Common names of the Asiatic ibex superspecies at a turning point in its taxonomy and management

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Abstract
Common names of the Asiatic ibex superspecies at a turning point in its taxonomy and management. Common names of species matter in species management. However, taxonomic inertia and a blurred perception of a species can hinder the updating of framework documents and conservation schemes. Ibexes from Asia are a notable case of a polytypic species with numerous common names. This review examines data on the common names and taxonomy used for this superspecies. Some taxonomic units and common names are more consistent with recent genetic data than others and highlight management and/or conservation issues. The standardized use of this information in management schemes for the *Capra sibirica* complex will help lessen the risk of the extinction of distinguishable ibex conservation units from Asia, and, indirectly, of other species that share their geographical ranges.

Key words: Biodiversity conservation, *Capra sibirica,* Human perception, Phylogenetic species concept, Polytypic taxon, Conservation units

Resumen
El nombre común de la superespecie de íbice de Asia es un elemento decisivo en su taxonomía y su gestión. El nombre común de las especies importa para su gestión. No obstante, la inercia taxonómica y una percepción imprecisa de las especies pueden dificultar la actualización de los documentos marco y los planes de conservación. Los íbices de Asia son un caso notable de especies politípicas con numerosos nombres comunes. Esta revisión examina los datos sobre los nombres comunes y la taxonomía de esta superespecie. Algunas unidades taxonómicas y nombres comunes son más coherentes que otros con las evidencias genéticas recientes y con los retos de gestión y conservación. El uso estandarizado de esta información en los planes de gestión del complejo *Capra sibirica* ayudará a disminuir el riesgo de extinción de unidades distinguibles de íbices de Asia e, indirectamente, de las otras especies con las que comparte sus áreas de distribución geográfica.

Palabras clave: Conservación de la biodiversidad, *Capra sibirica*, Percepción humana, Concepto filogenético de especie, Taxón politípico, Unidades de conservación

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Introduction

Common names (CN) of species are derived from the way most people designate them (Doran, 1903) and may have practical importance for the perception and management of species (Farnworth et al., 2011; Sarasa et al., 2012). Nowadays, common names are increasingly being carefully chosen, above all for species confronted by conservation challenges (Kim et al., 2014; Jemmett et al., 2022). In Asia, *Capra sibirica* (Pallas, 1776) is a species of conservation concern (Reading et al., 2020) and a key prey species for flagship threatened predators such as the snow leopard (*Panthera uncia* Schreber, 1775; Kachel et al., 2017). Genetic studies of ibexes from Asia are unravelling evidence of allopatric speciation (Zvychaynaya, 2010; Joshi et al., 2020). This represents a potential turning point for the recognition of distinct species of these mountain ungulates although this was first suggested on morphological grounds more than a century ago (Camerano, 1917a, 1917b). *Capra sibirica* has probably received more names than any other species of the genus (Hepter et al., 1988) and it is perceived as a polytypic species. Hunters have used various common names for local morphotypes of this species for many years (e.g. ProfiHunt, 2022). Scientists are also prone to use regionalized names at subspecies level (Heptner et al., 1988; Fedosenko and Blank, 2001). However, Asiatic ibexes are still presented as a single species and in key framework documents such as those produced by the IUCN and CITES (Reading et al., 2020; CITES, 2022) the listing of the main regionalized common names and/or globalized names is incomplete. Therefore, the risk is high that distinct conservation units now recognised as part of '*Capra sibirica*' may be overlooked as conservation targets (Thakur et al., 2018; Gippoliti and Groves, 2020). An integrated compilation of the common names linked to the revised diversity reported in Asiatic ibexes may have practical benefits for greater public awareness and for updating management schemes.

Methods

Google Scholar (GS) is a web search engine that enables researchers and the general public to identify sources by searching for specific topics and key words, notably on wildlife–related issues. Although biases related to language and grey literature have been reported for some results derived from GS (Haddaway et al., 2015; Yasin et al., 2020), GS will retrieve almost any primary study (Yasin et al., 2020). Furthermore, it provides free tools for people without budgetary resources and gives information on the literature of species.

