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Bridging conservation science and traditional knowledge of wild animals: The need for expert guidance and inclusion of local knowledge holders

Viktor Ulicsni[1*], Dániel Babai[2], Csaba Vadász[3], Vera Vadász-Besnyői[4], András Báldi[1,5], Zsolt Molnár[1,5]

[1] MTA Centre for Ecological Research, Klebelsberg Kuno u. 3, Tihany 8237, Hungary

[2] Institute of Ethnology, MTA Research Centre for the Humanities, Tóth Kálmán u. 4, Budapest 1097, Hungary

[3] Kiskunsági National Park, Liszt Ferenc u. 19, Kecskemét 6000, Hungary

[4] Institute of Botany and Ecophysiology, Szent István University, Páter K. u. 1, Gödöllő 2100, Hungary

[5] Institute of Ecology and Botany, MTA Centre for Ecological Research, Alkotmány u. 2–4, Vácrátót 2163, Hungary

*Corresponding author: e-mail: ulicsni.viktor@okologia.mta.hu

Abstract

Many people call for strengthening knowledge co-production between academic science and indigenous and local knowledge systems. A major barrier to cooperation seems to be a lack of experience regarding where and how traditional knowledge can be found and obtained. Our key question was whether the expert judgment of academic zoologists or a feature-based linear model is better at predicting the observed level of local familiarity with wild animal species. Neither the zoologists nor the model proved sufficiently accurate (70% and 60%, respectively), with the inaccuracy probably resulting from inadequate knowledge of the local ecological and cultural specificities of the species. This indicates that more knowledge is likely to come from local knowledge than zoologists would expect. Accuracy of targeting the relevant species for knowledge co-production could be improved through specific understanding of the local culture, provided by experts who study traditional zoological knowledge and by local knowledge holders themselves.

1. Introduction

Species and ecosystem conservation and the sustainable use of natural resources all require reliable information. Most evidence, however, originates from academic science, while other knowledge systems are largely ignored (Tengö et al. 2014; Asselin 2015). Recent evidence shows that indigenous peoples and local communities contribute highly valuable knowledge to conservation science and practices, including achieving conservation targets (Berkes et al. 2000; Huntington 2000; Uprety et al. 2012; Forest Peoples Program et al. 2016).

The use of traditional knowledge in conservation science, practice and policy is, however, limited by a number of epistemological differences, uncertainties of knowledge validation, and power asymmetries (Berkes et al. 2000; Huntington 2000; Nadasdy 2005; Molnár et al. 2008). For these reasons academic zoologists (i.e. those not familiar with traditional knowledge) are often reluctant (to the point of refusal) to cooperate with local knowledge systems (Gilchrist & Mallory 2007).

Expanding knowledge sources and collaborating with other knowledge systems is supported also in the policy arena by CBD (Convention on Biological Diversity) and IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services). IPBES emphasizes in its assessments the importance of strengthening dialogue and knowledge co-production between knowledge systems, and of recognizing and respecting the contribution of indigenous and local knowledge (ILK) and Indigenous Peoples and Local Communities (IPLC) to the conservation and sustainable use of biodiversity and nature's contribution to people (Díaz et al. 2015; Lundquist et al. 2015). Scientists are motivated (urged) to bridge knowledge systems.

While local knowledge of wild plants (especially medicinal and edible species) is widely respected and used in science (Turner 2014), this is less common in the case of wild animal species (Gilchrist & Mallory 2007). Ethnozoology, as a branch of ethnobiology, studies the interactions between humans and animals, such as traditional ecological knowledge on wild animals (Hunn 2011; Alves 2012). Research into traditional zoological knowledge has ramifications for many other fields, including ethnology, cultural anthropology, monitoring, population biology, conservation biology, biodiversity assessments, and conservation practice and policy (Table 1).

Table 1 here

Zoologists and conservationists often seek species-specific local knowledge. A major barrier to cooperation with local knowledge holders seems to be a lack of experience on where and how traditional knowledge (e.g. on wild animal species) can be found and obtained, and how to work together with local knowledge holders to generate new knowledge for conservation (Idrobo & Berkes 2012; Turvey et al. 2014). Zoologists motivated by CBD, IPBES or other organizations to bridge knowledge systems would benefit from having greater advance knowledge of which species are locally known and the depth of this knowledge, enhancing their chances of success (Ens et al. 2014).

In order to make better predictions of the availability of local knowledge on wild animal species, there needs to be greater understanding of how such knowledge may be affected by certain features of the species (e.g. size, abundance, habitat and usefulness).

This paper provides a case study that deals with two questions:

1) Is the expert judgment of academic zoologists (with little or no expertise in traditional knowledge) better at predicting the observed level of local familiarity with wild animal species than a feature-based linear model? (Local familiarity here means the proportion of local knowledgeable informants who know the species, and was used as a proxy for knowledge availability); and

2) Which are the most useful morphological, ethological, ecological and cultural features for predicting the level of local familiarity with wild animal species?

2. Materials and methods

2.1. The reference dataset and the observed level of familiarity

An exceptionally large dataset is available on the local traditional zoological knowledge of three local faunas (171 vertebrate and 212 invertebrate taxa) of Central Europe from which the local knowledge was obtained for the current analysis (see data and methods of data collection in Ulicsni 2012; Ulicsni et al. 2013, 2016): Romania (Nușfalău), Slovakia (Vyšné Valice and Gemerské Michalovce), and Croatia (Lug, Vardarac and Kopačevo). No new interviews with locals were conducted for the present case study. All three study areas are characterised by moderate continental climate; the potential vegetation is a closed *Quercus* forest with mosaics of meadows and wetlands. Locals practice traditional, corn-, wheat-, cattle- and fruit-based agriculture in a diverse semi-natural rural environment. The local knowledge of possibly all locally known species was collected during picture-based interviews with 57 highly knowledgeable elderly people (average age 75 years, selected by snowball method) between 2010 and 2012 (see details in Ulicsni 2012; Ulicsni et al. 2013, 2016). We determined the level of observed familiarity, that is, the proportion of local knowledgeable informants who know the species at least moderately, i.e. can list at least 3 independent memes (information units e.g. sound of a species, habitat of a species, smell of the Spanish fly, special food storage mounds of steppe mice) related to the species – an admittedly arbitrary decision. Latin names follow de Jong et al. (2014). Prior informed consent was obtained before all the interviews, and ethical guidelines suggested by the International Society of Ethnobiology (ISE 2006) were followed.

2.2. Model estimation of expected familiarity

A linear model was constructed to quantify how particular features (morphological, ethological, etc.; i.e. explanatory variables) contribute to the level of observed familiarity (i.e. the dependent variable). Explanatory variables of the model were represented by 10 relevant features (traits and others) identified by traditional knowledge studies covering whole faunas (e.g. Ellen 2006). These features were size, morphological salience, ethological salience, abundance, habitat, danger to humans, harmfulness, usefulness, richness of national folklore, and nature conservational value. Each feature had 6 categories (0: no importance/no relation, 1: little importance, …, 5: great importance for humans). Each category of each feature was included as a factor in further analyses. Parametrization was based on published literature data. Only elements of traditional knowledge that are part of an average biologist's or zoologist's knowledge (who are not experts in traditional knowledge) were taken into account during parametrization (e.g., folk songs about ladybirds known to all Hungarians). The elements of this very basic common traditional knowledge were defined by the authors. The explanation of values of the different features is detailed in Table S1.

The species included in this analysis were those for which there was sufficient information (data from at least 20 informants) in our dataset (166 species (Table S2 and S3)). Bird and fish species were omitted because sufficient data about these taxa are not yet available (our past interviews focused on lesser-known animal species and less on birds).

Table 2 here

For variable selection (i.e. for separating the significant and the redundant variables), a forward stepwise procedure was used, based on the corrected Akaike's Information Criterion (AICc), applying the stepAIC() function of MASS package of R (Venables & Ripley 2002). This resulted in a set of candidate models.

Coefficients of the final linear model were calculated via model averaging. All the candidate models with significant explanatory power (with ΔAICc≤4) were included in the model averaging. Using the coefficients, a derived variable – the level of estimated familiarity – was calculated for each species. The level of estimated familiarity for a certain species was calculated as the sum of the values of coefficients of the relevant factors.

The differences between the levels of estimated and observed familiarity were calculated for the 81 species selected for the zoologist prediction (see below). We decided arbitrarily to analyse the top and bottom 20% (the most over- and underestimated species), that is, 2x16 species, in more detail.

