A Legal Protection of Metazoan Parasites

Exploring Biopolitical Complexities Through Comparing Parasites and Invasive Alien Species

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How does the parasite usually take hold? He tries to become invisible. We must speak of invisibility again.

— Michel Serres, *The Parasite*

Collaboration means working across difference, which leads to contamination. Without collaborations, we all die.

— Anna Lowenhaupt Tsing, *The Mushroom at the End of the World*

1. Introduction

The anthropogenic loss of biodiversity that is currently happening worldwide is considered one of the most urgent and dislocating threats of our time.[1] According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), nature, and therefore biodiversity, has a direct effect on 'a variety of materials fundamental for people's physical well-being and for maintaining culture', including food, medicines and energy.[2] Among the drivers of the biodiversity loss are land-use change, overexploitation, climate change, pollution, invasive alien species (IAS), the growth of the human population and an ever-increasing global economy.[3] Next to nature's relevance for humans, one may also argue that biodiversity has 'intrinsic value': value exceeding the human scope.[4]

As one of the nine Planetary Boundaries, rapid changes in biodiversity can have 'pervasive effects on Earth System functioning'.[5] The framework of Planetary Boundaries identifies 'levels of anthropogenic perturbations below which the risk of destabilization of the Earth System is likely to remain low'.[6] Biodiversity loss has exceeded its boundary ever since the first design of the Planetary Boundaries in 2009.[7]

Through the adoption of the Sustainable Development Goals, the United Nations has established conservation of biodiversity as an important environmental component that

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[1] David B Wake and Vance T Vredenburg, 'Are we in the midst of the sixth mass extinction? A view from the world of amphibians' (2008) 105 PNAS 11466; Ron Wagler, 'The Anthropocene Mass Extinction: An Emerging Curriculum Theme for Science Educators' (2011) 73 The American Biology Teacher 78; Rodolfo Dirzo and others, 'Defaunation in the Anthropocene' (2014) 345 Science 401; Stuart L Pimm and others, 'The biodiversity of species and their rates of extinction, distribution, and protection' (2014) 344 Science 987; Malcolm L McCallum, 'Vertebrate biodiversity losses point to a sixth mass extinction' (2015) 24 Biodiversity and Conservation 2497; Gerardo Ceballos, Paul R Ehrlich and Rodolfo Dirzo, 'Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines' (2017) PNAS E6089; Christopher N Johnson and others, 'Biodiversity losses and conservation responses in the Anthropocene' (2017) 356 Science 270; IPBES, 'Summary for policymakers of the global assessment report on biodiversity and ecosystem services (IPBES Secretariat Bonn 2019) <https://doi.org/10.5281/zenodo.3553579> accessed 5 June 2022; Malcolm L McCallum, 'Turtle biodiversity losses suggest coming sixth mass extinction' (2021) 30 Biodiversity and Conservation 1257.

[2] IPBES (n 1), 10.

[3] ibid 12-14.

[4] Convention on Biological Diversity (adopted 5 June 1992, entered into force 29 December 1993) (CBD) preamble.

[5] Johan Rockström and others, 'Planetary Boundaries: Exploring the Safe Operating Space for Humanity' (2009) 14 Ecology and Society.

[6] Will Steffen and others, 'Planetary boundaries: Guiding human development on a changing planet' (2015) 347 Science 736, 736.

[7] ibid 736; Rockström (n 5).

urgently requires improvement.[8] Legally, conservation of biodiversity is addressed through a wide variety of international conventions, including treaties concerning the protection of specific species.[9] Within the international legal context, the Convention of Biological Diversity (CBD) forms the focal point.[10] This legal framework states in article 1 that its primary objective is the conservation of biological diversity.[11] Furthermore, the CBD seems to lack a general hierarchy between species, thus suggesting equality between species as subjects of international biodiversity law.[12]

However, acknowledging the need for protection of species is ultimately a human decision, allowing a bias towards charismatic species to lead to unevenly spread conservation efforts at the expense of less popular, but equally threatened species.[13] One category for which legal protection is almost non-existent is the category of metazoan parasites. The term *metazoan* refers to the animal kingdom, thus excluding for example plants, fungi and bacteria.[14] Following numerous studies, in 2020 scientists rang the alarm bell by arguing for a global protection plan for parasites.[15] They based their argument on two crucial points: parasites play a vital role in conserving their ecosystems' biodiversity, and many parasite species are threatened with extinction. One of twelve methods to configure the protection plan contains the legal protection of parasites. The brevity of the section on legal protection only shows that this field of law is practically untouched.

However, configuring a legal protection for parasites is not a matter of simply copying protection measures for other species. Due to the specific characteristics of parasites, the call for legal protection opens an array of complexities. This thesis assesses one complexity by considering the issue of protecting parasites from a biopolitical lens. The notion of biopolitics

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[8] UNGA Res 70/1 (25 September 2015) UN Doc A/RES/70/1.

[9] For an overview of international conventions on conservation of biodiversity, see Arie Trouwborst and others, 'International Wildlife Law: Understanding and Enhancing Its Role in Conservation' (2017) 67 BioScience 784, 785-786.

[10] CBD (n 4).

[11] ibid art 1.

[12] As Trouwborst and others point out, instead of the term *international biodiversity law*, the terms *international nature conservation law* and *international wildlife law* can also be used. For this thesis, *international biodiversity law* will be used exclusively. See Arie Trouwborst and others, 'International law and lions (*Panthera leo*): understanding and improving the contribution of wildlife treaties to the conservation and sustainable use of an iconic carnivore' (2017) 21 Nature Conservation 83, 84.

[13] Thomas Davies and others, 'Popular interest in vertebrates does not reflect extinction risk and is associated with bias in conservation investment' (2018) 13 PLoS one.

[14] Eleanor Lawrence (ed), *Henderson's Dictionary of Biology* (14th edition, Pearson Books 2008) 402.

[15] Colin J Carlson and others, 'A global parasite conservation plan' (2020) 250 Biological Conservation 108596.

was constructed by Michel Foucault and serves to look at human governance from the perspective of life and death. This notion has also proven valuable for the field of nature conservation, as this typically deals with fostering life at the expense of other life.[16] After all, nature conservation is about the 'flourishing of non-human life' on the level of populations.[17] Inherently, this contains decision-making with regards to the life and death of populations. Care and harm intertwine.[18]

To consider the position of parasites within the biopolitical context, another, more abundant category is included in the assessment: the category of IAS. IAS can serve as a guide in this thesis due to both its similarities and differences with parasites. Interestingly, both categories are generally conceived as harmful and threatening, respectively to their host and their ecosystem.

Having established that protection of vulnerable parasite species is important from an ecological point of view, assessing the biopolitical complexities of the protection of parasites becomes relevant. This is the main purpose of this thesis. By doing so, this thesis aims to open the debate on the legal position of parasites.

In order to construct a coherent piece of work, the following question serves as a guide:

To what extent does a biopolitical analysis expose the complexities of a legal protection of metazoan parasites?

This thesis has the ambitious goal to open the debate on the protection of parasites. Therefore, the aim is not to provide clear-cut answers but rather to sketch a problematisation of the legal protection of parasites. The meaning of a problematisation is aptly described by Vito De Lucia, following Foucault: 'The goal of a problematisation is […] to open up, to

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[16] See *inter alia* Krithika Srinivasan, 'The biopolitics of animal being and welfare: dog control and care in the UK and India' (2013) 38 Transactions of the Institute of British Geographers 106; Christine Biermann and Robert M Anderson, 'Conservation, biopolitics, and the governance of life and death' (2017) 11 Geography Compass; Harold A Perkins, 'Killing One Trout to Save Another: A Hegemonic Political Ecology with Its Biopolitical Basis in Yellowstone's Native Fish Conservation Plan' (2020) 110 Annals of the American Association of Geographers 1559.

[17] Krithika Srinivasan, 'Conservation biopolitics and the sustainability episteme' (2017) 49 Environment and Planning A 1458, 1459.

[18] ibid.

question, to explore a problem […], and the solutions developed to address it.'[19] That this may ultimately lead to more questions rather than definite answers must be seen as a goal rather than a problem that should be avoided.

This thesis will be constructed on the basis of desk-research and a multi-disciplinary literature analysis, based on various academic fields, including biology, ecology, philosophy and law.

Chapter 2 elaborates on parasites as a category in the field of biology and their position in law. Consequently, chapter 3 works out the category of IAS, including a comparison of the categories of parasites and IAS. These chapters culminate in chapter 4, which deals directly with the main question of this thesis by performing a biopolitical analysis of the legal protection of parasites, in which particularly the notions of *bare nature* and *win-win approach* are discussed.

[19] Vito De Lucia, 'Bare Nature. The Biopolitical Logic of the International Regulation of Invasive Alien Species' (2019) 31 Journal of Environmental Law 109, 111.

2. Parasites And International Biodiversity Law

Having established the topic of this thesis, it is necessary to demarcate the definitions used in this thesis. This chapter elaborates on two sub-questions: First, *What are parasites and why is the category of parasites relevant to assess?*; and second, *What is the current position of parasites in international biodiversity law?* Following these questions, the first section focuses on parasites and their ecological relevance, while the second section elaborates on the position of parasites within international biodiversity law.

2.1 Parasites

2.1.1 Defining parasites

Despite the estimation that parasite species constitute the majority of species on Earth,[20] a consensus-based definition of parasites is currently lacking. This thesis adopts the working definition that Carlson and others use in their 2020 article, defining parasites as:

> species whose trophic strategy depends upon living on, or in, one or a few hosts and extracting host resources at some stage in their lifecycle. Consuming host resources should cause some form of harm to individual hosts, but "parasitic clades" may include species that are not measurably detrimental to hosts.[21]

Note that the category of parasites is not a counterpart of insects, amphibians or birds, as is shown schematically in Figure 1. Although in reality all parasites are distributed among a few taxonomic categories, in theory each of the categories can contain parasites.[22]

The essential condition for a species to be qualified as parasite is based on its trophic strategy: the way a species feeds. The trophic strategy sets parasites apart from, for example, predators. Predators also consume (parts of) living organisms, but their strategy is

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[20] Donald A Windsor, 'Most of the species on Earth are parasites' (1998) 28 International Journal for Parasitology 1939; Brendan B Larsen and others, 'Inordinate Fondness Multiplied and Redistributed: the Number of Species on Earth and the New Pie of Life' (2017) 92 The Quarterly Review of Biology 229.

[21] Carlson, 'A global parasite conservation plan' (n 15).

[22] For extensive databases on taxonomy of species, see <https://animaldiversity.org> and <https://www.catalogueoflife.org>.

fundamentally different.[23] Within the category of parasites, a distinction is made between ectoparasites, which are external feeders, and endoparasites, which feed from within their host.[24] An example of the former is the mite, opposed to the endoparasitic tapeworm.

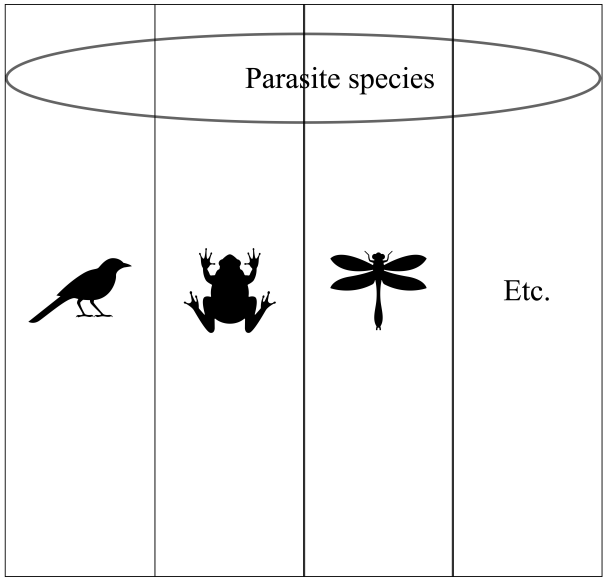

Figure 1: Schematic overview of the distribution of parasite species over taxonomic categories. (Claerhoudt, 2022)

Due to the diversity of parasites, many other distinctions and nuances can be applied, including regarding host-specificity and permanency of parasites.[25]

Another requirement to be qualified as a parasite, is that harm must be done to the individual host as a result of the parasitical behaviour. The threshold for such harm is very low. The unnoticed loss of a drop of blood to a tick is already sufficient.[26] In contrast, parasitic wasps

[23] Note that even within a zoologic family, trophic strategies may differ between different subspecies. For example, most flatworms are parasites, but the New Zealand flatworm (*Arthurdendyus triangulatus*) feeds on earthworms, using a strategy of predation. See for example Archie K Murchie and Alan W Gordon, 'The impact of the 'New Zealand flatworm', *Arthurdendyus triangulatus*, on earthworm populations in the field' (2013) 15 Biological Invasions 569.

[24] Nick Mills, 'Parasitoids' in Vincent H Resh and Ring T Cardé (eds), *Encyclopedia of Insects* (Elsevier Science & Technology 2009) 748.

[25] Concerning host-specificity: Host-specific parasites feed off a single host species while generalist parasites exploit multiple species. See Richard Wall and David Shearer, *Veterinary Ectoparasites: Biology, Pathology and Control* (Second edition, Blackwell Science 2001) 2.
Concerning permanency: If a species lives its entire lifespan on a single host it is called a permanent parasite, in contrast to temporary parasites. See Ke Chung Kim, 'Evolutionary Relationships of Parasitic Arthropods and Mammals' in Ke Chung Kim (ed) *Coevolution of Parasitic Arthropods and Mammals* (John Wiley & Sons 1985) 11.
For an overview of different distinctions within parasitism, see Heinz Mehlhorn, *Animal Parasites: Diagnosis, Treatment, Prevention* (Springer 2016) 1-10.

[26] Notwithstanding ticks that serve as transmitters of bacteria, but then the potentially more detrimental harm is based on a different parasitical relationship, namely the relationship between the bacteria and the final host.

inject their eggs into a host, after which the larvae feed themselves with the inside of the host, ultimately leading to the host's death.[27]

Considering feasibility, and based on the the biological articles that form the starting point for this thesis, three additional restrictions are taken into account in order to set clear borders within which this thesis operates.

First, the scope of this thesis is restricted to metazoan parasites. The term *metazoan* relates to 'multicellular animals, sometimes more strictly applied only to those multicellular animals with cells organized into tissues and possessing nervous tissue'.[28] Simply put, metazoan parasites belong to the animal kingdom.[29] Parasitical behaviour is abundantly present in other categories of species, such as bacteria, viruses and fungi, but these will not be considered here.[30]

A second restriction concerns the relevance of parasites in terms of biodiversity. As the next section shows, parasites form a crucial role in biodiversity. This creates the basis on which parasites fall or should fall within the scope of international biodiversity law and consequently forms a boundary for this thesis. In other words, this thesis only deals with ecologically valuable parasites.

