PHILOSOPHICAL TRANSACTIONS A

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Opinion piece

Cite this article: Monge-Ganuzas M, Guillén-Mondéjar F, Díaz-Martínez E, Herrero N, Brilha J. 2024 Geoconservation at the International Union for Conservation of Nature (IUCN). *Phil. Trans. R. Soc. A* **382**: 20230053. https://doi.org/10.1098/rsta.2023.0053

Received: 28 March 2023
Accepted: 28 June 2023

One contribution of 16 to a Theo Murphy meeting issue 'Geodiversity for science and society'.

Subject Areas:
geology

Keywords:
geoconservation, nature conservation

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THE ROYAL SOCIETY PUBLISHING

Geoconservation at the International Union for Conservation of Nature (IUCN)

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This work describes the achievements made towards geoconservation within the International Union for Conservation of Nature (IUCN) from the 1990s onwards. The key milestones in the recognition of geoconservation within the IUCN are presented. Initially, the IUCN's geoconservation efforts were focused on refining the criteria for World Heritage (WH) designation. Subsequently, the actions focused on spreading the geoconservation framework within the IUCN World Conservation Congresses (WCCs), the establishment of an expert group on geoconservation within the IUCN World Commission on Protected Areas (IUCN-WCPA) and the publication of

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guidelines for geoconservation. We describe how the inclusion within the IUCN membership of three organizations—two of them Spanish: The Geological Society of Spain (SGE) and the Society for the Defence of Geological and Mining Heritage (SEDPGYM); and one international, ProGEO—has been a key factor. These organizations have achieved the adoption of resolutions in which geoconservation, its vision, its principles and its definitions have been taken into account in the IUCN WCC (2008–2020 period), and have promoted the geoconservation conceptual framework among nature conservationists. We also analyse the progress made and offer a series of recommendations to improve geoconservation in the future adopting a more integrated approach to nature conservation within the IUCN.

This article is part of the Theo Murphy meeting issue 'Geodiversity for science and society'.

1. Introduction

Initially, Sharples [1] defined geoconservation as the conservation of certain geological elements owing to their intrinsic, ecological and heritage values. Later, Prosser [2], (p. 568) expanded this definition by qualifying geoconservation as 'the action taken with the intent of conserving and enhancing geological, geomorphological and soil features, processes, sites and specimens, including associated promotional and awareness raising activities and the recording and rescue of data or specimens from features and sites threatened with loss or damage'. Moreover, it is clear that geoheritage is also essential to support geoscientific studies [3], implement educational and interpretative uses [4,5], develop recreational and touristic activities [6,7], provide ecosystem geoservices [8–10] and to support a range of cultural interests [11], among others. We can affirm that conserving some valuable geological elements (geoheritage) is, therefore, a social need [12].

However, historically, society has identified nature conservation principally with the conservation of biodiversity. This may be because society views nature as largely comprising only species and habitats, ignoring the importance of the geological elements that underpin and provide the active processes, landscapes and substrate materials that interact with them. In addition, bio-conservationists, concerned about species survival after World War II [13], foresaw the essential connection between human survival and biodiversity conservation and knew how to link their thinking to international concerns of the day. However, they overlooked the essential role that geodiversity plays in the persistence and resilience of biodiversity and, therefore, in that of human beings. With regard to the relationship between geodiversity and biodiversity, Crofts [14], (pp. 263–264) commented that 'geodiversity compared with biodiversity still lacks the status and standing in political, diplomatic, policy and public arenas' and that although 'it is the abiotic equivalent of biodiversity and is, therefore, its natural complement, geodiversity has a separate and unlinked focus'. This author also states that international expert groups have collaborated to develop the conceptual basis and arguments for international agreement and action on biodiversity, whereas for geodiversity this is non-existent.

The International Union for Conservation of Nature (IUCN), established in 1948 in Fontainebleau (France), is a worldwide membership union for nature conservation [15]. It is composed of both government and civil society organizations and harnesses the experience of more than 1400 member organizations and the input of more than 18 000 experts. Every four years, it convenes the IUCN World Conservation Congress (WCC) where its members set the global conservation agenda by voting on recommendations and guide the secretariat's work by passing resolutions and approving the IUCN Programme. The IUCN Council is its principal governing body between sessions of the WCC. Members of the IUCN elect commission chairs and representatives from member organizations to serve four-year terms on the Council. The IUCN secretariat works with member organizations and IUCN Commissions to implement the vision of the IUCN's membership. The secretariat includes around 900 staff and projects in over 160 countries.

