extremely small genetic pool it will alter the frequency of occurrence of specific genes within the whole breeding population, thus depriving the breed of certain phenotypic and behavioral characteristics common to its ancestors in the region of origin. In the longer run, so-called inbreeding depressions as to health and physical performance will appear.

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When deciding upon genetic losses one has to look closely at the breeding animal and also seek help through inbreeding coefficients and ancestral loss coefficients. The inbreeding coefficient determines by which percentage the heterozygous has decreased and the homozygous has increased within a dog comparable to the breeding average. The formula of calculation by weight of the inbreeding coefficients (IK) reads as follows: IK = (1/2) n1+n2+1.

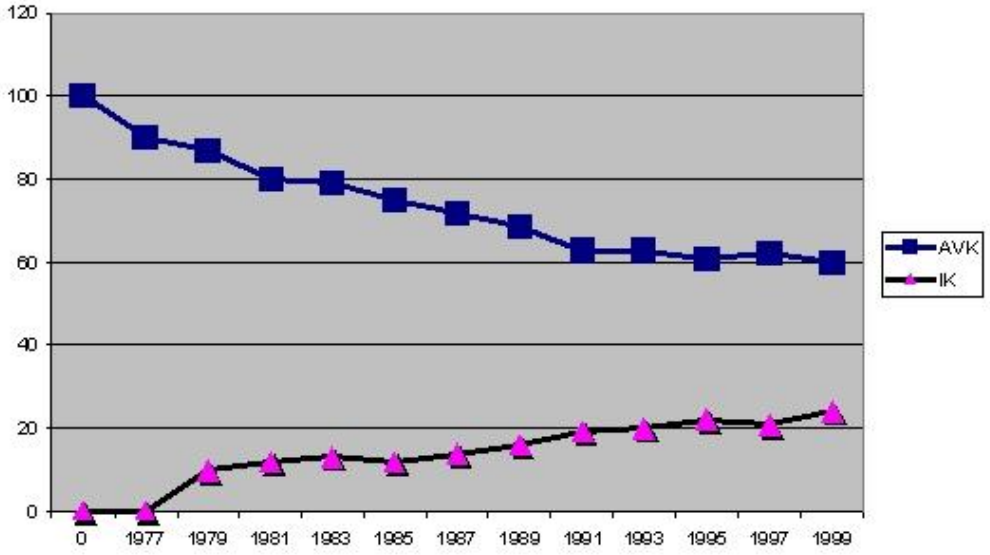
The ancestral loss coefficients (AVK) (formula designed by Prof. Schlegel, University of Vienna) are the quotient out of a number of uniquely found ancestors within the overall group of ancestors.

Example: Within a group of the third known generation only eight out of 14 ancestors are different individuals, then the quotient for this group will be 8:14 = 0,55. This means an ancestral loss of 55 percent. An AVK of 60 for example means a loss of heterozygous of 40%.

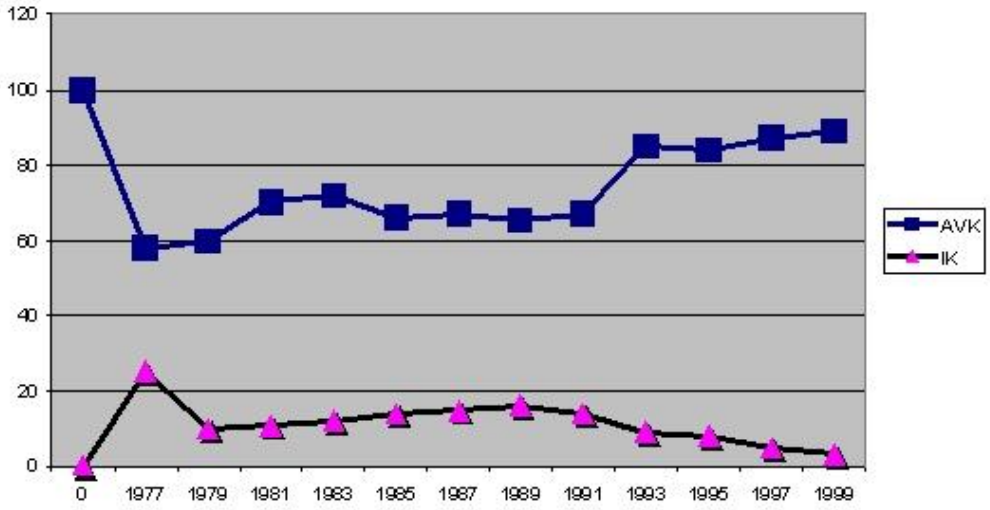
I have analyzed the European stock (900 individuals between 1977 and 2001) taking the IK and AVK into account. In order to gain an annual average figure, all documented individuals were given their IK and AVK. These figures were then added and divided by the figure of entries.

The result shows a steady decline of the AVK figure for the Azawakh population in France. Towards the end of the 1990's the AVK has sunk under the genetic threshold of 70 percent. In accordance to this development the inbreeding coefficient increased over its critical figure of 20 percent. There is a "bottle neck" to be seen where the initial genetic range of the first Azawakh imports from the former African colonies gave way to a situation which cannot be corrected with the genetic material of the current French breeding because of the dramatic narrowing of the genetic pool.

