

## Hirsutism as a Conservation Measure: Biodiversity and Conservation Should Also Include Parasites<sup>1</sup>

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**Abstract:** Parasites are as much at risk of extinction as their hosts, if not more so. Herein it is proposed that an effort be made to protect the pubic louse, *Pthirus pubis*, from population decline and eventual extinction. Reasons for population decline are discussed, and the potential benefits of maintaining the louse population are explored.

**Key words:** Co-extinction, parasitology, invertebrate conservation, Psocodea, Pthiridae, hirsutism, biodiversity, conservation

It is an accepted truism amongst scientists that the world is undergoing, or is about to undergo, an anthropogenic mass extinction event (Ceballos et al. 2010, Dirzo et al. 2022, Whitehouse 2022). Mitigation of this extinction event must come from human intervention (Novacek and Cleland 2001). An extinction event is happening right under our noses (see Windsor 1995), and it is up to us as entomologists to take steps to prevent the loss of a species. That species is none other than the pubic louse, *Pthirus pubis* (Linnaeus). I realize that this species may not be seen as worthy of preservation, in part due to its parasitic lifestyle, but mainly because it recalls Linnaeus himself, who is currently out of favor with some entomologists. The Entomological Society of America renamed its student quiz competition, dropping his name, but (somewhat hypocritically) continuing to use the system of nomenclature that he developed. A case can be made, however, for the conservation and propagation of this species, hated though it and its describer may be.

### Biology of *Pthirus pubis*

Pubic lice, along with head lice and body lice (and follicle mites), have been with humans since antiquity and before (Drali et al. 2016). The lice that infest humans are congeneric with the lice that infest chimpanzees and gorillas, arguing for an ancient and even prehistoric relationship (Reed et al. 2015). In fact, Reed et al. (2007) determined that the species *P. pubis* and *Pthirus gorillae* Ewing diverged three to four million years ago. Kenward (1999), Rick et al.

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(2002), Reinhard and Buikstra (2003), Bain (2004), and Fornaciari et al. (2009) have written about finding pubic lice on mummified human remains. Mumcuoglu et al. (2003) reported body lice (*Pediculus humanus humanus* Linnaeus, as *Pediculus humanus corporis*) from ancient textiles. The biology of the pubic louse is described in detail by Nuttall (1918). A brief synopsis is presented here. Anyone wanting more detailed information on the biology of *P. pubis* should read the work by Nuttall (1918). Briefly, the louse infests the hairs in the pubic and inguinal areas of the human body but can also be found in the hairs of the axillae, chest, legs, and even beard and eyelashes, generally among men. Transmission generally is via sexual contact although transmission via contact with contaminated fomites is possible. Females usually outnumber males on the host, and they can lay up to three eggs per day. Infestations are often detected at clinics where people go to receive treatment for sexually transmitted diseases (Durden et al. 2014). The true number of people infested with pubic lice is unknown; embarrassment may lead many people to self-medicate rather than report to a medical professional (Burgess and Myint 1983, Maheshwary 2020, Torrone et al. 2021). There should be no shame, however; even a king had crabs (Fornaciari et al. 2009)! According to Anderson and Cheney (2009) about 2% of the population harbors pubic lice. People are not unaware of the pubic louse. Most young people attending university in Australia and the United States seem to have at least a basic understanding of how pubic lice are transmitted between people (Minichiello 1996, Anderson and Cheney 2009).

### ***Pthirus pubis* considered as a threatened species**

Extinction of species is a two-phased process (Gilpin and Soulé 1986). In the first phase, threats (often caused by human activity) like habitat degradation or loss, and killing individuals due to human-animal conflicts, cause populations of the species to decline. After a time, this results in very small, fragmented, and isolated remnant populations. These remnant populations are now vulnerable to other threats, and they enter the second phase of the extinction process. At this point, threats are due more to unpredictable genetic and demographic events. In other words, small populations will lose genetic diversity very quickly due to genetic drift and inbreeding. This negatively impacts the fitness of the population (Leus 2011).