Subspecies

Numerous taxonomic units have been proposed for *Capra sibirica,* whose taxonomy has evolved over time (Fedosenko and Blank, 2001; Groves and Grubb, 2011). This review focused on the seven potential subspecies of *C. sibirica* that stand out in recent literature as accepted or of uncertain taxonomic status. The number of sources including information on the subspecies of *C. sibirica* was estimated using the following key words searched for in GS: '*Capra sibirica sibirica*' (Pallas, 1776); '*Capra sibirica hagenbecki*' (Noack, 1903); '*Capra sibirica alaiana*' (Noack, 1902); '*Capra sibirica formosovi*' (Zalkin, 1949); '*Capra sibirica sakeen*' (Blyth, 1842); '*Capra sibirica hemalayanus*' (Hodgson, 1841); and '*Capra sibirica dementjevi*' (Zalkin, 1949). Sources were checked up to 2021 (as an index of total sources) and for the following temporal windows: 'before 1971', '1972–1981', '1982–1991', '1992–2001', '2002–2011' and '2012–2021'. The final period represents an index of recent sources and is very important for conservation since information and assessments that are over ten–years old are considered by the IUCN to be out of date (Rondinini et al., 2014). Checking sources listed by GS using abbreviations for genus and/or species (e.g. *Capra s.*, or *C. s.*) gives results that are too partial (not included here) due to small sample sizes and the skewed usage of abbreviations for tautonomic subspecies.

Common names

First, English common names were listed when appearing in scientific references (e.g. Fedosenko and Blank, 2001), framework documents for conservation (Reading et al., 2020) and sources linked to trophy hunting (ProfiHunt, 2022). Then, an assessment of the sources that used the English common names of *C. sibirica* was performed using the following key words: 'Asian ibex', 'Asiatic ibex', 'Siberian ibex', 'Altai ibex', 'Gobi ibex', 'Khangay ibex', 'Mongolian ibex', 'Central Asia ibex', 'Central Asian ibex', 'Central Asiatic ibex', 'Tian Shan ibex', 'Mid Asian ibex', and 'Himalayan ibex'. Sources were checked using the same temporal windows as for subspecies (details in the previous paragraph).

Results

Scientific names

Capra sibirica was cited with several trinomial names in sources listed by GS: *C. s. sibirica* (n = 14); *C. s. hagenbecki* (n = 8); *C. s. alaiana* (n = 5); *C. s. formosovi* (n = 2); *C. s. sakeen* (n = 10); and *C. s. hemalayanus* (n = 8). *C. s. dementievi* was not detected in references when searching with GS; the number of sources citing other taxonomic units varied over time (fig. 1).

Common names

At least twelve common names were found in English to refer to ibexes from Asia. Three names were used unevenly both in the past and more recently to denominate ibexes from Asia as a whole ('Siberian ibex', 'Asiatic ibex' and 'Asian ibex', figs. 2, 3). Among the names referring to potentially distinguishable populations, 'Himalayan ibex' was the most frequently used

