



Risky Zoographies: The Limits of Place in Avian Flu Management

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ABSTRACT Global anxieties about avian influenza stem from a growing recognition that highly-virulent, highly-mobile disease vectors infiltrate human spaces in ways that are difficult to perceive, and even more difficult to manage. This article analyses a participatory health intervention in Việt Nam to explore how avian influenza threats challenge long-held understandings of animals' place in the environment and society. In this intervention, poultry farmers collaborated with health workers to illustrate maps of avian flu risks in their communities. Participant-observation of the risk-mapping exercises shows that health workers treated poultry as commodities, and located these animals in environments that could be transformed and dominated by humans. However, these maps did not sufficiently represent the physical and social landscapes where humans and poultry coexist in Việt Nam. As such, farmers located poultry in environments dominated by risky nonhuman forces such as winds, waterways, and other organisms. I argue that these divergent risk maps demonstrate how ecological factors, interpersonal networks, and global market dynamics combine to engender a variety of interspecies relationships, which in turn shape the location of disease risks in space. I develop the term *risky zoographies* to signal the emergence of competing descriptions of animals and their habitats in zoonotic disease contexts. This concept suggests that as wild animals, livestock products, and microbial pathogens continue to globalise, place-based health interventions that limit animals to particular locales are proving inadequate. *Risky zoographies* signal the inextricability of nonhuman animals from human spaces, and reveal interspecies interactions that transect and transcend environments.

Introduction

No one knows where or when the next mutation in the virus will occur. It could be in a duck pond in the Mekong Delta tomorrow or it could be a year hence in a poultry market in Thai Binh. But one thing is certain: if the virus does come ... jet travel will speed it round the globe in days.¹

From the moment that outbreaks of highly pathogenic avian influenza [HPAI] emerged in 2003, forecasts of global devastation have permeated popular imagination.² Media discourses

¹ Mark Honingsbaum, "On a Wing and a Prayer," *The Guardian*, accessed 21 February 2011, <http://www.guardian.co.uk/world/2005/mar/20/birdflu.features>.

² Highly Pathogenic Avian Influenza (HPAI) refers to the AH5N1 strain of avian influenza that appeared in Southeast Asia at the end of 2003. This article uses HPAI, avian influenza, avian flu, and bird flu to refer to this strain.

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portend viruses navigating the planet, jumping from poultry to people and then proliferating through human transportation networks. In response, global health practitioners have been racing to identify areas of risky interspecies encounters. To do so, they deploy recognised epistemic tools: maps. While some avian flu maps trace disease risks through human trade and transportation networks, others inscribe risks in the flight paths of migratory birds. Still other maps graft disease risks onto the spaces where people and poultry meet, establishing a pictorial nexus between animal bodies and human disease. When scaled down to the community level, these maps plot species interfaces in discrete places, making them available to mechanisms of surveillance and control.

This article uses ethnographic data from a community-based health intervention in northern Việt Nam to explore how the problem of avian influenza is rendered knowable, visible, and governable. Coordinated by the Joint UN-Government Program on Human and Avian Influenza, this intervention brought together a range of actors, including transnational and state health workers, local government authorities, and small-scale farmers. The intervention's primary objective was to encourage farmers to change their poultry production behaviours as a means to prevent avian flu transmission. In order to effect these behavioural changes, the intervention implemented risk-mapping exercises in several farming communities. In these exercises, health workers asked farmers to collectively draw maps of their communities, to demarcate sites where avian flu transmission occurs, and to identify places where they could change their farming behaviours for disease control. Through such hands-on mapping exercises, health workers sought to promote local awareness about avian influenza vectors and their appropriate management.

I employ participant-observation of these mapping exercises to show that health workers and farmers plotted poultry in multiple, place-based relationships with both human and nonhuman disease vectors. Specifically, health workers rendered poultry as a commodity located in places occupied by farms, markets, slaughterhouses, and roads. In these places, humans emerged as the primary transmitters of avian flu. Further, because these poultry places could be bounded, mapped, and surveyed, they cohered well with health agendas in which farmers bore the burden of disease control. At the same time, health workers obscured poultry's presence in places occupied by unpredictable natural forces, wild birds, and changing ecologies. But it was poultry's location in these environments that farmers illustrated in mapping exercises. In demarcating bird flu transmission risks, farmers pointed to a host of nonhuman actors—chilling winds, flying feathers, and migrating viruses—whose relationships with poultry fostered disease. In farmers' maps, poultry occupied places where nonhuman vectors dominated, and farmers themselves were absolved of responsibility for disease control.

I argue that these competing maps reflect broader struggles over how to define avian flu risks and their appropriate management in Việt Nam. While health workers sought to control avian flu in human vectors by standardising the ways in which farmers interacted with poultry, farmers targeted nonhuman vectors in order to uphold their socially and culturally inflected relationships with these animals. Through these tools of knowledge,³ farmers and health workers posited particular interspecies relationships according to their distinct political, economic, and social positions. Risk maps thus became canvases for health workers and

³ Becker, Peter and William Clark, eds., *Little Tools of Knowledge: Historical Essays on Academic and Bureaucratic Practices* (Ann Arbor, MI: University of Michigan Press, 2001).

farmers to develop, debate, and sanction particular understandings of poultry and its environments.

I suggest that avian flu risk-mapping exercises can be fruitfully analysed through the framework of zoography, a concept that refers to the biological description of animals and their habitats. I employ *risky zoographies* to signal the diverse and competing ways that actors mapped interspecies interactions in zoonotic disease contexts. This approach addresses scholarship in anthropology and critical animal studies that documents how animals transgress spatial locations and reconfigure their relationships with humans.⁴ Analyses of livestock biosecurity, for example, show how social actors locate disease risks in heterogeneous places, which feature diverse and contested relationships between humans and domestic animals.⁵ With specific reference to bird flu, Lowe shows how multispecies relationships constantly transform as viruses, animal hosts, and human institutions encounter each other in global health practice.⁶ I bring this research into new ethnographic arenas, by focusing on a health intervention that promoted an exchange of knowledge between health practitioners and health subjects. By examining risk-mapping exercises as contingent epistemic practices, I draw critical attention to the role that nonhumans play in the processes through which pandemic threats are rendered visual and acted upon. The risky zoographies emerging in these exercises visibly express the entanglement of humans and nonhumans in space. In doing so, they reveal how morally and politically situated interspecies relationships shape disease control efforts, as well as associated understandings of shared habitats and environments.