As this thesis aims to assess parasites from the perspective of species protection and conservation, the third restriction excludes parasites that are not endangered and therefore are not in need of protection. Due to the limited knowledge on parasites, this may lead to a theoretical outcome. Furthermore, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, which holds the authoritative position in determining the conservation status of species, largely ignores parasites.[31] Despite listing

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[27] Species with parasitical behaviour leading to the death of its host are called parasitoids. Without specifically focussing on parasitoids, parasitoids are here treated as a sub-genre of parasites and thus within the scope of this thesis. Note that literature may differ regarding the inclusion of parasitoids within the category of parasites, as some sources treat parasitoids as a category separate from parasites.

[28] Lawrence (n 14) 402.

[29] ibid 36.

[30] To contribute to the readability, this thesis will not continually mention *metazoan parasites*, but simply *parasites*, therewith referring to all parasites within the boundaries here confined.

[31] International Union for the Conservation of Nature (IUCN) Red List of Threatened Species <https://www.iucnredlist.org> accessed 5 June 2022.

some parasite species, its criteria have been called ‘wholly unsuitable’ for the application to parasites.[32]

Despite the observation that parasites form ‘a major blind spot’ in conservation biology,[33] a call for the protection of parasites has become widespread among parasite experts.[34] They base their plea on two crucial arguments. First, parasites play a vital role in conserving the biodiversity of their ecosystems.[35] Second, a substantial number of parasite species is threatened with extinction.[36] The next two sections elaborate on these arguments.

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[32] Mackenzie L Kwak, Allen CG Heath and Pedro Cardoso, ‘Methods for the assessment and conservation of threatened animal parasites’ (2020) 248 Biological Conservation 108696.

[33] Carlson, ‘A global parasite conservation plan’ (n 15).

[34] ibid; Donald A Windsor, ‘Equal Rights for Parasites’ (1995) 9 Conservation Biology 1; Lance E Durden and James E Keirans, ‘Host-Parasite Coextinction and the Plight of Tick Conservation’ (1996) 42 American Entomologist 87; Noah Kerness Whiteman and Patricia G Parker, ‘Using parasites to infer host population history: a new rationale for parasite conservation’ (2005) 8 Animal Conservation 175; Romain Pizzi, ‘Veterinarians and Taxonomic Chauvinism: The Dilemma of Parasite Conservation’ (2009) 18 Journal of Exotic Pet Medicine 279; Andrés Gómez and Elizabeth Nichols, ‘Neglected wild life: Parasitic biodiversity as a conservation target’ (2013) 2 International Journal for Parasitology: Parasites and Wildlife 222; Eric R Dougherty and others, ‘Paradigms for parasite conservation’ (2016) 30 Conservation Biology 724.

[35] Carlson, ‘A global parasite conservation plan’ (n 15); Windsor, ‘Equal rights for parasites’ (n 34); Larsen (n 20); Peter J Hudson, Andrew P Dobson and Kevin D Lafferty, ‘Is a healthy ecosystem one that is rich in parasites?’ (2006) 21 TRENDS in Ecology and Evolution 381; Kevin D Lafferty, Andrew P Dobson and Armand M Kuris, ‘Parasites dominate food web links’ (2006) 103 PNAS 11211; Armand M Kuris and others, ‘Ecosystem energetic implications of parasite and free-living biomass in three estuaries’ (2008) 454 Nature 515; RCA Thompson, AJ Lymbery and A Smith, ‘Parasites, emerging disease and wildlife conservation’ (2010) 40 International Journal for Parasitology 1163; Elizabeth Nichols and Andrés Gómez, ‘Conservation education needs more parasites’ (2011) 144 Biological Conservation 937; Takuya Sato and others, ‘Nematomorph parasites drive energy flow through a riparian ecosystem’ (2011) 92 Ecology 201; Jennifer A Dunne, ‘Parasites Affect Food Web Structure Primarily through Increased Diversity and Complexity’ (2013) 11 PLoS Biology; André Frainer and others, ‘Parasitism and the Biodiversity-Functioning Relationship’ (2018) 33 Trends in Ecology and Evolution 260; John P McLaughlin, Dana N Morton and Kevin D Lafferty, ‘Parasites in marine food webs’ in Donald C Behringer, Brian R Silliman and Kevin D Lafferty (eds), *Marine Disease Ecology* (Oxford University Press 2020); Roderick B Gagne and others, ‘Parasites as conservation tools’ (2022) 36 Conservation Biology e13719.

[36] Carlson, ‘A global parasite conservation plan’ (n 15); Kwak, ‘Methods for the assessment and conservation of threatened animal parasites’ (n 32); Andy Dobson and other, ‘Homage to Linnaeus: How many parasites? How many hosts?’ 105 PNAS 11482; Robert R Dunn and others, ‘The sixth mass coextinction: are most endangered species parasites and mutualists?’ (2009) 276 Proceedings of the Royal Society B 3037; Kevin D Lafferty, ‘Biodiversity loss decreases parasite diversity: theory and patterns’ (2012) 367 Philosophical Transactions of the Royal Society B 2814; Lajos Rózsa and Zoltán Vas, ‘Co-extinct and critically co-endangered species of parasitic lice, and conservation-induced extinction: should lice be reintroduced to their hosts?’ (2014) 49 Oryx 107; Giovanni Strona and Kevin D Lafferty, ‘Environmental change makes robust ecological networks fragile’ (2016) 7 Nature Communications; Carrie A Cizauskas and others, ‘Parasite vulnerability to climate change: an evidence-based functional trait approach’ (2017) 4 Royal Society Open Science; Colin J Carlson and others, ‘Parasite biodiversity faces extinction and redistribution in a changing climate’ (2017) 3 Science Advances; James P Herrera, James Moody and Charles L Nunn, ‘Predictions of primate-parasite coextinction’ (2021) 376 Philosophical Transactions of the Royal Society B.

2.1.2 The relevance of parasites for their ecosystems

According to the CBD, biological diversity (or biodiversity) concerns

> the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.[37]

In the same provision, an ecosystem is defined as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit'.[38] When considering the relevance of parasites in relation to biodiversity and their ecosystems, the huge variety of parasite species stands out. Even though exact figures remain subject to debate, it is estimated that parasite species contain the majority of species on Earth,[39] making parasitism 'the most common animal lifestyle'.[40] This has caused Windsor to notice that if this is the case, 'then most biological knowledge stems from studying the minority of species'.[41] To place the huge diversity of parasite species in perspective to non-parasitical species, or free-living species, it is sufficient to realise that almost every free-living species attracts several host-specific parasite species.[42] Even without exact figures, the number of parasite species can thus be assumed to be a multiplication of the number of free-living species.

Keeping in mind that the variability is an essential factor in the assessment of biodiversity within an ecosystem, the abundance of parasite species already accounts for a certain relevance, or as Lafferty puts it: 'a high diversity of parasites indicates a complex and functioning set of interacting free-living species'.[43] In fact, not only the variability of the species is impressive, the collective biomass of parasites within one ecosystem may exceed that of top predators.[44] Next to quantitative arguments, the ecological importance of parasites also lies in their qualitative functions.

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[37] CBD (n 4) art 2.
[38] ibid.
[39] Larsen (n 20) 231.
[40] Lafferty, 'Parasites dominate food web links' (n 35) 11211.
[41] Windsor, 'Most of the species on Earth are parasites' (n 20) 1939.
[42] Dougherty (n 34) 725.
[43] Lafferty, 'Biodiversity loss decreases parasites diversity: theory and patterns' (n 36) 2825.
[44] Kuris (n 35) 515.

In the field of ecology, food webs are used to show the connectivity and energy flow through ecosystems.[45] Studying the position of parasites within these food webs revealed that parasites 'strongly affect food web structure. Indeed, they disproportionately dominate food web links'.[46] This influence gives parasites an important 'role as trophic regulators',[47] meaning their presence holds or restores the natural balance of food webs.

An example of this regulation came to light in a study on parasitical horsehair worms (*Gordionus* spp.), camel crickets (*Diestrammena elegantissima* and *Diestrammena asynamorus*), and Japanese trout (*Salvelinus leucomaenis japonicus*).[48] This study showed that the worms have a lifecycle in which they parasitise different species. When in the final larval stage, which the worm spends inside a cricket on land, the worm needs to enter water in order to continue its lifecycle. To achieve this, the worm 'manipulates its cricket host to enter streams',[49] where the cricket gets eaten by fish and frogs. Here, the worm secedes both the cricket and the fish. The benefit for the ecosystem's biodiversity through this peculiar event is twofold. First, as the crickets provide a food source for the Japanese trout, the fish leave other potential food in the stream alone.[50] This enriches the biodiversity of the stream. Second, if available, the crickets account for 60% of the caloric intake of the Japanese trout.[51] Considering the Japanese trout's endangered status,[52] one could argue that the fulfilling of the lifecycle of the horsehair worm is a crucial factor for the survival of the Japanese trout species as a whole.

Lastly, their presence in food webs shows yet another remarkable role for parasites. The interaction between parasites and their hosts can ultimately create evolutionary advantages

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[45] Lafferty, 'Parasites dominate food web links' (n 35) 11211.
[46] ibid 11214.
[47] Dougherty (n 34) 725.
[48] Takuya Sato and others, 'Nematomorph parasites indirectly alter the food web and ecosystem function of streams through behavioural manipulation of their cricket hosts' (2012) 15 Ecology Letters 786.
[49] ibid.
[50] ibid 787.
[51] Sato, 'Nematomorph parasites drive energy flow through a riparian ecosystem' (n 35) 204.
[52] IUCN Red List of Threatened Species <https://www.iucnredlist.org/species/19876/9100290> accessed 5 June 2022.

for both species, making parasites evolutionary drivers.[53] Like a pendulum, parasites challenge their hosts and vice versa. This correlation leads to co-evolution.

2.1.3 The threat of extinction of parasites

As mentioned above, there is wide consensus that a sixth mass extinction is now well under way.[54] Habitat loss as a result of climate change presents many parasite species with a risk of extinction.[55] Moreover, parasites are particularly vulnerable to environmental changes due to their dependence on other species.[56] This increased vulnerability 'may be 10 times higher than the baseline extinction rate of their hosts'.[57] Put differently, the downside of the positive contribution of parasite species to the richness of biodiversity comprises a sensitivity of parasites to their environment, including the diversity of potential host species.[58] A study on the decline of caterpillars in a Costa Rican forest shows this interdependency.[59] Climate change and land use change not only led to a rapid decrease of the studied caterpillars; the decline of associated parasites led the researchers to report that these findings 'can be extrapolated to an impressive 30% drop in parasitism over the next 100 years'.[60]

Due to their connectivity within their complex ecosystems, the consequences of an extinction wave among parasites could be severe. According to Strona and Lafferty, 'future species losses should trigger secondary extinctions and eventual ecosystem collapse'.[61] The study on the Japanese trout is a striking example of this.[62] Cizauskas and others point out that the

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[53] Carlson, 'A global parasite conservation plan' (n 15); Peter H Thrall, 'Coevolution of symbiotic mutualists and parasites in a community context' (2006) 22 TRENDS in Ecology and Evolution 120; William E Feeney, Justin A Welbergen and Naomi E Langmore, 'Advances in the Study of Coevolution Between Avian Brood Parasites and Their Hosts' (2014) 45 Annual Review of Ecology, Evolution, and Systematics 227; Andrei Papkou and others, 'Host–parasite coevolution: why changing population size matters' (2016) 119 Zoology 330; Gerrit Joop and Andreas Vilcinskas, 'Coevolution of parasitic fungi and insect hosts' (2016) 119 Zoology 350; Christoph Vorburger and Steve J Perlman, 'The role of defensive symbionts in host–parasite coevolution' (2018) 93 Biological Reviews 1747.

[54] Wake (n 1); Wagler (n 1); Dirzo (n 1); Pimm (n 1); McCallum, 'Vertebrate biodiversity losses point to a sixth mass extinction' (n 1); Ceballos (n 1); Johnson (n 1); IPBES (n 1); McCallum, 'Turtle biodiversity losses suggest coming sixth mass extinction' (n 1).

[55] Carlson, 'Parasite biodiversity faces extinction and redistribution in a changing climate' (n 36).

[56] ibid; Herrera (n 36).

[57] Cizauskas (n 36).

[58] Lafferty, 'Biodiversity loss decreases parasite diversity: theory and patterns' (n 36) 2825.

[59] Danielle M Salcido and others, 'Loss of dominant caterpillar genera in a protected tropical forest' (2020) 10 Scientific Reports.

[60] ibid.

[61] Strona (n 36).

[62] Sato, 'Nematomorph parasites indirectly alter the food web and ecosystem function of streams through behavioural manipulation of their cricket hosts' (n 48).

structure of disease communities may also be disrupted as 'some pathogens could experience competitive release as rare species go extinct'.[63] Altogether, 'the loss of parasite biodiversity could make a significant contribution to the sixth mass extinction'.[64]

Despite the function parasites fulfil for sustaining a rich biodiversity in their ecosystems and the threat of extinction that parasites face, parasites are poorly represented in efforts for the protection of threatened species. The next section examines to what extent parasites are present in international biodiversity law, more specifically the CBD. The first paragraph of the section assesses the scope of the CBD in relation to the protection of parasite species. Consequently, the presence of parasites in the CBD framework from perspectives other than conservation is displayed. The final paragraph presents an overview of the parasites that are currently captured by species protection legislation.

2.2 Parasites in international biodiversity law

2.2.1 Parasites in the Convention on Biological Diversity from the perspective of conservation

The CBD does not specifically mention species or ecosystems but rather presents a holistic approach to biodiversity in general.[65] This approach serves as standard for the wide array of plans, programmes and Decisions of the Conference of the Parties (COP) published through the CBD Secretariat, giving the CBD 'the character of a framework convention'.[66]

From the presumption that parasites are underrepresented in biodiversity law, the preamble of the CBD presents a promising intention. It starts by expressing the view that biodiversity contains intrinsic value,[67] as well as various other values, including ecological value.[68]

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[63] Cizauskas (n 36).
[64] Carlson, 'Parasite biodiversity faces extinction and redistribution in a changing climate' (n 36).
[65] Philippe Sands and Jacqueline Peel, *Principles of International Environmental Law* (4th edition, Cambridge University Press 2018) 387.
[66] ibid 404; For an overview of the output of the CBD, see <https://www.cbd.int/convention/>.
[67] Note that the CBD consistently uses the term *biological diversity*, rather than *biodiversity*. The meaning of these terms is identical. This thesis uses the term *biodiversity*.
[68] CBD (n 4) preamble first paragraph.

