OFFICIAL REPORT
AITHISG OIFIGEIL

Rural Affairs, Islands and Natural Environment Committee

Wednesday 17 November 2021

Session 6

The Scottish Parliament
Pàrlamaid na h-Alba

Wednesday 17 November 2021

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RURAL AFFAIRS, ISLANDS AND NATURAL ENVIRONMENT COMMITTEE
11th Meeting 2021, Session 6

CONVENER

*Finlay Carson (Galloway and West Dumfries) (Con)

DEPUTY CONVENER

*Beatrice Wishart (Shetland Islands) (LD)

COMMITTEE MEMBERS

*Karen Adam (Banffshire and Buchan Coast) (SNP)
*Dr Alasdair Allan (Na h-Eileanan an Iar) (SNP)
*Ariane Burgess (Highlands and Islands) (Green)
*Jim Fairlie (Perthshire South and Kinross-shire) (SNP)
*Rachael Hamilton (Ettrick, Roxburgh and Berwickshire) (Con)
*Jenni Minto (Argyll and Bute) (SNP)
*Mercedes Villalba (North East Scotland) (Lab)

*attended

THE FOLLOWING ALSO PARTICIPATED:

Professor Bill Austin (University of St Andrews)
Dr Helaina Black (James Hutton Institute)
Professor Sir Ian Boyd (University of St Andrews)
Professor Rob Brooker (James Hutton Institute)
Judith Brown (Scottish Government)
Susan Davies (Scottish Seabird Centre)
Professor Paul Fernandes (University of Aberdeen)
Mairi Gougeon (Cabinet Secretary for Rural Affairs and Islands)
Joe Kirk (Scottish Government)
Dr Tara Marshall (University of Aberdeen)
Kevin Matheson (Scottish Government)
Professor Marc Metzger (University of Edinburgh)
Professor Pete Smith (University of Aberdeen)
Andrew Voas (Scottish Government)
Keith White (Scottish Government)

CLERK TO THE COMMITTEE

Emma Johnston

LOCATION

The Mary Fairfax Somerville Room (CR2)

Scottish Parliament

Rural Affairs, Islands and Natural Environment Committee

Wednesday 17 November 2021

[The Convener opened the meeting at 09:00]

Animal Welfare (Kept Animals) Bill

The Convener (Finlay Carson): Good morning, and welcome to the 11th meeting in session 6 of the Rural Affairs, Islands and Natural Environment Committee. I remind members who are using electronic devices to switch them to silent mode.

Our first item of business is consideration of the legislative consent memorandum for the Animal Welfare (Kept Animals) Bill. I refer members to papers 1 and 2. I welcome Mairi Gougeon, the Cabinet Secretary for Rural Affairs and Islands, and her officials, who are not joining us remotely but who are certainly remote in that they are at the back of the committee room. I welcome Andrew Voas, the veterinary head of animal welfare, and Keith White, a solicitor, from the Scottish Government. I invite the cabinet secretary to make an opening statement.

The Cabinet Secretary for Rural Affairs and Islands (Mairi Gougeon): Thank you, convener. I am delighted to be before the committee to discuss the LCM, to give effect in Scotland to some of the clauses of the bill.

The bill will make provision for the welfare of certain kept animals that are in, imported into or exported from Great Britain. The Scottish Government proposes legislative consent for the clauses that are related to prohibiting the export of animals for slaughter and fattening, animal welfare and retained direct European Union legislation, and the importation of dogs, cats and ferrets. It also proposes consent on amendments to the licensing of zoos in Great Britain.

The provisions of the bill that do not extend to Scotland relate to the keeping, selling and breeding of primates and the offence of livestock worrying. The Scottish Government has the devolved power to legislate for the welfare of primates through secondary legislation, and the Scottish Parliament has already legislated to improve the protection of livestock in relation to incidents of worrying through its support of the Dogs (Protection of Livestock) (Amendment) (Scotland) Act 2021, which came into force on 5 November.

The Scottish Government recently committed to working with the other United Kingdom Administrations to seek to end the unnecessary long-distance transport of animals for fattening or slaughter outside the UK. The bill provides an opportunity to have consistent control over such exports and to assist enforcement agencies to ensure that such unnecessary movements no longer take place.

The bill makes provision for prohibiting or regulating the movement of animals into Scotland for the purpose of protecting animal welfare or animal health. Committee members will be all too aware that the importation of animals—puppies, in particular—involves widespread suffering and illegality. Puppies are frequently imported with fraudulent paperwork, underage and unvaccinated, before being transported and sold to unsuspecting buyers in Great Britain by dealers who illegally pose as home breeders. Reducing the number of pet animals that can be imported by individuals, along with restrictions on the import of young animals or those in late pregnancy, will significantly help to address those issues. The measures have been called for by many of the main animal welfare organisations, and the Scottish Government supports their introduction.

There are also concerns about the growing number of dogs that are being imported with cropped ears and other unnecessary and cruel mutilations that are not legal in the UK. The bill seeks to address those concerns.

The licensing of zoos has been applied consistently across Great Britain for many years, more recently under the provisions of the Zoo Licensing Act 1981. That consistent approach has worked well to protect animals that are kept in zoos, and I would like that approach to continue.

The proposed amendments to the 1981 act seek to introduce more meaningful conservation, education and research activities for all licensed zoos, through improved standards for modern zoo practice that have been developed by the Zoos Expert Committee. That will greatly improve the knowledge base in relation to many animals and contribute to their future care.

The Scottish Government fully recognises that for the measures in the bill to be successful, it must be introduced consistently across Great Britain to avoid unscrupulous importers and exporters seeking to change their point of entry or exit in an attempt to exploit any inconsistencies between Administrations, which they no doubt would seek to do, considering the high value of puppies and certain breeds of dog.

Consistent legislative measures across GB will also greatly assist when it comes to the interpretation and enforcement of new controls. A

co-ordinated GB-wide approach to tackling the issues that are covered by the bill is widely supported and welcomed by many key stakeholders.

I am strongly of the view that allowing the UK Parliament to legislate for all GB Administrations in those areas is the most timely, efficient and effective way to achieve those important changes.

The Convener: Thank you very much, cabinet secretary. We will move on to questions.

Do you intend to make suggestions on how the bill might be strengthened? A briefing from the Dogs Trust suggests that 97 per cent of owners have three dogs or fewer, but the legislation says that five dogs should be allowed to be imported under the pet owners scheme. Is that appropriate? Do you have any intention of strengthening that provision to ensure that the puppy trafficking that we are seeing through the likes of Cairnryan does not continue?

Mairi Gougeon: The measures that are proposed in the bill will have a significant impact as they stand. As I have said, the maximum number of animals that can be imported will be five per vehicle, which is already a significant change. Again, though, we are in constant discussion with animal welfare organisations; indeed, I am due to meet the Dogs Trust, and I will, no doubt, have that conversation with it. It is important to have that discussion with such organisations, and then discuss with other Administrations the question whether further amendment is needed. Obviously, I am more than happy to have the discussion and to consider the matter fully.

Mercedes Villalba (North East Scotland) (Lab): The current provisions seem to make exceptions for the tail docking of working dogs and the declawing of cats. In the light of those exceptions, are you satisfied with the legislation? Does it go far enough?

Mairi Gougeon: It gives us the power to introduce regulations that will help to prevent the importing of dogs with mutilations that, at the moment, are illegal right across the UK.

The Scottish Animal Welfare Commission has done work on that, too. The regulations will have a significant impact when they are introduced along with some of the measures that I have mentioned such as the minimum age at which animals can be imported, which were the subject of a recent consultation that closed in October, the results of which we are currently analysing. I hope that they will stop the importation of dogs with such mutilations.

Rachael Hamilton (Ettrick, Roxburgh and Berwickshire) (Con): Is it okay to ask about zoo licensing, convener?

The Convener: Absolutely.

Rachael Hamilton: The UK Government is to ban the keeping of primates as pets in England to ensure that the care of primates is kept up to zoo-level standards. It is also phasing out the ownership of primates in general. Will the Scottish Government follow suit?

Mairi Gougeon: We can already do that in Scotland through secondary legislation. We continue to look at and consider the issue. The Scottish Animal Welfare Commission has been doing work on the keeping of exotic pets, which shows that, as I have said, we already have the power to look at and control that. I should say that, in the legislation at the moment, it is not straightforward that it would be a complete ban on the keeping of primates, and I think that what the UK Government is looking to introduce through this legislation are powers that already exist in Scotland to allow us to give effect to that.

My officials might want to add to that.

Andrew Voas (Scottish Government): As the cabinet secretary has said, we have the power to introduce licensing regulations in Scotland, and we have recently done so for the licensing of animal rescue centres and cat, dog and rabbit breeding. We could introduce licensing for exotic pet keeping or primates, and, indeed, the Scottish Animal Welfare Commission has set up a working group specifically to look at exotic pet keeping. We will consider its recommendations in the future and legislate if appropriate.

Rachael Hamilton: Why can the same commitment not be delivered through the bill?

Mairi Gougeon: Because we do not need the powers in the bill to give effect to that in Scotland. It is not that we are not going to do it; we have the powers to do it already, and SAWC is looking at the matter. It makes sense to look at its work on the issue before we take anything forward.

Jim Fairlie (Perthshire South and Kinross-shire) (SNP): I have more of a point than a question. You are talking about restricting the number of dogs to be brought over. I would just urge that, when you have conversations with the Dogs Trust this afternoon, you are cognisant of the fact that people who have dogs as working companions, such as shepherds, keepers and guys like that, will often have at least five dogs. Shepherds travel a lot between Ireland and Scotland for work. It is just to make sure that there is a provision in the regulations that enables them to do that.

On tail docking, it is absolutely essential that working dogs that are going to ground or under cover have a shorter tail, for their own welfare. You will have seen the evidence in the past of dogs that are working with big waggy tails going through undergrowth and coming out with them shredded. You might be aware of that, but I just wanted to point it out.

Mairi Gougeon: We are not looking to stop legitimate movements of animals. However, we have a significant problem when it comes to the illegal trade of puppies, in particular, that come into the country. It is important that we get the balance of measures right. That is why we are in constant discussion with various animal welfare organisations, the British Veterinary Association and the Scottish Animal Welfare Commission to look at the proposals. I think that what is proposed will significantly impact the illegal trade, which is what we want to clamp down on.

Ariane Burgess (Highlands and Islands) (Green): In relation to the ban on live animal exports for slaughter, is the Scottish Government considering further regulations on animal transport, and will those be progressed at a Scotland or a UK level?

Mairi Gougeon: That is what the bill gives effect to—it gives us the power to make further regulations should we want to make changes to animal transport legislation. Again, however, given the nature of movements of livestock, in particular, throughout GB, it makes sense for us to discuss it with other Administrations if we are to make changes.

We consulted on the issue early in the year, and we recently published the response to that consultation. However, if we are going to make any changes to animal transport, we will also consult on any proposals that come forward, because we want to ensure that we do not disadvantage those who live in our remote and island communities when it comes to animal movements.

The Convener: Minister, we have already corresponded with you on the topic of border controls. In relation to movements between the UK and Ireland in the context of EU exit, what are the implications of the bill for border controls in relation to domestic animal movements and the prohibition of livestock exports, including enforcement requirements?

Mairi Gougeon: There will always remain a concern. Even if we implement the restrictions across GB on imports of dogs, cats and ferrets—and I hope that doing so will significantly impact the illegal trade that currently takes place—we have to be cognisant that criminal enterprises and organisations tend to be behind many of those movements, and they will be looking for any avenue to get access. There will always be the threat that there could be exports or movements of animals into Northern Ireland from the EU that would then have access to Scotland. We will just have to pay close attention to that. I hope that, with all the measures that are proposed in the bill, the powers that we are given and the regulations that will come in future will have a significant impact on that trade. However, we will have to keep a close watch on that element.

The Convener: I have just one other question, on zoos. There was correspondence about the timescales for implementation of some of the new regulations. The conservation aspects of the regulations are all welcome, but have you any concerns that the timescales might put some of our zoos and conservation parks in Scotland at risk because of the short time that they potentially will have in which to implement the policies in the bill?

Mairi Gougeon: I believe that the draft standards that are being proposed are due to go out to consultation shortly. I am not aware of those concerns—they have not been raised directly with me—but Andrew Voas might have more information on them or on whether they have been raised with officials.

Andrew Voas: Once the draft standards are available and with the zoos for consultation, it will help greatly. Zoos will then have a better understanding of exactly what the draft standards propose and they can consider how much work would be required to make any changes that would be necessary to meet those standards.

The Convener: How will the Scottish Government engage with the Scottish Parliament and Scottish stakeholders when it comes to any secondary legislation that is made under the powers in the bill?

09:15

Mairi Gougeon: Part 3 requires that regulations are subject to the affirmative procedure. If we make those regulations in Scotland, there will be an opportunity for scrutiny by the committee. If we also give consent for the secretary of state to legislate on our behalf, we will go through the usual processes for that. We intend to work with the committee and to keep you informed to ensure that scrutiny can take place.

Jenni Minto (Argyll and Bute) (SNP): Returning to the first question, how will the legislation help when minibuses with more than one person in them might be used to try to bring in larger numbers of young pups or kittens?

Mairi Gougeon: It will help in a number of ways. You gave the example of how a minibus might be full of animals, depending on the number of individuals who are in it. That would not be possible any more. There would be a maximum of five animals per vehicle, regardless of the number of individuals. That would have a significant impact.

We will also see changes when the regulations are implemented. One of the biggest and most positive changes will be the ability to introduce an age limit for movement. We might be able to prevent the import of dogs who are less than six months old. We think that that would significantly impact the trade, as would the proposals that are subject to future regulations and deal with moving heavily pregnant dogs. The combination of all those measures will, I hope, put a stop to that trade, although there are elements that we will have to keep a close eye on.

Beatrice Wishart (Shetland Islands) (LD): To follow on from that question, I am intrigued that five animals can be brought in in a car, whereas only three animals can be brought in by air or by a foot passenger. Will you give me an understanding of the reasons behind those figures?

Mairi Gougeon: The officials might have further information about how we arrived at those numbers.

Andrew Voas: There has to be a balance between allowing the reasonable movement of families or family groups—who may have a few animals between them—and reducing the limit, which is currently five animals per person. As we have heard, that could mean that six people could bring in 30 pups in a minibus. That will stop.

