The important question of taxonomy and its impact on conservation efforts was brought to general attention by Robert May in 1990 with a News and Views article in Nature entitled “Taxonomy as destiny.” Taxonomy, however, has built-in instabilities that result in name changes, raising the question of whether name changes have a consistent impact on conservation efforts. Our review investigates three possible outcomes of taxonomic change, namely a positive impact on protection efforts, a hampering impact, or no measurable impact. We address these cases with a review of the relevant literature: specifically, government and conservation agency reports, scientific papers, and the general press, as well as correspondence with biologists active in plant and animal conservation. We found no evidence of a consistent effect of taxonomic change on conservation, although splitting taxa may tend to increase protection, and name changes may have the least effect where they concern charismatic organisms.
There have been several reviews that have analyzed the number of species moving on and off of local red lists as a result of changes in taxonomy. These changes were due mainly to the adoption of narrower or wider species concepts or to the correction of nomenclatural errors (Garnett et al., 2003; Lozano et al., 2007). However, changes in status on endangered species lists often do not equate to changes in conservation efforts. In this study, we therefore focus instead on cases where taxonomic change had a direct effect on conservation funding or efforts towards monitoring and research. This may have biased us towards finding positive or negative effects, rather than no impact (see Section 4). The specific question we wanted to answer was: Are the effects of “improved” (new) taxonomies on conservation efforts consistent and hence predictable? Although our review is limited by its qualitative nature, consisting of a number of case studies, it includes a broad range of clades, from several countries, classified under a variety of conservation laws and systems. To our knowledge, this is the first attempt to objectively focus on the practical effects of taxonomic instability on conservation efforts.

2. Methods

2.1. Survey for information

We searched for species or populations on lists of threatened or endangered species whose protection had changed due to changes in taxonomic rank or circumscription. Change in protection was defined and categorized as described below. At the global level, the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species (IUCN Red List; www.iucnredlist.org) and the species listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) were consulted. To determine changes in conservation status at regional or local levels and/or country legislation for protected species, we searched the following databases: US Fish & Wildlife Service (USFWS), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the Species at Risk Act Registry (SARA) of Canada, the Joint Nature Conservation Committee (JNCC) of the United Kingdom, Bayerisches Landesamt für Umwelt (Bavaria State Environmental Agency, Germany), The British Columbia Conservation Data Centre (CDC) and the Missouri Species and Communities of Conservation Concern Checklist. We also looked for information in the World Wildlife Fund, the Nature Server and the Xerces Society for Invertebrate Conservation, given that these organizations are currently dealing with endangered species conservation programs. We surveyed journals focusing on conservation (Biodiversity and Conservation, Biological Conservation, Conservation Biology, Conservation Genetics, Journal for Nature Conservation), general journals that report on conservation (e.g., Nature), and we searched the databases Science Direct, Blackwell-Synergy, JSTOR and Biomed Central using the search terms “conservation status change,” “taxonomic status change,” and “propose change conservation,” among others. Finally, we contacted experts from different branches and organizations concerned with nature conservation.

2.2. Impact of taxonomic change on conservation

Based on our initial findings and incorporating the terminology used in the 1990 Nature issue, we have separated our cases into three categories: (1) taxonomy protects, when the change had a positive effect on the conservation, for example, via increased efforts in monitoring programs; (2) taxonomy is irrelevant, when the change of rank or circumscription did not have any impact on the conservation status or efforts in conservation programs; and (3) taxonomy kills, when a taxonomic revision led to the decrease or discontinuation of conservation programs being carried out. A change in protection (conservation) was defined as increased or decreased monitoring of any kind, as well as increased or decreased funding for research on the respective organism.

3. Results

3.1. Taxonomy protects

We found numerous examples where a change in taxonomy led to increased efforts in conservation, in groups as diverse as plants, birds, frogs, dolphins, and giraffes. One example is the Chiricahua leopard frog (Rana chiricahuensis), whose current range is restricted to eastern Arizona in the United States (Table 1). This species was originally assigned to Rana pipientis, but was subsequently split into over two dozen species (Hillis, 1988), one being the Chiricahua leopard frog (Platz and Mecham, 1979). Because of the rapid extirpation of this frog from its historical range (Clarkson and Rorabough, 1989), the Chiricahua leopard frog was listed as threatened in 2002 under the Endangered Species Act of 1973 (ESA), whereas R. pipientis enjoys no special conservation status (Humphrey and Fox, 2002; Rorabough, 2002). In response to the listing, the Malpai Borderlands Group was formed (Glick, 2005), which is a group of private landowners and over 12 public institutions that has thus far protected over 30,350 ha of private land in the form of conservation easements.

