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Social Parasitism in Ant and Human Societies

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Introduction

This paper will attempt to bring to light a new study proposed by Professor Anil Hira in the field of bioeconomics studies. Though other nonhuman social societies, such as honeybees, can be used to draw parallels to human societies, in this paper I will focus specifically on ant social societies that are more “than a hundred million years older than humans” (Gordon, 2010, p.1). The reason I have decided to study ants and human societies is because both societies are the two most successful social organizations on the planet. Ants are one of the “most highly social of all organisms” (Wilson, 1991, p. 14) and dominate the insect world. Furthermore, like humans, ants succeed because they communicate effectively and efficiently (Hölldobler & Wilson, 1994). There is abundant literature on biological studies of ants; in the research for this literature review, I have selected some noteworthy literature on ant behaviour that I believe will

help to initiate a discussion on ant behaviour. The literature review includes the work of Hölldobler & Wilson, 1994, 2011; Gordon, 1999, 2010; Sudd, 1967; Moffett, 2010; Bourke & Franks, 1995; Hugh, 1967; Abbott, Lach & Parr, 2010; Gotwald, 1995 and Deslippe, 2010. However, for this paper I will focus on social parasitism found to be the most intriguing phenomena in ants (Buschinger 1986; Hölldobler & Wilson 1990; Aron et al 1988; Deslippe, 2010). The main question I will address is: in what ways and for what reasons do social parasites manipulate their host? I would argue that social parasitism, whether in humans or ants societies, is based partly on self-interest and nature. This paper will focus only on coercion, deception and power as variables to analyze social parasitism in both human and ant societies. I will apply the Emery rule where possible in order to explain whether “social parasites and their hosts share common ancestry and therefore are likely to be close relatives” (Boomsma et al, 2004, p.37). Firstly, I will analyze the concept of power in human societies and ant societies. Secondly, I will demonstrate that the concept of “free rider” can be applied to both human and ant societies. Finally, I will analyze slavery in human and ant societies and explore whether it is necessary for social parasites to share common ancestry with their hosts to enslave them.

1. Types of Parasitic Life History: Emery’s Rule

Among the ant species, the three main types of social parasites known are temporary parasitism, permanentinquilines and slave-making (Aron et al.1999; Deslippe, 2010). While going over the literature review on social parasites, I noticed that there is a rule known as the Emery rule, which is cited by various authors (Crozier & Lowe, 1997; Deslippe, 2010; Boomsma et al. 2004; Bourke & Franks, 1991; Wilson, 1971). This rule tries to explain the relation between the social parasites and their host. There are two versions of Emery’s rule. The first is the strict version, which explains that there is a close relation between the social parasites and

their hosts with whom they also share common ancestry (Emery 1909; Wilson 1971; Heinze & Buschinger 1988; Ward 1989; Bourke & Franks 1991). The second is the loose version, which explains that even though there is a close relation between the social parasite and their host they don't share the same ancestry or descendants (Crozier & Lowe, 1997; Crozier et al., 2002).

2. Temporary Parasitism: Concept of Power

a. Temporary Parasitism in Ant Societies

Firstly, from my review of literature concerning ant temporary social parasites it appears to me that the focus is more on the queen parasite ant and the host queen (Aron et al., 2001; Deslippe, 2010). As Hira mentioned, the queen is often at the center of the colony's reproduction (Hira, 2013). The queen parasite ant will invade the colony of its host, "kill the resident queen, and use the host worker worker-force to raise her brood until the parasite workers have developed and progressively replaced their hosts" (Aron et al.1999, p.173). In other words when invading other colonies, the queen ant is seeking control over resources. One example of the social parasite ant is the *Lasius Claviger* (Deslippe, 2010). Thus, in terms of temporary parasitism in ant societies, it seems to me that the queen parasite *Lasius*' interest is at stake and there is an urgent need for the queen parasite to kill the host queen to take control over the resources of the host colony by force.

b. Temporary Parasitism in Human Societies

In human societies this temporary takeover of power would be explained partly by a "coup d'état" triggered by a group within a society. By coup d'état I mean the "forceful seizure of the machinery of state government, a common phenomenon of history and of the contemporary world" (Wells, 1974, p.871). The reason I believe this concept would partly

explain my point is because after a coup d'état in human societies not all the rulers taking over the group would develop social parasitism. The cause of a coup d'état in human societies would be mainly because of socioeconomic deterioration, failure of civilian politicians and want for more military power by a particular group (Wells, 1974). I will also argue that it is partly because of human nature since in human history coup d'état is a recurrent event (Wells, 1974). Also as Hira stated, in human societies the rise and fall of kingdoms around a royal family has been a common event in human history (Hira, 2013). However, when we take into consideration that there is a need for the parasite ant to secure leadership to control other colonies resources, it becomes more complex to understand the behaviour of human in human societies by using rational choice theory. For example, the Palestine-Israel conflict hostilities go beyond seeking resources only (Hira, 2013). In both human and ant societies it seems to me when self-interest of a group or colony is in danger, extreme measure can be taken to overthrow the leader of the host by using force and power.

