

Online trade poses a threat to biosecurity in New Zealand

José G. B. Derraik · Simon Phillips

Received: 19 August 2009 / Accepted: 28 September 2009 / Published online: 14 October 2009
© Springer Science+Business Media B.V. 2009

Abstract Online trade is recognized as one of the major wildlife conservation challenges of present times, but its ability to facilitate biological invasions seems to be often overlooked. In New Zealand, online trading poses a biosecurity risk associated with the importation of unwanted flora and fauna into the country, as well as the spread of undesirable organisms within internal borders. We provide a number of examples to highlight the importance of this issue. There is no simple solution for this problem; it not only requires vigilance and quick action by the appropriate authorities, but it is also necessary to raise awareness by educating the public (both selling and buying species) and liaising with those in charge of online trading sites.

Keywords Internet · Online trade · Biosecurity · Invasive species · New Zealand

Introduction

The marked expansion of the internet brought remarkable changes to the way information is exchanged worldwide. For those involved in research, the immediate access to online literature is an incredibly useful resource. On the other hand, as with any other human tool, the internet's capability to facilitate professional and social connections around the globe has potential for misuse.

New doors for illegal trade in wildlife have been opened, and online trade is said to be one of the major wildlife conservation challenges of this generation (IFAW 2008). In the report *Killing with Keystrokes* the International Fund for Animal Welfare (IFAW 2008) reveals the internet trade of numerous species protected by the Convention on International Trade in Endangered Species (CITES). These include the sale of ivory, birds, reptiles, primates and big cats. It seems that in the black market trade of rare species, the rewards from successful transactions far outweigh the financial penalties incurred in the event the perpetrators are caught. As a result, even critically endangered gorillas have been available for purchase over the internet, reportedly from £4,500 in London (Frith 2005). The main culprit in the international online trade seems to be the USA-based auction site eBay, which bent to pressure last year and banned the sale of ivory to protect endangered elephants (Anonymous 2008; Greenemeier 2008).

However, an important aspect that seems to be often overlooked is the facilitation of biological

J. G. B. Derraik (✉)
Disease & Vector Research Group, Institute of Natural Sciences, Massey University, Albany Campus,
Private Bag 102-904, NSMC, Auckland, New Zealand
e-mail: derraik@gmail.com

S. Phillips
MAF Biosecurity New Zealand, PO Box 2526,
Wellington, New Zealand

invasions associated with the online trade of organisms. In New Zealand, online trading poses a biosecurity risk associated with the importation of unwanted flora and fauna into the country, as well as their movement within internal borders. The primary threat posed by online trade is likely to result from species that are sold and intentionally or accidentally released into the environment.

Numerous threats to biosecurity in New Zealand

There are several recent examples illustrating the numerous threats posed by online trade in New Zealand. In late 2006, 16 lizards illegally smuggled into the country were seized from various locations after it was discovered these were being sold on Trade Me (New Zealand-based equivalent of eBay). The species being sold online included eight iguanas (*Iguana iguana*), two emerald tree monitors (*Varanus prasinus*), five Chinese water dragons (*Physignathus cocincinus*) and a blue tree monitor (*Varanus macraei*). The latter is a rare species and, following arrangements with Indonesian authorities, it was returned to that country, but the other species had to be euthanized for biosecurity reasons (ERMA NZ 2007). The emerald monitors were found to be infected with a protozoan (*Hepatozoon* sp.) absent from New Zealand. Such parasite could pose a threat to endemic reptile species, such as the tuatara (*Sphenodon guntheri*) that is classified as vulnerable in the IUCN Red List of Threatened Species (IUCN 1996). The iguanas were also found to be infected with a *Salmonella* serotype not present in New Zealand.

A barrier to enforcement against a number of species is that those with populations established in New Zealand before legislation came into effect are legally exempt from biosecurity regulations, unless authorities officially declare that action is required against a particular organism. Thus, the movement and the consequent spread of potentially invasive organisms within New Zealand is also a significant biosecurity issue. An invasive species may have a restricted distribution within the country for a variety of reasons (e.g. its spread being hindered by environmental barriers), and pet traders using online auctions to sell such animals are making them more popular and accessible, ultimately facilitating further

introductions to the wild and invasion of more suitable habitats.

One such case is the red-eared slider (*Trachemys scripta elegans*), which is included in the World Conservation Union (IUCN) list of 100 of the world's worst invasive species (Lowe et al. 2000). This species is a very popular pet worldwide, being 'mass-produced' in the USA for the international trade (Cadi et al. 2004). In New Zealand it seems to be one of the most affordable and easily obtained exotic reptiles (Kikillus et al. 2009). Isolated populations of the species have been found in the wild in New Zealand (Thomas and Hartnell 2000; Dykes 2007), and climatic models indicate that a number of northern areas are suitable for its establishment (Kikillus et al. 2009). Some regional authorities now classify *T. s. elegans* as pests, and are advocating that research is carried out to determine whether they are likely to become invasive in New Zealand (Kikillus et al. 2009). In the meantime, unrestricted online trade means that it is likely that feral populations may become more widely established, and consequently affect native freshwater environments.

