



## Environmental Audit Committee

Oral evidence: [Invasive species](#), HC 913

Wednesday 22 January 2014

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Written evidence from witnesses:

- [Wildlife and Countryside Link](#)
- [CABI](#)

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Members present: Joan Walley (Chair), Neil Carmichael, Katy Clark, Zac Goldsmith, Mark Lazarowicz, Caroline Lucas, Caroline Nokes, Dr Matthew Offord, Mr Mark Spencer, Dr Alan Whitehead, Simon Wright

### Questions 1-77

Witnesses: **Carrie Hume**, Wildlife and Countryside Link, **Dr Helen Bayliss**, British Ecological Society and Centre for Environmental Policy, Imperial College, **Dr Helen Roy**, Centre for Ecology and Hydrology, **Dr Richard Shaw**, CABI, and **Dr Mark Spencer**, Natural History Museum, gave evidence.

**Q1 Chair:** I would like to begin by giving a very warm welcome to the five panellists that we have in front of us as our witnesses today. It is a bit of a squeeze and as you will see, we have a full Committee so we are going to have to keep ourselves in order, so as to get through the questions that we have for each of you this afternoon. I also think it might be helpful just to point out that we are expecting a vote around about 2.45 pm, so you might just like to be aware of that.

In welcoming you to our session this afternoon, I would just like to make an opening remark, in the sense that this inquiry arose out of a previous inquiry that we did into wildlife crime, where we promised that we would come back to the issue of invasive species, which is in fact what we are doing now, so as a Committee, we are keeping our word to Parliament. We are also very mindful that this is a timely occasion to carry out this inquiry, because of the EC proposal for regulation on the prevention and management of the introduction and spread of invasive alien species. Obviously, we feel that this is an opportunity for us to feed into the current discussions that are currently going on inside Europe at the moment.

With that, by way of background—and if I could also ask you to make sure you speak loudly because it is important for Hansard to be able to pick up the acoustics in this room—I would like to start off and just ask you if you could identify for us the main impacts of invasive species on native plants and animals in Britain. Carrie, do you want to start off? If you wish to add a supplement to what Carrie says, please catch my eye.

**Carrie Hume:** Yes, thank you. In the written evidence from Wildlife and Countryside Link, we have highlighted various impacts on some of the NGOs who Wildlife and Countryside Link represent, impacts on our conservation programmes, species that we are trying to conserve that are being directly affected by invasive species, and we have highlighted some of the costs that we are bearing as charities to address some of these species. Some of the impacts that I am interested in are those on aquatic habitats, and some of the aquatic plants that we have in this country that are quite invasive are deoxygenating water, they are out-competing a lot of our native species and in some cases creating complete monocultures and replacing our native aquatic fauna.

**Q2 Chair:** When you say “habitats” are you looking at specific habitats or are you making the connection with place as well?

**Carrie Hume:** Both.

**Q3 Chair:** Would you like to flag up any particular areas of special concern?

**Carrie Hume:** My personal concern is the effects on wetlands, which are one of the most affected habitats, both in the UK and globally.

**Dr Spencer:** I would like to add to that. I think often we tend to focus as a society on problems in our pristine—or perceived to be pristine—wildlife habitats, and often one of the things that tends to be happening is urban environments are often the focal points for new biological invasions. We tend not to think about urban habitats and urban environments as being impacted by non-native species. There are also significant human well-being consequences as well for some of these invasive species, so we need to look at a wider palette of perception of that, where plant life, animal life, rich biodiversity and humans are being affected as opposed to Britain’s chalklands or our ancient woodlands. It is across the board.

**Dr Shaw:** We should not ignore the financial costs, which you are probably already aware of. Carrie was commissioned to do a review of the financial impacts of invasive species to GB, which came up with a figure of £1.7 billion per annum divided across all the taxa, and I support Mark’s comments that the impacts are across everything. It is not just small windows of exposure, it is every sector of society and almost every habitat in our environment, so it is a huge cost and we are bearing that every year and the cost is increasing. That is not including the downstream ecosystem service effects, which are probably 90 to 100-fold higher.

*Sitting suspended for a Division in the House.*

*On resuming-*

**Q4 Chair:** We can now resume and I think we were with you, Dr Shaw, just talking about the way in which this affects urban and rural areas, economic issues. Perhaps you could just resume from where we were?

**Dr Shaw:** Yes. We did a thorough review of Great Britain’s costs by sector and by species with lots of expert input and came up with this large figure of £1.7 billion, but always with a caveat that that is an underestimate. The downstream unrecognised, unknown and immeasurable effects are enormous. The effects on ecosystem services, which I think my colleagues are better placed to talk about, are significantly larger, orders of magnitude

larger, than the problem that we can measure financially, so the true costs to the country are very high indeed.

**Dr Roy:** With respect to the ecosystem side of things, some of the invasive alien species will have a direct impact on another species, maybe they will eat the other species, for instance, but some of these invasive—“non-native” and “alien” I am going to use interchangeably and I apologise for that, but I mean the same thing—non-native species will have quite far-reaching ecosystem effects, and some of the species we know are what we might term ecosystem engineers, for instance, and they will have a very fundamental role in unravelling ecosystems. Some of the ecosystem services that we rely on are very hard to quantify in terms of value and I think that is something that we need to get a better idea of, and we are getting better at having an idea of the value of ecosystem services. These might be things such as the services that a species might provide for food security, for instance, so a predatory ladybird eating aphids in a crop would be providing a service to us. We are getting better at quantifying those and as we do, this figure of £1.7 billion increases and increases.

**Q5 Chair:** Thank you. You have mentioned economic activities and the overall cost, but could you be a bit more specific about that and could you also perhaps refer to effects on human health as well?

**Dr Shaw:** I can obviously provide the report. It is freely available through the Defra website so it might—

**Chair:** It might be helpful to have that specifically, yes.

**Dr Shaw:** Of course. Yes, I am very happy to pass that on. It divided into mainly agriculture—that was where the big costs were on plant pathogens and plant pests—cost of chemical control of all those measures for the exotic species was very high, transport, £81 million, but it hits all of them. It is not surprising to me, but it is surprising that every single sector that was assessed had a significant cost associated with it from invasive species, and they were divided, interestingly, evenly between plants, plant pathogens and mammals, all sharing about £400 million worth of impact, rabbits being by far the highest figure. Interesting, yes.

**Q6 Chair:** Human health, we have not heard much about that. Dr Bayliss?

**Dr Bayliss:** I was just going to say there are some specific species where we know have quite defined impacts, like giant hogweed, which has sap that causes nasty blistering and skin reactions, and the oak processionary moth, which has recently arrived in London, which has respiratory and skin implications, and it was first detected because local residents were complaining of rashes; they were living near to where the moths were. But then there are also more complex interactions between species and the environment and human health. For example, in America, loss of trees to tree diseases and tree beetles have led to increases in respiratory conditions and things, so there are a lot of ways. We do not necessarily understand how these could impact on human health indirectly and there is not necessarily that much evidence, and there has not been that much research directed into that area, but it is certainly something that needs to be considered.

**Q7 Chair:** In terms of impacts and talking about the UK, how does what we have here and the controls and the situation that we have differ from countries with a history of stringent biosecurity? I am thinking of New Zealand.

**Dr Shaw:** We cannot get anywhere near New Zealand. They are far ahead of anyone else in the world as far as biosecurity is concerned, next to Australia. These are countries with longer standing recognition and respect for the problems caused by invasive species, but I would point out—and my colleagues will all agree—that the UK or GB, in the case of Non-native Species Secretariat, is far ahead of the rest of Europe. That was recognised in the European meeting on Monday most recently, where England and Scotland were specified as being far ahead of the rest of Europe, and that is something to be looked up to. There is definitely a tick in the box for our performance so far compared to our European neighbours.

**Dr Roy:** I support that, that we are way ahead with the GB Non-native Species Secretariat co-ordinating the activity on non-native species across GB, and it is recognised that we are leading the way in Europe. That is tremendously exciting and I would like to see that continue.

**Q8 Chair:** On a continuum, it would be us and then Europe and New Zealand, as it were?

**Dr Roy:** Yes.

**Dr Spencer:** It is also very hard to compare very different parts of the planet biologically as well. The native flora and fauna of Australia and New Zealand, for example, has had a very different evolutionary history to British and European flora, so making comparisons in terms of impacts on native biodiversity is very complex and very difficult. The history of introduction into the British Isles is also very different. In the UK, particularly with plants, which is my area of expertise, we have had hundreds of years of introduction of non-native plants, initially from Europe, because that is historically where our first contacts were in terms of trade and commerce, and then increasingly further afield, so the patterns and demography of the non-native species interactions are very different in those other countries.

