

Bird Migration Across the Himalayas

Wetland Functioning Amidst Mountains
and Glaciers

**Edited by Herbert H.T. Prins
and Tsewang Namgail**

With a foreword by H.H. The Dalai Lama



21 Evidence of Human Presence in the Himalayan Mountains: New Insights from Petroglyphs

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Ancient Peoples in the Himalayas

Birds have a subtle yet remarkable and ubiquitous presence in the Himalayan scenery. Just as high peaks, glaciers and barren valleys have never been a barrier to their migration, these geographical features never stopped people from moving across the Himalayas. The concept of mountains as an impassable obstacle is nothing more than imagery. Extensive archaeological surveys have been conducted in Ladakh and Himachal Pradesh (India), Mustang (Nepal) and western Tibet (Tibetan Autonomous Region, China) between 1995 and the present. These surveys have brought to light the antiquity of human occupation in the Himalayas, which, far from being an isolated and disconnected part of the settlement of secluded parts of Inner Asia, is, on the contrary, a crossroads.

Evidence of prehistoric human presence in the western Himalayas has been found in the form of lithic tools. For the protohistoric and early historic periods, the bulk of the remains consist of rock art. Although painted images, sometimes sheltered, were found, until now, petroglyphs along riverbanks and on plateaus are the salient feature of western Himalayan rock art. Tens of thousands of engraved images have been documented in Ladakh, Mustang, western Tibet and more recently in Spiti (Himachal Pradesh).

As with any archaeological material, when it comes to interpretation, rock art has its advantages as well as disadvantages. Apart from its sheer quantity, rock art is also characterized by its diversity. The subjects and themes represented are extremely varied, making the possibilities of analysis almost endless. Furthermore, the immobility of petroglyphs makes them the most reliable material for identifying and understanding the movement of ancient people. However, to date, no sound chronometric technique is available for dating petroglyphs. On the issue of chronology, experts depend on the combination of various parameters such as the degree of patina covering the images. Patina has been defined as 'visually obvious skin on rock surfaces which differs in colour or chemical composition from the unaltered rock and whose development is a function of time' (IFRAO, undated). Also important in chronology is knowledge of the techniques and tools used to produce the petroglyphs, as well as their thematic, stylistic and comparative analysis. Ideally, engraved images should be brought into perspective with representations found on other types of material (ceramics, textiles, metal objects, etc.)

through which cultural and chronological contexts can be asserted. However, archaeologists face another difficulty in the Himalayan region, that is, the lack of excavated materials from the area itself, and for this they have to look to sites further afield.

Within the Himalayas, rock art was first reported from Ladakh at the end of the nineteenth century, and this was when it was most thoroughly studied. In this chapter we, therefore, focus on the petroglyphs of this western Himalayan region. More specifically we concentrate on the fauna of Ladakh through zoomorphic images engraved on rock surfaces. We provide further insights into the bird images, their spatial distribution and identification, and conclude with comments on their possible historical and cultural significance.

Animals in the Rock Art of Ladakh

Petroglyphs in Ladakh were first reported by Western explorers as early as the 1880s. In the first decade of the twentieth century, Moravian missionary and scholar A.H. Francke published several articles based on his discoveries along the Indus. Renowned geologists and Tibetologists H. De Terra and G. Tucci made further mention of petroglyphs in the 1930s. Ladakh attracted rock art researchers again only in the late 1980s and early 1990s from the region itself (T. Ldawa Tsangspa), India (R. Vohra, B.R. Mani) and abroad (P. Denwood, G. Orofino, H.-P. Francfort). During this period, specialized papers on Tibetan rock inscriptions and protohistoric zoomorphic images were published along with general presentations of rock art (for a detailed historiography of the rock art of Ladakh as well as all references, see Bruneau & Bellezza, 2013).

A systematic documentation of Ladakh's rock art was initiated in 1996 by M. Vernier in Central Ladakh and Zaskar. He recorded about 10,000 petroglyphs across the region (Vernier, 2007). Since 2006, we (the authors) have been working in collaboration and we have further investigated Lower and Upper Ladakh as well as the Nubra area. To date, we have identified 158 rock art sites (91 sites have been systematically documented and 67 surveyed only) totalling almost 20,000 petroglyphs. Most rock art sites are located on the banks of the Indus and its tributaries (Nubra, Shayok, Zaskar, Doda and Tsarab Rivers). The size of these sites varies from a single isolated rock to a cluster of up to about 1000 engraved boulders (for the location of rock art sites, their access to water and possible use as resting places, see Bruneau & Bellezza, 2013).