Another example is the online sale of introduced frogs that are already established in New Zealand. Although it is illegal to release these animals into waterways, this does not prevent people from doing so once they tire of their pets. This is of concern for biosecurity and conservation authorities as the pet trade of tadpoles is facilitating the spread of the chytrid fungus *Batrachochytrium dendrobatidis* around New Zealand (Waldman et al. 2001). This fungus has been responsible for massive morbidity and mortality in amphibian populations worldwide, and the movement of infected animals by trade appears to be the primary cause of its spread (Johnson and Speare 2003). In New Zealand, *B. dendrobatidis* is likely to be implicated in the decline of endemic frog species, which were already under threat (Bell et al. 2004; Waldman et al. 2001).

The sale of genetically modified organisms is another problem. Such organisms are regulated by New Zealand's Hazardous Substances and New Organisms Act 1996 and cannot be imported or released in New Zealand without approval from the Environmental Risk Management Authority. In 2007 MAF Biosecurity New Zealand (MAFBNZ, the country's lead biosecurity agency) launched an investigation after members of the public reported the online

auction of brightly coloured zebra danios (*Danio rerio*) suspected to be genetically modified organisms. Laboratory testing confirmed their GMO status, and MAFBNZ tracked down and subsequently destroyed over 200 hundred specimens (Loughnan et al. 2007).

The aquarium trade appears to be the main driver behind the increased biosecurity risks associated with the internet trade. The New Zealand Biosecurity Strategy recognized the internet mail order of marine organisms as a particular threat (Biosecurity Council 2003), citing as an example the invasive seaweed *Caulerpa taxifolia*. This species is readily available over the internet, and can be easily ordered from overseas. Its introduction and spread in coastal waters in many areas of the world had dramatic ecological and economic consequences, and it seems that its release from aquaria has been responsible for most, if not all, of the major *C. taxifolia* invasions (Walters 2009).

The illegal importation or movement of potential invasive species within, or into the country poses a threat not only to environmental, social and economic values but also to human health. The Malaysian trumpet snail (*Melanoides tuberculata*) for example, was relatively recently found to be established in New Zealand (Duggan 2002). Overseas, *M. tuberculata* is the intermediate host of a number of trematodes that are human parasites (Derraik 2008), and it is believed to have been released into the New Zealand environment from aquaria (Duggan 2002). Its distribution until recently was thought to remain limited to geothermal waters in the central North Island, but recent data indicate that it is more widespread than previously thought. *Melanoides tuberculata* has been sold widely on online auction site Trade Me, which may account for its spread to other locations.

Another example is the previously described illegal importation of iguanas infected with an exotic *Salmonella* serotype. Reptiles are widely recognized as common sources of *Salmonella* infection to humans, as demonstrated by frequent case reports worldwide, particularly in North America (Mermin et al. 1997; Woodward et al. 1997; CDC 2003). There are numerous *Salmonella* serotypes/phages overseas that are not present in New Zealand, and although these usually cause gastroenteritis, *Salmonella* infection may be associated with serious human disease such as septicemia and meningitis (Mermin et al. 1997; CDC 2003). As a result, the arrival of such exotic human pathogens into New Zealand in

association with illegally imported reptiles is a human health concern.

Issues and possible mitigating measures

One of the challenges to detection of invasive species at the border is that often the custom declaration on a mail package fails to accurately disclose its contents (intentionally or unintentionally). If the package containing the organism then evades other biosecurity controls (e.g. detector dogs), a noxious species will slip through the system and possibly find their way into the New Zealand environment. Species that are considered to be a threat to New Zealand may be classified as unwanted organisms under the Biosecurity Act 1993, pursuant to section 2(1), which prevents their legal sale, propagation, or distribution within the country. However, for these legal tools to be of use, it is necessary to monitor the online trading and subsequently enforce the legislation. These measures may be resource-hungry, and thus unlikely to be a regular activity put into practice by the appropriate authorities. In addition, as previously discussed, the legislation does not curtail the sale of organisms already present in New Zealand that are either not yet identified as potential hazards or not officially declared as such.

It is possible that the examples discussed here are just the tip of the iceberg. In New Zealand, no single authority has the responsibility of regularly monitoring online auction sites. As a result, the detection of such online sales in New Zealand occur on an *ad hoc* basis, either reported by members of the public or identified by staff of one of the country's biosecurity or conservation agencies.

Finally, while this issue has been discussed primarily in the context of New Zealand, biological invasions are a worldwide issue, and the online trade is a clear doorway for new invasions. It seems important that members of the public, especially those with technical knowledge of species that are potential threats, remain vigilant. In the event that a potential hazard organism is found to be for sale, the respective authorities should be notified. It seems that in many cases the culprits are ignorant or misinformed of the associated issues, rather than intentionally attempting to breach the legislation. It is therefore necessary not only to educate the public (both selling and buying

species), but also to liaise with those in charge of online trading sites to increase awareness of the issue.

