Pestering capitalism: thinking with Halyomorpha halys about multispecies relations and ecological unsustainability

João Aldeia[1]

University of Coimbra, Portugal

Abstract

Many non-human species trouble human-oriented forms of multispecies life, which leads to classifying some of these species as pests. One of the fields of daily life most disturbed by the action of pests is modern capitalist agriculture, leading to different types of pest management by which human beings attempt to eliminate pests' opposition to the anthropogenic appropriation of the life-making efforts and energy of multispecies assemblages, an appropriation which is essential for capital circulation. In dominant modern capitalist cosmologies, the disturbances caused by pests automatically justify and require their attempted extermination. Without denying that pests are troubling, I argue that the technoscientific framing of human relationships with these species is insufficient as a way of understanding and interacting with them. Rather than exclusively seeing pests as a problem, the manner in which humans interact with these species points us to several foundational – and in themselves problematic – aspects of modern capitalist world-ecology. Taking my research on networks concerned with kiwifruit farming and commercialization in Portugal as a basis for my arguments, I look at how actors in these networks propose to deal with Halyomorpha halys, the brown marmorated stink bug, in an attempt to think with this species about the (inextricably connected) socio-ecological unsustainability of modern capitalist world-ecology and the bio-thanato-political strategies of immunization employed to deal with non-human species in this political ecological system.

Keywords: bio-thanato-politics; Halyomorpha halys; *immunitas*; kiwifruit farming; modern capitalist world-ecology; pests

Résumé

Nombreuse espèces non humaines perturbent les formes de vie multi-espèces guidées par des humaines, ce qui conduit à classer quelques de ces espèces comme nuisibles. L'agriculture moderne capitaliste est un des domaines les plus perturbés par l'action des espèces nuisibles, ce qui conduit à des diffèrent formes de gestion de ces espèces par lesquels les humains essaient d'éliminer leur opposition à l'appropriation anthropogénique des efforts et de l'énergie par lesquels dès assemblages multi-espèces créent la vie, une appropriation qui est essentielle pour la circulation du capital. Dans les cosmologies capitaliste modernes dominantes, les perturbations causées par les espèces nuisibles automatiquement justifient et exigent la tentative de les exterminer. Sans nier que ces espèces sont inquiétantes, j'argument qu'encadrer les relations entre humains et des espèces nuisibles de façon technoscientifique n'est pas suffisant comme manière de comprendre ou de faire ces relations. Plutôt que de concevoir des espèces nuisibles seulement comme un problème, la façon comme les humains interagissent avec elles indiquent nous renvoie à plusieurs aspects fondamentaux – et en eux-mêmes problématiques – de l'écologie-monde moderne capitaliste. Ayant comme base ma recherche sur les réseaux dédiés à l'agricole et commercialisation des kiwis au Portugal, j'analyse comment les acteurs de ces réseaux proposent de s'occuper de Halyomorpha halys, la punaise marbrée, pour penser avec cette espèce sur deux topiques inextricablement liée: à la non-durabilité socio-écologique (inextricablement liée) de l'écologie

---

[1] Dr. João Aldeia, Centre for Functional Ecology, University of Coimbra, Portugal. Email: alvesaldeia@gmail.com.
Acknowledgements: I thank Fátima Alves and the referees for commenting an earlier draft of this essay, as well as the editors of *Journal of Political Ecology* for their work. Any problems that remain are my sole responsibility. I also thank the kiwifruit farmers, scientists, and others, that allowed me to conduct field work at their places of business. Funding was from two projects: ReNATURE (CENTRO-01-0145-FEDER-000007) and i9Kiwi (PDR2020-101-031204 I9K).

mondiale capitaliste moderne et les stratégies bio-thanato-politiques employées pour interagir avec des espèces non-humains dans ce système écologique politique.
Mots-clés: agriculture des kiwi; bio-thanato-politique; espèces nuisibles; Halyomorpha halys; *immunitas*; écologie-monde moderne capitaliste

Resumo

Diversas espécies não-humanas perturbam formas de vida multi-espécie orientados por humanos, o que leva a que sejam classificadas como pragas. A agricultura moderna capitalista é um dos campos da vida quotidiana mais significativamente perturbado pela acção de pragas, o que dá origem a diferentes tipos de gestão de pragas pelos quais seres humanos tentam eliminar a oposição destas espécies à apropriação antropogénica dos esforços e da energia mobilizados por conjuntos multi-espécies, uma apropriação que é fulcral para a circulação do capital. Nas cosmologias modernas capitalistas dominantes, as perturbações causadas por pragas automaticamente justificam e exigem que se procure exterminá-las. Sem negar que espécies classificadas como pragas são um problema, defendo que o enquadramento tecno-científico da relação humana com estas espécies é insuficiente como modo de as compreender e de interagir com elas. Não encarando as pragas exclusivamente como um problema, o modo como os humanos interagem com estas espécies aponta para diversos aspectos fundacionais – e em si mesmos problemáticos – da ecologia-mundo moderna capitalista. Partindo da minha investigação sobre redes envolvidas na agricultura e comercialização do kiwi, discuto como os actores destas redes propõem lidar com o Halyomorpha halys, o sugador castanho marmoreado, numa tentativa de pensar com esta espécie sobre duas questões inextricavelmente ligadas: a insustentabilidade sócio-ecológica da ecologia-mundo moderna capitalista e as estratégias bio-tanato-políticas de imunização que são mobilizadas para lidar com espécies não-humanas neste sistema político-ecológico.
Palavras-chave: bio-tanato-política; capitalismo; ecologia-mundo moderna capitalista; Halyomorpha halys; *immunitas*; kiwicultura; pragas

1. Introduction

For humans whose lives unfold in modern capitalist world-ecology, interacting with Halyomorpha halys, also known as the brown marmorated stink bug, can be unsettling. Halyomorpha halys reproduces quickly and in large numbers. It can spread throughout vast geographical regions by moving in circulating vehicles, commodities or luggage. It spoils crops by making them both aesthetically unappealing (thus, many times, unsellable) and unpalatable, or even rotten, which translates into losses of food products valued at tens of millions of dollars in North America and Europe. During colder seasons, populations of Halyomorpha halys look for sites to overwinter, and they find human residences adequately dry for this purpose, leading to the invasion of some houses by thousands of individual insects. Furthermore, as its name indicates, it sometimes emits an awful smell. To make matters worse, at least outside the area of Southeast Asia from where it is native, Halyomorpha halys performs no known useful ecological task that might justify putting up with its many faults. Given the practical difficulty of blocking its entrance in our countries, farms, and homes, many people would prefer to exterminate it, thus protecting farmers' livelihoods, food security, residential areas, and the GDP.

I acknowledge how troubling Halyomorpha halys can be, and I do not undervalue its negative effects on human well-being. However, instead of solely thinking about the ways in which its existence is bad for humans and trying to manage it (probably by killing it), there are actually useful things that we can learn about the world we live in, and ourselves, by thinking with Halyomorpha halys. The article explores the manner in which it pesters modernity and capitalism, providing us with important insights into the (inextricably linked) bio-thanato-politics of anthropogenic immunization and the socio-ecological unsustainability of modern capitalist world-ecology. It shows how some species are framed and governed as pests in modern capitalist agriculture.

As for if, or how, humans *should* exterminate Halyomorpha halys to protect forms of life that some of us went through a great deal of effort to establish, I leave it for others to decide. I take no stance on the matter, and I think that those who want to get rid of Halyomorpha halys present quite a strong case. Personally, I certainly would not want my home invaded by it, nor would I wish for crops to be lost to its action. The issue of how to deal with species classified as "pests" is seldom straightforward, and it would be simplistic to unreservedly state that Halyomorpha halys should be left alone by humans despite the human suffering its action

might cause. But it is no less simplistic to understand our shared lives with Halyomorpha halys merely in terms of the best technical way to dispose of it. Thinking with Halyomorpha halys points to deeper issues in modern capitalist world-ecology than the technical ways in which it should be dealt with, contributing to the critique of the forms of life that have created the conditions of possibility for this insect to be a problem.

2. Method

To think with Halyomorpha halys I use the research I carried out from December 2018 to December 2019 to characterize the networks involved in farming, storing, and selling kiwifruit (mostly, actinidia deliciosa and actinidia chinensis) in Portugal. I observed interactions at different sites of these networks, including kiwifruit orchards, storage facilities, and meetings in which kiwifruit farmers were present to discuss their business, usually alongside scientists, supermarket managers, and Portuguese state bureaucrats.

I did not set out to understand how human actors in these networks deal with Halyomorpha halys. Rather, the concern shown with this insect by several kiwifruit farmers, as well as scientists and Portuguese state officials who work closely with them, emerged inductively during fieldwork. Although at the time there were no known populations of Halyomorpha halys in the country, several kiwifruit farmers, scientists and public officials frequently expressed concerns with what they considered the likely entrance of this insect in Portugal. This had already happened in other countries, where Halyomorpha halys destroyed significant portions of various crops, including kiwifruit (Kritikos *et al.*, 2017; Leskey & Nielsen, 2018; Puketapu, 2019; Teulon & Xu, 2018).

Kiwifruit is not Halyomorpha halys' sole, or even, it appears, preferred, crop to eat (Gaspar *et al.*, 2019; Kritikos *et al.*, 2017; Naves, 2019; Teulon & Xu, 2018). As such, my research scope was narrow both in terms of geographical setting and in what pertains to the agricultural fields to which I was attentive. Nevertheless, methodologically, I am engaging here in empirically-grounded speculative and, at times, lateral thinking more than in any kind of systematic analysis.

This methodological stance entails two concomitant narrative movements. On the one hand, I am moving from the specific setting of Portuguese kiwifruit farming circa 2019 to some of the chief foundational features of modern capitalist agriculture – and, in a broader sense, of modern capitalist world-ecology as whole. I do not deny heterogeneity or space-time specificity in this movement, but I opt to highlight key historical, philosophical, and political dynamics of this political ecological system – to a large degree because these are the directions towards which I was pointed to by the contemporary unfolding of the brown marmorated stink bug's pestiferous life.