**Q9 Chair:** Just switching the subject slightly and reverting to an inquiry that we have just done on biodiversity offsetting, when the Secretary of State referred to what was happening in Australia, for example, in terms of good practice, might there be reservations about his comments there in terms of the differences that there are?

**Dr Spencer:** In broad sweep, my personal feeling is that the Australian and New Zealand approaches are a model which much of the rest of the world can follow. They undeniably lead across a wide range of non-native species biology control approaches, including biocontrol. With regard to offsetting, it is not my area of expertise, but I think there are lessons to learn. It is just the fine-grain approach and response in terms of what we do in the UK with particular problems is going to be different.

**Dr Roy:** We do have examples within GB of success stories with respect to non-native species control. One of the things at the moment of interest is one of those species that we are particularly concerned might arrive is the Asian hornet, and that poses a threat to our bee-keeping community, for instance, and indeed wild pollinators, of which there are many hundreds of species. There is a contingency plan in place that has been co-ordinated by the Non-native Species Secretariat so that when we get our first knowledge of that species being in Britain, there is a plan of action to be carried out, and I think that that kind of practice with this contingency planning is the way to go forward.

**Q10 Chair:** Dr Shaw, you just talked about the different situation in New Zealand, but you said that there was respect there and a different perception presumably on the part of the public. How much do you think that this issue that we are debating now is dependent upon informed public understanding and debate about this whole issue and the area of behaviour change as well?

**Dr Shaw:** Hugely dependent. In Australia and New Zealand, there is a general passion about their environment, which I think exists a lot in the UK as well, but they have not necessarily sold the invasive things, on the massive threat that is posed. It is not about the bogeyman or the invader, it is about the value of the ecosystem it is invading and they have so many examples of invasive species that are on scales we cannot imagine here. Rubber vine is a project I worked on with my colleagues. It covered 40,000 square kilometres of world heritage habitat. We cannot conceive of an invasion of that scale and you can understand why they are so far ahead of us as far on biosecurity, which is what they now call what we are talking about today. It is completely understandable, because they have such a depauperate environment and such a lot to lose, and the general public know an awful lot more than the general public do here.

**Carrie Hume:** If I may, one of the major differences in New Zealand is they have a Biosecurity Act—they have given it importance in its own right as an Act—and a Biosecurity Minister. They have invested quite heavily in a communications campaign directed at the public, which although we have made starts on in this country, we do not have the funds. That is where a lot of their success has been gained, through effective communication campaigns.

**Dr Roy:** I would agree entirely with the comments that have already been made and I would just point to some of the successes that we have had in Britain with respect to the Check, Clean, Dry campaign and also the Be Plant Wise campaign, which are excellent examples of what can be done, but we just need to be doing more of that. Raising awareness and public engagement is extremely important for surveillance and monitoring.

**Q11 Zac Goldsmith:** I am interested in what you think the biggest drivers are for the upsurge in the number of invasive species and particularly which of those drivers should we be focusing on on the basis that we can do something about them?

**Dr Spencer:** International trade. In a nutshell, in the broad context, if you look at the size and the scope of international trade as it has developed over the last 150 years, you can plot the spread of problematic non-native species almost concurrently with that. In more detail, I think particularly in the United Kingdom, we have a developing and a long-term problem with trading plants for horticultural purposes both in terms of non-native species, but also plant pests. I think it is very important to consider non-native species biology, also parallel—

**Dr Spencer:** We need to also consider non-native species biology in the context of plant health and animal health as well. The pathways are almost entirely the same and the conversations about these three issues often involve the same pathways, and horticulture is a significant pathway.

**Q12 Zac Goldsmith:** So when you talk about international trade, you are not just talking about the deliberate trade in plant species or animal species, you are talking about the accidental consequences of other forms of international trade?

**Dr Spencer:** Some of it can also be parallel. For example, trading wood products can bring in non-native species as unforeseen consequences, and the classic example obviously in the British Isles has been Dutch elm disease in the past and more recently Chalara. Often the non-natives are coming in parallel with the objects that we are trading. Sometimes it is the material we are trading that is in itself potentially a source of biological invasion.

**Q13 Zac Goldsmith:** Just going back to Helen Bayliss' point about the Japanese hornet or Asian hornet, did you mention that?

**Dr Roy:** I made that comment.

**Zac Goldsmith:** You mentioned that? Sorry, excuse me.

**Dr Roy:** No, that is fine.

**Zac Goldsmith:** Out of interest—you are obviously on the lookout to see whether or not it comes in—what is the most likely route that it would use, for example, to come in?

**Dr Roy:** With the Asian hornet, it is not going to be through a trade route necessarily. It is likely to be carried over by somebody, for instance, on holiday in France or something like that. It is likely to be a more accidental movement, and in some respects, that is very difficult then to manage those kinds of accidental introductions. Similarly, we know that we have an increasing number of species for which we do not know what the pathway was for its arrival. Again, there are difficult groups of species that we have to grapple with as well, but we can begin to know a lot better. I think also we need to think about the different environments. The different environments, freshwater or marine, might have different drivers associated with them, but for the Asian hornet, we know enough about how its ecology is likely to unfold when it first arrives, and the early warning is important for the Asian hornet.

**Q14 Zac Goldsmith:** Can I come back to Mr Spencer? You talked about international trade. How about land management changes and how big a factor is that?

**Dr Spencer:** In general, when you also consider shifts in environmental conditions as things that are happening in the world as all sorts of drivers in their own right, habitats, whether they be agricultural, human habitats or the wider landscape, once they are under pressure and have been heavily impacted by humans in adverse ways, are often much more vulnerable to biological invasions in all their forms. The stresses that we are putting on the environment in terms of environmental change issues as a whole, coupled with the invasive species, mean that habitats that are vulnerable to change in their own right, water bodies, for example, through pollutants, those pollutants are going to affect the dynamics, which makes invasive species much more likely to colonise those habitats because the resilience of the native communities has been dampened down for various reasons.

**Q15 Zac Goldsmith:** It is still directed at you, but anyone else, please feel free to jump in. To what extent do you think climate change increases or changes the risk of invasive species becoming more of a problem?

**Dr Spencer:** Very quickly, I do a lot of work in recording plant life in the London area. There has been a very significant change in the abundance of certain non-native species and their behaviour over the last 20 or 30 years. A significant example that I am very concerned about is tree of heaven, which for 260 years or so—

**Chair:** Sorry?

**Dr Spencer:** Tree of heaven, sometimes known as tree of hell to folks like myself. It has been in British horticulture since the 1760s and it is only in the last 20 or 30 years that its behaviour has changed significantly. It now reproduces seed very abundantly. It is known to be in certain parts of the world like Southern United States and Southern Europe one of 100 worst.

**Q16 Zac Goldsmith:** What is it?

**Dr Spencer:** It is an ornamental tree, very popular. It looks like a super-charged ash tree, a very beautiful tree, very elegant, but it is an emerging threat that we need to take seriously and consider.

**Q17 Zac Goldsmith:** You would put that down to climate change?

**Dr Spencer:** My personal opinion—and it has never been quantified in terms of evidence gathered through research, which is a question we can probably tackle later—is that, yes, we are seeing significant changes in its behaviour in recent years.

**Dr Bayliss:** If I can just pick up on that, in fact urban areas may be very important in picking up where climate change is having an effect because they can be several degrees warmer than the surrounding areas, and particularly in London because it is such a large urban area. It could be that we start to see the effects of climate change in some of these species in urban areas before we start to see them in the wider countryside. But climate change can affect species that are already here and it might mean that some of them become better suited to the conditions as the climate warms or changes, like the tree of heaven, but then it could also have other impacts, for example, changing the way that species respond to management and changing interactions between species and things. There is a range of different ways in which it could potentially impact on invasive or potentially invasive species.

**Dr Shaw:** Another early indicator is Cornwall, where you get an awful lot of new plants arriving because the climate is a little warmer, but there is also this thing called an invasion debt, so it is not just what is coming on to our borders now, it is stuff that we already have here. We have thousands of species. We have a legacy of invaders waiting to escape and take advantage of these new niches through disturbance or climate change, as you rightly point out.

**Dr Roy:** I would just add some examples in that respect. I mentioned earlier the idea of ecosystem engineers and ants, for instance, are a type of ecosystem engineer. There are some ant species that we see on the horizon that with a little bit of climate warming will be able to establish, and we have seen them in other countries—such as the Argentine ant—cause extensive problems.

**Carrie Hume:** Sorry, if I may just bring in one other example that concerns me immensely, it is water hyacinth, which is present in over 50 countries. Water hyacinth: it is coined as one of the world's worst water weeds. It is present in over 50 countries, every continent except Antarctica. It should only be in the Amazon basin. It causes hundreds of billions of dollars worth of damage across Africa. It is already being sold and traded in the UK, it is already present, coming out through Spain. We know that the wetlands in the UK

are suitable for water hyacinth. All it needs is one or two degrees and it will go, so that is another species that I am quite concerned about.

