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Preparing and Repairing. The Conservation of Heritage after the 1997 Bird Influenza Outbreak in Hong Kong

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Abstract

This article describes how pandemic preparedness has transformed relations between humans and birds in Hong Kong. If preparedness requires to imagine that a pathogen emerging from birds becomes pandemic, what is the role of memory, experience and heritage in the production of this imaginary? Preparing for future pandemics is linked to repairing vulnerable environments if it focuses on the diversity of relations and the material ecologies which are threatened by an emerging pathogen. After describing the measures implemented in Hong Kong to prepare for an influenza pandemic coming from birds, the article focuses on a specific location, Kadoorie Farm and Botanical Gardens, which recapitulates all the tensions experienced by the Hong Kong population in trying to repair the massive loss of bird life at the time of the handover of the British colony to the Chinese People's Republic. The logic of conservation and heritage is applied to the diversity of the bird population as a sentinel species for emerging pandemics.

Keywords: Hong Kong; sentinel; repair; biosecurity.

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Preparedness is a governmental technique to anticipate the future based on the imagination of a catastrophic event to mitigate its consequences. By contrast with prevention, which relies on probabilities to calculate the risk of an event based on its occurences in the past, preparedness uses scenarios and simulations to anticipate an event whose probability cannot be calculated but whose consequences are perceived as catastrophic (Lakoff, 2017). First used in the military domain, for nuclear threats or bioterrorism, techniques of preparedness have penetrated the field of disaster management and particularly framed the perception of emerging infectious diseases. A new pathogen, such as Influenza, Ebola or SARS-Coronavirus, is perceived by global health and public health authorities as potentially pandemic because it can spread rapidly across the globe to humans who have no immunity, thus interrupting the global flow of persons and commodities. A pandemic pathogen is one of the events for which governments have been prepared in the last twenty years, even if every emerging pathogens disrupts the techniques of preparedness previously implemented, as we have seen with the current Covid-19 pandemic.

In this article, I want to show how techniques of preparedness have been applied in the territory of Hong Kong to anticipate an influenza virus coming from birds in China. The territorial dimension is essential to understand how scenarios of pandemics reveal vulnerabilities in local networks of hospitals or transportation systems, but also how early warning signals of pandemics transform the perception of living beings in the environment. Hong Kong has been conceived as a sentinel post for pandemic pathogens because the diversity of species concentrated in the same environment, such as farms and markets, made it a perfect reservoir to observe the mutations of emerging viruses. The term "sentinel" defines the position of a soldier who captures signals of the presence of the enemy on the first line of the battlefront, but it also characterizes cells who capture antigenic information of pathogens at the entrance of the immune system, unvaccinated chickens in a poultry farm threatened by avian influenza and by extension a territory where citizens are particularly sensitive to environmental threats. In the multiscalar construction of sentinels as techniques of preparedness, Hong Kong has played a significant role because its inhabitants have become accustomed to imagine that an influenza virus affecting some chickens could wipe out the human species by a pandemic.

The production of a pandemic imaginary has often been analyzed in the language of science fiction, which does as if the contact with animals threatened humans of zoonotic pathogens (Wald, 2008; Lynteris, 2019). Rather, I want to argue in this article that daily practices of conservation must also be analyzed to understand how the pandemic imaginary has transformed relations between humans, animals and microbes, and how these relations must be conserved to build sustainable habitats (Lorimer, 2017). Working with virologists, poultry farmers and birdwatchers, I have realized that the infrastructures whose vulnerabilities are revealed by pandemics are sites of long-term relationships and attachments expressed through signs, images and memories. Rather than taking vulnerability and risk as quantitative frames, which is often the case in the literature on disaster management, I take them as indicators of potentialities in the relations between humans and non-human animals, whose perception varies following ecological histories and religious practices. I will describe these sites as natural and cultural heritage, where birds are preserved as well as the buildings in which they have been raised, because I argue that preparedness moves beyond the opposition between nature and culture when it perceive endangered animals as anticipating dangers for humans (Vidal & Dias, 2016).