On the other hand, I am also moving from direct observation of emergent concerns of Portuguese kiwifruit farmers (and others who work with them) with how to manage Halyomorpha halys to political ecological processes that I did not directly observe because, at the time of fieldwork, Portuguese kiwifruit farmers did not physically interact with Halyomorpha halys. It was only in 2020, some months after the end of my fieldwork, that several populations of Halyomorpha halys were identified in the country (Grosso-Silva *et al.*, 2020).[2] In 2019, there were certainly anxious discussions of the likely entrance of Halyomorpha halys into Portugal among kiwifruit farmers, scientists and some representatives of Portuguese state institutions. Even by then there was an unfolding of emergent practices aimed at identifying Halyomorpha halys as soon as it was in the country, to deal with it (see the following section). But my aim here is not to focus on these in themselves but, rather, to let my arguments be pushed by this emergent unfolding of practices to delve into how some species are framed and governed as pests in a modern capitalist agricultural system.

In both of these methodological movements, I am concerned with exploring where Halyomorpha halys can guide us. Although my arguments are not presented in the more storied fashion that many adhere to in some subfields of political ecology, I am taking methodological inspiration in the works of Deborah Bird Rose (Rose, 2005, 2006, 2008, 2012; Rose, van Dooren & Churlew, 2017), Thom van Dooren (2011, 2014), and Anna Tsing

[2] Although my original intention in December 2019 was to have returned to the field, this proved impossible due to the outbreak of the Covid-19 pandemic.

(2019), among others, in this exercise of thinking with a non-human species – or, to be more precise, of thinking with the multispecies assemblages in which this species' life develops.

This methodological choice results in a less than perfectly linear narrative structure, which is a necessity due to the kind of guide that Halyomorpha halys has proved to be during research. It pushed me to keep pulling threads in several directions and narratively weaving them together in a somewhat patchy way because neither its life nor modern capitalist world-ecology obey to a clear-cut and tidy logic, which unavoidably leaves some blank spots in the narrative tapestry that Halyomorpha halys guided me to build. I do not deny the limits of such an approach and it would be untenable for all academic writing to follow such a strategy. But, at times, this kind of empirically- and theoretically-grounded speculative and lateral stance can be put to productive use insofar as it gives greater freedom to explore multiple emerging connections between a small insect and the world it exists in – with the willing or unwilling company of humans. Even so, my arguments are entirely exploratory and are not intended as definitive statements on what Halyomorpha halys can show us about life in modern capitalist world-ecology.

These narrative patches are presented here as lessons taught by Halyomorpha halys – if one is willing to give them the due attention they deserve. These are, essentially, small – imperfectly but nevertheless – linked essays in a narrative that aims to highlight and tentatively explore fundamental, and fundamentally problematic, features of modern capitalist world-ecology. After characterizing how pests are framed in Portuguese kiwifruit farming, I look at how some species are classified as agricultural pests due to their opposition to capitalogenic appropriation of nature, as well as by discussing how the pest management logic entailed by this classification contributes to ecological unsustainability (lesson 1). I then focus on the central role ascribed to fostering death as a way of making certain forms of multispecies life (lesson 2). I conclude by discussing how this magnification of death is inseparable from the manners in which privileged human categories in this political ecological system disobligate themselves towards non-human others (lesson 3). The cadence is given by the progressive narrative importance of what I believe to be one of the crucial issues for both the field of political ecology and life forms living in modern capitalist world-ecology: that, both philosophically and materially, this political ecological system is socio-ecologically unsustainable because the daily biopolitical practices that "make live" (Foucault, 2003, p. 241 *et passim*) within it are fundamentally thanatological.[3]

3. How Halyomorpha halys pesters modern capitalism

What we currently recognize as kiwifruit is a historically recent thing. Fruits originating from vines of actinidia deliciosa and actinidia chinensis are genetically and genealogically related to wild fruits found in China centuries ago (Ferguson, 2004; Huang & Ferguson, 2001), but the latter were not farmed and its political ecological, as well as its political ontological, similarities with contemporary kiwifruit should not be overestimated. After moving actinidia vines from China to New Zealand at the beginning of the twentieth century, it took some decades for kiwifruit to turn into an agricultural crop or commodity in any significant manner, which only occurred by the mid-twentieth century, when exports to the United States of America began – the very name "kiwifruit" was only invented then in an effort to make it more marketable in that country (Ferguson, 2004). Beginning in the 1970s, and significantly accelerating from the 1990s onwards, the international kiwifruit market started to establish itself and grow, leading farmers in different countries, including Portugal, to import actinidia vines to plant them (Ferguson, 2004; Franco, 2008; Huang & Ferguson, 2001; Martino *et al.*, 2007, p. 9-13), thus substituting crops, forests, and the like that formerly grew where actinidia orchards were planted.

In the first decade of the twenty-first century, Portuguese actinidia orchards, many of them very recent plantings, seemed very resilient, which was to a large degree due to a lack of troubling pest species. Until a few years ago, there were no known pests in Portugal that caused significant damage in actinidia orchards (Félix, Cavaco & Xavier, 2008; Martino *et al.*, 2007, p. 122). To deal with the pests that did (and still do) appear, orchard owners and farm workers – with the aid of non-human species and non-living things – must carry on a number of different practices, all of which aim at either reducing the likelihood of a particular pest finding the

[3] From thanatology, the study of death and dying.

orchard an appealing place to be, or killing said pest in the swiftest possible manner. Pharmaceutical pesticides or even other species could be used to kill them, and/or extra care could be placed on weeding the orchard floor so that pests do not go there in the first place (Félix & Cavaco, 2008; Félix, Cavaco & Xavier, 2008; Martino *et al.*, 2007, p. 122-124).

At the time, most of the agricultural-economic troubles of kiwifruit farmers were caused by adverse climatic conditions (e.g. hail, frost) or by fungi (among which the chief troublemaker was Botrytis cinerea) (Antunes, 2008; Chicau, 2008; Martino *et al.*, 26-32, 122-129; Oliveira & Veloso, 2008; Sofia, 2008), but even these were manageable in terms of agricultural practice and corporate accounting. This changed in 2010 with the appearance in Portugal of Pseudomonas syringae pv actinidiae, the bacteria that causes bacterial canker in actinidia vines (DGAV, 2012, p. 6; INE, 2013, p. 20), which has since caused significant agricultural and economic damage to the country's orchards.

Now, Halyomorpha halys (Figure 1) is emerging as a second, potentially even costlier, threat to Portuguese kiwifruit farming. Several kiwifruit farmers fear that known pest control practices could turn out to be less efficacious for opposing Halyomorpha halys' actions, even though they have worked against other pests in Portuguese kiwifruit orchards for years. In other countries and for other agricultural crops, pest control practices have had little efficacy against Halyomorpha halys, leading to an interruption of integrated pest management practices and to an increase in the use of broad-spectrum insecticides (Lee *et al.*, 2013; Rice *et al.*, 2014).[4] As one farmer pointed out, "Halyomorpha [halys] might become *the* problem" for international kiwifruit farming.[5]

Figure 1: Halyomorpha halys. Source: https://commons.wikimedia.org/wiki/File:Pentatomidae_-_Halyomorpha_halys-001.JPG

Halyomorpha halys, more commonly known as the brown marmorated stink bug, is an insect that originates from Southeast Asia that has caused significant damage in kiwifruit orchards (among several other crops) in Europe and North America. It reproduces quickly (each female lays hundreds of eggs per year and is capable of producing more than one yearly generation depending on climate) and populations of the species can

[4] Although pest management techniques are used to try to control the presence of Halyomorpha halys in farms and orchards, these have proven less effective in stopping the damage it causes to crops. Besides continuing attempts at integrated pest management, some farmers have used traps that attract the species with pheromones or enclosed fruit trees in protective nets that stop it from reaching fruit. Efforts to be more precise in pesticide application in the orchard or farm areas where Halyomorpha halys concentrates have also been made, as have attempts at using predatory species to kill it (Lee *et al.*, 2013; Leskey & Nielsen, 2018).

[5] Taken from my field diary and translated from Portuguese.

reach tens of thousands of individuals (Gaspar *et al.*, 2019; Inkley, 2012; Kritikos *et al.*, 2017; Naves, 2019; Rice *et al.*, 2014). Not only can the species fly at least five kilometres each day, with some individual insects having been recorded at over 100 kilometres (Kritikos *et al.*, 2017; Leskey & Nielsen, 2018), but it also spreads by hitchhiking on human vehicles, commodities and luggage, extending its range (Kritikos *et al.*, 2017). When it feeds on a kiwifruit it becomes aesthetically and organoleptically spoiled (developing spots and non-standard shapes, becoming smaller, tasting bad), and many times rotting in the process (Puketapu, 2019; Teulon & Xu, 2018). The damage caused by this species are magnified due to its highly polyphagous nature, with over 100 plant species on which it is known to feed. Many of these species are fruits and vegetables planted in agricultural settings and Halyomorpha halys significantly affects all of them. In many farms and orchards, Halyomorpha halys' feeding has resulted in crop losses of over 25% (Lee *et al.*, 2013; Leskey & Nielsen, 2018; Maistrello *et al.*, 2016; Nielsen & Hamilton, 2009; Rice *et al.*, 2014), and there are reports of some farmers having lost much greater percentages, reaching 90% in the case of some stone fruit orchards in the United States, in 2010 (Rice *et al.*, 2014). Besides loss of food quality and quantity, there is a significant economic impact on modern capitalist agricultural endeavours, with damage caused by Halyomorpha halys reaching tens of millions of dollars per season in several regions in North America and Europe (Leskey & Nielsen, 2018). Although kiwifruit farming has so far suffered less significant losses than other crops, anecdotal reports indicate that the percentage of harvest losses in orchards where Halyomorpha halys is present has been over 30% in some Asian and European countries (Puketapu, 2019).

Hence, in kiwifruit farming, Halyomorpha halys is a "pest", i.e. an organism whose action damages kiwifruits agriculturally and economically (Puketapu, 2019; Teulon & Xu, 2018). There are other aspects of Halyomorpha halys' behaviour that disturb human activities, making it a "nuisance pest." The species sometimes finds dry human residences to overwinter during colder seasons, when it stops reproducing and feeding, which leads, in the worst cases, to houses being invaded by tens of thousands of individual insects (Inkley, 2012). This can be unpleasant since large populations can damage residential structures (e.g. stain from their faeces) and, as its name indicates, the bug emits an unpleasant smell when manipulated or killed (Gaspar *et al.*, 2019; Inkley, 2012; Kritikos *et al.*, 2017). However, such annoyances, no matter how significant they can be, are secondary *vis-à-vis* the losses of harvests and profits, which are what justifies the classification of species as pests in modern capitalist agricultural endeavours such as kiwifruit farming.

