

Ships of the Andes

by ERIC HOFFMAN

One cold night in the Andean highlands, Felix Palacios and Nolberto Chambilla Mandamiento lay in their bedrolls looking at the stars. Around them knelt llamas, their legs folded snugly under woolly bodies. The animals' thick coats glistened with the frost that occurs 300 nights a year on the puna, the high plain. Felix, a graduate student in anthropology at the Catholic University of Peru in Lima, asked Nolberto, an Aymara-speaking llama herder, "If all the llamas and alpacas died, what would happen?"
"We would die," Nolberto replied.
"Why?"
"Because we raise llamas and llamas raise us."

SINCE 1975 Felix Palacios has worked to record the beliefs of highland herders like Nolberto. Nolberto lives close to Lake Titicaca, which straddles Peru and Bolivia. He represents traditional Andean pastoralism. His livelihood depends on the exchange of native animal products from the inhospitable 14,000-foot (4,200-meter) puna for agricultural goods grown at lower elevations. It is an ancient way of life, based on the only pre-European livestock domestication in the New World, and it echoes back to the rise and fall of once-great civilizations. There is a kinship bond between highland herders and their llamas and alpacas that is cemented by tradition, devotion, and harsh pragmatism.

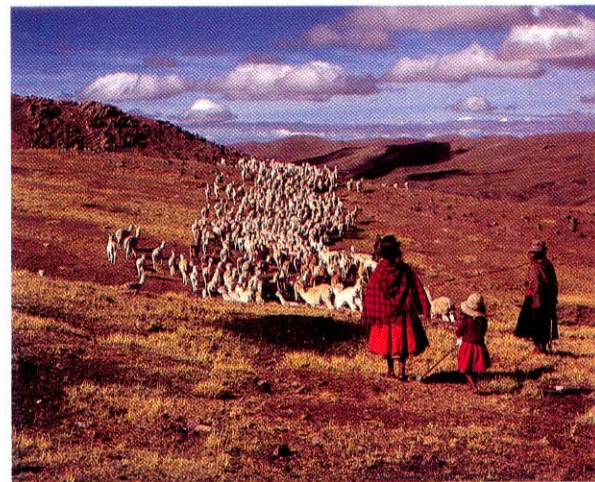
Like their Inca forefathers, today's highland pastoralists collect their llamas, load them with dried llama meat called *charqui* (a Quechua word from which we get our English jerky), sacks of dried potatoes (*chuño*), and raw alpaca wool. The pastoralists and their animals trudge for days to villages in the more temperate

lower elevations where they trade their goods for maize, wheat flour, squash, *quinoa* (grain similar to rice), chili peppers, beans, and sometimes fruit. With agriculture marginal at best on the harsh puna, these bartering trips are necessary.

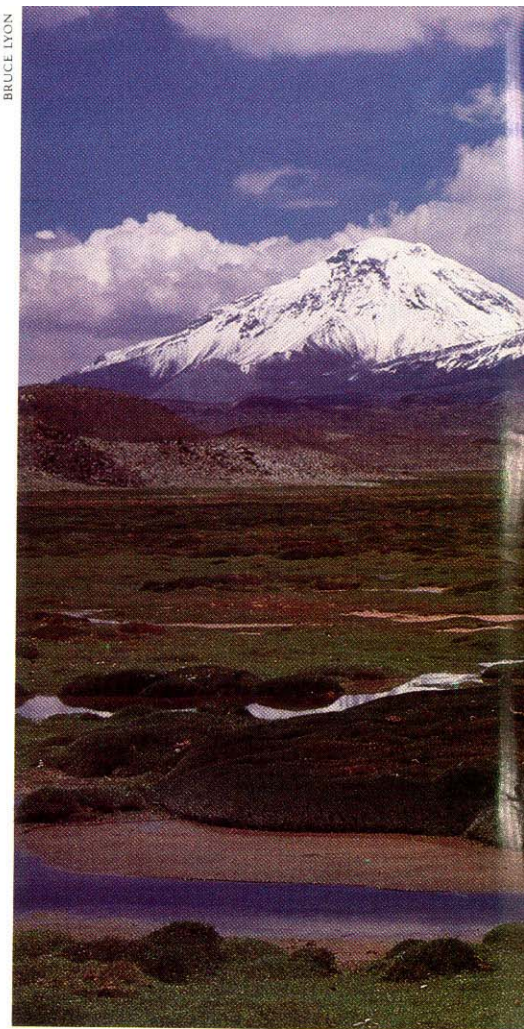
Movement of goods between highland herders, farmers of the temperate Andean valleys, and fishermen on the coast was crucial to the development of Andean cultures, which culminated in the Inca Empire (1438–1532). Spanish conquistador Francisco Pizarro and 170 men put an end to the Inca Empire 457 years ago. Despite constant pressures since the Conquest, Andean pastoralism has survived because both people and animals are well adapted to the harsh Andean environment. Though the animals figure prominently in Andean herders' culture and heritage, the pastoralists' way of life may not survive the pull of modernity.