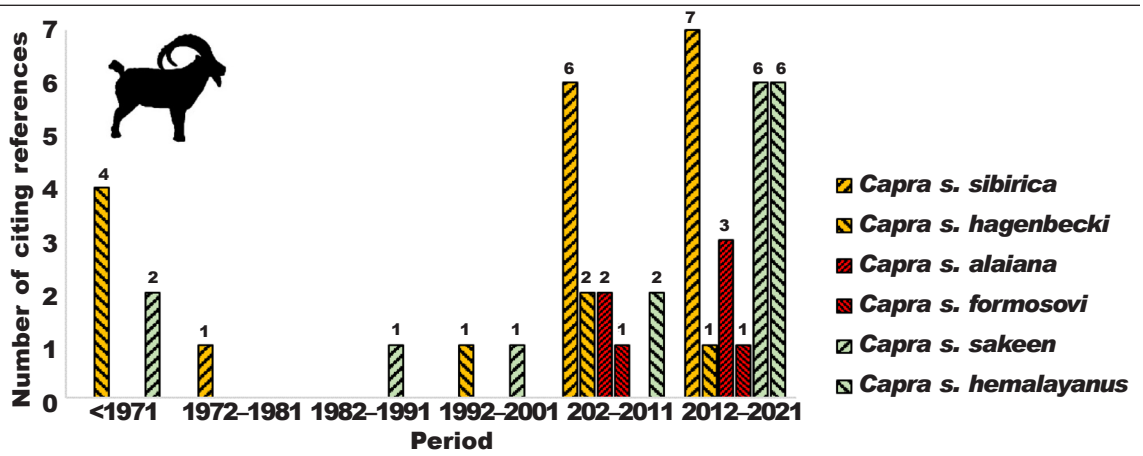

Fig. 1. Number of references cited in Google Scholar for the trinomial names of subspecies of Asiatic ibexes *Capra [sibirica]*. The checking of references was performed without using abbreviated trinomial names (see Methods).

Fig. 1. Número de referencias citadas en Google Académico para los nombres trinomiales de las subespecies de íbices de Asia, Capra [sibirica]*. En la comprobación de las referencias no se utilizaron nombres trinomiales abreviados (véase el apartado Métodos).*

term both in the past and in recent years to refer to *Capra s. sakeen*, which is sometimes referred to as *C. s. hemalayanus* (fig. 2). 'Altai ibex' appeared quite recently as a common name for *C. s. sibirica*, also known as the 'Siberian ibex'. *C. s. hagenbecki* has appeared as 'Mongolian ibex' and also as 'Gobi ibex' (fig. 3). *C. s. alaiana* is named 'Central Asian ibex', 'Central Asiatic ibex' or 'Tian Shan ibex' (fig. 3). Two further names are sometime used by stakeholders but were not detected in the sources listed by GS ('Khangay ibex' for *C. s. hagenbecki* and 'Mid–Asian ibex' for *C. s. alaiana*).

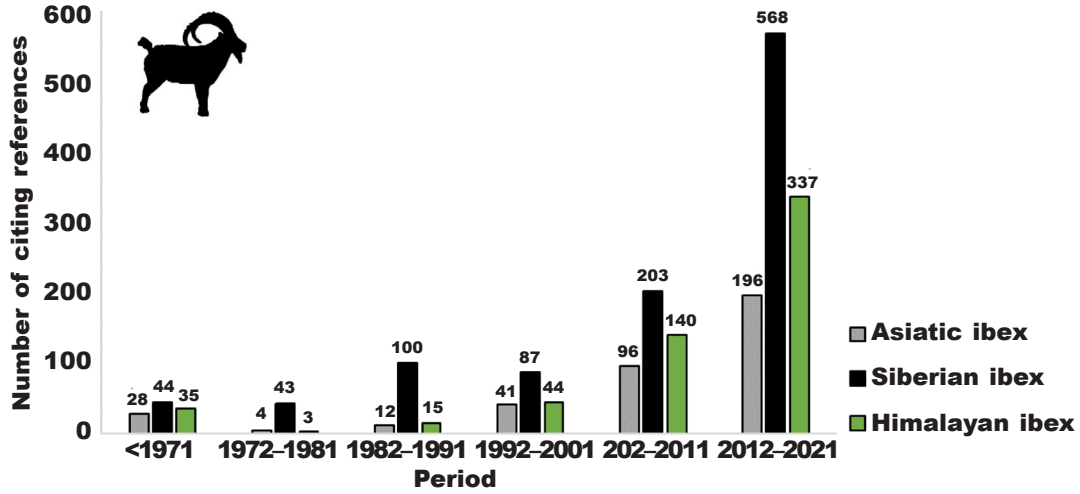

Fig. 2. Number of references in Google Scholar for the most frequent English common names of *Capra [sibirica]*.

Fig. 2. Número de referencias en Google Académico para los nombres comunes en inglés más frecuentes de Capra [sibirica].