In kiwifruit orchards, a pest is, essentially, an interloper. The beings and things that should be present at these orchards are *a priori* defined through the short-lived experience of kiwifruit farmers (given kiwifruit farming's historical youth) and by technical manuals offering best practice guidelines (Antunes, 2008; Martino *et al.*, 2007). Unlike other crops, which had to be remade into commodities, kiwifruit as we know it started as a commodity. Kiwifruit orchards exist to generate profits. This central objective of kiwifruit farmers defines the ontologies of what is welcome in orchards: actinidia vines, support structures (such as cement pillars and metal wires) to hold the vines in place and shape them, canopies and covers to protect vines and fruits from strong winds and other climatic phenomena (e.g. hail, frost), water and mechanical irrigation systems, industrial chemicals (e.g. fertilizers, pesticides, growth regulators, herbicides, fungicides) to maximize yields and oppose the nefarious effects of climatic phenomena and damaging life forms (e.g. bacteria, fungi, insects), machinery such as tractors to move around the orchard and facilitate the harvest and disperse commercially acquired pollen, honeybees and other pollinating insects, farm workers, small utensils such as pruning scissors, animals and plants that calibrate soil quality to the needs of actinidia vines. There are also species that kill animals and plants that damage actinidia vines or kiwifruit, and a few other ontologies (Antunes, 2008; Martino *et al.*, 2007). Although the list is apparently long, it is significantly shorter than the list of species present at the same site if it was, to the degree that it is currently possible, closer to wild nature.

All species that are not *a priori* defined as belonging at kiwifruit orchards are, implicitly or explicitly, made to be unwelcome. This is particularly true for those species that are explicitly acknowledged as damaging kiwifruit production in some way and, thus, are classified as weeds (plants), or disease vectors (e.g. fungi, bacteria) or pests (animals), all of which give rise to agricultural techniques designed to manage them. Depending on the agricultural production model of each farm (e.g. conventional, integrated, precision farming, organic) and on farmers' choices, these management techniques can be more or less technoscientifically and industrially driven, ranging from using other species to kill unwelcome ones to industrial chemical products

used for the same effect. Similarly, farmers can be more or less accepting of unwelcome species, as well as recognizing the productive functions performed by a larger or smaller number of species. Independently of the specific agricultural production model and choices made by each farmer, there are, inevitably, species that are unwelcome at kiwifruit orchards, and some of them are classified as pests.

Halyomorpha halys is one such species. It introduces itself in a kiwifruit orchard actively opposing the daily efforts that other species undertake to make a harvest come to its successful conclusion – actinidia vines feeding so that buds bloom into kiwifruits, insects pollinating actinidia flowers, human workers trimming the vines, and all other welcome species whose activities contribute to make that orchard agriculturally and commercially productive. The collective activities of these species is what leads to maximizing yields or the marketable qualities of fruit, and it is by appropriating these activities that orchard owners are able to maximize corporate profits. By opposing them, Halyomorpha halys shows itself hostile to fundamental capitalist goals.

By damaging kiwifruit, Halyomorpha halys raises the likelihood that the collective efforts of other species turn out to be a (partial or total) waste of time, energy, or money – especially for orchard owners. From the perspective of kiwifruit farmers, food is lost that someone might have eaten, along with investments made to establish an orchard, salary costs, and personal income to pay their family's monthly bills. Although there are many species classified as pests whose interference worsens the marketable qualities of kiwifruit and/or the quantity of harvested fruit (which is only harvested if it has the potential to be sold), Halyomorpha halys' specific interferences appear to be potentially capable of rendering a much larger quantity of kiwifruit unsellable.

An interesting thing with these concerns about Halyomorpha halys is that they emerged in Portugal before this insect's physical presence was confirmed. The bug was found shortly after the end of my fieldwork (Grosso-Silva *et al.*, 2020), but by late 2019 there were no known populations of Halyomorpha halys in Portugal. There was a single occurrence in which this insect was found entering the country alongside farming equipment imported from Italy, and it was swiftly dealt with (Diário de Notícias, 2019 October 10). Nonetheless, the pestiferous character of Halyomorpha halys began to change kiwifruit farming – and all related market areas, science and policy included – *a priori* of its confirmed physical presence in the country. New practices started. Articles were published in newspapers. Biologists that study Halyomorpha halys gave presentations at kiwifruit farmer meetings. Other meetings took place where biologists, kiwifruit farmers, and representatives of State institutions responsible for agricultural regulation (e.g. Direção-Geral de Alimentação e Veterinária, Direção-Geral de Agricultura e Desenvolvimento Rural) discussed what collective actions could be undertaken. An appeal was made to the country's general population, circulated in agricultural-related magazines, for people to report suspected sightings to the team of biologists studying it, preferably collecting and sending exemplars of the suspected bug so that they can be scientifically identified in a laboratory. A flyer with illustrations of Halyomorpha halys was made available online and in printed form to be distributed among farmers of kiwifruit and other crops, thus allowing anyone to visually identify the species. Employees of Portuguese State institutions responsible for national agricultural regulation became aware of the risks entailed by the spread of the species, and began conducting sporadic surveillance operations to check if trucks crossing the Spanish border into Portugal were bringing it with them.

All of these actions are intended to raise awareness to the economic threat from a pest species. They aim at quick identification of any individual or population of Halyomorpha halys within Portugal's borders to allow fast intervention – i.e. to enable actors connected with the kiwifruit market to quickly isolate and exterminate the pest. This species has no place in Portuguese farms and orchards because it threatens human wellbeing, and largely because it economically threatens agricultural commodities, including kiwifruit. A kiwifruit damaged by Halyomorpha halys is unsellable. Profits will not be generated, investments of money, time, and energy will be lost. As such, in modern capitalist world-ecology, ending the life of Halyomorpha halys is entirely justifiable.

4. Halyomorpha halys' first lesson: species become pests because they disturb the appropriation of nature

The classification of species as pests is millennia-old and inherently anthropocentric, but it has only been capitalogenic for a few centuries. Species such as Halyomorpha halys are not defined as pests because their actions cause ecological damage *tout court* but, rather, because they damage the peculiar types of ecologies that

are valued and fostered in modern capitalist world-ecology (Dutkiewicz, 2015; O'Gorman & van Dooren, 2017; Perfecto, Jiménez-Soto & Vandermeer, 2019; Phillips, 2013; Scott, 1998, p. 262-306). The fundamental criteria for a species to be classifiable as a pest in modern capitalist agriculture are that its interference in human-oriented multispecies assemblages (e.g. farms) makes human appropriation of nature costlier, thus hampering capital generation and circulation.

Since the start of modern capitalist world-ecology around the fifteenth century (Dussel, 1995; Lander (ed.), 2005; Mignolo, 1995, 2000; Moore, 2009, 2010, 2015; Patel & Moore, 2018), *Anthropos* set out to technoscientifically remake socio-ecological reality in an effort to control it. The aim was to facilitate the appropriation of those ontologies that, in historically contingent fashion, were classified as Nature (Aldeia & Alves, 2019; Moore, 2009, 2010, 2015, 2016; Patel & Moore, 2018; Plumwood, 1993; Scott, 1998; Serres, 1998). *Contra* many current simplistic narratives on the Anthropocene (Crutzen & Stoermer, 2000; Steffen, Crutzen & McNeill, 2007), *Anthropos* is not a shorthand for abstract humanity but, rather, for the peculiar kind of subjective archetype that is privileged in the abovementioned political ecological system (Crist, 2016; Hartley, 2016; Moore (ed.), 2016). It is Western, male, middle class or elite, and owns or manages property. It also uses technoscientific means and findings to exert mastery over the non-human, thus fulfilling what Descartes (2006, p. 51) wished for when he argued that science should make representatives of *ego cogito* (i.e. *Anthropos*) into "the masters and possessors of nature." [6]

Anthropos' motivations for socio-ecological transformation were not solely profit-driven but entailed a broader effort to order socio-ecological sites according to modern capitalist cosmology (Bauman, 2007; Debaise *et al.*, 2015; Latour, 2010; O'Gorman & van Dooren, 2017; Plumwood, 1993; Scott, 1998; Serres, 1998). However, the chief objective of this reality-remaking endeavour is to make what and who is classified as "human" (hence, belonging to "society", or "culture") and what is relegated to the realm of "Nature", work at the lowest possible cost for capital generation and circulation. *Anthropos* achieves this by appropriating the collective efforts that situated multispecies assemblages carry on to reproduce life (Moore, 2015, 2016; Patel & Moore, 2018).

Agriculture has been a set of techniques for remaking socio-ecological sites since before the dawn of modern capitalist world-ecology. But modern capitalist agriculture is inherently intended to remake nature in order to fully appropriate it, due the idiosyncrasy of its central objective. It does not aim to produce food to feed families working on a farm or the local community, or as a food surplus that can be delivered as tribute or tax for non-farming elites. Rather, above all, it produces commodities (Dove, 2019; Moore, 2009, 2010, 2015; Patel & Moore, 2018; Perfecto, Jiménez-Soto & Vandermeer, 2019; Phillips, 2013; Scott, 1998, p. 262-306).

The outcomes of agriculture became of interest to *Anthropos* primarily as a set of commodities, much changed, and farming became inextricably connected to the proliferation of contemporary ecological problems (e.g. biodiversity loss, climate change, desertification, deforestation, rising toxicities). To better contribute to capital generation, agriculture needed to better appropriate the life-making efforts of multispecies assemblages present at the sites where farms are located. This promoted the significant simplification of local ecosystems (Perfecto, Jiménez-Soto & Vandermeer, 2019; Scott, 1998, p. 262-306; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*). This simplification reached its most "radical" expression with twentieth century "high modernist" agriculture (Scott, 1998, p. 262-306), but it started earlier and, in various ways, continues today in all modern capitalist agricultural systems (Dove, 2019; Moore, 2009, 2010, 2015; Patel & Moore, 2018; Perfecto, Jiménez-Soto & Vandermeer, 2019; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*).

Although not all modern capitalist agriculture is based on the plantation model, the heterogeneous modern capitalist agricultural production models (e.g. conventional agriculture, precision farming, integrated agriculture, certain empirical forms of certified organic farming) share key features with plantation agriculture (Dove, 2019; Moore, 2009, 2010, 2015; Patel & Moore, 2018; Perfecto, Jiménez-Soto & Vandermeer, 2019; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*). The enormous contributions of modern capitalist agriculture's plantation-like features to contemporary socio-ecological problems justify using the designation

[6] Although Descartes was specifically referring to *ego cogito*, the cosmological privilege *Anthropos* grants to modern science and technology closely links it to the former. Modern capitalist technoscience has been historically crucial for *Anthropos*' appropriation of the world (Altvater, 2016; Debaise *et al.*, 2015; Latour, 2010; Scott, 1998; Serres, 1998).

