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Fostering Refugia Amid Unfolding Extinctions

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Abstract

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I thank the anonymous reviewers for their insightful comments.

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Keywords: double death, extinction, Holocene resurgence, home, refugia

> 'End of the world' does the concept no justice. The world's present would end. Its future, immeasurably vaster, would also vanish. Even our past would be canceled. Our struggle from the primal ooze, every childbirth, every personal sacrifice rendered meaningless, leading only to dust, tossed on the void-winds. (…) [No] vestige would remain. Ruins become sand, sand blows away… all our richness and color and beauty would be lost… as if it had never been.
>
> — Alan Moore, *Watchmen*

Introduction

The problem with extinction is loss. Extinction wastes forms of sociability and genetic features developed by the actions of past individuals, which stop feeding present generations of their species. It wastes what a growing number of individuals do in the present since their current vital experiences are diminished by the lack of support of lost multispecies partners and by the increased difficulty of conceiving future generations of their own species. And it wastes the future, as many potential lives, both of one's own species and of its partners, will never come into being – or will only exist damaged by those who have been irreparably lost (Rose, *Nourishing Terrains*, 'The Rain Keeps Falling', 'Judas Work', *Wild Dog Dreaming*, 'Multispecies Knots'; Tsing, 'A Threat to Holocene Resurgence', *Viver nas Ruínas*; van Dooren, *Flight Ways*, *The Wake of Crows*).

There is a whole lot of life being wasted and it is going to get worse. But what can be done to oppose this waste? If one assumes, as I do (Aldeia, 'Pestering Capitalism', 'Contemporary Extinctions'; Aldeia and Alves), that contemporary extinctions are the result of the ways in which certain (but not all) humans have turned non-humans into resources to be mastered and appropriated through technoscientific means (Haraway; McBrien; Moore, *Capitalism in the Web of Life*; Rose, *Wild Dog Dreaming*; Tsing, 'A Threat to Holocene Resurgence', *Viver nas Ruínas*; van Dooren, *Flight Ways*, *The Wake of Crows*), then the unwavering

faith in technoscience to correctly master the world cannot be the answer. Mastery, as Val Plumwood showed, is a large part of the problem at hand. A life-fostering answer to extinction has to unfold differently.

A possible answer might be found in Anna Tsing's argument on the need to foster 'Holocene resurgence', 'the work of many organisms, negotiating across differences, to forge assemblages of multispecies livability in the midst of disturbance' (Tsing, 'A Threat to Holocene Resurgence' 52).[1] Resurgence is the capability of species to work and live together to change ecosystems in ways that are premised upon relatively balanced inter-species interdependencies, thus enabling mutual flourishing. Inherent to resurgence is the capacity of species to bounce back from ecological and climatic damage, thriving after a period of imperilment. This capacity to bounce back is intimately tied to the existence of refugia where life can be nurtured in times of ecological and climatic hardship.

In this essay, I try to expand upon Tsing's idea by looking at the features of refugia that might enable them to keep life going amid contemporary extinctions. I will start with a brief presentation of modern capitalogenic extinction trends and of the manners in which these break multispecies interdependencies. Then, I will look into how refugia were crucial to allow (some) species to keep on living during the ecologically and climatically harsh, and extinction-prone, glacial periods of the Quaternary. The essay will end by discussing how refugia had and can still have the capacity to nurture multispecies life amid unfolding extinctions because they function as homes for refugees, allowing them to rest and recover from the outside world for a (geo-historically long) while and carry on with the multispecies work of resurgence.