Intrinsic value differs from other values through its non-instrumental quality.[69] This means it has value 'as an end in itself'.[70] Furthermore, this value is related to intrinsic properties and is based on objectivity, thus existing without a human valuer.[71] Ecological value is placed in the category of instrumental values.[72] Instrumental value can be described as 'the worth biodiversity derives from its human utility'.[73] Even though the term *ecological value* lacks a universal definition, the specific distinction between ecological value and other instrumental values in the preamble, such as genetic, scientific and cultural values, implies that ecological value contains the role that biodiversity has on the functioning of ecosystems. Next to having intrinsic value, biodiversity contributes to evolution and to 'maintaining life sustaining systems of the biosphere'.[74]

Despite the acknowledgement that biodiversity is in the interest of current and future generations of all living beings, the conservation of biodiversity is considered 'a common concern of humankind', thus accepting a particular responsibility for humans as opposed to non-humans.[75] The concept of a common concern of humankind suggests a scope that exceeds the interests of sovereign states.[76] Moreover, the concept 'includes a strong focus on intergenerational equity',[77] thus containing a moral duty on the current generation to maintain

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[69] Mattia Fosci and Tom West, 'In whose interest? Instrumental and intrinsic value in biodiversity law' in Michael Bowman, Peter Davies and Edward Goodwin (eds), *Research Handbook on Biodiversity and Law* (Edward Elgar, 2016) 55; Marcus Zisenis, 'To which extent is the interdisciplinary evaluation approach of the CBD reflected in European and international biodiversity-related regulations?' (2009) 18 Biodiversity Conservation 639, 640.

[70] John O'Neill, 'The Varieties of Intrinsic Value' (1992) 75 The Monist 119, 119.

[71] ibid 120.

[72] Werner Scholtz, ''Ethical and humane use', intrinsic value and the Convention on Biological Diversity: Towards the reconfiguration of sustainable development and use' (2021) 30 Review of European, Comparative & International Environmental Law 73, 78.

[73] Fosci (n 69) 55.

[74] CBD (n 4) preamble second paragraph.

[75] ibid preamble third paragraph. One might argue that this is obvious as non-humans are not among the ratifying parties of the Convention and, in line with the negation of the *pacta sunt servanda*-principle, can therefore not be burdened with an obligation they did not consent with. Furthermore, an appropriate response to the collapse of biodiversity may also be expected from the human species, as they are the main cause for the sixth mass extinction. See for example Johnson (n 1) 270; IPBES (n 1) 12.

[76] Frederiech Soltau, 'Common Concern of Humankind' in Kevin R Gray, Richard Tarasofsky and Cinnamon Carlarne (eds), *The Oxford Handbook of International Climate Change Law* (Oxford University Press 2016) 206.

[77] Chelsea Bowling, Elizabeth Pierson and Stephanie Ratté, 'The Common Concern of Humankind: A Potential Framework for a New International Legally Binding Instrument on the Conservation and Sustainable Use of Marine Biological Diversity in the High Seas' (White Paper 2016) <https://www.un.org/depts/los/biodiversity/prepcom_files/BowlingPiersonandRatte_Common_Concern.pdf> accessed 5 June 2022.

this equity for future generations. The negotiations prior to the adoption of the CBD express a similar vision.[78]

Also relevant in the case of parasites is the awareness of 'the general lack of information and knowledge regarding biological diversity',[79] and the vital significance of acting accordingly to prevent and stop biodiversity loss.[80] This culminates in the implementation of the precautionary principle, which holds that 'lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize' the threat of significant biodiversity loss.[81]

Overall, despite lacking a legally binding status, preambles generally express the intention of a treaty.[82] In that light, the preamble of the CBD presents an approach that grants a rich variety of values to biodiversity and postulates the responsibility on humankind to act in order to conserve biodiversity, including in situations where knowledge may be insufficient for scientific certainty.

This intention is extended through the objectives, stated in article 1, of which the conservation of biodiversity is especially relevant for this thesis.[83] As mentioned above, article 2 defines biodiversity.[84] A crucial consequence of this definition is that all sources of living organisms are included within the CBD: a hierarchy of species or other categories of living organisms is lacking entirely. This means that any element of biodiversity falls under the scope of the CBD. In terms of conservation, the Contracting Parties have the obligation under article 6 to '[d]evelop national strategies, plans or programmes'[85] and integrate this into relevant policies.[86] Through article 7, Contracting Parties must identify and monitor the components of biodiversity that play important roles for its conservation.[87] This includes a

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[78] 'Report of the Ad Hoc Working Group of Legal and Technical Experts on Biological Diversity on the Work of its Second Session' (7 March 1991) UNEP/Bio.Div/WG.2/2/5, par 17. <https://www.cbd.int/doc/meetings/iccbd/bdn-02-awg-02/official/bdn-02-awg-02-05-en.pdf> accessed 5 June 2022.

[79] CBD (n 4) preamble seventh paragraph.

[80] ibid preamble eighth paragraph.

[81] ibid preamble ninth paragraph.

[82] Makane Moïse Mbengue, 'Preamble' in Anne Peters and Hélène Ruiz Fabri (eds) *Max Planck Encyclopedia of Public International Law* (Oxford University Press, 2006) <https://opil-ouplaw-com.tilburguniversity.idm.oclc.org/view/10.1093/law:epil/9780199231690/law-9780199231690-e1456?rskey=fNiTOt&result=1&prd=OPIL> accessed 5 June 2022.

[83] CBD (n 4) art 1; The other objectives aim for 'the sustainable use of [components of biodiversity] (…) and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources'.

[84] ibid art 2.

[85] ibid art 6(a).

[86] ibid art 6(b).

[87] ibid art 7.

special category of species and communities which are, *inter alia,* threatened or important for the research into the conservation of biodiversity.[88]

This general assessment of the provisions of the CBD in relation to conservation of biodiversity provides the legal ground to argue for legal protection of parasites, as parasites fall under the scope of the CBD. The aforementioned scientific blind spot in relation to parasites does not allow Contracting Parties to close their eyes for the threat of extinction for these species and the far-stretching consequences their extinction could have for biodiversity. In fact, combining articles 6 and 7 with the precautionary principle poses a duty upon Contracting Parties to undertake measures for the conservation of the relevant species.

Next to the perspective of conservation, parasites can also be qualified as having a negative impact on biodiversity.[89] Therefore, it is not surprising that some of the direct references to parasites within the CBD situate parasites in this negative position in relation to the Convention's objectives. The next section elaborates on the perspectives other than conservation through which parasites are present in the CBD.

2.2.2 Parasites in the Convention on Biological Diversity from perspectives other than conservation

References to parasites in the CBD COP Decisions can be divided into three perspectives. First, parasites are considered as a threat in relation to pollinators. Second, parasites are detrimental for the health of other organisms, including humans. Finally, parasites can function as biological control agents.

Pollination is ‘the transfer of pollen from the male sex organ (anther) to the receptive portion of the female sex organ (stigma) in flowering plants’.[90] Next to insects such as bees and butterflies, pollination services can also be provided by birds, bats and rodents.[91] Due to the

[88] ibid Annex I under 2.
[89] Frainer (n 35).
[90] Gordon W Frankie and Robbin W Thorp, ‘Pollination and Pollinators’ in Vincent H Resh and Ring T Cardé (eds), *Encyclopedia of Insects* (Elsevier Science & Technology 2009) 813.
[91] Eugenie C Regan and others, ‘Global Trends in the Status of Bird and Mammal Pollinators’ (2015) 8 Conservation Letters 397, 398.

declining state of pollinators worldwide and the vital role pollinators play in conserving biodiversity,[92] pollinators form a returning topic on the CBD's agenda. The earliest COP Decision on this topic, in 2002, considers parasites as 'major contributors to this decline in pollinator population'.[93] This view resonates with the scientific consensus,[94] and is upheld in the latest COP Decision from 2018.[95] Native parasite species naturally interrelate with pollinators such as bees, but the anthropogenic introduction of non-native parasites, for example as an indirect result of the intentional introduction of other bee species, cause a detrimental threat as parasites jump over to unprepared native bee species.[96] The result of this can lead to diseases, neurological manipulation, development of deformed wings, or larvae feeding of honey and pollen.[97] Similar issues occur with other pollinators.[98]

In CBD COP Decision 14/6 (2018), one suggestion to 'limit the spread of parasites and pathogens' involves the development of counter mechanisms.[99] Furthermore, the preamble considers parasites as potential IAS.[100]

Second, the CBD also considers parasites as pests in a more general way, including their implications for human health. A pest is 'an organism that carries disease or harms plants or animals'.[101] An example of the implications that pests have on human health can be found in the 2018 CBD Report that refers to the number of parasites, viruses and bacteria that were found in wildlife meat sold in Malaysia,[102] a perspective that has come to the attention of the

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[92] See *inter alia* Jacobus C Biesmeijer and others, 'Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands' (2006) 313 Science 351; Simon G Potts and others, 'Global pollinator declines: trends, impacts and drivers' (2010) 25 Trends in Ecology and Evolution 345; Adam J Vanbergen and the Insect Pollinators Initiative, 'Threats to an ecosystem service: pressures on pollinators' (2013) 11 Frontiers in Ecology and the Environment.

[93] CBD COP Dec VI/5 (2002) UNEP/CBD/COP/DEC/VI/5, Annex II, I.2.

[94] See *inter alia* Peter G Kevan, 'Pollinators as bioindicators of the state of the environment: species, activity and diversity' (1999) 74 Agriculture, Ecosystems and Environment 373; Dave Goulson and others, 'Bee declines driven by combined stress from parasites, pesticides, and lack of flowers' (2015) 347 Science 1435.

[95] CBD COP Dec 14/6 (2018) CBD/COP/DEC/14/6, Annex I, II.10.

[96] Dave Goulson and William OH Hughes, 'Mitigating the anthropogenic spread of bee parasites to protect wild pollinators' (2015) 191 Biological Conservation 10. Note that in this context, the parasites most often considered are fungi and viruses. The example by Goulson and Hughes of the small hive beetle (*Aethina tumida*) on page 12 of their article shows that this issue also includes metazoan parasites.

[97] ibid 13.

[98] Sophie EF Evison and others, 'Pervasiveness of Parasites in Pollinators' (2012) 7 PLoS one e30641.

[99] CBD COP Dec 14/6 (n 95), Annex I, III.A.1.4.2.

[100] ibid preamble fourth paragraph.

[101] Peter Collin, *Dictionary of Environment and Ecology: Over 7,000 Terms Clearly Defined* (5th edition, Bloomsbury Publishing 2009) 160.

[102] CBD Report Towards a Sustainable, Participatory and Inclusive Wild Meat Sector (2018) CBD/COP/14/INF/7, 30.

greater public since the Covid-19 pandemic.[103] The Covid-19 virus acts as a zoonosis, which is 'an infectious disease that has jumped from a non-human animal to humans'.[104] In a different context, the spreading of parasites as IAS is also addressed, as some IAS can be considered as pests. In order to reduce the unintentional spreading of parasites due to trade in living organisms, it is suggested that disinfection of the living organisms can eliminate the presence of parasites, which could ultimately become IAS.[105] In this context, parasites are considered as by-products or waste as part of the transport of living organisms.

From a third perspective, parasites are situated as biological control agents. Biological control 'is a method of reducing or eliminating the impact or damage caused by an [IAS] (generally a targeted arthropod pest or weed species) by means of a biological agent'.[106] Of the four types of biological control agents, parasites qualify as classical biological control agents, which are 'host-specific natural enemies, generally from the country of origin of the target alien pest or weed'.[107]

Through the introduction of specific parasite species in an area that is suffering from an IAS, the parasites may serve as a natural enemy of the IAS, therefore limiting the spreading of the IAS, particularly if the IAS finds no other natural enemies in its new habitat. This method shows a lot of potential as many parasites are host-specific, thus not posing a threat to other species. Even if the parasite causes harm to species other than the IAS, the benefit of the overall result may still allow for this method to be employed. In that case parasites are intentionally introduced, even though the parasite species is an IAS itself.[108]

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[103] See for example Vijay Harypursat and Yao-Kai Chen, 'Six weeks into the 2019 coronavirus disease outbreak: it is time to consider strategies to impede the emergence of new zoonotic infections' (2020) 133 Chinese Medical Journal 1118; Dariusz Halabowski and Piotr Rzymski, 'Taking a lesson from the COVID-19 pandemic: Preventing the future outbreaks of viral zoonoses through a multi-faceted approach' (2021) 757 Science of The Total Environment 143723.

[104] World Health Organization, 'Zoonoses' (29 July 2020) <https://www.who.int/news-room/fact-sheets/detail/zoonoses> accessed 5 June 2022.

[105] CBD COP Dec 14/11 (2018) CBD/COP/DEC/14/11, par 23 footnote 5.

[106] CBD Report on the Application of Classical Biological Biocontrol Agents on Invasive Alien Species (2018) CBD/COP/14/INF/9, 6.

[107] ibid. The other types are augmentative biological control, conservation biological control and sterile insect technique. These are not relevant here and will not be discussed.

[108] CBD COP Dec VII/13 (2004) UNEP/CBD/COP/DEC/VII/13, par 7(e).

From these perspectives, three observations can be made. First, the versatile character of parasites is revealed through the crucial role that parasites play in food webs.[109] As such, parasites can have negative impacts, as is the case for pollinators and zoonoses, but they can also be applied to improve an ecosystem's balance in the function of biological control agents. Second, each of the three perspectives focuses on an ecological issue with a clear anthropogenic nature. All the main drivers of the decline of pollinators can be traced back to human behaviour,[110] the commercial approach to (wildlife) meat causes human interaction with organisms that have no natural connection to humans, and IAS are by definition introduced by humans.[111] Finally, parasites species are incredibly diverse,[112] but this is often unacknowledged. The three perspectives assessed in this section all focus on parasites as a whole. Within one COP report, the mention of parasites can include anything from 'protozoan parasites',[113] to 'the ectoparasitic mite Varroa destructor'.[114] Therefore, it can be argued that parasites are inaccurately generalised in the CBD framework. Interestingly, IAS play a role in each of the perspectives, suggesting that parasites and IAS often appear in the same context.

To complete the overview of the current status of parasites in international biodiversity law, the next section briefly examines the situation of parasites in relevant international legal instruments other than the CBD.