The first reference to geoheritage identification and management we can find in the IUCN bibliographic repository dates from the late 1990s. Wells [16] provided a contextual framework

on Earth's geological history in the form of an overview discussion paper which served to assist in evaluations of natural UNESCO World Heritage (WH) properties concerning former natural criterion (i) (current criterion (viii); [17]). Wells addresses the key events of the history of life on Earth; for which fossil deposits have made major contributions to this understanding; and whether the existing sites on the WH List adequately represented these various stages of Earth's history.

It was not until almost ten years later that geoheritage attracted renewed interest within the IUCN. Dingwall *et al*. [18] discussed again the role of the WH Convention in recognizing and protecting geological and geomorphological heritage, and presented proposals based on a global consultation. They stated that the UNESCO WH Convention could recognize geological (including geomorphological) values either directly or indirectly. Direct recognition of such values came through inscription of properties on the UNESCO WH List under current criterion (viii), either on its own or in combination with other natural or cultural criteria. Moreover, they affirmed that the Convention was also capable of recognizing the supportive value of geological (including geomorphological) values, underpinning biological, cultural and landscape diversity, but that the ways to achieve this needed further discussion. They indicated that the WH process was highly selective with its underlying principles for the recognition of heritage of outstanding universal value, with a high level of site integrity and authenticity and effective site management. Some geological and geomorphological phenomena and sites, although of national or regional significance, were not suitable for WH inscription because they did not meet the criteria of outstanding universal value or did not satisfy the required conditions of integrity or management. Dingwall *et al*. [18] concluded that, in determining the potential role of the WH Convention in protecting and recognizing a particular property, states, regional experts and international organizations should: (1) fully consider the use of alternative designation options, through national or international programmes; (2) consider if a property merits nomination under criterion (viii) alone or in combination with other criteria, or if the geological (including the geomorphological) values support biodiversity, cultural or landscape values; (3), undertake a rigorous global comparative analysis to ensure that a property does have global significance.

During the following years, the IUCN dedicated its geoconservation efforts to analysing different geological environments in relation to their identification and possibilities of declaration as the UNESCO WH sites. Some examples are the publications related to caves and karst [19], volcanoes [20,21] and desert landscapes and geomorphological sites [22]. Recently, McKeever & Narbonne [23] presented a revised global framework for the application of criterion (viii) for geological WH. These authors revised the study of Dingwall *et al*. [18] to refine the proposed themes, articulate the threshold of Outstanding Universal Value, and clarify the difference between criterion (viii) and UNESCO Global Geopark status. They also examined each designation and presented a pathway to help states determine whether one of these two UNESCO designations might be appropriate for any possible new territories, and to distinguish sites with the potential for inscription on the WH List.

From a geoconservation viewpoint, and linked to the idea of a more holistic approach to nature conservation, Crofts [24] stated that geoconservationists should think strategically in a wider context. He argued that they should embrace the whole of nature, as well as the cultural environments in which geoheritage exists. In this way, they could connect with global agendas, influence the evolution of thinking and promote action on an international scale. He also indicated that geoconservationists should be linking their approach with the interconnections between biotic and abiotic nature, and that there is a need to interact with the wider nature conservation movement and to put effort into celebrating iconic places in a meaningful way. Finally, he pointed out the scarce number of NGOs involved in geoconservation worldwide.

To help address the under-representation of geoconservation in the IUCN, three geoconservation organizations were made members: the Geological Society of Spain (SGE, since 2008), the European (now International) Association for the Conservation of Geological Heritage (ProGEO, since 2011) and the Spanish Society for the Defence of the Geological and Mining Heritage (SEDPGYM, since 2015). These three organizations are still working within

the IUCN with the objective that conservation of nature should consider the conservation of its indissoluble parts: biodiversity, the geodiversity that underpins it and geoheritage. The SGE includes a Commission on Geological Heritage created in 1994, which has the objective to promote research and proper conservation, use and management and dissemination of geodiversity and geoheritage [25]. The ProGEO was established in 1993 as a European association, but in June 2021 it became an international body. It is an NGO with members distributed worldwide and looks to a future in which conservation of geoheritage and management of geodiversity are integrated with biodiversity conservation. The SEDPGYM, founded in 1995, is concerned with geological and mining-metallurgical heritage. Its purpose is to promote, disseminate and coordinate activities aimed at the study, inventory, protection, conservation and restoration of both geological heritage and mining-metallurgical heritage.