In total, we identified 74 motifs in the rock art of Ladakh, which were either figurative or nonfigurative. The content is mainly zoomorphic: out of 13,597 images systematically recorded 7270 (53%) were classified as animals. The various species depicted were mainly identified through their body shape, horns and tails. They were, in decreasing order of occurrence, Ibex, wild sheep, Yak, canids, indeterminate caprids, felids, equids, birds, deer, Markhor, Argali, camel and antelope. For about a quarter of zoomorphic images, the species was indeterminate.

The Ibex *Capra ibex sibirica*, usually recognizable by its long upward and backward-curving horns, accounted for almost half of the zoomorphic images

(47%). It is one of the most common wild ungulates found north of the Himalayan ranges (Himachal Pradesh, Kashmir) and in Central Asia (in the Pamirs, Tien Shan and Altai Ranges) (Schaller, 1998). In Ladakh, the Ibex currently extends east to the environs of Leh and north to the Nubra Valley (Namgail *et al.*, 2013). In engravings, it is represented all over the region and is found at 83 out of 91 sites. Although solitary images occur, we most commonly find several Ibexes engraved on the same boulder. Sometimes the intention of representing a herd, typically from 5 to 10 individuals, is unquestionable.

Apart from the Ibex, wild sheep were also commonly found in the rock art of Ladakh (8.4%). By this term we refer to images of Blue Sheep (Bharal, *Pseudois nayaur*) and Urial *Ovis vignei*: both species have massive, short horns sweeping up and out, but their representation in the petroglyphs is not distinctive enough to discern between them. Such images are found all over Ladakh. Nowadays, the Bharal occurs throughout the region, except the westernmost part, whereas the Urial has a linear distribution along the Indus and the Shayok river valleys (Namgail *et al.*, 2010). There are solitary carvings of wild sheep, but they most often appear in herds.

The Yak *Bos grunniens*, easily identifiable by long, curved horns, conspicuous hump and short tail terminating in a large bushy tuft, was third in abundance in the rock art of Ladakh (7%). Yaks are, more often than not, represented in isolation. When they are part of compositions, they occur along with other individuals of their species or with Ibexes. Representations are those of wild Yaks, now occurring only in the Chang Chenmo Valley of eastern Ladakh. We do not know of any irrefutable representation of domestic Yaks (loaded or on a lead for example).

Canines (accounting for 4.5% of zoomorphic images), recognizable by fairly short legs, short, upright, pointed ears and long tails, are difficult to identify with accuracy. Straight tails might be indicative of Red Foxes *Vulpes vulpes* or Grey Wolves *Canis lupus*, as both species inhabit Ladakh, whereas curved tails might point to dogs. Some compositions display packs of canines attacking herbivores.

Other carnivores, and in particular the Snow Leopard *Panthera uncia* (1.8%), easily identified by a long thin tail, curled at the tip, and a spotted body, were also depicted in the rock art of Ladakh. Such images were only documented in the Indus Valley, where the snow leopard is still found. These were most often represented in packs; only in two instances was the snow leopard shown attacking an Ibex or a deer.

The last group of animals of importance in the rock art of Ladakh belonged to the Equidae family (4.8% of zoomorphic images). Seventy-five per cent of these images included a rider, thus identifying the animals as horses. However, anatomical details are not sufficient to identify the type(s) of mounts. Unmounted animals with a long neck, long legs and tail may be either horses or the Tibetan Wild Ass 'Kiang' *Equus kiang*. The Tibetan Wild Ass inhabits the entire Changthang (Tibetan Plateau) and was still common in eastern Ladakh at the beginning of the twentieth century (Schaller, 1998; Bhatnagar *et al.*, 2006). Images of the *kiang* are recognizable by their large head and robust body, but most of all by their short and bristly upright mane.

Other animals (birds, deer, Markhor *Capra falconeri*, Argali *Ovis ammon*, camel and antelope) accounted for about 1% (each) of zoomorphic engravings. Images of

Musk Deer *Moschus chrysogaster* and Tibetan Antelope *Pantholops hodgsonii* were of particular interest: both species currently inhabit areas of the Changthang, and their images suggest a wider distribution in the past, as do those of Markhor documented in the west of Ladakh. This wild goat is now found further west in the Gilgit-Baltistan province of Pakistan and in the Indian Himalayas.

Finally, of great significance are representations of double-humped Bactrian Camels *Camelus bactrianus*, sometimes mounted or on a lead. Most were documented in the Nubra Valley, where feral and domestic camels are still found, or in adjacent areas where they were used in the trans-Karakoram trade route until the middle of the twentieth century.