Cultivating and Controlling HPAI in Poultry-Keeping Environments

These mapping exercises must be understood within the broader context of avian flu control and its proposed changes to traditional poultry production in Việt Nam. Bird flu specialists from the United Nations and nongovernmental organisations developed mapping strategies as a response to the expansion of poultry production and the increased mobility of poultry (and its diseases) across Vietnamese landscapes. Since chicken was first domesticated in Southeast Asia over three thousand years ago, nearly every rural household in Việt Nam has kept a handful of chickens (and more recently ducks), which they use as protein supplements and liquid assets.⁷ A tradition of 'backyard,' scavenging production dominates poultry keeping in the country, wherein women, children, and the elderly raise birds in yards and gardens. In these settings, animals are free to range on food and frequently cross over to neighbouring land. Flock sizes fluctuate according to a household's disposable income, and farmers express little interest in developing their flocks or increasing productivity. Indeed, farmers spend few resources caring

⁴ Wyatt Galusky, "Playing Chicken: Technologies of Domestication, Food and Self," *Science as Culture* 19, no. 1 (2010): 15-35. S. Hinchliffe, "Inhabiting'-Landscapes and Natures," in *Handbook of Cultural Geography* (London: Sage, 2003), 207-225. Chris Philo, "Animal, Geography and the City: Notes on Inclusion and Exclusion," in *Animal Geographies: Place, Politics and Identity in the Nature-Culture Borderlands*, ed. Jennifer Wolch and Jodi Emel (London: Verso, 1998).

⁵ Andrew Donaldson, "Biosecurity After The Event: Risk Politics and Animal Disease," *Environment and Planning A* 40, no. 7 (2008): 1552-1567. Steve Hinchliffe and Nick Bingham, "Securing Life: The Emerging Practices of Biosecurity," *Environment and Planning A* 40, no. 7 (2008): 1534-1551.

⁶ Celia Lowe, "Viral Clouds: Becoming H5N1 in Indonesia," *Cultural Anthropology* 25, no. 4 (2010): 625-649.

⁷ Nguyen Van Duc and T. Long, *Poultry Production Systems in Vietnam*. Working Paper Number 4. (Rome: Food and Agriculture Organization, 2008), accessed 2 February 2012, <http://www.fao.org/docrep/013/al693e/al693e00.pdf>.

for these animals, particularly with regard to disease prevention. Farmers who sell poultry products generally transact with neighbouring consumers or transporters from their farm gates, while those with larger flocks may periodically bring them to market. Small farmers generally sell live poultry; rural Vietnamese consider live animals healthier and tastier than processed meat, and largely slaughter birds at home just before cooking.⁸ Taken together, traditional production systems require few inputs and investments, and have thus made poultry an important 'safety net' for lower income households.⁹

However, the economic and cultural conditions of poultry production in Việt Nam are shifting. Rapid economic growth and development is increasing incomes and altering consumer tastes, thus heightening demand for protein-rich meats such as chicken and duck. Poultry production and consumption have been growing at steady rates since the early 1990s, as domestic food demand moves away from rice toward livestock products.¹⁰ Despite this growth, poultry production remains concentrated in small-scale subsistence and semi-commercial farms, a trend that is overburdening producers whose backyard landholdings cannot accommodate growing flock sizes.¹¹ At the same time, poultry products travel further distances by foot, bicycle, motorbike, and truck—destined for urban markets where money, meat, and microbes circulate unabated between species.

The increased production and movement of poultry across Vietnamese landscapes has opened up new and dangerous disease ecologies. Avian flu specialists in the country suggest that, "inter-district and inter-provincial trade in poultry provides the biggest source of risk for biosecurity breaches."¹² In order to address these trends, the National Steering Committee on Human and Avian Influenza has undertaken efforts to restructure the poultry industry towards standardised commercial operations. Under the auspices of biosecurity, and in line with transnational UN Food and Agriculture Organization [FAO] recommendations, this strategy seeks to shift poultry production away from small-scale, household farms toward large-scale, market-oriented poultry operations. This shift entails substantial technical and financial inputs to existing poultry holdings. For instance, Việt Nam's Joint UN-Government avian flu strategies include: mass vaccination, changes in feed composition (from household scraps to industrial feed), disinfectant procedures, and sophisticated housing infrastructures. Poultry restructuring also promotes a form of standardisation that limits how small-scale farmers can trade and

⁸ P. T. Hong Hanh, Steven Burgos, and David Roland-Holst, *The Poultry Sector in Viet Nam: Prospects for Smallholder Producers in the Aftermath of The HPAI Crisis*. Research Report (University of California: Pro-Poor Livestock Policy Initiative, 2007).

⁹ At the same time, poultry, particularly chicken, has also played an important part in the ritual and cultural life of Vietnamese society. Families and friends exchange chicken during traditional festivals such as the Lunar New Year holiday (*Tết*) and village hero commemoration ceremonies. Funerals, death anniversary ceremonies, and weddings are incomplete without the presence of a boiled, golden-skinned (*da vàng*) chicken. Rural and urban dwellers also use chicken for religious offerings.

¹⁰ Poultry production had been growing at a rate of six percent between 1994 and 2004 (Agrifood Consulting International 2006), while poultry meat consumption had increased from 2.5 kg of meat per capita in 1995 to 5.5 kg in 2002 (Dolberg *et al.*, 2005).

¹¹ David Pfeiffer, P. Q. Minh, V. Martin, M. Epprecht, and J. Otte, *Temporal and Spatial Patterns of HPAI in Viet Nam*. PPLPI (Berkeley: University of California Press, 2007).

¹² T. H. H. Pham and David Roland-Holst, *Agro-Food Product Quality and Safety Management in Vietnam: An Overview of the Poultry Sector* (Rome: Food and Agriculture Organization, 2007), 3.

transport their poultry, namely through the establishment of contractual agreements with certified slaughterhouses, transporters, and vendors.¹³

Risk-mapping, then, comprises part of a transnational effort to fundamentally alter the composition of the country's poultry economy. In 2008, with the support of the FAO, the Vietnamese Department of Livestock Production proposed to raise the portion of large-scale commercial farms in the country from thirty-five to seventy-two percent by 2010, thus reducing the number of poultry keepers from eight to two million in the span of two years.¹⁴ Though these numbers were not met, they demonstrate that avian flu has "offered an opportunity for [Vietnamese] policymakers to accelerate their longstanding desire for the industrialization of livestock production for export."¹⁵ A move to industrialisation means targeting small-scale producers for disease intervention, and compelling changes in everyday farming practices toward international, commercial standards. As I describe below, principles of standardisation and commercialisation require substantial investments that conflict with established, low-cost and informal practices of poultry keeping. Further, place-based disease control strategies seek to reorient poultry production and movement in ways that upset social relationships in rural settings.¹⁶ In short, Vietnamese bird flu strategies not only threaten the economic wellbeing of millions of household producers, but they also challenge longstanding traditions of livestock keeping in the country. As one FAO programmer noted during the mapping exercise, "The entrepreneurs with the necessary resources will develop their farms for disease control while the others will eventually disappear."¹⁷

As a result of the disruptive nature of avian flu interventions, the maps I describe here became crucibles for defining, debating, and reconceptualising the place of poultry in Vietnamese social and physical environments. As tools of knowledge and governance, risk maps provide visual representations of the conflicting interests of health workers and farmers, and point to politically and culturally situated understandings of human-animal interactions in space. In what follows, I show that the risky zoographies illustrated in mapping exercises reflect a broad set of epistemologies that cohere around bird flu management; namely, the ideas and practices underlying particular locations of risks, and the politics that determine 'legitimate' or 'appropriate' ways to share habitats with other species.