Habitat loss seems to be the number one reason for the decline of *P. pubis*. Armstrong and Wilson (2006) appear to be the first to report on the negative effects of habitat loss on *P. pubis*. Over a six-year period, they observed simultaneous decreases in the amount of pubic hair presented by women at their clinic and the number of infestations by pubic lice. After a three-year lag, they

began to see a similar relationship in their men patients. Nor were they the only investigators to report such declines in hirsutism and genital pediculosis. Dholakia et al. (2014) conducted a ten-year study in which a strong statistically significant inverse correlation between hair removal and infestation by lice was demonstrated. Similarly, Desruelles (2013) noted that pubic grooming lessens the incidence of pubic lice. Dholakia et al. (2014) and Veraldi et al. (2018) asserted that removal of pubic hair destroys the natural habitat of pubic lice. Kelly et al. (2024) included manscaping as a threat to the pubic louse's natural habitat. This documentation of increasing rarity of *P. pubis* argues for its status as a threatened species (Bossart and Carlton 2002).

Habitat loss that threatens *P. pubis* is not a new situation. Although in Western societies the removal of body hair, including pubic hair, is a relatively new practice, dating to just after World War One (Basow 1991, Hope 1982, Smelik 2015), people have practiced pubic hair removal since ancient times in many parts of the world and in many cultures (Chen and Yesudian 2013, Romero-Gamboa et al. 2019). Chen and Yesudian (2013) posit that the mass media is responsible for popularizing the practice of pubic hair removal, just as women's magazines were instrumental in popularizing the removal of underarm and leg hair a century ago (Hope 1982). The practice of pubic hair removal is widespread today, with majorities of women and oftentimes pluralities of men engaging in the practice. Reports from Colombia (Romero-Gamboa et al. 2019), the United States (Basow 1991, Tiggemann and Lewis 2004, Boroughs and Thompson 2014), Australia (Tiggemann and Kenyon 1998, Deans et al. 2023), New Zealand (Terry and Braun 2013), Germany (Borkenhagen et al. 2020), South Africa (Beksinska et al 2020), and Saudi Arabia (Prabhune 2019), indicate that removal of body hair by women and men is a common practice. Among both women and men, removal of body hair is more popular among younger people (Gaither 2017, Obst et al. 2023, Eltobgy et al. 2024). It seems indisputable that *P. pubis* is declining in numbers in cultures where pubic hair removal is popular (Galván-Casas 2024).

There is another factor contributing to the decrease of *P. pubis*, the lack of opportunities for host-to-host transfer. Lice are socially-transmitted parasites, and their transmission depends on close bodily contact between infested hosts and new potential hosts (Duboscq et al. 2016). It may be surprising to some readers, but the frequency of heterosexual coitus is decreasing in some countries. Both Okumura et al. (2021) and Tsujimura et al. (2024) report declines in sexual intercourse in Japan. Twenge et al. (2017) reported a decline in sexual intercourse in the United States over a 25-year period. Declines were most pronounced in unpartnered individuals and those with school-aged children. Leiblum et al. (1993) noted that in only four years (1988 – 1992)

frequency of intercourse declined along with positive attitudes toward pre-marital intercourse. This phenomenon is not isolated to the United States and Japan. Herbenick et al. (2022) cite studies from Australia, Germany, and the United Kingdom that report similar declines. Decline in frequency of coitus and related declines in fertility can lead to demographic, economic, and social problems that are out of the scope of this paper but may negatively affect societies (Coleman and Rowthorn 2011, Kearney and Levine 2023). The situation is somewhat different for homosexual men, as their initiation of sexual activity is earlier than for heterosexual men, they have more partners than heterosexual men, and they continue to form new partnerships longer than do heterosexual men (Levin et al. 2009, Glick et al. 2012). Regardless of sexual orientation, frequency of sexual activity declines with age (Traeen et al. 2023).