2.2.3 Parasites in other international biodiversity law from the perspective of conservation

The most comprehensive legal instruments in the extensive body of international and regional treaties together constitute the 'Big 5'.[115] Next to the CBD, these are the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES),[116] the

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[109] See also Lafferty, 'Parasites dominate food web links' (n 35); McLaughlin (n 35).
[110] CBD COP Dec 14/6 (n 95) Annex I, II.10.
[111] See chapter 3.1.1 for an elaboration of the definition of IAS.
[112] Carlson, 'Parasite biodiversity faces extinction and redistribution in a changing climate' (n 36).
[113] CBD Review of Pollinators and Pollination (2018) CBD/COP/14/INF/8, par 134. Protozoans are single-cellular organisms, thus forming a fundamentally contrasting category to the aforementioned metazoans.
[114] ibid par 208.
[115] Trouwborst, 'International Wildlife Law: Understanding and Enhancing Its Role in Conservation' (n 9) 785-786.
[116] Convention on International Trade in Endangered Species of Wild Fauna and Flora (adopted 3 March 1973, entered into force 1 July 1975) (CITES).

Convention on the Conservation of Migratory Species of Wild Animals (CMS),[117] the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention),[118] and the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO Convention).[119]

Of these legal instruments, the CBD is assessed above. The Ramsar Convention and the UNESCO Convention principally regulate areas and contain no references to parasites. As the name suggests, the CMS addresses the conservation of migratory species by configuring Appendices with migratory species that require protection. The term 'migratory species' refers to species that naturally tend to cross 'jurisdictional boundaries', thus excluding species with a nomad lifestyle within the borders of states.[120] The species present in the Appendices include no parasite species. In the seven agreements concluded under the auspices of the CMS,[121] no reference to parasites is made.[122]

CITES is the principal treaty on the regulation of international wildlife trade.[123] Of the 'roughly 5,590' listed animal species,[124] two have a parasitic feeding strategy. These are the leeches Hirudo medicinalis and the Hirudo verbana.[125] These ectoparasites are listed in Appendix II,[126] which means regulated trade is necessary to prevent the species from being

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[117] Convention on the Conservation of Migratory Species of Wild Animals (adopted 6 November 1979, entered into force 1 November 1983) (CMS).

[118] Convention on Wetlands of International Importance Especially as Waterfowl Habitat (adopted 2 February 1971, entered into force 21 December 1975) (Ramsar Convention).

[119] UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (adopted 16 November 1972, entered into force 17 December 1975) (UNESCO).

[120] CMS (n 117) art I(1)(a).

[121] ibid art IV(3) and V.

[122] Agreement on the Conservation of Seals in the Wadden Sea (adopted 16 October 1990, entered into force 1 October 1991); Agreement on the Conservation of Populations of European Bats (adopted 4 December 1991, entered into force 16 January 1994); Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (adopted 17 March 1992, entered into force 29 March 1994); Agreement on the Conservation of African-Eurasian Migratory Waterbirds (adopted 16 June 1995, entered into force 1 November 1999; Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (adopted 24 November 1996, entered into force 1 June 2001; Agreement on the Conservation of Albatrosses and Petrels (adopted 19 June 2001, entered into force 1 February 2004); Agreement on the Conservation of Gorillas and their Habitats (adopted 26 October 2007, entered into force 1 June 2008)

[123] Bram Janssens and Arie Trouwborst, 'Rhinoceros Conservation and International Law: The Role of Wildlife Treaties in Averting Megaherbivore Extinction' (2018) 21 Journal of International Wildlife Law & Policy 146, 159.

[124] CITES, 'The CITES Species' (*CITES*) <https://cites.org/eng/disc/species.php> accessed 5 June 2022.

[125] For the sake of completeness, it must be noted that research has shown that at least the Hirudo verbana has, under certain circumstances, fed on organs of dead hosts. Therefore, the Hirudo verbana is strictly speaking not exclusively an ectoparasite. See Ulrich Kutschera, Manfred Roth and Jörg-Peter Ewert, 'Feeding on Bufoid Toads and Occurrence of Hyperparasitism in a Population of the Medicinal Leech (Hirudo verbana Carena 1820)' (2010) 5 Research Journal of Fisheries and Hydrobiology 9.

[126] CITES (n 116) Appendix II.

threatened with extinction,[127] or that regulated trade of that species is deemed necessary in order to control the trade of other species.[128] Trade in Appendix II-species is regulated through a system of export permits.[129]

Used in medicinal leech therapy, the Hirudo medicinalis is valuable for humans in a way that most parasites are not. As a result, the Hirudo medicinalis 'has certainly suffered in substantial parts of its range through over-exploitation for trade'.[130] Despite its medicinal use, extensive knowledge on this species remains lacking, most notably on whether the Hirudo medicinalis and the Hirudo verbana are distinct species.[131] Due to this confusion, a 'taxonomic split' was employed for the listing of the two leech species in 2017.[132] Both the Hirudo medicinalis and the Hirudo verbana are now present on Appendix II.

2.3 Conclusion

This chapter has established what parasites are and why they are relevant in relation to international biodiversity law. Subsequently, this chapter has assessed the position of parasites in current international biodiversity law.

Their trophic strategy is the major distinguishing characteristic of parasites. In addition, all parasites harm their host to some extent. In order to set the boundaries within which this thesis operates, the category of relevant parasites species is restricted to endangered metazoan parasites with a positive effect on their ecosystems and biodiversity as a whole.

From the intention that is expressed in the preamble, which articulates the intrinsic and ecological values of biodiversity, and from the lack of hierarchy between species articulated in article 2, it follows that parasites fall under the scope of the CBD. Based on the precautionary principle and the principle of a common concern of humankind, Contracting Parties are obliged to actively participate in the conservation of biodiversity. However, the only direct references to parasites in the realm of the CBD do not consider the legal

[127] ibid art II(2)(a).
[128] ibid art II(2)(b).
[129] ibid art IV.
[130] CITES COP Consideration of Proposals for Amendment of Appendices I and II (1987) Doc. 6.46, par 60.
[131] Mark E Siddall and others, 'Diverse molecular data demonstrate that commercially available medicinal leeches are not Hirudo medicinalis' (2007) 274 Proceedings of the Royal Society B 1481; Ulrich Kutschera and John M Elliott, 'The European medicinal leech Hirudo medicinalis L.: Morphology and occurrence of an endangered species' (2014) 91 Zoosystematics and Evolution 271.
[132] UNEP-WCMC, 'Report on species/country combinations selected for review by the Animals Committee following CoP16' (Cambridge 2017) AC29 Doc. 13.2 Annex I, 123.

protection of parasites. Parasites are considered as threats for pollinators and for (human) health in general, whereas the assignment of a function as biological control agents presents an instrumental approach to parasites. Without questioning the validity of these approaches as such, one can conclude that the 'Big 5' biodiversity conventions are incompatible with the numerous studies that prove the value of parasites for biodiversity. This is not the place to assess the reasons for this discrepancy, but the general lack of interest may be considered both unjust in relation to the inherent value of all organisms, and alarming, as biodiversity needs parasites for its conservation.

Due to the unexplored nature of knowledge on parasites, it may be useful to involve another category of species before turning to the biopolitical analysis. Therefore, chapter 3 assesses IAS, as this category presents relevant similarities and differences with parasites that may help to determine the biopolitical complexities of the legal protection of parasites.

3. Comparing The Categories Of Parasites And Invasive Alien Species

The focus of this chapter lies in comparing the category of parasite species with the category of IAS as a constructive basis for the biopolitical analysis in chapter 4. Therefore, the central question of this chapter is: *What are invasive alien species, and to what extent are they comparable to parasites?* In order to answer this question, this chapter opens with an elaboration of the category of IAS, including a theoretical comparison between parasites and IAS, and between these two categories and taxonomic categories of species. Consequently, the position of IAS in international biodiversity law is addressed.

3.1 Parasites and invasive alien species

3.1.1 Defining invasive alien species

Many organisations and scholars pay attention to IAS, often using slightly diverting definitions. In order to maintain a coherent framework in relation to the other chapters, this thesis takes the CBD as starting point. The CBD Secretariat defines IAS as 'species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity'.[133] The term *species* includes species of 'all taxonomic groups, including animals, plants, fungi and microorganisms'.[134] Although this is not specified in official legal documents of the CBD, it corresponds with the general text of the CBD as it includes all living organisms under the umbrella of biodiversity.[135]

The alienness of an IAS refers to the relationship between the species and its territory. For a species to be deemed alien requires the introduction or spreading of a species outside its natural territory.[136] The crucial aspect that separates IAS from for example migratory species, is that the 'introduction [of IAS] refers to the movement by human agency, indirect or direct,

[133] CBD Secretariat, 'What are Invasive Alien Species?' (*CBD*, 4 January 2010) <https://www.cbd.int/invasive/WhatareIAS.shtml> accessed 5 June 2022.
[134] ibid.
[135] CBD (n 4) art 2.
[136] CBD COP Dec VI/23 (2002) CBD/COP/DEC/VI/23, Annex footnote 57.

of an alien species outside of its natural range (past or present)'.[137] This definition indicates that the introduction inherently exists as a result of human interference in a broad sense.[138] Distinctions are made between direct or indirect, and intentional or unintentional introductions. The introduction of a species due to for example anthropogenic environmental changes, such as climate change, is considered indirect,[139] whereas direct introduction happens through the physical 'transport of propagules'.[140] An intentional introduction is for example the trade in exotic pets,[141] or the introduction of species as biological control agents, including parasite species.[142] Examples of unintentional introduction of IAS include the species that are transported as part of ballast water of large ships,[143] or the introduction of the European grass *Poa annua* on Antarctica.[144] It is important to note that the term *alien* automatically implies a certain reference to space and time: 'No species is inherently alien, but only with respect to a particular environment at a particular moment'.[145]

The second requirement for the qualification as IAS is the invasiveness of a species. According to the website of the CBD Secretariat, '[f]or a species to become invasive, it must successfully out-compete native organisms, spread through its new environment, increase in population density and harm ecosystems in its introduced range'.[146] This process is

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[137] ibid.

[138] A term often used in this context is 'feral'. Although the exact definition often varies, generally this term differs from IAS as 'feral' usually refers to species that have bewildered from their originally human environment, such as feral cats. This said, many IAS may also be called 'feral', see for example Anna L Tsing and others, 'Feral Atlas: The More-Than-Human Anthropocene' (website, Stanford University Press 2021) < https://feralatlas.org> accessed 5 June 2022. For more information, see *inter alia* Lara Gosling, Jenny Stavisky and Rachel Dean, 'What is a Feral Cat? Variation in definitions may be associated with different management strategies' (2013) 15 Journal of Feline Medicine and Surgery 759; Rocío Contreras-Abarca and others, 'Redefining feral dogs in biodiversity conservation' (2022) 265 Biological Conservation 109434.

[139] Personal e-mail communication with dr. Piero Genovesi (Chair IUCN SSC Invasive Species Specialist Group), May 2022.

[140] Franz Essl and others, 'A Conceptual Framework for Range-Expanding Species that Track Human-Induced Environmental Change' (2019) 69 BioScience 908. Note that, in the Anthropocene, it is hard to imagine a species that moves to a new habitat without any connection to indirect human agency. The wide, all-encompassing scope of indirect introduction therefore remains subject to debate as technically, every newly introduced species can be considered an IAS.

[141] Shan Su, Phillip Cassey and Tim M Blackburn, 'The wildlife pet trade as a driver of introduction and establishment in alien birds in Taiwan' (2016) 18 Biological Invasions 215; Jérôme MW Gippet and Cleo Bertelsmeier, 'Invasiveness is linked to greater commercial success in the global pet trade' (2021) 118 PNAS.

[142] See chapter 2.2.2.

[143] Katie E Costello and others, 'Assessing the potential for invasive species introductions and secondary spread using vessel movements in maritime ports' (2022) 177 Marine Pollution Bulletin 113496.

[144] Marco A Molina-Montenegro, 'Assessing the importance of human activities for the establishment of the invasive *Poa annua* in Antarctica' (2014) 33 Polar Research.

[145] Charles R Warren, 'Perspectives on the 'alien' versus 'native' species debate' (2007) 31 Progress in Human Geography 427, 431.

[146] CBD Secretariat (n 133).

summarised as ‘arrive, survive and thrive’.[147] However, this catchy phrase is not completely accurate, as it leaves out the most problematic aspect. Next to the economic damage that IAS can cause, it is the harming of an ecosystem, often through threatening native species, that makes IAS one of the biggest current threats to biodiversity.[148]

The situation on Gough Island constitutes a striking and well-documented example of the devastating effect of IAS on biodiversity. This Southern-Atlantic island is an important breeding island for numerous albatross and petrel species. The house mouse (*Mus musculus*) was probably introduced on Gough Island in the late 19th century through frequent visits of fishers and whalers.[149] Without predators on the island, the mice could adapt to their new habitat.[150] A study in 2003 showed that part of their diet included avian carrion.[151] More recently, evidence was gathered that mice prey on albatross and petrel chicks,[152] and even on the burrowing adults.[153] It is worth noting that albatross chicks can weigh 10 kilograms, but the sheer number of mice combined with the persistence of the attacks make the birds very

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147 ibid.

148 Daniel Simberloff and others, ‘Impacts of biological invasions: what's what and the way forward’ (2013) 28 Trends in Ecology & Evolution 58; Joe M Caffrey and others, ‘Tackling Invasive Alien Species in Europe: the Top 20 Issues’ (2014) 5 Management of Biological Invasions 1; Gloria Luque and others, ‘The 100th of the world’s worst invasive alien species’ (2014) 16 Biological Invasions 981; Anthony Ricciardi, ‘Ecology of Invasive Alien Invertebrates’ in James H Thorp and D Christopher Rogers (eds), *Thorp and Covich's Freshwater Invertebrates: Ecology and General Biology* (4th edition, Academic Press 2015); Carles Carboneras and others, ‘A prioritised list of invasive alien species to assist the effective implementation of EU legislation’ (2018) 55 Journal of Applied Ecology 539; Petr Pyšek and others, ‘Scientists’ warning on invasive alien species’ (2020) 95 Biological Reviews 1511.

149 AG Jones, SL Chown and KJ Gaston, ‘Introduced house mice as a conservation concern on Gough Island’ (2003) 12 Biodiversity and Conservation 2107; Richard J Cuthbert and Geoff Hilton, ‘Introduced house mice Mus musculus: a significant predator of threatened and endemic birds on Gough Island, South Atlantic Ocean?’ (2004) 117 Biological Conservation 483.

150 Richard J Cuthbert and others, 'Drivers of predatory behavior and extreme size in house mice *Mus musculus* on Gough Island’ (2016) 97 Journal of Mammalogy 533.

151 AG Jones (n 149) 2110.

152 M Genevieve, W Jones and Peter G Ryan, ‘Evidence of mouse attacks on albatross chicks on sub-Antarctic Marion Island’ (2010) 22 Antarctic Science 39; Richard J Cuthbert and others, ‘Observations of mice predation on dark-mantled sooty albatross and Atlantic yellow-nosed albatross chicks at Gough Island’ (2013) 25 Antarctic Science 763; Ben J Dilley and others, ‘Effects of mouse predation on burrowing petrel chicks at Gough Island’ (2015) 27 Antarctic Science 543.