This article thus connects preparing for future pandemics and repairing vulnerable environments. Centemeri et al. (2021) argue that a repairing perspective requires to take into account "disaster recovery through a consideration of the variety of material ecologies that

become visible as a result of their misfunctioning and the efforts to repair them". I want to join this perspective with the perspective of preparing for future pandemics, which requires from those who live and work with birds to imagine viruses crossing the frontiers between species. We will see that this connection between prepare and repair has taken two forms in Hong Kong: massive killings of birds to protect humans fro an influenza virus, and conservation of bird species to avoid their extinction on the Hong Kong territory. In the disjunction between a disaster actually affecting birds lives and a disaster that could potentially affect human life, the massive death of birds was perceived by Hong Kong citizens as signaling their own collective death, thus complicating a multispecies approach of disaster recovery (Kirksey & Helmreich, 2010). Following this approach, I will ask how the decision to kill or cure bird lives has been understood as signal of what could happen to human lives, on which grounds it has been justified, and how the fabric of memory and heritage has absorbed this traumatic event (Kirschenblatt-Gimblett, 1998).

This article relies on the ethnographic research I conducted in Hong Kong between 2007 and 2013, based on interviews with virologists, ornithologists, poultry farmers, retailers and consumers as well as scientific and administrative literature on avian influenza. After describing the measures implemented in Hong Kong to prepare for an influenza pandemic coming from birds, I will focus on a specific location, Kadoorie Farm and Botanical Gardens, which recapitulates all the tensions experienced by the Hong Kong population in trying to repair the massive loss of bird life at the time of the handover of the British colony to the Chinese People's Republic. I have returned to Kadoorie Farm every time I went to Hong Kong, as I always felt that it was a site of intense historical reflexivity and ecological sensitivity. I consider it as a good sentinel post in its attempt to conserve its bird population rather than destroy it under the threat of bird flu, and I ask how it can be a model for a democratic participation to the conservation of heritage in a world threatened by pandemics.

1 Hong Kong's New Identity as a Sentinel Post for Avian Influenza

Bird flu outbreaks have punctuated the history of Hong Kong, in its transition from a garrison entrepot and financial centre for the British Empire to a sentinel post in the global economy under threat of a pandemic coming from China, as a never-ending disaster. This history of pandemic preparedness begins in 1972, when Kennedy Shortridge creates an Influenza unit at the Department of microbiology of the University of Hong Kong — even if mythical narratives draw the genealogy of this department to 1894, when Alexandre Yersin, trained in Paris by Louis Pasteur, built a caban to study the transmission of plague in Pokfulam, the area of Hong Kong where the Department of microbiology was later created (Peckham, 2013). Shortridge had been trained in microbiology within the school of medical sciences launched by Frank Macfarlane Burnet in Australia after the Second World War, who built the first hypotheses on the mutations of influenza viruses which should lead global health organizations to adapt vaccination (Anderson, 2004). While his colleague Robert Webster had observed that these mutations occurred among wild birds, considered as the animal reservoir of influenza viruses, and were then transmitted to humans via pigs (Webster & Campbell, 1972), Shortridge observed that the last flu pandemics, in 1957 and 1968, started in the south of China. Since China was not a member of the World Health Organization at that time, the emergence of flu viruses was not detected early. Shortridge built networks of personal relations (*guanxi*) with veterinarians in Guangdong, and collected samples of flu viruses among ducks and pigs in the area. He had observed that rice paddies of south China used wild ducks as pesticides, a system known as *daotian*

yangya (Zhang et al., 2009; Fearnley, 2020) — thus bringing them in close proximity with humans and pigs. He concluded that this traditional ecology was an "influenza epicenter" for the rest of the world. "The densely populated intensively farmed area of Southern China adjacent to Hong Kong," he wrote with the renowned British influenza expert Charles Stuart-Harris, "is an ideal place for events such as interchange of viruses between host species." (Shortridge & Stuart-Harris, 1982, p. 812)

In the preface to a reference book on avian influenza, Shortridge mentioned the memory of the 1918 flu pandemic in Australia:

> My mother's compelling stories about the devastating reaches of the pandemic have stayed with me since my earliest years. What started out as a spark of interest has led me to search the hows and whys of influenza pandemics through birds and mammals (Greger, 2006, p. XI).