IK- and AVK- distribution in French breeding



IK- and AVK- distribution in German breeding



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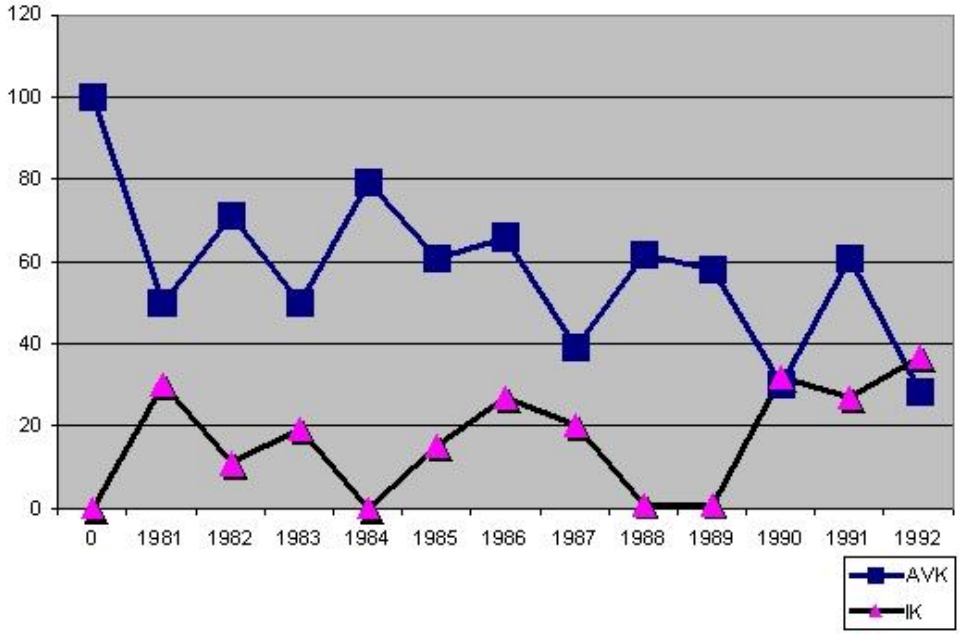
The German breeding started during the Seventies in quite a similar situation to that in which the French population is at present. Due to the incorporation of Azawakhs from France and contemporary imports from Africa, Azawakh breeding in Germany seems to be on the safer side.

Homozygous is considered within "normal" breeding of pets as the key to optimizing a breed. Inbreeding means to make dogs and their genetic material homozygous. The bigger the IK, the bigger the possibility that descendants will be homozygous in certain genes. There is the obvious question, however, which genes will become homozygous by such breeding – the favored ones or – also – the unfavorable genes. The most undesirable characteristics or traits, which occur within a homozygous bloodline, are hereditary. But only descendants of individuals, who carry the recessive faulty material themselves, will show this in their phenotype. A characteristic, which, through inbreeding, should have been strengthened, might be coupled with a faulty characteristic, which is undesirable. Or it is the other way round – the genes which are undesirable and which one wishes to eliminate through inbreeding are coupled with a gene which is most desirable. To act along this experimental line within a breed which is few in numbers could have serious consequences, namely the collapse of the breed as a whole.

Negative results with inbreeding do not occur overnight, nor do they show in a multitude or all at the same time. Some bloodlines seem to have a higher level of inbreeding tolerance than others before negative effects show. Even in very tight bloodline breeding with relatively high IK and AVK, genetic deficiencies can stay hidden over a long period of time. They may, through genetic luck, stay within certain limitations or only show certain physical or psychic characteristics, which are not that obvious to breeder or owner alike, or are simply tolerated. This could have quite dramatic effects, as those negative results on the phenotype and behavior will influence both judges and the public, luring them into the belief that those characteristics are natural and on the whole desirable. Partly as a result of that, the breadth of the "breeding philosophy" is astonishing wide and it may differ individually, as shown below, from the IK- and AVK-average typical for the Azawakh population as a whole, e.g. in Germany or France.