This paper reviews the geoconservation actions taken within the IUCN, the successes achieved and the need for improvement. It also explains the work that the three member organizations have carried out during the last decades and sets out a series of recommendations for the new challenges that geoconservation will have to face in coming years.

2. The world conservation congress, Barcelona (Spain) 2008 (WCC 2008)

The slow but steady incorporation of geoconservation into the IUCN resolutions began in 2008 when the SGE joined the IUCN as a national and non-governmental member [26]. In that year, the IUCN included the conservation of geoheritage and geodiversity into its agenda, following a motion proposed by the SGE to the WCC, which was approved with high acceptance. The motion became the 'WCC2008-Res040 Conservation of geodiversity and geoheritage' resolution [27] (see table 1). This resolution recalled that geodiversity is a crucial factor conditioning biological, cultural and landscape diversity, and that humans must preserve for future generations geological aspects with high scientific, cultural, aesthetic or educational values [28].

Resolution WCC2008-Res040 took advantage of the fact that the United Nations General Assembly had proclaimed 2008 as 'The International Year of Planet Earth' to raise awareness of the importance of Earth sciences in achieving sustainable development. Moreover, the IUCN was aware of the growing interest and commitment of states, NGOs and communities to save, study and sustainably use their geodiversity and geoheritage, as they were considered as factors underpinning biological, cultural and landscape diversity. The IUCN also considers geoheritage because of its economic and intrinsic values, which need to be preserved and handed down to future generations. Another strong argument supporting the adoption of the 2008 resolution was the work led by the Global Geoparks Network (GGN) to promote the conservation and sustainable use of geoheritage. Additionally, Recommendation Rec(2004)3 'Conservation of the Geoheritage and Areas of Special Geological Interest' approved by the Council of Europe in 2004 also helped to adopt the decision [29]. This latter resolution called to strengthen cooperation among international organizations, scientific institutions and NGOs in the field of geoheritage conservation, and to participate in geoconservation programmes.

Resolution WCC2008-Res040 called for IUCN members to support the secretariat in the design, organization, hosting and funding of future IUCN World Conservation Forum sessions on geodiversity and geoheritage to ensure that those sessions would achieve the involvement of government, independent-sector groups and international organizations around the world. The WCC also requested the IUCN Director General convene a series of meetings on geodiversity and geoheritage and to establish a secretariat focal point to facilitate the organization of these meetings. Moreover, the WCC called on IUCN Commissions, especially, the World Commission on Protected Areas (WCPA), to support the secretariat in the implementation of these actions.

However, resolution WCC2008-Res040 did not provoke significant changes in IUCN strategies or budgets. From 2008 onwards the IUCN was supposed to have designed, organized and encouraged workshops and conferences about geoconservation, as was previously done in relation to biodiversity conservation. Unfortunately, despite the fact that 15 years have passed

Table 1. List of resolutions directly related to geoconservation approved by the IUCN's General Assembly during the period 2008–2020. There are other resolutions with indirect links to geoconservation (https://portals.iucn.org/library/resrec/search).

IUCN GEO-RESOLUTIONS
WCC2008-Res040 Conservation of geodiversity and geoheritage.
WCC2012-Res048 Valuing and conserving geoheritage within the IUCN Programme 2013–2016.
WCC2016-Res083 Preservation of moveable geoheritage.
WCC2020-Res074 Geoheritage and Protected Areas.
WCC2020-Res088 Conservation of the natural diversity and natural heritage in mining environments.

since the adoption of this resolution, the IUCN continues to use the term biodiversity when the whole of nature is addressed.