2.3. Zoologists' expert judgment of local familiarity

81 of the 166 taxa were selected by random stratified sampling for a questionnaire, ensuring that all the main taxonomic groups (mammals, reptiles, amphibians, molluscs, insects, and "other invertebrates") were represented. Three roughly equal groups contained species that were locally well known, moderately known and almost unknown (based on Ulicsni 2012; Ulicsni et al. 2013, 2016) (see also Table S2).

We asked 20 zoologists from Hungary and Romania who are familiar with the studied areas (researchers working at universities, museums and research institutes, zoology teachers, governmental and civil conservationists) to complete the questionnaire. Specialists in single species or small taxonomic groups (according to publication lists) were excluded. Of the 42 zoologists who qualified, 20 selected at random were asked to classify each species into four categories based on the level of familiarity they would expect: almost everybody will know the species (3 points), many people (ca. 40-60% of the informants) will know the species (2 points), only a few people will know the species (1 point), or the species will be unknown to locals (0 points). For each species the average value of the 20 answers was calculated.

Spearman's rank correlation was applied in order to test the statistical dependence between a) the ranking of specific explanatory variables and the level of familiarity expected by zoologists and b) the ranking of specific explanatory variables and over- or underestimation of familiarity by zoologists.

Species were ranked according to the observed levels of familiarity based on traditional knowledge holders, and by the level of familiarity predicted by the zoologists. The differences between the two ranks were calculated. Again, we analysed the top and bottom 20% (the most over- and underestimated species), that is, 2x16 species, in more detail.

3. Results

Following the stepwise variable selection, the key features included in the final linear model were: abundance, folklore, size, habitat, morphology, danger to human and nature conservational value. None of the single features had significant explanatory power (Table S5). The best explanatory power was provided by the combination of the variables listed above (Table S5). The constructed linear model predicted the level of familiarity accurately in ca. 70% of the species (see species close to the axis in Fig. 1). On average the constructed linear model underestimated the level of familiarity by just 2.9%. For individual species, however, the difference between the observed and calculated familiarities was much higher (21.8%). Based on the 2x16 most over- or underestimated species, the chance of overestimation increased with the usefulness of the species, while underestimation increased with the richness of folklore, and also if the size and abundance of the species were below average.

Fig. 1. here Level of familiarity with 81 wild animal taxa, calculated by the linear model (percentage of knowledgeable informants expected to know the taxon) and observed locally. The most over- and underestimated 2x16 species (20%) are indicated by red and green marks, respectively (see also Table S4).

Fig. 2. Level of local familiarity with 81 wild animal taxa, as predicted by zoologists (almost all locals know it = 3 points, no locals know it = 0 points) and observed among local knowledgeable informants (%). The most over- and underestimated 2x16 species are indicated by red and green marks, respectively (see also Table S4).

Zoologists' predictions of the level of local familiarity were accurate for ca. 60% of the species (Fig. 2). In the case of the zoologists' predictions, significant dependencies were found between explanatory variables: size, ethological salience, abundance, habitat, danger to humans, usefulness and the level of familiarity expected by zoologists (Table S2). Overestimation occurred with species characterised by less than expected local usefulness, and less than expected danger to humans;

underestimation occurred with species unexpectedly frequently encountered by villagers, more than expected harmfulness, more than expected nature conservational value, and rare small-bodied species.

Nine species were underestimated by both the model and the zoologists: golden flower bug (*Cetonia aurata*), Eurasian weasel (*Mustela nivalis*), earwigs (Dermaptera), chicken cody louse (*Menacanthus stramineus*), Spanish fly (*Lytta vesicatoria*), great silver water beetle (*Hydrous piceus*), slow worm species (*Anguis fragilis* s.l.), engraver beetles (*Ips* spp.), and wildcat (*Felis silvestris*), while also nine species were overestimated by both the zoologists and the model: apple maggot (*Rhagoletis pomonella*), wasp spider (*Argiope bruennichi*), red louse (*Bovicola bovis*), Eurasian beaver (*Castor fiber*), stoat (*Mustela erminea*), European praying Mantis (*Mantis religiosa*), oriental cockroach (*Blatta orientalis*), European rabbit (*Oryctolagus cuniculus*), and European fire-bellied toad (*Bombina bombina*).

Zoologists underestimated sand lizard/Balkan wall lizard taxon (*Lacerta agilis/Podarcis taurica*), harlequin ladybird (*Harmonia axyridis*), horse-leech (*Haemopis sanguisuga*), Hungarian gall wasp (*Andricus hungaricus*), green shield bug/southern green stink bug taxon (*Palomena prasina/Nezara viridula*), bats (Chiroptera), and stone marten (*Martes foina*); while overestimated brown bear (*Ursus arctos*), backswimmers (Notonectidae), adder (*Vipera berus*), European pond turtle (*Emys orbicularis*), steppe polecat (*Mustela eversmanni*), common fish louse (*Argulus foliaceus*) and true weevils (Curculionidae).

The model underestimated European hornet (*Vespa crabro*), common liver fluke (*Fasciola hepatica*), stag beetle (*Lucanus cervus*), firebug (*Pyrrhocoris apterus*), body louse (*Pediculus humanus humanus*), Colorado potato beetle (*Leptinotarsa decemlineata*), and common clothes moth (*Tineola bisselliella*); while overestimated forest caterpillar hunter (*Calosoma sycophanta*), a family of predatory mites (Parasitidae), Italian striped-bug (*Graphosoma lineatum*), red deer (*Cervus elaphus*), antlions (Myrmeleontidae), steppe mouse (*Mus spicilegus*) and golden jackal (*Canis aureus*).

4. Discussion

Both the zoologists and the linear model inaccurately estimated the level of local familiarity of ca. 30-40% of the species. Unexpectedly, little difference was found between the accuracy of the model (60%) and that of the zoologists (70%). The list of the most over- and underestimated species overlapped by ca. 50%.

A zoologist's perception of wild animal species differs from that of a local farmer. The two groups perceive different things as interesting, beautiful, valuable or harmful. In some cases zoologists were unaware if a given species was a provider of a certain ecosystem service or a cause of serious damage at a local level. The model, built upon general zoological knowledge, was also unable to consider local cultural and ecological specialities. Over- or underestimation of certain species were, however, often easy to explain with expertise in traditional zoological knowledge.

The most common cause of knowledge underestimation by both zoologists and the model was the undervaluation of or the lack of information on local socio-economic contexts and beliefs. For example, in the case of the Hungarian gall wasp (*Andricus hungaricus*), besides its use as tanning material, superstitions might play an important role in it being locally well-known: "*My mother always compelled me to throw them out* (when as a child I was collecting them. It cannot be kept near the house because) *hens will not brood*." (Ulicsni et al. 2016).

Abandoned practices also contributed to a higher level of familiarity than expected. Although the use of the Mediterranean medicinal leech (*Hirudo verbana*) has considerably declined, knowledge of its former use was passed on effectively. The same is true for the black-colored carpenter bees (*Xylocopa violacea, X. valga*) whose honey bag was widely eaten before the spread of commercial sweets. "*If you take it apart there is a small honey sac in the middle. When we were young, we often caught it to get the honey from them.*" (Ulicsni et al. 2016). The Spanish fly (*Lytta vesicatoria*) has been used as an aphrodisiac and against rabies: "*When someone was bitten by a rabid dog, he had to eat eight…*".Many locals still remember this. Today this species is only used as bait for fishing.

Damage caused by a taxon may also affect local people more sensitively than expected, which is why zoologists, who represent another knowledge system and lifestyle, might underestimate familiarity with a species. For example, the damage done to fish caught in a traditional fish trap (called *varsa*) by the great silver water beetle (*Hydrous piceus*) is very conspicuous. The chicken body louse (*Menacanthus stramineus*) is also a very dangerous parasite killing domestic fowl. Almost everybody can identify it and, suprisingly, precisely distinguish it from mites (Gub 1996). Locals argue that the Eurasian weasel (*Mustela nivalis*), the stone marten (*Martes foina*) and the wolf (*Canis lupus*) kill more animals than they could take and eat, behave very annoyingly,and cause a lot of damage. There are also many superstitions surrounding them. For example, it is believed that the Eurasian weasel sucks the udder of cows, causing mastitis. "*It bites the udder so it is spoiled.*" Sometimes it was cured with the skin of the weasel (Ulicsni et al. 2013). Level of familiarity was also overestimated if zoologists were unaware of the fact that local people did not associate damage with the pest that caused it. In these cases the species had lower familiarity level than expected (e.g. the common fish louse (*Argulus foliaceus*)). Another possible reason for this latter species to be lesser-known is that the old experienced fishermen have died out and their knowledge is lost (Ulicsni et al. 2016).