Damaged life, wasted life

Extinction overflows from dying species to damage the vital experiences of all those individuals of other species whose lives depended on interacting with the dying (Rose, 'The Rain Keeps Falling', 'Judas Work', *Wild Dog Dreaming*; Tsing, 'A Threat to Holocene Resurgence', *Viver nas Ruínas*; van Dooren, *Flight Ways*, *The Wake of Crows*).[2] This is particularly true in the current context of large-scale and quickly-unfolding extinction. For the past 500 years, coinciding with

the beginning of capitalist modernity (Dussel; Mignolo, *The Darker Side of the Renaissance*, *Local Histories/Global Designs*; Moore, *Capitalism in the Web of Life*; Patel and Moore, *A History of the World*), extinction rates have accelerated far beyond the natural background (the standard extinction rate in geological time). Different sources diverge on exactly how much over the natural background current extinction rates are, but they are estimated to be somewhere from 100 times (Ceballos et al., 'Accelerated Modern Human-Induced Species Losses', 'Vertebrates on the Brink') to 1000 times higher (De Vos et al.). As of May 2023, 940 species are known to have gone extinct since 1500 A.D., without taking into account the 86 species that are 'extinct in the wild', and at least 45,187 species are 'threatened with extinction' (IUCN). Given the lack of data on most of the world's species, most of which are thought to be unknown, many more are likely to be endangered (IPBES; Pimm and Raven 98-99).

These numbers have led some to argue that we are living through the 'sixth mass extinction' event in planetary history (Kolbert; Leakey and Lewin; Sepkoski 263-283 et passim; Wilson).[3] Since there are significant methodological difficulties in quantifying and comparing current and past extinction rates, this categorization might not be entirely accurate. To start with, the fossil record has little information on species, which frequently leads palaeontologists to work with families and genera, and biologists to deal with species, which are taxonomical levels that are not automatically commensurable (Barnosky et al. 52 et passim; Sepkoski 270 et passim). Despite this, there is little doubt that the magnitude of contemporary extinctions is one of the crucial problems of our time.

Extinction breaks the inter-generational and inter-species bonds on which the continuity of life depends, damaging life and wasting lived experiences (Rose, *Wild Dog Dreaming*, 'Multispecies Knots'; van Dooren, *Flight Ways*). As Zygmunt Bauman reminded us, the centuries-old unfolding of capitalist modernity leads to 'wasted lives'. It does so, however, in a far broader way than Bauman assumed, since he was talking about human lives (notwithstanding sparse comments on the unintentional ecological impacts of literal waste produced by mass consumerism). In the Capitalocene,[4] extinction wastes 'time, death, and generations' (Rose et al.) of both humans and non-humans. It erases the past, diminishes the present and annuls the

future of dying species and, in doing so, it damages the vital experiences of the individuals of all other species who depended on the dying ones. Millennia-old interactions, shaping genetic features and forms of sociability across species and generations, are shattered and stop.

Life requires individuals of different species to do things together, whether intentionally or not. In the course of their daily activities, individuals sweat and bleed, they care and die, they make efforts, spend energy and use their time to sustain themselves and their immediate kin. This entails interacting with other individuals of other species in peaceful or violent ways, from birds spreading plant seeds to predators killing herbivores. If all goes well in a situated multispecies entanglement, the time, effort and energy spent in the pursuit of survival and/or well-being overflow to nourish other individuals of other species and of other generations (Rose, *Nourishing Terrains*, 'The Rain Keeps Falling', 'Judas Work', *Wild Dog Dreaming*, 'Multispecies Knots'; Tsing, 'A Threat to Holocene Resurgence', *Viver nas Ruínas*; van Dooren, *Flight Ways*, *The Wake of Crows*).

Death is a large part of what species and generations share. As Deborah Bird Rose and Thom van Dooren remind us, life and death are inextricably linked both across intra-species generations and across inter-species interactions. Through these sequential and synchronous bonds, 'multispecies knots', to use Rose's expression, manage 'to bend death back into life' (Rose, 'The Rain Keeps Falling' 124; see also 'Judas Work', *Wild Dog Dreaming*): dead organisms turn into nourishment for other species, whose activities allow further species to flourish, which in turn will allow the next generation of the dead organisms' species to thrive (Rose, 'The Rain Keeps Falling', 'Judas Work', *Wild Dog Dreaming*, 'Multispecies Knots'; van Dooren, *Flight Ways*).