The proposal at the moment is for five animals per vehicle. The Dogs Trust has been lobbying to have that number reduced. That is a possibility that we would want to discuss with the other GB Administrations. The number of five animals per person comes from current EU legislation. We have to set a reasonable figure that allows reasonable and legitimate movement but that has an impact on the abuse of the pet travel scheme that goes on at the moment.

The Convener: There are no further questions. Are members satisfied to delegate authority to me to sign off the committee's report to the Parliament about the LCM?

Members *indicated agreement.*

The Convener: Thank you, cabinet secretary. We will suspend briefly to allow a changeover of witnesses.

09:18

Meeting suspended.

09:21

On resuming—

Subordinate Legislation

Eggs (Amendment) (Scotland) Regulations 2021 [Draft]

The Convener: Our next item of business is consideration of the draft Eggs (Amendment) (Scotland) Regulations 2021. These regulations are subject to the affirmative procedure, and I refer members to paper 3. Once again, I welcome Mairi Gougeon, the Cabinet Secretary for Rural Affairs and Islands, and her officials. We have with us Judith Brown, solicitor; Joe Kirk, senior poultry officer; and Kevin Matheson, livestock policy manager. I invite the cabinet secretary to crack on with her opening statement.

Mairi Gougeon: Thank you for having me here to speak about the regulations. The draft instrument would amend retained European Commission regulation 589/2008 on the marketing standards for eggs with regard to checks done on imported class A eggs. At the moment, checks for class A egg marketing standards take place at the place of destination, such as egg packing centres and wholesale premises. However, for eggs imported from third countries, the retained EU regulation requires that the checks are carried out at the time of customs clearance. Given that the UK has left the EU, a greater number of checks would need to be made at the border. Therefore, the instrument would amend the regulations to enable marketing standards checks to continue to be undertaken on imported class A eggs at the place of destination, rather than at customs. The checks are and would continue to be undertaken by suitably qualified egg marketing inspectors prior to release for retail sale or mass catering.

The instrument would also enable checks on imported class A eggs to take place where resources are already established and where there is already expertise. We believe that that approach would be more efficient and practical. In reality, there are currently no imports of eggs directly into Scotland from the EU or elsewhere, other than infrequent and small quantities from the Republic of Ireland, although some eggs arrive in Scotland from the EU via English ports. For that reason, the UK and Welsh Governments are taking forward corresponding amendments for their jurisdictions.

I hope that those remarks are helpful in setting out the rationale for the draft instrument. Of course, I am happy to take any questions that committee members might have.

The Convener: Thank you. I will kick off with a question. Given that it is some time since we left

the EU, why has this legislation been brought forward only now?

Mairi Gougeon: An awful lot of work has had to be undertaken very quickly since we left the EU. As I said, in effect, this Scottish statutory instrument puts into legislation what has been happening in practice with the checks at the place of destination. That is why it is being brought forward now.

The Convener: Are we likely to see more SSIs to allow inspections at the place of destination—rather than at border crossings—for other products?

Mairi Gougeon: I cannot give you a definitive answer on that today, but I am happy to come back to you with further information.

Rachael Hamilton: The policy note states that class A eggs are rarely imported, as you said. How many eggs are imported?

Mairi Gougeon: As I have said, movements are very infrequent and involve very small quantities that come directly into Scotland from the Republic of Ireland. I do not know whether officials have the exact numbers.

Kevin Matheson (Scottish Government): We do not. As the cabinet secretary said, very small numbers come into Scotland from the Republic of Ireland. The amendment is about future proofing, in case we ever get an influx of imports in the future. That is the whole point.

Rachael Hamilton: Given that a de minimis number of class A eggs is coming in, is that monitored? Are veterinary or other inspectors there, to ensure that we do not have fraud and that those measures are kept in place?

Mairi Gougeon: Highly trained inspectors undertake that work. That is also the point of the statutory instrument, because it means that we can focus our resources and that more inspections will be enabled than would happen if it was determined that they were to take place at a customs checkpoint, which would split the resources that we have and would take our inspectors away from the work that they are currently doing and the checks that they already undertake. It therefore allows us to better utilise the resource that we have at the moment. The SSI does not change any of the checks that take place; all that it does is change where they take place.

Jim Fairlie: I have a very quick question. I assume that we are talking about eggs in the shell rather than liquid or powdered eggs.

Mairi Gougeon: Yes.

The Convener: What consultation did you have with egg packaging and wholesale organisations to look at the pros and cons of the instrument? Were there any adverse impacts of carrying out the inspections at a wholesaler's premises or wherever, rather than at a border post?

Mairi Gougeon: Consultation was done on a GB basis. From what I understand, NFU Scotland was the only Scottish stakeholder to take part in that consultation. It commented that the proposals made sense. However, I think that there had been other opinions within that consultation—from the British Egg Industry Council, I believe. The Department for Environment, Food and Rural Affairs had held a round table.

I pass the question to officials, who can give more information about comments on the proposals.

Kevin Matheson: A round table was held to talk through any issues. The Scottish Government poultry inspector made the point that we were far more likely to uphold the marketing standards if we could make inspections at packaging centres and wholesale premises, because that is where all our resources are and where we are set up to do it. As the cabinet secretary said, if we were to take staff away from routine inspections and put them at customs posts, that would result elsewhere in a watered-down version of the checks. It is fair to say that no dissent followed from the round table.

Jim Fairlie: My very brief question is probably for Kevin Matheson. What would the potential threats be to our industry if we were importing eggs from another country?

Kevin Matheson: I think that they would involve competition in the domestic egg market. Maybe Joe Kirk has a better idea about that. One thing that came up in the consultation was that, as long as the same checks were applied to imports as to domestic eggs, we will be happy. Again, we went back to the point that the best way that we can guarantee that is to do those checks at the points of destination.

The Convener: Since there are no further questions, we move to formal consideration of motion S6M-01816, which is agenda item 3.

Motion moved,

That the Rural Affairs, Islands and Natural Environment Committee recommends that the Eggs (Amendment) (Scotland) Regulations 2021 [draft] be approved.—[*Mairi Gougeon*]

Motion agreed to.

The Convener: Is the committee content to delegate authority to me to sign off a report on our deliberations on that affirmative instrument?

Members *indicated agreement.*

The Convener: Excellent. That completes consideration of the affirmative instrument. I thank

the cabinet secretary and her officials for attending.

09:30

Meeting suspended.

09:42

On resuming—

Climate and Nature Emergencies

The Convener: Welcome back, everyone. Our main item of business is the first in a series of evidence sessions on the climate and nature emergencies. Today, we will be focusing on the science behind the climate and nature emergencies, particularly as it relates to the rural economy.

I welcome our first witnesses, who will be discussing the marine environment: Professor Bill Austin, chair of the Scottish Blue Carbon Forum; Professor Sir Ian Boyd, marine mammals specialist from the University of St Andrews; Susan Davies, head of the Scottish Seabird Centre; and, from the University of Aberdeen, Professor Paul Fernandes, chair of fisheries science, and Dr Tara Marshall, senior lecturer in fisheries science.

We will kick off with some questions. We see many reports from the likes of the Intergovernmental Panel on Climate Change on global findings. How applicable are those findings on biodiversity loss and climate change to Scotland's marine environment? Are the levels of pressure in Scotland different from those in the rest of the world? Are the impacts likely to be different?

Professor Bill Austin (University of St Andrews): Good morning. Thank you for the question. This is a global challenge and Scotland faces the same challenges as many other countries. The biodiversity loss in our seas is growing, and nature and climate need to be thought of in the round.

We will probably come back to this, but we have wonderful natural capital in our seas in Scotland and we have opportunities for nature-based solutions.

09:45

Professor Sir Ian Boyd (University of St Andrews): I definitely agree with Bill Austin. We are talking about Scotland in a global context, and Scotland needs to play its part. Scotland has certain natural assets. Its marine system is a particular asset—it is very large relative to the land area, and it is very rich in certain ways, particularly in terms of its renewables, but, to some extent, it is biologically rich as well. If we are going to repair the global environment, Scotland is a not insignificant part of that, and it needs to play its part.

On the impact of climate change and the work of the Intergovernmental Science-Policy Platform on

Biodiversity and Ecosystem Services, Scotland will probably be less affected than many other parts of the world. Most of the climate change impacts will really be felt in the global south, in the tropical regions of the world. Nevertheless, there will be impacts. The sea level has risen, we have coastal communities that are vulnerable to sea level rises, and, as Bill Austin said, we are seeing changes in biodiversity. Some of the impacts might not be related to climate change and might be natural. However, quite a lot of them probably are related to climate change, and it is always difficult to distinguish that signal as climate change from the noise of natural variation. Nevertheless, we are becoming better and better at zeroing in on the signals that are represented in biodiversity in particular as a result of climate change.

Scotland is not immune from those impacts, and we rely hugely on our marine areas, particularly for food production. That is not only about capture fisheries; it is also about our aquaculture, which has an environmental footprint that extends well beyond Scotland. For those things to thrive, Scotland must play its part. We must also be very careful that Scotland does not export its response to that to more vulnerable parts of the world. Putting all those things together, Scotland cannot say that it is immune from climate change. It will probably be impacted slightly less, but it must play its part in a very substantial way to solve the problem on a global scale.

The Convener: I am quite surprised to hear that Scotland might not be affected to the extent that the ecology of the global south will be. We hear about coral reefs and whatever and about warmer seas being depleted, which makes the news headlines. However, here in Scotland, we are worried about our wild salmon populations, and we hear about the reduction in the food that is available to puffins and other birds and about sand eels moving further north. We hear that, year on year, our shoals of fish are moving further north to colder waters.

Therefore, Susan Davies, whether it is the rise in water temperature, global warming leading to the loss of oxygen or the increase in carbon dioxide, what will the impact be in Scotland? How do you see bird life being affecting, for example?

Susan Davies (Scottish Seabird Centre): We see a wide range of effects on the wildlife in Scotland. Half of Scottish species have decreased in abundance over the past 20 years, and unsustainable fisheries are one contributing factor to that.

With regard to Scotland on the world stage, we have internationally important populations of breeding seabirds. Globally, seabirds are considered to be the most vulnerable group of birds. In the UK, 22 breeding species are now on either the red or amber list of birds of conservation concern. Since 1986, breeding numbers have declined significantly, by 56 per cent. Making the connection with climate change, we see that many of those that have been affected are surface feeders—a classic example is the black-legged kittiwake—but other species have been affected, too, such as the Atlantic puffin. Modelling in a new report by the British Trust for Ornithology suggests that nine out of 10 puffins in the UK might be lost in the next 30 years. If we use seabirds as an example, we can see that there is undoubtedly a wide-ranging effect, which we have a responsibility to address.

However, as Ian Boyd said, the issue is not just about climate change. We also have issues with fisheries, invasive species and marine pollution and litter, which are affecting those environments, too.

The Convener: I sometimes feel that, with a lot of the species loss that takes place in Scotland, the process does not happen right in front of our noses. For example, we do not notice that sand eel and other feedstocks are moving further north, and the general public are not aware that cod are getting closer to the Arctic circle.

Professor Fernandes, can you give us an idea of what is happening to our fisheries? As that takes place below the surface of the sea, we obviously cannot see what is happening. How is climate change affecting our fisheries in Scotland?

Professor Paul Fernandes (University of Aberdeen): There are two points to make on that, the first of which is that the situation is complicated by the fact that fisheries management—[*Inaudible*.]—a lot in the past 20 years.

I will give you a good example. In the North Sea and the west of Scotland, we have much lower quantities of cod, but huge quantities of hake have appeared. That is largely because management—[*Inaudible*.]

The Convener: Can I stop you for a second, Professor Fernandes? We are struggling to hear you. Could you move closer to the microphone?

Professor Fernandes: I am sorry. Can you hear me now? Is that better?

The Convener: If you could bear with us, we will try to improve the sound quality.

Professor Fernandes: Is that better?

The Convener: Not yet. Please bear with us.

Welcome back. I hope that our information technology glitches are over.

Professor Fernandes, could you resume your comments about the impact of climate change on fishing stocks in Scotland?

Professor Fernandes: I was making the point that climate change is undoubtedly having an effect on our stocks. As you mentioned, species are moving further north or into deeper waters. However, it is hard to tease that apart from another big change that has taken place, which people are less aware of. I am referring to the fisheries management changes over the past 20 years, as a result of which we are taking less out of the sea than we used to. In the 1990s, we took about 60 per cent of our adult populations through fishing; that level has now gone down to 20 to 30 per cent, which is a huge reduction in exploitation. That has had a positive effect on most of our fish stocks.

If we look at the top 10 species of interest to Scotland—which include mackerel, prawns, haddock, cod, angler fish, herring and hake—we see that all those stocks, with the exception of cod, are doing rather well. They have reasonably high biomasses and are being fished sustainably.

10:00

The interesting one when it comes to climate change is cod. That species is probably suffering from the effects of the movements to the north. There is very little cod in the southern North Sea; there is much more in the northern North Sea. However, there is now more hake than ever in the northern North Sea. Hake is, in many respects, a competitor to cod. Although there is very little cod to the west of Scotland and in the North Sea, there is a huge amount of hake. Hake has similar things to eat, but we do not have the quota for it. Perhaps we will come back later to how we manage our fisheries, because those changes will have to be reflected in how we manage our fisheries from the points of view of both sustainability and allocations.

Dr Tara Marshall (University of Aberdeen): I agree with Paul Fernandes's assessment. Fish mortality has declined dramatically. It is very important to keep that in mind.

However, climate change is impacting the basic biology of fish. Fish are cold blooded, which means that their metabolism scales with temperature, so climate change will impact how quickly their little internal combustion engine runs. That will impact their growth rates—how quickly they grow large—and that will impact their reproductive rates and when they spawn in the seasonal cycle. It will also impact the overall fecundity of an individual fish—how quickly it matures. All those impacts on the basic biology of the fish will impact yields.

On the point about biodiversity, there will be some winners and some losers. We are seeing incursions of warm-water species into UK waters, and that is increasing the richness of the fish community.

The Convener: That is fascinating. I am about to move on, because I am at risk of hogging the whole session. You talked about changes in growth. Do warmer waters increase growth rates or, because cod are cold-water metabolising fish, if you like, do they slow them down? Do warmer waters have the opposite effect to what would be our normal thinking, which is that warm water increases growth?