From this description of zoomorphic images, we note that the species depicted reflect a local fauna dominated by ibexes and wild sheep. These ungulates are still widespread in the region, whereas other species such as the wild Yak and antelope are now found only in eastern Ladakh. Their representation in rock art might reflect a narrowing of their habitat induced by a change of climate and by anthropogenic pressure. At the Neolithic site of Kiari (circa 900 BCE) in eastern Ladakh, bones of Himalayan Goral *Nemorhedus goral* were found, suggesting a modification in game and vegetation conditions, since this bovid lives in wooded environments (Ota, 1993). All the wild ungulates, except for camels, were represented in a cynegetic (i.e. hunting) context in the rock art of Ladakh. However, hunted animals accounted for a small percentage of zoomorphic representations. For example the Yak was being hunted in only a quarter of all images. In hunting scenes, the prey was often being chased or savaged by one or several dogs. Along with horses and camels, dogs were the only domestic species definitely represented in the rock art of Ladakh: all other species appear to be wild.

Because of the animals depicted, we suggest that the rock art of Ladakh was largely created by indigenous people familiar with the local fauna. Nevertheless, petroglyphs are not merely an inclusive natural history inventory: large animals such as the bear, and small mammals such as the marmot, hare and pika, which are common in nature, did not occur in rock art. The species represented in the rock art of Ladakh are influenced not only by the natural environment, but also by the cultural background of the engravers, the best example being that of the Ibex. The Ibex is still present in oral traditions and rituals of the Ladakhis as well as several peoples in the Pamirs, Hindu Kush, Iranian plateau and Caucasus, but is absent from other areas of Tibetan culture, thus underscoring the existence of ancient beliefs (Dollfus, 1988).

Bird Representations in the Rock Art of Ladakh

Among the zoomorphic petroglyphs of Ladakh, 130 images have been identified as representing birds. They were found at 22 rock art sites across Ladakh: all are indicated and labelled on the map (Figure 21.1).

Figure 21.1 shows that there were very few images in Zaskar (only six, and all located at one site: Zamthang, near Char village) or Nubra (13 images in total at four sites: Tsati, Murgi, Chomolung and Yulkam). A few bird images were located along the Indus (in central and lower Ladakh, from the site of Trishul in the east, to Tilichang in the