**Q18 Zac Goldsmith:** I was going to ask if, by your definition, it would be possible for UK plants to be classified as invasive species. I would be interested to hear if there is a consensus on the panel, but I suppose the second part relates to what you have just said, and that is is it possible then that long-term British native plants could become invasive species because of climatic or other types of change? If so, what would be a good example of something that is considered to be an English or British native that has a threat potentially of becoming a real problem?

**Dr Shaw:** I would say no.

**Q19 Zac Goldsmith:** You would not classify them as invasive?

**Dr Shaw:** No, because what is always forgotten is the suite of natural enemies that they support, so a native species has an inherent collection of things that evolve with it that keep it in check as well, as happens in the native range for exotic species, and they have an inherent value because of that. Compared to an exotic invasive species, they can be invasive according to a technical measurement of them spreading into a different range, but to be a damaging invasive species, you have to take into account the biodiversity impact. They have an inherent baggage of biodiversity that comes with them and I think that is a very clear distinction to me. I cannot imagine ever describing a native species as a damaging invader.

**Q20 Zac Goldsmith:** Does anyone disagree with that on the panel?

**Dr Spencer:** No, but I can see the direction from which you are coming. Obviously there has been some commentary in the biodiversity community about native invaders and bramble and stinging nettle are often cited. I absolutely agree with what Richard is saying about this, that there are constraints in the pathogens that hold them. Many of those species that are changing their behaviour are to do with environmental pollution, management issues—for example, nitrates and phosphates in the case of stinging nettles, which have become more abundant probably through that—or shifts in land management, so there are different issues driving changes in the behaviour. It is not invasive species biology. Invasive species biology is incredibly linked to a concept called predator release. For example, the tree of heaven example I just gave you, it comes from a rather odd plant family called the Simaroubaceae, which is from south-east Asia. We have no members of that plant family in Europe. Therefore, we have no native biodiversity in Europe that has a taste for that plant or that group from that family. Therefore, it is released from the constraints it had at home in south-east Asia and it can spread like wildfire once the environmental conditions are the same, and that is the same here for our native plants.

**Q21 Zac Goldsmith:** Does anyone want to add to that?

**Dr Roy:** I would add that I would agree that there is a clear distinction between the native and the non-native species.

**Q22 Zac Goldsmith:** Can I ask you, if a species historically existed in this country and there was a long period of time where it did not exist and then through whatever means it was reintroduced—an obvious example is the wild boar; this is a bit of self-indulgence, because I am always bringing up wild boar in these meetings—would you regard the wild boar as an invasive species? I suppose that is the question. Do you regard it as an invasive species?

**Dr Bayliss:** It is a difficult one to answer because it pushes at the boundaries of how we define invasive species. If you are talking about something that has been introduced to an area, as you rightly say, if it was a historical range, then is it native or not, I think the key issue is that if the species is present and causes problems and it needs to be managed for that, then maybe the semantics of the discussion do not get in the way of action, if that is necessary.

**Dr Spencer:** I was going to say a very similar question has been asked around rhododendron ponticum, which people often say used to be native in the British Isles before the last ice age, and in that particular case, it is somewhat factually incorrect because the entity we now have in the British Isles is a hybrid between rhododendron and ponticum and some North American species, so it is a different being.

I think with the wild boar example, also you have to bear in mind that since wild boar became extinct in the British Isles, the British landscape has changed. Man's landscape management practices have changed and so there are some different complexities around landscape management. Again, as I mentioned, the stinging nettle.

**Q23 Zac Goldsmith:** There is some discussion within academic circles that the threat of invasive species is often exaggerated. I do not think any of you, based on what you have said, would subscribe to that, but what would you say in response to some of those discussions that are happening and some of the submissions that perhaps we have had as a Committee?

**Carrie Hume:** At quite a high level, I would disagree. For example, we had the Millennium Ecosystem Assessment in 2005, which gave a very thorough peer-reviewed overview of impacts on ecosystems around the world, and that put invasive species alongside climate change and habitat loss as the major threats to biodiversity. I think we have enough material to know, we have the CBD, for example, and we obviously have the EU regulation and our own strategy. There is enough understanding of this being significant enough, I think.

**Dr Roy:** Within Britain, we have about 2,000 established non-native species, so these are species that are reproducing actively within the British landscape. Of those 2,000, there are about 200 that cause a problem and they are the ones that are termed the invasive non-native species. While we might appreciate that there is a proportion of the non-native species that do not cause problems, those that do cause problems, those 15%, cause quite extreme problems. I do not believe that there is anyone in the invasion biology community who would exaggerate the message with respect to those. We are drawing on empirical evidence as best we can, we are drawing on expert knowledge as best we can and there is no doubt that the impact studies that have been published reveal a very strong message.

**Dr Shaw:** There is a very good paper I can provide to the Committee—I can pass the paper on—that debunks the nay-saying argument about the invasive species bandwagon, as they call it. They address issues like an invasive species is adding on to the biodiversity count as well, at the loss of all the other things that were associated with the native species that were replaced. The example they cite is 33 bird species have gone extinct in Hawaii and 33 new bird species have arrived in Hawaii. The 33 new bird species are ubiquitous global species. Is that a good thing? My argument, it is not a good thing. They also talk about them being more productive. Invasive species are more productive, the plants in particular, but they are more productive perhaps in a carbon sequestration way, but

certainly not in a biodiversity way, because they often have the biodiversity value of concrete.

**Q24 Neil Carmichael:** Thank you. What I would like to talk about to some extent is sort of territorial issues here, because of course when you talk about invasion, relying on the map is one thing, but how we control and deal with these things is quite another. Obviously we have one or two EU directives on this theme in mind, so that is what I would like to discuss. Given the fact that plants and animals do change naturally—that is an accepted fact—what is the appropriate basis for defining whether a species is non-native? Dr Shaw.

**Dr Shaw:** You are talking about evolution there, that one things move from one thing to another?

**Neil Carmichael:** Yes.

**Dr Shaw:** That is a natural process, indeed. The definition that we chose in CABI with the Invasive Species Compendium, it is an invasive alien species—meaning non-native to the region in which you are talking about—whose establishment and spread threatens ecosystems, habitats or species with economic or environmental harm. That is the categorisation I like personally. There are other ones. The CBD has a very clear one. The definition of invasive species is pretty hard to argue with. It is an established scientific descriptor, so I am happy and I think we are all happy with the descriptions that are out there.

**Q25 Neil Carmichael:** You are not too happy then with the proposed EU regulation? It defines invasive alien species as species whose introduction or spread has been found to threaten biodiversity or ecosystem services.

**Dr Shaw:** I am happy with that. I think they have added or are trying to add human health on top of that as well.

**Neil Carmichael:** It is not on at the moment.

**Dr Shaw:** Okay. It is close enough. I do not think it is worth fighting too hard about that. I think that captures all the things that we would be concerned about.

**Q26 Neil Carmichael:** Is that a view you all share?

**Dr Roy:** Yes, the EU definition is based on the Convention on Biological Diversity and that is the one that we would also use when we are constructing, for example, the GB non-native species information portal, which is a Defra-funded project, to gather all the information on non-native species in Britain. We align with that CBD definition. It is clear. There is no doubt that sometimes there is some uncertainty, that we are not entirely sure of the origin of a species, for instance. There can be some uncertainty, but in most cases it is a very clear-cut scenario. For example, we know that the harlequin ladybird, a well-known invader, was native to Asia and introduced into mainland Europe by humans. That is a really important part to it as well. When we look over evolutionary time, it has been more of a natural process, whereas what we are talking about here is a rapid escalation in the movement of species by humans.

**Q27 Neil Carmichael:** It is the impact on humans as well as the function of humans in dealing with these that we should be considering as well, Carrie?

**Carrie Hume:** I was going to say, I have in front of me the definition and it does currently include human health and economy, so it takes into account every way in which

invasive species can impact the environment, ourselves, the way we live. It is worth saying that the regulation also currently has a clause in it excluding species that are expanding through natural means. That is recognised, that those are a separate issue.

**Dr Spencer:** We had a conversation about this concept of natural means and I think one of the things I feel is interesting and probably concerning is how we define natural means as we move into the future. Increasingly, environmental change impacts—certainly I suspect ourselves on the panel here would agree—are caused by human activity, so when do you define a difference between natural and human mediated range shifts? That is probably going to become harder in the future, but I would certainly agree with the definition of things as stand. It may need to become more nuanced as we move into the future in how we respond to it. The critical thing is that we respond to an emerging threat to do with our biodiversity and human well-being and economic well-being.