Putting Poultry in its Place: Health Workers' Maps

From 2008-9, I spent fourteen months conducting research on the effects of avian influenza management on poultry-raising practices and interspecies relationships in Việt Nam. As part of this research, I volunteered on an avian influenza intervention carried out in northern Việt

¹³ Nick Honhold, Annie McLeod, Satyajit Sarkar and Phil Harris, *Biosecurity for Highly Pathogenic Avian Influenza* (Rome: Food and Agriculture Organization of the United Nations, 2008).

¹⁴ Joachim Otte, David Pfeiffer, R. Soares-Magalhaes, Steven, Burgos, and David Roland-Holst, "Flock Size and HPAI Risk in Cambodia, Thailand and Viet Nam," Accessed 13 March 2009. <http://www.dfid.gov.uk/r4d/Output/178633/Default.aspx>.

¹⁵ Tuong Vu, *The Political Economy of Avian Influenza Response and Control in Vietnam* (Brighton: STEPS Centre, 2009), 9.

¹⁶ It is important to note that Việt Nam's approach to avian flu management is multi-faceted, with some effort being made to safeguard smallholding farmers in the wake of structural transformations to the poultry industry. These efforts are supported by the FAO in partnership with local and transnational researchers and NGOs, and include creating niche free-range poultry markets and encouraging alternative agricultural endeavours.

¹⁷ Fieldnotes, 14 April 2009.

Nam by a transnational humanitarian organisation in partnership with a transnational agricultural agency and a Vietnamese mass organisation.¹⁸ The team consisted of Linh, a Western-educated Vietnamese communications expert, Hạnh, a mass organisation representative, Neil, an expatriate veterinarian, and his colleague Anh, a Vietnamese veterinarian.¹⁹ Throughout the analysis, I refer to these individuals collectively as health workers.

As noted, this intervention sought to encourage farmers to change their poultry production practices (behaviours) for disease prevention. Its primary activity was a participatory mapping exercise, which brought together groups of ten to twelve household poultry farmers whose flocks generally numbered a few hundred birds or less. In these exercises, health workers asked farmers questions about their farms and the surrounding areas. Through these questions and the subsequent dialogues, health workers encouraged farmers to draw the places where poultry could be found in their commune, trace the movement of poultry between these places, and demarcate the routes by which poultry leave the commune on their way to district and provincial markets. By mapping the locations and movement of poultry, health workers wanted farmers to identify disease transmission routes and delineate places where they could change behaviours to prevent disease. The rationale underlying the mapping intervention came from the FAO, whose experts on avian influenza write, "The disease is mostly spread by the action of man [sic], moving either infected birds or contaminated materials."²⁰ Herein lies the crux of health workers' risky zoography. Mapping exercises work from the assumption that humans determine the environments where poultry and its diseases exist.

Early on in the intervention, Linh, Anh, and I met to discuss the results of a pilot mapping activity with chicken farmers in a commune south of the capital. Linh and Anh celebrated farmers' dexterous use of multicolored markers and butcher paper, and marvelled at how participants bent over tabletops, floors, and easels to illustrate their communities (Figure 1). Despite these results, Anh warned that, "the big picture of the commune is still missing. We need to get the value chain where all actors are put into place: veterinarians, vendors, hatchery owners etc. I can print out a GIS map of the commune that they can label ... the map should show the movement of people." Linh added that we should make a key with the basic features we needed on the map.²¹ This key marked health workers' first practice in geographic limitation; for health workers, environmental actors are exclusively people. Humans occupy and order all of the 'basic features': farms, markets, hatcheries, slaughterhouses, cages, gates through which people enter and exit farms, materials for washing hands and feet when contacting poultry, and arrows for roads. Providing a map and key beforehand, Linh and Anh presented the surrounding ecology and its nonhuman populace as a background to be inscribed upon by 'the movement of people.' In short, health workers located poultry in a landscape dominated by human vectors.

¹⁸ Technically nongovernmental, mass organisations were developed by the Vietnamese Communist Party to implement government policy at the local level. In groups like the Việt Nam Farmers' Union, Việt Nam Women's Union, and Việt Nam Youth Union, mass organisations mobilise volunteer brigades to visit households and introduce government measures to citizens.

¹⁹ In order to protect their privacy, I have changed the names of all of the participants in this bird flu intervention.

²⁰ Honhold *et al.*, "Biosecurity," 2.

²¹ Fieldnotes, 7 April 2009.



Figure 1 A group of small-scale farmers map the location of poultry farms in their community, northern Việt Nam.
Photo by author.

Emerging from these mapping practices was a commoditised poultry object whose existence, location, and life trajectory could be determined by rational, economically-driven human actors. Critically, the mapping activity asked farmers to identify the areas where *their* behavioural changes could prevent bird flu. Health workers were not concerned with modifying poultry behaviours; rather, the intervention was premised on the idea that human behaviours could dictate the course of poultry diseases. Drawing on the FAO Principles of Biosecurity,²² and behaviour change recommendations enumerated by Việt Nam's National Steering Committee for Avian Influenza Control and Prevention [NSCAI],²³ one of the intervention's goals was for farmers to restrict people from entering the areas where they keep poultry; that is, erect barriers in key locales to segregate poultry from non-essential human contact. A script that health workers used in the mapping exercise read, "Ask: Where are the gates to your farm? Are they closed? Locked?"²⁴ Health workers also encouraged farmers to refrain from moving poultry on unclean vehicles. They followed FAO suggestions to limit human movement of poultry and poultry-related products, ideally to certified transporters.²⁵ Barring all else, they wanted farmers to adopt a priority behaviour laid down by the NSCAI: wash hands and footwear before and after contact with poultry, preferably at the entrance to household farms and poultry coops.²⁶

²² Honhold *et al.*, "Biosecurity."

²³ National Steering Committee for Avian Influenza Control and Prevention. *National Strategic Framework for Avian and Human Influenza Communications 2008-2010* (Hanoi, Vietnam: Partnership for Avian and Human Influenza, 2008).

²⁴ Fieldnotes, 14 April 2009.

²⁵ Honhold *et al.*, "Biosecurity."

²⁶ To encourage this behaviour, Linh decided to provide the commune with washbasins, scrub brushes, sandals, and soap. She created a "learning by doing" exercise to demonstrate how, where and when to use these materials.