3. Permanent Inquilines: Free Rider

a. Free Rider in Ants' Societies

Secondly, from my literature review I believe that the most extreme form of social parasitism is permanent inquilinism (Aron et al., 2001; Deslippe 2010). Permanent inquilinism occurs when the parasite ants have “lost the worker caste and completely rely the host worker force to raise their brood” (Aron et al., 2001). One of the fundamental differences between permanent inquilines and temporary social parasites is that the former are more tolerant to their host queens than the temporary social parasites that typically kill their host queens once they enter in their new colony (Deslippe, 2010). One interesting example of an extreme social parasite

is the ant queens *Teleutomyrmex schneideri*, which are very tiny in size compared to their host *Tetramorium caespitum*. The parasite ants do not contribute in any way to the economy of their host colonies and spend most of their time riding on the back of its host *Tetramorium caespitum* which is larger in size and can accommodate and support at least two queen *Teleutomyrmex schneideri* on (Hölldobler & Wilson, 1994). The burden of the parasite population can cause the population of the host workers to diminish (Hölldobler & Wilson, 1994). The result of a recent study by Aron et al. on the effects of the inquiline parasite *Plagiolepis xene St.* on queen distribution and worker production of its host *Plagiolepis pygmaea Latr* shows also “a decrease of worker production in parasitized nests under laboratory conditions” (Aron et al., 2001,p.78). The parasite ant *Teleutomyrmex schneideri* is a good example to analyze the concept of “free rider”. The fact that the host ant *Tetramorium caespitum* does not take any action to coerce the parasite ants *Teleutomyrmex schneideri* not to ride on its back allow the parasite ant to permanently free ride on its back. In the ant societies free riders do not contribute to the economy of the collective goods.

b. Free Rider in Human Societies

If we analyze the parasite ants that have lost their worker caste and must rely on the host worker to raise their brood in a human perspective, we can think of the parasite ants as a capitalist cooperation that has lost its workers due to higher wages in force in a state or because of fierce competition on the market by other capitalist corporation. As such, the capitalist corporation will be forced to look for other workers and pay them a lower wage for the same work that their workers' caste would have done. By moving away to some other state to avoid taxes the capitalist corporation becomes like a social parasite on the host state; therefore the capitalist corporation becomes dependent on the host state for its survival. Thus, it is in the self-

interest of the capitalist corporation to move to another state, and by evading taxes through offshore deception, for its survival. The free rider proposition in human societies “asserts that in a wide range of situations, individuals will fail to participate in collectively profitable activities in the absence of coercion or individually appropriable inducement” (Stigler, 1974, p.359). If we take the example of the capitalist corporations who evade taxes by moving their companies offshore are actually having a free ride not to contribute in the collective good of their home country. Also, since the government fails to take any action to eliminate the loop hole that allows those corporations to free ride they become permanent free riders. Recent examples of free riders in the United States are the beneficiaries of the “bail outs”. In 2008, the United States government handed out billion dollars of taxpayer money to capitalist corporations such as banks who were partly responsible of the economic crisis (Hira, 2013). Others countries such as those in the European Union have followed the same trend by bailing out failed countries like Greece with billions of euros of taxpayer funds. I believe it is in the self-interest of the government for the capitalist corporation to remain stable otherwise there may be a domino effect of the fall of many capitalists’ corporations in the world dependent on the US economy. It is also in the self-interest of the bankers to have the taxpayer’s money to survive. Thus, it becomes difficult to get a grasp of who is a social parasite. Thus, that will confirm of hypothesis that social parasitism in humans is indeed partly driven by nature and self-interest. As Hira mentioned, if we apply only rational theory to explain the economic crisis that happened in the US with a mathematical formula we will not go further in a deep analysis of the problem (Hira, 2013). I support this idea as we do have to take into consideration the aspect of human nature. And since human behaviour is a more complex issue we need to take into account in bioeconomics studies of human behaviour as well.

4. Slave-making

a. Slavery in Ant Societies

The last forms of parasitism in ants “is the enslavement of other kinds of ants” (Hölldobler & Wilson, 1994, p.126). One example of a well-known slave-maker is the Amazon ant *Polygerus*, which directs their raids against the *Formica* ants who are similar in appearance to them (Hölldobler & Wilson, 1994). Among the slave-maker ants, there are different ways in which they conduct their raid and make their slaves. Firstly, the parasite ants *Polygerus* steal the brood of other colonies of ants (Deslippe, 2010; Aron et al., 2001), which they rear to become their own so that they perform the work of the parasite ant’s colony. For example, when raiding other colonies, the Amazon ant *Polygerus* will kill any worker ants of the other colonies that will stop them from their invasive mission (Hölldobler & Wilson, 1994). The Amazon ants *Polygerus*’ attack against the *Formica* is very quick because they plan their attack before invading the latter colony by exploring the surrounding and leaving an odor trail to the *Formica* ant’s nest (Talbot in Hölldobler & Wilson, 1994). Wilson and Regnier also discovered that “the American slave-making ant *Formica subintegra* uses propaganda substances, resembling alarm pheromones to confuse and scatter the defenders” (Hölldobler & Wilson, 1994, p.131). As a result the captured workers “behave exactly as though they were sisters of the slave makers” (Hölldobler & Wilson, 1994, p.130). However, not all the attacks by the some parasite ants are quick: sometimes it depends on the parasite ant’s species and how much resistance the host worker will provide in result to an attack on their colonies. For example, *Formica subnuda* ants are “met with great resistance by the host species” (Deslippe, 2010, p.1) and as a result mortalities on both side increase as resistance increases. Lastly, despite having large amount of food in their reserve, the *P.breviceps* slave-makers cannot depend on their own efforts and must