**Q28 Neil Carmichael:** Last year, I took to Parliament the Antarctic Act and one of its measures was actually to control what goes to the Antarctic to protect what is already there. It is pretty easy to do that, certainly in comparison to any other continent, because clearly not many people go and those that do are well-prepared for the cold weather and difficult conditions. Certainly, that would include, almost as a sort of afterthought, the fact that you were not going to be taking anything else. That raises the question, does it not, how you apply that logic to continents that are less easy to deal with? Does anyone have any thoughts?

**Dr Shaw:** We have a huge advantage being an island, compared to the rest of Europe, which has a real challenge with an almost completely open border surrounded by many other countries. The issue is much more acutely felt there. We can do rather more, much as New Zealand and Australia have shown, to protect our borders; as they describe it, the Border Protection Service.

**Q29 Neil Carmichael:** In summary then, you appear to be happy with the EU definition, but you probably think more needs to be done to make it work.

**Dr Shaw:** Absolutely.

**Carrie Hume:** The proof is always in the delivery.

**Dr Roy:** Yes, exactly, that is the thing. One aspect that I think is extremely important is that we do need to collaborate across Europe. This is not something we can stand alone and work on in isolation. It involves us having communication across Europe. We needed to know that the Asian hornet had spread extremely rapidly through France so that we could put in place contingency plans here in Great Britain. Anything that enhances that communication and that sharing of information as rapidly as possible has to be a good thing. I agree that we have to see that the proof is in the delivery.

**Neil Carmichael:** Okay, thank you.

**Q30 Mark Lazarowicz:** Just as a matter of interest, the Asian hornet, which is spreading from France and we expect will arrive here any time, I suppose, I know it obviously varies from species to species, but what has been the speed of movement toward the UK from across France? How rapidly can things become a threat or become seen as a threat?

**Dr Roy:** They can very, very rapidly spread and it is quite remarkable when you think of a small insect and you think how rapidly a small insect can spread, both through its own flight processes and by being caught in wind currents, for instance, but also through further human movement. Once it has arrived within a country, there can be activities of humans that

then move it rapidly through the country. It has been only a few years since it arrived in France. It has swept up to the north of France and there have been the first records in Belgium as well already. As Richard said, we are an island nation, so we do have the sea that these things have to hop across, but just as a parallel example, the harlequin ladybird that arrived in 2003/04 into Britain from France, it then spread at 100 kilometres per year once it was here. When you think this is a small insect of about six to eight millimetres in length, that is a phenomenally rapid spread.

**Q31 Mark Lazarowicz:** Okay, thanks for that. Just to go back then, my principal question was to pursue in more detail this EU regulation. I understand that the regulation is going to cap the European-wide list of species of concern of 50 species. We are also told that the Commission has estimated that there are 12,000 alien species established across Europe, of which 10 to 15% are invasive, which works out at about 1,500, according to my calculations. A cap of 50, first of all, is that going to make a difference? Is there a sense in having a cap or should we just say, “These are the most threatening species around” and you have to decide how many, be it 10, 100 or whatever?

**Dr Shaw:** I can answer that, with some relief. I was at the Commission, the European Parliament on Monday and the 50 cap is dead. I am almost certain that is the end of it. There was wide condemnation of it as a concept from the Commission to the Parliament, to the committees that report to it, so I would not stake my life on it, but my reputation. I think the 50 cap is gone.

**Carrie Hume:** What is not important is the number we end up with; it is the process we go through in order to identify the priority species. We very strongly feel a cap is very undermining and that the species we home in on and decide are of EU concern should be prioritised through a risk assessment process.

**Dr Roy:** I am excited to report that I am leading a project for the European Commission in terms of evaluating those risk assessment processes to come up with a list of minimum standards that those risk assessments must meet in order for a species to be deemed robustly and rigorously tested to appear on this list. That is working with 10 other collaborating organisations around Europe, so it is tremendously exciting that we have this part to play in that process.

**Q32 Mark Lazarowicz:** Thanks for the iteration, because you have updated what we knew today, so that is helpful to us in terms of our brief, but in that case perhaps I can take it further and ask something else. Can you tell me how this EU regulation is going to work, in the sense that clearly what is native and non-invasive to one part of the EU will not be in another part of the EU, what is native to Cyprus, Malta, Romania will not be the same as Britain, Ireland, Finland? First of all, is this going to be an EU-wide list of species? In which case, is it not going to miss what could be important threats to certain parts of Europe or is it going to be something different? Can you give us more information on your current state of thinking?

**Dr Shaw:** I can describe my take on the meeting I was at where I believe the European Parliament, Commission, whatever you call it, is restricted in what they can do. I think they do need to have a Europe-wide approach, which is a weakness, a huge weakness, not just because of species that are native in other parts of Europe. Rhododendron is a perfect example, although it is a hybrid. They kept talking about water hyacinth. It was a good example, but they used the example of irresponsible British tourists with homes in Spain releasing water hyacinth into the rivers. I do not think there was any proof to that, but that

was an example they were using, but it kept being repeated as an interesting example. There is an example where a country like Spain would certainly want to have water hyacinth on the list, but some parts of the British society may not want it on the list because it is a beautiful plant and it dies in the winter, so it is not a threat at present. It is going to be something that will be in the debate from now on and I worry that they will not be able to include it. My real fear is that if it is not on the list, however long the list may be, there is no obligation to do anything. There is a lot of talk about collaboration and working together and having longer lists than other countries and a longer list than the list that is on the list, but the worry is that if it is not on the list, you do not have to do anything. Therefore, that is probably the Achilles heel of the whole system.

**Dr Roy:** I was going to just add that I think it is still really important that within Britain we still carry out the absolute best practice that we possibly can, that we are not necessarily limited by the EU regulation; that we still use the best of our legislation—I am not a legislation expert—and our best practices to ensure that we deliver the best for Britain with respect to the invasive alien species.

**Carrie Hume:** I was just going to add to that that killer shrimp and demon shrimp and friends are all examples of these that originate from Eastern Europe. They came into this country a couple of years ago. We are very much in favour of invasive natives being on the one list. I cannot imagine that in the future, if those species arrive here, that our own country will not act to address those.

**Q33 Mark Lazarowicz:** That relates to the last question that I was going to pursue, which was having a list, is there a danger that it becomes something that then narrows down the possibility of change when those future threats are developing? Is there a danger your list of not 50, but however many there are, then become the ones you deal with? How far will this take into account new threats, new developments?

**Dr Stringer:** I think it is very important that any list, whether it be white, black and the other forms of listing, are iterative and need to be designed in such a way that developments in knowledge and information can be added and responded to rapidly. A list that will only be updated once every 20 years, for example, is not going to be very helpful. We need to have a list that is dynamic, whatever the philosophy behind the list is. Particularly going back to climate change and environmental change, a species that, for example, could be relatively sedate in south-east Europe as a native species can be grown again, for example, or kept in houses as a pet, for example, in southern England may not be harmful at the moment, but a shift in the environmental parameters could change its potential in the future. We need to have a list that shifts.

**Dr Roy:** My understanding from the European Commission in relation to this project that we are working on with regard to the minimum standards of risk assessment is that the list will be dynamic. There will be a committee for updating that list and doing so in a rigorous and scientific manner.

**Dr Bayliss:** If I could just say, I agree with what has been said and I just wanted to reiterate what Helen had mentioned about the fact that if they do have this European list, we have great work being done in this country to make sure that it does not take away from rapid responses to emerging threats here, because as you rightly said, there is a good chance that it will not take into account the pests that are necessarily the most pressing for us if they are already present within Europe and even considered native. For example, the oak processionary moth, we have been trying to manage that here, but it is considered native in quite a lot of Europe, even though it is believed to be expanding its range, associated with

climate change. Species like that may not be necessarily picked up, but they are still species that are of serious concern for us here. We need to make sure we have a way of keeping up action on those emerging threats that are national level as well as an EU level.

**Q34 Dr Whitehead:** If you visit the bottom of my garden, you can probably find most of the existing invasive species in the UK, but in terms of those that we are talking about that might arrive, have not arrived, are on the horizon—and clearly we have identified a number of difficulties in that respect—what would you see would be the most effective surveillance routes for invasive species? Would there be different surveillance routes for different species? I imagine there is a big difference between accidental introduction of species, but nevertheless presumably surveillance for that and practices that might continue to pretty deliberately implant species to the UK.

**Dr Roy:** We already have surveillance strategies in place linking with the Non-invasive Species Secretariat again through the GB non-native species information portal. These include, for instance, an online recording system through something called iRecord, which allows for somebody to record any non-native species they see at all and we also have a number of online forms for specific species such as the Asian hornet. There is also an email address whereby people can report sightings of concern. There is a way in which everyone in the country can have a responsibility for being aware of the threat posed by some of these new species arriving.