To summarise, health workers' maps limited the risk of disease transmission to human vectors, and posited a poultry commodity that could be literally manhandled, surveilled, and controlled. Through these exercises, poultry appeared in places where they interacted with human actors: farmers, hatchers, slaughterers, sellers, neighbours, and consumers. As far as nonhuman actors were concerned, health workers mapped places where poultry encounter motorbikes, boats, market stalls, sandals, boots, and cages,—objects that humans operate. These inscription practices cohered nicely with bird flu management goals. Limiting poultry and its diseases to human-dominated places allowed health workers to do their job: prevent disease through place-based behavioural interventions. Although much research has pointed to nonhumans as primary vectors for the bird flu virus (poultry, pet birds, large livestock, and wild birds), this intervention selectively targeted human vectors that could be more easily regulated with established biopolitical and economic governance structures.²⁷ Here we see that mapping risks entailed more than simply apprehending and recording a pre-existing physical reality. Rather, putting poultry in its place meant articulating limited, hierarchical relationships between species through the strategic control of information and representation.

Re-placing Poultry: Farmers' Maps

Equipped with unlabeled GIS maps and keys (to replace the butcher paper used in the pilot exercise), health workers expected farmers to locate disease transmission risks along poultry commodity value chains. They were thus surprised when farmers generated maps where poultry were far removed from markets, motorbikes, slaughterhouses, and roads. In an early meeting with a group of farmers, Mr. Liên proudly displayed his map. Colour-coded and flawlessly annotated, the map's central object was his household chicken farm. When Anh asked how many meters lay between his chicken coop and his house, Mr. Liên swept his hand across his map and proclaimed, "I know that it's wrong, I want to restructure the whole area so that the coop is positioned against the wind. This will prevent the chickens from getting sick. But I don't have the money to do this!"²⁸ Anh asked about this distance because Việt Nam's national bird flu policy recommends at least twenty-five meters between coops and houses in order to discourage people from unnecessary entry into poultry-keeping areas (where they can introduce viruses from outside the farm). Anh's question referred to a people-to-poultry relation. Mr. Liên's answer, however, referred to a wind-to-poultry relation.

Reacting to these dichotomous maps, the intervention team suspected that Mr. Liên believed poultry get sick because of the weather, when in 'reality' poultry contract disease via viral transmission between human and nonhuman animals. This reaction reflects what development workers frequently call 'cultural barriers,' or belief systems and embedded practices antithetical to their agendas. Prevalent in international health, the concept of 'cultural

²⁷ Scientific research surrounding avian flu is ongoing. Scientists do not know why the disease shows symptoms in chickens while remaining undetected in wild birds and to some extent, ducks. While transmission occurs through bodily secretions and contaminated materials, it is unknown whether these infectious agents are more likely to be found in the droppings of migratory birds, the saliva of infected chickens, the feces of wading ducks, the yolks of undercooked eggs, or the pollutants on motorbikes and sandals. Additionally, much debate surrounds whether small-scale, backyard poultry flocks are at a higher risk than industrial-integrated, commercial flocks; and whether market places, slaughterhouses, hatcheries, or farms are more likely to attract contaminants. Agrifood Consulting International, *The Impact of Avian Influenza on Poultry Sector Restructuring and its Socio-Economic Effects* (Rome: FAO, 2006).

²⁸ Fieldnotes, 7 April 2009.

barriers' has become a scapegoat to explain away failed interventions. Rather than critically reflecting on the socioeconomic, political, structural forces determining health outcomes in target communities, or fully considering the effects of interventions on social dynamics such as class and gender hierarchies, health workers cite 'cultural barriers' as the reason for ineffectual programs.²⁹ In this view, culture becomes rather like a handicap to be overcome in the name of development. Here I want to note an instance of my positionality in this intervention. Whenever the topic of 'barriers' was raised in relation to behaviour change, I pointed to a fundamental contradiction implied by the intervention: despite wanting to encourage farmers to cultivate 'local knowledge,' and to choose behavioural changes for disease control, health workers nevertheless came to each mapping exercise with a pre-made list of 'key behaviours' they wanted farmers to adopt. Most of the time my colleagues agreed with me, but because of the pressures to encourage participation while simultaneously promoting national behavioural objectives, they were compelled to carry on with what they were doing.

A closer examination, however, reveals that Mr. Lien's risk map was not an articulation of misguided cultural beliefs. Anh and Mr. Liên ordered interspecies interactions in ways that reflected their divergent interests. Anh mapped poultry in relation to a farmer's house, where the birds contract disease through interactions with humans who carry viruses into the household from the outside. Anh was informed by FAO discourses that depict HPAI as a disease transmitted via human vectors. He also generated his map from a structural position in which he was tasked with modifying human behaviours and farm infrastructures to prevent disease. Mr. Liên mapped poultry in relation to the wind, where the birds contract disease through interactions with nonhuman vectors. He was informed by phenomenological experience on farms where poultry cough, secrete unsightly fluids, and get cold legs and feet during the winter season. He was also inscribing from a position in which fluctuating incomes and volatile markets compromised his capacity to alter poultry-keeping arrangements. This confrontation over risky zoographies was rooted in divergent practical experiences and political-economic concerns.

Further along in the intervention Hahn exhorted a group of farmers to close and lock the gates separating their farms from their neighbours' farms. A frustrated participant countered, "What's locking a gate going to do? The environment's just polluted here. There are feathers flying all over the place! They can float over walls and down the canals. What can we do?"³⁰ In Hahn's risky zoography, farm gates should be locked to control people-poultry interactions that transmit disease. In response, the farmer located poultry in a place where it contracts disease via contact with contaminated ecological forces. In this participant's zoography, poultry relations were limited to the nonhuman—flying feathers and conspiratorial canals.

Significantly, the farmer's statement signaled the political-economic structures that shape topographies of poultry production in Việt Nam. Pollution (*ô nhiễm môi trường*) was a constant concern for rural dwellers in northern Việt Nam at the time of my research. In these areas, agro-industrial, mining, and manufacturing enterprises were colonising rural landscapes, infusing the air and waterways with industrial contaminants, and pushing human and livestock populations into increasingly limited spaces. We can thus understand the farmer's scepticism

²⁹ Hahn and Inhorn, "Anthropology and Public Health."

³⁰ Fieldnotes, 14 April 2009.

about behavioural modifications as a political response to the structural factors that forced certain forms of interspecies proximity in his community.