One reason for underestimating level of familiarity might be that zoologists considered morphological salience of a species more important than its impact (e.g. use and harm). Namely, they expected the morphologically more salient species to be better known. The wasp spider (*Argiope bruennichi*) and the European praying mantis (*Mantis religiosa*) are morphologically very striking species but have no actual impact on humans, so they are little-known by locals. Unexpectedly, locals have learnt even the names of these species, mostly in school and from media (Ulicsni et al. 2016).

Size seemed to be an important factor if it was a distingishing feature from other similar (related) species, like for the large stag beetle (*Lucanus cervus*) among bugs and the European hornet (*Vespa crabro*) among smaller wasps.

One reason for overestimation might be that zoologists based their predictions on their knowledge of natural and urban areas rather than rural agricultural landscapes. If a species was abudant in urban areas but rare in rural ones and zoologists did not know that, they overestimated the level of familiarity. A good example is the oriental cockroach (*Blatta orientalis*). It does not occur in rural areas in our region, people cannot encounter it, and do not know what it is (Ulicsni et al. 2016).

Some of the locally better known species have only appeared in the recent past in our region. Zoologists did not expect the locals to recognise them, e.g. the harlequin ladybird (*Harmonia axyridis*). Suprisingly, locals did know that it appeared 5-7 years ago and they did not mistake it for other ladybird species. Another of this kind of newcomer taxa was the green shield bug/southern green stink bug taxa (*Palomena prasina*/*Nezara viridula*). Local people put them into the same folk taxon and have already observed that one winter is needed to change color from green to brown (Ulicsni et al. 2016).

In summary, the most common causes of underestimation by both zoologists and the model were undervaluation and an insufficient understanding of local values, beliefs and ecology. Another reason for underestimation was that zoologists considered the morphological salience of a species as more important than its impact (e.g. use or harm). Neither dangerous species nor species of high nature conservation value were consistently over- or underestimated. Unexpectedly, legal protection or endangerment had only minimal impact on the level of familiarity of the species. Biró et al. (2014) also show that many rare, threatened and thus protected plant species are less well known than expected, as these are most frequently small and non-utilized species that are rare also at the local scale.

Knowledge loss has a high impact on the available local traditional knowledge in our region, especially in more industrialized and urbanized areas (Biró et al. 2014). On the other hand, there is still a considerable amount (comparable to many tropical and boreal regions) of actively used traditional ecological knowledge in the economically marginal areas utilized with extensive land-use practices in East-Central Europe (Molnár et al. 2008, Biró et al. 2014). However, this traditional knowledge is fading rapidly, and most of it may be lost in the next decades.

It is a well-known phenomenon that knowledge about a species can be heavily influenced by the needs, practices and worldview of local cultural groups (Alves 2012; Berkes 2012). There are many examples from different cultures around the world of unexpectedly salient species. For example, in the tropics, the larvae of some weevil species play a significant role in human diet as they are the main source of essential tryptophan. As a result, locals know a lot about these species, their habitats, behaviour, etc. (Ramos-Elorduy 2002). In East Africa there is a unique traditional use for whirligig beetles (Gyrinidae) and predaceous diving beetles (Dytiscidae), as a stimulant for breast growth (Kutalek & Kassa 2005). Fruits and roots hoarded for the winter by rodents are exploited for food by several local Siberian communities (Ståhlberg & Svanberg 2010), resulting in these rodent species and their habitat and behaviour being well known and distinguished.

There are several limitations to our study. For the zoologists, the ordinal scale had only four categories, as they argued they could not estimate the level of familiarity more precisely. The accuracy of the model could be increased by using a larger sample size. However, the sample size used was limited by the number of species known to the local communities studied and the number of taxa with sufficient information in our dataset. Data on observed familiarity may not be totally accurate either. Interviewing 57 people about more than 350 species is time-consuming, not to mention tiring for the informants. On the other hand, the unexpectedly large (50%) overlap between the zoologists and the model regarding the most inaccurately estimated species corroborates the robustness of our analysis

(50% is far from being a random pattern). We are also aware that in the local community, the level of familiarity does not necessarily correlate with the depth, richness and usefulness of traditional knowledge, and that knowledge erosion might affect depth of knowledge more than the mere recognition of a species (Biró et al. 2014).

5. Conclusions and recommendations

Local familiarity of 30-40% of the species was significantly under- or overestimated by the zoologists and the linear model. This high level of uncertainty shows that it may be unrealistic to expect academic zoologists with limited understanding of traditional zoological knowledge to identify adequate target species for knowledge co-production and thus bridge knowledge systems. It also raises ethical issues, for example, how correct it is to push scientists preparing assessments (e.g. in CBD or IPBES) to do reviews in areas they are not familiar with. It induces unfavorable bias in recognition given to different perspectives, and also imply the negative pracitce relying solely on external perspectives. This way both the local and external experts are treated unfairly which hinders the possibilities of the effective knowledge co-production.

Cooperative research based on more than one knowledge system can unite the benefits of different ontological and epistemological systems. For example, traditional zoological knowledge is often considered a useful complement to scientific approaches to wildlife research and conservation (Huntington 2000, Moller et al. 2004; Prado et al. 2014). Cooperative research can eliminate knowledge gaps, which can benefit all stakeholders who are actively involved in the process (Raymond et al. 2010). Cooperation can decrease the power imbalance between the representatives of knowledge systems, thereby contributing to the involvement of the local community and the wider use of knowledge in nature conservation (Raymond et al. 2010, Tengö et al. 2014, FPP et al. 2016). We argue that bias and underestimation of local knowledge can hinder these processes, can lead to less efficient cooperation and even waste resources, for example, if communication of conservationists is not adjusted well to the knowledge locals have of target species and species groups.

When selecting teams of authors for IPBES assessments, increasing attention (although still not enough) is paid to including experts on Indigenous and Local Knowledge in order to bridge knowledge systems. It is our sincere hope that traditional knowledge holders and their knowledge can thus more effectively promote the protection of species and habitats and the sustainable use of biodiversity, and increase awareness of the need for conservation. For example, better understanding of local knowledge of wild flora and fauna could help develop more complex community-based conservation programs. Inclusive conservation approaches can take into account not only the knowledge of locals but also local economic and socio-cultural aspects (e.g. perceptions based on local values and beliefs). Better recognition of local knowledge could also help the preservation and transmission of local knowledge necessary for the continuation of local – often still sustainable – land-use practices.

We argue that researchers of traditional and local knowledge can function as bridging experts in these activities, aiding zoologists and conservationists who seek target species for knowledge co-production. Meanwhile, zoologists would have the opportunity to decolonize their approaches, open up to traditional knowledge, and learn how to work in collaboration with local people. We believe that a more efficient bridging of knowledge systems could increase the chances of success and lead to improved cooperation between conservation practice, academic science, and indigenous and traditional knowledge holders.