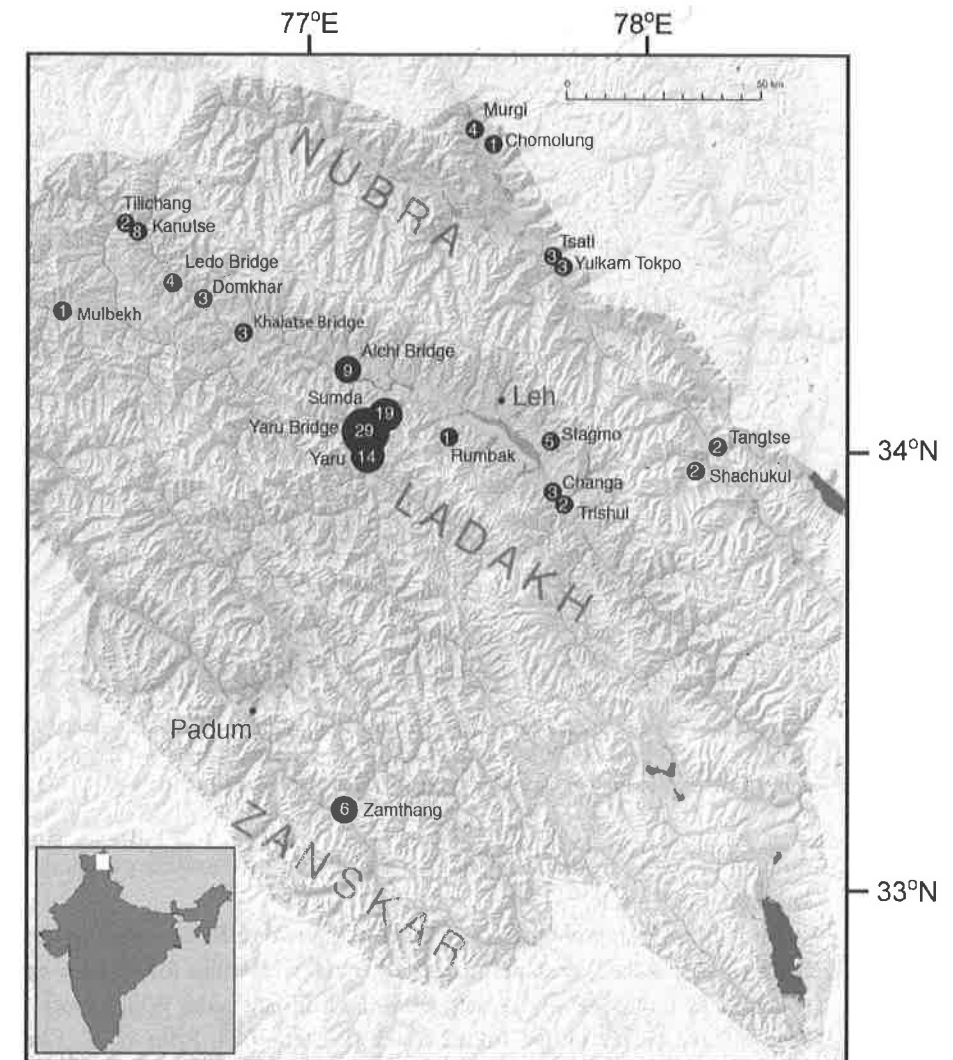


Figure 21.1. Location of rock art sites in Ladakh (India) with bird images and number of images at each site (Credit: M. Vernier /A. Pointet; reworked by H. van Oeveren). The white block in the top of the inset gives the location of the map.

west), but the main concentration of bird images was found in the Zaskar Gorge, on both banks of the river (Figure 21.2), about 25 km upstream of its confluence with the Indus. There, the three sites of Yaru, Yaru Bridge and Sumda accounted for half of all bird images recorded in the whole of Ladakh (62 images). It seems possible that this concentration could be partly explained by the Zaskar Gorge being an avian migration corridor. Except for a small number of images (one at Rumbak, two at Shachukul, one at Zamthang and one at Tangtse) displaying a white patina and a crude engraving technique, all bird images were characterized by a brown patina



Figure 21.2. View of the Zaskar Gorge upstream of the Zaskar River confluence with the Indus in Ladakh, India (Photo credit: M. Vernier). (A black-and-white version of this figure will appear in some formats. For the colour version, please refer to the plate section.)

ranging in colour from dark brown to medium brown, and they demonstrate a skilful engraving technique.

Birds in rock art were mainly represented in two different ways: flying (with one or both wings stretched) or standing on the ground (with wings folded back on their bodies) (Figure 21.3), respectively as seen from the front and side. Whilst more than 310 bird species have been reported from Ladakh (Pfister, 2004; Prins *et al.*, Chapter 20), the criteria of identification of the images are usually not very precise. Bird images tend to be schematic, and the presence of a beak only enables us to qualify the representation as that of a bird. In some cases the shape of the belly, wings and neck, the length and shape of the legs, as well as the presence of distinctive head or tail feathers, allows identification of the type of bird represented. As we will see, orders of birds can be identified through the images but not species (except in one case).

Many bird images are indeterminate: they show the bird as seen from the ground with outstretched and pointed wings depicted horizontally, downwards or upwards. The tail is generally quadrangular or V-shaped. A good example of this was documented at the site of Murgi (Figure 21.3: line A, number 7). A beak as seen in profile is sometimes, but not always, indicated. When it is depicted as hooked, we can identify the image as that of a raptor. In some instances, long tail feathers are clearly engraved, as on the images from Sumda (Figure 21.3: B16, C33–34). It is not possible to conclude whether buzzards,