3. The world conservation congress, Jeju (South Korea) 2012 (WCC 2012)

Four years later, the SGE proposed a new motion and four geoconservation-related activities to be developed at the WCC 2012 Forum: a training course about geoconservation, a round-table on geoheritage and geodiversity, presentation of a thematic poster and a documentary about geoheritage and geoconservation [26,30].

Because the IUCN Draft Programme 2013–2016, presented for discussion, was entirely focused on biodiversity, in March 2012 both the SGE and ProGEO made a joint proposal for its amendment. They proposed that, when reference is made to 'natural diversity' in general, then that term should be used instead of 'biodiversity', which had been the practice to date. It was also proposed to use the terms geodiversity and geoheritage in IUCN strategic documents where appropriate. These proposals, which apparently did not imply any paradigm shift in the nature conservation world, surprisingly, were not accepted. The IUCN European Regional Office replied that this change in terminology implied a change in IUCN policy, and that therefore, an explicit resolution passed by the IUCN General Assembly was necessary to change IUCN policy. The conclusion, considering this answer, was that it was necessary to present a motion requesting such a change in the programme.

The SGE motion was approved by the General Assembly, becoming resolution 'WCC-Res048 Valuing and conserving geoheritage within the IUCN Programme 2013–2016' [31]. This resolution recommends that when reference in this programme is made to 'natural diversity' in general, then that term should be used instead of 'biodiversity'. In addition, the resolution highlighted the increasing interest and greater commitment of states, NGOs and communities with respect to the preservation, value assessment, study and sustainable use of geodiversity and geoheritage. The resolution acknowledged that geoconservation also contributes to prevent the loss of species and habitats, and to preserve the integrity of ecosystems, as well as to safeguard the diversity and quality of landscapes. Moreover, resolution WCC2012-Res048 introduced for the first time a reference to the pioneering work carried out by UNESCO and other international institutions in the promotion and sustainable use of geoheritage to stimulate local socio-economic development in underdeveloped regions through the GGN.

Following the adoption of resolution WCC2012-Res048, the WCC requested the IUCN Director General initiate a discussion in the regions on the conservation and management of geodiversity and geoheritage, in collaboration with IUCN members and other organizations. Resolution WCC2012-Res048 also called on IUCN Commissions, and in particular the WCPA to: (1) promote and support local socio-economic development initiatives, such as Global Geoparks, based on the sustainable use of geoheritage, including the proper management of geoheritage in protected areas; (2) promote and support, in collaboration with UNESCO and the International Union of Geological Sciences (IUGS), the elaboration and extension of the inventory for the Global Geosites

Programme, as well as other regional and international inventories of geosites and (3) support the Secretariat in the implementation of the actions requested in point 2 above.

During the WCC 2012, geoconservationists made a significant step forward to strength geoconservation within the IUCN with the acceptance of the WCPA to establish a Geoheritage Specialist Group (WCPA-GSG, https://www.iucn.org/our-union/commissions/group/iucn-wcpa-geoheritage-specialist-group) [30,32–35]. One year later, ProGEO and SGE members and other geoheritage experts attended a workshop held in Korea to develop the proposal. The formal recognition of this group came in 2013 after the WCPA-GSG terms of reference were officially approved by the IUCN [34,36]. The purpose of the GSG is to provide specialist advice and guidance on geoconservation for the management of protected areas, to help to integrate geoconservation into IUCN programmes and to promote the links between geodiversity and biodiversity [37].

Following resolution WCC2012-Res048, geoconservationists worked to get geoheritage on the agenda of the sixth IUCN-WCPA World Parks Congress (WPC) that was held in Sydney, Australia, in 2014, and published a paper to promote geoconservation in protected areas on the IUCN's *Parks* journal [14,35].

In 2015, a new version of the WCPA Protected Area Governance and Management manual was published, which, for the first time, contained a chapter on geoheritage [38]. These authors stated that geoheritage conservation is not just restricted to Category III (Natural Monument or Feature), but applies across all six IUCN protected area categories [39].

4. The world conservation congress, Honolulu (USA) 2016 (WCC 2016)

Thanks to the work done by geoconservationists during the WCC 2016, the final Hawaiian Commitments statement makes explicit the need to conserve nature in a holistic way. The SGE and the ProGEO held a training session on geodiversity; geoheritage, geoconservation, geoparks and geotourism; geoconservation was included in 14 resolutions, and geoconservation concepts were tacitly embraced in the IUCN Global Programme 2017–2020 [40–42].

