Chapter 11
The Incredible World of Insects in Central America: A Virtual Interview with Prof. Dr. Bugs at La Suerte (Costa Rica) and Ometepe (Nicaragua)

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(Dr. Bugs is a fictional researcher and entomologist somewhere from the southern USA or the European Union (EU) working at La Suerte and Ometepe on insects. While we never met him (or her) in person, the answers we received are quite representative. They cover some of the most common questions students have for La Suerte and Ometepe when it comes to insects, studying them, and what is necessary for their conservation).

Die Floehe und die Wanzen

gehoeren auch zum Ganzen

(Approx translated as "The fleas and the bugs, are part of us";

a German proverb by J. W. Goethe)

Good evening Dr. Bugs, many thanks for talking to us. We would like to start off our discussion on insects with a basic question: How many insects are there at La Suerte?

Well, that's almost a philosophical question, isn't it? They are not really countable, I would say. Just look around, and try to get us an estimate, and for what area and within what radius? And how many species do we miss? I would say, insects are not so well expressed in numbers. I say that also because of the different life stages insects can have. And secondly, many insects can move, walk and fly. Quantitative monitoring schemes, like the ones carried out with birds let's say, are quite dubious for insects. At best, we can hope for an index of abundance…perhaps (Fig. 11.1).

Thanks, so we assume the same applies for Ometepe?

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Fig. 11.1 A heteroptera found during a night hike; La Suerte, Costa Rica. This is a huge tropical species group consisting of thousands of species

Yes, of course.

Hm, so if we cannot get at the individual number of insects, would it be possible to get an estimate then on insect species at least?

We are trying this, and with some minimum estimates, but we cannot provide such numbers as of yet. Worldwide, app. 1 million species have been described, so far.

Wow, that comes as a surprise to me, though. How much longer would it take to get a good estimate for species then? I think worldwide some people say there should be 8–30 million species or so, right?

We are trying to estimate this here, and with some minimum estimates, but we cannot provide such an estimate yet. Also, the taxonomy of insects varies a lot, and is still revised. But the reason why there is hope to get at good estimates sits in new technology, like bar coding, etc. That's very exciting for us.

Ok, but these methods are still in their infancy; right? All we know about new techniques is that they tend to pose more questions than they answer; like the newly found cryptic species (which can increase the true species estimate dramatically).

Of course, but you have to start somewhere.

Now that we know that numbers do not work well for insects, how would we express insect and species abundance for Ometepe, and for Central America in general?

Yeah, I would propose the use of methods like pit fall traps, night trapping or trapping webs—probably one of the best methods—and standardize them for effort explicit in space and in time. In addition, we still prefer using the traditional methods such as fogging and collection.

Dr. Bugs, in your study and classes, you are following the classic entomologist route "we sort'em postmortem." It reminds people of counting the "deck chairs of the Titanic." How useful is that approach really?

I probably do not understand your question. In entomology, we use the established methods of the profession. We stay within those established methods, and are well trained in them. We describe and document species by distinct features, and then place them in an evolutionary context with a phylogeny and clades. Many of these features can only be obtained when we study specimen in the hand and for longer. This is done through collections which need to be established first, and then curated. For La Suerte and Ometepe, we have some initial collections in the field. We improve them each time, and collect species again once we are in the field.

…so when you park these collections in the field at the station, what then about decay of these field collections due to tropical conditions? And what a shape are these collections in without a real curator and so many people using them?

Yes, this is a problem, we try to make it better, each year we come back.

Dr. Bugs, do we really have to fog entire trees and kill insects for that? Isn't that making insects suffer, and reducing their populations? There must be an impact and collateral damage each time that is done; not?

In regards to your reference of "fogging," this is an established science method to obtain all insects in an area, and for inventory. We do not know how to use other methods. I am not a statistician to know the optimal sampling number. Secondly, insects are really not like mammals. They feel and live differently; no IACUC is needed for them. So I see 100 % no problem in collecting insects, as a hobby and for taxonomy and research. We have always done it that way, are trained to do it, as do many others all over the world as the standard method of research as the heart of entomology for centuries. That's what the traditional schools and institutes do, e.g., The Natural History Collection on in Tring/England, The Smithsonian/US or with CSIRO in Melbourne/Australia.

Hm, Dr. Bugs, I doubt insects have no feelings, nerves, brains and skills, e.g., the discipline of sociobiology shows us just that. But you probably agree that animals, even insects, should at least be respected as creatures of the earth, right? Biodiversity matters, so we should express it in many different ways.

Entomologists are objective, work for science, and do peer-reviewed publications; many new species get described. We do so with the methods of choice and convenience. That's what we and others teach here.

…with the ether box always handy…

Of course, new species must be described.

Just curious, are there major insect collections curated in developing countries?

I don't know. I never checked much there. Probably not so many.

Fig. 11.2 A "walking stick" from La Suerte, Costa Rica; these species can be found all over Central America. They are highly valued in the pet trade

Dr. Bugs, after so many years of collecting and study, how many publications on entomology, and new documented species exist for La Suerte or Ometepe (when compared with Costa Rica and Mexico overall, various museums and research programs in and outside of the country, e.g., CONABIO, INBIO and GBIF)? Judged by the teaching and collection efforts, I assume we have many?