Surprisingly, the 1968 flu pandemic, called "Hong Kong flu", left few traces in the memory of the Hong Kong population, probably because the Hong Kong government was then much more concerned by the social troubles caused by the arrival of refugees from the Cultural Revolution and the threat of social uprisings caused by "Chinese spies" (Caroll, 2007, p. 150). But it affected strongly the health of the population: 500,000 persons were infected, which is 15% of the population, while the pandemic killed one million persons worldwide, with a lethality rate of 0.5% but severe symptoms (Knott, 2018). The colonial government of Edward Youde launched a massive policy of welfare state in the 1970's to cope with the social and sanitary needs of refugees (Caroll, 2007, p. 168). Consequently, Shortridge's work in collecting flu samples from south China aimed both at repairing and anticipating pandemics: since flu viruses are severe when they jump from animals to humans, the best way to repair the trauma of the past pandemics was to prepare for the next pandemic by monitoring animal reservoirs.

Shortridge's strategy proved successful in 1997, twenty-five years after he implemented it. The British colony was about to return under Chinese sovereignty, after a treaty was signed by Margaret Thatcher and Deng Xiaoping claiming that Hong Kong and China would be "one country, two systems" (Caroll, 2007, p. 179). Cases of a new influenza virus, called H5N1 by the experts of the World Health Organisation, were detected in February among 12 humans, 8 of whom died, and killed 5,000 chickens. Shortridge raised the alarm: there were 1,000 live poultry markets in Hong Kong at that time, and in some of them 36 percent of chickens tested positive for H5N1. He recalled,

> One moment birds happily picked their grains, the next they fell sideways in slow motion, grasping for breath with blood slowly oozing from their guts. I had never seen anything like it. I thought, 'My God. What if this virus were to get out of this market and spread elsewhere?' (Greger, 2006, p. 35)

Because the flu vaccine was made on chicken eggs, it was impossible to vaccinate chickens and humans for this new virus, which was lethal for both. In November 1997, Shortridge consequently recommended the Hong Kong government a difficult decision, that had been already used in the United States for similar outbreaks of influenza in poultry farms : kill all the live poultry on the territory to eradicate the animal reservoir of the virus. A team of civil servants from the Agriculture Department was assigned to this difficult task, which was repeated every time an influenza virus was detected in poultry farms or markets. "Most of them had never seen live poultry before. They had to learn. Now some of them have become experts in

poultry culling," the head of the Agriculture Department later declared (Kolata, 1999, p. 240). The term "culling" is used euphemistically to describe the killing of infected animals to clean the flock, but Shortridge said to me in an interview: "We didn't cull, we conducted a slaughter!"[1]. Shortridge justified this massive killing as a preemptive measure to lower the probability of a flu pandemic starting from Hong Kong:

> Poultry were killed market-by-market as signs became evident, leading to the preemptive slaughter of all poultry to prevent human infection. Early detection and reaction was the order again in 2002 and 2003. Thus, there now lay the prospect for influenza-pandemic preparedness not only at the human level but, better still, at the baseline avian level with the ideal that if a virus could be stamped out before it infected humans, an influenza incident or pandemic will not result. In 1997, the world was probably one or two mutational events away from a pandemic, while in 2002, with earlier detection, it was probably three or four events away (2005, p. 10).

The logic of pre-emption was used by Shortridge to justify a sovereign gesture anticipating the spread of a pandemic virus from poultry markets, but it betrayed a failure of the logic of preparedness which required to detect zoonotic virus before they spread to humans. The massive slaughter of poultry was a shock for the Hong Kong population, since most of them came from rural provinces of mainland China and shared a similar approach to farming based on a small household with chickens and pigs.[2] It was not uncommon before 1997 to see backyard poultry in Hong Kong, while this practice was forbidden by the government after 1997. Poultry farms were allowed under strict conditions : ducks, considered as sane carriers of the virus, could not be raised, and chickens should be sent to a central market for inspection.

The violent eradication of established practices in agriculture, which in actual fact led to the disappearance or strict control exerted on animal species, echoed the fears that Hong Kong citizens nourished about returning under Chinese control. In a way, Hong Kong citizens identified themselves with the slaughtered chickens, geese, ducks and quails. There were many fears before 1997 that the Hong Kong population would be crushed by the Chinese People's Liberation Army just as it had crushed students in the Tiananmen square in 1989 — an event mourned annually on June 4 in the parks of Hong Kong. A Chinese saying goes: "Kill chickens to warn monkeys" (*sha ji jing hou*), which indicates that the massive killing of chickens was also a sign of China's restored sovereignty over Hong Kong. The killing of more than one million poultry may also have recalled Mao Zedong's 1958 mobilization of the Chinese population against sparrows, which were considered pests (Shapiro, 2001, p. 88). It was a major trauma in the relations between the Hong Kong population, their political government and their natural environment.