The process of formulating motions to the General Assembly at WCC 2016 changed radically. Given that the motion process was relatively long and had already caused pressures on time, at previous WCCs in 2015, IUCN members approved a procedure through which a large part of the process takes place electronically several months before the WCC. Thus, members left for the General Assembly the face-to-face debates and the most important votes.

The motion submission process, therefore, began with a four-month period to formulate electronically motion proposals supported by a minimum of five organizations (previously the minimum was three). The online system allowed entering the motions, as well as checking them and inviting support or questions. A working group analysed the proposals presented to avoid overlaps and issued a list of preliminary approved motions, in some cases after negotiation with the proposing members. Subsequently, IUCN members examined and debated online the proposed motions under the moderation of a person from the Working Group on Motions assigned to each draft motion. This person successively modified proposals as the discussions progressed until the members agreed a final proposal. The proposed motions were voted on electronically and those finally approved were transferred to the General Assembly for their registration and protocol approval. Those proposals without consensus were debated in the General Assembly for subsequent voting during the WCC 2016.

In addition to the approval of resolution WCC2016-Res083 on the preservation of movable geoheritage [43], ten resolutions explicitly name aspects of geoconservation, and three other use inclusive terms in compliance with resolution WCC2012-Res048. Resolution WCC2016-Res083 showed the need to promote proper conservation and management of movable geoheritage, which includes fossils, meteorites and rocks of special interest. This geoheritage is a constituent and inseparable element of natural heritage, and possesses scientific, educational, cultural and aesthetic values that should be preserved and transmitted to future generations. This resolution also showed that movable geoheritage frequently records important events, processes and

periods of the geological history of the Earth that are crucial towards understanding the evolution of climate and life on our planet. Moreover, it acknowledged that the increasing effects of economic development and international commerce on movable geoheritage frequently are not sustainable and, in addition, are inconsistent with national and international regulations. The resolution also highlighted the fact that most of the geoheritage is not in protected areas and that movable geoheritage is easily prone to plundering and destruction. Therefore, the conservation and management of movable geoheritage requires governments to integrate geoconservation within their nature conservation strategies. For all these reasons, resolution WCC2016-Res083 called on the World Commission on Environmental Law (WCEL) and the WCPA to: (1) promote and support national and international initiatives oriented towards the conservation and sustainable use of movable geoheritage; (2) prepare and promote internationally, guidelines on the protection, conservation and management of it and (3) promote and support, in collaboration with UNESCO and the IUGS, discussion on the conservation and management of movable geoheritage, in compliance with national and international regulations of its commerce. Unfortunately, this resolution has so far made little progress and few steps have been taken in the international regulation of movable geological heritage, although it is an issue of utmost importance.

5. The world conservation congress, Marseille (France) 2020 (WCC 2020)

The GSG produced a geoconservation handbook in the IUCN Best Practice Protected Area Guidelines Series, 'Guidelines for geoconservation in protected and conserved areas' [44]. The purpose of this book is to help all those involved in protected areas management to have access to the most up-to-date information derived from geoscientists. Section 1 of the book describes the purpose of the guidelines, outlines the context of geoconservation and notes key additional sources of guidance. Section 2 provides standard definitions, describes the five key values of geoheritage and geodiversity, and explains the relevance of geoconservation for the IUCN. Section 3 describes the general principles for geoconservation and provides essential context for applying the guidelines. Section 4 describes the key steps in the establishment of geoconservation protected areas and geological features and processes. Section 5 provides detailed guidance on all aspects of managing geosites in protected areas, applying the IUCN Management Categories. Sections 6 and 7 focus on threats to geoheritage, how to deal with them and provide guidance on assessing risk and effects. Section 8 sets out the general principles for interpretation, education and public outreach for geoconservation. Finally, Section 9 summarizes key points, stressing the important interaction and interdependency between geoconservation and biodiversity conservation.