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Figures

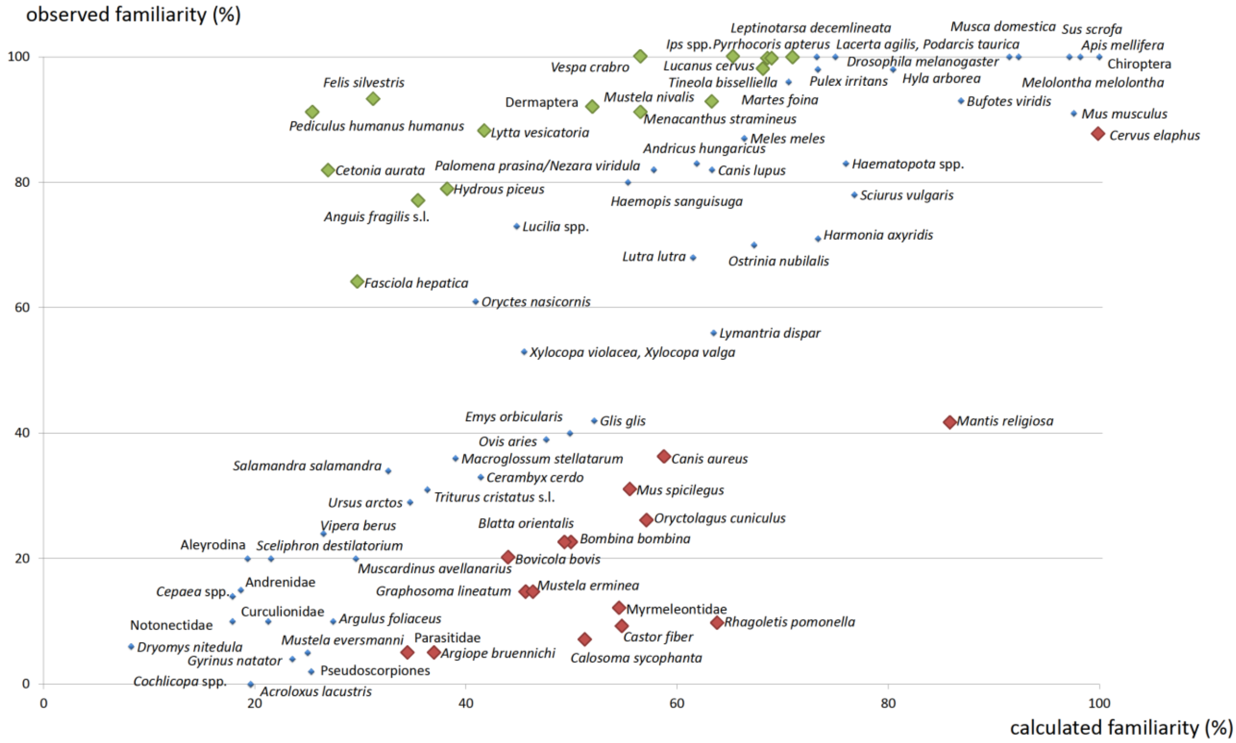

Fig. 1. Level of familiarity with 81 wild animal taxa, calculated by the linear model (percentage of knowledgeable informants expected to know the taxon) and observed locally. The most over- and underestimated 2x16 species (20%) are indicated by red and green marks, respectively (see also Table S4).

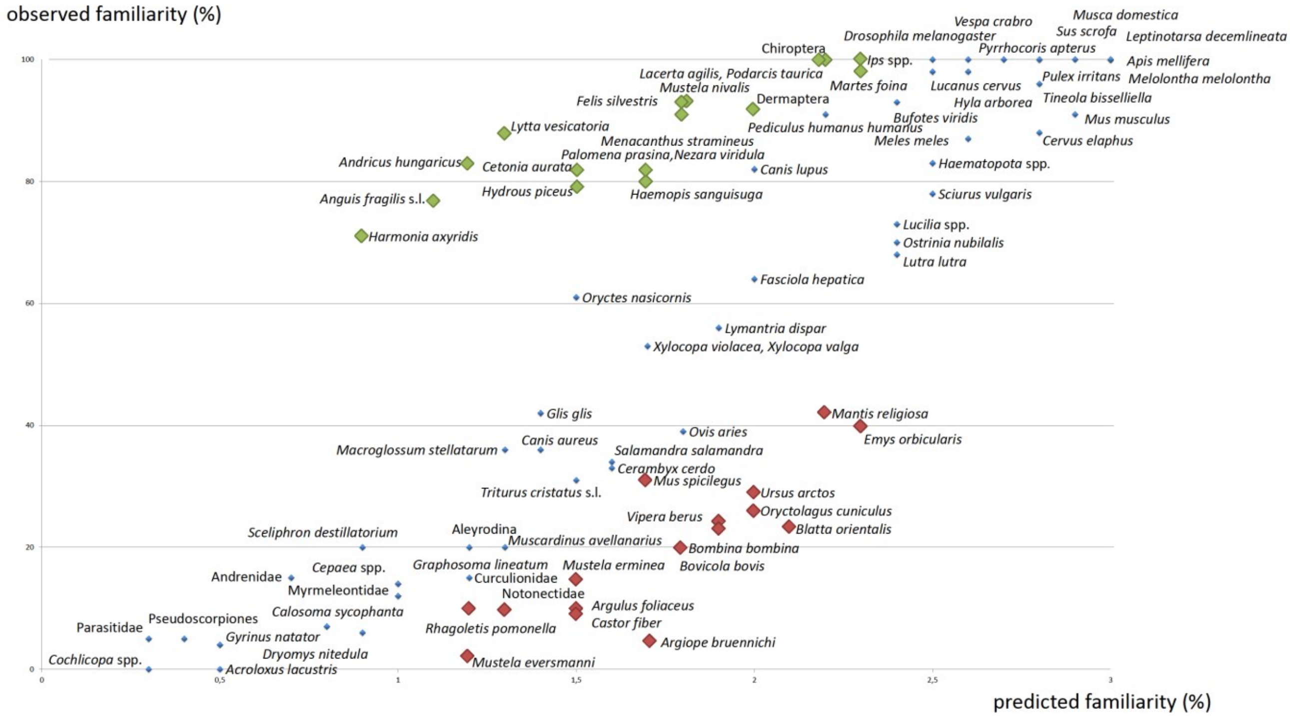

Fig. 2. Level of local familiarity with 81 wild animal taxa, as predicted by zoologists (almost all locals know it = 3 points, no locals know it = 0 points) and observed among local knowledgeable informants (%). The most over- and underestimated 2x16 species are indicated by red and green marks, respectively (see also Table S4).

Table 1. Examples of traditional zoological knowledge relevant to the conservation of wild animal species.

Topics	References
Folk nomenclature, folk taxonomies, identification of species hitherto unknown to academic science	Diamond & Bishop 1999, Beaudreau et al. 2011
Location of new populations and habitats of endangered species	Huntington 2000, Rea 2007, Alves 2012, Padmanaba et al. 2013, Ziembicki et al. 2013, Service et al. 2014
Monitoring data on rare, protected and invasive species, developing monitoring indicators	Huntington 2000, Colding & Folke 2001, Moller et al. 2004, Nadasdy 2005, Turvey et al. 2013, Danielsen et al. 2014
New information on behaviour, food spectra, life histories and reproductive cycles of less known (and threatened) species, especially on economically/culturally important species	Huntington 2000, Tideman & Gosler 2010, Idrobo & Berkes 2012, Polfus et al. 2014, Voorhees et al. 2014, Tendeng et al. 2016,
Knowledge on the local impacts of resource use on biodiversity (incl. land-use history)	Huntington 2000, Molnár et al. 2008, Tideman & Gosler 2010, Alves 2012 , Herrmann et al. 2014
Old-new extensive land-use practices to be rediscovered for better conservation management	Berkes et al. 2000, Johnson & Hunn 2010, Gilchrist & Mallory 2007, Uprety 2012
Insights into local population regulation practices of game and fish species, incl. taboos and other social norms	Colding & Folke 2001, Neto & Pacheco 2005, Jacqmain et al. 2005, Rea 2007, Kendrick & Manseau 2008, Silvano & Jørgensen 2008, Alves 2012, FPP et al. 2016
Local knowledge on how to prevent overexploitation of globally traded species used in medicine, handcrafts, etc.	Neto & Pacheco 2005, Alves 2012, Berkes 2012
Insights into motivations, decision-making strategies and worldviews (incl. cultural, symbolic and spiritual connections) of local stakeholders on land management to help resolve conflicts about protected areas, large predators, game species, scavengers and	Nadasdy 2005, Berkes 2012, Lescureux & Linnell 2013, Morales-Reyes et al. 2017

“less appreciated species” (e.g. snakes)	
Traditional knowledge to be brought into local formal education in a culturally appropriate way to prevent cultural erosion	Kimmerer 2002

Table S1

The 10 features used to parametrize the model

Size: the absolute size of the species was used: 1) just visible by eye; 2) smaller than 3 cm; 3) 3-15 cm (largest insects and smaller vertebrates); 4) 15-50 cm (smaller vertebrates); 5) larger than 50 cm (ungulates, meso- and larger predators).

Morphological salience: species were categorized by colour, body form (unique, extraordinary, bizarre or different from the simplest rounded form): 1) rounded body with no conspicuous parts (e.g. red louse (*Bovicola bovis*)); 3) moderately conspicuous (e.g. European honey bee (*Apis mellifera*)); 5) striking colour and special morphology (e.g. fire salamander (*Salamandra salamandra*)).