The extinction of a species interrupts these – agonistic or harmonious – situated inter-species relations of mutual support on which life depends. Extinction is a phenomenon of what Rose calls 'double death', an amplification of death that not only entails the death of individual bodies or populations (the first death) but also breaks sequential and synchronous bonds between species and generations, between life and death, making the act of turning death back into life significantly more difficult – or even impossible. The result of double death is the spread of the

damages of extinction to remaining species whose vital experience depended on the support provided by the deceased one (Rose, 'The Rain Keeps Falling', 'Judas Work', *Wild Dog Dreaming*; van Dooren, *Flight Ways*).

Especially when extinction reaches a magnitude similar to the current one, the interruption of multispecies bonds translates into waste. As van Dooren argues (*Flight Ways* 10 et seq.), extinction is a process that begins before the last individual of a given species has died and continues to be felt after this death by members of other species who have irrecoverably lost some form of inter-species mutual support. Before and after the death of the final individual of a species, the amount of waste starts pilling up: past and present efforts, time and energy spent, practices of care for multispecies kin, bonds linking generations going back for millennia, all become for nothing since they only have meaning as long as life, in one way or another, keeps on going within a situated multispecies community. Extinction leads to 'wasted lives' (Bauman) and, within them, wasted deaths that nourish no one (Rose, 'Judas Work').

Despite the catastrophic scale of extinction in the Capitalocene, hope still remains. Although capitalogenic double death severely diminishes life's capacity to bounce back from disturbance, many multispecies communities retain the ability to resurge after (and in the midst of) severe damage. This capacity is life's last hope against death's magnification, allowing species to fight back and keep on living – and even, if future climatic and ecological conditions permit, enabling them to prosper again. However, as the world becomes ecologically and climatically harsher, nurturing the life-making work of resurgence is only possible in the long term if there remain places where these multispecies communities can find the physical and emotional security that they require to go on. It is to these places that I turn my attention in the following section.

Refugia and extinction during the Quaternary

During the Quaternary,[5] climate has oscillated between glacial and interglacial periods of varying durations. Since each species requires specific climatic and ecological (and social) conditions to survive, the vital possibilities of species adapted to temperate climates severely diminish in

glacial periods and species adapted to colder climates experience similar hardships during interglacial periods. In past glacial and interglacial phases, many species went extinct, but others survived in various refugia (Ashcroft; Bennett and Provan; Birks and Willis; Dahl; Gómez and Lundt; Keppel et al.; Provan and Bennet; Schmitt and Varga; Stewart and Stringer; Stewart et al.).[6]

A refugium is a smaller or larger area whose climatic and ecological features enable it to house relatively small populations of species in a harsher world for a time period that is geo-historically relevant (Ashcroft; Birks and Willis; Keppel et al.; Stewart and Stringer; Stewart et al.). Some refugia last only for a single glacial or interglacial cycle (or potentially even less) whereas long-term refugia remain for several glacial/interglacial cycles lasting in total tens of thousands of years (Cartwright et al.; Stewart et al.). Short-lived and sometimes smaller refuges exist, but these are not synonymous with refugia (Ashcroft; Keppel et al.). Whereas a refugium is large enough to house small populations of species, a refuge is, many times, merely an individual shelter (Ashcroft 1408). Likewise, these kinds of sites exist in very different chronologies: a refugium persists for a period that is geo-historically relevant, whereas a refuge works on a shorter, ecologically relevant, temporality (Keppel et al.). Both refugia and refuges are important to protect life, but they are not the same.

For the last 700,000 years, glacial phases have been much longer than interglacial ones, which has led species adapted to temperate climates to spend much longer periods in refugium (Birks and Willis; Stewart et al.). During the glacial ages of the Quaternary, which were both colder and drier (due to lack of precipitation) than interglacial periods, many of the planet's areas became uninhabitable to these species. Many of these species contracted in both number and geographical range and retreated to refugia located either at lower latitudes (Ashcroft; Bennett and Provan; Gómez and Lundt; Keppel et al.; Provan and Bennett; Stewart et al.) or in microclimates at higher latitudes, such as valleys, high places or near mountain water springs (Ashcroft; Bennet and Provan; Birks and Willis; Keppel et al.; Provan and Bennett; Schmitt and Varga; Stewart et al.). Although some species died in refugium (Cartwright et al.; Stewart and

Stringer; Stewart et al.), those that survived until outside conditions became more amenable then expanded again, spreading out into the world (Bennett and Provan; Birks and Willis; Provan and Bennett; Stewart and Stringer; Stewart et al.; Schmitt and Varga).