Of all the animals found in the Americas prior to European colonization, llamas and their diminutive woolly cous-

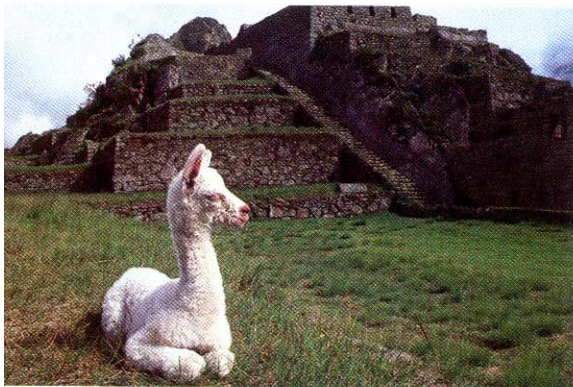
Opposite: Two women rest with their llamas in Cuzco, Peru. Below: Huaycho women let out alpacas to graze.



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Right: Alpacas graze on community pasture in Parinacota, Chile. Below: An alpaca fawn rests in front of ruins at Machu Picchu, Peru. Bottom: A pair of guanacos



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ins, alpacas, have had the most comprehensive influence. Like the buffalo in North America, llamas were a source of meat, fuel (in the form of dried manure), and hides for clothing. But unlike buffaloes, llamas could be domesticated. They were let out each morning to graze, and they returned to their rock corrals, known as *canchones*, each evening. These ancient corrals are spread throughout the *altiplano* (the high plateau around Lake Titicaca and northwestern Bolivia), where they have been used by llama caravans for centuries.

Llamas are beasts of burden; alpacas are shorn for their high-quality fiber. Both animals are butchered. This level of domestication guarantees a steady source of meat, high-quality textile fiber, and a means to move large amounts of goods through rugged mountain areas.

Llamas and alpacas are members of the camel family, Camelidae, of which there are six living species. The ancestors of today's camelids evolved in North America between 9 and 11 million years ago. These creatures eventually died out in North America, but not before spreading to Asia and South America. They reached Asia via the land bridge that connected Alaska to Siberia. Today's Asian and African species are the bactrian (two-hump) and dromedary (one-hump) camels.

When the Spaniards arrived in South America, they recorded four kinds of camelids. The wild forms are the guanaco (*Lama guanicoe*) and vicuña (*Vicuna vicugna*) or *Lama vicugna*). The domestic forms are the alpaca (*Vicugna pacos* or *Lama pacos*) and llama (*Lama glama*). Despite their ability to interbreed and produce fertile offspring, each has been classified as a separate species. A debate on the separate genus classification of vicuñas and alpacas has hinged on the fact that vicuñas, and to some extent alpacas, have different dentition from llamas and guanacos. Depending on an author's sentiments, scientific

papers list vicuñas and alpacas in either the *Vicugna* or *Lama* genus. Paleontologists speculate that the common ancestor for all four species predates today's wild forms by at least 20,000 years.

The four South American humpless camelids have much in common. They are ruminants, that is, cud chewers like cows. They are typified by long necks, slender legs, padded cloven hooves, large round eyes, and wool-covered bodies. All are extraordinarily alert creatures and can survive in places where it freezes most nights and forage is not plentiful.