A further example of the limits of place-based bird flu interventions occurred at the end of a mapping activity with central Vietnamese farmers. After nearly an hour of discussion and illustration of poultry movement in the area, a concentration of red arrows flowing from several farms toward the provincial capital lay dead center on the map—just north of the commune in question. Pointing to this red area, Neil asked, “Where do you think the next outbreak will come from?” The farmers all agreed that the outbreak would come from the southwest because of the direction of the river flow. With a weak smile concealing frustration, Neil whispered to me, “So after all that it’s still the naturalistic idea of disease along water routes and not market chains.”³¹ Differently situated health workers and farmers were again looking at the same map and describing different zoographies. Despite the material fixity of these maps, poultry places were not given, stable, or singular. Instead, poultry gained spatial integrity through its position in multiple relationships with both human and nonhuman vectors. The multiplicity of these interspecies relationships was revealed to me in a mapping exercise where farmers superimposed their own map on top of the pre-supplied GIS map and key in order to capture poultry’s position vis-à-vis other livestock, local waterways, and wind patterns (Figure 2). These risky zoographies reveal that poultry exist in heterogeneous environments, which shift according to their encounters with other actors and organisms. As Hinchliffe notes, “Nonhuman spaces become entangled one moment only to develop, through their dynamic sociability, other kinds of spaces in the next.”³²



Figure 2 Participants discuss a map illustrated on butcher paper rather than the pre-supplied GIS map and key.
Photo by author.

³¹ Fieldnotes, 16 April 2009.

³² Hinchliffe, “Inhabiting,” 221.

It could be argued that farmers maintained a narrow focus on waterways and winds while health workers limited their perspective to markets and motorbikes. These arguments imply that bird flu risks can be known through a broadening of scope or an altering of perspective. However, framing the problem as one of incomplete or inaccurate knowledge obscures the social and political contexts in which poultry places come to be apprehended and managed. The next section describes the distinct socioeconomic capacities and political objectives that informed farmers' and health workers' risk maps. The ways in which these actors altered, rejected, and reinterpreted each other's maps reveal that their competing risky zoographies stemmed not only from established modes of interspecies interaction, but also from different ideas about who has the responsibility, and power, to control bird flu. In other words, their struggles demonstrate the political and moral economies that shape knowledge production and human-nonhuman relations in global health orders.

Politicising Poultry: Negotiating the Limits of Place

Law and Singleton write that the problem of difference in multiple objects becomes one of relating objects together or holding them apart.³³ To hold objects apart requires bringing one to presence while obscuring the other. A similar negotiation of 'objects' can be seen in the differential treatment of poultry and wild birds as disease vectors in bird flu management. When avian influenza first broke out in Việt Nam in 2003, control efforts focused on tracing the flight patterns of migratory birds as well as their interactions with poultry populations.³⁴ When these interventions proved expensive, difficult, and unsubstantiated by scientific research, health workers developed new interventions that targeted farmers' behaviours.³⁵ But the migrating birds did not entirely disappear from the disease ecologies in which avian flu exists. In a biosecurity workshop I attended, a Vietnamese health officer asked the FAO's chief HPAI veterinarian how to address the risk of wild birds. The veterinarian replied somewhat sarcastically, "This is a people-borne disease, even familiar and scary wild birds may need people to spread disease."³⁶ In this exchange the FAO specialist foregrounded poultry's relationships with humans over wild birds, which allowed him to locate the risks of bird flu transmission in people-dominated places.³⁷ He further foregrounded human-dominated settings in his biosecurity audit form, which delineated transmission risks in commercial and backyard poultry establishments, markets, collection centers, and zoos. He assured us that, "uncontrollable spread may occur via wind, insects, rodents, and wildlife *but it is relatively uncommon*."³⁸ In other words, in order to promote a health agenda premised on changing human behaviours, this specialist limited agency to humans. Nonhuman actors "may" make

³³ John Law and Vicky Singleton, "Object Lessons," accessed 21 May 2010, <http://www.heterogeneities.net/publications/LawSingleton2004ObjectLessons.pdf>

³⁴ In one instance the FAO experimented with affixing satellite positioning backpacks on wild birds in order to monitor their movements and exchanges with poultry. Bruce Braun, "Biopolitics and the Molecularization of Life," *Cultural Geographies* 14, no. 1 (2007): 6-28.

³⁵ Jeff Gilbert, Personal Interview, 27 October 2008.

³⁶ Fieldnotes, 2 February 2009.

³⁷ Barbara Noske's provocative comparison of livestock to proletariats finds salience here as health workers map poultry that are alienated from other animals and their surrounding nature. Barbara Noske, *Beyond Boundaries: Humans and Animals* (Montreal; New York: Black Rose Books, 1997).

³⁸ Fieldnotes, 2 February 2009, emphasis added.

poultry vulnerable to disease, but human activity dominates the places where poultry diseases can be transmitted and controlled.

A second negotiation of place occurred when farmers like Mr. Liên expressed plans to reorient poultry coops to avoid the wind. Seasonal winds are a constant concern for poultry farmers, particularly in northern Việt Nam where the weather cools significantly in the winter. Farmers refer to these winds as *gió bắc* (northern winds), and engage in a number of practices to safeguard their poultry from *bị gió* (catching a wind). In the winter months, farmers have come to expect substantial poultry deaths. However, when farmers mentioned the influence of winds on poultry illness, health workers obscured poultry's encounters with these nonhuman forces, and downplayed the latter's ability to spread disease. Neil explained to one group of farmers that there are more outbreaks in the winter not because of the weather, but because there is more poultry in the country, as trade in poultry products intensifies for the Lunar New Year holiday.³⁹ Another transnational veterinarian noted that, "It's not about winds but movement." In dialogue with farmers who enact risky zoographies affected by seasonal weather patterns and nonhuman agents, health workers limited poultry to places driven by human-centered, commoditised market exchanges. Through their interactions, farmers and health workers grounded poultry in particular social relationships, multiplying these relationships in negotiation with one another, and in ways that cohered with their varied experiences and interests. Their conflicting risky zoographies reflect what Latour calls the "dynamic sociability" at the heart of spatial configurations.⁴⁰

Inasmuch as poultry places comprise multispecies social relations, they become subject to power struggles over who gets to determine and manage those relations. Locating poultry along the commodity value chain allowed health workers to inscribe a relationship of domination between farmers and poultry, such that controlling the ways that farmers interacted with poultry would prevent disease. Wary of the costs and efficacy in changing their behaviours, and drawing on local epidemiological practices, farmers responded by positing places where poultry encounter risky nonhuman vectors. These poultry places required alternative methods for controlling disease. For example, a farmer concerned about flying feathers refused to participate in a hand-washing exercise and instead asked us to provide the commune with disinfectant to spray around farms. In another discussion about restricting people from entering coops, a farmer pointed towards a heron flying overhead and joked, "See, there's your problem. Kill it! What are we supposed to do about this?" His neighbour agreed, noting, "They should make a medicine."⁴¹ Finally, a farmer who stated that she could not afford to segregate her chickens from the rest of her house or from her neighbours pulled me over to a canal during a farm tour. Pointing to the green foam and floating trash bags, she lamented, "We didn't have bird flu in the past. But now environmental pollution is a huge problem. The government should clean this up."⁴²

Mapping poultry in environments where humans did not dominate allowed farmers to request financial and technical assistance from authorities, and to point out the broader social and ecological spaces in which poultry and people coexist. A phrase I heard countless times

³⁹ Fieldnotes, 14 February 2009.