If extinction is understood as an unfolding process that begins before the last individual of a species dies (van Dooren, *Flight Ways* 10 et seq.), then refugia are inextricable from extinction. This is both because the final fate of a species might be to die in refugium (Brown et al.; Cartwright et al.; Stewart and Stringer; Stewart et al.) and because the ecological movement of retreating to refugia entails a significant reduction of a species' geographical range and number of individuals (Bennett and Provan; Keppel et al.; Stewart et al.): in geo-historical time, the survival of some populations in refugium goes hand in hand with the death of many other (perhaps most) populations of the same species outside refugia. But the link between them also involves refugia's role in opposing extinction, insofar as the unfolding extinction of a species might be avoided by the survival of refugee populations, especially if these refugia last long enough for them to re-enter the world under more favourable ecological and climatic conditions. In any case, biogeographical research is consensual in finding that refugia do not enable the long-term survival of all (or even most) individuals of a species; they allow the long-term survival of species by protecting a number of individuals that is large enough to repopulate the world later on. Refugia protect life, but not all lives.

Refugia are dynamic. In geo-historical time, these are not photography-like sites where the old, pre-glacial (or pre-interglacial) world is kept untouched only to reemerge unchanged after a while. It is likely that sites that work as refugia do so because they retain certain climatic and ecological features that were common before the world started to become harder to live in (Birks and Willis 148; Keppel et al. 394). But refugia are not mere replicas of the past. These are sites where life goes on, carrying with it some features of the old world and mingling them with new multispecies partnerships established in refugium. Neither ecological and climatic conditions nor forms of multispecies sociability survive untouched in refugia. Rather, as lived-in places, refugia are sites of changing multispecies entanglements where the world is actively remade, with (pre-refugium) communities changing and being formed anew (Schmitt and Varga). When refugee species leave refugia, they mobilize both old and new relationships, as

well even newer ones that they establish post-refugium, to remake the outside world. The relative isolation of species and populations in each refugium, coupled with the need to adapt quickly to the new ecological, climatic and social conditions in refugium, might accelerate the rate at which populations of the same species diverge from one another in different refugia (and possibly promote speciation). When different populations of a species start to leave their respective refugia and spread, they come across each other and breed, adding genetic features to the whole species (Birks and Willis; Stewart and Stringer; Stewart et al.).

This all means that refugia allow life to go on, which is inevitably dynamic. As Deborah Bird Rose put it, 'life wants to live, wants to be embodied, and keeps finding its ways back into life. Life is always in a state of metamorphosis, across death into more life, crossing bodies, species, and generations' (Rose, *Wild Dog Dreaming* 137). If refugia are available, it seems that life's perpetual metamorphosis might even – sometimes – allow it to change enough to keep on going, in one form or another, in the midst of extinctions.

Refugium as home

Refugia have the potential to oppose life wasted by double death because, in a geo-historical time frame, the ecological and climatic (and social) features of these sites enable them to function as homes for multispecies refugees. In his poem, *The death of the hired man*, Robert Frost defined a home far better than I ever could:

> Home is the place where, when you have to go there,
> They have to take you in.
> I should have called it
> Something you somehow haven't to deserve.[7]

A home is a place that enables physical and ontological security.[8] A home is crucial for security because it is the site of emotional, social and physical stability *par excellence*, providing its inhabitants with the security that they require to rebuild their identities (Aldeia, 'A casa vista da rua', *Governar a vida na rua* 100 et seq.; Hiscock et al.; Pereira 23 et passim). It is, essentially, a haven (Hiscock et al.).