Paleontologists believe the llama was bred from the guanaco. The dentition and skeleton of both animals are almost identical. Individuals in both species usually weigh between 200 to 350 pounds (90 to 160 kilograms). Easily trained, llamas make excellent beasts of burden. There are no wild llamas. Subspecies of guanacos, which are wild, once roamed the Andes, but today they are found chiefly in the southern Andes, Patagonia, and in the



Below: Vicuñas on the Chilean altiplano look strikingly like the llamas depicted in a Peruvian rock painting that was made about 500 A.D.

continent's southernmost archipelago, Tierra del Fuego. In contrast to the llamas, whose coloration varies, guanacos are always distinguished by a brown coat, a black or grey head, and evenly marked white underside. Both guanacos' and llamas' woolly coats are usually riddled with coarse guard hair, which diminishes its commercial value. Llama fiber is commonly used to make ropes and textile products, such as potato sacks.

Alpaca dentition suggests that the animal is descended from the vicuña. Vicuñas and many alpacas have no enamel on the tongue side of their incisors. These teeth are unique among large ungulates in that they grow continually. The animals regenerate their incisors after they are worn down from grazing stubbly grasses. Vicuñas and alpacas are smaller than llamas and guanacos. As the smallest of the four species, vicuñas weigh around 90 pounds (40 kilograms). They are the most delicate-looking members of the camel family and have large eyes. Usually found

between 13,000 and 16,000 feet (4,000 and 5,000 meters), they live in stark, uncompromising environments far above the tree line.

Like the guanaco, the vicuña has uniform markings. The coat is cinnamon with a white underbelly and a light-colored head. The *mensalis* subspecies has a distinct white bib of hair hanging from its chest. Except for the bib, the vicuña's fiber is usually free of guard hairs and is exceptionally fine. For this reason, many connoisseurs consider it the most luxurious fiber in the world. A vicuña fiber is 10 to 15 microns thick (a micron is one thousandth of a millimeter) compared with 22 to 32 for alpacas and 25 to 70 in llamas. Human hair, by comparison, often exceeds 100 microns.

Because of their valuable fleeces, vicuñas were in danger of extinction from heavy poaching for most of this century. In the 1960s, the Peruvian government successfully moved to protect them, and



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Known for its softness and lightness, alpaca wool is second only to vicuña, which isn't readily obtainable because the skittish creatures don't take to domestication. Below: The fleece of an alpaca that has never been shorn and two freshly shorn alpacas

today there are approximately 100,000 vicuñas, most of them in the Peruvian highlands.

Alpacas (100 to 175 pounds, or 45 to 80 kilograms) are usually larger than vicuñas, about half the size of a guanaco or llama. Alpacas come in many colors and their wool is longer than vicuñas'. At Inca Tops, a large Peruvian wool-processing mill near Arequipa, fleeces are separated into twenty-one colors in hues of black, brown, silver, caramel, red, coffee, white, and fawn. Alpaca fleeces are categorized as *huacaya* (presence of crimp, a wavy quality that enhances its use in spinning and weaving) or *suri* (lustrous, straight fiber with no crimp). About 90 percent of alpacas have *huacaya* fleeces. Known for its softness and lightness, alpaca fiber is second only to vicuña, which isn't readily obtainable since the skittish creatures do not take to domestication.

Alpaca fiber processing and production is a multi-million dollar industry in Peru,

where 76 percent of the alpacas live. There are an estimated 3.5 million alpacas, 80 percent of them owned by traditional Quechua- or Arayama-speaking pastoralists in the highlands of southern Peru and Bolivia.

ARCHAEOLOGISTS have been able to date when camelids were first domesticated from camelid remains at sites once occupied by prehistoric man. Their estimates, still controversial, are based on subtle differences between alpaca and vicuña teeth as well as corroborative evidence.

Archaeologist Jane Wheeler of the University of Colorado at Boulder was the first to describe differences between alpaca and vicuña teeth. In 1984 at a dig in Telarmachay, in central Peru, Wheeler found a great number of camelid skeletal remains with dentition consistent with modern-day alpaca teeth. She interpreted this to be a result of controlled breeding practices, since only vicuña dentition was found prior to the discovery of the first alpaca remains. She also found a large number of skeletal remains of *cria*, or baby, alpacas, as well as remains of baby guanacos or llamas. Wheeler reasoned that the number of *cria* skeletons had to be a result of domestication rather than hunting practices. From her work at Telarmachay, she concluded that camelid domestication was underway between 4000 and 5000 B.C. The dig also yielded, from an older layer in the earth, deer and vicuña bones, suggesting that these animals were important elements in the local diet prior to consumption of domestic camelids.