Ethological character: species were categorized by sound, scent, mobility, conspicuous behaviour: 1) slow movement, and inconspicuous behaviour (e.g. lake limpet (*Acroloxus lacustris*)); 3) moderately conspicuous (e.g. great silver water beetle (*Hydrous piceus*)); 5) moves conspicuously, noisy (e.g. black carpenter bees (*Xylocopa violacea)*).

Abundance: abundance in the Carpathian Basin was used. If distribution is fragmented, gradient-like or patchy, the average population density was used: 1) rare species living either only in a few localities, or rare everywhere (e.g. Eurasian beaver (*Castor fiber*)); 3) moderately abundant (e.g. common dormouse (*Muscardinus avellanarius*)); 5) widespread and frequent/abundant almost everywhere in the Carpathian Basin (e.g. bats (Chiroptera)).

Habitat: the probability and frequency of human encounters was estimated: 1) very rarely seen by non-professionals or farmers because the species is reclusive and nocturnal, or lives under rocks in uncultivated areas (e.g. forest dormouse (*Dryomys nitedula*), European copper skink (*Ablepharus kitaibelii*)); 3) there is a medium chance of encounters (e.g. whirligig beetles (Gyrinidae)); 5) frequent around humans, and easily observed (e.g. house fly (*Musca domestica*)).

Danger to humans: anything ranging from minor to unbearable nuisances, or even to deadly attacks: 0) not dangerous to humans, causes no inconvenience (e.g. false scorpions (Pseudoscorpiones)); 3) moderately inconvenient, potentially dangerous (e.g. European honey bee (*Apis mellifera*)); 5) very dangerous or even deadly to humans (e.g. European hornet (*Vespa crabro*)).

Harmfulness refers expressly to harm done to livestock, crops or other human property: 0) no harm (e.g. sand lizard (*Lacerta agilis*)); 3) moderate harm (e.g. brown hare (*Lepus europaeus*)); 5) regular, substantial harm (e.g. Colorado beetle (*Leptinotarsa decemlineata*)).

Usefulness refers to how much a species directly serves the well-being of humans, livestock, crops or other human property (edible flesh or good fur, kills/eats parasites, important pollinator): 0) not directly useful, and of little indirect use (e.g. European tree frog (*Hyla arborea*)); 3) moderately useful (e.g. Hungarian gall wasp (*Andricus hungaricus*)); 5. significantly and directly useful (e.g. European honey bee (*Apis mellifera*)).

Subjective relation of humans with the given species, and their diverse occurrence in different folklore genres: 0) neutral relationship, the species does not appear in folklore (e.g. a family of predatory mites (Parasitidae)); 1) there is no widely known narrative element related to the species, but it is present in the spiritual and oral culture; 3) narratives are widely known, the species appears in folklore genres (e.g. Eurasian weasel (*Mustela nivalis*)); 5) the species is represented in numerous narrative text corpuses and diverse folklore genres, with strong emotional attachment or aversion (e.g. Red deer (*Cervus elaphus*)).

Nature conservation value was based on legally protected status and status of threat: 0) alien and native pest species; 1) native species, sometimes harmful, not protected, not endangered; 2) species that are not (or not significantly) endangered, not harmful, and cannot be hunted; 3) species protected or of special attention because of their value as game animal; 4) vulnerable, threatened species, officially protected in Hungary; 5) species highly and critically endangered in the Carpathian Basin.

Table S2

Values of features and observed, calculated and expected familiarity values

No.	scientific name	common name	size	morphological salience	ethological saliance	abundance	habitat	usefulness	harmfulness	danger to human	richness of national folklore	nature conservational value	observed familiarity (%)	calculated familiarity (model) (%)	expected familiarity (zoologists) (scores)
1	***Rhagoletis pomonella***	**cherry fruit fly**	1	1	1	4	5	0	3	0	0	1	10	62	1.2
2	**Pseudoscorpiones**	**false scorpions**	1	5	1	2	4	0	0	0	0	1	5	25	0.4
3	***Calosoma sycophanta***	**forest caterpillar hunter**	3	5	3	3	2	2	0	0	0	3	7	51	0.8
4	***Cetonia aurata***	**green rose chafer**	2	5	4	3	3	0	0	0	0	1	82	27	1.5
5	***Canis aureus***	**golden jackal**	5	4	4	3	2	0	3	2	1	2	36	59	1.4
6	**Andrenidae**	**mining bees**	2	1	1	2	1	1	0	1	0	2	15	19	0.7
7	***Ursus arctos***	**brown bear**	5	3	5	1	3	1	4	5	4	5	29	35	2.0
8	**Parasitidae**	**a family of predatory mites**	1	4	4	5	3	0	0	0	0	1	5	35	0.3
9	***Leptinotarsa decemlineata***	**Colorado potato beetle**	2	5	1	5	5	0	5	0	0	0	100	65	3.0
10	***Graphosoma lineatum***	**Italian striped-bug**	2	4	3	4	5	0	1	0	0	1	15	46	1.2
11	***Argiope bruennichi***	**wasp spider**	2	5	2	3	3	1	0	1	1	1	5	38	1.7
12	**Chiroptera**	**bats**	3	5	5	5	5	0	1	2	4	4	100	112	2.2
13	***Lucilia* spp.**	**blow flies**	2	5	3	4	4	0	1	3	0	1	73	47	2.4
14	***Drosophila melanogaster***	**fruit flies**	1	1	5	5	5	0	0	0	0	1	100	73	2.5
15	***Pulex irritans***	**human flea**	1	1	5	3	5	0	0	4	2	1	100	74	2.8
16	***Dryomys nitedula***	**forest dormouse**	3	4	2	1	1	0	1	0	0	5	6	8	0.9
17	***Castor fiber***	**Eurasian beaver**	5	4	5	2	3	0	3	0	2	4	9	53	1.5
18	***Mustela nivalis***	**Eurasian weasel**	4	3	3	3	4	0	2	0	2	2	93	62	1.8
19	***Meles meles***	**Eurasian badger**	5	5	4	4	3	0	3	1	0	1	87	65	2.6
20	***Cohlicopa* spp.**	**a pulmonate gastropod genus**	1	2	1	3	1	0	0	0	0	1	0	20	0.3
21	***Salamandra salamandra***	**fire salamander**	3	5	1	1	1	0	0	1	2	4	34	33	1.6
22	**Dermaptera**	**earwigs**	2	4	3	4	4	0	0	1	2	1	92	53	2.0
23	***Lacerta agilis, Podarcis taurica***	**sand lizard, Balkan wall lizard**	3	3	4	5	4	0	0	0	1	3	100	75	2.2
24	***Cervus elaphus***	**red deer**	5	5	4	4	3	4	3	2	5	1	88	114	2.8
25	***Mus spicilegus***	**steppe mouse**	3	2	3	3	3	0	2	1	0	1	31	54	1.7
26	***Sceliphron destillatorium***	**mud dauber wasp**	2	3	3	3	4	0	0	2	0	1	20	23	0.9
27	***Lymantria dispar***	**Gypsy moth**	3	2	3	4	3	0	4	0	0	0	56	60	1.9
28	**Myrmeleontidae**	**antlions**	1	1	5	3	5	0	0	0	0	1	12	55	1.0
29	**Notonectidae**	**backswimmers (true bugs)**	2	4	4	3	3	0	1	2	0	1	10	20	1.3
30	***Harmonia axyridis***	**harlequin ladybird**	2	5	5	5	4	0	2	1	2	0	71	72	0.9
31	***Mus musculus***	**house mouse**	3	3	4	5	5	0	4	3	4	0	91	96	2.9
32	***Musca domestica***	**housefly**	2	1	5	5	5	0	1	1	2	1	100	92	2.8
33	***Apis mellifera***	**European honey bee**	2	3	4	5	5	5	0	3	5	2	100	99	3.0
34	***Mustela erminea***	**stoat**	4	4	2	2	2	0	1	0	2	4	15	46	1.5
35	***Menacanthus stramineus***	**chicken body louse**	1	1	2	3	5	0	3	1	0	1	91	55	1.8
36	***Mantis religiosa***	**European praying mantis**	3	5	4	4	4	1	0	0	2	3	42	86	2.2
37	***Macroglossum stellatarum***	**hummingbird hawk-moth**	2	3	5	4	5	0	0	0	0	1	36	39	1.3
38	***Xylocopa violacea, Xylocopa valga***	**black coloured carpenter bees**	3	4	5	3	3	0	2	3	0	1	53	46	1.7
39	***Vipera berus***	**adder**	4	3	3	1	2	0	2	5	3	5	24	28	1.9
40	***Blatta orientalis***	**oriental cockroach**	2	3	3	3	5	0	1	4	3	0	23	53	2.1
41	***Lytta vesicatoria***	**Spanish fly**	3	5	4	2	2	1	1	2	0	1	88	44	1.3
42	***Gyrinus natator***	**whirligig beetle**	1	1	5	2	3	0	0	0	0	1	4	24	0.5
43	***Hydrous piceus***	**great silver water beetle**	3	3	3	3	2	0	2	1	0	1	79	37	1.5
44	***Lutra lutra***	**Eurasian otter**	5	4	3	3	3	0	4	0	1	5	68	58	2.4