IK- and AVK- distribution at an inbreeding kennel



IK- and AVK- distribution within a bloodline kennel

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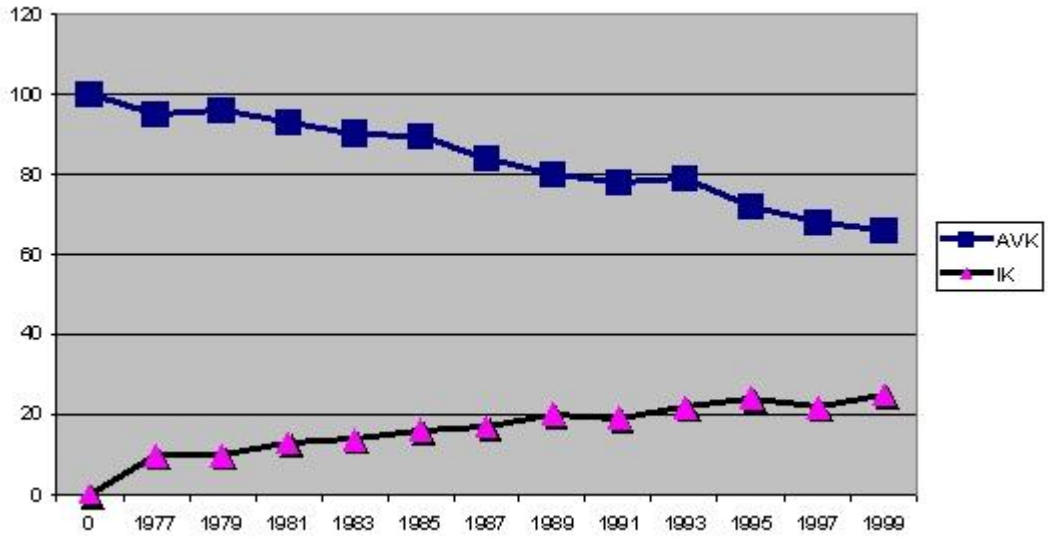
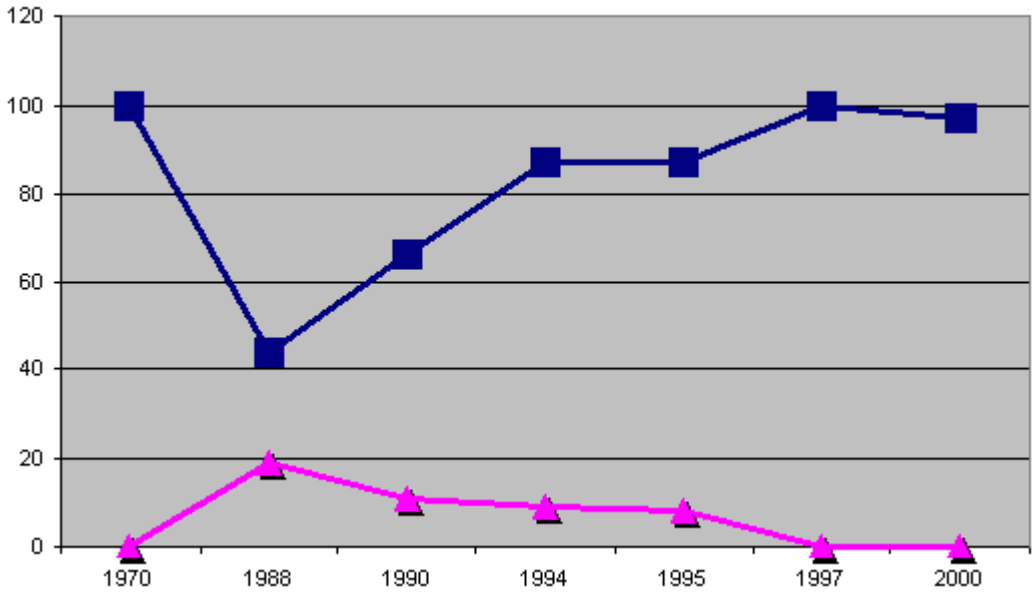


IK- and AVK- distribution within an outcrossing kennel



Tight or in-breeding does not necessarily lead to the end of the pole, especially if IK and AVK get back in balance through timely outcrossing. The threshold for IK stands at the mark of ten and the AVK threshold is believed to be at a figure of 75. Different from popular breeds with vast numbers, tight- and in-breeding within a minority population of “rare breeds” means, in any case, unrecoverable genetic losses and the risk of perennial illness causing changes.

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This desert-bred Azawakh male displays the typical characteristics of a broad front, strong fore- legs, lower line in ship-bow form, substantial head, strong lower jaws. These characteristics are very easily lost in the course of homozygous manipulation within the still limited genetic pool of the Azawakh population outside Africa.

Azawakh skull (Beli region, Burkina Faso): Strong teeth and well-developed lower jaw are part of the "survival equipment" in the native regions of the Azawakh.

A growing number of Azawakhs who have been reared exclusively on the inbred basis of the first imports tend to lose the above named characteristics of the original breed in the process of homozygous hyperstylisation with streamlined heads, weak jaws, swan-fashioned necks, narrow fronts, disfunctional shoulder and foreleg anatomy, exaggerated low and circular chests and a "French" gait similar to Italian Greyhounds – an appearance which might meet the European taste of extreme frailty and elegance, but hardly a resemblance of the original Nomad hound of the savannahs.

Fortunately, there is an increasing community of Azawakh addicts who care for the genetic preservation of the aboriginal breed outside its homelands with a sound genetic policy and the endevour to enlarge the breeding population by continuous imports with the broad hereditary treasure from the regions of origin. In the case of the

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Azawakhs, this is still a possibility for some time to come. Needless to say that the chances of preserving aboriginal breeds which are threatened in their historic homelands by means of a transfer to other countries or continents have an open end as to their future authenticity.

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