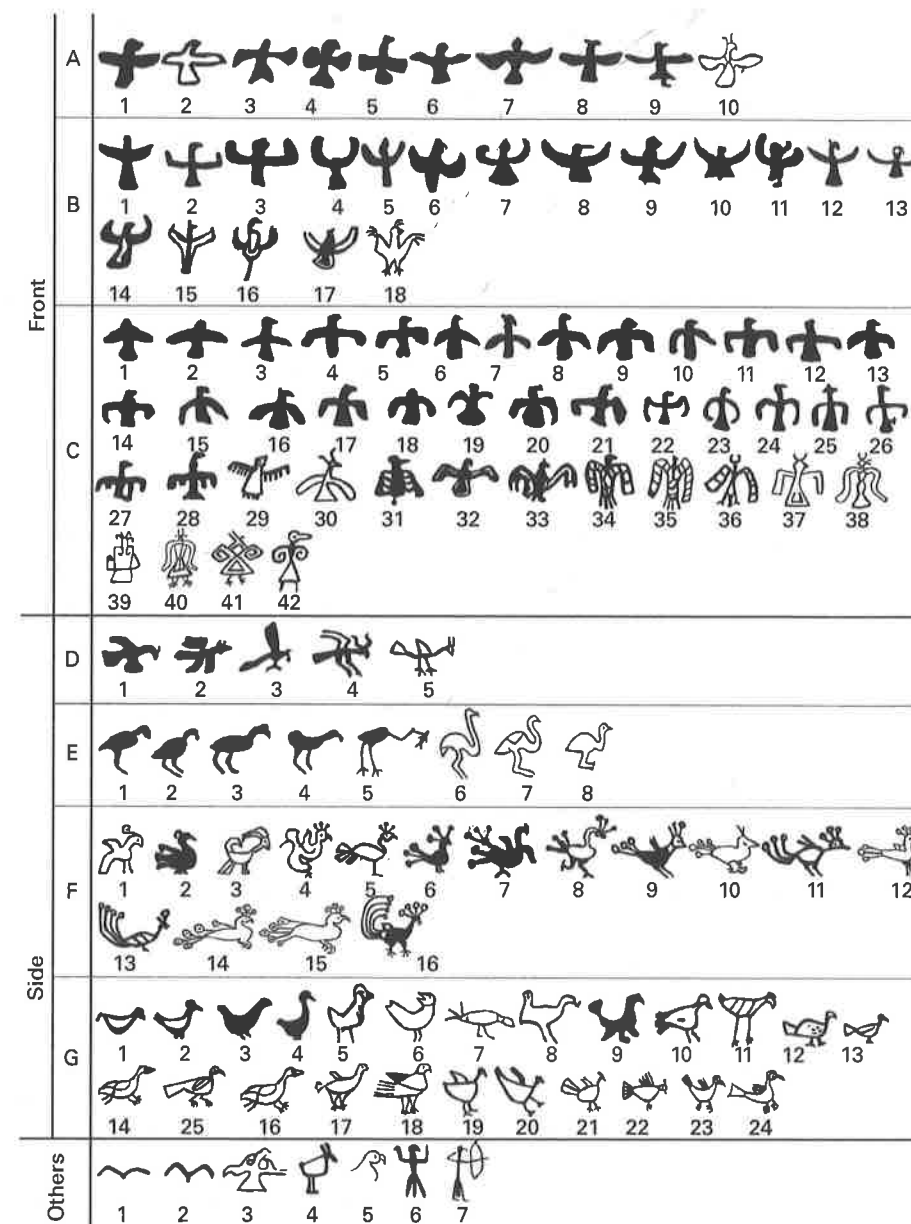


Figure 21.3. Engraved bird images from Ladakh, sorted by shapes and type. All images have been standardized (orientation and size) and redrawn according to photographic documentation for classification (Drawings: M. Vernier).

lammergeiers, kites, eagles or falcons, for example, are specifically represented. The bodies of raptors were usually fully engraved, whereas those of Galliformes or Anseriformes were, more often than not, outlined only (Figure 21.3: lines F and G). The rounded belly, rounded head and short legs enable us to hypothesize the representation

of snowcocks, partridges, quails, geese or ducks, but without being able to be more specific. These birds were engraved as seen from the side and as if standing on the ground. Toes (usually three) were sometimes indicated and a wing was sometimes represented folded over their ovoid body shape or stretched above it (Figure 21.3: G14–23). The tail, pointing either downwards or upwards, was sometimes indicated by a triangle or signified by feathers. An eye, in shape of a circle or dot, was often engraved. The curved beak on some images may point to galliformes. Some engraved birds are distinguishable from these generic images by the depiction of a crest and long tail and may represent the Common Hoopoe *Upupa epops* that is widespread in Ladakh and is recognizable by its fanned erect crest (Pfister, 2004) (Figure 21.3: F4, F6, F8). However, some crested bird images display a long curved neck and long feathers, both from the crest and tail, ending in circles (Figure 21.3: F9–16). These recall the train and eyed feathers of peacocks. This species is indigenous to the Indian subcontinent and is found in moist and dry deciduous forests mainly below an altitude of 1800 m and in rare cases at about 2000 m. It is feasible that the climate of Ladakh was moister in the past (as suggested earlier by the bones of Himalayan goral excavated at the site of Kiari), but because of the high altitude it seems very unlikely that the peacock ever inhabited Ladakh.

Other images of relatively long-necked birds, but without crests, might refer to species found in the region: recognizable through their long legs, they are probably migratory birds of the Rallidae, Gruidae or Ardeidae (Figure 21.3: E5–8). This identification is proposed not only based on the way these birds were represented, but also on their context.

At the site of Yaru, four heron-like birds were represented in a group, arranged in a circle, a depiction of a water body, such as a pond or lake (Figure 21.4). This is confirmed by the image of a fish in its centre. This composition is surrounded by several other images of birds, represented as flying, as well as images of *khyungs*, the mythical horned eagle indigenous to the Tibetan cultural area, discussed separately later in this chapter. A unique petroglyph from Murgi (Nubra) shows a long-necked bird, most probably a crane, holding a fish in its beak. (Figure 21.3: E5). At Yulkam (Nubra), there are three heron-like birds associated with 22 other animal motifs, among which a lizard, a human hand, a mascoïd (a design representing a stylized human face or a mask), a bowman, Blue Sheep and Ibexes. *In situ* observation of the patina and engraving technique indicated that all images were contemporary with each other. The main image, by its relative large size (69 cm wide and 63 cm high) and central position, is that of an Ibex with bent legs, hindquarters and body ornamented by a volute and S motif, respectively. This type of zoomorphic representation, discussed at length in another paper, is typical of the 'animal style' or 'art of the steppes' (Bruneau & Vernier, 2010). Beyond its possible Iron Age (first millennium BCE) dating, what is of interest is the association of zoomorphic images in this specific style with birds (for a discussion of bird images in the 'animal style', see Kubarev & Zabelin, 2006). The same association (i.e. bird and Ibex) is found at the well-known and significant sites of Domkhar (lower Ladakh) and Zamthang (Zaskar) where birds display a fanned erect crest. The pair from the latter site was discussed at length by H.-P. Francfort, who proposed a dating, based on comparative analysis with petroglyphs from northern Pakistan and Chinese bronzes,