The WCC 2020 was an opportunity for geoconservationists to have a high-level meeting with the newly elected IUCN President, Ms Razan Al-Mubarak, and to directly voice their concerns on a global scale and propose a way for better integration of geoconservation within the IUCN. Moreover, an unprecedented milestone at this congress was the approval of resolution 'WCC2020-Res074 Geoheritage and Protected Areas'. This resolution supports the development of a study on key geoheritage areas (KGAs), as a complement to the existing key biodiversity areas (KBAs) programme, in order to protect geosites of highest importance for global conservation and advance towards more integrated nature conservation. The IUCN General Assembly adopted this Resolution with 97% of votes in favour. In addition, within the congress, the Institut de Formation de Recherche et d'Expertise En Milieux Souterrains (IFREEMIS), together with other promoters, organized a face-to-face and online event to present resolution WCC2020-Res074. This resolution was the result of the fusion of three converging motions: (1) 'Geoheritage, protected areas and Key Areas for Geoheritage', proposed by ProGEO; (2) 'Incorporation of geological substrate, reliefs and active geological processes in the management of Protected Areas', proposed by the SGE and (3) 'Take more account of natural cavities in nature protection policies', proposed by Réserves Naturelles de France, within the framework of the IFREEMIS.

Resolution WCC2020-Res074 considers that the survival of humans depends on both geological elements and biodiversity. It also recognizes that the main geological elements that

directly influence biodiversity are: (1) the geological substrate, which determines hydrology, erosion, nutrients, soil chemistry and vegetation health and cover; (2) the relief, which determines the climate, hydrology, soils and habitats and the distribution of species and (3) the active geological processes, which determine habitats and the distribution and survival of species. In addition, it also considers that geoheritage plays a crucial role in the conservation of biodiversity and protected areas. Resolution WCC2020-Res074 also considers the specificity of natural cavities resulting from complex dynamic processes. It recognizes the biological and geological interest in natural cavities, which combine endokarstic and volcanic geological formations with terrestrial and aquatic habitats, and which support the fauna, flora and fungi typical of these environments, and include elements and landscapes without equivalent on Earth. In addition, the resolution notes that underground environments remain largely unknown and difficult to access, and are a challenge for investigation.

By adopting resolution WCC2020-Res074, the IUCN expressed concern that protected-area policies and management do not yet fully address the role of geodiversity in ecosystem services. Although some countries have legislation or other means for protection of geoheritage, resolution WCC2020-Res074 recognizes that the mechanisms available at the international or national level are not sufficient to guarantee the conservation of geosites, and that many of these sites are at risk. The IUCN also welcomed through this resolution the efforts of the IUGS to support the Global Geological Landmarks Programme to identify sites of international significance, and the initiative of the IUGS International Commission on Stratigraphy, which identifies places of global importance as standards for key stages in the history of the Earth. The resolution also expressed IUCN appreciation of the efforts of the WCPA-GSG to develop guidance tools for protected area managers.

Resolution WCC2020-Res074 includes several requests for the director generals of both the IUCN and the WCPA, to: (1) mobilize the IUCN regional offices and its global programme in support of national efforts to collect and publish data on geoheritage and geodiversity in protected areas; (2) support the development of a detailed study that contemplates the establishment of a future initiative of the IUCN on KGAs, as a complement to the existing programme of KBAs, in order to protect geosites and move towards more integrated nature conservation; (3) encourage work to improve information and proper interpretation of geodiversity and geoheritage in order to increase visitor awareness and (4) collaborate with the IUCN Commission for Ecosystem Management (CEM) to foster a concerted effort to conduct a red-list ecosystem assessments of ecosystems of geological interest and incorporate geoheritage assessments as part of the normal procedure for ecosystem assessments and red lists.

National members are also called upon to: (1) promote knowledge about geodiversity and geoheritage; (2) ensure the effective protection of this component of the natural heritage; (3) establish or improve national legislation regarding the protection of geoheritage and enable the necessary conditions to implement effective conservation measures and (4) promote the exploration and respectful study of underground environments and their interrelationships with the surface. The resolution also requests states, non-governmental organizations, universities, researchers, economic actors and administrators of protected areas to consider issues related to underground environments in the definition and implementation of nature conservation policies and to adopt a holistic approach to the management of underground natural environments considering all the relationships between biological and geological elements. Since the approval of this resolution, a group of experts within the WCPA-GSG is working on the definition of the concept of KGAs and the procedures for their declaration.