A plant example where taxonomic change (i.e., new taxonomy, not necessarily a taxonomy arrived at by majority consensus) has led to increased protection is in the mountain ash (Sorbus) of central Europe. Recently, over 20 new species were described in this formerly poorly documented genus (Meyer et al., 2005: but see Aldasoro et al., 2004). All 20 are now found on the Bavarian Red List of Vascular Plants, with subsequent support for their conservation coming from the Bayerische Landesamt für Umweltschutz, the Naturpark Fränkische Schweiz, the foundation Schöpfung Bewahren Konkret, and other nature protection organizations, including several volunteer and benefactor agencies (Scheueringer and Ahlmer, 2003).

Similarly, conservation of the Ozark spring beauty (Claytonia ozarkensis) was beneficially affected by a taxonomic name change. This herb occurs sympatrically with congeners in Arkansas, Missouri and Oklahoma. Specimens had been misidentified as Claytonia virginica or Claytonia caroliniana until a complete taxonomic revision of the genus resulted in the description of the new, previously overlooked species C. ozarkensis in 2006. This discovery triggered immediate protection efforts (Missouri Natural Heritage Program, 2009) due to the rarity of C. ozarkensis, which consists of only a dozen populations (G. Yatskievych, Missouri Botanical Garden, St. Louis, personal communication, 2008).

Another example of new taxonomy leading to increased conservation efforts is that of the California gnatcatcher, Polioptila californica. The California gnatcatcher was originally recognized as a species in 1881, but was lumped back with the black-tailed gnatcatcher (Polioptila melanura) half a century later because of similarities in plumage coloring (Grinnell, 1926). It was re-split from the black-tailed gnatcatcher in 1989, on the basis of distinctive song and morphology (Atwood, 1988; later confirmed by molecular studies; Zink et al., 2000). After recognition of its species status, the California gnatcatcher received greater habitat protection (from encroaching development) and better monitoring programs (Zink et al., 2000), in a variety of national and state parks (Atwood and Bontrager, 2001). As in the case of the Chiricahua leopard frog, the species from which the California gnatcatcher was split received no special attention. Taxonomic research revealed the narrow geographic range of these species, bringing to light the need to protect them and this need was acted upon with increased conservation efforts.
Table 1
Summary of cases where changes in taxonomy either helped conservation efforts, hampered them, or were irrelevant for conservation efforts.