⁴⁰ Latour, "We Have Never Been Modern."

⁴¹ Fieldnotes, 15 April 2009.

⁴² *Ibid.*

throughout the intervention was, “We’re poor, behaviour change is difficult!”⁴³ At one point an exasperated Linh said, “I look forward to the day when you tell us that your communities can do things yourselves and you don’t need any more money!”⁴⁴ It is significant to note here that Việt Nam is one of the world’s largest recipients of Official Development Assistance and is often referred to as the “darling of the donor community” for its efficient use of donor funds.⁴⁵ Development programs have taken place in every single Vietnamese province, and there is fierce competition between localities to attract development assistance. As a result, there is a tendency among Vietnamese citizens and local officials to expect large sums of money to accompany development projects, an expectation bolstered by the fact that development workers nearly always descend on communities in shiny sport-utility vehicles and carting expensive equipment (in this case GIS tools and large cameras). In their risk-mapping exercises, then, community members were not helplessly leaving poultry’s existence up to fate or incipient ‘naturalistic’ forces. In fact, they were demanding that something be done about the encroaching industrial entities that pollute local areas, the injustice of well-financed health programs that shift the cost and burden of disease control onto poor farmers’ shoulders, and the rationales behind health programming that ignores local medical practices. And so while health workers’ human-dominated risky zoographies permitted them to do their job of preventing disease by changing farmers’ behaviours, farmers’ nonhuman-dominated risky zoographies provided space for them to protect their livelihoods and seek improved socioeconomic conditions.

De/limiting Place: Accounting for Indeterminate Interspecies Interactions

Negotiations over risk maps reveal the limits of health interventions that seek to rationalise livestock production spaces and instill market-oriented behaviours among Vietnamese poultry farmers. While they may seem rather trivial behavioural changes, hand-washing and restricting entry into gated poultry-keeping areas actually conflict with longstanding livestock production practices based on village moral economies and local evaluations of animal health.

As noted, farmers spend few resources on disease prevention—as the costs of pharmaceutical intervention or veterinary visits outweigh the costs of losing a few birds to disease. Investing in poultry coops with locked gates is thus not a high priority for farmers. But there are also significant social costs associated with behavioural changes. Restricting entry into poultry keeping areas confronts longstanding practices of selling poultry at the farm gate. Household farmers generally sell eggs and birds to consumers or transporters who evaluate the value of the products based on phenomenological evidence: examining the animals for clear eyes, quick movements, warm legs, shiny feathers, and deep red combs. In fact a hallmark of healthy fowl is the condition of its legs. Golden, taut thighs and feet reflect a bird’s ability to run freely (*chạy*), an activity that precludes the enclosed and locked coops that health workers promoted. Farmers argued that preventing traders from entering poultry keeping areas to make these assessments would not only offend customers (who are also friends and neighbours), but it would also impede sales. In addition, limiting entry to poultry areas would disrupt kinship relations. Relatives observe, interact with, and discuss the health of each other’s poultry to both

⁴³ Recall Mr. Liên’s complaint that he did not have the funds to reorient his farm away from the wind.

⁴⁴ Fieldnotes, 10 April 2009.

⁴⁵ Saich, Anthony *et al.*, 2008. “Choosing Success: The Lessons of East and Southeast Asia and Vietnam’s Future,” <http://www.innovations.harvard.edu/showdoc.html?id=98251>.

make conversation and gauge one another's financial wellbeing. Further, in the densely populated northern and central areas of the country, limited landholdings mean that households with more than fifty or so birds often spread their flocks across kinship networks. The farmers I lived with divided their chicken flock among the backyards of various in-laws and cousins. As such, there was much foot and motorbike traffic between households. Restricting this movement would upset existing forms of familial exchange and support, as well as artificially divide what is considered to be one flock dispersed over space.

Further, the participants complained that asking either family members or potential vendors to wash their hands before entering poultry keeping areas would risk offence, not least because these poultry areas often overlapped with households. Many noted that these behaviours were rude (*mất lịch sự*) particularly when directed at village leaders and elders. Several others noted that these interventions would erode sentiment, or good will among neighbours (*mất tình cảm*). Creating and maintaining sentiment is a central organising principle in village moral economies in Việt Nam. The spaces that poultry occupy, and their relationship to humans, thus reflect a number of social and cultural forces in rural Vietnamese society that cannot be reduced to strictly instrumental disease control practices.

Steeped in kinship networks, moral economies, and livelihood strategies, poultry exist in myriad place-based relationship with humans. But this is not to say that poultry are isolated from rationalised market activities, nor are they always immune to human domination. There exists much overlap in the ways that social actors in Việt Nam conceptualise interspecies relationships. Over the course of my fieldwork I found that Vietnamese farmers, veterinarians, and rural dwellers often related to poultry in ways that expressed a belief in human mastery over animals. The language used to describe animals, popular tales told about animals, and the ways in which animals (both domestic and wild) are handled by all manner of persons in Việt Nam, signal hierarchical divisions between species. The farmers I lived with often took a stewardship role with regard to poultry, priding themselves on their ability to control disease on their farms. At the same time, many health workers, particularly those with experience on poultry farms, acknowledged the role of nonhuman actors in spreading disease. Apart from behavioural interventions, several avian flu interventions in Việt Nam target viruses, waterways, migrating birds, and other ecological agents. Indeed, the risky zoographies described here are just a few of many that are brought to existence in the context of bird flu management in Việt Nam. These diverse ways of relating to poultry and disease vectors point again to the limits of singular, place-based understandings of disease transmission, and reveal the indeterminate, ever-shifting social and political forces at play in shaping risky zoographies.

Conclusion

Corresponding to the "ontological turn" in social science,⁴⁶ anthropologists are increasingly concerned with investigating the ways in which animals engage in social relations with humans. Important to this work is a move away from understanding animals as merely "sustenance and symbol,"⁴⁷ towards explorations of how animals act to shape social worlds.⁴⁸

⁴⁶ Amiria Henare, Martin Holbraad and Sari Wastell, *Thinking Through Things: Theorising Artefacts Ethnographically* (New York: Routledge, 2006).

⁴⁷ Eugenia Shanklin, "Sustenance and Symbol: Anthropological Studies of Domesticated Animals," *Annual Review of Anthropology* 14 (1985): 375-403.