The WCC 2020 also adopted resolution WCC2020-Res001 Archiving Resolutions and Recommendations meeting retirement criteria, consolidating policy and future reviews, so the IUCN developed and applied a series of criteria for identifying implemented, elapsed, superseded or obsolete resolutions and recommendations. Because of this action, resolutions WCC2008-Res040 and WCC2012-Res048 were archived, although in our opinion part of the content of them is still operational, for example, the part that requires holistic terms to be used when referring to nature.

Another resolution of great interest for geoconservation proposed by the SEDPGYM and adopted at the WCC 2020 is resolution WCC2020-Res088 'Conservation of the natural diversity and natural heritage in mining environments'. This resolution considers that mining activity often exposes geoheritage like karst cavities, fossils and minerals or geological structures, such as the giant geodes in the mines in Naica (Mexico) and Pulpí (Spain), or the dinosaur fossil tracks in the Cretaceous limestone quarry in Sucre (Bolivia). It also reflects that mining activity can generate landscapes of high aesthetic value that can be declared protected landscapes (e.g. the Río Tinto mines, Huelva, Spain) or UNESCO WH Sites (e.g. the Las Médulas Roman gold mines, León, Spain). Moreover, this resolution considers that in these surface and underground mining environments the geological and biological processes can be very diverse and unusual. In this regard, it is important to note that these environments can contain unique types of mineral or species, and that they are very useful for the study of the origin and evolution of life and natural diversity (both of geodiversity and biodiversity) in extremophile environments on this and other planets. In addition, underground and surface (opencast mines and quarries) mining environments are natural laboratories for investigating and teaching about the natural processes and their results. However, after the end of mining activities, on occasions, the restoration of the mining environment can lead to the irreparable loss of the geological, biological and cultural natural heritage that the exploitation had generated.

Moreover, appropriate restoration can also lead to long-term conservation of geoheritage. Therefore, one might think that restoration is as much an opportunity as it is a threat. The objective would be to ensure the restoration that it conserves instead of damaging the characteristics revealed through the mining, etc.

Resolution WCC2020-Res088 calls on IUCN member states to conserve mining environments whose value derived from the conservation of their natural heritage, both geological and biological, is considered greater than the value of their restoration. Similarly, it asks IUCN member states to launch initiatives to guarantee that the natural heritage of these mining environments is used for biodiversity conservation, and also to promote scientific, educational, cultural and tourist purposes, and to this end: (1) encourages IUCN member states to draw up inventories of the natural and cultural heritage resulting from mining activities, both historical and current, and to take the necessary legal action to conserve them; (2) urges IUCN member states to ensure that mining authorizations and their environmental impact studies include a requirement for initiatives for the conservation and sustainable use of the natural heritage that arises during the activity and after it finishes, in mining restorations; (3) asks IUCN member states to support public and private initiatives for the sustainable scientific, educational and tourist use of mining environments, with the proper safety measures and (4) calls on IUCN member states to take steps to raise positive awareness and to educate civil society, companies, non-governmental organizations and public authorities regarding the conservation of the natural and cultural heritage generated in mining environments.

In addition to the adoption of the resolutions mentioned above, thanks to the participation of geoconservationist members in face-to-face and online debates, many other WCC 2020 resolutions adopted geoconservation points of view and approaches, such as resolution WCC2020-Res018 'Conservation of spring ecosystems in the Mediterranean region', resolution WCC2020-Res 021 'Planning of maritime areas and biodiversity and geodiversity conservation' or resolution WCC2020-Res033 'For the urgent global management of marine and coastal sand resources', among others.

6. Discussion and conclusion

As has been shown, geoconservation was not explicit in the initial objectives of the IUCN, which mainly focused on the conservation of biodiversity. Nevertheless, the IUCN began in the 1990s to show some interest in certain geosites of international relevance, mainly associated with the process of WH designation. However, it was not until the inclusion of geoconservation member organizations in 2008 that the General Assembly began to adopt resolutions related to

geoconservation. It should also be noted that some key individuals also played an important influential role at the 2007 meeting of the Protected Area Categories celebrated in Almeria, both behind and in front of the scenes, and subsequently in the creation of the WCPA-GSG as well.