"Plantationocene" (Haraway, 2016, p. 99-103; Haraway, Tsing & Mitman, 2019; Moore *et al.*, 2021) instead of the "Anthropocene" (Crutzen & Stoermer, 2000; Steffen, Crutzen & McNeill, 2007), "Capitalocene" (Haraway, 2016; Moore, 2015; Moore (ed.), 2016), "Homogenocene" (Mann, 2011), or other alternatives, to describe the current geological age.

Aiming at profit maximization, modern capitalist agriculture attempts – with varying degrees of success – to socio-ecologically transform the sites where farms are located to suit its chosen commodities. Choices concerning the type of crops to be planted in order to maximize production (and profits) are made with the guidance of technoscientific research, some of it promoted by State policy. Attention to the adequacy of chosen crops to local ecological history is, at best, a distant concern *vis-à-vis* their potential productivity. Technoscientific research can make these crops better-(than-)nature and correct local ecological conditions to suit them. Much as in capitalist factories, this political ecological system privileges specialization in single commodity-crops, i.e. monoculture. Appropriated multispecies activity is made to function unidirectionally towards agricultural and commercial growth of the singular crop (Dove, 2019; Moore, 2009, 2010, 2015; Perfecto, Jiménez-Soto & Vandermeer, 2019; Scott, 1998, p. 262-306; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*). Beyond the support of species that are not directly productive, the endeavours of modern capitalist farms are regularly aided by technoscientifically developed mechanical instruments and chemical products (e.g. fertilizers, pesticides, herbicides, growth regulators). The goal of maximizing farm production and profit influences most decisions made in this agricultural paradigm: farm size (e.g. larger, allowing for economies of scale), farm design (e.g. where to plant seeds, at what density, with what kinds of support structures), techniques to foster crop growth (e.g. when, how and in what quantities to apply fertilizers, growth regulators or pesticides), and companion species (pollinating insects, but not plants that compete for soil nutrients), among other features (Perfecto, Jiménez-Soto & Vandermeer, 2019; Scott, 1998, p. 262-306; Wallace *et al.*, 2016, 2020, p. 141-181).

Many – but by no means all – features of plantation agriculture are present in kiwifruit farming. Kiwifruit orchards are sites of ecological simplification – more so in the conventional, rather than organic model. Monoculture is the rule, with a small number of cultivars, mostly of actinidia deliciosa and, at a distant second place, actinidia chinensis. A single cultivar, Hayward (actinidia deliciosa) – created through scientifically-aided agricultural experimentation in New Zealand in the 1920s – dominates these ecological sites in all current kiwifruit-producing countries with the exception of China (Ferguson, 2004; Huang & Ferguson, 2001, 2002). Lab based and agronomic research on kiwifruit continues, trying to create more resilient, hence profitable, cultivars. Chemical products (e.g. pesticides, fertilizers, herbicides, growth regulators) are still being refined (Antunes, 2008; Martino *et al.*, 2007; Tavares, 2016).

To increase kiwifruit resilience, previous local ecologies must be physically altered. Orchards are materially designed to allow mechanization, by planting actinidia vines in rows with enough space between them for tractors. Vines are supported by cement pillars and metal wires (Martino *et al.*, 2007, p. 45-48; Rodrigues, 2008, p. 58-61). They are protected from the weather by trees or plastic windbreaks (Martino *et al.*, 2007, p. 29-30; Oliveira & Veloso, 2008, p. 45-51), as well as by plastic canopies and nets to stop hail and frost. Fertilizers and rotavators transform soil quality to better suit actinidia vines (Curado & Neves, 2008; Martino *et al.*, 2007, p. 32-33, 43-45, 88-107; Pacheco, Calouro & Santos, 2008). Mechanical irrigation systems, some computer-aided, control how much water vines receive and when, requiring a stable and relatively cheap water source such as a river or agricultural storage (Martino *et al.*, 2007, p. 48-55, 83-85; Oliveira & Silva, 2008).

Profit-driven ecological simplification also entails trying to appropriate the work of other species present in the orchard, which can have ecological, agricultural, and, above all, commercial benefits for the kiwifruit harvest. Technical guidelines and orchard-level practices are divided on whether to leave plant species other than actinidia at the orchard floor or to weed them out (manually, or with herbicides). Some farmers even plant "ecological infrastructures" (i.e. non-commercial plant mixtures), to provide soil nutrients or nourishment for insects, such as bees, which pollinate kiwifruit sprouts. The activities of these welcome insects and plants are directed by commercially-minded human actors to support the growth of kiwifruit'.

Kiwifruit farming has historical, philosophical, and political ecological affinities with plantation agriculture, even if not all Portuguese farmers follow a conventional production model. Operating under integrated or certified organic farming reduces, but does not eliminate, the amounts of industrial chemical products that are used at the orchard. It also increases tolerance to the presence of a larger variety of plant and

animal species in those sites, and changes, but does not stop, capitalogenic appropriation of their work. Certified organic kiwifruit can sell for higher prices, there may be more European bans on agrochemicals that justify stopping their use preventively, and some farmers believe less ecological disturbance is good for the kiwifruit harvest. These choices might be ecologically preferable but they still operate under a profit-driven political ecological system. And they are still premised on the technoscientifically-supported appropriation of multispecies energy for human goals.

The regular appearance of agricultural and economically aggressive pests like Halyomorpha halys is inevitable in the simplified ecosystems of modern capitalist agriculture. Ecological simplification, alongside fast global circulation, actively turn some species into obstacles to capitalogenic appropriation of the work of multispecies assemblages in farms and orchards, which leads to their classification as pests. Simplification reduces overall local ecological resilience due to the homogeneity of appropriated multispecies assemblages, all of which become equally vulnerable to the same climatic, bacterial, viral, and animal threats. When pests appear, the regular use of industrial pesticides leaves some individuals alive, making future generations of the species more resilient, requiring newer, stronger, agrochemical treatments in a continuous spiral of ecological control-and-destruction (Perfecto, Jiménez-Soto & Vandermeer, 2019; Scott, 1998, p. 262-306; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*).

Agriculture is also involved in the global circulation of people and commodities, which accelerated significantly over the last few centuries (Bauman, 2000; Birtchnell, Savitzky & Urry, 2015). Intentionally or not, non-human species travel to sites where they disturb the multispecies assemblages that were already there (Crosby, 2003, 2004; Dutkiewicz, 2015; Mann, 2011; Phillips, 2013, p. 1688 *et seq.*; Tsing, 2019, p. 241-265; Wallace *et al.*, 2016, 2020, p. 141-181 *et passim*). The traveller can be an aggressor (as is the case with the Southeast Asian Halyomorpha halys) or prey (kiwifruit is a traveller to Europe itself). This unavoidable creation – and magnification – of pests makes their management (many times, a euphemism for "extermination") a crucial issue for modern capitalist agriculture.[7]

Modern capitalist pests are, to borrow Anna Tsing's formulation (Bubandt & Tsing, 2018; Tsing, 2019, p. 14-16, 241-265), "feral" forms of nature, i.e. unplanned non-human responses to capitalogenic multispecies interference that are many times (but by no means always) hostile to *Anthropos*' plans. The manner in which *Anthropos* interacts with such feral species in agricultural sites clearly points to the vicious circularity of modern capitalist reality-(re)making endeavours. The daily practices unfolding in agricultural sites – unintentionally, albeit inevitably – help to create pests, i.e. impossible-to-assimilate-and-appropriate life that opposes the efforts to assimilate and appropriate other species and ecosystems. *Anthropos*' subsequent pest management practices, many times by way of extermination, attempt to regain control over reality. But this continuous attempt at control-for-profit pushes more forms of non-human life to answer back, giving rise to new anthropogenic efforts at control.

I am not denying that species classified as pests cause harm to human life in ways that are more than economic, nor that crop damage can result in hunger and hurt farmers and their families. I am merely using the lessons of Halyomorpha halys to argue that modern capitalism itself creates the material conditions of possibility for these kinds of ecological damage, albeit mostly in unintentional ways. It is *Anthropos* that introduces troubling, and capital-unfriendly species into ecosystems, which then classifies them as pests, and afterwards tries to control them (usually by extermination). The socio-ecological unsustainability of modern capitalist world-ecology is, thus, inherent to this political ecological system's (ways of making) nature.

5. Halyomorpha halys' second lesson: death is a capitalogenic reality-making technique

Jason Moore (2015) reminds us that when thinking about capitalism's relation with nature many of us tend to focus on the wrong question. At stake is not knowing the ways in which modern capitalism destructively

[7] See Wallace *et al.* (2016, 2020) on how modern capitalist agriculture, including stockbreeding, actively increases the aggressiveness of pathogens. Although Wallace *et al.*'s chief interest is viruses and epidemic zoonotic disease, their critical descriptions undeniably indicate an isomorphism between modern capitalist agriculture's promotion of pests and how daily practices in agribusiness actively make these pathogens more aggressive to both humans and non-human species.

acts upon nature but, rather, understanding the manner in which this political ecological system makes nature and puts it to work. However, like Moore himself, one should never lose sight of the fact that the specific ways in which capitalism makes nature work for its goals are thanatological (McBrien, 2016; Haraway, 2016; Rose, 2006, 2008; van Dooren, 2011, 2014; Tsing, 2019; Wallace *et al.*, 2016, 2020).

Modern capitalist reality-remaking activities make life by feeding on death and by promoting death's proliferation. Many activities that have historically been essential for the emergence and maintenance of this political ecological system – from fuel to food to several others – are inextricably bound to death. This includes the death of those humans who are not, at a given time at a particular place, deemed worthy representatives of politically qualified humanity and, thus, are expelled from it to the realm of pure biological nature. Contemporary use of fossil fuels is one of the most obvious and literal examples of modern capitalist thanatology, one which shows how some of the most basic daily activities of this world-ecology cannot be performed without appropriating the energy of dead species and without further amplifying death in the form of greenhouse gases emissions (Malm, 2016; McBrien, 2016, p. 117 *et passim*). Similarly, industrial meat production inherently depends on continuous massive slaughter of edible animal species to make humans live. The daily practices intended to make this slaughter commercially viable have led to the spread of aggressive pathogens, some of them resulting in zoonotic epidemics (Keck, 2019; Wallace *et al.*, 2016, 2020).