The logic of preparing for pandemics by the early detection of viruses in their animal reservoirs was reinforced in 2003 with the SARS crisis (Severe Acute Respiratory Syndrome). A coronavirus circulating among bats and transmitting accidentally to humans through the civet cats consumed in Chinese traditional medicine returned to its animal reservoir when civet cats

1. K. Shortridge, interview with author, Hong Kong, 2 February 2009.

2. In an interview I made in January 2009 with farmer Wang Yichuan, who was also the head of the Hong Kong Poultry Farmers Association, he recalled that this trade union was founded in 1949 with 145 farms breeding around 1,000 chickens, while the number of poultry farmers had lowered to 30 sixty years later. He considered himself as heriting from ordinary Chinese immigrants who came to Hong Kong with poultry as a source of wealth.

were killed and their sale forbidden. Shortridge then wrote an article with his two colleagues at the Hong Kong University Department of Microbiology who had identified the SARS virus in animals and humans, Guan Yi and Malik Peiris, in which he concluded that the

> [s]tudies on influenza ecology conducted in Hong Kong since the 1970's in which Hong Kong essentially functioned as an influenza sentinel post indicated that it might be possible, for the first time, to have influenza preparedness at the baseline avian level. (Shortridge et al., 2003, p. 76S).

Shortridge and his colleagues' article was infused with the idea that live poultry markets was a tradition in Hong Kong that needed to be modernized and regulated, just as Chinese traditional medicine in mainland China or "wetmarkets" in Singapore — a term used to impose the daily cleaning of these markets where animals are sold and killed in front of the consumers. Hong Kong microbiology experts recommended these strong biosecurity measures after 2003 to control the risk of infection between humans and birds in live poultry markets, which added up to the measures of inspection implemented in 1997 (Woo et al., 2006).

Biosecurity meant not only the extraordinary *mise-en-scène* of killing poultry in the central market of Hong Kong, or organizing simulations of bird flu outbreaks in markets and hospitals, but also the more ordinary work of surveillance and control in farms and markets (Lakoff & Collier, 2008). Since the H5N1 avian influenza virus emerged in Hong Kong in 1997 and spread to the rest of the world after 2005, the measures imposed in Hong Kong were used as a model for those recommended by international administrations to countries facing the risk of transmission from birds to humans. Margaret Chan, who had managed the outbreaks of H5N1 and SARS in Hong Kong between 1997 and 2003, was elected head of the World Health Organization in 2006 and promoted the International Health Regulation, which made pandemic preparedness a priority. Being a sentinel post of influenza meant that Hong Kong was at the vanguard of measures to control zoonotic diseases with pandemic potential, and a kind of experimental site for measures that should be applied on the whole Asian continent.

2 Changing Relationships between Humans and Birdlife in Hong Kong

The measures imposed by the Hong Kong government to regulate the live poultry industry were so strong that they clearly aimed at reducing or even suppressing this traditional activity. Retailers had to kill all the live poultry at the end of the day and wash their shop every night, and the market was closed for one day every night to clean it from potential infections. Because of the liberal tradition of the Hong Kong government due to its position as a hub in the global trade between East and West (Grantham, 1965), it was impossible to forbid selling live poultry on the territory, as the Beijing authorities had done after the first cases of avian influenza in the capital city. But it was clearly a paradox to see live poultry sold in the markets of a modern city highly aware of the risks of zoonotic transmission. Hong Kong citizens were attached to the tradition of eating a "fresh" chicken, which is supposed to be more tasty and more secure than "chilled" poultry imported from mainland China. While the government encouraged the consumption of "chilled" poultry in supermarkets, the consumption of live poultry declined only gradually.[3] A fresh chicken was compared by Hong Kong consumers to a fresh fish that

3. Between 2002 and 2008, the number of live chickens consumed in Hong Kong per year declined from 30 million to 5 million, while the number of chilled chickens consumed in Hong Kong per year raised from 1 million to 35 million (Agriculture, Fisheries and Conservation Department of the Hong Kong government).

could be chosen in a pond before being eaten in a restaurant or at home. Looking at the live poultry was part of the pleasure of eating its meat, by contrast with pork or beef whose meat was sold in pieces. Consequently, poultry farming in Hong Kong remained a strong economy, with thirty farms raising around 50 000 chickens each. They were organized in a trade union to cope with the risks of avian influenza, since all the chickens in the farm had to be killed if there was one single case of infection. Biosecurity measures in the farms, such as nets to protect the poultry from wild birds or ponds to clean the boots of workers and the wheels of trucks entering the farm, were perceived as obstacles by poultry farmers and often not respected (Liu, 2008).