In the 6,000 years since domestication of alpacas and llamas, a series of "high" cultures rooted in Andean pastoralism flourished and perished. Most of these cultures are known through archaeological site names. The earliest was centered around an ancient ruin called Chavin de



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This woman spins fine alpaca fiber in the community of Tuqsa, in the southern highlands of Peru.

Huántar in central Peru. The Chavin culture, which peaked in 300 B.C., left its mark throughout the Andes and coastal Peru in the form of immense stone figures depicting anthropomorphized eagles, hawks, jaguars, monkeys, and caymans.

Llamas were conspicuously absent from Chavin art, but very much part of their culture, according to George Miller, an anthropologist at California State University, Hayward. Miller specializes in the early pastoral cultures of the high Andes. "We know the Chavins ate a lot of llama meat," says Miller, "but apparently they took their spiritual inspiration from animals more exotic than the llama. The llama was probably the Chavin equivalent to a Jersey cow or Toyota pickup."

Indeed, the appearance of tropical creatures in highland art clearly indicates that the highland culture had contacts with tropical Amazonia. In 1985 at an archaeological dig near the coastal town of Arica in northern Chile, a piranha jaw was found, evidence that trade routes actually connected the Amazon to the coast 5,000 years ago.

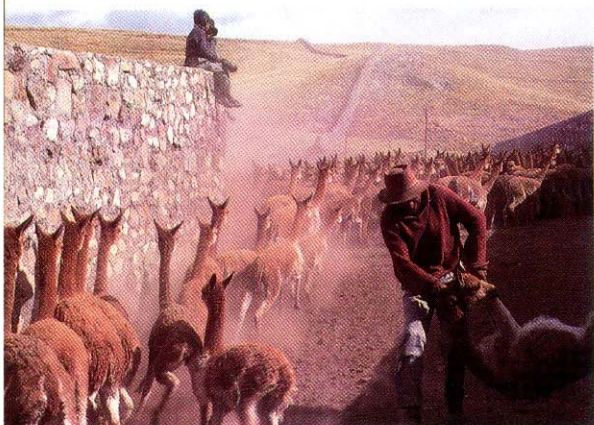
The Chavin culture was followed by the Moche and Nazca, and later Huari cultures, each dependent on Andean pastoralism and leaving behind characteristic textile products. The Pucara culture, which flourished near Lake Titicaca about 2,500 years ago, is thought to have bred the alpaca intensely for high-quality wool production, which was maintained by ensuing cultures. The Pucara textiles that have survived are among the most attractive hand-woven wool items ever produced in the region. Although there was no written language in these Andean cultures and no record of the size of herds or the volume of trade, anthropologists speculate that the trade surpassed all other prehistoric cultures in the Americas.

When conquistador Francisco Pizarro kidnapped the Inca leader Atahualpa for



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Vicuña drives called *chacos* were conducted by the Incas, with thousands of participants encircling wild vicuñas and driving them into massive stone corrals, where they were shorn and released. Bottom: A modern version of such a drive in the southern Andes in 1974. Top: A vicuña being carried for shearing at the round-up



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ransom, 26,000 pounds (12,000 kilograms) of silver and 13,000 pounds (6,000 kilograms) of gold arrived on llama back in a period of a few months. On a single day in 1532, Spanish chroniclers recorded the arrival of 225 llamas loaded with gold. This sorry episode, which resulted in the garroting of Atahualpa after payment of the ransom, provides one of the few recorded glimpses into early historic use of llamas as pack animals.

Archaeological digs have produced similar examples of pottery, metallurgy, masonry, and religious shrines hundreds of miles from one another, demonstrating that ideas as well as goods were constantly moving throughout the areas served by llama caravans in time periods long before the Incas.