Moore is right that the question that needs to be asked is, how capitalism makes nature work for its aims? Modern capitalism socio-ecologically transforms the world to make multispecies assemblages whose daily activities can be appropriated for capital creation. This is, inherently, biopolitical in the sense that it requires a continuous mobilization of forms of power that "intervene mainly (...) in order to improve life by eliminating accidents, the random element, and deficiencies" (Foucault, 2003, p. 248; see also Foucault, 1994, 2009, 2010), thus showcasing "the right to make live and to let die" (Foucault, 2003, p. 241). It also shows that biopolitical exercises necessarily entail regulating not only humans but also their environment. This was something that Foucault (2009, p. 20-23 *et passim*) discussed when he argued that liberal and neoliberal governmentalities can only work by intervening over the *milieu* which gives humans their life possibilities. Foucault, however, never sufficiently expanded this logic to take into account how biopolitics is always premised on "geopower" (Parenti, 2016), those exercises of power that are intended to shape (socio-)ecological phenomena, in particular through the historical assistance of technoscience.[8]

What concerns me here is that by looking at the processes by which modern capitalism makes life, it becomes undeniably clear that biopolitics is always inextricable from thanatopolitics – much as several authors have made abundantly clear, albeit mostly excluding nature's role in bio-thanato-politics from their discussions (Agamben, 1998, 2010; Aldeia, 2016, 2018; Arnold, 2004; Esposito, 2010a, 2010b, 2011).[9] The bio-thanato-politics of modern capitalist world-ecology makes a strong case for designating the current geological age by what is, perhaps, its most harrowing feature: not plantation agriculture, not the privilege of *Anthropos*, not the idiosyncrasy of capital *tout court*, but, rather, the unavoidable relation between capital and magnified death postulated by McBrien's (2016) "necrocene."

The bio-thanato-political *modus operandi* of modern capitalist world-ecology becomes clear in its magnification of the extinction of species. As McBrien puts it, "the history of capitalism's expansion" can only be understood by focusing on how it unfolds "through the process of *becoming extinction*" (2016, p. 116). Since the year 1500, around the time this world-ecology was beginning (Dussel, 1995; Lander (ed.), 2005; Mignolo, 1995; 2000; Moore, 2009, 2010, 2015; Patel & Moore, 2018), the extinction of species appears to have accelerated far beyond the natural background, i.e. the standard extinction rate in geological time (Barnosky *et*

[8] A longer discussion of the need to broaden biopolitics to better take into account the roles non-human elements play in it is beyond this essay, but various researchers have (heterogeneously) contributed to this effort (Darier, 1999; Dutkiewicz, 2015; Fletcher, 2017; Luke, 1999; Malette, 2011; Rutherford, 1999; Wolfe, 2013).

[9] I am most definitively not claiming to be the first to look at the bio-thanato-politics of multispecies interaction. See, for example, Dutkiewicz's (2015) discussion of the relations between biopolitics and necropolitics in the governance of introduced species in New Zealand, Lynch's (2019) attempt to think biopolitics and thanatopolitics beyond the intra-human using the case of human/bedbug cohabitation, or Wolfe's (2013) broader theoretical discussion of how biopolitical and thanatopolitical thought has and has not taken animals into account.

al., 2011; Ceballos *et al.,* 2015, 2020; De Vos *et al.*, 2015; IPBES, 2019; IUCN, 2021). Between purposeful death of unwelcome species (even those that were minding their own business when Europeans started arriving at their living quarters), planned death of edible species, the simplification of ecosystems, and general anthropogenic urbanization – all of which were intended to foster certain kinds of life in which the non-human could be better appropriated for the well-being of *Anthropos* – extinctions were inevitable.

Bio-thanato-politics is visible both in its guiding intentions and in its consequences. The acceleration and proliferation of extinctions, among other thanatological aspects of this world-ecology, shows us that modern capitalist life-making endeavours inevitably amplify death in ways that, to think alongside Deborah Bird Rose (2005, 2006, 2012), equate to "double death" (see also van Dooren, 2014, p. 53-61 *et passim*). For Rose (2012), multispecies communities keep going because their members are connected both diachronically and synchronically. Each individual of a given species feeds on the life-making efforts of all past generations of that species and contributes (gives) its own efforts to future generations. But diachrony only goes so far. Life also inherently depends on synchronic interspecies relations by which the activities and energy of a species nourish several others. Death is one of the processes by which different generations and different species become interconnected insofar as the whole multispecies community is able to "bend death back into life" (Rose, 2005, p. 124). An individual of a species lives through the inheritance gifted to it by its same-species ancestors (its parents that birthed and nurtured it, its more distant ancestors who contributed to building its genetic characteristics, etc.) and by the simultaneous support provided by other species (a species of trees proliferates because pollinating animals spread its seeds, a species of birds survives because it feeds on fruits that grow on those trees, and so forth). If all goes well, when an individual of a species dies, its remains will provide nourishment to other species – to necrophagous animals, to bacteria that help decompose those remains, etc. The multispecies work being carried out turns back to benefit other individuals by taking care of the soil they live on, by providing nutrients to the plants they feed on, and so forth (Rose, 2012; van Dooren, 2014). These imbricated relations between species that occur (also) through death are why Rose (2012) argues that multispecies communities are "multispecies knots in ethical time", assemblages of life that are brought together by "time, death, and generations" – three fundamental issues for both life and its study, as was pointed out by Rose, van Dooren and Chrulew (2017).

Double death fundamentally disrupts the multispecies and intergenerational bonds by making it more difficult – *in extremis*, impossible – for remaining multispecies members to keep bringing death back into life (Rose, 2005, 2006, 2012). This becomes clear in the case of capitalogenic extinctions. When a species dies *in toto* at a given site – the first death – its death deprives remaining species in that multispecies community from its millennia-old work, which fundamentally harms the survivors, decreasing their well-being and, perhaps, their life chances. So, instead of contributing to life, the first death starts opposing life both in the survivors' present and in their future, thus amplifying death potentially *ad infinitum* (or, at least, until the last individual of the last species of that multispecies community dies) (Rose, 2005, 2006, 2012; van Dooren, 2014).

Modern capitalist reality-making activities are not novel in causing death. Their specificity is their continuous capacity to double death by shattering local multispecies bonds. Modern capitalism transforms death from an integral part of vital processes to an enemy of life that multiplies and spreads. This has political, ethical, and ecological implications, and I will look at some of these by turning my attention back to Halyomorpha halys.

***

Pests like Halyomorpha halys and, particularly, the practices developed to manage them, show that modern capitalist world-ecology is thanatological (see Section 3) before extinctions – i.e. extinctions unfold within this political ecological system because it is thanatological. It is not clear, however, that the extinction of Halyomorpha halys would entail double death in the sense of starting a cascading effect that would irreparably damage other species through the absence of the exterminated one. Halyomorpha halys is a recent arrival in Portugal and many other places, and it does not appear to perform any ecological functions that benefit previously-present species. But taken as a part of a broader pest control endeavour, the attempted ecocide of

Halyomorpha halys is a part of modern capitalist bio-thanato-politics and, thus, of a larger propensity of this political ecological system to promote the amplification of death in its life-making activities.

Even if Halyomorpha halys does not perform ecological work that benefits other species (at least, not outside Southeast Asia), its (wished for) ecocide shows that modern capitalist world-ecology cannot avoid causing double death. There are not many nuances possible in managing the presence of Halyomorpha halys in farms and orchards: structurally, it has been placed in a position in which it can either be killed or left alone. If Halyomorpha halys is to be killed, it will most likely be through the extensive use of industrial pesticides. Alternative pest control techniques have been less effective (see Footnote 3) than broad-spectrum insecticides in farms and orchards in several countries (Lee *et al.*, 2013; Rice *et al.*, 2014). This has fatal consequences for soils, the atmosphere, humans, other animals, and plants, and, in some sites, has already resulted in "secondary pest outbreaks that are typically controlled by natural enemies" (Rice *et al.*, 2014, p. 7). But the issue at hand is not choosing between using pesticides to kill or alternative pest management techniques to let live. Farmers around the world do make choices on the means of pest control to be employed to manage Halyomorpha halys. Their choices, however, tend to be framed as matters of technical effectiveness of different ways of killing the species.

Even in settings where farmers abstain from intensively employing broad-spectrum pesticides, most other techniques used to agriculturally manage Halyomorpha halys – such as using traps that attract it using pheromones, precision pesticide applications or using predatory species – are also intended to exterminate it. Agricultural multispecies thanatopolitics is not necessarily predicated upon the employment of industrial pesticides, although it most definitively tends to be intensified by it. So Halyomorpha halys′ death starts appearing as the first, amplifying, death that eventually spreads to others.

Death, and even killing, can in some situations contribute to perpetuating multispecies life. However, most of these management techniques not only kill but magnify death by enacting – or, at least, attempting to enact – purposeful ecocide, albeit in different forms and with various intensities. And yet, a collective stance for the other possibility that is structurally available, i.e. keeping Halyomorpha halys relatively undisturbed, is likely to result in the death of crops and of animals that feed on these, as well as in reduced quantities of food for humans. Double death again appears: the first death, that of crops, magnifies itself to harm other species.

I am not taking a stance on how farmers and other humans should deal with Halyomorpha halys. The choices to be made are not straightforward – and their outcomes are likely to be imperfect. I am merely stating that there are choices to be made and that humanity's relation with Halyomorpha halys is not solely a technoscientific matter. Politics and ethics, as well as ecological, agricultural, and economic concerns, need to be taken into account in pest management, and humanity's relationship with Halyomorpha halys cannot simply be rendered obvious by the superior (economic) interests of *Anthropos* and the technical capabilities available to protect them. Whatever the choices made, whether they are implicit or explicit, the very fact that we reached a point in which such choices must be made (no matter how uncomfortable) points to the ecological limits of a world-ecology in which life cannot be made except at the expense of doubling death.

6. Halyomorpha halys' third lesson: *Anthropos* rejects having obligations towards other species

The potential entrance of Halyomorpha halys in Portugal is framed exclusively in terms of the threats it poses to an abstract humanity whose adherence to modern capitalist goals is unquestioned. Among kiwifruit farmers, scientists, and Portuguese State officials, these threats primarily pertain to the damage that the species might potentially inflict upon agricultural commodities. This leads these actors to frame the prospective management of Halyomorpha halys primarily in terms of the technical capacities to protect agricultural crops, if necessary, by exterminating local populations of the pest.