45	*Ostrinia nubilalis*	European corn borer	2	1	2	4	5	0	4	0	0	1	70	64	2.4
46	*Anguis fragilis* s.l.	slow worm species	3	3	3	3	2	0	0	0	0	4	77	35	1.1
47	*Cepaea* spp.	land snail species	2	4	1	3	3	0	1	0	0	1	14	18	1.0
48	Aleyrodina	whiteflies	1	4	3	3	3	0	4	0	0	1	20	16	1.2
49	*Vespa crabro*	European hornet	3	3	5	4	4	0	3	5	0	1	100	58	2.6
50	*Haemopis sanguisuga*	horse-leech	3	1	4	3	1	0	0	0	0	1	80	55	1.7
51	*Fasciola hepatica*	common liver-fluke	2	2	3	2	4	0	3	2	0	1	64	30	2.0
52	*Melolontha melolontha*	cockchafer	3	4	5	5	4	0	5	0	2	1	100	89	3.0
53	*Bovicola bovis*	red louse	1	1	2	2	5	0	1	0	0	1	20	44	1.8
54	*Acroloxus lacustris*	lake limpet	1	2	1	3	1	0	0	0	0	1	0	20	0.5
55	*Emys orbicularis*	European pond turtle	4	5	2	2	3	0	0	0	1	4	40	50	2.3
56	*Muscardinus avellanarius*	common dormouse	3	3	2	3	1	0	1	0	0	4	20	30	1.3
57	*Mustela eversmanni*	steppe polecat	4	3	2	2	2	0	2	0	0	4	2	23	1.2
58	*Ovis aries*	mouflon	5	5	3	2	3	1	3	0	0	0	39	46	1.8
59	*Cerambyx cerdo*	great capricorn beetle	3	5	4	2	3	0	1	0	0	3	33	41	1.6
60	*Andricus hungaricus*	Hungarian gall wasp	3	4	1	3	3	3	0	0	3	2	83	62	1.2
61	*Glis glis*	edible dormouse	4	3	3	3	2	0	3	0	2	4	42	50	1.4
62	*Lucanus cervus*	stag beetle	3	5	4	3	3	0	1	1	2	3	98	69	2.6
63	*Martes foina*	stone marten	4	4	4	4	5	1	4	0	0	1	98	70	2.3
64	Curculionidae	true weevils	2	4	1	3	3	0	4	0	0	1	10	18	1.5
65	*Oryctes nasicornis*	European rhinoceros beetle	3	5	1	2	2	0	0	0	0	3	61	41	1.5
66	*Argulus foliaceus*	common fish louse	1	2	4	3	2	0	2	0	0	1	10	26	1.5
67	*Haematopota* spp.	clegs (horsefly species)	3	2	4	3	4	0	2	3	1	1	83	76	2.5
68	*Tineola bisselliella*	common clothes moth	2	2	3	5	5	0	5	0	0	1	96	67	2.8
69	*Pediculus humanus humanus*	body louse	1	1	2	1	5	0	0	2	0	1	91	27	2.2
70	*Ips* spp.	engraver beetles	1	1	2	4	5	0	5	0	0	1	100	62	2.3
71	*Canis lupus*	wolf	5	4	4	1	1	2	4	5	5	5	82	63	2.0
72	*Triturus cristatus* s.l.	crested newt species	3	4	1	3	1	0	0	0	0	4	31	36	1.5
73	*Oryctolagus cuniculus*	European rabbit	4	4	5	2	4	1	1	0	2	0	26	57	2.0
74	*Sus scrofa*	wild boar	5	5	4	5	3	4	4	5	4	1	100	98	2.9
75	*Felis silvestris*	wildcat	5	4	2	2	1	0	1	1	0	5	93	32	1.8
76	*Pyrrhocoris apterus*	firebug	2	4	5	5	5	0	2	0	1	1	100	67	2.7
77	*Sciurus vulgaris*	Eurasian red squirrel	4	5	5	4	3	0	1	0	4	3	78	77	25
78	*Bombina bombina*	Europ. fire-bellied toad	3	4	4	4	3	1	0	1	0	3	23	51	1.9
79	*Palomena prasina/ Nezara viridula*	green shield bug southern green stink bug	2	2	5	4	5	0	3	0	0	1	82	56	1.7
80	*Hyla arborea*	European tree frog	3	4	3	5	3	1	0	0	4	3	98	80	2.5
81	*Bufotes viridis*	European green toad	3	4	2	4	5	1	0	1	2	3	93	88	2.4

Table S3

Values of features, observed and calculated familiarity values for species used in the model but not used in the questionnaire

No.	scientific name	common name	size	morphological salience	ethological saliance	abundance	habitat	usefulness	harmfulness	danger to human	richness of national folklore	nature conservational value	observed familiarity (%)	calculated familiarity (model) (%)
1	***Vulpes vulpes***	**red fox**	5	5	3	5	4	3	5	2	4	0	100	100
2	***Capreolus capreolus***	**European roe deer**	5	5	5	5	4	4	3	1	3	1	100	100
3	***Talpa europaea***	**common mole**	4	5	5	5	5	0	4	0	3	3	98	100
4	***Rattus norvegicus***	**brown rat**	4	3	4	5	5	0	5	4	3	0	100	96
5	***Lepus europaeus***	**brown hare**	4	5	4	4	4	3	3	0	4	3	100	87
6	***Erinaceus roumanicus***	**eastern hedgehog**	4	5	4	5	5	2	0	1	3	3	100	100
7	***Coccinella septempunctata***	**seven-spot ladybird**	2	5	3	5	4	5	0	0	5	2	100	100
8	***Paravespula germanica***	**German wasp**	2	5	5	5	5	0	2	4	2	1	100	86
9	***Vespula vulgaris, Polistes gallicus***	**paper wasp species**	2	5	5	5	5	0	2	4	2	1	61	86
10	***Helix spp.***	**edible snails**	3	5	4	4	4	2	3	0	4	2	100	89
11	***Spermophilus citellus***	**European ground squirrel**	4	4	5	3	4	0	1	1	2	5	53	70
12	***Araneus* spp.**	**spider species**	2	5	5	5	5	1	0	1	4	1	42	86
13	***Sarcophaga carnaria***	**common flesh fly**	2	4	5	5	5	0	4	3	0	1	66	59
14	***Dama dama***	**fallow deer**	5	5	4	2	3	5	3	1	0	0	46	46
15	***Alces alces***	**elk**	5	5	3	1	1	3	3	3	1	2	3	33
16	***Bombus terrestris***	**buff-tailed bumblebee**	2	4	4	5	4	4	0	1	1	2	25	57
17	***Cricetus cricetus***	**common hamster**	4	4	3	2	3	1	3	1	1	3	65	41
18	***Mustela putorius***	**European polecat**	4	4	3	3	4	1	4	0	2	1	91	69
19	***Natrix natrix***	**grass snake**	4	4	4	4	4	0	0	0	2	3	96	75
20	***Pelophylax lessonae P.* kl. *esculenta P. ridibundus***	**pool frog, edible frog, marsh frog**	3	3	5	4	3	1	0	0	3	3	67	62
21	***Hirudo medicinalis***	**European medicinal leech**	3	4	3	4	3	1	0	4	1	3	100	63
22	***Lacerta viridis***	**European green lizard**	3	4	5	3	4	1	0	1	1	3	55	64
23	***Palingenia longicauda***	**Tisa mayfly**	3	4	5	2	3	2	0	0	2	3	18	49
24	***Apis mellifera* var. *ligustica***	**Italian bee**	2	2	4	4	4	4	0	3	1	1	31	58
25	***Taenia solium Taeniarhynchus saginatus***	**pork tapeworm, beef tapeworm**	4	3	1	2	5	0	4	5	0	1	38	49
26	***Gryllotalpa gryllotalpa***	**European mole cricket**	3	4	3	5	5	0	4	0	1	1	98	93
27	***Lumbricus* spp.**	**earthworms**	3	4	3	5	5	3	0	0	1	1	100	93
28	***Arion lusitanicus***	**Portuguese slug**	3	4	4	4	5	0	5	0	0	0	16	71
29	***Lampyris noctiluca***	**common glowworm, Central European firefly**	2	4	5	5	4	0	0	0	3	1	69	66
30	***Harmonia axyridis***	**harlequin ladybird**	2	5	5	5	4	0	2	1	2	0	71	72
31	***Ixodes* spp.**	**ticks**	1	2	3	4	5	0	3	5	2	1	94	74
32	***Geotrupes* spp.**	**dor beetles**	2	3	5	4	4	3	0	0	1	1	53	39
33	***Microtus arvalis***	**common vole**	3	2	2	5	4	0	4	1	0	1	42	83
34	***Hypoderma bovis***	**warble fly**	2	4	4	3	4	0	2	3	0	1	77	30
35	***Blaps* spp.**	**tenebrionid beetle**	3	4	4	5	5	0	0	1	0	1	33	83
36	***Diabrotica virgifera***	**western corn rootworm**	2	4	4	4	4	0	5	0	0	0	2	35