153 Cuthbert, ‘Observations of mice predation on dark-mantled sooty albatross and Atlantic yellow-nosed albatross chicks at Gough Island’ (n 152); Christopher W Jones and others, ‘First evidence of mouse attacks on adult albatrosses and petrels breeding on sub-Antarctic Marion and Gough Islands’ (2019) 42 Polar Biology 619.

vulnerable. Despite the fascinating evolutionary aspects of this case,[154] the consequences for the albatross and petrel species are devastating. One victim to the mice's adaptability is the Tristan albatross (*Diomedea dabbenena*), a critically endangered species of which over 99% of its global population breeds on Gough Island.[155] The annual average of 3% of population decline is mainly caused by the chick predation of mice, although other factors such as fisheries bycatch also play a role.[156]

Another study shows that bird populations on Gough Island had a considerably low breeding success and a high chick mortality rate compared to populations on other islands.[157] Considering the fragile status of the bird species and their dependency of Gough Island has led to the prediction that the house mouse on Gough Island is rapidly driving a number of bird species into extinction.[158] Despite being a relatively isolated island without a permanent human population, disposing the mice off the island has proven extremely difficult. A comprehensive and expensive eradication programme has managed to kill most of the mice, but recently, camera traps showed that mice are still present on the island.[159] It is precisely this thorny issue of killing one species in order to save another that the next chapter elaborates on through the notion of biopolitics.

Having established the category of IAS, the next section aims to compare the categories of parasites and IAS. First, it assesses the position of the two categories in relation to taxonomic categories. Second, the characteristics of parasites and IAS are compared, in order to present

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[154] Their large body size, high survival rate and predatory behaviour make the mice on Gough Island a typical example of the island syndrome. This phenomenon captures the predictable differences between populations of a species on an island compared to populations of the same species on the mainland, as Charles Darwin already noticed on his expeditions with the HMS Beagle in the 1830s. See *inter alia* Jonathan B Losos and Robert E Ricklefs, 'Adaptation and diversification on islands' (2009) 457 Nature 830; Robert J Whittaker and others, 'Island biogeography: Taking the long view of nature's laboratories' (2017) 347 Science; Simon Baeckens and Raoul Van Damme, 'Quick guide: The island syndrome' (2020) 30 Current Biology R329.

[155] Ross M Wanless and others, 'From both sides: Dire demographic consequences of carnivorous mice and longlining for the Critically Endangered Tristan albatrosses on Gough Island' (2009) 142 Biological Conservation 1710, 1711.

[156] Richard J Cuthbert, John Cooper and Peter G Ryan, 'Population trends and breeding success of albatrosses and giant petrels at Gough Island in the face of at-sea and on-land threats' (2014) 26 Antarctic Science 163.

[157] Anthony Caravaggi and others, 'The impacts of introduced House Mice on the breeding success of nesting seabirds on Gough Island' (2019) 161 Ibis 648.

[158] ibid; Dilley (n 152); Ross M Wanless and others, 'Can predation by invasive mice drive seabird extinctions?' (2007) 3 Biology Letters 241; Richard J Cuthbert and others, 'Low burrow occupancy and breeding success of burrowing petrels at Gough Island: a consequence of mouse predation' (2013) 23 Bird Conservation International 113.

[159] Gough Island, 'News Update: Mouse found on Gough' (*The Gough Island Restoration Programme,* 14 December 2021) <https://www.goughisland.com/post/news-update-mouse-found-on-gough> accessed 5 June 2022.

differences and similarities. These are relevant for the purpose of this thesis, which is to apply the notion of biopolitics onto the category of parasites.

3.1.2 Comparing parasites and invasive alien species to other categories of species

One of the prime aims of the scientific discipline of zoology is the classification and categorisation of animal and plant species.[160] Ever since Carl Linnaeus introduced his Linnaean taxonomy,[161] the classification of species remains a journey based on revision and adaptation.[162] This is not surprising, as regardless of its accuracy and comprehensiveness, zoological classification remains a human invention to order nature, and it has no immediate effect on the development of nature as such.[163] Despite this ongoing uncertainty, the zoological taxonomy constitutes the dominant system of ordering the world of flora and fauna. This includes its establishment in legal instruments. Although legislation often focusses on a specific aspect of the aimed species, for example its endangered status, the listing of species always follows the Linnaean nomenclature.[164]

As shown above, parasites and IAS are constructed in different types of categorisations. Both parasites and IAS can in theory belong to any taxonomic group. Interestingly, as parasites and IAS are not part of the same categorisation, a species can tick the boxes of three different categorisations: it is part of a taxonomic group, as a result of its trophic strategy it may be a parasite, and due to its alienness and invasiveness it may be an IAS. Implementing the three categorisations results in Figure 2.

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[160] Ernst Mayr, *Principles of Systematic Zoology* (McGraw-Hill 1969) 1.

[161] Carl Linnaeus, *Systema Naturae* (10th edition, Laurentii Salvii 1758), <https://www.biodiversitylibrary.org/item/10277#page/3/mode/1up> accessed 5 June 2022.

[162] See for example the uncertainty on the classification of the Hirudo medicinalis and Hirudo verbana as mentioned in chapter 2.2.3.

[163] The platypus (*Ornithorhynchus anatinus*), which is classified as a mammal despite lacking one of its pivotal requirements, is a striking example of this.

[164] See for example CITES (n 116) Appendix I, II and III; CMS (n 117) Appendix I and II.

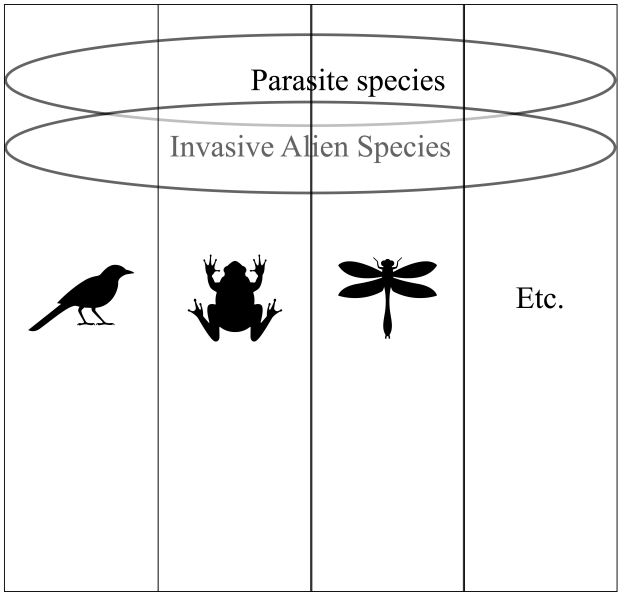

Figure 2: Schematic overview of the distribution of parasites and IAS over taxonomic categories. (Claerhoudt, 2022)

3.1.3 Comparing the characteristics of parasites and invasive alien species

This section aims to explain the added value of using IAS in order to explore the biopolitical complexities of a legal protection of parasites. Despite being configured by two separate categorisations, an assessment of the conceptual similarities and differences between parasites and IAS is valuable from the perspective of legal research, as IAS are abundant in international biodiversity law, whereas parasites are almost completely ignored. Comparing both categories has led to the following seven features.

First, it strikes that the characteristics of parasites are all inherent to the species. Even when the definition employs a broader scope, including for example the Common cuckoo (*Cuculus canorus*),[165] the included species can only qualify on the basis of natural features. This is different for IAS. IAS show natural behaviour in an unnatural environment. Time and space define whether a species is considered alien and invasive.

Second, as a consequence of the factor of location, the label of IAS usually only applies to a part of the global population of a species, in contrast to the parasitical characteristics that are

[165] Depending on the applied definition, the Common cuckoo can also be seen as a parasite, due to its parasitic brooding strategy. See for example David J T Douglas and others, 'How important are climate-induced changes in host availability for population processes in an obligate brood parasite, the European cuckoo?' (2010) 119 Oikos 1834.

inherent to entire species. The qualification of IAS is thus on the scope of specimens or populations. This intraspecies distinction can lead to rather contradicting situations in terms of the human approach to such a species. Whereas the European Union (EU) takes measurements to protect the European honey bee (*Apis mellifera*),[166] it has been suggested that their ecological impact in the USA and Australia is a negative one, theoretically qualifying them as IAS.[167] Although this has not yet resulted in their listing in legal documents, they are considered as IAS on the website of the CBD.[168]

An important difference between parasites and IAS is the impact they have on their environment, which configures a third and fourth feature of comparison. On a micro-scale, the parasites whose protection has been called for, harm their host species, possibly to the point of death. On a macro-scale however, these species do not threaten biodiversity. On the contrary, their ecological value to biodiversity is precisely the starting point for this thesis. On the other hand, IAS pose such a serious threat to the conservation of co-existing species in their new ecosystem that Burgiel and others state that IAS 'essentially become a form of biological pollution'.[169] Even if an IAS is not directly preying on original species, the sheer presence of a new neighbour makes life for original species so much harder that the consequences may be catastrophic. An example of this is the Red squirrel (*Sciurus vulgaris*) on the British Isles, which has been replaced by the bigger Grey squirrel (*Sciurus carolinensis*), not by being eaten but by losing the competition for the same food and habitat.[170]

A fifth point of comparison refers to conservation status. As shown in the previous chapter, many parasite species are endangered, and it is assumed that many parasite species have already gone extinct. IAS flourish by definition, which is exactly why the issue of IAS is considered such a threat for biodiversity.

This difference translates into the sixth parameter, namely the position of parasites and IAS in international biodiversity law. IAS are abundantly present with a very clear motive: they are a

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166 See for example <https://ec.europa.eu/food/plants/pesticides/protection-bees_en>.

167 Diane Thomson, 'Competitive Interactions Between the Invasive European Honey Bee and Native Bumble Bees' (2004) 85 Ecology 458.

168 See <https://www.cbd.int/invasive/photo.shtml?id=1554&returnurl=%2finvasive%2fphoto.shtml>.

169 Stas Burgiel and others, 'Invasive Alien Species and Trade: Integrating Prevention Measures and International Trade Rules' (2006) The Center for Environmental Law and Defenders of Wildlife, 6.

170 Dan Perry, 'Animal Rights and Environmental Wrongs: The Case of the Grey Squirrel in Northern Italy' (2004) 5 Essays in Philosophy 327, 332.

threat and therefore their spread needs to be prevented or halted. Parasites are almost completely absent in biodiversity law, especially in the context of protecting them.

Last, on a more conceptual level, the terms *parasites* and *IAS* are interchangeable, leading to a *transposition of terms*. After all, the act of parasitising and the act of being an IAS are both negatively conceived by external agents. For a host species, a parasite is an alien species that invades the host. Even more so, one may argue that IAS are the true parasites on the scale of global biodiversity, as they take from their ecosystem without giving in return. This broader take on the definition of parasites resonates with philosopher Michel Serres' approach.[171] His perception of parasitism refers mostly to behaving as a parasite, rather than naturally being one.[172] This approach might not maintain the same scope as the biological definition employed in this thesis, but it does show the fluidity in the way parasites and IAS relate to each other.[173]

	Parasites	**Invasive Alien Species**
Scope of label	On the basis of natural behaviour — not related to space and time	On the basis of unnatural location — related to space and time
Scope of label	On the scale of species	On the scale of specimens or populations
Relation to their environment on a micro-scale	Causing harm	Causing harm
Relation to their environment on a macro-scale	Crucial for maintaining a healthy ecosystem and conserving biodiversity as a whole	Detrimental for their ecosystem and threatening biodiversity as a whole
Conservation status	Declining — Many species endangered or gone extinct	Flourishing
Presence in international biodiversity law	Almost completely absent	A key issue for many legal instruments
Transposition of terms	Parasites are IAS to their hosts	IAS are parasites to their ecosystems

Table 1: Overview of comparison between characteristics of parasites and IAS.

[171] Michel Serres, *The Parasite* (University of Minnesota Press 2007).

[172] Illustrative of this is the book's opening, in which a fable about two rats supports a philosophical elaboration of parasitic relationships. See ibid 3-14.

[173] In a different context, this fluidity also opens the possibility of a debate on the position of human beings in relation to this transposition of terms: the human species has established itself as the invasive species par excellence, parasitising the Earth at the expense of almost everything and everyone.

3.2 Invasive alien species in international biodiversity law

As the sixth feature of the previous section mentioned, IAS are a much-targeted category in biodiversity law. This section presents an overview of the legal status of IAS. The overview starts with an assessment of the CBD, followed by a more general exploration of other international and regional biodiversity law.

3.2.1 Invasive alien species in the Convention on Biological Diversity

Within the CBD, IAS are addressed in relation to in-situ conservation, which primarily contains 'the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings'.[174] Next to a number of measures, Contracting Parties are expected to '[p]revent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.[175] IAS are thus considered to be a threat to the conservation of ecosystems and more specifically to populations of species within those ecosystems. In COP Decision IV/I (1998), the issue of IAS was acknowledged to be a cross-cutting issue, specifically in relation to the thematic programme of island biodiversity.[176]

CBD COP Decision VI/23 (2002) adopted the Guiding Principles for the Implementation of article 8(h) CBD, on the management of IAS.[177] The second principle presents the 'Three-stage hierarchical approach' to manage IAS, consisting of prevention, eradication and control.[178] Prevention is considered to be 'generally far more cost-effective and environmentally desirable' than other measures,[179] a view that is shared by most scholars.[180] Unfortunately, prevention measures can be compared to a chain, with the weakest link

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[174] CBD (n 4) art 2.
[175] ibid art 8(h).
[176] CBD COP Dec IV/1 (1998) CBD/COP/DEC/IV/1, C. For an overview of the thematic programmes and cross-cutting issues, see <https://www.cbd.int/programmes/>.
[177] CBD COP Dec VI/23 (n 136) II.
[178] ibid Annex A.
[179] ibid.
[180] Philip E Hulme, 'Beyond control: wider implications for the management of biological invasions' (2006) 43 Journal of Applied Ecology 835, 836; James C Russell and others, 'Invasive alien species on islands: impacts, distribution, interactions and management' (2017) 44 Environmental Conservation 359, 364; Gabriela I E Brancatelli and Sergio M Zalba, 'Vector analysis: a tool for preventing the introduction of invasive alien species into protected areas' (2018) 24 Nature Conservation 43, 44

determining its strength.[181] Prevention requires knowledge prior to the actual introduction of a species, thus including an element of prediction. Generally, prevention remains very difficult and records a low success rate.[182]

Due to the complexity of prevention, eradication is a widely used option for the management of IAS.[183] Being the preferred second stage of IAS management,[184] Guiding Principle 13 states that 'eradication is often the best course of action to deal with the introduction and establishment of [IAS]'.[185] Eradication 'is the application of control measures aiming at extirpating an entire population of a pest from an area'.[186] This includes a wide variety of options, including fertilising techniques, introducing biological control agents, or poisoning or shooting the IAS. The success rate of an eradication programme can be attributed to four factors: 'reaction time, the extent of the infestation, the knowledge of the invading species' biology, and whether the campaign was on an island or the mainland'.[187] Its biopolitical implications make eradication particularly relevant for this thesis, as will be elaborated in the next chapter.