In this way, the discussion of how to interact with Halyomorpha halys highlights the central and fundamental role played by immunization in modern capitalist world-ecology. Roberto Esposito uses immunization as a metaphor to describe contemporary bio-thanato-politics (2010a, p. 73-115 *et passim*, 2011). For Esposito, immunization is an active strategy aiming to avoid the spread of contagion in a community, which, paradoxically, requires reflexively introducing in it a controlled amount of death to guarantee that life as a

whole doesn't move towards death (2010a, p. 74-75 *et passim*; 2011, p. 2-3 *et passim*). This means that in this world-ecology the biopolitical protection of the kinds of multispecies life that are fostered (above all, life that can be appropriated for capital generation) is necessarily accomplished through thanatopolitical exercises by which pests – among other forms of life – are killed. Esposito's discussion is framed in mostly intra-human terms that do not render explicit the roles played by non-human natures in this world-ecology, or how they are appropriated (Lynch, 2019; Wolfe, 2013). Nonetheless the operation of a bio-thanato-political immunization strategy is clear in the daily interactions of *Anthropos* with many other species.

Modern capitalist world-ecology is not the first political ecological system to use immunity as a form of regulating life and death, or to distribute privilege and subordination. Esposito clearly shows that in Roman Antiquity the power of privileged subjects and human categories (e.g. *pater familias*) was inherently based on a form of immunity. In this period he finds the first etymological key to understanding immunization. *Immunitas* appeared as a privilege expressed by the dispensation of *munus*, the gift-obligation that all members of a given *communitas* – except those that are *immunis* – have to perform towards that community. *Munus* is, essentially, an obligatory expropriation of the individual (the proper) towards the common. It translates into things one must do-give to the well-being of the whole community. It is *munus* that etymologically ties *communitas* to *immunitas*, the latter appearing as the negation not exactly of *munus* itself but, more precisely, of the *cum-* in *communitas* (*cum* + *munus*), the communality enabled by this shared gift-obligation. The status of being *immunis* is, simultaneously, an exception and a privilege that leaves some individuals without an obligation to the common (Esposito, 2010b, p. 6 *et passim*, 2011, p. 5-6 *e passim*).

Modernity changed the meaning of immunity significantly moving towards an active and reflexive strategy of immunization. The second historically relevant paradigm of *immunitas* is found in modern vaccination (Esposito, 2011, p. 7-9 *et passim*). Bio-thanato-politics became a continuous effort to control the inherent danger of *communitas*: to entirely deindividuate each of its members through their continuous performance of *munus* (i.e. their continuous transference of themselves towards the common). Modern *communitas* is understood as something permanently at risk of ending, either through *excess* (the common overwhelms the individual) or through *deficit* (individuals do not give enough to the common). In modern capitalist world-ecology, the first risk, that of community destroying itself through excess, is considered the most dangerous of the two. The constant threat of death that community faces gives rise to an effort to find the right balance between the proper/individual and the common, as well as between life and death. If life is to remain, then, it can neither be uncontrollably fostered nor entirely constrained to the point of biological death. Rather, as with modern vaccinations, life must be constantly protected but this can only be achieved by inoculating it with a controlled dose of the pathogen that might kill it. This means that, since what threatens *communitas* is the uncontrollable unfolding of destructive violence – either via totalitarian communality or through bond-denying individualism – then a controlled amount of violence needs to be permanently introduced in the community to save it from itself (Esposito, 2010a, p. 73-115, 2010b, 2011, p. 9-10 *et passim*). The State has a crucial role to play here, as Weber (2004, p. 33) reminded us when he defined it as the entity that has the monopoly of legitimate violence; its use of force is intended to avoid the unchecked dissemination of violence through the whole community.

Esposito argues that all of this is premised on an incorrect understanding of *communitas*, which leads immunization strategies to fundamentally constrain life in their efforts to protect it through controlled death (2010a, p. 73-115 *et passim*, 2010b, 2011). Immunization might stop life from falling towards biological death; but it can only do this by forcing life to stay at the point of its biology. Thus, it simultaneously opposes death and politically qualified, and worthy, life. *Communitas* cannot not be understood if it is conceived as an essence, a thing, an identity shared by its members (and by no one else). It is not a property but precisely its opposite. It is the common that opposes the proper. It is, thus, a shared absence, a shared lack, a shared debt, a shared expropriation of the individual (the proper) towards the common. What enables this expropriation is, precisely, *munus*, the gift-obligation whose giving-performance by community members binds them together in diminishing themselves towards the common (Esposito, 2010b).

Esposito's understanding of those that share the lack that is *munus,* is implicitly anthropocentric. But there is no reason, at least, not *a priori*, for *munus* to be exclusive to humans (Lynch, 2019). Rather, *munus* is the making of multispecies communities – much like Rose (2012) points at in her discussion of how

multispecies gift holds multispecies communities together. The *munus* that circulates between individuals of the same, and different, species is the energy that each one spends in its vital(-making) efforts and, in so doing, benefits many others, of the same species as well as of others, currently alive as well as yet to be born. This does not connect different individuals of different species in the manner of a shared identity but, rather, it binds them through what they lack together – their constant transfer of effort and energy towards the multispecies common; a common in which no particular ontological category (e.g. *Anthropos*) has the privilege of unidirectional appropriation of this gift. It is relatively irrelevant if these transfers of effort and energy occur with or without the reflexive understanding of concerned individuals and species. Gift giving is an obligation whose normativity is many times left unspoken – and even unthought (Caillé, 2000; Godbout, 2000; Godbout & Caillé, 1997). It might create expectations among some of its participants, but there does not appear to be any reason to assume that this is necessarily the case with all of them. Following Mauss (2008), we know that the gift entails a triple obligation: to give, to receive, and to retribute. This is the fundamental point of the gift, whether it takes into account humanity alone, or also other species. One is obligated to give, not to another individual, but the common created by gift giving (Aldeia, 2014, 2017; Chabal, 1996; Portugal, 2006, p. 563-564 *et passim*). One is obligated to participate in gift giving to create communality.

Halyomorpha halys shows us that it is precisely this obligation towards other species that *Anthropos* actively denies through its immunitary life-making – and death-fostering – bio-thanato-political strategies. In modern capitalist agriculture, pest management is, among other things, an attempt to render both commercial farms and *Anthropos* immune. It is an effort to immunize the kind of multispecies assemblages that *Anthropos* values – because it can make them work for its goals – by denying that these assemblages are communities. This is, perhaps, the most fundamental feature of the *Anthropos* relationship to non-human species: a self-appointed capacity to disobligate itself towards them by restricting *munus* to representatives of itself.

This is, inevitably, thanatological. To protect the kind of life that it values, to foster the kinds of life whose efforts he can appropriate at the lowest cost possible, *Anthropos* excludes multispecies life-making work from the realm of communality-making obligation and reduces it to biophysical characteristics, with no inherent political or ethical value. Thus, life at farms and orchards is permanently under the threat of unwelcome species, pest included, which requires the active deployment of controlled death to stop the whole farm-community from slipping into the realm of death – leading to the loss of crops, as well as of invested time, effort, and money. Pesticides are applied according to technical guidelines intended to fulfill the instrumental objective of guaranteeing that those profitable natures can be appropriated. Alternative pest control strategies such as using other species to kill pestiferous ones, are also intended to accomplish the bio-thanato-political goal of immunizing the farm or the orchard. The technoscientifically-supported controlled death of pests is needed to protect the anthropogenically-created precarious homeostasis of these radically simplified ecosystems. But it is precisely this continuous strategy that stops life's unchecked flourishing at those sites, reducing it to the controlled ecocidal nurture of multispecies assemblages that are made to go on living, but impoverished, to fulfill the aims of *Anthropos*.

Not only orchards and farms are immunized in this fashion. *Anthropos* actively promotes its own immunity towards multispecies communities by reducing interactions with other species to the deployment of technical means to reach instrumental goals (chiefly among them, capital creation). In actively using death to create the forms of life it values, *Anthropos* denies having obligations towards non-human species – including towards those that are only threatening its valued forms of life due to anthropogenic disturbances to their native ecosystems. This includes moving Halyomorpha halys from Southeastern Asia to other parts of the world where it is ecologically out-of-place and out-of-balance.

By pointing us to the bio-thanato-politics of agricultural pest control, Halyomorpha halys also teaches us that *immunitas* is a significant aspect of modern capitalist world-ecology's socio-ecological unsustainability. This political ecological system cannot protect itself from its own fundamental ways of acting. It can only deal with the consequences of its own actions in the short term, by doubling down on its thanatological immunitary logic. Insofar as it unfolds through death, agricultural pest management can only protect life for the single season it takes for a given crop to grown into a viable commodity – and it can only do this by continuously introducing a slice of death into the multispecies assemblages it is trying to protect. Industrial pesticides and alternative pest control practices, such as directing species to kill species, are clear, albeit metaphorical,

examples of the *pharmakon* (the poison that can also be a cure, i.e. an antidote, if applied in smaller, controlled doses) without which immunization cannot operate (Esposito, 2011, p. 15, 121-127 *et passim*).

The destructive effects of modern capitalism's constructive spiral logic are clear. Reality is remade to control it and so it can be better appropriated (e.g. a site is razed to plant an orchard). Non-human species resist these efforts and become feral (e.g a pest arrives). This leads to more deployments of harsher technoscientific means of control-via-extermination (e.g a new industrial pesticide is employed). Some of the pestiferous species survives, and become more resilient to those pesticides, or another pest eventually makes its presence known. And so-on *ad infinitum* – or, at least, until the material conditions of possibility of this bio-thanato-political operation are reached at some unforeseeable, but inevitable, time. Modern capitalist agriculture can only deflect, and never solve, the structural socio-ecological problems to which it contributes. It is inherently incapable of dealing with feral nature in the long run and can only shift these problems to other geographical areas, other multispecies communities, and to the future.

7. Conclusion

One morning while writing a draft for this essay, I looked at an outside wall of my home and saw a bug remarkably similar to Halyomorpha halys resting there. The first thought that went through my mind was "Ugh! Should I squash it?" The bug soon flew away, but the memory stayed. Although, as other humans do, I personally find the perspective of sharing my home with Halyomorpha halys quite unsettling, this does not solve the issue at hand. Humans do share worlds with Halyomorpha halys and many other species classified as pests, and some of them are more troubling. Our decisions on how to interact with them need to be open to critical thinking and discussion in ways that are not *a priori* closed by the deployment of available technoscientific means of ecocide that aim to protect the kinds of multispecies life that *Anthropos* values.