This understanding of the home as a site where the subject can rebuild itself is already clear in Levinas' argument that the home is an 'implement' used for 'habitation' (*Totality and Infinity* 152-153 et seq.). For Levinas, the home is one of the 'things necessary for the life of man' since 'it serves to shelter him from the inclemencies of the weather, to hide him from enemies or the importune' (152). In fact, 'the home occupies a privileged place' among these necessary things, which does not mean that the home is an end in itself but, rather, that the home is the 'condition, and in this sense [the] commencement' of human activity. For individuals to live in the world, they need a site to where they can go to collected themselves, which they can afterwards leave to go live in the world. As Levinas writes:

> Man abides in the world as having come to it from a private domain, from being at home with himself, to which at each moment he can retire. He does not come to it from an intersideral space where he would already be in possession of himself and from which at each moment he would have to recommence a perilous landing. But he does not find himself brutally cast forth and forsaken in the world. Simultaneously without and within, he goes forth outside from an inwardness [intimité]. Yet this inwardness opens up in a home which is situated in that outside (*Totality and Infinity* 152).

Much like the ecological and climatic features of refugia make them into havens relatively removed from an inclement outside world, the home is not a part of the remaining world, although home and world are inextricably interconnected since the world can only be lived in insofar as it is relationally linked to a home that allows exiting from and entering into the outside.

Levinas is just talking about humans, but this characterization of the home can be expanded to other species.[9] Home is a haven which individuals and populations of a species can regularly return to and stay in when they grow tired from the hardships of the outside world. It is a site where they can go in search of the physical and ontological security that they need to rest, gather themselves and survive. A home is not merely a site where they can take physical shelter without respite, temporarily and tenuously interrupting the anxieties and adversities of the outside without diminishing them. Construed in this way, a shelter does not provide the safety and consistency required for any sort of a good life to be lived, both within and outside that site. Being a haven, a home is the most primal requirement for individuals of different species to be secure: it allows them to bring with them a certain degree of that safety when they go outside because they know that their stay in the world, with all the difficulties that it entails, is temporary. In this sense, having a home is the primal requirement for life to go on. But a home is not enough to provide all the security that these individuals need. Other issues come into play, such as availability of nourishment or of temporary shelter in the world (which is not a home). However, no other condition of security can come to fruition without the existence of a home. This is why, as we know from Hannah Arendt's (267-302) discussion of refugees, losing one's home means losing all the certainties and protections upon which life depends.

Staying at home, however, is just as temporary staying outside. Sooner or later, its inhabitants must leave their home. Hence, a home is not a heterotopia of abandonment, it is not walled off site from where no exit is possible, even if there are boundaries between the home and its outside. Being the first requirement for the physical and ontological security that is indispensable for life, having a home is not in itself sufficient to live but, rather, a *conditio sine qua non* for individuals and species to be able to live within and outside the home. A home is a site of hospitality where no one can bar one's entry and a site of security that allows physical and subjective recovery – between stays in the outside world.

In the face of large-scale extinctions, refugia can help to keep life going because they are homes for refugees of many species. Refugium-as-home works far beyond the timeframe of individual biography or even of short familial history. Refugia are homes on a geo-historical time scale and their potential to oppose the waste of life brought about by modern capitalogenic

double death depends on their capacity to function as homes in the – really – *longue durée*. Refuges capable of nurturing the lives of different-species refugees on the much shorter time frames of years or decades are also needed, but these are not the same as refugia. A refuge is a shelter, a refugium is a home. The temporalities of climate change and extinction are long ones, even if they have undoubtedly accelerated in capitalist modernity. In the past, refugia enabled life to go on amid mass extinction events because these sites had relatively stable ecological and climatic features for durations counted in millennia (Ashcroft; Birks and Willis; Keppel et al.; Stewart and Stringer; Stewart et al.). Fighting against wasted life requires the maintenance and recovery of sites that have *potential* ecological and climatic conditions to house refugees of various species for undetermined periods.