One group of individuals that appears to have frequent intercourse is university students. Higgins et al. (2011) found that students are “doing it” and are generally happily doing so but that some individuals do experience feelings of guilt afterwards (more so women than men). Brandhorst et al. (2012) also found that university students are engaging in intercourse but that they may not completely understand what they are doing. As von Sadvoszky et al. (2002) discovered, there is a lot of misinformation about what constitutes risky behavior among US university students. Furthermore, sexually active students tend to overestimate the activity of their peers (Page et al. 2000). Sexual activity among university students is not peculiar to the United States; studies have revealed such activity in Australia (Whatnall et al. 2020), Canada (Meston et al. 1996), China (Chi et al. 2012), Colombia (Alzate 1978), Ethiopia (Dingeta et al. 2012), Iran (Zahedi et al. 2019), Nigeria (Omoteso 2008), Poland (Stokłosa 2021), Spain (Castro 2016), Sweden (Tydén et al. 2012), and Turkey (Yasan et al. 2009). It would appear that there are many opportunities for host-to-host transfer of lice provided both parties maintain suitable habitat for the louse.

### **The case for saving *Pthirus pubis***

The question arises, why save the pubic louse? Of what good is it? Do we really want to make decisions on saving endangered species based on our own perceptions of how “good” they are? Sadly, this is already done. As Small (2019) has written, concern for the conservation of invertebrates is limited to a few species, particularly those that appeal to humans. “Biodiversity” does not mean only the free-living animals and plants. Parasites are among the most diverse of all organisms and deserve the same protections (Windsor 1995). Yet parasites are underrepresented on endangered species lists (Lymbery and Smit 2023). In fact, parasites are no less at risk than their hosts, no less relevant than their hosts, and may even be more vulnerable to extinction (Thompson et al.

2017). Whether we like it or not, parasites are native components of biodiversity (Jørgensen 2014). It is neither logical nor defensible to exclude parasites from conservation decisions (Lymbery and Smit 2023). Parasites are routinely neglected when such decisions are made and are even adversely affected by conservation practices enacted to save their hosts. Rózsa and Vas (2015) and Barrett and Fischer (2023) describe human-caused extinctions of lice during attempts to save the host species. Furthermore, Rózsa and Vas (2015) list forty (40) critically endangered louse species. These extinctions at the hands of human “saviors” are particularly egregious because, as Rubio-Godoy and Pérez-Ponce de León (2023) point out, although some parasites are definitely pathogenic, most exert negligible effects on the host and may even be truly non-pathogenic. Co-conservation of parasites and hosts is important because parasites can be considered beneficial to the ecosystem (Small 2019, Rubio-Godoy and Pérez-Ponce de León 2023). There is evidence that parasites provide a benefit to individual organisms; Jackson et al. (2009) found that parasites exert an immunomodulatory effect on their hosts and that hosts without parasites could exhibit abnormally high levels of immune activity that could lead to immunopathology. It is possible that pubic lice may have an effect on the human immune system. Human lice, including the pubic louse, like other lice, have their own bacterial flora (Allen et al. 2007). Mana et al. (2017) isolated *Acinetobacter johnsonii* from pubic lice in Algeria. A bacterium in the genus *Bartonella* has also been isolated from pubic lice (Patel et al. 2021). Weyer (1952) experimentally infected *P. pubis* with the causative agents of epidemic typhus (*Rickettsia prowazekii*) and trench fever (*Bartonella quintana*, as *Rickettsia quintana*). See Fu et al. (2022) for a review of pathogens associated with pubic lice.

Here we run into another area that is outside the scope of this paper, that of the morality of exterminating species. There appears to be broad consensus among scientists and nonscientists alike that human-caused extinctions are bad, although that “badness” seems not to apply to the extermination of vectors of disease agents (Wienhues et al. 2023). Whether human-caused extinction of *P. pubis* would be a moral act is not going to be addressed here. Those persons interested in the morality of humans driving insect species to extinction may want to start their reading with Lockwood’s (1987) essay.