While vaccination was compulsory against influenza, some chickens were left unvaccinated at the entrance of cage rows, with a ratio of 60 sentinels for 4000 chickens. They were found dead more massively when an influenza virus entered the farm, which allowed the farmer to raise an alert. The use of sentinel birds is common for a range of infectious diseases, such as the Westnile virus transmitted to humans by mosquitoes, and for which chickens are put into cages to check if they seroconvert to the disease that is lethal in humans but not in birds (Doherty, 2012). The Chinese word for sentinel birds is *shaobingji*, which literally means : chickens whistling like soldiers. This means that chickens are allies of humans in their fight against a virus that circulates asymptomatically among wild birds : they die first of a virus that could ravage the human species if turned into a pandemic.

As I was thinking of Hong Kong's new identity in a changing ecology, the analogy between the position of sentinel chickens in a poultry farm and the position of Hong Kong as a sentinel post between China and the global economy struck me in two manners. On one side, it could be argued that sentinels are sacrificed when the farm or the territory are exposed to infectious threats: they die by raising alarm so that the farm or the territory can be cleaned. This interpretation is common in what anthropologists define as "pastoral societies" which rely on the sacrifice of some living beings to save the rest of the flock. But sentinel chickens don't always die, and their conservation in a space of exposure allows humans to know more about the presence of microbes in the environment. Sentinel chickens are used in a liminary space between humans and birds because they display their common vulnerability. Their function is not only to repair by cleaning the territory from its cursed parts but to prepare the population by displaying sites of exposure.

This view of sentinels as mediators of communication is commonly shared by hunting societies. It is striking to know that that the domestication of the red junglefowl (*Gallus Gallus*) occurred in south China between 10,000 and 7,000 years ago, before this species became globalized as a major source of the industrialization of the meat production, and that archeologists assume, based on bone remains, that it was domesticated for the purpose of divination (Simmons, 1991, p. 298). Preparing for pandemics through the use of sentinels birds might thus be linked to an old technique of anticipation in the transition from hunting to pastoral societies. In this perspective, repair and prepare can be contrasted as the classical anthropological operations of sacrifice and divination, which are often entangled in human societies but must be distinguished as different techniques to manage the life and death of non-human animals.

The emergence of the H5N1 virus in 1997 can be characterized as a disaster in two senses. Literally, it has destroyed all the live poultry on the territory, to which Hong Kong citizens were attached, as backyard chickens or duck farms were forbidden by the government and live poultry farms and markets were strictly regulated. Metaphorically, it has destroyed a sense of identity of Hong Kong citizens under British rule as strong producers of a global industry, and shaped a new sense of identity under their new government by Chinese sovereignty. Preparing

for future pandemics was a way to repair this lost identity, by converting a trading post into a sentinel post. Hong Kong became a sentinel post for the global spread of avian influenza like sentinel chickens at the entrance of poultry farms to raise alert on the spread of the virus. Several movies produced by Hong Kong film makers reflected this vulnerability of Hong Kong under Chinese rule, configured by the doctrine "one country, two systems", such as Johnny To's *Sparrow* which depicts a woman as a bird trapped in a cage. To understand how art can become a way to express this new relation between humans and bird, I will look at the politics of cultural heritage and natural conservation in the case of a specific farm: the Kadoorie Farm.