Figure 21.4. Rock engraved with four heron-like birds arranged around a circle, a possible pond or lake (left corner). This group is surrounded by several other images of flying birds and *khyungs*, Yaru rock art site (Ladakh) (Photo credit: L. Bruneau, Image enhanced using Adobe Photoshop©). (A black-and-white version of this figure will appear in some formats. For the colour version, please refer to the plate section.)

between the seventh and fourth centuries BCE (Francfort *et al.*, 1990). The association of bird and Ibex is not uncommon in the 'art of the steppes', as illustrated by a bronze piece from Kandia (Kohistan, northern Pakistan) representing a crouching Ibex with a bird's head attached to its horn (Jettmar, 1982). This piece was compared to similar bronzes from the Pamirs and dated to the fifth or third century BCE (Jettmar, 1982; Litvinsky, 1993; Parzinger, 2001). The Kandia plaque seems to have been locally produced because of the crested bird, most probably a Himalayan monal *Lophophorus impejanus*, a species not encountered in the Pamirs (Jettmar, 2002). We might also mention here a metal piece, acquired in Leh, in the shape of a bird of prey, comparable to pieces from the steppes, but unfortunately, its provenance being unknown, it does not provide much valuable information (Koenig, 1984). We should also mention here the images of four peacocks engraved at the site of Dachi (Dachi/Dartsigs, lower Ladakh), where stags, on the tips of their hooves and with their heads turned backwards, as well as felines with bodies ornamented with volutes and typical of the 'animal style' were found engraved nearby.

Other images of peacocks were found at the site of Yaru Bridge, but their cultural context is very different. One of these peacocks is standing with its beak

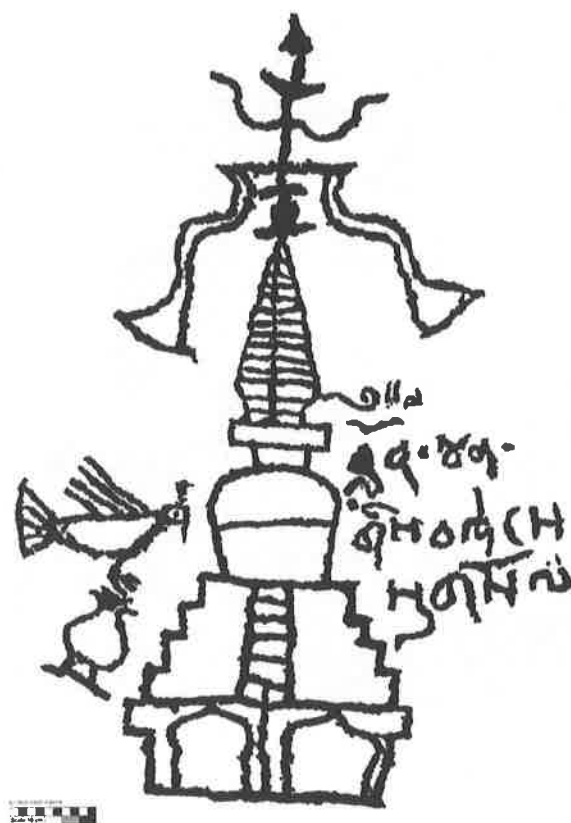


Figure 21.5. A bird holding a vase engraved next to a *stūpa* and an early Tibetan inscription, Alchi rock art site (Ladakh) (Credit: L. Bruneau & M. Vernier).

above a floral design. This association is found again at the same site with two birds (one peacock and one crested bird) holding the petals of a flower in their toes. We assume a Buddhist context for these bird images based on the fact that many of the petroglyphs at the site of Yaru Bridge are from the historic period and include *brāhmī* inscriptions (unpublished) as well as the historic composition of an elephant *Elephas maximus*, Yak and Blue Sheep (for more details about this composition, see Bruneau & Bellezza, 2013). This association (bird/flower) is also encountered at the rock art site at Alchi, where it is indubitably associated with Buddhist *stūpa* engravings. There, below the carving of a triple *stūpa* on a common platform, two birds (galliformes or anseriformes) are depicted standing and facing each other on the side of a lotus petal. The identification of the central motif as a lotus is made possible by the identical ornamentation of the *stūpa* platform. The identification of the lotus ornamentation in the carvings is confirmed by ruined *stūpas* all over Ladakh with similar decorations plastered on their bases (for a list of such *stūpas*, see Devers *et al.*, 2014). Below the *stūpa* and next to the birds is the representation of a vase, a well-known Buddhist motif.