Dr Marshall: Yes. You are thinking like a biologist, so my congratulations to you. The fish grow and their engines run faster at higher temperatures. That causes them to grow very quickly as juveniles. They grow fastest when they are young. They reach sexual maturation and their growth rates then slow to virtually nothing. Therefore, they do not grow as large, as adults, as they used to. We are seeing that very much in haddock fisheries at the moment. There are real problems in Scotland. People are not landing large haddock in Scotland; those occur more in Norwegian waters, which Scotland no longer has access to, or which it has less access to. In essence, those growth impacts reduce yields, because people have to catch more of those smaller fish in order to make up a tonne.

The Convener: It is good to know that I learned something many years ago as a science graduate of the University of Aberdeen. Thank you.

Dr Alasdair Allan (Na h-Eileanan an Iar) (SNP): This question is probably for Professor Austin, although others might have an interest in it, too.

The issue of rising sea levels presents an existential threat to some parts of the world. A few days ago, I found myself speaking to a politician from Tuvalu who made that very point. However, as was mentioned earlier, it also has an impact on the Scottish coastline. I represent the Western Isles, so I have a particular interest in that. Will you say a bit more about what the trajectory is and what you expect to see—for instance, on the west coast of Scotland—over the next few decades?

Professor Austin: That is a great question. The point about Tuvalu and some of the most vulnerable in the world relates to what we discussed earlier.

Yes, the sea level will continue to rise. That is one of the sobering facts that the IPCC raised in its report—a "code red for humanity"—just over a month or so ago. We all have to grasp the fact that our greenhouse gas emissions—collectively, globally and historically—are driving the changes and that the sea level rise, in particular, will continue. That means that our coastal communities and habitats will be vulnerable and

that we need to think about adaptation strategies. We are increasingly thinking about the need for natural systems to respond and about ways to realign our coastlines so that they continue to give us not only natural adaptation and protection but ecological benefits.

That is far more challenging for us as communities. Your constituency, the Western Isles, is facing some of those challenges. We will need to spend more on coastal defence where that is appropriate. However, in some areas, in our marine planning, we need to accept that we will need to realign our coastlines and work with our communities to support those changes.

Dr Allan: I have often cited an example in my constituency, where a school has had to move because of the very phenomenon that you are talking about.

Has any attempt been made to quantify the costs that we face in the coming decades as we try to cope with the infrastructure problems that Scotland will face as a result of rising sea levels?

Professor Austin: I think that the economics around this—the economics of nature and of our natural capital—need to change, so there are some challenges ahead for us.

Infrastructure costs are very high in the face of sea level rise and may be unsustainable. Our Dynamic Coast colleagues, who are funded by the Scottish Government, have been looking at coastal change and erosion. I have been doing some work with sports such as golf—for example, Montrose golf course in the north-east is eroding significantly every winter.

We need to look across the piece, but I think that we now have the science to do the projections. There is uncertainty because the concentration pathways of greenhouse gases that go into the atmosphere—that drives global warming, which then drives sea level rise—carry some uncertainties, but there is no reason for us not to be able to model the economic costs. I suspect that the reinsurance industry is looking at that point quite carefully and that the expertise is out there to do that.

As I said, the issue will have to be central to our marine planning systems.

Dr Allan: I think and I hope that the 26th UN climate change conference of the parties—COP26—has produced a much deeper and wider public interest in and understanding of some of those issues.

I was certainly shocked by the statistics that suggest that, if we move from 1.5°C to 2° of warming, that 0.5° difference doubles some of the consequences that we are talking about—it makes them twice as difficult, which is a dramatic difference.

Can you or others on the panel give an illustration of the difference between those two possible scenarios that face us if we do not do something in the next 12 months, before the next COP, particularly in relation to the impact on the coastline in Scotland?

Professor Austin: Very briefly, those scenarios would play out through the representative concentration pathways that I mentioned. Those are the model-based projections that drive our climate and then drive sea level rise.

As I said, we need to accept that there are some uncertainties in the projections, but 0.5° will, in Scotland, potentially translate into a change in sea level of the order of tens of centimetres by the end of the century. Those are long-term changes that we cannot avoid—they are coming. I agree that the degree to which they come depends on the international community. It is a global problem, and Scotland can play its part; the net zero agenda is important in that regard. Leveraging that message is important, because we will experience global warming in a very real way, through sea level rise.

The Convener: Perhaps we can hear from Professor Sir Ian Boyd on those points, before I bring in Ariane Burgess for a supplementary question.

Professor Boyd: To some extent, Bill Austin has answered the question in the way that I would have done. We rely very much on the UK's climate projections, which were updated in 2018, for information on sea level rise. Those projections suggest that, at the lower end, the rise will be up to 0.5m by the end of the century; at the upper end, we are talking about 1m or more. To some extent, that does not sound like a huge amount, but when we add extreme weather events on top of that, we start to see extreme scenarios that will cause problems in coastal areas. We are talking mainly about coastal communities.

One of the advantages of the UKCP18 scenarios is that, in the future, planners and engineers should be able to build those into the design scenarios for infrastructure. If they are not doing that, they definitely should be—that should be a requirement of planning infrastructure and development. The problem is our legacy. We have not always done that, and we have built on coastal areas that may well be vulnerable in the future. As far as I know, we have not actually quantified the costs of protecting those areas, or of moving people out of them, but—as Bill Austin said—the costs will be substantial. That will have more of an effect on the east coast than the west coast, because sea level rise and the probability of

coastal flooding will be rather greater in the east. That is partly a result of the nature of the physical structure of the coastlines.

I hope that that gives the committee an impression of where the vulnerabilities lie and the science that underpins the projections that we can make into the future.

Ariane Burgess: Professor Boyd, you talked about the need to look at changing the infrastructure in our coastal communities. Have you had a chance to look at the national planning framework 4? Perhaps you have not, because it came out only recently and it is quite a big tome. If you have, do you think that it reflects the need for a radical change for our coastal communities? Do the policies and the spatial planning give us the right steer towards the radical level at which we need to do things?

Professor Boyd: I am sorry to say that I have not looked at NPF4, so I cannot comment. I should look at it. It would be utterly amazing if the framework had not taken that aspect into account. As to the tone of the framework, I cannot comment at this stage. My feeling is that the tone of any such document would need to express quite high levels of ambition.

Ariane Burgess: I open up that question to everyone else on the panel, in case someone has had a chance to take a quick look at NPF4.

It seems that no one has been able to look at it yet. I hope that it will be on your reading lists.

The Convener: I think that the committee will come to NPF4 sooner than we expect, and there will be a bit of work to do there.

We move to questions on blue carbon from Mercedes Villalba.

10:15

Mercedes Villalba: It would make sense for me to direct my first question to Professor Bill Austin. How important is carbon capture and storage in marine and coastal environments in respect of climate change? What are the main pressures on blue carbon stores in Scotland?

Professor Austin: I begin by recognising, as COP26 has done, the growing significance of our oceans in our climate system. Many of us were very pleased to see the ocean-climate nexus conversation growing at COP26.

As chair of the Scottish Blue Carbon Forum, I was pleased to see blue carbon moving up the agenda in the context of nature-based solutions that provide the potential for both climate mitigation and adaptation. Therefore, I would say that it is important. We know that nature-based solutions are probably extremely important in reaching the overall goals of net zero; they offer us up to 30 per cent of the emissions reductions that we need to achieve. That creates exciting opportunities to reimagine nature and to think about our wealth—as I said earlier, Scotland has a wealth of natural capital. As Sir Ian Boyd said, our oceans are a very important part of that story.

Blue carbon is important. The main pressures that we face—to go back to the previous question on our coastal wetlands—include sea level rise. Historically, in parts of the UK, we have lost up to 80 or 85 per cent of those wetlands. Area for area, they are the most effective habitats on our planet for sequestering and storing carbon. They are extremely important, and they give us a lot of benefit for relatively small areas.

With regard to offshore, we are broadening our concepts of blue carbon. One of the pressures that we are realising concerns avoided emissions, if I can put it that way: the idea that our shelf sea sediments store vast quantities of carbon, and that pressures on the sea bed are driving some losses, which are potentially avoided emissions. The science in that regard is quite challenging and it is early days, but in Scotland we are doing well in developing our understanding of that science.

Blue carbon probably relates to, at best, 1, 2 or 3 per cent of net zero, but the sooner we start to protect and repair those systems, the sooner we will build up the sinks. As we get closer to net zero, they will become increasingly important.

I will give you an analogy that I think that everyone in Scotland would appreciate. Andrew Millar made this point recently—we had a conference on this theme during COP26, and he spoke as the chief scientific adviser on environment, natural resources and agriculture. The analogy is our peatlands. The great success story of the peatlands has been recognising the need for their restoration, both to avoid emissions and to repair those globally important ecosystems. I think that we can do the same for the marine ecosystem; I am very optimistic about that. We have an opportunity, but there are some challenges.

Rachael Hamilton: I have a supplementary question for Professor Austin on that point. Do you believe that the Scottish Government should have its own strategy for restoring and protecting the blue carbon habitats that you talked about?

As another supplementary to what you said about measuring blue carbon, how do you actually do that? Various groups say that blue carbon does not actually go into the atmosphere. Can you tell the committee how that works?

Professor Austin: It depends on how much time the committee has, but I can try.

With regard to the Scottish Government's strategy, I commend the Government on its support for that area, which is very positive. We recently heard from the UK Government that it will follow suit and establish a UK-wide partnership, but we have had that work in Scotland for a number of years, so we are leading by example.

On the question of avoided emissions, I think that you are focusing on our shelf seas and the claims regarding emissions from bottom trawling in particular. It has been claimed that trawling disturbance of our sea bed is equivalent to global emissions from aviation. I think that the evidence for that is weak—in fact, we are doing some work in the forum that suggests that that is not the case. However, parts of our sea bed are more vulnerable to disturbance, and we call those blue carbon hotspots.

I was pleased that, in August, the Scottish Government announced a new commitment to marine protection, which will, for the first time, develop highly protected marine area networks that will involve looking at blue carbon and its vulnerability.

The dialogue is changing. In a way, it is exciting that designation for marine protection could now move forward and encompass blue carbon thinking. That is the right way forward—it involves putting climate and nature together, and recognising the services that nature provides through blue carbon. Those are natural ecosystem functions, and blue carbon offers us those services.

The science is much stronger with regard to our coastal wetlands. We need to understand a little bit more about their emission of greenhouse gases, but we have a very good understanding of the stocks, and we are currently working with the Department for Business, Energy and Industrial Strategy and colleagues in DEFRA to try to move that particular habitat—it falls under the IPCC guidelines, so it is in the framework—into our national greenhouse gas inventory. I think that that will create—in the same way as happened with our peatlands—an important impetus for greater protection and restoration, as well as opportunities for investment. We can tie those schemes to coastal flood protection and build in the blue carbon, in which investors are extremely interested, so that we do not have to expect that work to be paid for entirely by Government.

The Convener: Before I bring in Susan Davies, I have a quick question. Professor Austin, you mentioned bottom trawling, which is an emotive point—you might regret mentioning it. You suggested that there was some evidence that the bottom trawling industry emits as much carbon as aviation, but you said that that was a weak argument. That is an issue in which science is crucial in ensuring that we address the big-ticket issues rather than the ones that produce an emotive response.

With regard to blue carbon, there are the physical disturbances that we have discussed and there is climate change, as well as land use and land management changes. Exactly how critical in that equation is physical disturbance in comparison with other climate change factors with regard to carbon dioxide in the ocean, the ability to sequestrate carbon dioxide and whether we are at the tipping point for that changing? Just how important is physical disturbance in the big picture?

Professor Austin: I do not regret mentioning bottom trawling. There is scientific literature that argues that that has an important impact on our shelf seas. I recognise that we have a fishing industry and a range of stakeholders and that it is incumbent on us to have an evidence base when making such decisions, as you pointed out.

As I said, some of the science has been questioned; I question it myself. The current science evidence base needs to be stronger in that area, but there is no doubt that bottom trawling damages benthic marine ecosystems—I am sure that Marine Scotland colleagues would tell us that—and that we need to think far more carefully about that resource and natural capital on our sea bed in relation to the management of our fisheries. We must realise that consideration of bottom trawling is part of that story. It is not about stopping the activity; it is about thinking about how to manage it more effectively, with the avoided emissions that I mentioned built into the prioritisation of the highly protected marine areas that the Government has committed to developing.

The Convener: Three other witnesses want to comment on blue carbon, and then we will move on to discuss sustainable fisheries.

Susan Davies: I echo much of what Bill Austin outlined, particularly the illustration in relation to the carbon storage potential of our marine sediment and peatland resource. There is much more potential for carbon storage in our marine sediments, so it is important that we protect those.

We have the marine protected areas system and we have some knowledge about our blue carbon stock and the distribution of that. However, in addition to that being built into the management measures for marine protected areas, we must ensure that it is considered in relation to marine spatial planning and our regional planning system for the marine environment. There is much to be done in that regard. Although we have some marine protected areas and the commitment to strictly protect 10 per cent of those areas, that has

not yet translated into the reality in our seas, so it is important that we make progress in those areas.

Professor Fernandes: I want to come back to the point about trawling, which is a contentious issue. We need to be clear that, as Bill Austin alluded, the estimate of how much carbon is emitted by trawling was based on one section of a 2021 scientific article, which made a big impact. The science associated with that estimate is based on a contentious—at the very least—model of carbon deposition in sediments.

Estimates from the University of Strathclyde are in complete contrast to those in the 2021 paper. For example, that paper says that there is lots of carbon in the southern North Sea, whereas the University of Strathclyde's measurements suggest that most of the carbon is in the northern North Sea, in deeper sediments associated with mud. All in all, there is a suggestion that that paper overestimates the amount of carbon that is being released by at least an order of magnitude. I just want to point out that the science associated with trawling is very much in its infancy and that more work needs to be done.

10:00

When considering the impact of trawling on biodiversity and habitats, we also need to bear in mind that there have been a lot of marine protected areas, some of which have had management interventions for the past 10 or 15 years now, such as those to stop trawling in sensitive areas where there are deepwater corals to the west of Scotland in the Rockall area. We need to look at the marine protected areas that we have and introduce appropriate legislation to prevent trawling where it affects those habitats, because a large part of the North Sea might not have the sensitive habitats that would suffer as a result of trawling.