However, there are other times where a targeted campaign is really very useful as well, for example, with the Asian hornet, ensuring that the bee-keepers are really very aware of the species and that they are very vigorously engaged in surveillance for that particular species. It might be that with a freshwater species the angling community would have a bigger part to play in that regard. Of course, there still are some other species that are not easily recognisable by members of the public, and then there is a need for the professional surveillance to be undertaken as well. We need a multi-stranded approach, but we have very good systems in place for dealing with the data very rapidly coming in. We just need to ensure that the awareness is raised among all the people who can play a part in that surveillance and monitoring.

**Q35 Dr Whitehead:** That I guess might place the emphasis almost on crowd-sourcing of surveillance groups, but the EU regulations or likely EU regulations are going to, are they not, specify particular priority pathways such as ships' ballasts?

**Dr Roy:** Yes, absolutely. As I mentioned, there are many ways in which we can go about the surveillance and we can go about the early detection of the species, and indeed the prevention of their arrival in the first place. For example, with the shipping and the ballast water side of things, there are activities that they can ensure take place to reduce the risks associated with ballast water, for instance. We need to have lots of different approaches to the surveillance and monitoring and we need to make sure that the data that we gather is shared very effectively among all the people who need to know about that information so that they can act accordingly.

**Dr Stringer:** Certainly we would agree at the Natural History Museum that engaging the public in terms of observing and recording and monitoring is incredibly important for organisms that you can identify visually, for example. Many organisms are frankly far more complex than that and require significant training and experience. I am sure many of you have heard the term taxonomic impediment or something similar, which is the need for skilled taxonomists and people who understand a particular group. The group of organisms

that I am very concerned about, phytophthoras, which are a fungal group of organisms, very serious plant pests causing major problems, with many non-native species in there, they need very dedicated skills, services and laboratories to do identification work on these groups of organisms.

We also need to be able to hold on to the material we collect. With emerging non-native species or plant diseases, for example, we need to be able to collect those objects, not only the observation, but the object. We know that many species, when they come from their home territory into a new environment, they rapidly evolve. Vouchering a new pathogen, plant pest or invasive species when it comes into our landscape is very important because it is those early collections that can help us understand how these organisms are responding to our environment.

**Dr Roy:** I think that we are tremendously lucky in Britain with our legacy of wildlife recording, people recording plants for hundreds and hundreds of years, and still this recording activity across many, many different taxonomic groups. It is still going on. We have these so-called amateur experts who are out there as volunteers gathering information on just about any wildlife you could possibly imagine. We have to remember that when we are thinking about people engaged in surveillance and monitoring, a large number of them do have phenomenal taxonomic expertise and we really should support and nurture them in this process too.

**Q36 Dr Whitehead:** I understand from that that probably therefore in terms of unspotted colonies of whatever somewhere that have been secretly breeding away and nobody knows until it is too late, that is not really an issue as far as the UK is concerned. I am sorry to put it like that, but you would feel reasonably confident that in terms of, as it were, what is going on post-landing—

**Dr Roy:** I would say we cannot be complacent, that we have to raise awareness and we have to ensure that surveillance and monitoring is the best we possibly can do. What I was saying was that in comparison to many other countries we are in a fantastic position to be able to do that. I would not go so far as to say we would be unlikely to miss something. We still might miss something, but we are in a much better position than many, many other countries. We are probably in the best position worldwide with respect to our wildlife experts.

**Dr Bayliss:** If I could just say that I know it was in the media a lot at the time, but when the Chalara ash dieback was found, it was not until people started looking for it that they then realised it was there. In that particular instance, I think it was a case that once people knew to look, it was there, they were able to find it. A lot of invasive species, when you are talking about plants and animals in particular, they are a lot easier to spot than a tree or plant disease. There are great existing networks that are out there and are monitoring sites looking at particular species or habitats, they are a really valuable tool to tap into for those sort of organisms.

**Q37 Dr Whitehead:** When we talk about species that might land—we have talked about the Asian hornet—but have not landed yet, but may then indeed change their behaviour quite rapidly once they have landed, what sort of scoping is there for species that might look like that were they to come to the UK? Is there a sort of horizon scanning process going on or should there be, if there is not?

**Dr Roy:** Yes, so last year we carried out a horizon-scanning exercise on behalf of Defra where we gathered experts across taxonomic groups to take a collaborative approach, a

consensus workshop where we used both expert opinion and published peer-reviewed evidence to come up with a horizon-scanning list. That activity is going on and has gone on before that. That was just a new method that we tried. It was tremendously successful in terms of coming up with a list that we all felt was a rigorous list. There were 96 species on that list at the end of it. There were 30 that we put into a very high category of probability of arrival, establishment and then biodiversity impact, so there is activity going on and there are some good established methods for doing that.

Again, just as we talked about with this list for the EU regulation, it is an activity that we need to repeat. We cannot just do it and then that is it, we have the list. We have to keep reviewing it and repeating that exercise.

**Q38 Dr Whitehead:** In terms of that horizon scanning, you have mentioned 96 species. Is there any sort of read-across where people returning from holiday might be informed that they are carrying such species on their sandals and they ought to be aware or whatever?

**Dr Roy:** Yes, we did have a look at the pathways that we anticipate these species arriving on. We also looked at the origin of those species. Historically, many of the non-native species that arrived in Britain have been from European origin and then arrived in Britain. We are seeing an increasing trend for species to be arriving from much further afield in recent years, so Asian species coming into Britain. It is two-way traffic as well. We are handing out species too, but they are travelling much longer distances, so we have looked at that aspect. With respect to the pathways, many of the species that we highlighted would come in as stowaways and that is really quite a tricky pathway to deal with, in a sense. It is not necessarily one that can easily be tackled, but nevertheless, just because we think that at the moment, we should embrace a challenge and think about how we are going to do better at that.

**Dr Shaw:** One of the weaknesses of the system is that we are very good at working with recidivists, species that have misbehaved elsewhere. That is the only real guarantee that you have a potential invader, it has misbehaved in the same ecoclimatic range. When you come to trying to predict species that you know very little about, you are in a much weaker position. I work in biological control and we worked on one of the worst weeds in New Zealand. It took us three years to find it in its native range, and when we found it, it was a tiny population and you would never have predicted it would have been an invasive species. There is a big gap in the system and we cannot overcome that. That is just a scientific thing. I would suggest, just to stir things up a bit, Japanese knotweed would have passed a pest risk analysis 100 years after its arrival because it does not set seed, it does not spread by seed. How can it possibly become invasive, based on the knowledge that we had, the published knowledge at the time? There are all the sleeper weeds, the potential future invaders and the things that we know nothing about that could be invasive. That is my doom and gloom scenario of, “We know a lot, but we do not know a lot”.

**Q39 Simon Wright:** I wanted to come on to the risk assessments that are used in Britain for identifying invasive species. Is there sufficient evidence available to adequately inform those risk assessments of potential invasive species?

**Dr Shaw:** For most, yes, but I would pass on to Helen because she has been doing a lot of the risk assessment stuff, but I would say that for most of them, there is.

**Dr Roy:** I think we constantly want more information, as scientists. We are never satisfied. We always want to have more and more empirical evidence. There are some

taxonomic groups where we know that we have knowledge gaps. For example, terrestrial invertebrates, we have highlighted a number of exercises. We just need to know more about them. We need to get a better understanding of them, but we do have a great risk assessment method for Great Britain. I am looking forward to working with countries across Europe to look at other risk assessments and deriving this list of minimum standards that will be hopefully used for the EU regulation.

**Q40 Simon Wright:** To what extent does listing rely on subjective judgments when hard data is not there and what problems might that lead to?

**Dr Stringer:** I have done several PRAs, pest risk assessments, myself on behalf of Government agencies and it is true that sometimes there is not available published peer-reviewed scientific evidence. Sometimes you have to rely upon your expert opinion, the knowledge and experience of other people in your field and practitioners on the ground, those amateur natural historians, for example, we have been talking about, and grey literature. Yes, scientists always want more money to do more research, definitely, and with the current scenario, we probably need to more bravely embrace using grey literature and expert opinion.

The genus phytophthora is a good example where there are many of these fungal organisms evolving in the world at the moment because of human activity in landscapes. They are turning up very, very rapidly. Phytophthora has a very, very bad track record, we know that already. Nearly every time a new species turns up in a new environment, it does bad things, therefore if you have a PRA for two or three other phytophthora species, on the balance of probability and looking at risk factors and knowledge and experience and grey literature, we should probably consider moving to a more rapid response as opposed to going through a full risk assessment process, which may lose us the time we need to deal quickly.

**Dr Bayliss:** Also, I agree entirely that we need to embrace some of the grey literature, because for some species that is all we have, and for some species all we have is the expert opinion. We are also giving a lot of thought to uncertainty so that we can begin to assess species, give it a particular category, but alongside that declare the uncertainty surrounding that score. That is the transparency, if you like, of the scientific process and we are always going to have a level of uncertainty with respect to these risk assessment processes. We are getting better in our thinking about how we communicate that level of uncertainty.