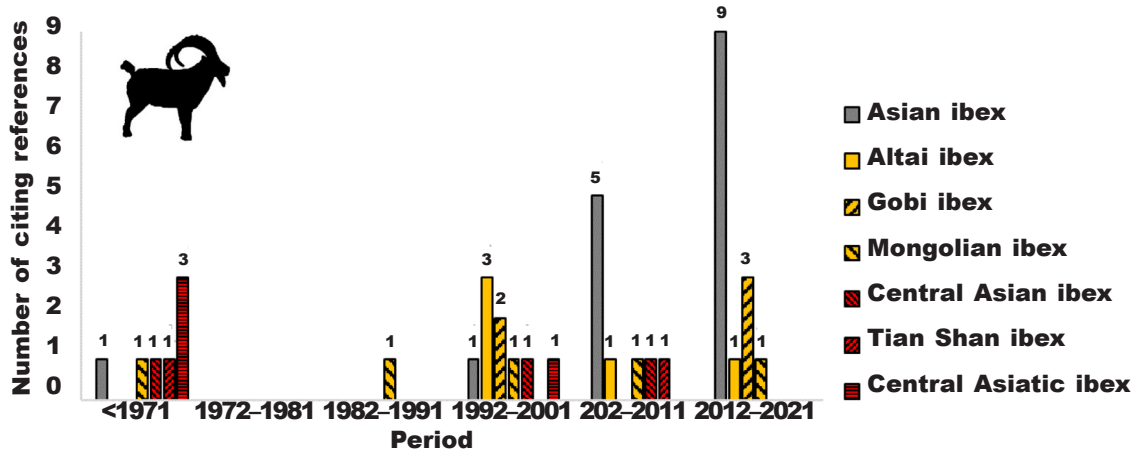

Fig. 3. Number of references in Google Scholar for the less frequent and emerging English common names of *Capra [sibirica]*.

Fig. 3. Número de referencias en Google Académico para los nombres comunes en inglés menos frecuentes y emergentes de Capra [sibirica].

Discussion

Of all the species in the genus *Capra*, the Asiatic ibex is by far the most widely distributed (Couturier, 1962; Reading et al., 2020), and has been the basis in the past for several proposed taxonomic units (15 potential units listed in Couturier, 1962; and13 listed in Heptner et al., 1988) and for numerous common names in various languages (Couturier, 1962; Heptner et al., 1988; Fedosenko and Blank, 2001; Groves and Grubb, 2011). Once apparent synonyms were taken into account, the highly diverse nomenclature used for the Asiatic ibex was reduced to 4–7 potentially distinguishable units (Fedosenko and Blank, 2001; Groves and Grubb, 2011; fig. 4). Zoologists used several morphological traits, mainly related to body size, horns, skulls and coat, to propose the following distinguishable units (Fedosenko and Blank, 2001). *C. s. sibirica* is described as small, with relatively short horns and contrasting dark and light patches on the rather light–coloured coat in males in winter; the back, sides and upper parts of the neck are mainly dirty–white or yellowish–white. *Capra s. hagenbecki* is close to *C. s. sibirica* in size but it has relatively longer horns, a grayish, pale brown coat, and no light saddle. The coat of old males sometimes turns almost white. *Capra s. alaiana* is described as larger than the other subspecies; the adult male coat during winter is mainly dark brown–grey, with less contrasting dark and light patches than those of *C. s. sibirica*; the light saddle–like spot on the dorsum varies in shape and size. *C. s. sakeen* may be close to *C. s. alaiana* but has relatively short horns that are thicker at the base; adult males have a light–coloured coat in winter; their back and sides have been described as pale brown or creamy white, the dorsal stripe as pale brown, other parts as light yellowish brown, and beard and tail as black–brown. Nonetheless, morphological traits are highly variable in Asian ibexes and the use of these characteristics for taxonomy has been an open debate for many years (Couturier, 1962; Heptner et al., 1988; Fedosenko and Blank, 2001). Future descriptions of distinguishable units of Asian ibexes might also benefit from future genetic studies and from the light shed by current knowledge of cryptic species (Bickford et al., 2007; Fišer et al., 2018).