<table>
<thead>
<tr>
<th>Name</th>
<th>IUCN* ver. 3.1 (IUCN, 2008)</th>
<th>Local red lists</th>
<th>Geographic region</th>
<th>Case details</th>
<th>Impact of taxonomy on conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rowan/mountain ash Sorbus spp.</td>
<td>Not listed</td>
<td>All listed</td>
<td>Central Europe</td>
<td>Revision of Sorbus (Meyer et al., 2005), led to many new species receiving attention from local protection agencies</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Scurvy-Grass Cochlearia bavarica (Vogt, 1985)</td>
<td>Not listed</td>
<td>Highly endangered</td>
<td>Southern Bavaria</td>
<td>Chromosome and morphological analysis led to description of C. bavarica as new sp. in 1985</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>California gnatsnatch Poliopilina californica (Brewster, 1888)</td>
<td>Least concern</td>
<td>Least concern</td>
<td>California</td>
<td>Subspecies which gained full species status in 1989 (Zink et al., 2000)</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Chiricahua leopard frog Rana chiricaheusensis (Platz and Mecham, 1979)</td>
<td>Vulnerable</td>
<td>Threatened</td>
<td>Arizona</td>
<td>Genetically distinct from R. pipiens (Platz and Mecham, 1979), which has no special conservation status in the USA</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Spring beauty Claytonia azakensis (Mill and Chambers, 1993)</td>
<td>Not listed</td>
<td>Critically imperiled</td>
<td>Arkansas west to Oklahoma</td>
<td>Described as new species in 2006 (Miller and Chambers, 2006)</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Rockeys mountain tailed frog Acridita montanus (Nielson et al., 2001)</td>
<td>Least concern</td>
<td>Endangered in Canada</td>
<td>BC along the Rocky Mountains, into Montana</td>
<td>Split from A. truei based on molecular evidence (Carstens et al., 2005; Nielson et al., 2001)</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Pink River Dolphin Inia boliviensis (d’Orbigny, 1834)</td>
<td>Data deficient</td>
<td>Data deficient</td>
<td>Amazon</td>
<td>Genetic data strongly indicate the existence of a separate gene pool/species in Bolivia (Banguera-Hinestroza et al., 2002)</td>
<td>Increased conservation</td>
</tr>
<tr>
<td>Lapland marsh-orchid Dactylorhiza laponica (Laest. ex Hartm) Soö (1873)</td>
<td>Not listed</td>
<td>Delisted</td>
<td>British Isles</td>
<td>Synonymized under D. trunei, a more frequent species (Bateman, 2001). D. laponica lost status as threatened sp.</td>
<td>No change</td>
</tr>
<tr>
<td>Galápagos Sea Lion Zalophus wollebaeki (Sivertsen, 1953)</td>
<td>Endangered</td>
<td></td>
<td>Galápagos endemics are protected</td>
<td>Species status validated with molecular data (Wolf et al., 2007). It has experienced population size decrease in the last 30 years</td>
<td>No change</td>
</tr>
<tr>
<td>West African Grassie Graffia camelopardalis peralta (Linnaeus, 1758)</td>
<td>Least concern</td>
<td></td>
<td>Niger</td>
<td>Genetic evidence points to another sp. or ssp. not represented in zoos and losing habitat in west Africa</td>
<td>No change</td>
</tr>
<tr>
<td>Polar Bear Ursus maritimus (Phipps, 1774)</td>
<td>Vulnerable</td>
<td>Federally threatened</td>
<td>Circumpolar</td>
<td>Genetic evidence: this sp. is this species is poorly distinct from brown bears (Talbot and Shields, 1996a,b)</td>
<td>No change</td>
</tr>
<tr>
<td>Red Wolf Canis rufus (Audubon and Bachman, 1851)</td>
<td>Critically endangered</td>
<td></td>
<td>Southeast USA</td>
<td>Genetic data shows that this is a form of the Gray Wolf, C. lupus (Wilson and Reeder, 2005)</td>
<td>No change</td>
</tr>
<tr>
<td>Marbeled Murrelet Brachyramphus marmoratus (Gmelin, 1789)</td>
<td>Endangered</td>
<td></td>
<td>Pacific Northwest</td>
<td>There are actually five sp. (Friesen et al., 2005); Petition filed in May 2008 to remove the sp. from the endangered wildlife list; action is under review</td>
<td>No change</td>
</tr>
<tr>
<td>Ramsey canyon leopard frog Rana subauvocalis (Platz, 1993)</td>
<td>Critically endangered</td>
<td>Protected by local conservation agreements</td>
<td>SE Arizona</td>
<td>R. subauvocalis genetically indistinguishable from R. chiricaheusensis (Goldberg et al., 2004)</td>
<td>No change</td>
</tr>
<tr>
<td>Green Sea turtle Chelonio mydas (Bocourt, 1868)</td>
<td>Endangered</td>
<td>Threatened</td>
<td>East-Pacific, but range unclear</td>
<td>No genetic distinction between C. agassizii and C. mydas (Karl and Bowen, 1999)</td>
<td>No change</td>
</tr>
<tr>
<td>Dusky seaside sparrows Ammodramus maritimus nigrescens (Ridgway, 1873)</td>
<td>Extinct</td>
<td>Not listed</td>
<td>Florida</td>
<td>Species status removed in 1973, along with protection. The subspecies was declared extinct in 1990 (Rising, 2005)</td>
<td>Decreased conservation</td>
</tr>
<tr>
<td>Lloyd’s hedgehog cactus Echinocereus lloydii (Britton and Rose, 1922)</td>
<td>Not listed</td>
<td>Delisted in 1999</td>
<td>Texas and New Mexico</td>
<td>Was a hybrid between E. coccineus and E. dayacanthus (Powell et al., 1991)</td>
<td>Decreased conservation</td>
</tr>
<tr>
<td>Cape Verde kite Milvus milvus fasciculata (Hartert, 1914)</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Cape Verde archipelago</td>
<td>Not genetically distinct (Johnson et al., 2005). No protection given to the subspecies</td>
<td>Decreased conservation</td>
</tr>
<tr>
<td>Idaho springsnail Pyrgulopsis idahoensis (Pilsbry, 1933)</td>
<td>Data deficient</td>
<td>Nationally endangered but recently delisted</td>
<td>SW Idaho</td>
<td>Listed in 1992 as endangered sp., but delisted in 2007. Reason: this sp. should be grouped with Pyrgulopsis robusta (Hershler and Liu, 2004), a sp. with a much greater range</td>
<td>Decreased conservation</td>
</tr>
<tr>
<td>Mitchell’s satyr butterfly Neonympha mitchelli mitchelli (French, 1889)</td>
<td>Not listed</td>
<td>Nationally endangered</td>
<td>SW Michigan and N Indiana</td>
<td>New pops found in AL, MS and VA, but actually of the ssp. N. francisci francisci; lost conservation status since this is not an endangered species (Goldstein et al., 2004)</td>
<td>Decreased conservation (for new populations)</td>
</tr>
</tbody>
</table>