37	*Lynx lynx*	Eurasian lynx	5	4	1	1	1	0	1	1	1	5	29	23
38	*Astacus astacus*	European crayfish	3	5	3	2	1	2	0	1	1	4	90	46
39	*Meloe* spp.	oil beetles	3	4	3	3	3	0	2	0	2	3	11	59
40	*Tettigonia viridissima*	great green bush-cricket	3	5	3	5	4	0	1	0	0	1	73	82
41	*Psyllobora vigintiduopunctata*	22-spot ladybird	2	5	2	5	3	4	0	0	0	1	68	46
42	*Coronella austriaca*	smooth snake	4	3	3	2	2	0	0	1	1	4	2	34
43	*Hydrous piceus*	great silver water beetle	3	3	3	3	2	0	2	1	0	1	79	37
44	*Sorex, Crocidura* spp.	shrews	3	4	2	4	3	1	0	0	0	3	54	50
45	Thomisidae	crab spiders	2	5	3	5	3	1	0	0	1	1	4	56
46	Aphididae	green colored aphid species	1	2	4	5	5	0	3	0	0	1	100	65
47	Julidae	millipede species	2	4	2	5	5	1	0	1	0	1	16	58
48	*Gerris* spp.	water striders	2	4	5	5	4	0	0	0	0	1	58	47
49	*Argyroneta aquatica*	diving bell spider	2	2	5	4	1	0	0	2	1	3	0	40
50	*Rana dalmatina, Rana temporaria*	agile frog, common frog	3	3	2	3	3	1	0	0	1	3	20	46
51	*Polyommatus* spp.	blues (butterfly species)	2	5	3	4	4	0	0	0	0	2	31	44
52	Chaetocnema	flea beetles	1	1	4	5	4	0	4	0	0	1	61	63
53	*Lithobius* spp.	common centipedes	2	4	4	5	4	0	0	0	0	1	44	47
54	*Bruchus pisi Acanthoscelides obtectus*	pea beetle, bean beetle	1	1	1	5	5	0	5	0	0	1	58	73
55	*Cossus cossus*	goat moth	3	3	3	3	4	0	4	0	0	1	5	47
56	Bivalvia	clams	3	4	1	4	3	1	0	2	0	1	83	53
57	*Tipula* spp.	crane flies	3	4	2	5	4	0	0	0	0	1	60	73
58	*Nyctereutes procyonoides*	racoon dog	5	4	2	1	1	1	1	3	0	0	0	13
59	*Martes martes*	pine marten	4	4	2	1	1	0	1	0	0	4	16	6
60	*Acheta domestica*	house cricket	2	1	3	3	5	0	0	0	0	1	33	57
61	*Pediculus humanus capitis*	head louse	1	1	1	3	5	0	0	5	1	1	100	68
62	*Rhagoletis cerasi* s. l.	cherry fruit fly	1	1	1	5	5	0	4	0	0	1	94	73
63	*Oecanthus pellucens*	Italian tree cricket	2	3	4	4	3	0	1	0	0	1	40	18
64	*Agriotes* spp.	click beetles	2	3	3	4	4	0	1	0	0	1	27	29
65	*Microtrombidium pusillum*	dwarf velvet mite	1	3	2	5	4	0	0	2	0	1	17	40
66	Thysanura	silverfish species	2	3	2	5	5	0	0	0	0	1	0	50
67	Psychodidae	moth flies	2	3	4	3	5	0	0	0	0	1	13	32
68	Cercopidae	froghoppers (cicad species)	2	5	1	5	4	0	0	0	0	1	74	56
69	*Eisenia fetida*	redworm	3	4	1	4	4	1	0	0	0	1	10	61
70	*Apodemus agrarius*	striped field mouse	3	4	3	4	2	0	0	0	0	1	54	50
71	*Osmia adunca*	mason bee species	2	2	4	1	3	2	0	1	1	1	18	10
72	*Sitophilus granarius*	wheat weevil	1	1	1	4	4	0	5	0	0	1	22	52
73	*Braula coeca*	bee louse	1	3	1	4	2	0	4	0	0	1	6	16
74	*Pthirus pubis*	crab louse	1	1	2	1	5	0	0	5	0	1	8	29
75	*Cimex lectularius*	bed bug	1	1	1	1	4	0	0	5	2	1	27	35
76	*Myzus cerasi*	black cherry aphid	1	1	2	4	4	0	3	0	0	1	16	52
77	*Fannia canicularis*	lesser house fly	2	1	2	3	5	0	1	1	0	1	15	57
78	*Chrysopa* spp.	lacewings	2	2	3	4	4	0	0	0	0	1	29	46
79	*Gonepteryx rhamni*	common brimstone	2	5	3	3	3	0	0	0	0	1	7	27
80	*Ablepharus kitaibelii*	European copper skink	3	2	2	1	1	0	0	0	0	5	0	18
81	*Bielzia coerulans*	Carpathian blue slug	3	5	1	1	1	0	0	0	0	3	5	16
82	*Natrix tesellata*	dice snake	4	1	1	1	1	0	0	0	1	3	2	34
83	*Taenia multiceps*	tapeworm species	1	1	1	1	3	0	3	0	0	1	9	5
84	*Haematopinus suis*	hog louse	1	1	2	1	3	0	1	0	0	1	29	5
85	*Simulium* spp.	black flies	2	1	1	2	1	0	2	1	0	1	25	20

Table S4
Attributes of the candidate model set (limited to models with significant explanatory power)

Modell	AICc	DAICc	rel.likelihood	weight
familiarity ~ abundance + folklore + size + habitat + morphology	1130,5	0	1	0,478
familiarity ~ abundance + folklore + size + habitat + morphology + gs	1132,1	1,6	0,4493	0,2148
familiarity ~ abundance + folklore + size + habitat + morphology + danger to humans	1132,6	2,1	0,3499	0,1673
familiarity ~ abundance + folklore + size + habitat	1134,2	3,7	0,1572	0,0752
familiarity ~ abundance + folklore + size + habitat + morphology + nature conservation value	1134,5	4	0,1353	0,0647

Table S5
Estimated values of coefficients of explanatory variables and calculated familiarity for the 81 species

