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Perspective

‘Genetic resources’, an analysis of a multifaceted concept

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ABSTRACT

‘Genetic resources’ is a key concept of the Convention on Biological Diversity (CBD) and the Nagoya Protocol (NP). However, the term was coined to describe value in biodiversity and create an incentive for its protection and is thus of practical relevance for biological conservation beyond the legal context. The scope of this concept is also of interest to researchers, who may be unsure for which types of analysis they are legally and ethically expected to enter access and benefit sharing (ABS) negotiations. This article presents a biologically informed analysis, which leads to an understanding of ‘genetic resources’ that considers various associations and implications of this notion, such as its relation to biodiversity and the role that intellectual property rights (IPR) play in the discourse. The aim is to provide a coherent, consistent and comprehensive understanding of the concept that can integrate and explain these aspects and consider both classical and novel ways of using genetic resources. Based on the biological function of genetic resources and an analysis of how they are currently used and valued, this article argues that genetic resources are a particular type of natural resource that is informational rather than tangible. This interpretation clearly identifies utilising digital genomic sequences as a form of using genetic resources. However, the article also discusses regulatory exceptions for certain utilisations of genetic resources and it mentions the possibility of treating digital sequences as such an exception.

1. Introduction

The term ‘genetic resources’ has received wide attention as a key concept in the UN Convention on Biological Diversity (CBD) and is used in the domestic legislation of the states that are parties to the CBD. In environmental politics and communication, the term is used to emphasise the instrumental value of biodiversity and to explain why we benefit from its protection and conservation.[1] Moreover, ethicists refer to genetic resources, for instance, in their discussion of fair access and just distribution (e.g., De Jonge, 2011; Deplazes-Zemp, 2018; Schroeder and Pogge, 2009). The concept also raises various legal, policy and economic questions, for instance, concerning the implementation of an access and benefit sharing (ABS) scheme for genetic resources or appropriate property regimes (e.g., Kamau Evanson and Winter, 2009; Oberthür and Rosendal, 2013; Ruiz Muller, 2015; Vogel, 1994). Finally, it is argued here that because the term ‘genetic resources’ refers to usable, useful and beneficiary aspects of living nature (the object of biology) it is important to take into account biological features and characteristics of these resources. This article reflects theoretically on the concept of ‘genetic resources’ with the aim of considering and combining its various interdisciplinary connotations. It is *not* a legal analysis that seeks to interpret and explain the concept with reference to other legal documents and decisions. Instead, it is an argumentative text that discusses and critically examines the legal context of the CBD as one example in which the term is used. The article relates this use of the term to the biological foundation of genetic resources, to an analysis of what it is that is actually been used as a resource and an analysis of different connotations with the term such as biodiversity and intellectual property rights (IPR). The aim is to present a comprehensive interpretation of the concept of genetic resources, which can consider these different elements of the analysis and which fulfils the criteria of coherence and consistency. A ‘coherent interpretation’ is understood as an interpretation without any logical contradictions and a ‘consistent interpretation’ is understood as interpreting a concept in the same way throughout time and in different situations.

While the definition of ‘genetic resources’ has been discussed in the policy and legal context (e.g., Ruiz Muller, 2015; Tvedt and Schei, 2013), the biological perspective on the concept, including its biological foundation and relation to biodiversity, has not received sufficient attention so far. One aim of this article is to reinforce engagement with this concept in the biological community. Conservation biology is an ideal subdiscipline to start such a discussion for several reasons: Conservation biologists are usually familiar with the concept from the CBD, which is the international regulatory framework for biodiversity conservation. Further, due to its applications and political implications, conservation biology has a long tradition of interdisciplinary discourse.

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[1] E.g.: WWF “Arguments for protection” http://wwf.panda.org/what_we_do/how_we_work/protected_areas/arguments_for_protection/ (accessed December 2017)

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Moreover, conservation biologists work with genetic resources in the context of biodiversity and thus have fundamental and practical insights into their use and value. Finally, conservation biologists have an interest in clarifying the scope of this concept because as users of genetic resources, they are expected to enter ABS negotiations with provider states when such resources are exported. The conditions under which researchers are expected to enter ABS negotiations is not only a legal but also an ethical question. It is part of good scientific practice to consider these issues also in cases when there is no legal requirement, for instance, because the provider state is not a party to the CBD.

The article begins with a brief introduction to the historical roots of the concept.

1.1. Historical roots of the concept

The history of the concept 'genetic resources' can be traced back to at least the 1970s and 1980s, when it appeared in the context of agricultural plants. In a 1975 *Science* article entitled "Our Vanishing Genetic Resources", Jack Harlan deplored that novel trends in agriculture result in the reduction of cultivated crop varieties and highlighted the importance of collections to conserve genetic diversity (Harlan, 1975). Based on the same concerns, the International Board for Plant Genetic Resources (IBPGR) was founded in 1974.[2] In 1983, the Food and Agriculture Organisation (FAO) of the United Nations established the Commission on Genetic Resources for Food and Agriculture, which is responsible for issues related to genetic resources in an agricultural context. These early institutional endeavours conceived genetic resources as the common heritage of mankind.[3] However, the notion that genetic resources represent humanity's common heritage has been strongly criticised. Pat Mooney, for instance, argued that there was a "gene drain" from the global South towards the North, which was exploited by the latter. He writes: "The South has been donating this material in the belief that its botanical treasures form part of the 'Common Heritage' of all humanity. Meanwhile, the North has been patenting the offshoots of this common heritage and is now marketing its new varieties, at great profit, around the world" (Mooney, 1983: p3). This concern has been supported by so-called biopiracy cases, in which unauthorised companies in the North accessed genetic resources and traditional knowledge from the global South.

