



DR. FRANCK COURCHAMP

EATING BIODIVERSITY

Dr. Franck Courchamp of France's National Center for Scientific Research (CNRS) explains why a reduction in meat consumption would be good for everyone, lists the catastrophic consequences of biological invasions, and suggests what could be done to protect giraffes.

ACADEMIA: What research question is currently keeping you awake at night?

FRANCK COURCHAMP: It's difficult to say, because I work on many different topics at the same time and conduct many projects. I'm now recruiting six master's students, each will be working on a different topic. But biological invasions are the leading topic for me. I'm trying to predict biological invasions based on global scenarios for climate change. This poses a gigantic environmental problem, the most serious one, only closely behind habitat destruction. It's even more important than pollution. It's linked to the death of many people, because invasive species carry different viruses and parasites. That's a very important topic, but we don't have tools at our disposal that would allow us to prepare for the consequences.

Why are such invasions dangerous?

If a species is introduced and spreads into a new region, it can cause enormous damage, because the ecosystem isn't prepared for its presence. There may be no predators or parasites that control it. So it can take over the entire ecosystem and cause damage in a biologically uncontrollable way. There are plenty of such species all over the world, starting from microbes, through plants, marine and terrestrial species, insects, birds, mammals... In each country, there are hundreds of invasive species, and this poses a major problem for ecology, economies, and human health. Climate change has a huge impact on the distribution of invasive species. For example, insects are cold-blooded animals and therefore highly dependent on climate.

Currently, winters in Europe are too cold for many species, so they can't stay for the whole year, but as winters get warmer, they gradually become more established, year after year, and invade new territories, which were previously inaccessible.

Could we compare this phenomenon to climate-induced human migrations?

In this field it is very hazardous to compare biological invasions by plants and animals, which are ecological processes, to human population movements, for several reasons but primarily because of the xenophobic connotations. There is no reason to fear human migrations, unless of course they are from conquering armies, but there are plenty of reasons to fear biological invasions, because by definition these species are ones that are introduced into new ecosystems by human activities and cause ecological and economic damage. Not all introduced species pose a threat, in fact a low percentage do, but given that there are now so many such introductions with global trade, the end result is many biological invasions and much impact.

But invasive species could be also dangerous to humans, right?

Yes, in many different ways at that. First of all, they cause sanitary problems. Let's take mosquitoes, for example. The tiger mosquito transmits around thirty different viruses and therefore poses a direct danger to humans. But there's also damage that is done to economies. For example, many insects eat crops or

agricultural products. This means gigantic costs for societies – if a large portion of crops is destroyed by invasive species, people will have to pay a lot more to buy food in stores. Our recent research showed that invasive insects cost the world over 70 billion dollars annually.

tropical regions. More and more fish species are attacking other fish, causing enormous losses for humans and ecosystems.

I'm currently trying to establish the costs of the introduction of all invasive species for people and economies. We have difficulty attracting the attention of politicians as decision-makers to this topic. People are aware of climate change, the exploitation of animals, and pollution, but biological invasions are the worst. We must do something to increase awareness of this issue, especially among the public and decision makers. In order to do so, we must measure the scale of the problem and add the financial aspect. And the amounts are staggering!

What do you mean?

I can't reveal that yet, because we're about to publish an article in *Nature*. I suspect this will cause a stir in the media, because these are really mind-blowing amounts.

All the things you are talking about sound terrifying. Are you working on any topics that are more optimistic?

No. That's because this is really a disastrous period for biodiversity. I've just submitted a paper in which I list megafauna species, or large animals, that are threatened. We have demonstrated that 70% of all large animals, which means 200 species, are declining, and 59% are threatened by extinction. This situation is largely caused by the fact that we eat them. We're eating bio-

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The situation of wild species like giraffes and lions is dramatic. They are threatened by extinction, but people don't realise it because images of them are everywhere. That's paradoxical, because these are the animals we love most.

Do insects form the largest group of invasive species?

Yes, they are very problematic, but we also have problems with larger animals as well as plants and microorganisms, such as fungi – they could have a gigantic impact on the destruction of crops. In France, we have recently observed many flatworms that come from



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diversity, which means large fish, turtles, mammals. There's only one bird among the large animals, namely the ostrich, and people also eat this species, both the meat and eggs. That's very sad. We depend on biodiversity, and people don't even realize that.

Would it be better if we only ate farm animals?

No, it would be better if we ate meat only three or four times a week. By nature, we're omnivorous, not herbivorous, but this doesn't mean that we need to eat meat two or three times a day. When agriculture was developing in Europe after World War II, governments encouraged people to eat meat. So, this is now a very strong habit. People think that if there's no meat in a meal, it is not fully nutritious. If you tell parents that children will get some vegetarian meals at school, they will worry that their kids will be hungry or have nutrition deficiencies. We've completely overlooked the fact that they should not eat meat every day, because that's simply bad for health. We know many diseases that follow from the excessive consumption of meat. In addition, reducing meat consumption would be hugely beneficial for the environment.

You're also involved in science popularization and environmental protection. Have you noticed any changes in people's awareness, in societies?

I can definitely see positive changes. People are increasingly aware, there are more and more environmentally friendly products in stores, for example ready vegetarian meals, which were not there two years ago. Also, more and more people are trying to reduce meat consumption. I've recently talked to a person that was not linked to environmental protection in any way. That person told me that she and her colleagues at work talk about that, try to change their habits. It seems to me that this is a general trend. I think that's one of many positive aspects of science popularization.

Are such changes visible only in the capital or also in towns and rural areas?

Ecological-friendly products, for example mock meat or meat substitutes, are now available in chain stores in the whole of France. I see that as an example of

changes that are taking place in the whole of the country.

You're also studying population dynamics. What does this area involve specificity?

It's about relations between species, for example a predator and its prey. In this case, their population sizes are mutually dependent. If there are more prey, there will be more predators because they will be well fed and will reproduce more. In turn, that will increase predation and therefore cause a drop in the prey population. And if the prey population declines rapidly, there will be fewer predators, too, because they will die of hunger. The same holds true for host-parasite relationships, competitive relationships, and so on. Population numbers are interlinked with those of other species, forming complex patterns that we try to understand and predict.

However, at present I'm mainly studying the population dynamics of species in the context of conservation biology. For example, I want to know why a specific population is declining and what we can do to stop this process. Unfortunately, such phenomena are usually anthropogenic, which means that I study the influence of human activity on biodiversity.

I'm also involved in a project on how people perceive charismatic species such as lions and elephants. I'm checking if this helps in their conservation. For this type of studies, we sometimes work together with psychologists. I have created a list of the most charismatic wild animal species. Most of them are threatened by extinction. That's paradoxical, because these are the animals we love most. The situation of giraffes and lions is dramatic, but we've hypothesized that people don't realize that, because images of those animals are everywhere – in company logos, on cereal boxes, T-shirts. For this reason, people have a biased perception of the size of their populations. Several months ago, we suggested that companies that use the images of such threatened animals should pay for copyrights, and the money could be allotted to the protection of those species. Maybe something like this could be done.

INTERVIEW BY JUSTYNA ORŁOWSKA