The history of modern capitalist world-ecology is filled with examples of how this bio-thanato-political strategy of immunization can only amplify death to the point of it becoming a threat to both humans and non-humans. Sometimes, ecocide might be rendered structurally inevitable due to path dependencies in this world-ecology. At least for the time being, in this political ecological system, human well-being might sometimes have to trump protection of other species. But this must involve political and ethical considerations. And each time a thanatological operation unfolds, death and suffering are magnified, and the material limits of modern capitalist appropriation of nature grow closer.

Notwithstanding the significant inconveniences brought about by its presence, the brown marmorated stink bug can be a useful teacher. The ways in which its life unfolds point to key features of modern capitalist world-ecology. Specifically, Halyomorpha halys allows us to think critically about humanity's relationships with other species, about the death-promoting ways in which *Anthropos* makes and tries to protect certain forms of multispecies life, and also about the problems of contemporary dominant agricultural production models. Halyomorpha halys' actions cannot be appropriated by *Anthropos* for its goals. This species also makes it significantly harder to appropriate the activities of several others. But it is abundantly clear that there is much more to Halyomorpha halys' life than technoscience and capital assume. While deciding how we can and want to interact – and maybe continue to live – with this species, we would do well to keep learning with it.

References

Agamben, G. (1998[1995]), *O poder soberano e a vida nua. Homo sacer.* Presença.

Agamben, G. (2010[2003]), *Estado de excepção*. Lisboa: Edições 70.

Aldeia, J. (2014), Para além do Estado e do Mercado. A dádiva no fenómeno dos sem-abrigo, *Dados*, 57(1), 167-197.

Aldeia, J. (2016), *Governar a vida na rua. Ensaio sobre a bio-tanato-política que faz os sem-abrigo sobreviver*. PhD dissertation, Sociology. Faculty of Economics, University of Coimbra.

Aldeia, J. (2017), Um outro modo de pertencer. A ação moral dos sem-abrigo, *REALIS – Revista de Estudos Anti-Utilitaristas e Pós-Coloniais*, 7(2), 143-179. https://doi.org/10.51359/2179-7501.2017.22608

Aldeia, J. (2018), Uma bio-tanato-política que faz os sem-abrigo sobreviver, *Problemata: Revista Internacional de Filosofia*, 9 (2), 216-234. https://doi.org/10.7443/problemata.v9i2.35564

Aldeia, J. & Alves, F. (2019), Against the environment: Problems in society/nature relations, *Frontiers in Sociology*, 4(29). https://doi.org/10.3389/fsoc.2019.00029

Altvater, E. (2016), The Capitalocene, or, geoengineering against capitalism's planetary boundaries. In Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. (139-152). PM Press.

Antunes, M. D. (2008), Colheita e conservação. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (192-204). Universidade do Algarve.

Antunes, M. D. (ed.), (2008), *Kiwi. Da produção à comercialização*. Universidade do Algarve.

Arnold, K. (2004), *Homelessness citizenship, and identity: The uncanniness of late modernity*. State University Press of New York.

Barnosky, Anthony *et al.* (2011), Has the Earth's six mass extinction already arrived? *Nature*, 471, 51-57.

Bauman, Z. (2000), *Liquid modernity*. Polity.

Bauman, Z. (2007[1991]), *Modernidade e ambivalência*. Relógio D'Água.

Birtchnell, T., Savitzky, S. & Urry, J. (2015), Moving cargos, In Birtchnell, T., Savitzky, S. & Urry, J. (eds.), *Cargo mobilities: Moving materials in a global age*. (1-16). Routledge.

Bubandt, N. & Tsing, A. H. (2018), An ethnoecology for the Anthropocene: How a former brown-coal mine in denmark shows us the feral dynamics of post-industrial ruin, *Journal of Ethnobiology*, 38(1), 1-13.

Caillé, A. (2000), *Anthropologie du don: Le tiers paradigme*. Desclée du Brouwer.

Ceballos, G., Ehrlich, P. R. *et al.* (2015), Accelerated modern human-induced species losses: Entering the sixth mass extinction, *Science Advances*, 1(5). https://doi.org/10.1126/sciadv.1400253

Ceballos, G., Ehrlich, P. R. & Raven, P. H. (2020), Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction, *Proceedings of the National Academy of Sciences*, 117(24), 13596-13602. https://doi.org/10.1073/pnas.1922686117

Chabal, M. (1996), Quand la réciprocité semble non réciproque... Ou la réciprocité cachée, *Revue du MAUSS semestrielle*, 8, 132-141.

Chicau, G. (2008), Doenças de conservação. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (186-191). Universidade do Algarve.

Crist, E. (2016), On the poverty of our nomenclature. In Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. (14-33). PM Press.

Crosby, A. (2003[1972]), *The Columbian Exchange: Biological and cultural consequences of 1942*. Praeger.

Crosby, A. (2004[1986]), *Ecological Imperialism: The biological expansion of Europe, 900-1900*. Cambridge University Press.

Crutzen, P. & Stoermer, E. (2000), The Anthropocene, *Global Change Newsletter*, 41, 17-18.

Curado, F. & Neves, N. (2008), Manutenção do solo na cultura da actinídea, In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (111-119). Universidade do Algarve.

Darier, É. (1999), Foucault and the environment: An introduction. In Darier, É. (ed.), *Discourses on the environment.* (1-33). Blackwell.

De Vos, J. M. *et al.* (2015), Estimating the normal background rate of species extinction. *Conservation Biology*, 29(2), 452-462. https://doi.org/10.1111/cobi.12380

Debaise, D. *et al.* (2015), Reinstituting nature: A Latourian workshop. *Environmental Humanities*, 6, 167-174. https://doi.org/10.1215/22011919-3615943

Descartes, R. (2006[1637]), *A discourse on the method of correctly conducting one's reason and seeking truth in the sciences*. Oxford University Press.

DGAV (Direção-Geral de Alimentação e Veterinária) (2012), *Plano de Ação Nacional para o controlo da* Pseudomonas syringae *pv.* actinidiae *do Kiwi (PSA)*. Lisbon: DGAV, Ministério da Agricultura Mar,

Ambiente e Ordenamento do Território. Available at: <https://www.drapc.gov.pt/base/geral/files/18_plan_kiwi.pdf>.

Diário de Notícias (2019, October 10), Cientistas alertam para perigos do percevejo asiático que pode invadir Portugal, *Diário de Notícias*. Available at: <https://www.dn.pt/vida-e-futuro/cientistas-alertam-para-perigos-do-percevejo-asiatico-que-pode-invadir-portugal-11391014.html>.

Dove, M. R. (2019), Plants, politics, and the imagination over the past 500 years in the Indo-Malay Region, *Current Anthropology*, 60, 309-320. http://doi.org/10.1086/702877

Dussel, E. (1995[1992]), *The invention of the Americas: Eclipse of " the Other" and the myth of modernity*. Continuum.

Dutkiewicz, J. (2015), Important cows and possum pests: New Zealand's Biodiversity Strategy and (bio)political taxonomies of introduced species, *Society & Animals*, 23, 379-399.

Esposito, R. (2010a[2004]), *Bios. Biopolítica e filosofia*. Edições 70.

Esposito, R. (2010b[1998]), *Communitas: The origin and destiny of community*. Stanford University Press.

Esposito, R. (2011[2002]), *Immunitas: The protection and negation of life*. Polity.

Félix, A. P. & Cavaco, M. (2008), Inimigos naturais das pragas da actinídea. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (133-153). Universidade do Algarve,

Félix, A. P. M. & Xavier, A. (2008), Pragas da cultura. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização.* (120-132). Universidade do Algarve.

Ferguson, A. R. (2004), 1904 – the year that kiwifruit (*Actinidia deliciosa*) came to New Zealand, *New Zealand Journal of Crop and Horticultural Science*, 32, 3-27. https://doi.org/10.1080/01140671.2004.9514276

Fletcher, R. (2017), Environmentality unbound: Multiple governmentalities in environmental politics, *Geoforum*, 85, 311-315. https://doi.org/10.1016/j.geoforum.2017.06.009

Foucault, M. (1994[1976]), *História da sexualidade I – A vontade de saber.* Relógio D'Água.

Foucault, M. (2003[1997]), *Society must be defended. Lectures at the Collège de France, 1975-1976*. Picador.

Foucault, M. (2009[2004]), *Security, territory, population: Lectures at the Collège de France, 1977-1978*. Palgrave Macmillan.

Foucault, M. (2010[2004]), *Nascimento da biopolítica.* Lisboa: Edições 70.

Franco, J. (2008), História e desenvolvimento comercial, In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (13-19). Universidade do Algarve. 13-19.

Gaspar, H. *et al.* (2019, August/September), Percevejo Asiático. A praga agrícola que quer viver consigo bate à porta, *Voz do Campo*, August/September. Available at: <http://vozdocampo.pt/2020/05/30/percevejo-asiatico-a-praga-agricola-que-quer-viver-consigo-bate-a-porta/>.

Godbout, J. (2000), *Le don, la dette et l'identité. Homo donator versus homo oeconomicus*. La Découverte.

Godbout, J. & Caillé, A. (1997[1992]), *O espírito da dádiva*. Instituto Piaget.

Grosso-Silva *et al.* (2020), Confirmation of the presence of *Halyomorpha halys* (Stål, 1855) (Hemiptera: Pentatomidae) in mainland Portugal, *Arquivos Entomolóxicos*, 22, 373-376.

Hartley, D. (2016), Anthropocene, Capitalocene, and the problem of culture, Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. (154-165). PM Press.

Haraway, D. (2016), *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

Haraway, D, Tsing, A. L. & Mitman, G. (2019), Reflections on the Plantationocene. A conversation with Donna Haraway and Anna Tsing. Published June 18, 2019. Updated October 12, 2019. Available at: <https://edgeeffects.net/haraway-tsing-plantationocene/>.

Huang, H. & Ferguson, A. R. (2001), Kiwifruit in China, *New Zealand Journal of Crop and Horticultural Science*, 29, 1-14.

Huang, H.; Ferguson, A. R. (2002), Kiwifruit (*Actinidia chinesis* and *A. deliciosa*) plantings and production in China, 2002, *New Zealand Journal of Crop and Horticultural Science*, 31, 197-202.