3 The Kadoorie Farm: A Center for Bird Conservation and Historical Heritage

The politics of heritage in Hong Kong has been described as a mix of weak initiatives from the government and strong mobilizations from citizens (Veg, 2008). As the real estate pressure leads to the destruction of historical buildings, and because Hong Kong is not famous for being a destination of cultural tourism, the heritage of the British colony has been rarely preserved, by contrast with the Portuguese colony of Macao, inscribed on the UNESCO World Heritage List in 2005. However, ten years after the handover of the British colony, civil society organisations have developed to preserve the heritage have developed, promoting cultural trails along traditional Hakka houses or defending colonial buildings against destruction. The Hong Kong Heritage Museum has been opened in 2000 in Sha Tin, east of the New Territories, with beautiful displays about Cantonese opera and fishermen's techniques. The Tai Kwun Centre for Heritage and Arts has opened in 2018 in Soho, in the busy streets of Hong Kong island, in the former Central Police Station. But none of these places deals with traditional relations between humans and birds in Hong Kong. To learn about them, you can go to one of the four aviaries opened to the public in Hong Kong parks or to the Bird Market in Mong Kok, where exotic birds are displayed or sold. However, there is only one place that keeps local birds as a cultural heritage and a testimony of a disastrous history: the Kadoorie Farm.

The Kadoorie Farm and Botanical Garden is located along the road between Nam Cheong and Tai Po, right in the middle of the New Territories. It is a series of small ironated buildings, water streams, terraces and forest trees along the slopes of Tai Mo Shan, the highest mountain in Hong Kong culminating at 1800 meters above sea level. It was created in 1956 by two bankers, the Jewish brothers Horace and Lawrence Kadoorie, who owned Hong Kong's most prestigious hotel, The Peninsula, and the main power company in China. In 1951, with the arrival of refugees from mainland China, they had set up an association to teach them agricultural techniques that would allow them to become independent. Their motto was : "helping people to help themselves". This motto had already granted the success and prestige of the Kadoorie brothers when they financially supported European immigrants in Shanghai in the 1930's (Kaufman, 2020). The Kadoorie Farm was designed as a site of demonstration where agriculture techniques were displayed on pigs and chickens. Local farmers were taught how to build cages, select breeds, hatch eggs, ventilate (as backyard poultry was replaced by closed farms), vaccinate (particularly against Newcastle disease, that killed chickens massively without being transmissible to humans). Refugees who learnt how to raise animals were given pigs and chickens if they built a farm in the valley. This philanthropic endeavor was also a way to meet the demands of the market. Because of the boycott of Chinese products by the United States, poultry raised in Hong Kong was exported and sold to the Chinese diaspora in North

America. While in 1949, there were 145 farms breeding around 1,000 chickens in Hong Kong, they expanded in a few years to more than 1,000 farms raising around 100,000 chickens each (Yeung, 1956).

This model of livestock development gradually declined and was transformed into a model of biodiversity conservation as the US market turned to chickens from mainland China and as the bird flu outbreak damaged the poultry industry in Hong Kong. In 1995, the Legislative Council passed an ordinance that established the Kadoorie Farm and Botanic Garden Corporation (KFBGC) with a mission to educate the public to nature conservation. The Kadoorie family was still on the board of the company and heavily funded it. Horace Kadoorie had introduced parrots and flamingoes in the farm who outlived him — he passed away in 1995, and a statue of him smiling and sitting on a bench welcomes the visitor entering the park. In 1994, just before his death, he supported the creation of a raptor "sanctuary" to provisionally host vulnerable wild birds. It had been proposed by his friend Jim Ades, a British officer and passionate birdwatcher who collected birds in the wild and rescued those he found sick or illegally passed through the border with China. Horace Kadoorie hired Jim Ades' son, Gary, as the head of the Fauna Conservation department. Under Gary Ades' management, this rescue activity became a major attraction, with more than one thousand birds rescued every year. Visitors come to see the flamingoes and parrots, often not knowing that they are as old as the farm itself, but also the eagles and owls who have just been rescued, with information about their biography in the centre, detailing when they were brought, what injuries they suffered, when they would be released. Raptors are released every sunday on the summit of the mountain from the Kadoorie Brothers Memorial Pavilion, two small Chinese temples overpassing the valley — a Memorial race is organized there every year. While the Kadoorie brothers were buried in the Jewish cemetery, this pavilion has been considered as an inhabited place with the souls of the birds who were rescued and released there.