**Q41 Simon Wright:** If the listing of an evasive species was not justified, would it ever be possible to know that that listing was unnecessary?

**Dr Shaw:** Do you mean if it was successful in preventing it arriving?

**Simon Wright:** We do not know whether or not—

**Dr Shaw:** A lot of risk assessments are done on species that are already here, so time would tell would be the answer to that, whether you need to be vigilant in its rate of expansion, for example. We are straying into the precautionary principle here.

**Q42 Simon Wright:** Yes, indeed, and to what extent does that apply, precaution?

**Dr Shaw:** Yes, and whitelists and blacklists. Should you be excluding everything you have a remote suspicion about and just accepting the things that are proven to be benign? Obviously from a biosecurity standpoint, you should, but in reality, that would probably end the trade and activities too much, but there are examples where species have behaved

themselves very well for a long time and then become invasive. Yes, it is a balance. I am not sure I can give the complete answer on that.

I do not think there are any cases I can imagine where anyone has pointed to it being a mistake to have banned anything or to have imposed a restriction.

**Dr Bayliss:** Often this is not done by one individual, it is a panel of people, it is a panel of experts and it is that consensus of the expert opinion that leads to the conclusion and draws in all the empirical evidence they can possibly find. It is a very, very thorough process within the GB structure.

**Q43 Mark Lazarowicz:** You were saying earlier that scientists always want more money to do research and that is obviously the case, but we also heard about how our system is pretty good compared with many countries in the world, but Australia and New Zealand are much more developed in the system. In terms of spending on research, how do we compare, for example, with the best in the world and Australia and New Zealand in terms of our biosecurity research, if you can tell us?

**Dr Shaw:** I can tell you what we spend. Based on our assessment, it was £17 million on research which is 0.7 of 1% of the cost of invasive species, so not a lot. I cannot tell you New Zealand, but it would be fairly straightforward to find out and I can volunteer to try to find that out. I suspect it would be significantly less than New Zealand and Australia spend on biosecurity. That is pretty much a given.

**Q44 Dr Offord:** I wanted to ask what the most cost-effective approach to eradicating already established invasive species in this country was.

**Dr Shaw:** Can I just challenge the question to say that “eradication” is not the word I would use. Once a species is established and beyond the bounds of sensible eradication, which is often once you have finished the process of assessing it, it is always out of bounds, then the only sustainable solution is to implement biological control if it is proved to be safe and long term enough. I am always keen to avoid the word “eradication” because it is an incredibly difficult thing to achieve. I know someone who saw hydrocotyle ranunculoides, floating pennywort, in a river in Cornwall and instead of reporting it, they just pulled it out and burnt it and they said, “I have eradicated hydrocotyle from Cornwall”. That is exactly what should have been done and had it gone into the process—this thing can travel 20 kilometres and fill a whole canal in a season—I think it would have been beyond eradication, so early intervention is crucial if you do want to achieve eradication. Once things go beyond that, then we are talking about control and containment and not eradication.

**Q45 Dr Offord:** What can we learn from overseas countries about the early identification and eradication of invasive species before they get to this stage you have described?

**Dr Spencer:** We are already doing it ourselves in this country. I sit on a panel in London, London Invasive Species Initiative, and we are using a model that is used very much in Australia and New Zealand whereby we are going out and prioritising what we consider to be risks in the London area. On the eradication question, there is a non-native grass called Johnson grass, which is a very, serious invasive pest internationally, one of the worst. We have one established colony in the London area and we came together with the relevant landowners and community people, with the contractors, and we went in there and we have eradicated it. We do not know how much that saved the British economy but it may

well be very significant because this is a plant which causes hundreds of millions of dollars worth of damage internationally, easily. By removing it from the Regent's Canal in Central London and sending out a message that we need to just, in this particular case, stamp on it as soon as we see it in the British landscape, we could save ourselves a huge amount of money.

**Carrie Hume:** I would just like to add an example which is the Ruddy duck. It just goes to show that the cost effectiveness of whatever approach you are going to take is very different dependent on species and on its level of invasion. Ruddy duck is an American species that unfortunately escaped into the wild and started breeding in the UK in the 1950s and 1960s and reached a population of 6,000 birds. The reason this was a problem is because it hybridises with the White-headed duck, which is a globally threatened species, and it is one of the best examples worldwide for eradicating a species because of its pure biodiversity impact. We have spent a fair bit of money in this country addressing Ruddy duck. We have spent £5 million so far. It will be a successful eradication despite the fact we had already reached a population of 6,000 birds. There are some important lessons from that. Ideally, we would have addressed the Ruddy duck problem a lot earlier and we would have saved a lot of money, but nonetheless we were sure we could do it, so it was cost effective.

The lessons from that, talking to my colleague who was involved with some of the primary research, is that you need to ensure you have the money to see it through because some of these eradication programmes do take decades. It needs to be relevant to the threat, so here in this example you are talking about the probable extinction of the globally threatened White-headed duck because of the Ruddy duck, which in its native area is populous—it is not threatened in its home country.

I think also with the Ruddy duck, because it had already reached a population of 6,000, we needed a phased approach in that instance. We needed to trial the efficacy of culling, for example, whether culling is the right approach. We needed to take a regional approach and then assess whether it is likely to be effective and then go forward with the full eradication programme. Also with the Ruddy duck, it is a very good example of where we can undertake domestic eradication, but that would be undermined if the rest of Europe did not also address Ruddy duck. There are reservoirs in Belgium and France, for example, in private collections that may or may not escape and reinvade, so it is another good example of where we need that pan-EU approach.

**Q46 Dr Offord:** I think we should certainly thank you and congratulate you on the initiatives that address those kinds of problems. The cost effectiveness of this approach has been to rely upon conservation groups such as what you have described. Will there be enough with certain species to keep them either controlled, if possible, and in some examples, eradicate them?

**Carrie Hume:** Using Ruddy duck as an example, that was a really strong partnership between Government and RSB and WWT and the costs, certainly from Government, supported the life grant of around £5 million, but we think the total contribution we made in staff time and in kind terms was probably more like £10 million. It is quite substantial. You have questioned whether that is sustainable.

**Q47 Dr Offord:** Yes, exactly, sustainable. The question I am asking is does the Government need to do more? Does Defra need to be more involved, provide more resources, provide more effective—

**Carrie Hume:** I think this is why we just need a more strategic plan of what we are going to address and in what way and who the key stakeholders are. I think we are a little way from that at the moment because then we all have that clear picture of what are our total resources as a sector to address this. I think we are a little way from that.

**Dr Bayliss:** If I could just add that the earlier down the invasion pathway that a species can be targeted, then the more cost effective the management is likely to be, providing we have an effective response. If we can prevent things coming in, then that is obviously going to be the best option, but then as it arises, depending on how it is coming in, there will be different agencies and, as Carrie mentioned, different stakeholders involved at different stages. Some of those may be, for example, the border force coming into contact with things as they are coming to do their inspections. It may be there are a lot of different points at which different agencies and different organisations can come into contact with species as they are travelling along their pathway, if that makes sense. Ideally, the thing is to try to stop them before we get to the stage where there is going to have to be widespread action by a large number of conservation organisations because they are already quite widespread in their natural environment, and try to reach them while they are still quite contained, as Dick said, about the early rapid response when they are detected, and try to tackle them as soon as possible to prevent them becoming a problem.

**Dr Roy:** I think it is easy to be overwhelmed by the sheer numbers we are talking about and it is very important that we are not overwhelmed. We do, as the others have mentioned, take a strategic response and continue to think of innovative methods by which we can deal with these species as they arrive. I think that is an extremely important way forward.

**Dr Shaw:** As far as the investment is concerned, the Non-native Species Secretariat I think is two and a half people. It is pretty remarkable we are where we are with that limited resource, so whether the strategy investment could be higher, of course it could be higher.

**Dr Roy:** Yes. As we said at the very beginning, the Non-native Species Secretariat is extremely effective in their co-ordination of the non-native species strategy across Great Britain.

**Q48 Zac Goldsmith:** Catching them early obviously would save a great deal of money and the oak processionary moth was an example of where we did not act quickly enough or boldly enough. The effect is that the cost each year of just containing it is about what it probably would have cost in the first year or two to eradicate it, or at least would have given a chance of doing it. One of the reasons for that, as I understand it, is that while there is an obligation on homeowners to report oak processionary moths if they see them in their gardens, they are then also obliged to pay for the eradication that is necessary afterwards. The effect is that there were plenty of people who did not feel they could afford those costs who therefore probably—we do not really know this, but one assumes—did not report the problem in the first place. I understand that has changed recently and now the full cost of eradication is taken on, one way or another, by the Government, which I think is a good thing. Is this an issue, is that a flaw in our approach that applies across the board or is that something that has crossed your radar?