have large amount of slaves per season to support their colony (Savolainen & Deslippe, 1996) to survive.

b. Slavery in Human Societies

In human societies “slavery was a coercive system sustained by the mobilization of the entire society, and its maintenance rested on the use of unimaginable violence and the constant threat of violence” (Horton, 2005, p.11). The United States is an example where slavery plays an important role in the making of its economic power (Horton, 2005). As Horton points out, “the slave trade and the products created by slave's labour, particularly cotton, provided the basis for America's wealth as a nation” (Horton, 2005, p.11). To this day, slavery continues in Sudan where, “the relatively well-publicized and studied slave trade in Sudan represents a kind of slavery especially common in Africa. Sudanese slaves are captured during military raids performed and supported by their own government” (Re, 2002, p.32). However, today the concept of human slavery has changed to “modern slavery”. According to the “Trafficking in Persons Report” issued by the US Department of State on June 2012, “it is estimated that as many as 27 million men, women, and children around the world are victims of what is now often described with the umbrella term “human trafficking” (Clinton et al, 2012, p.7). Some examples of modern slavery are force labor, child force labor, sex trafficking, child sex trafficking and force child soldiers (Clinton et al, 2012). When going through the “Trafficking in Persons Report”, I noted that the common methods used by human slave-makers are force, deception, fraud and coercion. The question that remains to answer is why slavery continues in human societies and ant societies? As I have demonstrated slavery seems to be partly driven by nature. If we apply Emery's rule to the concept of slavery in human societies we can argue that common ancestry is not a necessary factor for the enslavement of other species. Thus in both humans and

ants societies, it seems to me that slavery becomes an essential work force used in the self-interest of other colonies or species. The methods used by both human and the ants slave-makers seem to follow a pattern in terms of force, deception and coercion.

Recommendations

While going through some of the available literature on ants, I have found that there are many topics relating to human behaviour that can be explored in future academic work, for example in the fields of communications, war and foreign policy, conflict and dominance, origin of cooperation and social parasites (Hölldobler & Wilson, 1994); colony organization, division of labor (Gordon, 2010); invasion (Abbott , Lach & Parr, 2010); traffic and navigation (Sudd, 1967); kin selection (Bourke & Franks, 1995); slavery (Moffett, 2010); caste system (Hölldobler , 2011); relations between neighbours (Hugh,1967) and emigration (Gotwald, 1995). Indeed, all these topics are interesting for further studies in order to better understand the correlation between ants and human societies, and human nature. Enacting laws and tougher regulations may partially solve the problems of social parasitism and slavery since humans are partly driven by human nature. It would be more interesting to add further variables from other discipline to better understand what makes humans commit or not to those laws or regulations. I recommend further interdisciplinary studies similar to our course POL358 and to keep an open mind in crossing boundaries of studies. For example, further studies in neuroscience, sociology, psychology, political science, and economics among others would prove interesting, and trying to think through them will be a good start to get a better glimpse of the complexity of human behaviour. Also today, “in an era of globalization, many argue that a ‘new’ type of slavery is emerging; indeed that globalization itself creates slavery or slave-like conditions” (Munck, 2010,

p.19). It would be interesting to study further what are the effects of globalization on social parasitism.

Conclusion

The aim of this paper was to open a discussion on ant societies and human societies on social parasitism. In this paper, the goal is to bring a contribution to bioeconomics studies which are an emerging field. I have analyzed three types of social parasitism namely: temporary parasitism, permanentinquilines and slave-making in ant societies and shown their relation to human societies. I have demonstrated that both human and ant societies follow a certain pattern in the use of force, power, coercion, violence, deception and exploitation to attain certain goals for self- interest. I have also shown that both ant and human societies are indeed partly driven by nature. I have demonstrated that in ant societies the social parasite ants will invade other colonies to seek resources whereas in human societies it becomes difficult to understand human behaviour by applying the rational choice theory. I have given the example mentioned by Hira related to conflicts in Israel-Palestine that go beyond the desire to just control human resources (Hira, 2013). This paper has its limits and other variables can be used to explain social parasitism, such as genes, which I have not analyzed in this paper. One of the most striking discoveries I have encountered while writing this paper is that both ant societies and human societies practice slavery even today. It would be interesting to further explore what drives human nature towards slavery?

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