Professor Boyd: I agree with all that has been said so far. However, I would really emphasise the importance of blue carbon. Overall, we underestimate its importance, at least at the Scotland level. Our sea area is about five times our land area, and our ability to fix carbon from the atmosphere is probably roughly equivalent to surface area, so sea area is going to be very important. The question is how much of that fixed carbon gets sequestered. What Paul Fernandes and Tara Marshall have said about the standing stocks of fish suggests that a higher standing stock of carbon might well be sitting there. I do not know whether that is correct, but the more that we maintain biodiversity in that Scottish sea area, the higher that standing stock is likely to be and the greater is the amount that is likely to end up on the sea floor, being integrated into marine sediment. Once it gets there—by a very circuitous route—the last thing that we should be doing is disturbing it again.

Whether disturbing it actually makes a huge amount of difference still has to be properly researched, as Paul Fernandes has correctly said, but we have to be very careful. This is about being precautionary rather than cavalier. I am not referring specifically to bottom trawling; we have to be very careful about anything that disturbs our sediments. The carbon in it has taken a very long route to get there and is really quite valuable. We need to be careful about it.

Rachael Hamilton: Professor Fernandes, given what you have said, do you believe that the current enforcement measures to ensure compliance are sufficient? You mentioned strengthening the legislation.

Professor Fernandes: I was referring to the management measures in many of our marine protected areas that have been brought into question in recent scientific articles that suggest that, for example, trawling in some of the protected areas is greater than it is outwith those areas. In addition to setting up marine protected areas, we need to decide what activities are allowed in them. For example, if you set up an area to protect harbour porpoises, which live in the middle of the sea, you need not ban trawling if trawling does not affect them. In such an example, management measures might not include a trawling ban but could include a ban on gillnets, which are harmful to harbour porpoises.

It is horses for courses. Negotiations are going on with the various stakeholders, but they need to be accelerated. The situation has now caused the international community to ask for highly marine protected areas, in which all activity is banned. Those are for the most sensitive environments, such as where there is deepwater coral, which, as I have said, has been protected for almost 20 years. I would suggest that management measures in some of the more recently set up marine protected areas be considered more quickly.

The Convener: For a final word on that question, we will hear from Bill Austin.

Professor Austin: I wanted to come back on the work of the Scottish Blue Carbon Forum.

We have led UK-wide spatial mapping of our shelf seas. We have also published the first-ever UK exclusive economic zone map of sedimentary carbon. We therefore understand those spatial patterns. I emphasise the point that we can prioritise areas for protection and help in that process with the narrative around blue carbon as a component of highly protected marine areas. We have to see that in the balance of the full range of activities across our seas and not simply as a

blanket measure or something that is misconstrued in that way.

The Convener: We will move on to the theme of sustainable fisheries management.

Beatrice Wishart: Good morning, panel. We have heard a little about the effect of climate change on the movement of fish species. Professor Fernandes indicated that stocks are moving and that some stocks are doing well, with the exception of cod, which are more abundant in the northern North Sea. I am told by fishermen that there is abundant cod in the fishing grounds. The witnesses will be aware of the concern in the fishing industry about the quality of the scientific advice, including the at-sea data gathering that feeds into the annual International Council for the Exploration of the Sea assessments and, ultimately, the total allowable catches. ICES says that it is willing to engage with the fishing industry to improve data collection and the way that data is interpreted, which is good, but that takes time—possibly years.

In the meantime, North Sea demersal fisheries are mixed fisheries, with cod being caught at the same time as several other species are during typical fishing operation, and there is a situation in which there is an acute shortage of cod quota and cod abundance, which restricts the fleet's capacity to catch species for which it has quota.

Will the witnesses say a bit more about how climate change is changing the distribution and abundance of stocks and how that impacts on the scientific evidence, which, in turn, impacts on the total allowable catches?

Dr Marshall: I thank Ms Wishart for that very detailed question, which encompasses a lot of things.

On how climate change is impacting our stock assessments and the data that go in, there are questions in the Scottish fishing industry about whether the information that is generated by standard research vessel surveys, for example, is adequately capturing the distribution. There are also open questions about the population structure—for example, whether west coast cod and North Sea cod should, like haddock stocks, which were recently combined, be considered as a single stock. Progress on that is on-going. Benchmarking exercises that involve Marine Scotland, the industry and the available scientists are taking place. They are currently discussing those aspects of the cod stock in Scotland.

The committee will appreciate that fish stocks are very dynamic systems. They will change all the time because of climate change or other factors, so we are continuously updating our understanding. As Beatrice Wishart rightly pointed out, that requires accurate data.

The industry has a role to play in contributing to the data acquisition on fisheries. We have a good example of that in the pelagic fishing industry in Scotland, in which a self-sampling programme has been run by the pelagic industry. The information that it gathers on board fishing vessels enters directly into the assessment process, which sharpens our real-time understanding of what is going on in the stock.

The demersal sector, which includes species such as cod, haddock and monkfish, is a little bit behind the curve. That is a more complicated fishery—more vessels and gear types are involved—but I think that there is some co-ordination with industry interest and effort in feeding in data so that scientists and the industry can jointly get the benefit of their own data.

We have a project on the west coast of Scotland for bycatch avoidance. The industry is doing exactly that in real time for its own benefit—avoiding bycatch of unwanted species, such as cod. That is possible, although it requires greater trust between the industry and Government to build those bridges and develop those conversations. I think that that is a positive solution.

Beatrice Wishart: That is an important point about bycatch, with the industry and scientists working together.

Professor Fernandes: I will make a point about cod, in particular—I alluded to this earlier. Cod is a very similar animal to hake. They are both piscivorous—they both feed on fish. In the northern North Sea and in the west of Scotland, there has been a massive increase in hake populations. There is as much hake and cod combined now as there was 30 years ago—although, 30 years ago, cod was dominant. That might be a climate signal. We had similar amounts of hake in the 1940s and 1950s—it has just come back, as a result of the management changes that I mentioned earlier. It is difficult to tease out the effects of climate and the big changes that we have had in management over the past 20 years that have improved the situation.

Beatrice Wishart: So, it is a combination of management and climate change.

Professor Fernandes: Yes.

Rachael Hamilton: I have a supplementary question for Dr Marshall following Beatrice Wishart's question. Do you agree with the Scottish White Fish Producers Association, which would like there to be an independent panel to assess the International Council for the Exploration of the Sea numbers?

Dr Marshall: The Scottish White Fish Producers Association has long been involved in the delivery

of sustainable management in Scottish fisheries. It has been at the table, it has attended the scientific working groups, and it has a very strong insight. That said, I think that the level of scientific scrutiny that is applied to ICES advice is extraordinarily high. It goes through various layers of committees, and the very upper layer of committees includes international scientists who work in the field of stock assessment.

Scientists are a very critical lot. We subject our own work to a high level of scrutiny. I have the highest regard for that. However, we bump up against the limits of knowledge, given the limited data availability. We work towards solutions over time, but I am not sure that having another step is necessarily the most optimal solution to the existing problem.

There is a global shortage of expertise in that area. It is hard to get people with the exact quantitative understanding of the models that underpin the assessment and the biology that is impacting the stocks. A lot of hard work goes into our current system.

The Convener: I ask Susan Davies and Ian Boyd to comment. I will then move on to a question from Karen Adam.

Susan Davies: I want to broaden the bycatch issue. Among our seabird species, many auk species, razorbills, common guillemots and Atlantic puffins are also impacted by surface and pelagic bycatch. It is important to consider the threats from climate change and activities taking place in the sea and the mitigation of those threats in the round; to take approaches to monitor those impacts; to examine the mitigation and the different techniques that can be used; to trial those and learn from them; and to use that information to feed into marine spatial planning and decision making.

10:45

Professor Boyd: I am going to be slightly critical of the scientific system—members might find that difficult, coming from a scientist. We work within quite a narrow scientific paradigm in which we do single-species stock assessments. They are kind of married into a multispecies process but, fundamentally, we do single-species stock assessments for multispecies fisheries, and the two things do not fit.

Single-species stock assessment works quite well for things such as mackerel, because that is fundamentally a single-species type of fishery. However, there is probably a different way of working with multispecies fisheries. ICES has worked under the single-species stock assessment paradigm for a long time, and I think that it has trouble thinking outside that box.

I would like to see new science in that area, and there is some. There are new ways of looking at stock assessments that are much more multispecies ways and which look at the whole community system. Instead of going out and sampling from particular stocks because they have quota for them, the fishermen could have a community quota. That might solve some of the problems.

However, to be frank, I think that the fishing industry just wants to take more fish, and I do not think that those new ways would necessarily provide more fish. They would just make it easier for the industry to exploit the stocks as they are presented by the ecology of the system.

Karen Adam (Banffshire and Buchan Coast) (SNP): I am sure that I do not need to stress how much coastal communities depend on fish for their food and livelihoods or how imperative it is that we get the local fishing industry on board when it comes to protecting the marine environment so that we can ensure high catches and healthy populations in future fisheries, among other objectives. Is a greater level of engagement needed between scientists, managers and stakeholders to steer the process? Is that essential to the successful development of harvest strategies, for example? If the witnesses agree with that, how do they see that being implemented, particularly in developing relationships and trust? What sustainable incentives could there be for the industry?

Dr Marshall: Thank you for another excellent question. I could not agree with you more on the need for engaging with communities. I could answer the question in multiple ways, but I will try to be brief.

In past years, there has been a real shift towards engaging with stakeholders in the conversations about fisheries management. When we were part of the European Union, for example, Aberdeen was home to the regional advisory council, where stakeholders came together to discuss fisheries management, and learning the skills to hold that type of conversation and develop consensus was really important. Now that we have left the EU, we can build perspective by having a variety of people at the table, including our communities, and we can develop mechanisms for that.

The industry wants to step up to the plate, as do other stakeholder groups such as environmental non-governmental organisations. We simply need a mechanism and a forum to evolve for our post-common fisheries policy lifetime. That is a great suggestion.

You framed your question around joining up policy agendas—for example, delivering

sustainable fisheries and healthy communities as well as nutritious food that has positive impacts for health. The joining up of policy objectives in that area would be fruitful. We can define win-wins by having those types of multi-stakeholder conversations.

Professor Fernandes: One of the ways in which to engage stakeholders more in the process is to give them opportunities to contribute to the science. A perfect example of that relates to the angler fish stock, which is among our most valuable resources. For the past 15 years, the industry has been directly involved with surveying angler fish, and the advice that is given is based on the results of the surveys. Consequently, that component of the industry does not question the science that comes out of that exercise and, when the quotas for angler fish went down, it was quite happy with the advice.

That contrasts with the cod situation, in which the stakeholders have less influence. The science suggests that there are fewer cod, particularly in the southern North Sea. The whole picture is a bit more complicated. The stakeholders are questioning that advice, but that is the only area in which they have major concerns.

Let us consider all the other species that I have mentioned: mackerel, nephrops, which is Scottish langoustine, haddock, herring, hake, whiting, saithe, megrim, ling and plaice. Those are the most valuable resources, and they are all doing rather well. Cod is the only exception, and the advice on cod is the only aspect that is being questioned. The questions are possibly valid, but they are complicated because of the issues that we mentioned earlier in relation to competition with hake, movements of the population to the north and so on. However, if the stakeholders can get involved, as in the case of angler fish, I think that that would help.

The Convener: Jim Fairlie would like to ask for clarification about a matter.

Jim Fairlie: The question is for Professor Fernandes. It is maybe a nerdy question, because I know absolutely nothing about fisheries. You said that there has been a large increase in hake and a huge decrease in cod. From the debates that I have been listening to, I know that that is disputed. Do the hake swim in the same waters as the cod? If they do, why are their numbers going up while cod numbers, according to the scientists, are going down?

Professor Fernandes: It is a good question. One of the main reasons why hake numbers are going up is that, after being overexploited for years, as was the case for many stocks, we have since reduced the fishing pressure on hake and stocks have rebounded. The hake population has exploded—it is five times greater than it was 20 years ago.

When a fish population increases like that—the same happened with mackerel 10 years ago, for example—it expands its range and moves into bigger areas. Hake have returned to the North Sea. As I said, we do not have assessments of catches from the 1950s but, at that time, there were lots of hake and large catches of that fish in the North Sea. The population has now returned to that level.

It could be that hake are outcompeting cod, but we do not know that for sure. However, it is interesting to note that the combined quantities of hake and cod in the northern North Sea and the west of Scotland are pretty similar to what they were 30 or 40 years ago, but the numbers have switched.

Jim Fairlie: I think that you have just answered my next question. Are the hake pushing out the cod?

Professor Fernandes: It is hard to say whether that is the case. However, hake are in places where the cod no longer are.

The Convener: We move on to the theme of marine protection and enhancement. Ariane will kick things off.

Ariane Burgess: I thank the panel for a brilliant and interesting session. My understanding is that, although the Scottish Government states that 37 per cent of our seas are protected under marine protected areas, only 1 per cent are fully protected as no-take zones, and a further 5 per cent are subject to a ban on trawling and dredging. I have a couple of questions. What are your thoughts on the extent to which Scotland's network of marine protected areas is fully developed? Is it developed sufficiently to support the functioning of marine ecosystems? If not, what might need to happen to complete the network? After you have answered that, I will ask another question.

The Convener: Is there anybody in particular that you would like to address the question to, Ariane?

Ariane Burgess: I will start with Professor Bill Austin.

Professor Austin: I will answer the question in the context of our coastal seas in particular and reflect on the notions of connected land-to-sea systems. We need to develop our thinking about marine protection in that area. Joined-up thinking is necessary for some of the coastal MPAs.

On enhanced MPA networks, the connectivity between protected areas would benefit from more thought about how we make the systems work. We have heard about climate change driving

range changes, so we need the protected areas to be connected to allow them to accommodate some of those long-term drivers.

Ariane Burgess: Thank you. Could I also hear from Professor Sir Ian Boyd?

Professor Boyd: How many marine protected areas we need, what the total area should be and how they should be connected are extraordinarily difficult questions to answer.