**Dr Bayliss:** I think that part of the problem with the oak processionary moth example, given it is in London and there is a huge range of different property owners and a lot of tenanted properties where the residents do not know or care what is going on in the property and would not even think to notify anyone, because they maybe think it is not their responsibility, I am sure that has played a part in it.

Then the outbreak of the Asian longhorn beetle in Kent was a contrasting response where they went in and they did pay to carry out the works and cut down the trees. Hopefully that has been a successful thing and I think the resources—

**Q49 Zac Goldsmith:** Sorry to interrupt. Does that mean it is a species by species thing? Why was it the case then with the oak processionary moth that the costs were landed on the homes of the homeowner, whereas in the case of the Longhorn beetle it was paid for by the authorities? Is it done on a species by species basis? Who decides these things?

**Dr Bayliss:** I am not sure why there was that difference within those two examples. I think with the Asian longhorn beetle, it was still quite confined and they felt if they went in and took immediate action, there was the chance of getting rid of it. I am not sure why these different decisions are made, but I think if the resources are there to carry out actions to eradicate, it would probably increase the chances of success of eradications in the future.

**Q50 Dr Offord:** What evidence has been collated from previous eradications or even controls on various species that ensures we have the knowledge so in the future we are able to completely eradicate other species? Is there a formal mechanism for collecting that information?

**Dr Bayliss:** I do not think there is, but I know there are some attempts being made to evaluate some outbreaks but a lot of the ones you see, for example, Defra have provided details but they are still ongoing, and I think it is really crucial that in the future these projects are evaluated so we can learn from them and so that lessons as to what works and what hinders, eradication attempts can then be used to inform future management interventions.

**Q51 Dr Offord:** My final question very quickly will be that if—and I take away from this that this is unlikely to happen—you have landscape or an environment where an invasive species has taken hold and it has been eradicated, how would the landowner or person responsible gain advice upon the return of it to its previous condition before that species, variety and whatever was there?

**Dr Spencer:** That is not something that is being addressed. As far as I am aware, I think the reality is that often, apart from real emergencies like the two weeks we had with the insects, with plant, an invasive species or on landscape level, say Himalayan balsam, eradication is often done with a complex network of voluntary bodies, wildlife trusts, landowners, the environment agency and usually often because of the funding parameters and the capacity issues for all of those bodies and the people involved, once a project has been completed, whether successfully or not, probably—to put it crudely—that is the end. The reality is there, it is a different pot of money in terms of habitat restoration, which is what you are talking about, so it jumps into another area. In essence, we tend to go, “That is done. What a relief”.

**Dr Shaw:** Fortunately, Defra have been funding a biocontrol programme against the Himalayan balsam under the water framework directive funding pot and we have a rust

that might well be released fairly soon, so that overcomes the landownership and network system. It also acts in a slower way, so you do not have this scorched earth approach to invasive species management, a slower approach allowing natives to compete on a better footing. That is the long-term goal, but we can learn a lot, to address your first question, from other countries that have control and restoration programmes together. We are probably a little behind that at this point.

**Q52 Chair:** Dr Shaw, just before we move on to some further questions from Zac Goldsmith, can I just ask you in terms of the evidence you gave us, in terms of the emphasis on the whole kind of prevention aspect of it, I think you were quite critical of Defra, a little bit critical, perhaps suggesting there was too much emphasis on prevention when, if there was a shipment that came in, nothing could be done to prevent huge benefits from that. Would you like to tell us a little bit more about where you think the balance should be in terms of Government attention and funding of different aspects of this?

**Dr Shaw:** I did not intend to come across critically. It is a temptation for all Governments to ignore the elephant in the room of the big invaders that seem to be out of control. Far from criticising Defra, they have been visionary in Europe, funding biological control programmes which address that large-scale invader that no one else can consider and most of Europe does not even understand the concept of biological control, so I should say they are visionary.

They are limited in budget and everyone agrees the best bang for your buck is to prevent and then early eradicate. It is the CBD, the hierarchy of intervention, so it is a sensible, economic thing to do. I guess I am also thinking from the public's perception, what they want to see, and this is my fear of the list. If the big names, the big invaders that everyone knows about do not end up on this list, then I think it will undermine credibility as far as any policy that is imposed. If you have an alert system where someone says, "I have just found this shocking invader in my garden. What are you going to do about it?" and nothing happens, there is an issue. You do need to be funding the full gamut of interventions. If you look at the big figure, the £12 billion that Europe talks about or the £1.7 billion we talk about, it is made up of the big names that are already here and already prevalent and already having a massive impact. We avoid them at your peril and there are more coming.

As to the balance, I would like to see more going towards the established species in Europe, not just the UK.

**Q53 Zac Goldsmith:** It is an issue you have already raised, Doctor Shaw, so I will be brief. I want to get back to this issue of the blacklisting trade and it would be useful to know whether or not you think the blacklisting approach is enough to minimise the risk of new invasive species coming in.

**Dr Shaw:** No.

**Q54 Zac Goldsmith:** Okay. A few questions ago, you touched on whitelisting as maybe an idealistic alternative but what is unrealistic about having a whitelisting approach?

**Dr Shaw:** To be credible, a whitelisting approach requires significant investment upfront to screen—a rapid screen albeit—species that are either already present or what needs to be introduced to say that they look to be safe, or they have been proven to be safe. It would require significant investment because there will be a lot of people wanting their species on that list to facilitate trade and everything else. Other countries have achieved it to some extent but—

**Q55 Zac Goldsmith:** What, the way it is being approached? Who has a whitelist?

**Dr Shaw:** I think Belgium has a whitelisting approach.

**Q56 Zac Goldsmith:** Has New Zealand or Australia? Do they have the same approach?

**Dr Shaw:** Effectively everything, yes. Everything is banned effectively until it has been proven.

**Zac Goldsmith:** Until it is proven to be okay.

**Dr Shaw:** Treated much the same as chemicals, I would imagine. That is your ideal goal. Blacklisting is inherently slow in that you have to go through the whole PRA process which, at the moment, is a slow process and it can only be limited to a certain number of species and it takes a long time for them to get on the list. You can still trade all the plants on that list that we all know have been shocking invaders forever, until April this year. They are still for sale right now.

**Q57 Zac Goldsmith:** With the blacklisting system, could you make it workable or is it necessarily always going to fall short of the ideal that is used in Australia and New Zealand and so on?

**Dr Shaw:** It will never be perfect. The blacklisting could be considerably longer. For plants, it is allowed to be extremely shortlisted. You have more experience on this.

**Carrie Hume:** I was just going to say, I do not think you necessarily need to have a black or a whitelist. You can have greys in the middle, so you can have a black list covering all of the baddies you know about and yes, you could beef that up so it is more rapidly updated, for example. You can also have a whitelist at the same time for certain groups you happen to know more about, for example, some aquatic plants. You could have a whitelist approach for those as well as a blacklist, although some obviously do not like the complication of having multiple lists. You are probably aware that Scotland has both, in effect, a black and a whitelist, so it has a blacklist, a possibility for a blacklist for the known baddies whilst having a whitelist just on release, which is different from sales, so you can have a bit of both.

**Q58 Zac Goldsmith:** The term greenlisting has been used in some of the evidence we have had. Is that what you mean by greenlisting? You are having grading of plants so they are okay, they are low risk, they are dangerous and so on.

**Carrie Hume:** Yes, I think so.

**Q59 Zac Goldsmith:** Is that what is meant by a greenlist?

**Dr Bayliss:** The greenlist I think is the list of species that are suggested because they are perceived as being the lowest harm to use.

**Q60 Zac Goldsmith:** Suggested to whom? To horticulturists?

**Dr Bayliss:** To people to plant out into a certain make of the wider environment for landscaping or whatever, not necessarily the ones that people would choose to put into their back gardens where they might still want to choose some of the more exotic species.

**Q61 Zac Goldsmith:** So a greenlist would be a guide for people making choices as consumers?

**Dr Bayliss:** The other end of the spectrum almost.

**Q62 Zac Goldsmith:** Yes. They are not mutually exclusive. More or the less, the point you were just making, you can have your greenlist, which is an advisory thing, but you still need a more robust approach in terms of the point of entry. I am just seeing where the difference is—your view is you can have, whether you call it a black or a whitelist, an approach which is based on the blacklist, but which is more robust, and which puts sufficient filters there to prevent—

**Carrie Hume:** Absolutely, because the five species that are finally, after seven years, to be banned in this country, this April, there is no indication of when that list will be reviewed. We can think of half a dozen other species that could go on that blacklist now and there is no process for those to be considered.