Control measures comprise the third stage of IAS management, if 'eradication is not feasible or resources are not available'.[188] According to Guiding Principle 15, control measures should 'focus on reducing the damage caused as well as reducing the number of the [IAS]'.[189] Despite the aim to reduce the number of IAS, the distinction with eradication implies that control measures are not aiming for complete extirpation of the population.[190] Regardless the difference in aim, the methods of control measures are often similar to eradication efforts. For example, the use of biological control agents by introducing a virus to the population of

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[181] Burgiel (n 169) 9.
[182] Hulme (n 180) 836.
[183] Piero Genovesi, 'Eradications of invasive alien species in Europe: a review' (2005) 7 Biological Invasions 127.
[184] CBD COP Dec VI/23 (n 136) Annex A.
[185] ibid Annex D.
[186] Therese Pluess and others, 'When are eradication campaigns successful? A test of common assumptions' (2012) 14 Biological Invasions 1365, 1366.
[187] ibid 1367.
[188] CBD COP Dec VI/23 (n 136) Annex A.
[189] ibid Annex D.
[190] Pablo García-Díaz and others, 'Management Policies for Invasive Alien Species: Addressing the Impacts Rather than the Species' (2021) 71 BioScience 174, 175.

invasive toads in Australia,[191] or allowing the hunting of IAS may limit the increase in population and keep the caused damage within control.[192]

3.2.2 Invasive alien species in other international and regional biodiversity law

Next to the CBD framework, IAS are dealt with in other international and regional legal instruments that aim for nature conservation and the protection of biodiversity. Although not all 'Big 5' conventions address the issue of IAS directly in their framework treaties, they do recognise the threat of IAS in their own contexts. Overall, the measures of other legal instruments are consistent with the CBD's three-stage hierarchical approach of prevention, eradication and control, whereas they also aim for co-operation between organisations and legal frameworks.

The World Heritage Committee states that IAS pose a significant threat to natural World Heritage properties,[193] based on both local reports and the global assessment by the IUCN.[194] A similar message is conveyed in Resolutions of the Ramsar Convention by expressing the awareness of 'the severe threat that alien species pose to the ecological character of wetlands',[195] while also stressing the importance of supplying information by Contracting Parties,[196] and the collaboration with organisations such as the CBD and IUCN.[197] The CMS poses a duty on Contracting Parties to endeavour action against IAS that play a role in the endangered status of listed species.[198] Moreover, CMS daughter agreements should address IAS issues accordingly.[199] An important role could be played by CITES, as this convention directly regulates trade, one of the key factors in the prevention of introduction of IAS. However, as CITES merely attempts to regulate trade of species in order 'not to endanger further their survival',[200] it mostly focuses on the protection of the intentionally traded

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[191] Thayalini Shanmuganathan and others, 'Biological control of the cane toad in Australia: a review' (2010) 13 Animal Conservation 16.
[192] Giovanna Massei, Sugoto Roy and Richard Bunting, 'Too many hogs? A review of methods to mitigate impact by wild boar and feral hogs' (2011) 5 Human-Wildlife Interactions 79, 83.
[193] WHC Dec 39 COM 7 (2015) 39 COM 7, 10.
[194] WHC Document 39 COM 7 (2015) WHC-15/39.COM/7, 22-24.
[195] Ramsar Convention COP Resolution VII.14 (1999) 1.
[196] Ramsar Convention COP Resolution VIII.18 (2002) 4.
[197] ibid 10.
[198] CMS (n 117) art III(4)(c).
[199] ibid art V(5)(e).
[200] CITES (n 116) art II(1).

species, rather than the status of other species that might be affected by wildlife trade. An exception to this is the message to the Contracting Parties that trade of species that may become IAS deserves extra consideration.[201] Altogether, the contribution of CITES on the issue of IAS does not extend the recommendation that Parties 'consider the problems of invasive species when developing national legislation and regulations that deal with the trade in live animals and plants'.[202] In line with article XIV of CITES, which allows Contracting Parties to adopt stricter regulations,[203] the EU constructed its Regulation 1143/2014 on IAS (EU IAS Regulation), perhaps the strongest border-crossing legal instrument that addresses IAS.[204] The EU IAS Regulation stands out by its introduction of concrete action plans on controlling the pathways of IAS,[205] and setting up a surveillance system,[206] early detection notifications,[207] and rapid eradication procedures,[208] among others.

Other regional treaties that acknowledge the threat of IAS are, *inter alia*, the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention),[209] the Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America,[210] and the Convention on Conservation of Nature in the South Pacific (Apia Convention).[211]

The issue of IAS has also found its way into international legislation outside the nature conservation regime. Examples of this are the United Nations Convention on the Law of the Sea (UNCLOS),[212] the International Health Regulations,[213] and the International Convention

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[201] CITES Dec 10.76 (2004) AC20 Doc. 20.
[202] CITES Conf. 13.10 (Rev. CoP14) (2004) 1.
[203] CITES (n 116) art XIV.
[204] Regulation no 1143/2014 on the prevention and management of the introduction and spread of invasive alien species (22 October 2014) OJ L 317 (EU IAS Regulation).
[205] ibid art 13.
[206] ibid art 14.
[207] ibid art 16.
[208] ibid art 17.
[209] Convention on the Conservation of European Wildlife and Natural Habitats (adopted 19 September 1979, entered into force 1 June 1982) (Bern Convention).
[210] Convention for the Conservation of the Biodiversity and the Protection of Wilderness Areas in Central America (adopted 5 June 1992, entered into force 20 December 1994) art 24.
[211] Convention on Conservation of Nature in the South Pacific (adopted 12 July 1976, entered into force 26 June 1990) (Apia Convention) art V(4).
[212] United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) (UNCLOS) art 196(1).
[213] International Health Regulations (adopted 23 May 2005, entered into force 15 June 2007).

for the Control and Management of Ships' Ballast Water and Sediments (BMW Convention),[214] among others.[215]

3.3 Conclusion

In order to prepare a biopolitical analysis of the protection of parasites, this chapter has introduced IAS as a useful category to compare parasites with. To do so, it presented an explanation of what IAS are, before comparing the categories of parasites and IAS conceptually.

The requirements for the qualification as IAS contain the introduction of a species in a new habitat through human agency, followed by the species' survival, thriving and damaging impact within its new ecosystem. Based on these requirements, any species can become an IAS, regardless of its taxonomic class. Perhaps because of this, international law on IAS remains generally broad, presenting a framework that allows for tailored action per species, habitat or jurisdiction. The main three IAS management strategies consist of prevention, eradication and control. Even though prevention is in any case preferable, reality has shown that this is not always possible, leaving eradication and control measures as remaining options. Without being exhaustive, a view on the various legal instruments shows that the issue of IAS is well-represented in international and regional law.

The comparison between parasites and IAS has presented a number of similarities and differences. Compared to taxonomic categories, parasites and IAS find themselves in a similar position, as they both manoeuvre across the taxonomic categories. This can cause overlap, with a single species being able to tick three boxes. Comparing parasites and IAS as such, several interesting features stands out. Despite only sharing the characteristic that they cause harm on a micro-scale to co-existing species in their environment, it is nonetheless possible to speak of a transposition of terms. Parasites are IAS to their hosts, whereas IAS are parasites to their ecosystems. It must be emphasised that this consideration moves outside the scope of biological or legal definitions, but this notion may prove to be helpful for the construction of the biopolitical analysis in the next chapter.

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[214] International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted 13 February 2004, entered into force 8 September 2017).

[215] For an overview of relevant legal instruments dealing with the issue of IAS, see <https://www.cbd.int/invasive/done.shtml>.

4. The Legal Protection Of Parasites Through A Biopolitical Lens

This chapter aims directly at the main question of this thesis, which is repeated here for the sake of completeness: *To what extent does a biopolitical analysis expose the complexities of a legal protection of metazoan parasites?* To arrive at a constructive problematisation, this chapter opens with a brief introduction into Foucauldian biopolitics and its extension into nature conservation, followed by a depiction of Agamben's notion of bare life and its application to IAS. Consequently, the main arguments of this thesis are presented. Section 2 examines the consequences of the biopolitical status of parasites, particularly in relation to the notion of bare nature. Section 3 argues that a biopolitical lens can open up encouraging opportunities for the legal protection of parasites.

4.1 Biopolitics

4.1.1 Michel Foucault's notion of biopolitics

Much of Michel Foucault's approach to political philosophy is based on his assessment of the historical development of aspects of human history, such as sexuality,[216] or health care.[217] To organise his philosophy, Foucault presented the notion of biopolitics, which he used as a lens for his research and which still draws many scholars' attention today, leading to a vast output to reflect on. Keeping in mind the boundaries of this thesis, only specific aspects will be dealt with here.

Biopolitics essentially deals with the power of life and death. Foucault explains that in the classical time, an absolute sovereign could decide over the lives of his subjects in order to maintain the survival of himself as the Hobbesian sovereign.[218] This right has transformed into a power that ultimately aims for the protection and survival of a population.[219] In other words, 'the ancient right to *take* life or *let* live was replaced by a power to *foster* life or

[216] Michel Foucault, *The History of Sexuality Volume 1: An Introduction* (Vintage Books 1990).
[217] Michel Foucault, *The Birth of the Clinic: an Archaeology of Medical Perception* (Routledge 2003).
[218] Foucault, *The History of Sexuality Volume 1: An Introduction* (n 216) 135.
[219] ibid 136-137.

disallow it to the point of death'.[220] Within this development, one of two forms of this biopower is regulated by '*a biopolitics of the population*', the other mode being focussed on the disciplining of the body as a machine.[221] To summarise, biopolitics concerns the strategies and regulations on the killing (or at least not protecting) of one life in order to protect another life.

From this short overview of Foucault's biopolitics, it must be repeated that Foucauldian biopolitics can serve as a lens through which one can assess a certain phenomenon. Foucault does exactly that in his own work: he departs from his explanation of biopolitics to develop an understanding of sexuality as a political issue.[222] Therefore, the notion of biopolitics has been applied to many academic fields since, some of them rather distant from Foucault's initial interest, which was to use biopolitics to explain the governance of human life. One such field is the context of nature conservation, as biopolitics proves to be a useful notion to apply to non-human individuals and populations.[223]

4.1.2 Extending biopolitics into nature conservation

An investigation into the analysis of biopower by Paul Rabinow and Nikolas Rose accommodates the explanation of biopolitics' extension into nature conservation.[224] Rabinow and Rose configure three elements that need to be present in order to speak of a situation where biopower may apply. First, it requires an established truth discourse on the characteristics of life, including 'an array of authorities considered competent to speak that truth'.[225] Biopolitics thus 'requires a systematic knowledge of "life" and of "living beings"'.[226] Second, building on this truth discourse, strategies of 'intervention upon collective existence in the name of life and health' are constructed.[227] Finally, biopower is characterised by modes of subjectification. These modes contain, for example, keeping track

[220] ibid 138.
[221] ibid 139.
[222] ibid 135.
[223] Srinivasan, 'Conservation biopolitics and the sustainability episteme' (n 17) 1461; Biermann (n 16).
[224] Paul Rabinow and Nikolas Rose, 'Biopower Today' (2006) 1 BioSocieties 195.
[225] ibid 197.
[226] Thomas Lemke, *Bio-Politics: An Advanced Introduction* (New York University Press 2011) 119.
[227] Rabinow (n 224), 197.

of statistics of life and death of a population, which can 'help to produce norms that mobilize human subjects to discipline their own behavior'.[228]

Following these three elements, the expansion of biopolitics into the field of nature conservation can be rationalised. The importance of maintaining biodiversity through the protection of species or ecosystems participates in the current truth discourse on life on Earth.[229] This is accompanied by strategies of human intervention, whether on an individual scale in the form of euthanasia or neutering,[230] or on a larger scale by intervening in an ecosystem in order to create a better living space for non-human beings.[231] The third element of Rabinow and Rose is not sufficient for a direct expansion into a non-human realm, as subjectification for self-governance is implausible in the case of animals.[232] Therefore, Krithika Srinivasan argues that the additional possibility of 'agential subjectification' needs to be considered in order to place nature conservation in a biopolitical framework.[233] Agential subjectification refers to the biopolitical decisions of conservationists on behalf of an animals' well-being, thus subtracting the *self* from *self-governance*.[234] Furthermore, Srinivasan argues that, even with agential subjectification, a biopolitical approach to non-human worlds remains different from its original Foucauldian intent because harming human individuals is still perceived very differently from harming animal individuals.[235]

4.1.3 Giorgio Agamben's notion of bare life

Before turning to the application of biopolitics on the categories of parasites and IAS, one last theoretical notion needs explaining. Of the many critiques and additions to Foucault's biopolitics, one of the most evocative and controversial works is Giorgio Agamben's 1995

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[228] Biermann (n 16).
[229] See for example footnote 1, which contains a collection of authoritative studies, representing such a truth discourse.
[230] Srinivasan, 'The biopolitics of animal being and welfare: dog control and care in the UK and India' (n 16) 106.
[231] Perkins (n 16).
[232] Srinivasan, 'The biopolitics of animal being and welfare: dog control and care in the UK and India' (n 16) 114.
[233] ibid 115; Krithika Srinivasan, 'Caring for the collective: Biopower and agential subjectification in wildlife conservation' (2014) 32 Environment and Planning D: Society and Space 501, 509.
[234] Srinivasan, 'The biopolitics of animal being and welfare: dog control and care in the UK and India' (n 16) 115.
[235] Srinivasan, 'Caring for the collective: Biopower and agential subjectification in wildlife conservation' (n 233) 509.

book on *bare life*.[236] Interpreting Aristoteles, Agamben distinguishes the political life (*bios*) from the bare life (*zoē*).[237] He argues that in order to apply biopolitics, or to put it more crudely, to kill one life to protect another, human lives can be transformed into bare life. Bare life manoeuvres outside the political order and can therefore be killed or harmed with impunity.[238] Paradoxically, by being excluded from the political order, bare life is simultaneously included,[239] as even its exclusion has (bio)political consequences, both for the bare life itself and for the political life. Like Foucault, Agamben primarily focused on the relevance of his notion in relation to humans as subjects of governance, but this has not stopped various authors to consider the application of bare life in the field of nature conservation, introducing the term *bare nature*.[240]

4.1.4 Invasive alien species as bare nature

Of particular relevance for this thesis is Vito De Lucia's assessment of IAS in relation to the notion of bare nature.[241] De Lucia shows how the decision to label a species within a certain space as IAS transforms these lives into bare nature.[242] By becoming bare nature, an array of legal tools suddenly becomes available, resulting in Agamben's paradox of being both excluded and included in the political spheres.