All the above cases have one common thread: they represent species that have been subdivided, with the more narrowly circumscribed entities then afforded increased protection.

3.2. Taxonomy is irrelevant

We found at least five situations where conservation efforts ignore taxonomic changes. First, there is the case of charismatic organisms. An example of a charismatic animal is the red wolf (Canis rufus), a highly endangered mammal with remaining populations in small regions of the US and Canada (Nowak, 2002, 2003). The species status of the red wolf has been a matter of debate, with some workers viewing it as a distinct species, others as a hybrid between the grey wolf (Canis lupus) and the coyote (Canis latrans; Wayne and Jenks, 1991). Further molecular analyses suggest that the red wolf is a subspecies of C. lupus (Murray and Waits, 2007). As far as we could ascertain, these changes have not changed conservation efforts or monitoring and reintroduction programs (USFWS, 2007b).

A similar case is the polar bear (Ursus maritimus). Several phylogenies of Ursidae, based on mitochondrial and nuclear DNA, increasingly suggests that polar bears and brown bears (Ursus arctos) are not mutually monophyletic (Taibot and Shields, 1996a, 1996b; Waits et al., 1999). This may mean that the polar bear is not a biological species, a fact that could hinder conservation efforts. Nevertheless, after a 3-year long review, the USFWS made its final ruling in 2008 that the polar bear is a threatened species (Schliebe and Johnson, 2008). This has led to continued monitoring and conservation activities among assorted institutions (USFWS, 2008). However, the real threat for the polar bear now is climate change (Williams, 2009).

Another example of a charismatic animal that has received continued protection despite changed taxonomy is the green turtle (Chelonia mydas). This sea turtle had been considered an endangered species since 1982 due to decreasing population sizes (IUCN). In 1999, a molecular study indicated no significant distinction between the green turtle and the black turtle (Chelonia agassizii; Karl and Bowen, 1999), and as a result Chelonia mydas and C. agassizii are now treated as a single species (NMFS and USFWS, 2007). However, a monitoring program for the green turtle was started in Mozambique in 2004 by the WWF Homeland Foundation-USA and represents an investment of $210,000 USD (www.wwf.org.mz). Despite the fact that the taxonomy of black and green turtles remains doubtful, monitoring and protection have been maintained continuously.

The second situation where conservation decisions ignore taxonomic changes concerns certain areas and ecosystems of the world that are protected and, therefore, everything living within those areas receives conservation status, regardless of taxonomic name changes. One such ecosystem is the Galápagos archipelago, and the example animal is the Galápagos sea lion (Zalophus wollebaeki). Until recently, this sea lion was considered a subspecies of the California sea lion (Zalophus californicus), which has a different demography and conservation status. In 2006, an analysis of mitochondrial and nuclear DNA markers showed that the Galapagos sea lion is a separate species (Wolf et al., 2007). However, monitoring and conservation actions have not been affected by the taxonomic change (Alava and Salazar, 2006; CDF, 2006).