INE (Instituto Nacional de Estatística/Statistics Portugal) (2013), *Estatísticas agrícolas 2012*. Lisbon: Instituto Nacional de Estatística, I.P.

Inkley, Douglas (2012), Characteristics of home invasion by the Brown Marmorated Stink Bug (Hemiptera: Pentatomidae), *Journal of Entomological Science*, 47 (2), 125-130. https://doi.org/10.18474/0749-8004-47.2.125

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (2019), *Summary for policymakers of the IPBES Global Assessment Report on biodiversity and ecosystem services*. IPBES. http://doi.org/10.5281/zenodo.3553579

International Union for Conservation of Nature (IUCN) (2021), *The IUCN Red List of Threatened Species*. 25 March 2021. Available at <https://www.iucnredlist.org/>.

Keck, F. (2019), Livestock revolution and ghostly apparitions: South China as a sentinel territory for influenza pandemics, *Current Anthropology*, 60, 251-259. https://doi.org/10.1086/702857

Kritikos, D. *et al.* (2017), The potential global distribution of the brown marmorated stink bug, *Halyomorpha halys*, a critical threat to plant biosecurity, *Journal of Pest Science*, 90(4), 1033-1043. https://doi.org/10.1007/s10340-017-0869-5

Lander, E. (ed.) (2005), *A colonialidade do saber. Eurocentrismo e ciências sociais. Perspectivas latino-americanas*. CLACSO.

Latour, B. (2010[1991]), *Nous n'avons jamais étés modernes: Essai d'anthropologie symétrique*. La Découverte.

Lee, Doo-Hyung *et al.* (2013), Review of the biology, ecology, and management of *Halyomorpha halys* (Hemiptera: Pentatomidae) in China, Japan, and the Republic of Korea, *Environmental Entomology*, 42 (4), 627-641.

Leskey, T. & Nielsen, A. (2018), Impact of the invasive Brown Marmorated Stink Bug in North America and Europe: History, biology, ecology, and management, *Annual Review of Entomology*, 63, 599-618. https://doi.org/10.1146/annurev-ento-020117-043226

Luke, T. (1999), Environmentality as Green Governmentality, In Darier, E. (ed.), *Discourses on the environment*. (121-151). Blackwell.

Lynch, H. (2019), Esposito's affirmative biopolitics in multispecies homes, *European Journal of Social Theory*, 22 (3), 364-381. https://doi.org/10.1177/1368431018804156

Maistrello, L. *et al.* (2016), Citizen science and the early detection of invasive species. Phenology of first occurrences of *Halyomorpha Halys* in Southern Europe, *Biological Invasions*, 18, 3109-3116. https://doi.org/10.1007/s10530-016-1217-z

Malette, S. (2011), Foucault para o próximo século: Ecogovernamentalidade, *Ecopolítica*, 1, 4-25.

Malm, A. (2016), *Fossil capital: The rise of steam power and the roots of global warming*. Verso.

Mann, C. (2011), *1493: Uncovering the New World that Columbus created*. Alfred A. Knopf.

Martino, J., Cunha, C., *et al.* (eds.) (2007), *Manual do kiwicultor*. Associação Portuguesa de Kiwicultores.

Mauss, M. (2008[1923-4]), *Ensaio sobre a dádiva. Forma e razão da troca nas sociedades arcaicas*. Lisboa: Edições 70.

McBrien, J. (2016), Accumulating extinction: Planetary catastrophism in the Necrocene, In Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. (116-137). PM Press.

Mignolo, W. (1995), *The darker side of the Renaissance. Literacy, territoriality, and colonization.* University of Michigan Press.

Mignolo, W. (2000), *Local histories/global designs: Coloniality, subaltern knowledges, and border thinking*. Princeton University Press.

Moore, J. (2009), Madeira, sugar, and the conquest of nature in the 'first' Sixteenth Century. Part I: From island of timber to sugar revolution, 1420-1506, *Review*, 32 (4), 345-390.

Moore, J. (2010), Madeira, sugar, and the conquest of nature in the 'first' Sixteenth Century, Part II: from regional crisis to commodity frontier, 1506-1530, *Review*, 33 (1), 1-24.

Moore, J. (2015), *Capitalism in the web of life: Ecology and the accumulation of capital*. Verso.

Moore, J. (2016), The rise of cheap nature, In Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. (78-115). PM Press.

Moore, J. (ed.) (2016), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. PM Press.

Moore, S. S. *et al.* (2021), Plantation legacies. Published January 22, 2019. Updated May 15, 2021. Available at: <https://edgeeffects.net/plantation-legacies-plantationocene/>.

Naves, P. M. (2019, March), O sugador *Halyomorpha halys* (Heteroptera; Pentatomidae), uma nova ameaça à agricultura portuguesa, *Vida Rural*, vol. March 2019, 32-34. Available at: <http://www.iniav.pt/fotos/editor2/o_sugador_halyomorpha_halys.pdf>.

Nielsen, A. & Hamilton, G. (2009), Seasonal occurrence and impact of *Halyomorpha halys* (Hemiptera: Pentatomidae) in tree fruit, *Journal of Economic Entomology*, 102(3), 1133-1140.

O'Gorman, E. & van Dooren, T. (2017), The promises of pests: Wildlife in agricultural landscapes, *Zoologist*, 39(1), 81-84. draft

Oliveira, M. & Silva, R. (2008), Rega da actinídea, In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (84-90). Universidade do Algarve, 84-90.

Oliveira, M. & Veloso, F. (2008), Exigências edafo-climáticas. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (43-53). Universidade do Algarve.

Pacheco, C., Calouro, F. & Santos, F. (2008), Nutrição e fertilização, In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (91-110). Universidade do Algarve.

Parenti, C. (2016), Environment-making in the capitalocene: Political ecology of the state. In Moore, J. (ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism* (166-184). Oakland: PM Press, 166-184

Patel, R. & Moore, J. (2018), *A history of the world in seven cheap things: A guide to capitalism, nature, and the future of the planet*. Black Inc.

Perfecto, I., Jiménez-Soto, M. E. & Vandermeer, J. (2019), Coffee landscapes shaping the Anthropocene: Forced simplification on a complex agroecological landscape. *Current Anthropology*, 60, 236-250. https://doi.org/10.1086/703413

Phillips, C. (2013), Living without fruit flies: Biosecurity horticulture and its markets, *Environment and Planning A*, 45, 1679-1694. https://doi.org/10.1068%2Fa45274

Plumwood, V. (1993), *Feminism and the mastery of nature*. Routledge.

Portugal, S. (2006), *Novas famílias, modos antigos. As redes sociais na produção de bem-estar*. PhD dissertation, Sociology. Faculty of Economics of the University of Coimbra.

Puketapu, A. (2019), *BS1847. Review of the biology, ecology, and management of the Brown Marmorated Stink Bug (*Halyomorpha halys*) with reference to Kiwifruit (*Actinidia chinensis). A Plant & Food Research Report prepared for Zespri Group Limited. SPTS No. 17628. Available at: <https://www.kvh.org.nz/vdb/document/104806>.

Rice, K. *et al.* (2014), Biology, ecology, and management of Brown Marmorated Stink Bug (Hemiptera: Pentatomidae), *Journal of Integrated Pest Management*, 5(3), A1-A13. https://doi.org/10.1603/IPM14002

Rodrigues, S. (2008), Condução e poda. In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (58-68). Universidade do Algarve.

Rose, D. B. (2005), The rain keeps falling, *Cultural Studies Review*, 11(1), 122-127.

Rose, D. B. (2006), What if the Angel of History were a dog? *Cultural Studies Review*, 12 (1), 67-78.

Rose, D. B. (2008), Judas work: four modes of sorrow, *Environmental Philosophy*, 5 (2), 51-66.

Rose, D. B. (2012), Multispecies knots of ethical time, *Environmental Philosophy*, 9 (1), 127-140.

Rose, D. B., van Dooren, T. & Chrulew, M. (2017), Introduction: Telling extinction stories, In Rose, D. B., van Dooren, T. & Chrulew, M. (eds.), *Extinction Studies: Stories of time, death, and generations*. (1-18). Columbia University Press.

Rutherford, P. (1999), The entry of life into history. In Darier, E. (ed.), *Discourses on the environment*. (37-62). Blackwell.

Scott, J. (1998), *Seeing like a state: how certain schemes to improve the human condition have failed*. Yale University Press.

Serres, M. (1998[1992]), *The natural contract.* Michigan University Press.

Sofia, Jorge (2008), Doenças da actinídea, In Antunes, M. D. (ed.), *Kiwi. Da produção à comercialização*. (170-185). Universidade do Algarve.

Steffen, W., Crutzen, P., & McNeill, J. (2007), The Anthropocene: Are humans now overwhelming the great forces of nature? *Ambio*, 36(8), 614-621. https://doi.org/10.1579/0044-7447(2007)36[614:TAAHNO]2.0.CO;2

Tavares, D. F. (2016), *Avaliação de bioestimulantes para potenciar o abrolhamento em actinídia (*Actinidia deliciosa *cv 'Hayward')*, M.A. Thesis in Engenharia Agronómica – Hortofruticultura e Viticultura. Instituto Superior de Agronomia of Universidade de Lisboa.

Teulon, D. A. J., & Xu, B. (2018), Biosecurity risks from stink bugs to New Zealand kiwifruit identified in Chinese language literature, *New Zealand Plant Protection*, 71, 140-150. https://doi.org/10.30843/nzpp.2018.71.163

Tsing, A. L. (2019), *Viver nas ruínas. Paisagens multiespécies no Antropoceno*. IEB Mil Folhas.

van Dooren, T. (2011), Invasive species in penguin worlds: An ethical taxonomy of killing for conservation, *Conservation and Society*, 9 (4), 286-298. http://doi.org/10.4103/0972-4923.92140

van Dooren, T. (2014), *Flight ways: life and loss at the edge of extinction*. Columbia University Press.

Wallace, R. *et al.* (2016), *Big farms make big flu: Dispatches on infectious disease, agribusiness, and the nature of science*. Monthly Review Press.

Wallace, R. *et al.* (2020), *Dead epidemiologists: On the origins of Covid-19*. Monthly Review Press.

Weber, M. (2004[1921]), Politics as a vocation, In Weber, M. *The Vocation Lectures.* (32-94). Hackett Publishing Company.

Wolfe, C. (2013), *Before the law: Humans and other animals in a biopolitical frame*. University of Chicago Press.