Although, like Robert Frost's hired man, one can go home one final time to die among kin, refugia are not hospices where the last remaining survivors of a multispecies community await their deaths. Rather, they are sites where these survivors keep on living as best they can on an increasingly 'damaged planet' (Gan et al.) while they wait for the ecological and climatic conditions of the outside world to change enough so that they – or their descendants – can go out and try to live a better life. The possibility of eventually leaving the refugium and flourishing, even if this only occurs generations down the line, is intimately tied to a refugium's capacity to foster resurgence, which is a *conditio sine qua non* of refugia's opposition to extinction, double death and waste. In this sense, a refugium-as-home works much like Noah's Ark – an inherently multispecies arrangement – amid the unliveable or barely liveable landscapes razed in the Capitalocene.

Due to the site's ecological, climatic and social features, the individuals and populations of different species that make a refugium their shared home can nurture each other. In each refugium, old and new multispecies partners nurture each other by working and living and dying together, carrying on the multispecies activities involved in resurgence to create whatever kind of life is possible amid an unforgiving world. But home must eventually be left. Unless it collapses before the time is right (Brown et al.; Cartwright et al.; Stewart and Stringer; Stewart et al.), a refugium lasts for the geo-historically long, but *a priori* undetermined, time period in which refugee populations need to live there – until they can leave. Hence, refugia are also sites

from where the multispecies work of resurgence can eventually spread when external conditions are met and refugee populations go out into the world, increasing in number and extending in geographical range. As they leave the refugium and come across other former refugees, new forms of multispecies sociability, whether harmonious or predatory, need to keep being established, remaking the new, post-refugium world as they go along.

Inconclusive and tentative remarks. Fostering refugia amid unfolding extinctions

Refugia are important for life to go on amid capitalogenic damage and waste. They are crucial pieces in the efforts to oppose this amplification of death, which can still be curbed (to a very unsure degree) if the logic of intra-human and multispecies relationships privileged in the Capitalocene is refused in multiple sites and different, more horizontal, political ecological relationships are fostered there both between humans and between species. Refusing the relational logic of capitalist modernity is refusing mastery (Plumwood), hence, it does not entail building refugia under human guidance. Rather, refusing mastery involves flattening the hierarchical ontological distribution upon which Cartesian capitalist modernity is premised. This would minimize ecological damage and waste, which would foster the conditions of possibility for the spontaneous emergence of refugia where multispecies communities can nurture their own lives in refugium without mandatory human stewardship. This is not synonymous with rewilding (Soulé and Noss), although situated instances of rewilding might be involved in the nurture of refugia.

Curbing ecological destruction and refusing mastery would also foster the emergence of refuges, which are also crucial to nurture life amid unfolding extinctions, albeit on shorter time frames than refugia. But the temporalities of extinction and climate change are long ones, at least regarding their lasting effects. Sites of immediate and short-term shelter are needed, but opposing modern capitalogenic extinction requires more durable homes for multispecies refugees to survive in worlds whose ecological and climatic features are expected to be hostile for a long time. No matter how many refuges one finds, it is difficult to imagine how the lives of many species could continue in the long term without the stability provided by refugia.

Refugia are unavoidably heterogeneous. Since different species require different climatic and ecological conditions to survive in refugia, a site that can serve as refugium for some species can be ill-suited for the survival of others. Furthermore, only sites with (species-)specific ecological and climatic conditions can function as refugia. Fortunately, heterogeneity is good for life as it builds redundancy into (social and) ecological processes. The heterogeneity of refugia turns them into sites of political ecological experimentation in the making of shared multispecies worlds. Each refugium houses different multispecies entanglements, developing different kinds of situated interspecies relationships that lead to different ways of making collective worlds. Some of these will be better adapted to local conditions than others. Some will be long-lasting, and others will crumble before or after refugees leave their refugium. But multispecies communities can learn ways of making shared worlds from each other, both from those that are successful and from failed ones. In those refugia where humans can be present, they have to either make do without the *hubris* of mastery (which would be easier for some humans than others) or, possibly, die and take the whole refugium with them.