Taxonomic topics

A curious taxonomic and biogeographic phenomenon occurs in the case of the Himalayan ibex, *C. s. sakeen/hemalayanus*. Groves and Grubb (2011) underlined that the name *C. s. hemalayanus* was reported from Nepal, even though the species does not occur there, i.e. the species was not included in the national red list of Nepal (Jnawali et al., 2011). Furthermore, no description is given in the original paper by Hodgson (1841) so it seems that *hemalayanus* can be considered as *nomen nudum*. Despite this, both *sakeen* and *hemalayanus* were used in a similar number of citations up to 2021, the latter being somewhat more frequently used by stakeholders since 2012. A consistent standardization of the scientific name of the Himalayan ibex is thus required.

Taxonomic inertia can negatively affect ungulate management and conservation, notably in the case of trophy–hunted species (Gippoliti et al., 2018a, 2018b). Until recently, Asiatic ibexes were considered a non–CITES–listed game species (Mallon, 2013). However, the framework has nowadays partly changed (CITES, 2022) and the CITES Trade Database includes for 2014–21 437 records of *C. sibirica*, totalling a reported 1603 (according to importers) or 1783 (according to exporters) traded individuals (https://trade.cites.org). Historical and recent evidence of taxonomic diversity and

Fig. 4. The range of the Asiatic ibex, *Capra [sibirica]*, adapted from Reading et al. (2020). The location of the distinct units (*Capra sibirica, Capra alaiana and Capra sakeen*) that stand out as genetically differentiated at species level (Zvychaynaya, 2010; Joshi et al., 2020), the location of uncertain units (?) and related regionalized English common names are shown (see text and Fedosenko and Blank [2001]). The delimitation and updating of the distribution of the various conservation units remain to be done.

Fig. 4. Área de distribución del íbice de Asia, Capra [sibirica]*, adaptado de Reading et al. (2020). Se muestran el emplazamiento de las unidades (*Capra sibirica*,* Capra alaiana *y* Capra sakeen*) que destacan por estar genéticamente diferenciadas a nivel de especie (Zvychaynaya, 2010; Joshi et al., 2020), la ubicación de las unidades inciertas (?) y los correspondientes nombres comunes en inglés regionalizados (véase el texto y Fedosenko y Blank [2001]). Queda por hacer la delimitación y la actualización de la distribución de las varias unidades de conservación.*

the related common names of the taxa are still pending stronger integration into a proper sustainable management plan. Nevertheless, the Asiatic ibexes do seem to fit at least the superspecies concept (Amadon, 1966). The Himalayan ibex *C. [s.] sakeen* (I–T clade in Joshi et al., 2020) could be considered a species (fig. 4) to have two steps pending: (1) standardization of the scientific name in favour of '*C. sakeen*'; and (2) evaluation of *C. [s.] dementievi* to subspecific level or otherwise. Evidence from the North–Asian (*C. [s.] sibirica* and *C. [s.] hagenbecki*) and Central–Asian ibexes (*C. [s.] alaiana* and *C. [s.] formosovi*) (Zvychaynaya, 2010; AMR and KZ clades in Joshi et al., 2020) could lead to the recognition of two further species (fig. 4) and encourage addressing their potential structuring into subspecies. Finally, additional research into the Siberian/Altai ibex *C. [s.] sibirica* and Gobi ibex *C. [s.] hagenbecki* (fig. 4) could help resolve whether these perceived units (Bilguun et al., 2019; AMR clade in Joshi et al., 2020) should be considered as distinct species or subspecies from the North–Asian ibex that range in and beyond Siberia.