One of the agents working at the rescue center of KFBGC at the time of my research, named Captain Wong, was very active in the protection of birds. He was scandalized by the birds found dead in natural parks where Buddhist practitioners released birds — a tradition called *fangsheng*, "let live". These birds were trapped from the wild and sold in the Bird Market of Mong Kok to be released in improper environments, where the stress of being encaged often led them to die. With the support of birdwatchers associations in Hong Kong and Taiwan, Captain Wong organized a conference in Taipei in 2015 to document this practice. He negotiated with the Hong Kong government and the Hong Kong Buddhist Association that the release of birds was replaced by the release of seafood — turtles, fish, frogs, shells... Captain Wong was proud to invite Buddhist practitioners to the bird release ceremony at the Kadoorie Brothers Memorial Pavilion on Sundays. It was a kind of secular ritual, where the souls of birds were traced through a GPS antenna, that allowed birdwatchers to follow their movements in the wild. Books were distributed to Buddhist practitioners indicating where to properly release wild birds. Called "scientific release handbooks" (*kexue fangsheng shoushu*), they imitated the handbooks in which Buddhist prayers were noted to accompany animal release.

Another memorial site in the Kadoorie Farm was hidden from the public gaze: a cage containing chickens, with a warning to the visitors: "The Chicken Display House will be closed under further notice to ensure the chickens at the Kadoorie Farm & Botanical Gardens are protected from any possible outside contamination while bird flu concerns still exist in Hong Kong." It was presented by the rulers of the Farm as a center for the conservation of local breeds, particularly the Wai Chow, the White Wai Chow and the Guangzhou chicken, which disappeared from mainland China during the Cultural Revolution. Shing Tam-Yip was the

head of the breeding team, taking care of the 2500 chickens and 9 pigs — the pigs were displayed to visitors as mascots of the Farm. A passionate birdwatcher and plant scientist trained at Hong Kong University, Shing Tam-Yip detailed to me the measures of protection of these chickens against avian influenza.[4] If the virus entered the farm, he said, it would be the end of these local breeds. The Kadoorie farm had its own system of alert, more severe than that imposed by the government to other poultry farms, with three levels (vigilant, serious, urgent). Indeed, in case of an outbreak of bird flu in the surroundings of the farm, the cost of culling would not measure the value of the meat, but the genetic knowledge preserved by decades of selection. All chickens were vaccinated, except for 60 of them who acted as sentinels, scattered all over the aviaries. These chicken farms had to be closed to the public in 1997 with the emergence of the H5N1 flu virus. Shing Tam-Yip told me that before 1997, the selection of the purest breed was a public ceremony, but that it became private after 1997 for safety reasons. Selection consisted in sexing the males from the females, ringing the females, preserving the males who had the highest value and destroying the rest of the males. Shing contrasted the killing of one-day chicks for selection to the massive killing of poultry as a preventive measure against bird flu

> We use CO_2. This is not torture. For ten seconds they shake a lot, but after twenty seconds it is silent. When they killed poultry at the central market of Cheung Sha Wan, the quantity of gaz was not enough. Poultry died after a very long time. It was really torture. People watching on television felt distress.

By many accounts, the Kadoorie Farm displays counter-measures to the biosecurity measures adopted against avian influenza by the Hong Kong government, and elaborates a science of conservation that remedies the politics of destruction of birds. While the Hong Kong government culls all chickens when some of them are found infected with the influenza viruses, hoping to gradually cancel the live poultry activity itself on the territory, Buddhist associations pray for the souls of the birds and release them in natural parks, thus duplicating the economy of chickens as commodities by an economy of souls. Birdwatchers are breaking with this economy of pastoral care by what can be analyzed as techniques of hunting societies (Keck, 2020). Coming from a colonial history of hunters (MacKenzie, 1988; Fan, 2004; Moss, 2004; Peckham, 2014), they have built a conservatory in the middle of the territory where "pastoral" techniques of power are reversed into "cynegetic" techniques of power. Raptors are released with GPS antenna to follow their movements, and chickens are selected with a scientific measure to reduce their suffering. Birdwatchers, following techniques of hunters, are able to take the perspective of birds on their death, and to share the vulnerability of birds in a world threatened by disasters (Viveiros de Castro, 1992). Sentinel chickens are communicating with humans about the threats that affect them in common by bearing the signs of zoonotic viruses, while the Hong Kong government relies on politics of sacrifice when it kills live poultry to eradicate the avian reservoir of these viruses.