To reverberate to the situation on Gough Island, the practical consequences of the bare nature-qualification become clear. An extensive eradication programme through aerial droppings of intoxicated baits was set up with the prime objective to 'prevent the extinction of the Critically Endangered Tristan albatross, the Endangered MacGillivray's prion, and several other small seabird species that are affected by invasive non-native mice'.[243] In biopolitical terms, harming the mice is rationalised for fostering the birds.

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[236] Giorgio Agamben, *Homo Sacer: Sovereign Power and Bare Life* (Stanford University Press 1998).
[237] ibid 1.
[238] ibid 8.
[239] ibid 9.
[240] See *inter alia* Rob Shields, 'Feral suburbs: Cultural topologies of social reproduction, Fort McMurray, Canada' (2012) 15 International Journal of Cultural Studies 205, 211; Jobb D Arnold, 'Bare Nature and the Genocide–Ecocide Nexus — The Conditions of General Threat and the Hope of Cultural Adaptation: The Case of Canada's Tar Sands' (2018) 21 Space and Culture 18.
[241] De Lucia (n 19).
[242] ibid 126.
[243] Gough Island, 'The Project' (*The Gough Island Restoration Programme)* <https://www.goughisland.com/the-project> accessed 5 June 2022.

From a legal perspective, the biopolitical measures that have been undertaken to eradicate the invasive mice from Gough Island are in line with article 8(h) of the CBD.[244] Even more so, through Foucauldian racism, which can be understood as 'a process of differentiation',[245] introducing 'the break between what must live and what must die',[246] the CBD encourages Contracting Parties to deal with the issue of IAS appropriately, thus justifying the killing of entire populations of species. The house mouse on Gough Island, by being qualified as IAS, has been transformed into bare nature and may be killed with impunity. That the house mouse is being placed outside the political life of nature conservation can also be shown by the complete lack of interest in ethical considerations of the eradication programme. An assessment of several studies on the eradication programme on Gough Island shows that efficiency is prioritised, while no mention of the mice' perception is made.[247] When considering potential baits, it is mentioned that one bait's disadvantage is that it does not kill 'contaminating invertebrates', demonstrating the aim for complete death.[248] All in all, De Lucia makes a relevant point when stating that IAS are a striking example of how protecting life is entangled with producing death, especially through the transformation of species into bare nature.[249]

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[244] CBD (n 4) art 8(h).
[245] De Lucia (n 19) 126.
[246] Michel Foucault, *Society Must Be Defended: Lectures at the Collège de France 1975 – 1976* (Picador 2003) 254.
[247] John Cooper and others, 'Earth, fire and water: applying novel techniques to eradicate the invasive plant, procumbent pearlwort *Sagina procumbens*, on Gough Island, a World Heritage Site in the South Atlantic' in CR Veitch, MN Clout and DR Towns (eds), *Island invasives: eradication and management: proceedings of the International Conference on Island Invasives* (IUCN 2011) 162; Richard J Cuthbert and others, 'Preparations for the eradication of mice from Gough Island: results of bait acceptance trials above ground and around cave systems' in CR Veitch, MN Clout and DR Towns (eds), *Island invasives: eradication and management: proceedings of the International Conference on Island Invasives* (IUCN 2011) 47; Richard J Cuthbert and others, 'Evaluating the effectiveness of aerial baiting operations for rodent eradications on cliffs on Gough Island, Tristan da Cunha' (2014) 11 Conservation Evidence 25.
[248] John Parkes, 'A Feasibility Study for the Eradication of House Mice from Gough Island' (2008) RSPB Research Report 34, 29 https://www.rspb.org.uk/globalassets/downloads/documents/conservation-projects/tristan-da-cuhna-programme/a-feasibility-study-for-house-mice-eradication-from-gough.pdf> accessed 5 June 2022.
Note that this is not just typical for uncharismatic species such as mice or rats, which are generally seen as pests: the same attitude is taken towards other species, such as the (rather beautiful) Red-whiskered bulbul (*Pycnonotus jocosus*), of which over 5000 specimens were shot by snipers. See De Lucia (n 18) 132.
[249] De Lucia (n 19) 133.

4.2 Parasites as bare nature

At this point it is time to return to the case of parasites. The previous chapter established that the categorisation of parasites and IAS differs in the sense that parasites are qualified on the basis of their natural feeding strategy whereas IAS earn their label due to circumstances based on human interferences. In relation to the notion of bare nature, this creates a further nuance. IAS are transformed into bare nature through their human-fabricated label,[250] but parasites do not require such a human-induced transformation. In other words, parasites are not transformed into bare nature, they automatically are bare nature! This is proven by their (almost) complete absence in international biodiversity law from the perspective of species protection, essentially excluding parasites from protection. Parasites may thus be killed with impunity. Perhaps this reveals an important difference between the notions of bare life and bare nature: whereas humans are automatically included in the political life, this is not the case for non-humans.[251]

The different positions of humans and non-humans can be explained with Foucault's distinction between the classical and the modern world.[252] In the classical world, law only included certain groups of people. For example, people outside the *polis* were not subjects of the law. Nowadays, legal systems ultimately capture all people, meaning that, in theory, people are protected by law everywhere and always. Therefore, bare life in the modern world can only be created through the process of excluding people.[253] Through time, humans have developed international law and politics that aim to include all humans by definition. For non-humans, such a development has happened only partially. Although the CBD does contain a lack of hierarchy among living organisms, the reality of parasites shows that this is

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[250] ibid 126.

[251] Note that, whereas the distinction between the terms *bare life* and *bare nature* has been established in previous sections and can therefore be applied consistently, a similar distinction between *political life* and *political nature* is missing. The relevant authors do not elaborate on this and the term *political nature* has not found its way into literature. Perhaps the most elucidating explanation for this is that the term *political nature* implies a *contradictio in terminis*: it is hard to see how including a non-human into the political world creates a distinction that can be described as *political nature* in relation to its counterpart *bare nature*. Therefore, it seems likely that in the context of human governance, one may speak of the dichotomy of political life and bare life, whereas the application of Agamben's notion to nature conservation introduces the notion of bare nature, but keeps the term *political life* useful. Nevertheless, this thesis uses *political life* in the context of both human governance and nature conservation.

[252] Foucault, *The History of Sexuality Volume 1: An Introduction* (n 216) 135.

[253] Although one could argue that some human rights issues still prove otherwise: is a child born from stateless parents not practically born as bare life?

merely a paper tiger. This means that bare nature can also exist in a permanent state of exclusion, so, by the non-inclusion of non-human life into the *bios*.

From this insight, it may need to be accepted that in order to extend the notion of bare life into bare nature, a transformation is no longer necessary. Parasites are not 'thrown in that zone of indistinction where life-affirming and life-negating practices coincide and conflagrate',[254] they are simply never taken out of it. In the field of nature conservation, specific legal instruments can induce such a metamorphosis, but in the case of parasites, this has not thoroughly happened yet.

For the sake of completeness, it needs to be added that science has also played a role in this phenomenon. The claim that 'food webs rarely include parasites',[255] suggests that through not considering parasites as valuable elements of nature, they are treated as bare nature even by conservation scientists. Furthermore, the 'major blind spot' that parasites constitute in conservation biology is likely to exist due to a lack of research, rather than to incapacity.[256] Obviously, a scientific gap should not be equalised to the notion of bare nature and its consequences, but connecting science and law may help to visualise the broad scope of the passive approach to parasites, and consequently, their status as bare nature. To a certain extent, parasites are invisible to human systems, whether legal or scientific.

Next to the non-inclusion of parasites in the political life, the perspectives from which parasites are mentioned in the framework of the CBD demonstrates the status of parasites as bare nature even further. According to COP Decision 14/6, threatening parasites that also qualify as IAS may, or even should, be extinguished in order to protect pollinators,[257] but the same COP Decision also mentions parasites next to IAS, suggesting that native parasites may be aligned with invasive parasites.[258] Similarly, parasites' roles in pests are connected to their presence as IAS. To connect this with bare nature: through their qualification as IAS, parasites are indeed transformed out of the political life, into bare nature. Once a parasite is considered an IAS, it can by definition no longer have positive ecological impacts. This makes parasites as biological control agents all the more interesting in this context. Here,

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[254] De Lucia (n 19) 126.
[255] Lafferty, 'Parasites dominate food web links' (n 35) 11211.
[256] Carlson, 'A global parasite conservation plan' (n 15).
[257] CBD COP Dec 14/6 (n 95), 4.
[258] ibid Annex I, II.10; This distinction was already present in earlier COP Decisions, see for example CBD COP Dec VI/5 (n 93), Annex II, I.2.

some parasites are granted instrumental value, although the lives of parasites are still not considered as full-fledged. In this scenario, bare nature (parasites) is used to combat bare nature (IAS) for the protection of other, more worthy (political) life. In theory this might include endangered parasite species, although in practice it is unlikely that sufficient numbers of endangered species would be available for such a technique. However, what remains is the attitude towards parasites as bare nature, available to be killed for the benefit of others.

The establishment of parasites as bare nature invokes three observations. First, the CBD's objective calls for a nuancing of labelling parasites as bare nature. Second, by means of the bare nature discourse, parasites allow for a detailed problematisation of human-nature relationships. These insights result in a third issue, which deals with extinction as a biopolitical consequence. This insight will lead to the final section, which attempts to show the potential of legal protection of parasites from a biopolitical perspective.

4.2.1 Parasites, bare nature and the Convention on Biological Diversity

Based on the CBD's general objective of 'the conservation of biological diversity',[259] the transformation of IAS into bare nature can be justified, as IAS pose a serious threat to biodiversity. However, parasites are not en masse threatening biodiversity. On the contrary, many parasite species are vital for the conservation of biodiversity. Being threatened with extinction, these species deserve protection just like other protected species. If the assumption of parasites as bare nature is correct, then parasites should be transformed out of this category, on the basis of both the available science and the CBD. In the juxtaposition of taking one life in order to protect another, the entire category of parasites currently constitutes the side of death, whereas a more accurate take on this would be to distinguish the *good* from the *bad* parasites, granting some parasite species the side of life instead. In case of the Japanese trout, the parasitic worm constitutes the side of life at the expense of individual crickets, whose deaths serve almost the entire ecosystem.[260]

The CBD provides a solid ground for an inclusion of parasites into the political life. Not only does the general lack of hierarchy among species suggest that living organisms cannot

[259] CBD (n 4) art 1.
[260] See chapter 2.1.2.

automatically be bare nature, the obligation of article 6, to '[d]evelop national strategies, plans or programmes for the conservation (…) of biological diversity',[261] opens the possibilities for the acknowledgement of parasites as living organisms within the domain of the *bios*.

4.2.2 Parasites, bare nature and human-nature relationships

A second insight from the qualification of parasites as bare nature relates to the debate on human-nature relationships. One of the biggest paradoxes in nature conservation is that by human attempts of protecting nature, nature always loses part of its naturalness. A striking example of this is wilderness protection: wilderness can only survive with a little help from humans, thus inherently losing (part of) its wild character.[262] To constitute a distinction between bare nature on the one hand, and the political life on the other, may in fact seem odd. It is not hard to imagine that no living organism would choose the political life over bare nature, if bare nature includes the non-intervention of humans. If the complete category of parasites, containing over half of all animal species, is indeed bare nature, this changes the perspective of human interference in nature considerably. One may argue that, as long as nature conservation and its accompanying legal framework ignores parasites, parasites remain without human intervention in their existence from a biopolitical point of view. *Bare nature* then becomes *pure nature*. Of course, in the Anthropocene, human intervention is present everywhere, but within the Earth as 'Planet Anthropocene',[263] parasites as a category may be as close to pure nature as possible, living unknown, untracked and untrammelled lives. This might not be problematic, considering that the most charismatic species 'are in a dire conservation state', while 'the large cultural abundance of these animals (…) hinders conservation communication efforts and therefore acts as an additional, pernicious threat'.[264]

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[261] CBD (n 4) art 6(a).
[262] Phillipa C McCormack and others, 'Wilderness Law in the Anthropocene: Pragmatism and Purism' (2021) 51 Environmental Law 383, 435.
[263] Bruno Latour, '"We Don't Seem to Live on the Same Planet" — A Fictional Planetarium' in Kathryn B Hiesinger and Michelle Millar (eds) *Designs for Different Futures* (Philadelphia Museum of Art & The Art History of Chicago 2019) 194.
[264] Franck Courchamp and others, 'The paradoxical extinction of the most charismatic animals' (2018) 16 PLoS Biology e2003997.

Agamben's use of the word 'exception' can be applied on parasites as bare nature.[265] Through exclusion of parasites in almost all legal instruments with a nature conservation objective, a method of non-intervention is applied to parasites to an unparalleled degree. Parasites are an exception in a human-governed world. Unfortunately, as many living organisms are threatened with extinction, one may argue that it is still safer for non-humans to be properly included in the political spheres instead of being bare nature and remaining off the human radar. This is not the place to discuss the balance between human interference and nature in greater detail, but the point that can be made here is that looking at parasites from a biopolitical lens shows that nature conservation practices inherently transform nature into politics, with the label of bare nature as unexpected (and perhaps unattractive) way out.

4.2.3 Extinction as a biopolitical consequence

Despite these insights, the practical danger for biodiversity, namely that parasites are quietly driven into extinction, remains. This implies that extinction can be a biopolitical consequence of the lack of legal protection of parasites. Following the model by Rabinow and Rose, populations of humans have been transformed into bare life on the basis of a truth discourse. The same goes for populations of non-humans, such as IAS. Regardless of ethical matters, effective eradication of IAS improves biodiversity, which is the only reason to transform non-humans into bare nature on the basis of the CBD.[266] Parasites however, are bare nature by their very being. Thousands of parasite species are bare nature on the scope of the entire species. Against the backdrop of the CBD and its objective of conservation of biodiversity, the question arises whether such indifference or even hostility towards the conservation of the majority of species is ecologically justifiable in any way. The significance of the 'variability among living organisms from all sources' suggests otherwise.[267] To put it differently: is it not impossible for a species as a whole to be detrimental to biodiversity? Even the most escalated cases of IAS do not demand the global eradication of an entire species. When speaking of the

[265] Agamben (n 236) 17-18. Agamben's use of the word exception is aptly explained in Justin Clemens, 'The Role of the Shifter and the Problem of Reference in Giorgio Agamben' in Justin Clemens, Nicholas Heron and Alex Murray (eds) *The Work of Giorgio Agamben: Law, Literature, Life* (Edinburgh University Press 2008) 53: 'This relation of exclusion-inclusion is not a simple outside-inside division; rather, what is excluded from human political life is precisely still included by its exclusion, that is, by being included as an exception.'
[266] CBD (n 4) art 2 jo 8(h).
[267] ibid art 2.