Interestingly, on another boulder at Alchi, we encountered a bird holding a vase engraved next to a *stūpa* (Figure 21.5). This association of bird and *stūpa* is also found at the sites of Ledo Bridge (lower Ladakh) and Zamthang (lower Zaskar). It was therefore concluded that these bird images have a religious value. Indeed, the presence of birds in Buddhist iconography is attested in the earliest forms of Indian art (for example at Sanchi, Madhya Pradesh), and is well attested in the mural paintings of early Ladakhi temples, on the ceilings of the Alchi Sumtseg, for example. Many *stūpa* images from the rock art site of Alchi are accompanied by Tibetan inscriptions dated from the mid seventh to the early eleventh century CE, and the bird images may be attributed to the same period (Takeuchi, 2012).

Images of the *khyung* can also be assigned to the historic period (circa 100 BCE–1000 CE; for details of the historical division of Ladakh, see Bruneau & Bellezza, 2013). Notably, except for one representation at the site of Kanutse, the 10 images of the pre-Buddhist mythical horned eagle were all documented in the Zaskar Gorge, at the sites of Yaru and Yaru Bridge (Figure 21.3: A10; C30, C36–40; D1–2, D4–5). Apart from the presence of horns, the most distinctive feature of *khyung* images is the rendering of the tail in the shape of a triangle. Most *khyungs* in the rock art of Ladakh are represented as seen from the front with wings pointing downwards (Figure 21.3: C30, C36–40). There are Tibetan copper alloy bird talismans with downward-pointing wings, but these are not common (for such a Tibetan talisman, see Bruneau & Bellezza, 2013). In Tibet, the horned eagle in rock art appears to date as far back as the Iron Age, and the *khyung* remains an important religious and secular symbol down to the present day. According to the Bön religion, the *khyung* was the primary political emblem and genealogical symbol of Zhang Zhung, a prehistoric kingdom and culture based in Upper Tibet (for a preliminary survey of the horned eagle rock art of upper Tibet, see Bellezza, 2012; 2013; for some of the major cultural functions of the horned eagle, consult indexes in Nebesky-Wojkowitz, 1993; Bellezza, 1997 2005, 2008; and Norbu, 2013).

While the significance of the rock art *khyung* remains conjectural, its copper alloy counterpart clearly had a talismanic function (for images of *khyung* talismans, see Bellezza, 1998; Norbu, 2013). Whatever their significance, *khyung* rock images unquestionably have a symbolic value and underscore the cultural interconnections between Ladakh and western Tibet. This is reinforced by the association of the *khyung* images with *swastikas* (anti-clockwise) and the branched motif, engraved on the same boulders as the *khyung* images at Yaru and Yaru Bridge, which may refer to a Bön cultural background. About 100 *swastikas* were documented in the rock art of Ladakh, and motifs 10 ten branches (sometimes also referred to as ‘fishbone’ motifs). The branched motif appears to represent a tree and to have been imbued with symbolic or mythological meaning (for more details about the boulder from Yaru and the association of images, see Bruneau & Bellezza, 2013) (Figure 21.4). These motifs (*swastika*, branched motif and *khyung*) are only very exceptionally found in the rock art of Ladakh and noticeably not in association, except at the sites of Yaru.

Conclusion

The species engraved in the rock art of Ladakh are those of the local fauna, and this conveys information about the people who produced the images, that is, indigenous people, and environmental change, under the assumption that the petroglyphs represent a reasonably close relation between the motif and the local setting. It is clear that people did not make engravings of animals that they saw at faraway locations, nor were they influenced by exogenous imagery.