It is not well evidenced, but it is thought that you need to protect roughly one third of the marine area. However, we are terrestrial animals and take a terrestrial view of the marine environment. We think that, by putting lines on maps, we can create protected areas in the way that we might do on land with nature reserves, for example, but it is not really the same.

The marine system is highly dynamic. In other words, water flows around and things move over much greater distances—pollutants get sloshed around and noise moves at extreme speeds—so protecting areas in the marine system is quite different from doing so in the terrestrial system. Therefore—I have a particular view about this—we need overall protections in the marine environment. Although area-based protections are important, overall protections are much more important. For example, reducing the overall fisheries impact, which was described earlier, is probably the biggest step forward in my lifetime on protecting the marine environment.

There is a danger that we focus on area-based protection as the solution when, in fact, in a marine context, it would be much better to consider region-wide protection rather than area-based protection, because you will get more bang for your buck with it.

Ariane Burgess: Would reintroducing the three-mile inshore limit be a good way to protect our fisheries and marine biodiversity?

Professor Boyd: I will not comment on that idea, because I do not know what the evidence is. However, there is no doubt that our coastal areas are our most pressured areas. If we were to protect that immediate area, particularly the east-coast estuary areas, we would be doing ourselves a fantastic favour.

Ariane Burgess: The Marine (Scotland) Act 2010 seeks to promote the enhancement of marine protected areas in addition to their protection. To what extent has enhancement been achieved under that framework? What additional policies might we need to have in place? Is there anything missing from the framework?

Professor Boyd: I go back to what I said. My view is that we should have general region-wide enhancement more than enhancement of the marine protected areas. The marine protected areas are a slight misnomer. They are semi-protected a lot of the time: they are protected from some things and not others.

There has been progress. We have already heard evidence of that. Whether it is fast enough is another question. That is a value judgment that needs to be made. I am not sufficiently well up on what NatureScot has been doing with respect to monitoring and measuring the progress that has been made, but it will be able to tell you that. The reality is that we need to be able to measure the progress that we are making in the marine environment, but in general we struggle to do that and to evidence the fact that we are making a difference.

11:00

Ariane Burgess: Does anyone else want to comment on enhancement?

Professor Austin: One exciting area is climate mitigation, which we have discussed. We need to keep an eye on the emerging opportunities there. The focus has often been on biodiversity.

Susan Davies: Marine protected areas are good for biodiversity but also for food supply and carbon storage. They are one part of the system for managing the marine environment, and it is important that they are set in the context of the wider marine spatial plans and regional plans.

We are seeing more moves towards practical restoration projects in the marine environment, whether they focus on oyster beds, mussel beds or seagrass meadows. Those are important steps and they now require public and private financing. We need to learn from doing that restoration and build the science from it.

The Convener: I have a question to close our discussion on this theme. Regional marine planning areas can play a big part, and we see some great examples of that up in Shetland. However, part of that is about getting the stakeholders round the table to ensure that we have sustainable fisheries. Dr Marshall, are inshore fisheries groups well enough resourced to ensure that we get the best outcomes for marine protection, but also sustainable fisheries?

Dr Marshall: Inshore fisheries groups have become increasingly active in England as well as in Scotland. They can play a really important role, because inshore fisheries tend to have a lot of vessels, so a lot of people partake in them, unlike in the offshore fisheries. Inshore fisheries are really important, but they are complex because there are so many people, and there are issues that they need to tackle. They are also extremely data limited.

Scotland has a well-supported project called the Scottish inshore fisheries integrated data system—SIFIDS—which is run out of St Andrews. That project is supporting the inshore shellfish industry, and it is trying to get skippers to report data that can be used to monitor the status of the inshore stocks.

The inshore fisheries groups will play an increasingly important role. They have been funded by Marine Scotland and they should continue to get funding.

The Convener: That takes us nicely on to our next theme, which is data collection, data gaps and research needs. I ask Jenni Minto to kick off our questions on that.

Jenni Minto: I thank the panel for their evidence, which has been really interesting. I represent a west coast constituency. Finlay Carson started our questions by asking about Scotland and the rest of the world. I am interested in delving into the differences between the east coast and the west coast in Scotland. Last week, I visited the Scottish Association for Marine Science, which is based just north of Oban, and I learned about the research that it is doing. I was introduced to a robotic device that was about to head off from there all the way up to Iceland to learn about the changes in water. It will send back data in real time.

As well as hearing about the differences between the east and the west, I am interested in finding out what data is being collected to contribute to assessments of the health of the marine environment, where there might be gaps in that collection, and where more research is required. Dr Marshall talked about the limited number of scientists. How are we growing the scientist population through the various universities represented here but also through the Scottish Association for Marine Science?

I ask Professor Bill Austin to start.

Professor Austin: I should let you know that I am a visiting professor at SAMS, so I am delighted that you have visited and seen the amazing things that are being done there. I will pick up on the point that was made about restoration and learning as we go along with the science. Those two things can go hand in hand.

As you will have realised, my interest is in blue carbon, which is an emerging area for climate mitigation and adaptation. There is a great opportunity for understanding how to manage our seas. I am not sure how well we manage our seas, if we even do manage them at the moment. Protection can deliver those sorts of benefits. That is where the really exciting research lies, so, of course, that is something that I want to encourage. We have discussed the evidence base and what evidence will underpin the policies that we need in that area. Therefore, for the global challenge of climate mitigation, we need to improve our understanding of protection and restoration and of the benefits that flow from those measures.

Professor Boyd: We are always very challenged by monitoring progress in the marine system. It is data-poor, relative to what we have to deal with in the terrestrial system, for example. Not only is it very big but it is very remote, and it is expensive to get there. Therefore, the robotics from SAMS that you witnessed are wonderful, but that is becoming standard practice in the marine system—that is the way that science is going. It is moving towards relatively low-cost robotic systems to collect large amounts of data relatively quickly. However, there are still areas of the marine system that require people to get on ships and go out there to actually do the sampling. We do not really have robotic technologies that are suitable for that. Whatever happens, we will be pretty challenged, so there are some large data gaps.

We have talked quite a lot about fisheries, and the fisheries scientists do a fantastic job, but the reality is that they are dealing with what we would call quite sparse data sets a lot of the time, and they are making a lot of inferences based on those data sets. It is the same with sampling the benthic system, which is a massive area. Just getting to the benthic system—the sediments at the bottom of the sea—is a major logistical job in itself. Therefore, what I would try to get across is that, in Scotland, we need to continue to invest in the kind of science and infrastructure that you saw at SAMS. Given the importance of the marine system in Scotland—economically, culturally, environmentally and with regard to welfare—we do not invest nearly enough in marine science capabilities.

I will go back to some of the earlier discussions about involving communities in that. Our coastal communities could be much more involved in that, and our fishing industry could be much more involved in it, because it has ships going out to do one thing—fishing—but that could be doing multiple things. We are nowhere near as intelligent as we need to be to become much more informed about our marine environment to the extent that we might be informed about our terrestrial system, such as our mountains and moorlands. We have relatively little knowledge of the marine system, compared to the terrestrial system.

Dr Marshall: There are data gaps, but another issue is the accessibility of data. A lot of data is being collected that we simply cannot get at for scientific purposes. I could give you several examples, but I will give you just one that is a particular bugbear of mine: environmental impact assessments. People who decommission, say, oil

rigs do sediment surveys, taxonomic work on benthic invertebrates and so on, but those data are regarded as commercial property and are therefore inaccessible. We cannot fund research vessels to collect those types of data, and it would be fantastic if the industries and users of the marine environment could be required to supply their data.

There is the concept of the internet of marine things, which is this great vision of a future in which we have all different types of data painting a picture of the health of our marine ecosystems. Everybody needs to step up and contribute their data. The point that I want to make is that having accessibility and transparency would be a great result here.

Jenni Minto: Thank you. Because of time constraints, I will pass back to the convener.

The Convener: Indeed—we are really up against the clock now. I call Rachael Hamilton to ask our final set of questions, which is on COP26. I would appreciate it if the witnesses could keep their responses as brief as possible.

Rachael Hamilton: First, what are your takeaways from ocean action day at COP26? Secondly, how will the World Bank's problue fund help Scotland, and what projects would you like to be put forward in that respect? Finally, on the 30by30 commitment to protect 30 per cent of global seas by 2030 and to drive an increase in biodiversity, what kinds of marine environment policies could run parallel to that?

I will start with Paul Fernandes.

Professor Fernandes: Gosh, that is a big question. Some of the existing problems in, for example, fisheries relate to some of the questions that you have just asked. We still do not know how to deal with the problem of bycatch and discards at sea by the fishing industry, and we need to deal with them. Tara Marshall has a good project in the west of Scotland that is looking at stakeholder involvement in detecting hotspots, and we are also working on technical solutions.

I would also look to the Marine Alliance for Science and Technology for Scotland—or MASTS—that Ian Boyd set up to help with analysing a lot of the data and to Marine Scotland science to provide more resources for the increasing need to look not only at fisheries and aquaculture but at licensing and marine strategy framework directive-related issues covering the whole marine environment.

The 30by30 commitment will probably not help with fisheries management; instead, it will be very specifically for particular conservation needs with regard to biodiversity. It is very relevant, but there are other more effective tools than area management that we can use to enhance our fisheries.

Rachael Hamilton: Convener, I cannot see who wants to come in or who has their hand up.

The Convener: Perhaps we will just stick with the issue of fisheries. I call Dr Marshall.

Dr Marshall: I will limit my remarks to fisheries science in Scotland.

As the convener will know, I am a big advocate of the co-management concept, under which the fishing industry, in particular, is given greater responsibility for contributing, collecting and analysing its own data. In other words, it steps up to the plate. The version of co-management set out in "Scotland's Fisheries Management Strategy 2020-2030" was very preliminary and partial, and it was cast as people sitting around a table. Real co-management is just that: you have the responsibility and there are some power-sharing arrangements. That not only creates flexibility for the industry but requires greater transparency of it. I think that it would be positive to imagine what it would be like to use co-management approaches in a real way and not just to pay lip service to the idea.

11:15

Susan Davies: Thank you for the question, which covers a range of issues. Looking at the commitments and policies that need to be in place, I think that we already have a lot of the right policies and frameworks for managing the marine environment. The real challenge is the lack of pace in implementing them. We need to pull together the data more quickly to help inform the translation of those strategies into plans and to implement some of the measures, whether they be for protection in our marine protected areas or for wider marine spatial planning.

As for the financial investments that we are seeing by the World Bank and other private investors, there is a huge opportunity for that investment to go into the restoration of blue carbon habitats, and there needs to be a shift towards upscaling the amount of financial investment in that respect.

Professor Boyd: The emphasis on the oceans in COP26 was obviously to be welcomed, but the final point that I would make—this refers to the 30by30 commitment and all the other things that we have talked about—is that the oceans are highly dynamic. They have always changed through time, and they will continue to change. The really important thing is to try to understand better how they will change in future and what our role in that will be. If we try to preserve the oceans and the marine system in one particular state, we

will be doomed to failure. It will not happen, because nature will not allow it.

Instead, we need to be adaptable and, as has been mentioned, put things in place, try things out and see how the system responds. The whole fisheries management process is part of that story, and we need to learn from it and move on. This is as much about an attitude of mind and a philosophy as about anything else, and it is slightly different to what we experience in the terrestrial environment, where we would expect more long-term consistency than we would in most parts of the marine environment.

The Convener: Last but not least, I call Bill Austin.

Professor Austin: I spoke earlier about the optimism at seeing the ocean-climate nexus conversation grow at COP26, and I think that that will continue.

I am really encouraged by the oceans being seen as part of a new framework for nature-based solutions, with outcomes for climate, people and biodiversity, and it challenges us to rethink our oceans. Key to this will be the development of appropriate pipelines. For example, what we wish for will require pipelines for investment opportunities, and I think that the potential stakeholder engagement that has been referred to will be critical in that respect. After all, some of these areas are challenging and will require that engagement.

That would be my final observation, convener.

The Convener: Thank you very much. Unfortunately, we have come to the end of the session, but I very much appreciate the fascinating evidence that the witnesses have provided.

I suspend the meeting briefly for a changeover of witnesses.

11:18

Meeting suspended.

11:23

On resuming—

The Convener: Welcome back, everyone. I welcome our second panel, who will be discussing the terrestrial environment. We have with us Dr Helaina Black, honorary associate, and Professor Rob Brooker, head of ecological sciences, both at the James Hutton Institute; Professor Marc Metzger, chair in environment and society at the University of Edinburgh; and Professor Pete Smith, chair in plant and soil science at the University of Aberdeen.

I will kick off with a statement:

> "For terrestrial and freshwater ecosystems, land-use change has had the largest relative negative impact on nature since 1970, followed by the direct exploitation, in particular overexploitation, of animals, plants and other organisms mainly via harvesting, logging, hunting and fishing."

Is that level of pressure the same in Scotland as it is globally? Do those global impacts affect Scotland in different ways? I ask Professor Brooker to kick off.

Professor Rob Brooker (James Hutton Institute): The answer to the question of whether those are the key drivers of change in Scotland as well as globally is yes. At the Scottish level, there are continuing declines in biodiversity as a result of land use change, and the effects of climate change fit around the patterns of land use change impacts.

We are seeing continuing declines in the number and distribution of species, particularly in the more intensively managed land in Scotland. We are also seeing the largest and most immediate impacts of climate change in particularly temperature-sensitive environments such as mountain systems. Where the land use pressure is perhaps lower and those organisms are more heavily regulated by temperature is where it is easier and clearer to see the land use change impacts. A nice example of that is snow beds in Scottish mountain systems. There was mention in the newspapers recently of the sphinx snow bed in Braeriach, which has disappeared again. The organisms that are associated with those very cold systems are dropping away.

Are those global impacts affecting Scotland in different ways? In terms of the mechanisms and processes, the answer is no. What might be different in Scotland is the balance of those effects. In countries where there has been less historic land use change, there is a larger immediate impact of species loss because of planned use change. In Scotland, the issues are on-going decline, fragmentation of habitat and other factors that are perhaps more obvious in different environments such as mountain systems, which are more susceptible to climate change, and freshwater systems, which are more susceptible to pollution.

Dr Helaina Black (James Hutton Institute): I will make a couple of points that follow on from what Professor Brooker said. I will focus on soils, because I am a soil scientist. It is fair to say that the biggest changes with the soils in our environment happened before the 1970s. They have been going on for centuries as we have changed our land use.