‘calculations of permissible harm’,[268] Srinivasan refers to the killing of some individuals to protect the rest of the population. Deworming an individual animal to cure it may also be seen as permissible harm against the parasites, even if this would target ecologically valuable parasites, but it is hard to imagine any calculation would result in the justified elimination of a complete species.

Even if the analysis above is not followed and parasites are not considered as Agambian bare nature, the question remains why the international legal framework in the field of biodiversity almost without exception considers all parasites threats to biodiversity. This seems to result in a contradiction to its very own definition of biodiversity, article 2 of the CBD to start with.[269]

To show that this is not merely a theoretical issue, the sad story of the California condor louse (*Colpocephalum californici*) serves as an exemplary warning. In order to protect the endangered California condor (*Gymnogyps californianus*), in 1987, the last 22 wild specimens were captured for a breeding programme, for which they received delousing treatments.[270] This caused the host-specific California condor louse to go extinct.[271] Strikingly, no evidence ever suggested that the louse was a threat to the condor’s health.[272] Despite the successful delousing treatment, the California condor is still critically endangered, although the population has increased.[273] In fact, it might be questioned whether other, more detrimental parasites might not eventually fill the gap left by the anthropogenic wipe-out of the California condor louse.[274]

In biopolitical terms, the louse was harmed to the point of death in order to care for the condors. Due to the rarity of both species, this meant that the death of individuals resulted in the extinction of a species. Dubiously, in this case it is questionable if the chosen method was necessary for its greater goal.

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[268] Srinivasan, ‘Caring for the collective: Biopower and agential subjectification in wildlife conservation’ (n 233) 507.
[269] CBD (n 4) art 2.
[270] Robert K Colwell, Robert R Dunn and Nyeema C Harris, ‘Coextinction and Persistence of Dependent Species in a Changing World’ (2012) 43 Annual Review of Ecology, Evolution, and Systematics 183, 187.
[271] Pizzi (n 34) 280; Strona (n 36); Jeroen van Dijk and Kenneth de Baets, ‘Biodiversity and Host–Parasite (Co)Extinction’ in Kenneth de Baets and John W Huntley (eds) *The Evolution and Fossil Record of Parasitism* (Springer 2021) 76.
[272] Mackenzie L Kwak, ‘Australia’s vanishing fleas (Insecta: Siphonaptera): a case study in methods for the assessment and conservation of threatened flea species’ (2018) 22 Journal of Insect Conservation 545.
[273] IUCN Red List of Threatened Species <https://www.iucnredlist.org/species/22697636/181151405> accessed 5 June 2022.
[274] Dunn (n 36) 3042.

4.3 The potential of biopolitics for the legal protection of parasites

Opposite to extinction as a biopolitical consequence stands the potential of biopolitics for the protection of parasites. In her study on Olive Ridley turtles (*Lepidochelys olivacea*), Srinivasan argues that biopolitics in nature conservation enables a 'win-win outcome'.[275] By rationalising harm of individual turtles, the created circumstances allow the survival of the species as a whole. Next to that, in efficient conservation programmes, a balancing act of different interests lets surrounding species 'win' too. In this way, socio-economic activities by humans, otherwise detrimental for the turtle population, can continue.[276] This approach constructs the 'sustainability episteme', which connects care with harm in order to achieve a sustainable situation for the collective of different species.[277]

In case of parasites, examples of such a win-win approach are currently hard to find. In the story of the louse and the condor, the extinction of the louse ruled out the possibility for a win-win result altogether. From a legal point of view, such a story is disappointing. After all, the CBD functions as the international framework for the non-hierarchical protection of biodiversity, including parasites. In the setting up of biopolitical regulations and strategies, neglecting parasites may therefore be in breach of the CBD's objectives. Of course, this is not how it is usually interpreted. Returning to Rabinow and Rose, the truth discourse on parasites still considers parasites as bare nature, as they are perceived as threatening to other species, for example the California condor. Consequently, intervention strategies such as the delousing treatment are constructed to deal with this detrimental bare nature. Finally, through agential subjectification, the condors were caught and subjected to a breeding programme, with the lice as obvious victims. That harm against animals is still perceived differently from harm against humans,[278] is also evident for both the condor and the louse: the harm inflicted on condors by taking away their freedom in order to breed is hard to imagine as being perceived necessary in the case of humans, whereas the human equivalent of the anthropogenic extinction of the louse exceeds even genocide. When the same analysis is

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[275] Srinivasan, 'Conservation biopolitics and the sustainability episteme' (n 17) 1468.
[276] ibid.
[277] ibid 1464.
[278] Srinivasan, 'Caring for the collective: Biopower and agential subjectification in wildlife conservation' (n 233) 509.

applied to the case on Gough Island, the differences between parasites and IAS present themselves: IAS are also bare nature in current truth discourses, and therefore the CBD and other legal instruments allow for strategies to eradicate them. Agential subjectification plays a role because humans interfere for the benefit of the greater good, namely the biodiversity of an ecosystem. Notwithstanding issues of animal welfare, the qualification of IAS as bare nature on behalf of biodiversity can be justified.

However, the biopolitical framework also offers hope for the protection of parasites. In an alternative scenario, the 22 condors could still have been caught for a captive breeding programme, but due to a different, more advanced truth discourse on the basis of *what doesn't kill them makes them stronger*, the delousing treatment would have been withdrawn from the intervention strategy. Presuming that the presence of lice would not stop the birds from breeding, this would ultimately have resulted in the entangling of harm and care in order for a win-win situation: the condors and the lice survive, whilst leaving evolution take its course with both species. After successful agential subjectification, humans would also be called winners in this scenario.

For this alternative scenario, changing the truth discourse on parasites is necessary, to the extent of what may be called a paradigm shift.[279] If the crucial relevance of parasites for biodiversity is understood and accepted, certain parasite species may be transformed from the side of death into the side of life. This then allows for a strategy of intervention that protects parasites, as well as other species, through agential subjectification. A win-win outcome can ultimately be realised. Table 2 shows the potentially different outcome, next to the current biopolitical application on parasites and IAS.

[279] OUP Philosophy Team, 'Thomas Kuhn and the paradigm shift – Philosopher of the Month' (*OUPblog* 14 November 2019) <https://blog.oup.com/2019/11/thomas-kuhn-paradigm-shift-philosopher-of-the-month/> accessed 5 June 2022: 'A paradigm shift occurs when the scientific community adopts the new paradigm, which leads to the beginning of the new period of normal science.' In this case, the perception of parasites requires a paradigm shift from the biopolitical *side of death* to the *side of life.* For more information on Kuhn's paradigm shift, see Thomas S Kuhn, *The Structure of Scientific Revolutions'* (3rd edition, University of Chicago Press 1996).

	IAS	Parasites (currently)	Parasites (potentially)
Truth discourse	IAS are a threat to their ecosystems — bare nature (*zoē*)	Parasites are a threat to their ecosystems — bare nature (*zoē*)	Parasites are vital for their ecosystems — political life (*bios*)
Strategy of intervention	Eradication through regulation of harm and care — *side of death*	Eradication through regulation of harm and care — *side of death*	Foster them through regulation of harm and care — *side of life*
Agential subjectification	On behalf of endemic species, IAS need to be eradicated	On behalf of host species, parasites need to be eradicated	On behalf of both host and parasites species, a win-win approach is necessary
Role of biopolitics	Biopolitics as a means to emphasise the different interests of categories of species	Biopolitics as a means to emphasise the different interests of categories of species	Biopolitics as a means to emphasise the potential of the protection of mutual interests

Table 2: Application on invasive alien species and parasites of the three elements of biopolitics can lead to a more beneficial way of protecting species, including parasites.

4.4 Conclusion

This chapter contained the biopolitical analysis of the legal protection of parasites. Through his notion of biopolitics, Foucault presented a method which allowed for a detailed assessment of the power of life and death. This notion has developed, *inter alia*, into the field of nature conservation, although this required an adjustment of the analytical model of biopolitics by Rabinow and Rose. Srinivasan provided this through the agential subjectification, dealing with the unlikely element of self-governance of a non-human population. Adding to the original Foucauldian vocabulary Agamben's notion of bare life (*zoē*) and its translation into the context of nature conservation, shows how IAS were excluded from the political life (*bios*) and could thus be killed with impunity. Against this theoretical backdrop, the biopolitical stage was set to construct the two main arguments of this thesis.

First, it became evident that parasites are considered bare nature. In contrast to IAS, this does not happen through a process of exclusion, but it exists by their passive non-inclusion in the political spheres. This insight may also have consequences for the notion of bare nature in relation to the original notion of bare life. Consequently, the justification of such a status of parasites is questionable against the backdrop of the CBD's objective and available research

on the ecological value of parasites. Furthermore, the position of parasites as bare nature raises questions in the sphere of human-nature relationships, while the justification to keep entire species bare nature, with the increasing risk of extinction remains disputable, to say the least.

Secondly, Srinivasan has argued that biopolitics in nature conservation permit a win-win outcome. It is this approach that shows the potential of a legal protection of parasites from a biopolitical lens. A paradigm shift is required to alter the truth discourse in relation to parasites, so that parasites are transformed to the side of life. In the grant scheme of biodiversity, this opens up the possibility to aim for a win-win outcome, at the benefit of parasites, free-living non-human species, and ultimately, humans.

5. Conclusion

Acting in order to slow down the sixth mass extinction and to maintain the liveability of planet Earth is crucial. Against that backdrop, this thesis has focused on a largely neglected category of species: parasites. The direct cause for this topic was the article in which Carlson and others call for a global parasite conservation plan, including a legal component.[280] Their claim is based on two main arguments: parasites constitute a vital role for the conservation of biodiversity while at the same time, it is estimated that a large number of parasite species is threatened with extinction. These arguments led to an assessment of the current position of parasites in biodiversity law, most specifically the CBD. On a general level, parasites are covered by the CBD, as the CBD contains a lack of hierarchy among species. Contrastingly, all mentions of parasites in the CBD framework perceive parasites as having a negative impact on biodiversity. Other legal instruments take a similar stance, apart from the occasional exception.[281] Without disputing these negative impacts, comparing the legal status with biological and ecological literature grounds the claim that parasites are represented inaccurately and incompletely in international biodiversity law.

In stark contrast with this is the legal status of IAS. Being acknowledged as one of the biggest threats for biodiversity, humans go a long way to correct this category of species that originates solely from anthropogenic behaviour. Among different strategies, eradication of IAS is particularly valuable for the biopolitical analysis this thesis pursued. In terms of the conceptual characteristics of IAS, the similarities and differences in relation to parasites form an interesting comparison between the two categories. This resulted in the interchangeable character of the terms parasites and IAS, simply called ‘transposition of terms’: parasites are IAS to their hosts, while IAS are parasites to their ecosystems. A more concrete message to be conveyed from this comparison is that IAS form a serious threat to biodiversity, whereas many parasites are essential for conserving biodiversity.

[280] Carlson, ‘A global parasite conservation plan’ (n 15).
[281] For example, the listing of the Hirudo medicinalis and the Hirudo verbana in Appendix II of CITES. See CITES (n 116) Appendix II.

Having set the stage, the thesis then proceeded with an analysis through a lens of biopolitics, examining the complexities that a legal protection of parasites generates in the light of the governance of life and death. Against the backdrop of Foucault's original work on biopolitics, Rabinow's and Rose's analysis, the extension of biopolitics into nature conservation nuanced by Srinivasan's adjustment and Agamben's developed notion of bare life, which was then applied to IAS by De Lucia, the biopolitical analysis of parasites produced two main arguments.

…only parasites have this genius for being invisible.[282]

First, parasites are currently bare nature. They manoeuvre outside the political life, allowing anyone to kill parasites with impunity. Curiously, the process of exclusion from the *bios* into the *zoē* is not required in the case of parasites, as they were never included in the first place. This invokes the suggestion that the notion of bare life (relating to humans only) cannot be copied wholesale into the notion of bare nature. Staying closer to the law, the assessment of parasites in the CBD resonates with the (dis)qualification of parasites as bare nature. However, this position is problematic against the premises that parasites are important for biodiversity and that many parasite species are endangered. Paradoxically, the CBD thus both opts for the protection of parasites and the elimination of parasites. Although this may also be based on the lack of specificity in the CBD's use of the term *parasites*, it shows its current inadequacy in this field of biodiversity regulation.

Consequently, the insight of parasites as bare nature revealed more paradoxes in the context of human-nature relationships. Although not directly related to the legal discourse, issues dealing with human interference in nature form an important consideration in our contemplations on how to regulate nature. Parasites, as bare nature, are also pure nature, although the Anthropocene forces that term to be forever relative.

A last point raised against this backdrop is the issue of justification. Whereas, despite questions on animal welfare, the label of bare nature of IAS can be explained on the basis of objectives of biodiversity, parasites manufacture a different story. Their circumstances do not allow for a (mal)treatment as bare nature. In fact, one may argue that allowing or even initiating the complete wipe-out of a species can never be beneficial for biodiversity,

[282] Serres (n 171) 237.

although a cynic might mention the human species as an exception. Surely, evolution would have been capable of getting rid of the California condor louse if it deemed such a development necessary? Instead, and again with keeping the Anthropocene in mind, humans took the fate of this louse, and potentially many other parasites, in their hands, with devastating effect.

...staying alive — for every species — requires livable collaborations.[283]

However, not all is lost. The second main argument contains that biopolitics also offers hope and opportunities for the legal protection of parasites. The win-win approach to nature conservation has led to the sustainability episteme, in which harm and care result in the survival of more than just one targeted species. In this episteme, the California condor would be protected not at the expense of the louse species, but together with it. Despite the gap of knowledge on parasites, it is not unthinkable to mould the truth discourse that is required for the inclusion of parasites into the side of life.

It is tempting to interpret biopolitics as putting one group of living organisms against the other, life versus death, harm versus care, *bios* versus *zoē*. However, this is not necessary, as biopolitics can also explain win-win situations. Parasites may benefit greatly from this approach. Vice versa, other species might benefit just as much.

[283] Anna L Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press 2015) 28.

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