IN THE 1400s the Inca Empire, also known as Tahuantinsuyu, meaning “four quarters of the world,” began what would be the final pre-Hispanic Andean unification. The Incas eventually con-

trolled what is now Peru, Bolivia, southern Ecuador, southern Colombia, northern and central Chile, and northwestern Argentina. This area took in 3,200 miles (5,000 kilometers) along the Andes, stretching from the Pacific to the Amazon rain forest, encompassing 20,000-foot (6,000-meter) peaks and the vast, harsh *puna*.

The Incas held camelids in the highest regard and carefully regulated both use of wild camelids and husbandry of domestic ones. Vicuña drives called *chacos* were conducted, with thousands of participants encircling wild vicuñas and driving them into massive stone corrals, where they were shorn and released. The luxurious fiber collected was reserved exclusively for the ruling class.

Llamas and alpacas were central to Inca religious and ritualistic practices. In Cuzco, the Inca capital, a llama or alpaca was sacrificed every morning, afternoon, and evening to honor certain gods and to mark annual events such as harvest time and birthing season of the herds.

Even though the Incas’ domestic husbandry practices were never recorded in detail by the Spanish, available evidence points to a commitment to improve and keep separate the fiber qualities of the alpaca and the carrying capacity of the llama. The scarcity of skeletons of llama-alpaca hybrid animals from the Inca period suggests that llamas and alpacas were kept from interbreeding. Hybrid crosses are known today as *huarizos* or *waris*. The reason for avoiding *waris* is that an intermediate-sized animal without the carrying capacity of a llama or the fleece quality of an alpaca is not very useful. To this day traditional pastoralists usually butcher *waris* or castrate the larger males and keep them for packing.

The first Spaniards to enter the Inca Empire wrote of a large pack llama used

Quechua girl with cria, or baby, llama
in Cuzco, Peru

by the royal armies. Spanish chronicler Jose de Acosta described llamas capable of carrying four to eight *arrobas* (an *aroba* was equivalent to 25 pounds.) If Acosta was accurate, the llamas of the 1500s of this region were stronger than today's llamas, which are usually hard-pressed to carry more than 100 pounds (45 kilograms) on a long journey.

The Spanish incursion severely disrupted native pastoralism, and with it, thousands of years of selective breeding. Chronicler Cieza de Leon wrote:

When the natives hid their flocks, the Spaniards tortured them with cords until they gave [the animals] up. They carried off great droves [of domestic camelids] and took them for sale at Lima for next to nothing. The soldiers and citizens took all the Indians' cloth and were selling it in the square at such low prices that a [llama or alpaca] was sold at half weight. They were killing all the [llamas and alpacas] of the land they wanted for no greater need than to make tallow candles. The Indians are left with nothing to plant, and since they have no cattle and can never obtain any, they cannot fail to die from hunger.

It's estimated that as many as two-thirds of the domestic camelids were killed off by the sword or by mange introduced from Spanish sheep and cattle. "The Inca people weren't the only victims of the Conquest," says Miller. "The Spanish brought a kind of zoological imperialism, which altered forever the complexion of wild and domestic camelid populations throughout the Andes. Spanish horses, mules, sheep, swine, and dogs were spread across the Andean landscape carrying foreign diseases and competing with the camelids for prime grazing areas. The only survivors were those in marginal habitats where their evolutionary advantage allowed them to survive where European stock could not."





Above: Wild guanacos roam the puna in Chile. Below: Naturally aborted llama fetuses are sold by street vendors on Witchcraft Street in La Paz, Bolivia. Thought to wield protective spiritual powers, the fetuses are often planted under the cornerstones of newly constructed buildings. Next to the fetuses is a basket full of sweets.



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IN THE EARLY 1970s, while Miller was doing field work on the *puna* between Lake Titicaca and Cuzco, he discovered intact many Inca beliefs and rituals involving camelids. Sensitivity and devotion similar to a kinship bond are strong among traditional herders. Miller relates the legend of Ausangate:

Ausangate is a magnificent snow-covered peak south of Cuzco and the legendary source of llamas and alpacas. According to legend, Pachamama [Mother Earth] loaned alpacas and llamas so the people of the puna could survive. Since the animals belong to Pachamama, they must be well fed and never treated cruelly. If they aren't properly cared for, Pachamama will call them back to Ausangate and people will disappear.