The Kadoorie Farm can be analyzed as a "ruin" of the Hong Kong colonial past, in the sense developed by Anna Tsing (2015). With its memorials, ironated buildings and old flamingoes bearing the traces of the founding brothers, it resists the standardization of the poultry industry. Paradoxically, while the Kadoorie brothers taught Chinese immigrants in Hong Kong how to raise chickens in an intensive and industrial manner, these chicken breeds are now conserved as what cannot be scaled up to the globalization of the chicken industry (Tsing, 2005) — also

4. Shing-Yam Tip, interview with author, 15 February 2009.

called the "chickenization" of the global farms (Silbergeld, 2016). They are also conserved as challenges to the "livestock revolution", displaying the strengths of biodiversity against the exposure of standardized poultry to emerging viruses (Fearnley, 2019). After being a model of the global industry during the era of '"made in Hong Kong" commodities, the Hong Kong territory has become a model for the "endangerment sensibility" (Choy, 2011; Vidal & Dias, 2016). In the environmental movement emerging in China (Weller, 2006; Hathaway, 2013), Hong Kong citizens are attentive to the threats on their environment and careful to conserve the habitats and animals with which they live. This engagement in the reparation of an environment threatened by industrialization and its correlated diseases consists in a sense of shared vulnerability with all the living beings inhabiting the same territory (Pelluchon, 2020). Here, repair is not opposed to prepare, as in the contrast between sacrifice and divination we have seen before, because the conservation of a diversity of poultry breeds is considered as a means to mitigate the emergence of flu viruses from birds.

4 Conclusion

This article has explored the connections between preparing for future disasters and repairing vulnerable environments as two perspectives on the same event, the potential transmission of pandemic pathogens from birds to humans. I argue that preparing for pandemics brings this connection with repairing environments, precisely because it needs to imagine the consequences of an infectious event, while the logic of prevention relies on calculation to anticipate the spread of a pathogen. If principles of preemption and precaution protect the human population by destroying the animal reservoir to eradicate the pathogen, thus drawing a strong boundary between humans and animals, techniques of preparedness consider viruses as tools to build new relationships with animals by monitoring the mutations of pathogens, in a way that bypasses boundaries between nature and culture. I focused on Hong Kong as a sentinel post for pandemic preparedness and, in its very center, the Kadoorie Farm as a site of cultural heritage and natural conservation. Kadoorie Farm can be conceived as an extraordinary sentinel technology to conserve what would be lost in case of a bird flu outbreak: the diversity of bird species.

In the first part of this article, I have shown how poultry farmers have integrated pandemic preparedness in their daily practices through the use of sentinel birds. Rather than contesting biosecurity measures imposed by the government, they have defended the value of the Hong Kong breed by contrast with the Chinese breed. The diversity of bird species has become a way to repair a territory damaged by the sacrifice of infected birds and to prepare for future outbreaks. In the second part of the chapter, I have studied the confrontation between ornithologists and Buddhist practitioners in Kadoorie Farm as potentially conflicting ontological engagements. The latter see birds as carrying signs of future goods in an economy of souls, while ornithologists see them as carrying signs of threats in a vulnerable ecology. Ornithologists have found a compromise between these two opposite views by releasing wild birds with technologies of tracking. While religious practitioners in this case repair the damages of infectious outbreaks by praying for the souls of animals, conservationists have found a way to prepare for species extinction by following bird movements. This tension between conservation and compassion in managing risks of transmission at the frontiers between species is instructive in a continent where humans and non-humans share a common vulnerability. While the management of pandemic risks is often conceived as a sacrifice of animal species considered as reservoirs

of infectious diseases, the description of techniques of repair and prepare in Hong Kong reveals other ways to valorize and mitigate the diversity of human and non-human animals.

The appropriation of preparedness by poultry farmers and birdwatchers in Hong Kong has thus led them to convert their capacities of caring for the health of birds into techniques of monitoring viral mutations. Politics of heritage conservation were good tools for this conversion because they transform warning signals into an aesthetics of biodiversity. As it is increasingly proved that a diversity of animal species is lowering the risk of zoonotic transmission (Keesing et al., 2006), promoting bird diversity is also a way to protect humans against a pandemic. A pandemic pathogen is thus perceived by poultry farmers and birdwatchers as a warning signal of the vulnerabilities shared by humans and birds in an industrialized environment. Preparing for future pandemics also means repairing wildlife and farming environments damaged by industrialization, and conserving their potentialities.

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