A third case of conservation efforts consciously ignoring taxonomy (at least low-level taxonomies) involves endangered groups that receive blanket protection, for example, Orchidaceae. The lapland marsh-orchid (Dactylorhiza lapponica), which occurs in sloping fens throughout Europe, has received conservation attention in the British Isles due to habitat loss and degradation. It was included in Schedule 8 of the Wildlife and Countryside Act, 1981 (JNCC, 2008), giving it additional protection. However, morphological and molecular studies have shown that individuals from the British Isles belong to Dactylorhiza traunsteineri, a common European species (Bateman, 2001). Consequently, D. lapponica has lost its threatened status (Cheffings and Farrell, 2005). Regardless of this taxonomic lumping, its collection remains highly restricted as it is included in Appendix II of CITES, which lists species that are not currently threatened with extinction but that may become so unless trade is controlled.

Organisms with economic value are a fourth case where taxonomic change is irrelevant to conservation efforts. An example are marine stocks such as salmon, tuna, oysters, and anchovies; taxonomic work on these animals focuses on identifying genetically distinct stock lines for creating guidelines and quotas. In the case of salmon, there was a push to identify wild strains that could qualify for wildlife protection under the ESA act (Allendorf and Waples, 1996; National Research Council, 1996).

3.3. Taxonomy kills

Cases where taxonomic change (i.e., new “good” taxonomy) resulted in less protection for populations concerned species that were lumped with another, typically becoming a subspecies or variety. The larger group then has a greater range, resulting in decreased conservation efforts for the subspecies. This was the case for the Idaho spring snail (Pyrgulopsis idahoensis), with a range limited to the Snake River in Idaho, USA (Hershler, 1994). In 1992, P. idahoensis was listed under the ESA as endangered (Duke, 1992), followed by recovery plans by the USFWS to restore habitat along the Snake River as well as ensure self-sustaining breeding populations of P. idahoensis (USFWS, 1995). However, new genetic evidence emerged in 2004, after which P. idahoensis was grouped with Pyrgulopsis robusta (Hershler and Liu, 2004). As a result, the USFWS removed P. idahoensis from the endangered list (USFWS, 2007a), which has resulted in decreased monitoring efforts (USFWS, 2007c).

The dusky seaside sparrow (Ammodramus maritimus nigrescens), declared extinct in 1990, is another case where a species was lumped within another larger species. This passerine bird’s extinction was due to loss of habitat in the salt marshes of Florida, USA (Walters, 1992). The dusky seaside sparrow was ranked as a species, Ammospiza nigrescens, until 1973 when the American Ornithologists’ Union (AOU) Checklist Committee lumped it with the seaside sparrow (AOU, 1973; Rising, 2005). The seaside sparrow has a much larger range and is a species of least concern. In the 1980s, there were petitions for protection of the duskies and for according them species status. However, by 1990, the dusky seaside sparrow was extinct (Walters, 1992; Rising, 2005).

Another case where new taxonomic insights (and following name changes) can result in less protection concerns hybrids, which are not protected under conservation acts and laws. Lloyd’s hedgehog cactus (Echinocereus lloydii) was listed as endangered in 1983 due to threats from over-collection and highway projects in the state of Texas (Poole and Riskind, 1987). However, data from morphology, cytology and experimental hybridization revealed that E. lloydii was a hybrid between Echinocereus coccineus and Echinocereus dasyacanthus (Powell et al., 1991). Accordingly in 1999 Lloyd’s hedgehog cactus was removed from the Federal List of Endangered and Threatened Plants, thereafter receiving less habitat protection (Kennedy, 1999).

4. Discussion

Our findings show that the phrase “bad taxonomy can kill,” coined by the editorial staff of Nature (1990) and used widely since
(Funk et al., 2002; Gittleman and Pimm, 1991; Khuroo et al., 2007; Mace, 2004; McNeely, 2002; Russello et al., 2005), does not ade-
quately describe how taxonomic research affects conservation. It
implies that good (new) taxonomies will generally help the protec-
tion of organisms, while bad (old) classifications will generally
harm conservation efforts. Instead we found that changes in taxon-
omy do not have consistent and predictable impacts on conserva-
tion. Nevertheless, there are some general trends: (i) All of the
examples where taxonomic change helped protection involve
splitting (Table 1: Chiricahua leopard frog, Ozark spring beauty,
Sorbus). (ii) Taxonomic change has least impact on the protec-
tion of iconic or charismatic organisms, protected areas of special sta-
tus, and economically important groups. And finally (iii), taxon-
omic progress can be detrimental to conservation when it
involves species amalgamation ( lumping) or reveals the hybrid
nature of a species.