### **How to save the pubic louse?**

An important but controversial method for rescuing species from loss is reintroduction, or translocation, namely, the moving of individuals from one location to another (Ewen et al. 2014). A careful consideration of all threats must be made, mitigation of those threats must be attempted, and reintroduced

populations must be monitored. In spite of the best efforts, reintroductions are often unsuccessful (Robinson et al. 2020). Weather, climate, habitat quality, and factors thereunto related have the greatest impact on species restoration (Bellis et al. 2019). Designation of critical habitat is a key part of species recovery (Rosenfeld and Hatfield 2006). Canessa et al. (2023) remind us that it is important to open as many sites as possible, as soon as possible, and to reinforce those sites with additional releases. Site selection should be dictated first by habitat restoration capacity, then by long-term sustainability. The first step in identifying critical habitat is to characterize habitat requirements of a given species based on its ecology and life history. The next step is to determine how different amounts and configurations of habitat affect the survival and recovery of the species in question (Reed et al. 2006).

Captive breeding and reintroduction are minor parts of the effort to conserve species (Bowkett 2009). In the case of *P. pubis*, captive breeding is not necessary, although it has been done (Burgess et al. 1983). As mentioned previously, about 2% of the population harbors *P. pubis* (Anderson and Cheney 2009). These individuals can serve as sources for stock to be reintroduced. It will be important to place specimens from different hosts onto the new host so as to avoid genetic detriments due to inbreeding (Leus 2011). An unknown number of potential hosts must volunteer, because enough critical habitat must be designated to ensure a successful reoccupation of previously occupied areas or colonization of previously unoccupied areas (Hochkirch et al. 2007, Camaclang et al. 2014). Here we may run into a problem; “colonization” is “evil” (see Ćirković 2020). Salvation of a species will require choosing what is perceived as the lesser of two evils. The perceived evils of colonization notwithstanding, few people will have to volunteer to be hosts for the endangered pubic louse. As Galloway (2018) writes, in a given animal population, many or most hosts are uninfested while a small number of hosts may harbor the greater proportion of the entire louse population. Or, more succinctly put by Reinhard and Buikstra (2003) and Anderson and Chaney (2009): “10% of the population harbors 70% of the parasites”.

Saving the pubic louse from extinction may not be easy. Convincing people to provide adequate habitat for this endangered species may be a battle lost before the first shot is fired. As Fahs (2022) wrote, women (and presumably men) remove hair for no other reason than that they want to. Smolak and Murnen (2011), along with other authors cited herein, list reasons why people, both women and men, remove body hair. Common reasons are to increase sexual attractiveness, cleanliness, and comfort. It seems unlikely that the general public will forego the hairless state just to ensure the survival of an insect that most people regard with disgust and that those who acquire an

infestation are distressed to encounter (Busvine 1984, Small 2019). It is even less likely that people who return to the hirsute state will volunteer to serve as hosts for *P. pubis*. Where the general public fails, the entomologist must step in and act. It is in the act of saving an endangered species that each entomologist can truly achieve scientific and political success, if not glory. For if the decision to release an imperiled species into new territory remains a political one (Sarrazin and Barbault 1996), and the personal is political (Hanisch 1970), then a political statement can be made by providing habitat and becoming a host for *P. pubis*. Maintenance of a hirsute body can be viewed as a politically revolutionary act (Fahs 2022). Not only will the volunteers have the satisfaction of participating in a species' recovery, but they may also be doing something of practical value. After all, lice may be a potential food resource; Mumcuoglu (2008) points out that in ancient times and even today, tribal peoples have eaten lice. According to Loiacono et al. (2016), however, it is likely that these people were merely killing the lice by crushing them between their teeth. Cultivation of a new food resource is not a trivial matter but the amount of lice that would have to be raised upon one person probably would preclude any serious consideration. Lice have been with humans as long as humans have been around (Patel et al. 2021). The past century has presented habitat challenges to all human-infesting lice (from trends in body hair removal). It is up to the entomologist to ensure that yet another species does not perish from the Earth.

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