Nevertheless, the adoption and implementation of geoconservation philosophy, principles and practice within the IUCN are still in their early stages. Geoconservation does not appear as an objective in the general programme of the IUCN nor, consequently, in the regional programmes. In addition, many IUCN members are completely unaware of the conceptual framework of geoconservation or of the Geoconservation Best Practice Guidelines that were intended to address this issue. This is probably the main reason why most IUCN members, when presenting their motions to the General Assembly, generally do not introduce either the lexicon or the conceptual framework related to geoconservation. Consequently, when geoconservationists present their ideas in the forums and debates organized by the IUCN or question the speakers who are members of the IUCN management teams, they do not know how to answer or do so in an imprecise and vague way.

The relevance of geoconservation to the broader nature conservation agenda has been previously well recognized and argued (e.g. [45]) but getting geoconservation on all agendas remains a challenge [24]. In order to address these deficiencies and advance geoconservation within the IUCN, we propose three recommendations.

First, it is necessary that more geoconservation-related organizations become members of the IUCN. among these potential members are representatives of natural protected areas, geological parks, geoconservation associations, natural science museums and even UNESCO Global Geoparks, Biosphere Reserves or WH Sites. Similarly, it is necessary to carry out training courses aimed at the IUCN membership related to the conceptual bases of geoconservation and the best practice guidelines. The ProGEO could be one of the leading entities for this informative and educational work since, with its international character, it could activate its regional working groups, considering both its role in lobbying IUCN national members and other potentially interested actors as a target audience. Moreover, the geoconservation bodies and specialists must become more actively engaged across a wider range of activities and working and specialist groups within the IUCN-WCPA where geodiversity and geoconservation are directly relevant and contribute to discussions, papers and reports that are being prepared, (e.g. with the Natural Solutions Specialist Group, Tourism and Protected Areas Specialist Group, the Climate Change Specialist Group, Connectivity Conservation Specialist Group, the High Seas Specialist Group, the Cultural and Spiritual Values Specialist Group, etc.), as well as targeting and prioritising key resolutions where inclusion of geodiversity can make a real difference to desired outcomes for nature conservation.

Second, it is essential to strengthen the WCPA-GSG, both in its membership and in the number of activities it carries out, but this requires time and funding support. This process involves incorporating new members, to publicize the activities of this group, and to carry out work as a consultative and educational body for IUCN membership.

Third, a strategic approach is required by geoconservation bodies to develop appropriate motions submitted to the IUCN General Assembly. This strategy involves constituting numerous groups of geoconservationists who have the capacity for dialogue and discussion in each of the phases of a motion's process. Currently, only three organizations are carrying out this work, each of which are obviously overstretched. The work must be carried out before, during and after the General Assemblies, when the regional programmes are discussed and forums are organized in this regard. Clearly, in order to carry out this work, greater conservationist membership and better organization are necessary.

The achievements described in this paper are not trivial and geoconservationists have done substantial work to reach the current situation. The approval of both resolutions WCC-2020-Res-074 and WCC-2020-Res-088 are unprecedented milestones for geoconservation in protected areas and mining environments. Their implementation is a work in progress, and they will probably open many doors to advance geoconservation within the IUCN. In addition to these specific resolutions (074 and 088), there are 28 more related in one way or another to geoconservation.

In just 15 years, 30 IUCN resolutions have included geoconservation topics, an achievement that can be used to accelerate a more integrated approach to nature conservation. However, there are still many challenges ahead to achieve this.

Data accessibility. This article has no additional data.

Authors' contributions. MM-G: conceptualization, formal analysis, investigation, methodology, project administration, writing—original draft, writing—review and editing; FG-M: supervision, validation; ED-M: supervision, validation; NH: supervision, validation; JB: supervision, validation.

All authors gave final approval for publication and agreed to be held accountable for the work performed therein.

Conflict of interest declaration. We declare we have no competing interests.

Funding. We received no funding for this study.

Acknowledgements. The authors would like to thank Dr Colin Prosser for his critical review of the original manuscript as well as another anonymous reviewer, whose work has contributed to a significant improvement of the final paper.

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