Contemporary scholarship describes how exchanges between human and nonhuman animals influence identity formation and conceptual frameworks,⁴⁹ encompass principles of reciprocity and domination,⁵⁰ and illuminate the permeability of human and animal binaries.⁵¹ Recent theoretical engagements with multi-species sociality⁵² have also provoked anthropologists to reconsider the separation between nonhuman nature and human culture, replacing the idea with synergetic accounts of the relationship between social organisation and the environment.⁵³

As epistemic tools for global health, risk maps render the interpenetration of organisms visible and governable in space, thus revealing the importance of geography in contemporary biopolitics. Although Foucault's insights on biopower have largely shifted analyses of political power away from the maintenance of territory toward the governing of people and populations, recent work in medical anthropology renews focus on the spatial aspects of biopolitics.⁵⁴ Redfield suggests that, "Peering through the management perspective of governmentality, we can glimpse an ecological dimension of biopower ... If bodies make up the target of power, they must be properly positioned and the conditions for reaching them established."⁵⁵

Spatial considerations are particularly salient in considerations of 'global health' orders. Lakoff and Collier suggest that the global scale of new biological threats challenges established ways of managing collective health, and confounds the boundaries of existing regulatory jurisdictions.⁵⁶ But global biological threats do not merely transcend national borders; they also push the boundaries of species divisions. The epistemological uncertainties engendered by bird flu thus create possibilities for understanding mapping exercises not only as instruments of power and authority, but also as experimental and potentially subversive activities.⁵⁷ This analysis has shown how health workers and farmers enacted heterogeneous relationships between species, by mapping risky zoographies where people and poultry encountered a variety of disease vectors and transmission routes. Risky zoographies shaped, and were shaped

⁴⁸ Molly Mullin, "Mirrors and Windows: Sociocultural Studies of Human-Animal Relationships," *Annual Review of Anthropology* 28 (1998): 201-204.

⁴⁹ Piers Vitebsky, *Reindeer People: Living with Animals and Spirits in Siberia* (London: Harper Collins, 2005).

⁵⁰ Paul Nadasdy, "The Gift in the Animal: The Ontology of Hunting and Human-Animal Sociality," *American Ethnologist* 34 (2007): 25-43. Robert Brightman, *Grateful Prey: Rock Cree Human-Animal Relationships* (Berkeley: University of California Press, 1993). Tim Ingold, *What is an Animal?* (Boston: Unwin Hyman, 1986).

⁵¹ Eduardo Kohn, "Runa Realism: Upper Amazonian Attitudes to Nature Knowing," *Ethnos: Journal of Anthropology* 70, no. 2 (2010): 171-196. Rane Willerslev, "Not Animal, Not Not-Animal: Hunting, Imitation and Empathic Knowledge among the Siberian Yukaghirs," *Journal of the Royal Anthropological Institute* 10 (2004): 629-652.

⁵² Eben Kirksey and Stefan Helmreich, "The Emergence of Multispecies Ethnography," *Cultural Anthropology* 25, no. 4 (2010): 545-576.

⁵³ Loretta Cormier, *Kinship with Monkeys: The Guajá Foragers of Eastern Amazonia* (New York: Columbia University Press, 2003). Paul Nadasdy, *Hunters and Bureaucrats: Power, Knowledge, and Aboriginal-State Relations in the Southwest Yukon* (Vancouver: UBC Press, 2003).

⁵⁴ Michel Foucault, *Ethics, Subjectivity and Truth: Essential Works of Michel Foucault 1954-1984* (New York: Penguin Books Ltd., 2000).

⁵⁵ Peter Redfield, "Foucault in the Tropics: Displacing the Panopticon," in *Anthropologies of Modernity: Foucault, Governmentality, and Life Politics*, ed. Jonathan Xavier Inda (Malden, MA: Blackwell Publishing), 64.

⁵⁶ Andrew Lakoff and Stephen Collier, "The Problem of Securing Health," in *Biosecurity Interventions: Global Health and Security in Question*, ed. Andrew Lakoff and Stephen Collier (New York: Columbia University Press, 2008), 7-33.

⁵⁷ David Pinder, "Cartographies Unbound," *Cultural Geographies* 14 (2007): 454.

by, diverse ideas about who and what constitute threats to vitality, who gets to define these threats, and how to control them. Laying bare the dynamic place of poultry in society and the environment, risky zoographies became embroiled in negotiations between differently positioned social actors. At these sites of knowledge production and exchange, poultry's dynamic relationships with humans and other creatures became consequential not only for disease control, but also for understandings about how to live with other species in an era of zoonotic threats.

Inasmuch as the maps described here expose diverse spatial configurations of humans and animals, and reveal disease ecologies as co-produced and constantly changing, they embody the methodological and theoretical challenges of biological developments at the species interface. In the face of impending disaster, risk maps illustrate what Haraway calls, "Contact zone[s] where the outcome, where who is in the world, is at stake."⁵⁸ Contact zones are messy and unpredictable; they expand and contract in accordance with shifting, lively encounters between beings. As such, the risk maps described here show poultry transcending topographies of market chains, and confounding tools of knowledge that would confine them to interactions with human actors. I have worked through a mode for interrogating these developments that brings spatial theories of knowledge production⁵⁹ into conversation with the "species turn"⁶⁰ in anthropology—foregrounding animals in the processes through which problems of human vitality are made visible and governable in space. This approach reveals maps as ciphers for multiple ways of geographically ordering humans and other creatures, and illustrates the limits of place-based modes of governing contact between species. In short, risky zoographies forge new frontiers for coexisting in spaces characterised not only by killing, but also by commerce, companionship, and care.

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⁵⁸ Donna Haraway, *When Species Meet* (St. Paul, MN: University of Minnesota Press, 2002), 244.

⁵⁹ David Harvey, *Spaces of Hope* (Berkeley: University of California Press, 2000), 111.

⁶⁰ Kirksey and Helmreich, "Multispecies Ethnography."