Acknowledgments Thanks to Abi Loughnan and Sonya Bissmire (MAFBNZ) for assistance and input.

References

- Anonymous (2008) Auction site eBay bans ivory sales to protect endangered elephants. The Daily Mail, 21 October 2008. www.dailymail.co.uk/news/worldnews/article-1079474/Auction-site-eBay-bans-ivory-sales-protect-endangered-elephants.html. Accessed 21 Sept 2009
- Bell BD, Carver S, Mitchell NJ, Pledger S (2004) The recent decline of a New Zealand endemic: how and why did populations of Arceuthobium's frog *Leiopelma arceuthobium* crash over 1996–2001? *Biol Conserv* 120:189–199
- Biosecurity Council (2003) The biosecurity strategy for New Zealand. www.biosecurity.govt.nz/files/biosec/sys/strategy/biosecurity-strategy.pdf. Accessed 21 Sept 2009
- Cadi A, Delmas V, Prevot-Julliard A-C, Joly P, Pieau C, Girondot M (2004) Successful reproduction of the introduced slider turtle (*Trachemys scripta elegans*) in the South of France. *Aquatic Conserv Mar Freshw Ecosyst* 14:237–246
- Center for Disease Control and Prevention (CDC) (2003) Reptile-associated salmonellosis: selected states, 1998–2002. *Morb Mortal Wkly Rep* 52:1206–1209
- Derraik JGB (2008) The potential significance to human health associated with the establishment of the snail *Melanoides tuberculata* in New Zealand. *N Z Med J* 121(1280):3221
- Duggan IC (2002) First record of a wild population of the tropical snail *Melanoides tuberculata* in New Zealand natural waters. *N Z J Marine Freshwater Res* 36:825–829
- Dykes M (2007) Red-eared slider turtle a potential hazard. *Manawatu Standard*, 10 November 2007. www.stuff.co.nz/manawatu-standard/news/53516. Accessed 21 Sept 2009
- ERMA NZ—Environmental Risk Management Authority (2007) New organism incidents: 2006–2007. www.ermanz.govt.nz/no/compliance/incidents0607.html. Accessed 21 Sept 2009
- Frith M (2005) Revealed: the illegal online animal trade. The Independent, 16 August 2005. www.independent.co.uk/environment/revealed-the-illegal-online-animal-trade-503078.html. Accessed 21 Sept 2009
- Greenemeier L (2008) Un-netting trade in endangered species: eBay vows crackdown on illegal ivory sales. *Scientific American*, 21 October 2008. www.sciam.com/article.cfm?id=eBay-vows-ivory-crack-down. Accessed 21 Sept 2009
- IFAW—International Fund for Animal Welfare (2008) Killing with keystrokes. www.ifaw.org/Publications/Program_Publications/Wildlife_Trade/Campaign_Scientific_Publications/asset_upload_file848_49629.pdf. Accessed 21 Sept 2009
- IUCN-World Conservation Union (1996) *Sphenodon guntheri*. Australasian reptile and amphibian specialist group. IUCN Red List of Threatened Species. Version 2009.1. www.iucnredlist.org. Accessed 21 Sept 2009
- Johnson ML, Spere R (2003) Survival of *Batrachochytrium dendrobatidis* in water: quarantine and disease control implications. *Emerg Infect Dis* 9:922–925
- Kikillus KH, Hare KM, Hartley S (2009) Minimizing false-negatives when predicting the potential distribution of an invasive species: a bioclimatic envelope for the red-eared slider at global and regional scales. *Anim Conserv* 12(suppl 1): 1–11
- Loughnan A, Williams R, Keeling S (2007) Fluorescent fish spark GM response. *Biosecurity* 78:4–5
- Lowe S, Browne M, Boudjelas S, De Poorter M (2000). 100 Of the world's worst invasive alien species—a selection from the global invasive species database. The Invasive Species Specialist Group (ISSG), World Conservation Union (IUCN). *Aliens* 12
- Mermin JH, Hoar B, Angulo FJ (1997) Iguanas and *Salmonella* Marina infection in children: a reflection of the increasing incidence of reptile-associated salmonellosis in the United States. *Pediatrics* 99:399–402
- Thomas M, Hartnell P (2000) An occurrence of a red-eared turtle (*Trachemys scripta elegans*) in the Waikato River at Hamilton, New Zealand. *Herpetofauna* 30:15–17
- Waldman B, van de Wolfshaar KE, Klena JD, Andjic V, Bishop PJ, Norman RJB (2001) Chytridiomycosis in New Zealand frogs. *Surveillance* 28(3):9–11
- Walters L (2009) Ecology and management of the invasive marine macroalga *Caulerpa taxifolia*. In: Inderjit (ed) *Management of invasive weeds*. Springer, New York, pp 287–318
- Woodward DL, Khakhria R, Johnson WM (1997) Human salmonellosis associated with exotic pets. *J Clin Microbiol* 35:2786–2790