The images of mammals have a high preponderance of animals from a steppe environment (Yak, *Kiang*) intermixed with those from a montane environment (Ibex, Blue Sheep, Urial). Most representations of birds (cranes, galliform birds, Hoopoes, geese etc.) were those of species still occurring in the area or that might have occurred in the past. Representations of deer in rock art, but most of all, the excavated bones of a Himalayan Goral, may refer to more forested conditions and 'indicate that the area experienced better vegetation and game conditions than today for early humans to cope with the physiological and environmental constraints' in the first millennium BCE (Ganjoo & Ota, 2012). Since the images of peacocks are found in Buddhist and 'animal style' contexts, we cannot infer that Ladakh was more forested than it is now in the first millennium BCE or CE, but rather that this bird was introduced into Ladakhi imagery. Were these images a distant echo resulting from a fascination with neighbouring cultures, respectively Buddhist and steppic, or were they created by people originating from those cultures? In other words, were they directly or indirectly transmitted, and by what means: trade, military, religious or other links? We mentioned a small metal piece in the shape of a bird displaying steppic characteristics that was purchased in Leh but of which the provenance is unknown. This piece points to the existence of small and easily transportable artefacts that could have been seen in the region and served as models. Besides artistic copying from portable art, we should also mention here the possibility of copying pre-existing rock images. Thus, avian representations, and more generally zoomorphic images, may not only be naturalistic (i.e. result from the observation of nature), but also artistic, that is to say resulting from thematic and stylistic conventions. This may be especially true for bird images of line B (Figure 21.3) with their non-naturalistic wings pointing upwards.

Leaving the question of naturalistic versus artistic aside, quite uniquely, our iconographic work, which stands in a very different scientific tradition than ecology, and uses different sources of information, may provide sound evidence for animal behaviour which cannot otherwise be deduced from observations and which otherwise leaves few material traces. 'The avian fauna features of the past in any zone can be reconstructed through analysis of available paleontological data. . . . The main obstacle to collecting data on birds from the ancient past is the relatively poor preservation of feathers and bones. Determining species also presents considerable difficulty. . . . Bird images . . . serve as an important and in some cases even unique source of information on the bird taxa composition . . . in the remote past' (Kubarev & Zabelin, 2006).

As indicated by this chapter, rock art is crucial to the understanding of the ancient fauna of Ladakh and more generally its past. Yaru, Stakna and other nearby major rock art sites have already suffered severe damage in recent years, due to the construction of a road along the Zaskar River. We would therefore like to raise our reader's awareness of the need and urgency of preserving rock art in Ladakh and more generally in the Himalayas.

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22 Pastoralism and Wetland Resources in Ladakh's Changthang Plateau

Sunetro Ghosal and Monisha Ahmed

Contested Ecologies of Changthang

The high-altitude plateau in eastern Ladakh, India, called Changthang (*byang-thang*: 'northern plains') is home to a rich assemblage of birds. The plateau is characterized by different habitats, including wetlands that serve as staging and breeding grounds for a diversity of migratory birds, and the wetland resources are shared with pastoral nomadic communities called the 'Changpas' (Northerners). The Changpas have traditionally relied on their herds of goat, sheep and yak for subsistence, by husbanding the pastures of the high-altitude steppe of Changthang and negotiating resource usage with the wild animals. However, changes over the past few decades have altered social relations within Changpa society, redistributed access to pastures, included new actors and introduced new economic pressures. In this chapter, we discuss the complexity of these changes and their impact on wetland resources in the region.

The Landscape of Changthang

Ladakhi Changthang is situated at an average height of 4500 m above mean sea level, which is around the upper limit for agriculture for this latitude. The short summer months (May/June to August) record maximum temperatures of 30°C and higher, while the temperature in the winter months (October to March/April) can drop to minus 45°C or lower.

Like the neighbouring regions of Tibet and the higher reaches of the Spiti Valley, high altitude and a short growing season limit cultivation on the alpine steppe in Changthang (Miller, 1999; Mishra *et al.*, 2003). However, high precipitation compared to other parts of Ladakh helps sustain a high-altitude steppe (Miller, 1999), on which a diversity of mammalian and avian fauna depend (see Pfister, 2004; Namgail *et al.*, 2007).

Changthang has historically been a complex natural, cultural and economic landscape. While some cultivation is practised at lower elevations of Changthang, nomadic pastoralism has historically been the main source of livelihood for local residents. Miller (1999) draws an 'ecological distinction' between the pastoral nomads of the Tibetan plateau in relation to those in other parts of the world. He argues that nomadic pastoral movements in Eurasia and Africa are driven by 'water or the lack of it', while the

Birds migrating across the Himalayan region fly over the highest heights in the world, facing immense physiological and climatic challenges. The authors show the different strategies diverse species use to cope. Many wetland avian species are seen in the high-altitude lakes of the Himalayas and the adjoining Tibetan Plateau, including Bar-headed Geese, one of the highest flying species known.

Ringling programmes have generated information about origins and destinations, but this book is the first to present information on the birds' exact migratory paths. Capitalizing on knowledge generated through satellite telemetry, the authors describe the migratory routes of a multitude of birds flying over or skirting the Himalayas.

The myriad of threats to migratory birds and the wetland system in the Central Asian Flyway are discussed, with ways to mitigate them. This volume will inform and persuade policy-makers and conservation practitioners to take appropriate measures for the long-term survival of this unique migration system.

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