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Bibliography

- AgriFood Consulting International. *The Impact of Avian Influenza on Poultry Sector Restructuring and its Socio-Economic Effects*. Rome: FAO, 2006.
- Becker, Peter and William Clark, eds. *Little Tools of Knowledge: Historical Essays on Academic and Bureaucratic Practices*. Ann Arbor, MI: University of Michigan Press, 2001.
- Braun, Bruce. "Biopolitics and the Molecularization of Life." *Cultural Geographies* 14, no. 1 (2007): 6-28.
- Brightman, Robert. *Grateful Prey: Rock Cree Human-Animal Relationships*. Berkeley: University of California Press, 1993.
- Cormier, Loretta. *Kinship with Monkeys: The Guajá Foragers of Eastern Amazonia*. New York: Columbia University Press, 2003.
- Duc, Nguyen Van and T. Long. *Poultry Production Systems in Vietnam*. Working Paper Number 4. Rome: Food and Agriculture Organization, 2008. Accessed 2 February 2012. <http://www.fao.org/docrep/013/al693e/al693e00.pdf>.
- Foucault, Michel. *Ethics, Subjectivity and Truth: The Essential Works of Michel Foucault 1954-1984*. New York: Penguin Books Ltd., 2000.
- Galusky, Wyatt. "Playing Chicken: Technologies of Domestication, Food and Self." *Science as Culture* 19, no. 1 (2010): 15-35.
- Gilbert, Jeffrey. Personal Interview, 27 October 2008.
- Hahn, Robert and Marcia Inhorn. *Anthropology and Public Health: Bridging Differences in Culture and Society*. Oxford: Oxford University Press, 2009.
- Haraway, Donna. "Cyborgs to Companion Species." In *The Haraway Reader*, 295-320. New York: Routledge, 2004.
- _____. *Modest_Witness@Second-Millennium.FemaleMan-Meets-OncoMouse: Feminism and Technoscience*. New York: Routledge, 1997.
- Harvey, David. *Spaces of Hope*. Berkeley: University of California Press, 2000.
- Henare, Amiria, Martin Holbraad and Sari Wastell. *Thinking through Things: Theorising Artefacts Ethnographically*. New York: Routledge, 2006.
- Hinchliffe, Steve. "'Inhabiting'-Landscapes and Natures." In *Handbook of Cultural Geography*, edited by Kay Anderson, Mona Domash, Steve Pile and Nigel Thrift, 207-225. London: Sage, 2004.

- Hong Hanh, P.T., S. Burgos, and D. Roland-Holst. *The Poultry Sector in Viet Nam: Prospects for Smallholder Producers in the Aftermath of the HPAI Crisis*. Research Report. University of California: Pro-Poor Livestock Policy Initiative, 2007.
- Honhold, Nick. *The Basic Principles of Biosecurity*. Presentation at the Biosecurity Working Group, Hanoi, Vietnam 2 March 2009.
- Honhold, Nick, Annie McLeod, Satyajit Sarkar, and Phil Harris. *Biosecurity for Highly Pathogenic Avian Influenza*. Rome: Food and Agriculture Organization of the United Nations, 2008.
- Ingold, Tim. *What is an Animal?* Boston: Unwin Hyman, 1988.
- Kirksey, Eben and Stefan Helmreich. "The Emergence of Multispecies Ethnography." *Cultural Anthropology* 25, no. 4 (2010): 545-576.
- Lakoff, Andrew and Stephen Collier. "The Problem of Securing Health." In *Biosecurity Interventions: Global Health and Security in Question* edited by Andrew Lakoff and Stephen Collier, 7-33. New York: Columbia University Press, 2008.
- Latour, Bruno. *We Have Never been Modern*. Cambridge, MA: Harvard University Press, 1993.
- Law, John and Vicky Singleton, "Object Lessons." Accessed 21 May 2010.
<http://www.heterogeneities.net/publications/LawSingleton2004ObjectLessons.pdf> (Original Publication 2004).
- Lowe, Celia. "Viral Clouds: Becoming H5N1 in Indonesia." *Cultural Anthropology* 25, no. 4 (2010): 625-649.
- Mullin, Molly. "Mirrors and Windows: Sociocultural Studies of Human-Animal Relationships." *Annual Review of Anthropology* 28 (1998): 201-204.
- Nadasdy, Paul. *Hunters and Bureaucrats: Power, Knowledge, and Aboriginal-State Relations in the Southwest Yukon*. Vancouver: UBC Press, 2003.
- _____. "The Gift in the Animal: The Ontology of Hunting and Human-Animal Sociality." *American Ethnologist* 34 (2007): 25-43.
- National Steering Committee for Avian Influenza Control and Prevention. *National Strategic Framework for Avian and Human Influenza Communications 2008-2010*. Hanoi, Vietnam: Partnership for Avian and Human Influenza, 2008.
- Noske, Barbara. *Beyond Boundaries: Humans and Animals*. Montreal: Black Rose Books, 1997.
- Otte, Joachim, D. Pfeiffer, R. Soares-Magalhaes, S. Burgos, and D. Roland-Holst. *Flock Size and HPAI Risk in Cambodia, Thailand and Viet Nam*, Accessed 13 March 2009.
<http://www.dfid.gov.uk/r4d/Output/178633/Default.aspx>
- Pfeiffer, D. U., P. Q. Minh, V. Martin, Michael Epprecht, and Joachim Otte. *Temporal and Spatial Patterns of HPAI in Viet Nam*. PPLPI. Berkeley: University of California Press, 2007.
- Pham, T. H. H., and D. Roland-Holst. *Agro-Food Product Quality and Safety Management in Vietnam: An Overview of the Poultry Sector*. Rome: Food and Agriculture Organization, 2007.
- Philo, Chris. "Animal, Geography and the City: Notes on Inclusion and Exclusion." In *Animal Geographies: Place, Politics and Identity in the Nature-Culture Borderlands*, edited by Jennifer Wolch and Jodi Emel. London: Verso, 1998.
- Philo, Chris and Chris Wilbert. *Animal Spaces, Beastly Places: New Geographies of Human-Animal Relations*. New York: Routledge, 2000.
- Pinder, David. "Cartographies Unbound." *Cultural Geographies* 14 (2007): 453-462.
- Redfield, Peter. "Foucault in the Tropics: Displacing the Panopticon." In *Anthropologies of Modernity: Foucault, Governmentality, and Life Politics*, edited by Jonathan Xavier Inda. Malden, MA: Blackwell Publishing, 2007.
- Saich, Anthony, Dwight Perkins, David Dapice, Vu Thanh Tu Anh, Nguyen Xuan Thanh, Huynh The Du. "Choosing Success: The Lessons of East and Southeast Asia and Vietnam's Future." Cambridge, MA: Harvard Kennedy School ASH Center, 2008.
<http://www.innovations.harvard.edu/showdoc.html?id=98251>.

- Scoones, Ian and John Thompson, eds. *Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice*. London: Intermediate Technology Publications, Ltd., 1999.
- Shanklin, Eugenia. "Sustenance and Symbol: Anthropological Studies of Domesticated Animals." *Annual Review of Anthropology* 14 (1985): 375-403.
- Tuong Vu. 2009. *The Political Economy of Avian Influenza Response and Control in Vietnam*. Brighton: STEPS Centre.
- Vitebsky, Piers. *Reindeer People: Living with Animals and Spirits in Siberia*. London: Harper Collins, 2005.
- Whatmore, Sarah. "Hybrid Geographies: Rethinking the Human in Human Geography." In *Human Geography Today*, edited by Doreen Massey, John Allen and Philip Sarre. Cambridge: Polity, 1997.
- Willerslev, Rane. "Not Animal, Not Not-Animal: Hunting, Imitation and Empathic Knowledge among the Siberian Yukaghirs." *Journal of the Royal Anthropological Institute* 10 (2004): 629-652.
- Wolch, Jennifer. *Animal Geographies: Place, Politics, and Identity in the Nature-Culture Borderlands*. New York: Verso, 1998.