Refusing mastery does not mean refusing technoscience in all situations. Ecologists, geologists, palaeontologists, geographers, climate scientists, among others, can help to identify sites that can potentially (but not certainly) work as refugia. If done without *hubris*, this search can be an important part of the 'arts of living on a damaged planet' (Gan et al.). Identifying such sites without resorting to mastery has two conditions. On the one hand, it requires flattening the epistemic hierarchy upon which capitalist modernity is premised and refusing to place technoscience above other kinds of knowledge. The identification of sites that can potentially be refugia requires dialogue between natural scientists, other academics, environmental activists, peasants, indigenous peoples and many others. Much of the historical knowledge of local ecologies is preserved by indigenous peoples across the planet, mostly in ways that are not directly translatable to the language of technoscience, and they have to be a part of the identification of potential refugia without being subaltern *vis-à-vis* the remaining participants. Although general knowledge on ecology and climate science is useful, identifying potential refugia requires local research and local dialogue across the planet to look into sites that have worked as refugia in the past and try to understand if they still retain this potential today. It also

requires looking at the sites that currently work as refuges for many species and communities and trying to ascertain if their ecological and climatic features might enable them to work as refugia on longer time frames. All of these sites must be cared for and these actors have to decide how to do it. Disagreement on what to do and on how to do it will be inevitable among such a heterogeneous assortment of people, but only those involved can work out how to move forward. Fortunately, the multiple local scales at which the nurture of refugia have to work allow for a variety of concomitant courses of action. Much like the making of shared worlds in refugium, some ways of deciding how to foster refugia will be more successful than others but communities involved in each local decision process can learn from each other. Redundancy-through-heterogeneity also works well for life's prospects at the preliminary level of deciding how to identify and care for potential refugia.

On the other hand, the key word in the strategic identification of potential refugia is not *identification* but *potential*. Looking for sites that might have adequate ecological and climatic features going forward is important, but it is also unavoidably contingent due to the long temporalities of climate change and extinction. This is why identifying potential refugia is not the same as creating them. The emergence of refugia can only be spontaneous. A strategy to fight against capitalogenic extinction in which refugia are important has hope at its core. Namely, the hope that there are still enough multispecies communities capable of undoing enough capitalogenic damage and that, as they make sites flourish across the planet, they nurture some places that can work as refugia where survivors might deal with the damage that was not undone. In other words, the contingent nature of a strategy premised on refugia as homes in the midst of a damaged planet starts and ends with hope that interspecies sociability is still strong enough to guarantee life's metabolic capacity to recover and to find sites where recovery is possible. This might seem like a flimsy hope, but if life's recover-ability is lost no alternative strategy can work.

Fostering refugia is crucial to deal with unfolding capitalogenic extinction. But broader political ecological changes need to be fostered simultaneously. This does not diminish the importance of refugia, but it points to the massive world-remaking work that needs to be done to deal with our current potential mass extinction event. A strategy solely premised upon

refugia runs the risk of turning refugia into tombs for the last of the living since they would have little chance of ever leaving their homes for a more amenable outside world. Furthermore, widespread political ecological transformation is the only way of ensuring that sites with the potential to function as refugia remain after the Capitalocene. At the very least, this means that to nurture the spontaneous emergence of refugia many sites must be off-limits to capital. It is difficult to imagine how any site will have the ecological and climatic features required to be a refugium without widespread degrowth (Latouche) and without the complete removal of capital from those places that have been contingently identified as potential refugia (meaning at least no extractivist industries, no industrial production, no plantation agriculture, no commercial hunting or fishing, no industrial waste disposal, no commerce, no commodity transportation, no tourism). In this sense, the crucial point of such a political ecological transformation is less deciding what needs to be done than it is deciding what needs to stop being done and how to stop doing it. The contingent identification of potential refugia will be a waste of time if the actors involved in it do not also think about how to move away from capitalist modernity.