Post-1970, there was a focus on land management and management intensity. In relation to soils, it is about not just management

but the combination of a number of stressors, including management intensity, management type and atmospheric pollution. A combination of those things has led to soil degradation, which affects biodiversity in the habitats that have soils.

In relation to soil habitats and degradation since the 1970s, I also point out the significant losses from development of the land area of soils, which has implications for our soil resources. What is happening in Scotland is no different from what is happening elsewhere in the world. There is a recognition that, globally, soils are degraded from all those different pressures. "The State of Scotland's Soil" report was published in 2011, if I remember rightly, and is a good illustration of those different threats and risks and what they mean for Scotland, and it also applies globally.

Professor Marc Metzger (University of Edinburgh): The previous two responses are really appropriate. I would add that there are differences in different parts of Scotland, such as the more extensively managed systems versus the intensive systems towards the east coast. The other thing to reflect on is the role of land ownership in Scotland, which is quite different from its role in many parts of the world, and certainly the north-western world. That reflects how land is used and how quickly changes in land use can be implemented. In some ways, concentrated land ownership means that large changes can happen quickly. We have seen that in the past, and we are seeing that now and potentially into the future in relation to forestry and rewilding.

11:30

The Convener: Finally, on that question, I will bring in Professor Pete Smith.

Professor Pete Smith (University of Aberdeen): Peatland planting for production forestry is one of the biggest legacy effects of the 1970s and 1980s. Tax breaks were given for planted production forestry on peatlands, which was disastrous, and we are just coming to terms with that now. It greatly increased emissions from, and the degradation of, our peatlands. We are now working out what to do with that forestry and whether to remove or leave the trees. That was a dumb decision that was made a few decades ago, and we are seeing the effects of that legacy today.

Dr Allan: Professor Smith, on that very point, looking to the future, I am keen to know whether some of those mistakes are reversible. I will touch on other questions briefly with regard to what we mean by "biodiversity intactness", but, helpfully, you raised the very point that I was going to ask about. I will not mention prominent broadcasters who invested in those trees in the 1980s. Are some of those decisions reversible?

Professor Smith: In a word, yes. Peatlands are a very important natural resource for Scotland. The main issue is that 80 per cent of them are degraded, but they can be restored. It is largely a matter of raising the water table and, in some cases, helping the peat-forming species, such as the sphagnum mosses, to come back. It can be dealt with, and the peatland action programme is embarking upon that restoration.

More specifically, on the afforested peatlands, there are debates about whether it is better to remove the trees or to re-wet the peatlands and allow the trees to remain. There is open debate about whether more damage would be caused by going in to harvest the trees or whether it would be better to leave the trees, abandon the timber and re-wet the peatlands by raising the water table. The peatlands can be restored, and we must do more.

The Climate Change Committee recommends that we should restore at least 80 per cent of our peatlands, but I think that the target should be 100 per cent by 2050, which would require stepping up our peatland restoration programme. It will require the same level of resource as is required for large infrastructure projects such as rail and road infrastructure projects. That is the sort of resource that we should be throwing at the issue, because it is critical for us in meeting our net zero targets and restoring biodiversity.

Dr Allan: I have a final, brief question for Professor Smith. In the environmental debate, we now factor in questions around biodiversity intactness. Scotland seems to be doing a bit better than some places in the UK on that score but perhaps not as well as other places in Europe. Other witnesses might want to chip in, but what do you understand by the term "biodiversity intactness"? In parts of Scotland such as the Highlands and Islands, for very good historical reasons, there is a slight recoil from the word "wilderness", so what is biodiversity intactness, and how do you reconcile that with attempts to repopulate fragile areas?

Professor Smith: I use the biodiversity intactness index in my work, but there are others in the meeting—particularly Rob Brooker—who know far more about it than I do, so I defer to him for an answer on that.

The Convener: Is Rob Brooker coming in?

Professor Brooker: Am I still muted? Can you hear me?

The Convener: There you are.

Professor Brooker: The biodiversity intactness index is set out as the proportion of biodiversity

that remains after human impact. The point that is made in the work that was done by the Natural History Museum is that it incorporates these big historical changes away from what the natural systems would look like.

Therefore, biodiversity intactness for highly developed countries that have had large populations for a long period, such as the nations of the UK, is substantially impacted by their long history of land management. Other countries that have not had such intensive and spread land management have a lower level of impact and, therefore, score higher in the biodiversity intactness index.

We have substantially reduced biodiversity relative to what we could have, but we also have important pockets of high biodiversity. We could increase the biodiversity throughout the landscape. One of the major challenges is in integrating conservation with our other land use needs. That was highlighted by a lot of the discussion at COP on nature-based solutions, but we might come on to that in a bit.

The Convener: The biodiversity intactness is a worrying statistic. We are highly focused on reducing carbon dioxide now, and we hear about net zero all the time. Are we addressing the biodiversity crisis in the way that we should? Should we attack it first and allow the climate to look after itself or the other way round? Do we have the emphasis right in Scotland? Our ability to change the amount of carbon dioxide in the atmosphere is limited by the size of our country, whereas the biodiversity loss in Scotland is pretty dramatic. Are we focusing on the right area?

Dr Black: We should not consider them as separate issues. We have an opportunity for a win-win situation with both. The evidence is clear that most of our habitats and land uses in Scotland could gain more carbon and help with mitigating and adapting to climate change. Fundamentally, carbon is the food source for most of our habitats and, if we work to restore carbon in habitats, we also work to restore them for biodiversity.

We need to move away from looking at the two as separate items. It is fundamental to developing nature-based solutions that we do not consider an ecosystem for one thing that it might deliver—carbon or biodiversity—but say that we want healthy ecosystems that will sustain biodiversity and contribute to the climate.

The Convener: That takes us smoothly on to our second theme, which is peatlands and soils.

Ariane Burgess: Good morning. We have already started to get into discussing peatland. Clearly, it is an important part of our terrestrial response to the climate and nature emergencies. I would like to hear from Professor Smith about the role of peatlands in biodiversity and climate change and about the tools that are available to help to support healthy peatlands. He talked about the massive scale of the issue. I am interested in finding out what is in place to allow us to take our action to the necessary level. I do not know whether he has had a chance to look at the national planning framework. Might the NPF be where we need to place the work on peatlands?

Professor Smith: As I said, 80 per cent of our peatlands are in a somewhat or very degraded state, so we have a lot of work to do to restore them. We have a peatland action programme to do that, but it is limited in scope and resources. It is also limited by practical constraints such as the availability of contractors to do the work. Therefore, we need to upskill the contractors and the people who can do the on-the-ground work. That requires more resource. As part of a green recovery, we could upskill rural workers and provide jobs in that sector.

On the issue of protecting biodiversity and hitting net zero, which you discussed with the first panel, we must employ nature-based solutions, wherever we can, that co-deliver climate change mitigation and adaptation, biodiversity, and support for people. That means protecting our existing high-carbon and high-biodiversity ecosystems, by which I mean our pristine peatlands; restoring the 80 per cent that are not in pristine condition; and better managing other parts of the land, including by creating novel ecosystems, particularly in urban environments, that can provide those benefits to biodiversity, nature and climate change. The focus should be on co-delivering in relation to biodiversity and climate change and on developing and supporting sustainable rural livelihoods by, for example, creating jobs in rural sectors that can support things such as woodland expansion and peatland restoration.

Ariane Burgess: Thanks. I have a question for Dr Helaina Black that is similar but that focuses on non-peat soils. What tools are available to support healthy soils, and what do we need to do about non-peat soils in our response to the biodiversity and climate emergencies?

Dr Black: I will start with what we need to do; it is not that dissimilar to what we need to do for peatlands and native systems. There is huge potential for storing carbon in agricultural soils, and there is an opportunity to improve the health of the soils by taking that joint action in managing for the climate, for biodiversity and for productivity. I will come back to that explicitly.

When it comes to agricultural soils, a lot of tools are out there, which are covered in advice to farmers on what to do and how to be productive—for example, in managing fertiliser inputs or

managing for water quality. However, a gap remains when it comes to the tools that provide information on a healthy soil. Companies offer analyses of soil health, for example, but the challenge in those is in understanding what they mean to an individual farmer in an individual location with distinct soil types and distinct management practices. The gap is in translating what we know from research about what makes a healthy soil and providing that in a way that farmers can understand, so that they can alter their management in order to improve healthy soils. We need to develop that transfer of knowledge between research and practice.

In Scotland, we are lucky that our agricultural soils are very healthy. In addition, because they are agricultural soils, they have huge potential for increasing carbon stores and reducing greenhouse gas emissions. The challenge there, again, is in the tools—the information given to farmers about how they can reduce their inorganic inputs, which are a major contributor to greenhouse gas emissions and are derived from fossil fuels, so they are getting more and more expensive. It is about how they can move away from reliance on things such as inorganic fertiliser and start to work more with the biodiversity that is in their soils, which provide the carbon storage and the nutrient dynamics. We are going to have to enable that fundamental shift.

A lot of research is out there. A lot of what we need to do is in plugging that information gap, in order to make that research applicable out on the farmer's field.

The Convener: Some organic farms have been running for 25 years. It has taken 25 years to get to a point at which nearly all non-organic fertiliser—nitrogen or whatever—has been removed and the soil has regenerated to such a point that it is delivering yields that are sustainable both economically and in terms of biodiversity. Has any work been done to assess the condition of Scotland's soils in order to give a timescale for their just transition—as I suppose we could call it—from artificial to organic fertilisers? We have a target to become net zero by 2045, and agriculture has a big role to play in that. What scientific work has been done to assess how long it will take for the soils, given their current condition, to start delivering in the future? Again, that question might be for Dr Black.

11:45

Dr Black: I will kick off, but I would like to hand over to Pete Smith once I have said a few things.

In Scotland, we are lucky to have a wealth of modelling capacity that allows us to look at how our systems might change over time. Looking at how long it might take for our farming systems to move to another status—that is, moving away from reliance on inorganic—it is clear that we have the capacity to do that, but you have hit on quite an interesting gap. We know a lot about transition to organic and how long that might take, and what it means for productivity. However, there is a gap at the intermediate stage. It is expected that we will have to retain a relatively high level of productivity in order to maintain society. In moving to reliance on organic, therefore, we will need something in between where we are now and becoming fully organic. There is definitely a modelling gap there, but we have the capacity to do that modelling.

I will hand over to Pete Smith, because he is much more experienced on the modelling side, which could underpin that shift.

Professor Smith: Aiming for perfection may be the enemy of progress. If we are aiming for a fully organic system, it will take a while to transition, but we could imagine a steadier transition towards more organic production through things such as agro-ecology. That is a bit like organic production, but it does not have the full certification that means that no external inputs can be used. Moving to something like a halfway house before we go to full organic, by using, promoting and supporting more agro-ecological approaches, would probably be the way to go. We could then transition without a loss of productivity, and farmers could learn as they go along, during the transition, about how to cope with fewer inputs from agrochemicals, rather than simply going organic overnight.

The Convener: Is there any sign of any policies that might help us to achieve that? Are there any such policies in the pipeline?

Dr Black: I must admit that I am not entirely familiar with the policy, but I know that there is increasing interest from farmers. A growing body of farmers are moving towards implementing what they call regenerative practices, which very much reflect agro-ecological principles. Regenerative farming might seem like a new term, but—to go back to what Pete Smith said—it is underpinned by knowledge of agro-ecological evidence.

There are some interesting principles that farmers can use and adopt quite easily, such as minimising soil disturbance or the addition of cover crops. There are certain management practices that farmers can start to play around with and adopt. With regard to policy, I defer to Rob Brooker or Pete Smith, because they are probably more aware of the actual policies that are in place.

One aspect of policy that will have significant implications for this area concerns where we go in managing soil carbon. The practices that we are

discussing will regenerate soil carbon, and a lot of farmers are now looking to see whether they can be incentivised to do that. The next step is to look at what will happen with agricultural subsidies or Government agricultural policy under the new schemes, and how those elements will encourage people to adapt to new management practices.

The Convener: I ask Rob Brooker for a brief response, followed by Pete Smith. I will then bring in Rachael Hamilton for a supplementary question.

Professor Brooker: With regard to policy and what Helaina Black said, I agree that payment mechanisms are key to whether we can encourage farmers to move down that route. My understanding is that we are currently in a stability phase in which the plan for Scotland is put in place following the movement away from the EU. What those payment structures look like will be critical.

If we are to shift towards more sustainable farming, there is a clear need for a shift towards payment for outcomes. Work is being done on that. The management practices that we put in place must deliver what we want. We also need good indicators of soil health so that we can assess whether we are getting the outcomes and the improvements in soil health that we want. We know from recent work that there is a suite of potential indicators. There will be work in the Scottish Government's next strategic research programme to look at how those indicators respond to different management regimes and to see how they can be used in moving farms from standard management practices to more sustainable ones. That could be linked to the payment mechanisms.

Professor Smith: The system of subsidies that replaces the common agricultural policy has the potential to incentivise small, sustainable management practices. We can use public money to pay for the public goods that are provided by farming. If someone changes their farming in a way that provides more natural capital, we need more information and a means of calculating the natural capital that is provided by that different farming system. Those changes might enhance biodiversity, store carbon, raise the amenity value or improve air or water quality. All of those public goods that might be provided by farming could be valued. An incentive system could be designed around the delivery of those public goods rather than around the often uneconomic production that was subsidised by the CAP.

There is a real opportunity for us to redesign our subsidy system to support what we want to get out of farming and how it can contribute to our net zero ambitions and our biodiversity targets.

Rachael Hamilton: It is important to listen both to the evidence and to farmers. They have been demonised. Farmers want to be part of the solution as we work towards net zero. They are already working on regenerative practices and putting in buffer zones. They are using rotational grazing and practising minimum tillage.

There is no definition of sustainable agricultural management. That makes it difficult for the farmers who are already doing those things to articulate how they can do more. I listened to Dr Black. There seems to be a gap between what farmers are doing and the expectations that we and the world have of them. If we consider that 95 per cent of agriculture relies on soil, agro-ecological or organic practices will not give us the food that we need to live on. We are in a difficult situation. I would like to hear Marc Metzger's comments on what I have said.