It has been suggested that a phylogenetic species concept may
courage up-ranking of varieties or subspecies to species, perhaps
up to by 48% (Agapow et al., 2004). This may cause taxonomic
inflation, a loaded term for what others see as the much-needed
incorporation of evolutionary research into taxonomy (Isaac et al., 2004; Knapp et al., 2005). The use of species lists in legisla-
tion and fundraising may also have created non-biological forces
that favor splitting over lumping (Kar1 and Bowen, 1999; Meiri
and Mace, 2007; Padial and De La Riva, 2006). Splitting carries
the added allure of associating the author’s name with the newly
described taxon. However, when Padial and De La Riva (2006)
looked at the number of amphibian subspecies up-ranked to, or de-
moved from, species rank between 1980 and 2004, they found no
definite trend and concluded that rank changes reflected random
fluctuations in taxonomic effort. Their paper also graphed a large
upsurge in taxonomic splits, beginning in the 1950s (their Fig. 3),
suggestive of a pervasive trend in herpetology away from recogniz-
ing subspecies and toward recognizing allopecies of a superspe-
cies. There do not appear to be data from other groups on
whether taxonomic change is becoming biased towards splitting
or if there is an increased willingness of taxonomists to split for
conservation purposes.

As pointed out by others (e.g., Leme, 2003), lumping of taxa can
lead to purely nominal extinctions. However, when errors are
made in synonymizing names, nominal extinctions lead to real
extinctions if species are delisted as a result, with subsequent ces-
sation in monitoring and policy efforts for their protection. Our
example of the dusky seaside sparrow is the only example we
found of such a nominal extinction having turned into a real
extinction. Conversely, there can be nominal resurrections where
species considered extinct are reborn through taxonomic research
(e.g., Melospiza melodia graminea, endemic to islands off the coast
of southern California; Patten and Pruett, 2009). If the resurrected
taxon has a restricted range and is at risk, then conservation ac-
tions might result, leading to another example of “good taxonomy
can protect.”

Since our literature search was focused on finding cases where
taxonomic change had a direct effect on conservation efforts, our
results may be biased towards positive or negative effects, rather
than no impact. Even so, we found many examples of taxonomic
change being irrelevant to conservation efforts (e.g., red wolf, polar
bear, green turtle, which may not be biological species, yet are ac-
tively protected). This illustrates that conservation efforts often (?)
disregard taxonomic research. Populations valued by humans, for
whatever reason – charisma, beauty, or economic worth – are pro-
tected regardless of their taxonomic rank. This fits with conserva-
tion, like taxonomy, being strongly biased towards particular
clades. In a review of 2700 conservation-focused articles, verte-
brates were the focus of 67%, yet contribute only about 3% of the
species on Earth (Clark and May, 2002).

A limitation of our review is that it is only qualitative; yet to our
knowledge, this is the first attempt to compile information on
whether taxonomic change has a consistent (positive or negative)
effect on conservation efforts. Our failure to pick up any consistent
relationship between revised taxonomic views and conservation
efforts suggests that the positive and negative effects of taxonomic
change on conservation efforts may balance each other. A question
for a future metaanalysis would be if different species concepts in
the different taxonomic sub-disciplines have influenced conserva-
tion measures for those organisms. If specialists in a given group
tended to accept narrower species, with their attendant smaller
ranges, they might unintentionally help their taxon’s conservation.

It is important to remember, however, that taxonomy has many
functions besides helping biodiversity conservation. Taxonomy is
the basis for communicating about organisms. Moreover, it is
important for medicine and human health (Utevsy and Trontelj
(2005) for a striking example). And, while taxonomic change may
have no predictable effects on conservation, a better understand-
ing of evolutionary relationships, resulting from taxonomic research, is
always an important addition to our knowledge about the organ-
isms that we want to protect.

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