One last point. Since species, mostly those adapted to temperate climates, have spent so much time in refugia in the last hundreds of thousands of years, being a refugee is a natural condition in geo-historical time, one that has allowed life to carry on in the midst of extinctions. Rather than disqualifying human refugees even further, this indicates that the choice for those living through difficult times might be between being a refugee or being dead outside refugia. Being a refugee is a primary ontological condition of the living, who are naturally in need of refugium – albeit very unevenly so depending on social class, place of birth, gender, phenotype and species. Realizing this could be a starting point to 'build our political philosophy anew [and our political ecology along with it] starting from the one and only figure of the refugee', as proposed by Giorgio Agamben (16), and to ease the pain and waste of life inflicted upon contemporary refugees-without-refugium, whether they are human or non-human.

Notes

[1]Tsing first proposed this argument in the conference paper 'Feral Biologies' (Tsing, 'Feral Biologies'), which is a previous version of Tsing ('A Threat to Holocene Resurgence'). I use the latter as a basis for this essay. Tsing's argument was later taken up by Donna Haraway.

[2]Part of this section was published in *The Journal of Population and Sustainability* in the article 'Contemporary Extinctions and Multispecies Thanatopolitics'. It was significantly revised for this essay.

[3]The five largest (known) mass extinction events (there have been others, of smaller scale) occurred near the end of the Ordovician (circa 450 million years ago), Devonian (circa 375 million years ago), Permian (circa 252 million years ago), Triassic (circa 202 million years ago), and Cretaceous (circa 66 million years ago) geological periods (Raup and Sepkoski).

[4]The Capitalocene (Haraway; Moore, *Capitalism in the Web of Life*; Moore (ed.), *Anthropocene or Capitalocene*) is a far better name for our current geo-historical epoch than the Anthropocene. Unlike mainstream narratives on the Anthropocene, in which the collective actions of an abstract and homogeneous humanity have a geological magnitude (Crutzen and Stoermer; Steffen et al.), the Capitalocene highlights the peculiar ways in which 'the web of life' is appropriated in capital-generation relations that spread ecological, climatic and social damage (Moore, *Capitalism in the Web of Life*). In the Capitalocene, *Anthropos* is not general but specific: it is Western, owns or manages property, puts its faith in technoscience and many times works through its neocolonial proxies. This *Anthropos* is the promoter and beneficiary of capitalist modernity, a political ecological system premised on breaking away from relatively horizontal relationships across species and understanding non-humans solely as resources to be appropriated or obstacles in the path to appropriate other resources.

[5]The Quaternary is the current geological period, which began around 2.58 million years ago. It consists of two epochs, the Pleistocene (from around 2.58 million years ago to 11.7 thousand

years ago) and the Holocene (from the end of the Pleistocene to the present), the latter of which is an interglacial age, i.e., a warmer and wetter time between two glacial periods. Although the Anthropocene has been proposed as a new geological epoch to the International Commission on Stratigraphy, this is yet to be accepted, so the Holocene remains the official current epoch.

[6]Most biogeographical research on the role of refugia focuses on glacial phases of the Quaternary in the Northern Hemisphere (mainly in Europe). The field has given much less attention to the Southern Hemisphere (Birks and Willis; Keppel et al.; Provan and Bennett), which points to a need to decolonize palaeontology that is, however, beyond this essay. Tsing ('A Threat to Holocene Resurgence' 63) has already noted this.

[7] This definition of home is used by Teresa Gowan in her ethnography of homelessness in San Francisco.

[8]The idea of ontological security, first argued by R. D. Laing (39-61 et passim) and popularized by Anthony Giddens (92-100 et passim), refers to the confidence a subject has in who and what he is, in the likelihood of his actions achieving his intended objectives and in the general stability of the world.

[9]This is not the place to further discuss Levinas' anthropocentrism. Despite a few ambivalent comments on the extension of ethics to animals (Levinas, 'The Name of a Dog'; Levinas et al.), his work confers an ethical privilege to humans *vis-à-vis* other animals. It is, however, possible to productively (even if agonistically) expand his ideas beyond the intra-human (Atterton; Davy; Diehm; Rose, *Wild Dog Dreaming*, 'Ruined Faces'; Sözmen).

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