Professor Metzger: You are absolutely right. One of the challenges is that the farming sector, which is already doing a lot, is waiting to do more, but farmers need clarity and they need to have multi-annual support to be able to change what they are doing. They can make the investment if we can get outside investment in.

We have been waiting for the transition away from CAP for a number of years. It is my understanding that clarity has again been postponed for another number of years. We do not have years to spare. I would encourage any signals from Government that might bring clarity to the sector about what is expected and how farmers will be supported. Without those signals, it is very difficult to expect them to commit to making substantial changes to their business practices. They need clarity about how they will be supported to do that.

The Convener: We will come back to the question of sustainable agriculture management. Beatrice Wishart has some questions about peatland.

Beatrice Wishart: Professor Smith, you indicated that 80 per cent of Scotland's peatlands are degraded but can be restored. There is concern about peat being dug up for the construction of wind farms and the installation of wind turbines for green energy. I am also aware of peatland restoration work occurring around such wind farm projects. What is the impact of wind farm building on the biodiversity of peatlands?

Professor Smith: I was involved in the development of the wind farm carbon calculator, and we know that, if you site a wind farm on peat, the carbon that you lose from the peat—by draining it in order to put the base in—can outweigh the carbon benefits of the turbine. Therefore, siting wind farms on pristine peatlands does not seem to make much sense in relation to the carbon payback time or our net zero targets.

The impact on biodiversity might be different, but the extent of the drainage around the turbine base determines how much carbon is lost and how much we lose those peat-forming organisms. However, generally, if wind farms can be sited away from peatlands—for example, on mineral soils—that gives win-win benefits, because it provides renewable energy without losing the carbon. Therefore, I think that we should favour that.

The Scottish Environment Protection Agency uses the wind farm carbon calculator tool and it is used in more planning developments, but the calculator allows other areas to be restored to compensate for installing turbines in the peatlands and allows the minimisation of the area that is drained. Whether that work happens in real life is another question, so where we site the wind farms deserves more attention, and we should give precedence to farms that are sited on mineral soils rather than on pristine deep peats.

The Convener: I have another question for you. Is there any calculation of how much peat has been displaced by the wind farms that we currently have and what their carbon impact has been? When local authorities grant planning permission, is there any obligation on them to use the wind farm carbon calculator to assess the suitability of new wind farms? Undoubtedly, through the new national planning framework, there will be a push for ever more new wind farms. Do we need the calculator to play a bigger role in the planning process?

Professor Smith: I do not think that anybody has done the calculation, but it could easily be done on the amount of carbon that has been lost by siting wind farms on the peatlands. We know the carbon content of the soils or peats where the farms have been placed, so we could do those numbers, but, to my knowledge, nobody has.

There is already a requirement to use the wind farm carbon calculator in the planning applications, and it is often used by the developers as well as the people who oppose the developments. They come up with different answers, depending on the extent of drainage that is put into the calculator. The carbon payback time is only one of the considerations that local authorities consider. They have to consider other issues, such as the creation of local jobs and generating sustainable energy within the locality, so the calculator is only one component. However, given the importance of the peats for carbon and biodiversity, I think that we should look at that again.

The Convener: Is there a suggestion that, at the moment, renewables sector developers might be greenwashing by saying, "We might be displacing peat here, but we will restore it somewhere else"?

Professor Smith: They could genuinely be doing that. If an area of peatland is affected by a wind farm, developers might invest in restoring peatlands elsewhere. However, we have a finite peatland stock, and, obviously, if we did not destroy the peatlands by putting wind farms on them, we would not need to restore that amount. We need to restore 100 per cent of our peatlands anyway, so, if developers restore peatlands elsewhere to compensate for displacing them, that is not additional, because the restoration would have to happen anyway.

The Convener: I appreciate that. We will now move on to the theme of sustainable agricultural management.

12:00

Jim Fairlie: As a former farmer, when I hear witnesses talking about what farmers have to do, I find some of these discussions pretty frustrating. First, I would like to know what you understand farmers already do. That is possibly the point that Rachael Hamilton picked up.

Dr Helaina Black, you talked about reducing the amount of fertiliser that is used. Recently, I visited a farm that is now doing precision drilling, so a computer tells them how much fertiliser to use. It used to be the case that you would splatter 3 hundredweight of NPK across the whole field. Now, it is all done by GPS, so you will use 4 hundredweight in one part, 1 hundredweight in another, nothing in another, 5 hundredweight in another, and so on. In that way, the field is fertilised to the exact extent needed, which gives you the maximum yield with the minimum amount of input. Fertiliser is very expensive—it costs more than £600 a tonne right now—so farmers do not want to waste it.

Then there is the use of glyphosate, which I know is controversial. The land gets eaten to the board, then you spray off the old grass and direct drill it with a crop after it has been fertilised by livestock over a number of years. We call that "regenerative farming"—I just call it "farming", because it has been done for generations. I would like to understand where the dichotomy has come from: farmers are being demonised for producing good-quality food in a sustainable way and they are being demonised for doing what they have always done. I would like to get a better understanding of that.

Dr Black: Thanks for that. You have highlighted something that is very important in that context, which is that farmers are always innovating. Sometimes, we can be a bit behind the curve with regard to providing farmers with the right

information. However, I come back to your statement that farmers are sustainable. In the context of producing crops, yes, they are. However, in the broader context of the term "sustainability", you have to question whether we can enable farming to carry on in the way that it is going, given that we have water quality issues and biodiversity losses, and given that we are looking at climate change mitigation and adaptation.

Farming a field does not happen in isolation from the wider landscape in which the field sits. That is at the heart of what we must deal with. We must ensure that we bring farmers with us in the conversation about how we address our biodiversity losses, improve our environment, make social gains and address climate mitigation. That is where the conflict or confusion or discussion must sit. The starting point is how we define sustainable management and what that means in Scotland as a whole—as a society—not sustainable management for production, not sustainable management for biodiversity, and not sustainable management for climate change mitigation. What does sustainable land use in Scotland—in order to deliver these multiple benefits that we want and desire—mean? A common view of that will help in the conversations that we have.

On the other side of that, we need to reflect on the fact that, as you said, the price of inorganic fertilisers is going up and up, and farmers are looking to adapt their farming systems so that they can maintain a farm into the future that can support incomes and the farming community. I do not necessarily see a conflict between that and regenerative farming and so on. It goes back to what Pete Smith said: every farmer is going to have to look at the transition to adapt to climate change. In that context, the tools that are out there will help carbon mitigation and biodiversity. Personally, I am not saying that we must expect every farmer in Scotland to become agroecological or regenerative, but there is a toolbox there that would allow every farmer in Scotland to work towards that transition.

To come back to the other things that we want farmers to do, the issue is about allowing farmers the flexibility to do them in their own environment. I agree that farmers have been demonised, but we now need to move forward and think about how we integrate the stories of climate, biodiversity and whatever else.

Yesterday, I was involved in a workshop on farm and soil carbon credits, and we asked the 200-odd people on it what they wanted the credits to achieve. I do not want to get into the issue of the credits themselves, but what I found fascinating in the responses to those questionnaires about what people wanted to achieve in their farming was that their top comment was about adapting farming to a future under climate change. That is what every farmer wants to achieve. We need to provide the tools to do it, and we are saying that reflecting on agroecological principles can help farmers with that transition.

The Convener: We are lucky to have two experts from the James Hutton Institute with us, so I will bring in Rob Brooker at this point.

From knowledge gained, as I have said, many years ago in the soil science department of Aberdeen University, I know that microbiology plays a huge role in this matter. The more artificial nitrogen we use, the less we rely on the microbes in the soil to fix It; in other words, microbiological and other matter in the soil is very good at allowing plants to take up nutrients, and the more artificial fertiliser we use, the less we rely on those microbes. As a result, reducing the use of artificial fertiliser has the regenerative effect of allowing these microbes to do their job again, and there is a tipping point at which the return on investment in terms of yield through the use of artificial fertiliser reduces. You do not get as big a bang for your buck, so to speak.

If that is correct, should the science be helping farmers with the decision to reduce their use of nitrogen and artificial fertilisers, given that, after a period, productivity that might have fallen will increase as the microbes in the soil start to do their job again? Again, this brings us back to the transition issue, but does part of the solution lie in knowledge transfer from you guys—the scientists—to grass-roots farmers to persuade them that doing things differently will not, in the long term, affect their bottom line and economic sustainability?

I am just seeing whether anyone is nodding. Would Pete Smith like to respond to that? [*Interruption*.] I beg your pardon—I had said that Rob Brooker would respond.

Professor Brooker: I am very happy to, and I can give you a nice example that brings many things together.

We have an Esmée Fairbairn Foundation-funded project on crop mixtures, which is basically about growing two species together instead of in monocultures. There is a lot going on there, some of which is about the biology. On average, the relationship between biodiversity in the system and the way in which it functions tends to be positive, and, indeed, you get most gain from adding biodiversity in species-poor systems. In a crop system, if you increase the number of crops that are growing together to two or three, the soil functions and the other functions that you have referred to will increase, too. With these crop mixtures, we have been able to reduce the

nitrogen inputs going into the system and still maintain—and, in some cases, even increase—yield, so there is a financial as well as an environmental saving. Moreover, the system is more sustainable, as you can, for example, have pea and barley mixes that can be used for animal feed, which reduces the global footprint.

There are ways of transitioning to a more sustainable farming practice that have both economic and environmental benefits. One of the key aspects of that work is that we are working with farmers as scientists, with on-farm trials and the farmers providing us with data. They are part of the solution, and they are telling us what the real problems are. Many of them would like to grow crop mixtures, but the solutions are partly about what to grow where and what might be the best stuff to put in and partly simple technical things such as having a separator for the mixed crop. In many cases, you cannot sell a mixed crop if it is combined; you need a separator, and not many people have them. This is not just about the biology—there are practical challenges, too.

I come back to a point that was made about the marine research: these people—the farmers and the fishermen—have to be part of this work, and we can enable that sort of thing through our online technologies. It is something that we need to look at. If we are to roll these things out more widely, we need online systems for gathering data so that we can work with farmers on tailored solutions. Crop mixture is a really nice example of the potential that is there, but it is still relatively small scale.

The Convener: Do you want to comment, Pete?

Professor Smith: Rob Brooker's answer was great, but one other thing could be considered. If there is a short-term yield penalty from transforming the farming system into one that gives a slightly reduced yield, we could consider using the farming subsidy system. The new farming system will provide more public goods, and we could use a proportion of funding to support the provision of those goods, which would make up for the drop in the production of private goods, such as the reduced yield to the farmer. The subsidy would not have to be big, because the yield production would probably only be small, but public funding could be considered for those types of farms to enable the transition to a farming system that provides more public goods.

The Convener: We move to Jim Fairlie for a final question on sustainable agriculture management.

Jim Fairlie: First, I want to come back on one or two of the points that have been made. Growing mixed combinable crops has been done for years—for example, grass can be sown with barley. Various things are already happening in agriculture. I will re-emphasise the point that you are all making, as it needs to be clarified. The farmers are already ahead of the game—they are doing stuff because they want to, and because they want to hand their farms on to the next generation. There needs to be far more cognisance of that among both the public and the scientific community.

I will move on to the role of livestock in global sustainable food systems, considering both climate change and biodiversity and what the conversations around eating less meat and dairy mean for livestock farming. To come back to a point that came up when we talked about sustainability in the earlier session on the marine environment, how is Scotland's system different from the global system? There is a misapprehension in that respect that we need to get past. Perhaps I can go to Marc Metzger on that first.

Professor Metzger: It is a very sensitive issue. It is important to recognise the difference between UK, and in particular Scottish, livestock farming and global systems. That distinction has been made in various studies, including at a high level with regard to grass-fed systems versus intensive systems. Even within grass-fed systems, with Scottish beef, Scottish agriculture is probably on the more sustainable side of the scale; I do not know whether one of my colleagues has the statistics to back that up.

We also need to realise—this applies in quite a few respects, in fact—that Scotland's environment has historically lent itself to a number of agricultural activities, and we should recognise that, in the future, we must make the most of our national conditions. We are naturally good at growing grass and raising livestock, and we should emphasise that point to the general public, and within the sector. Of course, those in the sector already know it, but we should emphasise it from a scientific perspective.

Within that, there is an element that I have been considering for a while. To what extent should we take responsibility for the fact that we can grow certain things, including trees, well in Scotland, with the environmental conditions that we have? Should we emphasise that we should make the most of that, instead of importing or exporting our goods to other parts of the world? Rather than see livestock raised or trees grown in other parts of the world, we should, as we are good at it here, take responsibility, in the sense that at least a significant amount of the land that we use should be used for the things that Scotland is environmentally suited to doing.

12:15

Professor Smith: I differ slightly from Marc Metzger on that in that I believe that we need a transformational change in our agriculture. We know that livestock agriculture, per unit of mass or per unit of protein or calorie, is 10 to 100 times more damaging than plant-based production in terms of climate change. We know that it uses 10 to 100 times more land, and 70 per cent of global freshwater, and that it is a major driver of biodiversity loss. We absolutely should consume less meat and dairy. That would also be better for the health of our citizens.

How will we manage that? It will have impacts on our farming sector, but we have to manage it. It has to be a just transition. We can make demand-side changes—we can request or promote healthy eating among our citizens so that they consume less meat and dairy. We could also consider an approach of less and better; I have heard that mentioned in the livestock industry. We would produce less but better meat, so that we consume less meat, fewer ruminant products and less dairy, but we make it better. We would focus less on intensive systems, which are more environmentally damaging, and more on systems that produce our livestock in a relatively more sustainable way.

The last thing that goes with that is that some farmers who are receiving subsidies to produce livestock that would not be economical to produce without the subsidies will have to be provided the means of diversification. We have to retrain and upskill them, so that they can be part of the just transition and do not lose their livelihoods in rural societies.

We cannot reach net zero and tackle our biodiversity targets by just fiddling around at the edges of our system. We have to think big. If we are to reach net zero by 2045, it is going to mean making some fundamental changes in what we produce and consume in our country.

Professor Metzger: I do not disagree with what Pete Smith says. I absolutely agree that we need change, but some of the polarised debate that we are having, particularly out in the general public, is not helpful. There is a place for livestock, although probably more expensive livestock, in Scotland. It does not help to polarise the debate to the extent that we have a huge argument against people who eat, buy or produce meat.