BEHAVIORAL TRAITS

Pastoralists believe that the ritualistic Inca method of slaughtering animals is the only correct way. In the method called *ch'illa*, two people hold the animal while an incision is made at the base of the rib cage. The person making the incision reaches into the chest cavity, pokes a sharpened fingernail through the diaphragm and pulls the aorta away from the animal's heart, killing it instantly. Quechua-speaking herders told Miller that this method is less painful than the European method of slitting the throat. As almost all bleeding occurs inside the animal's chest cavity, Pachamama is not stained with the animal's blood. The dying animal is covered with a blanket or shawl, so its spirit doesn't frighten the other animals. "When I asked why a particular animal was chosen, the herder often responded by pointing to a severe overbite or some other undesirable trait. Culling is part of the process," says Miller.

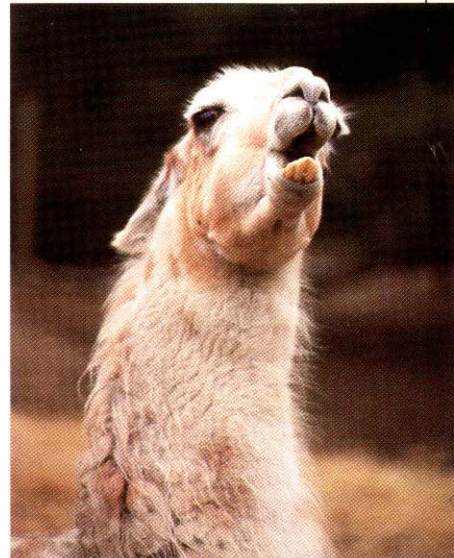
For Miller, Palacio, and other anthropologists recording the customs of highland herders, there's a feeling that the twentieth century is finally closing in on the traditional pastoralists' last strongholds in remote areas of the *puna*. "What the Spanish colonizers couldn't eradicate, the truck is making obsolete. Motorized transport and a rapidly expanding network of dirt roads are replacing llama caravan routes. The new ship of the Andes is the transport truck that villagers load their goods onto once or twice a year," says Miller. "Many herders have sold their llamas to slaughterhouses, and the last llama caravan may not be far off. When that day comes, one of the great stories of animal domestication will end." Nevertheless, Miller hasn't entirely written off the future of native pastoralism: "Although the llama's day may be ending, the alpaca, with its high-quality wool, will remain economically viable." □

Two llamas competing over prime eating territory may exchange warning grumbles.

If this doesn't settle the matter, they may assume threat postures, like the female llama in the photo at right, lifting their heads and tilting their noses skyward while pinning their ears back. Still unresolved, the conflict may explode into a contest of spitting and chest ramming.

South American camelids are a study in efficiency. They can get adequate nutrition from bunch grass with a protein content as low as 5 percent, much below the needs of most livestock (horses require grass with at least 12 to 14 percent protein). They digest and use food more efficiently than do most other ruminants. To thrive in the thin air three miles above sea level, camelids' red blood cell count is twice as high as that of most other animals; the elliptically shaped cells allow greater oxygen retention. The animals' padded, cloven hooves provide greater dexterity and gripping ability on treacherous rocky or ice-covered surfaces. Members of the camel family are natural pacers (the legs on the same side move in unison), which for moving across open spaces is the most efficient gait for a four-legged animal. By comparison, horses trot or gallop and must be trained to pace.

Among large ruminants, camelids' mating behavior and reproductive



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biology is unique. The females are "induced ovulators," which means they do not have a regular menstrual cycle. Females usually ovulate twenty-four to thirty-six hours after copulation. The male is a "dribbler," not an ejaculator like man and most other mammals. Coitus usually takes twenty to forty minutes with the male puffing his cheeks out and gurgling loudly. The very distinctive sound is called "orgling" by North American llama and alpaca breeders and *cutuneo* in Peru. Roughly eleven and a half months after mating, a single *cria* is born during the day.

Camelid herds are usually tranquil but ever alert. The animals move silently on padded feet and tend to communicate with body language rather than sounds. The sound most often heard is a soft humming, a mild expression befitting a gentle animal. Humming signifies insecurity during separation, slight discomfort, fear, or recognition.

—E. H.