(Reid, 2009). Together with increased expectations of financial profits from genetic resources, these concerns led to a paradigm shift, whereby access to genetic resources fell under the authority of state sovereignty.[4]

The most influential document for the current understanding of genetic resources is the CBD, which was opened for signature in 1992. The CBD considers different types of organisms in its definition of genetic resources as: "genetic material of actual or potential value", and genetic material as: "any material of plant, animal, microbial or other origin containing functional units of heredity" (CBD, article 2). Although not explicitly mentioned in this definition, the CBD omits the genome of *Homo sapiens* from its scope.[5] This convention takes up the discussion on who should be able to benefit from genetic resources by introducing a requirement for specific ABS procedures. During 2010, the Conference of Parties to the CBD adopted the Nagoya Protocol (NP), which established a legal framework for the implementation of ABS. The Protocol entered into force in October 2014, and had been ratified by some 100 states, as of December 2017. The NP adopts the definition of 'genetic resources' contained in the CBD and specifies: "'Utilization of genetic resources' means to conduct research and development on the genetic and/or biochemical composition of genetic resources, including through the application of biotechnology as defined in Article 2 of the Convention" (NP, article 2).

The term has thus been used for several decades in different contexts. Nevertheless, its meaning is not as straightforward as this standardised use might imply, which is the starting point for the analysis at hand.

2. Examples of using genetic resources

The analysis of the concept of 'genetic resources' in this article sets a strong focus on the enquiry of what it is that is actually being used and valued, when we speak of using genetic resources and on the biological foundations of these resources. In the following, three key examples of using genetic resources are introduced to establish a starting point for the analysis in the subsequent chapters. As a common denominator, all of these examples refer in one way or another to biodiversity as something that is valuable and they have been discussed as typical examples of using genetic resources.

2.1. Key example 1: plant genetic resources for food and agriculture

As stated above, the first discussion of genetic resources was in the context of crops. The aim of plant breeding is to improve and/or combine selected characteristics of crops. For this enterprise, the biological diversity of varieties with different properties is valuable. Breeders can draw upon these genetic resources to adapt cultivated plants to novel challenges such as climate change, which has increased the need for draught-resistant varieties of different types of staple food. In novel crop varieties, for instance, drought-resistance could be combined with other desirable traits, such as high yield or disease resistance. To facilitate the exchange of seeds or other plant tissue (germplasm) the FAO established a multilateral system which regulates the exchange of the 64 most important crops in the food sector, independently of the CBD's ABS system when they are being used in research, breeding and training.[6]

2.2. Key example 2: bioprospecting

With the establishment of the CBD, the focus of the concept of 'genetic resources' expanded from purely agricultural plants to include other organisms. The request for fair and equitable ABS in the CBD seems to have been driven, to a large degree, by expectations of financial benefits from bioprospecting (Harvey and Gericke, 2011). Bioprospecting has been defined as "the systematic search for biochemical and genetic information in nature in order to develop commercially-valuable products […]".[7] Some authors also use the term 'biodiscovery' for this type of activity (e.g., Robinson, 2014: p4).

[2] Today, IBPGR works under the name Biodiversity international see: http://www.bioversityinternational.org/about-us/who-we-are/history/ (accessed December 2017)

[3] This was explicitly stated in "The International Undertaking on Plant Genetic Resources". See: http://www.fao.org/docrep/x5563E/X5563e0a.htm#e.%20plant%20genetic%20resources%20(follow%20up%20of%20conference%20resolution%20,681 (accessed December 2017).

[4] Annex 3 to The International Undertaking on Plant Genetic Resources: Resolution 3/91: http://www.fao.org/docrep/x5587E/x5587e06.htm#e.%20commission%20on%20plant%20genetic%20resources%20and%20international%20undertaking:%20progress (accessed December 2017).

[5] The exclusion of human genetic resources was the topic of several COP decisions (https://www.cbd.int/decisions/cop/ (accessed December 2017): Decision II/11 explicitly "reaffirms that human genetic resources are not included". The Bonn Guidelines (adopted in Decision VI/24) mention this explicitly in their General Provisions 1C (paragraph 9, page 2). Also, in the discussion of different options in the International Regime on Access and Benefit Sharing, "human genetic resources" are explicitly excluded

(*footnote continued*)
when the scope of this regime is described (Decision XIII/4, Decision IX/12). Finally, when the NP was adopted at COP X (decision X/1) the parties agreed, bearing in mind decision II/11, that human genetic resources are not included.

[6] For more information on the FAO's Multilateral System see: http://www.fao.org/plant-treaty/areas-of-work/the-multilateral-system/overview/en/ (accessed December 2017)

[7] UNDP definition of bioprospecting: http://www.undp.org/content/sdfinance/en/home/solutions/bioprospecting.html (accessed December 2017)