The Convener: I am very conscious of the time: we have 20 minutes left. Rachael Hamilton has a quick supplementary question.

Rachael Hamilton: I completely agree that we should not be having a polarised discussion in which the importing of avocados and the cutting down of the rainforest to grow soya are used to argue against the carbon footprint of a farmer who produces home-grown foods in Scotland, but I will move on.

There seems to be uncertainty about the contribution of agriculture to greenhouse gases, and specifically about the calculation of methane emissions. Do the witnesses have a view on that?

The Convener: We will go to Marc Metzger and then to Pete Smith.

Professor Metzger: I am happy to hand over to Pete Smith.

Professor Smith: My guess is that you are referring to the global warming potential star metric.

Rachael Hamilton: Yes.

Professor Smith: That is a different way of calculating the climate footprint of methane. Methane is a short-lived greenhouse gas, so it has a big effect early in its life but less effect in the long term. The upside of that is that we can say that, if the number of animals in the livestock industry is kept at a constant, there will not be a net contribution to climate change, because the methane that is produced will be gone from the system quickly. The downside of that, for the livestock production industry, is that that makes methane a very attractive target for addressing climate change in the short term.

That is why, at COP, a number of parties signed up to the global pledge to reduce methane emissions by 30 per cent compared with 2020 levels. The target will be reached mainly by reducing emissions in the oil and gas sector, but there will also need to be reductions in methane emissions from the livestock sector. That could benefit the livestock sector in that we could say that we are overestimating the climate impact of methane, but reducing methane emissions would have a large impact.

It is thought that the global methane pledge could reduce global temperatures by about 0.2°C by 2030, which would have a big impact. It could be that using that metric and looking at the short-term impacts of methane puts methane in focus for rapidly reducing emissions in the short term, which could mean either fewer emissions per animal or a reduction in the total population of livestock that we raise.

I go back to my earlier point. I do not disagree with Professor Metzger; I do not think that anybody is trying to say that we should demonise the livestock industry and that we should all become vegan. We need a balanced approach with reduced consumption of meat and dairy, which we overconsume in this country at the moment. There also needs to be a balance in relation to farms.

The “less and better” way of looking at meat and dairy could be the way to go. It could provide sustainable livelihoods for farmers who produce their beef, dairy and sheep less intensively in the bioclimatic conditions that we have, which are ideal for raising cattle, as opposed to producing meat at an output level. We could coalesce around the “less and better” approach.

The Convener: We will move to our next theme, on forestry.

Jenni Minto: I am interested in hearing your views on the importance of forestry to climate change mitigation and of growing the right trees in the right places. As Professor Metzger said, there is a balance to be struck; every answer has indicated that there should be a balance. On the one hand, the UK is a mass importer of timber, but, on the other hand, we want to protect our existing trees and the associated biodiversity that they provide. What are your thoughts on getting that balance right?

Professor Brooker: That is clearly a topical issue. Getting the right trees in the right places for the right reasons is worth considering. One challenge at the moment is that the mechanisms for increasing our forestry do not take localised conditions into account. If you have the wrong tree and the wrong soil, you will get a net loss of carbon—for example, it does not make sense to plant trees on organo-mineral soils, which are halfway between the lode and mineral soils in deep peat. Having only an area metric is not the way to do it; we need localised solutions.

Another challenge in relation to the benefits of biodiversity is that some things win from planting trees. That depends on what you plant; a nice native woodland is better for biodiversity than a monoculture stand, but some of our biodiversity habitats are treeless and we would not want to plant on them. Species-rich grass is a nice example of where we need livestock to help to manage grassland as part of our biodiversity conservation. That is a good argument in favour of keeping some grazing systems going.

It is about having the capacity in the system to do the right tailored management, which has to be backed up by improved scientific knowledge about what the carbon balances and the other balances will be if we put woodlands in a particular area. We have some of that evidence and know some of that data, but there is more that we need to do on that to provide good information and support to land managers so that they can tailor local solutions.

Professor Smith: Although we require our woodlands to be in the right place and the right type of tree to be in the right soil, as has been said, native forests are the best option in the long run for biodiversity and carbon storage. We must remember that 80 per cent of our timber is imported and that, to replace coal and steel in the construction industry as part of our climate solution, we need more timber.

The fact that we rely on 80 per cent of our timber being imported suggests that we should increase our capacity to produce timber in Scotland. Just focusing on native species that co-deliver biodiversity would be a mistake, because we also need production forestry to produce timber to replace concrete and steel in the construction industry. We need a mixed approach to production forestry and native plantings for biodiversity and carbon sequestration, and that will probably require an even bigger area in which to plant trees of some sort—but there has to be a mixed portfolio of forestry.

The Convener: We talk about having the right tree in the right place, balanced with the need for timber. Surely that also applies to food: we need the right cow or the right sheep in the right place to fulfil our food security needs. I suppose that it is all down to regional land use and that sort of thing.

Is there another argument, however? We are talking about 25,000 hectares of sitka potentially being planted. It is a short-term product, so it captures carbon for a limited amount of time while it is growing, and it then gets cut down. In this country, it is generally used for short-term timber products, so that carbon goes back up into the atmosphere. Is there an argument that we need to do a lot more work to look into native species that might capture carbon more rapidly and for longer, and which stay in the ground for a lot longer before they are harvested? Is that work being done? Rather than having 25,000 hectares of sitka, perhaps we need 10,000 hectares of sitka and 15,000 hectares of traditional native broadleaf.

Dr Black: I will kick off on that, and I will then hand over to Pete Smith.

I would reflect on what it is that we consider when we expand our woodlands. There has been a lot of research about having the right trees in the right place and about the opportunities for different woodland types. In relation to the definitions of “sustainable management” and “sustainable production”, do we reflect on whether woodland expansion is fair, and do the short-term economic gains reflect wider societal benefits in the future? Is there a balance? Is it about only productivity, or are there wider ecosystem goods and services that need to be reflected from that woodland? Will it meet needs now and in the future? I do not know that we are reflecting on that when it comes to woodland expansion.

I hate to say this—although I keep saying it—but I wonder whether, if we had a good definition of what we want sustainable land use and land management to be in Scotland, that would help us to make decisions about what we want our woodlands to do for us and to decide whether we are comfortable with single-stand sitka in certain locations, while it would be better if we diversified in other locations for other things.

I will make one further comment in this context. We separate forestry and agriculture quite distinctly at the moment. I think that we should reflect on the fact that there are opportunities with agroforestry in current agricultural systems. We need to enable farmers to contribute to woodland expansion in a more flexible manner.

I will hand over to my colleagues, who probably have things that they wish to say on the matter.

The Convener: We are short of time. I will hand over to Marc Metzger, who has indicated that he wishes to respond.

Professor Metzger: Land use and its integrated nature have come up a couple of times now. We have the land use strategy in Scotland, which was launched in 2011. It has fallen flat a bit in recent times. If we want to integrate climate and biodiversity, it is important that we have a land use strategy, with a definition of sustainable land use, and that what can be fairly siloed policy efforts are more integrated.

We now have the regional land use pilots, which are noble in what they are trying to achieve, but they are severely underresourced. A single pilot covering all of the Highlands has £30,000 going towards having a policy officer. How can we think about integrated land use and all the issues that we have been discussing if there is so little resource?

What I really miss from the great energy that started off the land use strategy is having that definition and greater co-ordination between the different policy silos. We need to think about the integration issues that we have been discussing.

12:30

The Convener: That takes us nicely on to one of the issues that covers everything: data.

Karen Adam: Good afternoon. Urban gulls are having a severe impact on the lives of people who live in my constituency. Although their numbers are in decline overall, the numbers are increasing significantly in certain areas. That is just one example of the changing environment and climate impacts on local communities.

Where is more research needed to understand the drivers and impacts of change in the terrestrial environment? What data do we need in order to find solutions to such issues?

Professor Brooker: We have a big challenge with data in Scotland. We collect a lot of data, but it is not done in a strategic and integrated way. That makes it very challenging to do the cross-sectoral analysis that we need. For example, linking the biodiversity data to the farming data in order to examine the benefits that we get from some of the greening measures within the CAP funding is a real challenge.

A lot of the data on biodiversity is collected by amateurs. That is the right word. They are actually highly skilled people, but they are doing it free of charge. There is no strong funding structure to bring the data together. That was highlighted in the Scottish biodiversity information forum's report on the matter, which was several years back.

There are other challenges. For example, my understanding is that Scotland's environment web—SE web—is on pause because of the cyberattack on SEPA. SEPA hosted that service and, as I understand it, there is no access to it at the moment.

Marc Metzger and Helaina Black called for us to think about integrated sustainable management. To go with that, we need an integrated, supporting framework of data gathering so that we can examine the effects of the management that we would like to implement on the various metrics of sustainability that we think are important. At the moment, we have a lot of useful data but it is fragmented. That is a key point.

We also need new metrics for some aspects of sustainability. We have talked a lot about soil health. Work is being done to bring the new understanding on board, but it needs to be integrated with the wider monitoring framework.

Dr Black: I will focus on soils for an obvious reason. In 2009, the Scottish Government published the Scottish soils framework, in which there was a proposal to implement a national soil monitoring network. We are considerably further down the line and we really need to see action on the ground.

As various people have said, we have ideas about what soil health metrics could be, and we know certain things that we need to measure to support the modelling in order to predict how land use and land use management might change in the future, but, critically, we lack a good understanding of where we are now—that is, the baselines of our Scottish soils. If we can implement a national soil monitoring network, we can innovate in how we capture existing data and look to fill the gaps through different techniques.

I will give a good example. The peatland code requires people to gather data from peatland restoration. Those data feed back into research and development that helps to improve how we manage our peatlands and our predictions of how they will change. We need that interaction between land managers on the ground and the research community.

I will draw on an example that frustrates me a bit and on which I would really like something to move. It relates to the wealth of data that farmers or commercial organisations for the agricultural sector collect. A lot of data are generated daily by people who manage our land, but it is not clear how we access that for the national and public good. It is also unclear how research communities can access it to help to generate our future direction.

If there were two things that I would like to happen with regard to data gaps, they would be implementing a network and getting it on the ground and finding out how we capture data that are being collected at the moment. A really good example of that is the large campaign in the south-west of Scotland by a new company called Agricarbon, which is working with First Milk and Nestlé to baseline the dairy farms in Dumfries and Galloway and Ayrshire and is collecting new and innovative data on soil carbon stocks. I would dare to say that that data set is the most extensive on soil carbon stocks probably anywhere in the world, but certainly in the UK and Scotland. Those data are vital to, for example, the modelling work that Pete Smith is carrying out on how our systems will react to climate change and how we can mitigate things in that respect. For me, the issue is being able to benefit from what has already been generated.

The Convener: Before we move on to our very last questions, I have a question of my own that I just want a yes or no answer to, although I know that that is very difficult. Could the regional land use partnerships, which we know are underfunded, be the bodies to pull together all the data and the groups involved to ensure that we get national data gathering on, for example, soil? A nod of the head would be good.

I see Professor Metzger nodding, so that is one out of three. Thank you.

I call Rachael Hamilton to ask our final set of questions, which is on COP26 outcomes.

Rachael Hamilton: It is a wide question, but, for the sake of time, it can be answered in a couple of sentences. What are your takeaways from COP26 on land use and the rural economy, and what are your hopes for the next stage of COP15 with regard to biodiversity on land?

Dr Black: I will keep my answer very short, as others will have more to say.

I have just two comments. First, I want to see action on the ground on the restoration of our soils and habitats. Secondly, we need to know what is happening with the implementation of article 6 of the Paris agreement, which is on carbon markets, as it could have a significant impact on management.

Professor Brooker: For me, a major message from COP26 was the importance of nature-based solutions, which we have heard a lot about and which have the potential to deliver 30 per cent of the actions that we need. That clear message links directly to the Convention on Biological Diversity from COP15 in Kunming. Critically, any such move must involve local stakeholders for the sake of equitability; indeed, we have heard about the importance of involving farmers and other land managers in Scotland.

My hope for COP15 is that the importance of biodiversity conservation in solving the climate change crisis will drive more tangible action on that kind of conservation, because all that we have seen up to now are commitments, a continued decline in global biodiversity and some fairly weak targets aimed only at lowering the rate of that decline. We need to get on an upward curve with biodiversity. My hope for Kunming is that COP26 drives some action and stronger commitment on the ground.

Professor Metzger: For me, the greatest message from COP26 is the societal expectations of action. I know that this falls outside the formal COP itself, but I highlight the media exposure of the issue and that in Scotland, too, our society wants change and action. As for Kunming, we need, as Rob Brooker has said, stronger commitments that are then implemented.

Professor Smith: There are three big outcomes from COP26 that will affect rural communities and rural land use in Scotland. First, there is the pledge to halt deforestation and to begin restoring forests by 2030, which ties in with our woodland expansion targets. Secondly, the global methane pledge that I mentioned earlier to limit CO_2 by 30 per cent compared with 2020 levels might have implications on tackling greenhouse gas emissions from the agriculture sector, particularly the livestock and manure management elements, which are the biggest source of methane emissions.

Finally, I echo Rob Brooker's point about the emphasis on nature-based solutions throughout COP26. The increased target to protect 30 per cent of the land by 2030 means that we will need to expand the amount of land that we put aside for biodiversity, and that can happen only if some

systematic changes are made in the way in which we support agriculture. I come back to the point that tinkering at the edges of the current system will not deliver what we need with regard to biodiversity or climate change. Instead, we need a fundamental transformation in the way in which we produce our food and protect nature.

Rachael Hamilton: Can I follow that up with a question about the 2020 baseline, convener?

The Convener: Please be very quick.

Rachael Hamilton: Professor Smith, in the light of our earlier conversation, should agriculture be taken out of the 2020 baseline and recalculated in a different way?

Professor Smith: No. If the calculation was made using a different metric such as GWP star, it would make the impact of reducing methane emissions now even more important in the coming decade. Instead of decreasing the reliance on reducing methane, such a move would shove it further up the agenda. As a result, I do not think that it would be beneficial.

The Convener: I thank the witnesses very much for their fascinating and useful evidence. That concludes today's meeting.

Meeting closed at 12:41.

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