**Q63 Zac Goldsmith:** What is it? Can you describe that process? If there was a new threat that the experts identified, what would need to happen in order for that species to find itself on the blacklist?

**Carrie Hume:** What has happened historically is there was a consultation whereby stakeholders could come forward with evidence as to which species merited a blacklisting approach. Then we had several years of a black hole, not really knowing what was happening even though the provision was made to allow it to happen. So for many years, we did not hear and then I understand there are a number of committees that have to approve whether or not there is a ban on sale because of the likely implications or sometimes implications for trade. That seems to be a rather closed process. I do not have a complete insight into how those committees assessed whether those species merited banning or not, or whether they took on board all of the full evidence or not. I do not know what the process is. It is not clear and it is not clear what it should be moving forward either.

**Q64 Zac Goldsmith:** Just going back to the point about the whitelisting, I understand the point you are making in terms of how cumbersome and complicated and difficult that might be. Could you not start with a very generous whitelist which encapsulates more or less everything that is currently available but which we do not yet know is dangerous with a view to shrinking that whitelist over time, so you come at it almost from the opposite end? You are not going to start in a worse position than we are currently with a black list because those blacklisted species would not be on the whitelist but the ideal would be that you move in a general direction. I do not understand why that would be so hard to achieve, why it is unworkable.

**Dr Shaw:** It probably depends on who the obligation is upon to prove whitelisting status. You would assume the importer would be the person or the seller would be the person that has to show this is justifiably on a whitelist because it has been in horticulture for 150 years and has never escaped or invaded. There are lists already that some researchers have put together of species that have been in—Mark has been involved in this as well—that are benign.

**Q65 Zac Goldsmith:** To your point about it being unworkable, if you had a system whose goal is to have a genuine precautionary principle but where the starting point is where you are much more willing to give the benefit of the doubt to those species which have been here for a long time until they prove themselves to be, that would deal with the issue of unworkability, surely.

**Dr Shaw:** It would. I guess my unworkable comment was what the reality is, what trade and resistance would be.

**Q66 Zac Goldsmith:** You are talking about the politics of it. In terms of the practicalities—

**Dr Shaw:** I am sorry. I should be giving weight to it.

**Q67 Zac Goldsmith:** Okay. No, I am not giving criticism. If the issue is politics, not practicalities, you could make it happen.

**Dr Spencer:** Certainly, as Carrie alluded to, our experience of the last few years of any form of listing has been that it has been quite foggy at times in terms of process and species have remained or come on and off the list often for very interesting reasons. Other species have never been on the list because of cultural biases. A species which I find incredibly interesting is *buddleia davidii*, the so-called butterfly bush, has only been in the British Isles as a cultivated plant since the 1890s. It was first found in the wild in the 1920s. It is now one of the most abundant and widespread shrubs known in Britain, in urban and suburban areas. Myself and other people are increasingly concerned about the biodiversity costs of this species, rather counterintuitively as everyone thinks it is the butterfly bush. That species has never, to my knowledge, been on a list and stayed on a list and the reasons for listing or delisting being clearly transparent through the process. I think the matter of process and engagement to engage a stakeholder contribution to the listing is critical, no matter what the philosophy behind the list you use.

**Q68 Zac Goldsmith:** When it comes to putting things on a blacklist or whatever the list is, when it comes to ruling things out, would you also want to see in there an inclusion of processes? For example, you have very, very big, mature trees with huge root balls where the tree itself may be fine, no history of problems at all but where it is impossible to know that the root ball itself is not carrying hundreds of different, dangerous fungi, for example. As a process, would you like to see potentially those kinds of things examined with a view maybe for them to be put on a blacklist as a whole?

**Dr Bayliss:** I think that relates back to the issue of pathways and looking at pathways as a whole rather than at specific species maybe because it is something that I think would be quite difficult to address in the context of the listings. It is a big concern that plants can be moved around with, as you say, these huge root balls that could contain worms, nematodes, fungi, all kinds of different species, beetles and we do not know what is in them and what is being moved around. It is very difficult to do something about that.

Maybe an alternative approach would be to look at the ways in which the plants are transported and say there are certain ways of transporting plants, so if they are brought over without any growing materials attached, maybe they are preferable to importing trees that come with soil or whatever and looking at it from a pathways approach rather than the species planting.

**Q69 Dr Offord:** Do you feel the regulatory powers are sufficient to allow authorities to access land and property in order to control species? I say that in light of the Law Commission, who have recommended to the Government that in England and Wales they adopt the same as in Scotland with the species control orders.

**Dr Bayliss:** I will answer that one. I think the species control orders are something that should be looked at in more detail for replicating elsewhere. There are parallels within the

plant health order. There are the statutory notices that can be served under them and I think it is important to make sure that if we do go for a wider rolling out of species control orders across all the devolved nations that there is the political will and the resources to carry through any actions that arise as a result of those. I think they are definitely worth looking into, particularly in the case of the emergency species control orders where it would then facilitate the rapid response and would overcome problems to do with landowners paying or not wanting to report them, potentially.

**Q70 Dr Offord:** Do you feel there is anything else we could also learn from the Scottish example?

**Dr Bayliss:** I am not sure personally.

**Q71 Chair:** Anybody familiar with that who wishes to comment on the Scottish example?

**Carrie Hume:** There are three great things about the Scottish model. There are the species control orders, there is the obligation on certain groups to notify the authorities if they have certain species, which is something we are missing in this country as well, and thirdly, the Scottish model better embraces the precautionary principle because of this whitelist on release, which we do not currently have in this country. At the moment, we have a poorly communicated schedule 9, which is in effect a blacklist on release, which has never been used to prosecute. I think if we were to at least consider adopting a whitelist, at least on release, we could move forward.

**Q72 Dr Offord:** You mentioned about people not notifying the authorities of species as they discover them. Do you think there needs to be greater clarification as a result of that so people are aware of their legal liabilities?

**Carrie Hume:** Absolutely. I did a straw poll of my neighbours and family as to whether they knew what was on schedule 9, what they should not be allowed to grow in the wild, and absolutely no penetration of that knowledge at all.

**Q73 Dr Whitehead:** Can we return briefly to the post-EU directive, which does not envisage any action on the invasive species that are native in some parts of Europe, but of course not only is the EU expanding, but also includes territories such as Guadelupe and Montserrat and the Azores, with entirely different climates and native conditions. Would a regional strategy perhaps be rather better as far as the invasive species in concerned? I think you have mentioned invasive species in the UK that are native to other parts of Europe, and indeed that is where they first arrived from. Would that be a rather better way of going about dealing with, as it were, free movement of plants in Europe?

**Dr Shaw:** Absolutely. Having a regional approach would address the problem of species. Most species that are native elsewhere in Europe are invasive in other parts. It has been applied and proposed for regulation of biological control agents in glasshouses and the field, where you have two very clear ecoclimatic ranges that could be separated, so it is scientifically appropriate, in my opinion.

The discussions on Monday in the European Parliament were that these species would be covered through geographical co-operation. We will see.

**Q74 Dr Whitehead:** Do you have any understanding what that means?

**Dr Shaw:** I think the assumption is that even if they are not on the list, then it would be sensible to co-operate regionally to ensure protecting collective borders from those

invaders, but I do not see any obligation in the text I have seen that would require that to happen. I fear it may not happen as effectively as it should.

**Q75 Dr Whitehead:** Your view is that the regulation at the moment could be pretty useless?

**Dr Shaw:** In the case of species that are native elsewhere, I think there is a gap, yes, at present. It may well change, as we know. I hope my colleagues agree with that.

**Q76 Mark Lazarowicz:** When you say it may well change, as far as you know, is there ongoing discussion within the European institutions on whether it should be able to cover species which are native in some parts of the EU or not? Do you know that?

**Dr Shaw:** It was a discussion at the meeting and certainly a sticking point, if I was reading the situation correctly, and there are still two more events, if I understand correctly, before the possibility of a plenary reading in April, which is a very tight schedule. What can change at this point, I am not sure. I am not an expert in that field.

**Q77 Chair:** What do you think should come out of that further discussion?

**Dr Shaw:** What do I hope comes out of it? I would hope that they would treat it regionally and I would hope they will address the issue of derogations. I think there is a will by some parties, member states and/or representative trade bodies, that there would be derogations for various things, keeping invasion species in relatively contained environments and the impression I had was that the Commission were definitely against the idea of any derogation, apart from those for scientific research, which I was very pleased to see, but whether that will be supported by Parliament in every other discussion, I do not know. It drives a coach and horses through the strategy. If you have derogations left, right and centre for the various countries to keep things and other countries cannot, it really is pointless, in my opinion.

**Chair:** At that stage, we will draw the proceedings this afternoon to a close. Can I thank each of you for coming along and giving evidence to the Committee? Thank you very much indeed.