No.	scientific name	common name	size	morphological salience	ethological saliance	abundance	habitat	usefulness	harmfulness	danger to human	richness of national folklore	nature conservational value	calculated familiarity (model) (%)
1	***Rhagoletis pomonella***	**cherry fruit fly**	0	0	0	34	27	0	0	0	0	1	62
2	**Pseudoscorpiones**	**false scorpions**	0	-9	0	16	17	0	0	0	0	1	25
3	***Calosoma sycophanta***	**forest caterpillar hunter**	28	-9	0	27	6	0	0	0	0	0	51
4	***Cetonia aurata***	**green rose chafer**	2	-9	0	27	6	0	0	0	0	1	27
5	***Canis aureus***	**golden jackal**	32	-18	0	27	6	0	0	2	10	0	59
6	**Andrenidae**	**mining bees**	2	0	0	16	0	0	0	1	0	0	19
7	***Ursus arctos***	**brown bear**	32	-25	0	-2	6	0	0	3	19	1	35
8	**Parasitidae**	**a family of predatory mites**	0	-18	0	45	6	0	0	0	0	1	35
9	***Leptinotarsa decemlineata***	**Colorado potato beetle**	2	-9	0	45	27	0	0	0	0	0	65
10	***Graphosoma lineatum***	**Italian striped-bug**	2	-18	0	34	27	0	0	0	0	1	46
11	***Argiope bruennichi***	**wasp spider**	2	-9	0	27	6	0	0	1	10	1	38
12	**Chiroptera**	**bats**	28	-9	0	45	27	0	0	2	19	0	112
13	***Lucilia* spp.**	**blow flies**	2	-9	0	34	17	0	0	2	0	1	47
14	***Drosophila melanogaster***	**fruit flies**	0	0	0	45	27	0	0	0	0	1	73
15	***Pulex irritans***	**human flea**	0	0	0	27	27	0	0	3	16	1	74
16	***Dryomys nitedula***	**forest dormouse**	28	-18	0	-2	0	0	0	0	0	1	8
17	***Castor fiber***	**Eurasian beaver**	32	-18	0	16	6	0	0	0	16	0	53
18	***Mustela nivalis***	**Eurasian weasel**	26	-25	0	27	17	0	0	0	16	0	62
19	***Meles meles***	**Eurasian badger**	32	-9	0	34	6	0	0	1	0	1	65
20	***Cohlicopa* spp.**	**a pulmonate gastropod genus**	0	-8	0	27	0	0	0	0	0	1	20
21	***Salamandra salamandra***	**fire salamander**	28	-9	0	-2	0	0	0	1	16	0	33
22	**Dermaptera**	**earwigs**	2	-18	0	34	17	0	0	1	16	1	53
23	***Lacerta agilis, Podarcis taurica***	**sand lizard, Balkan wall lizard**	28	-25	0	45	17	0	0	0	10	0	75
24	***Cervus elaphus***	**red deer**	32	-9	0	34	6	0	0	2	47	1	114
25	***Mus spicilegus***	**steppe mouse**	28	-8	0	27	6	0	0	1	0	1	54
26	***Sceliphron destillatorium***	**mud dauber wasp**	2	-25	0	27	17	0	0	2	0	1	23

27	*Lymantria dispar*	Gypsy moth	28	-8	0	34	6	0	0	0	0	0	60
28	Myrmeleontidae	antlions	0	0	0	27	27	0	0	0	0	1	55
29	Notonectidae	backswimmers (true bugs)	2	-18	0	27	6	0	0	2	0	1	20
30	*Harmonia axyridis*	harlequin ladybird	2	-9	0	45	17	0	0	1	16	0	72
31	*Mus musculus*	house mouse	28	-25	0	45	27	0	0	2	19	0	96
32	*Musca domestica*	housefly	2	0	0	45	27	0	0	1	16	1	92
33	*Apis mellifera*	European honey bee	2	-25	0	45	27	0	0	2	47	0	99
34	*Mustela erminea*	stoat	26	-18	0	16	6	0	0	0	16	0	46
35	*Menacanthus stramineus*	chicken body louse	0	0	0	27	27	0	0	1	0	1	55
36	*Mantis religiosa*	European praying mantis	28	-9	0	34	17	0	0	0	16	0	86
37	*Macroglossum stellatarum*	hummingbird hawk-moth	2	-25	0	34	27	0	0	0	0	1	39
38	*Xylocopa violacea, Xylocopa valga*	black coloured carpenter bees	28	-18	0	27	6	0	0	2	0	1	46
39	*Vipera berus*	adder	26	-25	0	-2	6	0	0	3	19	1	28
40	*Blatta orientalis*	oriental cockroach	2	-25	0	27	27	0	0	3	19	0	53
41	*Lytta vesicatoria*	Spanish fly	28	-9	0	16	6	0	0	2	0	1	44
42	*Gyrinus natator*	whirligig beetle	0	0	0	16	6	0	0	0	0	1	24
43	*Hydrous piceus*	great silver water beetle	28	-25	0	27	6	0	0	1	0	1	37
44	*Lutra lutra*	Eurasian otter	32	-18	0	27	6	0	0	0	10	1	58
45	*Ostrinia nubilalis*	European corn borer	2	0	0	34	27	0	0	0	0	1	64
46	*Anguis fragilis* s.l.	slow worm species	28	-25	0	27	6	0	0	0	0	0	35
47	*Cepaea* spp.	land snail species	2	-18	0	27	6	0	0	0	0	1	18
48	Aleyrodina	whiteflies	0	-18	0	27	6	0	0	0	0	1	16
49	*Vespa crabro*	European hornet	28	-25	0	34	17	0	0	3	0	1	58
50	*Haemopis sanguisuga*	horse-leech	28	0	0	27	0	0	0	0	0	1	55
51	*Fasciola hepatica*	common liver-fluke	2	-8	0	16	17	0	0	2	0	1	30
52	*Melolontha melolontha*	cockchafer	28	-18	0	45	17	0	0	0	16	1	89
53	*Bovicola bovis*	red louse	0	0	0	16	27	0	0	0	0	1	44
54	*Acroloxus lacustris*	lake limpet	0	-8	0	27	0	0	0	0	0	1	20
55	*Emys orbicularis*	European pond turtle	26	-9	0	16	6	0	0	0	10	0	50
56	*Muscardinus avellanarius*	common dormouse	28	-25	0	27	0	0	0	0	0	0	30
57	*Mustela eversmanni*	steppe polecat	26	-25	0	16	6	0	0	0	0	0	23
58	*Ovis aries*	mouflon	32	-9	0	16	6	0	0	0	0	0	46
59	*Cerambyx cerdo*	great capricorn beetle	28	-9	0	16	6	0	0	0	0	0	41
60	*Andricus hungaricus*	Hungarian gall wasp	28	-18	0	27	6	0	0	0	19	0	62
61	*Glis glis*	edible dormouse	26	-25	0	27	6	0	0	0	16	0	50
62	*Lucanus cervus*	stag beetle	28	-9	0	27	6	0	0	1	16	0	69
63	*Martes foina*	stone marten	26	-18	0	34	27	0	0	0	0	1	70
64	Curculionidae	true weevils	2	-18	0	27	6	0	0	0	0	1	18
65	*Oryctes nasicornis*	European rhinoceros beetle	28	-9	0	16	6	0	0	0	0	0	41
66	*Argulus foliaceus*	common fish louse	0	-8	0	27	6	0	0	0	0	1	26
67	*Haematopota* spp.	clegs (horsefly species)	28	-8	0	27	17	0	0	2	10	1	76
68	*Tineola bisselliella*	common clothes moth	2	-8	0	45	27	0	0	0	0	1	67
69	*Pediculus humanus humanus*	body louse	0	0	0	-2	27	0	0	2	0	1	27
70	*Ips* spp.	engraver beetles	0	0	0	34	27	0	0	0	0	1	62
71	*Canis lupus*	wolf	32	-18	0	-2	0	0	0	3	47	1	63
72	*Triturus cristatus* s.l.	crested newt species	28	-18	0	27	0	0	0	0	0	0	36
73	*Oryctolagus*	European rabbit	26	-18	0	16	17	0	0	0	16	0	57

	cuniculus												
74	***Sus scrofa***	**wild boar**	32	-9	0	45	6	0	0	3	19	1	98
75	***Felis silvestris***	**wildcat**	32	-18	0	16	0	0	0	1	0	1	32
76	***Pyrrhocoris apterus***	**firebug**	2	-18	0	45	27	0	0	0	10	1	67
77	***Sciurus vulgaris***	**Eurasian red squirrel**	26	-9	0	34	6	0	0	0	19	0	77
78	***Bombina bombina***	**European fire-bellied toad**	28	-18	0	34	6	0	0	1	0	0	51
79	***Palomena prasina/***	**green shield bug**	2	-8	0	34	27	0	0	0	0	1	56
80	***Hyla arborea***	**European tree frog**	28	-18	0	45	6	0	0	0	19	0	80
81	***Bufotes viridis***	**European green toad**	28	-18	0	34	27	0	0	1	16	0	88