Common names

Common names of species do not necessarily fit with delineation of taxa (Stevens et al., 2014) and thereby do not define the application of scientific names. Nonetheless, accurate common names may matter in the management of species (Farnwoth et al., 2011; Sarasa et al., 2012). In terms of the common names found during this review, 'Himalayan ibex' seems unambiguously used to refer to *C. [s.] sakeen*. However, *C. [s.] alaiana* is often referred to as the 'Central–Asian ibex', 'Central–Asiatic ibex', 'Tian Shan ibex' or even 'Mid–Asian ibex' by both scientists and stakeholders, notably trophy hunters. The standardization of the common name of *C. [s.] alaiana* might help clarify the diversity within *Capra [sibirica]* and make it better known. 'Central–Asian ibex' and, especially, 'Tian Shan ibex' might be favoured if precedence in scientific literature and length of the name prevail (Kim et al., 2014). However, if the wide range and usage among stakeholders such as trophy hunters, and the length of the name are thought to be more important (Kim et al., 2014), 'Mid–Asian ibex' might

become more frequently used in the scientific literature. In any case, *C. [s.] alaiana* is rarely distinguished in scientific publications, but globally, it does seem to be the main origin of Asiatic ibex trophies, since about 77 % of individuals from the CITES records (for *Capra [sibirica]* in 2014–2021) were exported from Kyrgyzstan. Signs of overexploitation and concerns about trophy hunting of ibex in Asia have been growing in recent years (Nordbø et al., 2018; Reading et al., 2020; Blank and Li, 2021; Parker et al., 2023), at least in the case of *C. [s.] alaiana*. Unambiguous and standardized names for the distinct units of *Capra [sibirica]* might facilitate greater transparency in the wildlife trade, and better sustainable use of populations. It may be even contribute to ensuring that trophy hunting be better regarded as a conservation tool, above all for Asian caprids (Frisina and Tareen, 2009; Kachel et al., 2017). For *C. [s.] hagenbecki*, the names 'Mongolian ibex' and 'Gobi ibex' are cited but recent uses in publications suggest that the latter is preferred and may become prevalent. For *C. [s.] sibirica*, 'Altai ibex' is cited although the use of 'Siberian ibex' is even more common. However, 'Siberian ibex' is also used as a name for the ibex superspecies from Asia, even though its range extends far beyond Siberia and the inappropriateness of this epithet has previously been highlighted ('largely artificial and simply a translation of the Latin'; Heptner et al., 1988). Thus, the use of 'Siberian ibex' should be avoided when referring to the ibex complex from Asia, just as 'Bactrian' should be avoided for the wild camel *Camelus ferus* (Jemmett et al., 2022). Finally, 'Asiatic ibex' is commonly used for all ibexes from Asia, and 'Asian ibex' is emerging likewise in this same sense. It will be interesting to see whether greater awareness of the diversity of ibexes from Asia and of their common names will promote better use of standardized and unambiguous names in future publications. Indigenous people have a variety of local names for Asian ibexes such as *sibirskiy kozerog, teke, kiik, bun, djim, yangir* and *skyin*. (Couturier, 1962; Fedosenko and Blank, 2001). Whether these names potentially match conservation units is a question for further research. Furthermore, how the appeal of perceived units affects trophy collectors should also be closely monitored, and utilisation of wildlife should be regulated at local and international scales (i.e. CITES) to ensure that any improved knowledge of biodiversity does not threaten conservation units (Morrison III et al., 2009; van den Burg and Weissgold, 2020).

The species and subspecies of Caprinae such as the northern and southern chamois (*Rupicapra rupicapra* Linnaeus, 1758, and *R. pyrenaica* Bonaparte, 1845), and Alpine and Iberian ibexes (*Capra ibex* Linnaeus, 1758, and *C. pyrenaica* Schinz, 1838) are well distinguished and managed accordingly. For the sake of consistency, scientific and vernacular nomenclatures in frameworks related to the species of Asiatic ibexes should thus be updated.

Conclusion

Although further genetic studies and a complete taxonomic revision including updated morphological descriptions are still required, available scientific evidence and related common names for ibexes from Asia facilitate the recognition and naming of several taxonomic units within the Asiatic ibex complex that hitherto had been considered a single species. Steps towards such standardization would not only strengthen monitoring, assessments and management of *Capra* species but also their ecosystems and related uses.

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