…sorry, I do not know what CONABIO, INBIO, and GBIF are. In the coming years, we are trying to have our work written up (Fig. 11.2).

What about the great entomological collection in the Museum in Leon?

We have never been there; do they have a curator there? It's not on our travel route.

And what about peer-reviewed publications, and who really uses or knows about them?

Well, our work is not concerned with the use of publications, or with applied management questions. It's a good idea to cater this concept; a good thought probably for the future and for NSF grants. But we want to work on publications over the coming years, sure. For now, we need to have a reference collection first to establish our credentials in the field. Once this is completed, we can plan to start the scientific work, after just a few more years of collection.

Fig. 11.3 A beautiful moth from La Suerte, Costa Rica; they are often highly sought-after collector items

Being in the year 2014, can we not use rapid and non-intrusive methods, such as photos or genetics even? Would that not have research value for a development and for cutting-edge science, to be more pre-cautionary?

This only has limited value for me. I am trained in the traditional science view that one must always know it first. Acting before that can be very dangerous; we think. I do not support decisions that are based on weak research.

So, Dr. Bugs, you say all decisions and what gets published in entomology, and conservation science overall, is thorough and well understood?

The peer-review makes sure that is the case; sure.

Once they are killed and collected, what about the trading of insects, specifically butterflies and beetles? Some made it to the CITES list of endangered species for that reason. Can we do something about it when tourists and other people bring home some nice bugs?

Some people might do that. Many universities have had such types of collections earlier; sure (Figs. 11.3 and 11.4).

Is such a transfer of specimens really controllable? Can custom officers really identify tropical bugs and their remnants and whether they are listed with CITES? I mean, there are millions of species to know.

Probably they cannot do much. But with species ID methods, digital keys, and genetics, things have gotten much better now.

So, if not, then how much have insect populations been reduced; and for the sake of trading, just consider for instance the large tradeshows for such kind of animals?

I do not know. But insects also can be raised at home or on farms and sold that way. That saves the tropical stocks.

Fig. 11.4 A moth resting during the day; La Suerte, Costa Rica

But Dr. Bugs, there have been many examples showing otherwise. What do you think about insects and climate change?

I am not really aware of climate change in the tropics for insects. It's probably still too early to speculate about it.

Along the same lines, do you see impacts from the spraying on insects?

I am not an expert on that, sorry. I do not know.

But Dr. Bugs, using "fogging" as THE collection and research method, is that not based on the identical effect (=the animals die because of exposure to a rather toxic chemical that simply gets released in the air)?

Ah, I never thought of that; sure. But we are doing it scientifically.

Dr. Bugs, would you know (or study) ecological cascades when certain insect groups are removed?

I do not know; we do not study this.

I assume pollination and co-evolution remains a huge topic for entomologists, and for mankind really. The work by Dan Janzen and on the fig trees and wasps, or the acacia trees and the ants are just such classics. Have you investigated this in your studies in Central America?

I wish; so far we have focused on taxonomy only.

Could you briefly speak about the pollination required for bananas, orchards, and pineapples? The financial success of orchards and plantation must rely on the fact that these plants can develop a fruit.

We have not studied things outside of the station, sorry.

How many insects do you think are invasive to La Suerte and Ometepe?

Fig. 11.5 A dung beetle, trying to attract mates; Ometepe, Nicaragua

We do not study this, but I think several (killer) bees, some mosquitos probably, fruit flies brought in by the plantations, and the spread of dung beetles through cattle ranching. That should be it (Fig. 11.5).

Have you ever considered studying the impact of the surrounding plantations on insect diversity, distribution, and abundance? I mean, we see these planes spraying stuff every day.

What an interesting question, but our work is occupied with species taxonomy. I am not a conservationist.

On an even more relevant question then: How are insects managed in Central America?

Sorry, I am afraid, our research in entomology does not deal with applied questions. So I cannot answer your question. But I am not really aware of a Ministry of Insects (laughing).

I think it was Dan Janzen again who mentioned a longitudinal butterfly migration in the Pacific region of Central America. Do you know details on that?

For Ometepe, we noticed the large occurrence of butterflies during certain times; but I have not looked more into it myself (Figs. 11.6 and 11.7).

Yes, over the years, we have collected some butterfly survey data on the ring road of Ometepe. Many butterflies seem to use the puddles on the road, or the flowers of the shrubs nearby. But we also find specific butterflies and insects only in the old-growth forests. Have you looked into that subject much?

Not yet, a good idea.

Elsewhere in the tropics, people harvest insects and their larvae (grubs). Are you aware that people are doing that here?

Fig. 11.6 In Ometepe, Nicaragua, many butterflies can be observed that look exhausted and with decaying wings, like this Morpho specimen here

Fig. 11.7 A butterfly resting in the interior forest of La Suerte, Costa Rica

I never heard of it. We have a hard time to find many grubs; they exist though and in older tree trunks for instance. Not sure how they would taste.

If we may quickly switch the subject: Which insects should we be scared and worried about?

Well, in the field we keep trying to avoid bullet ants, of course. Many of them are around. Each year, we find a student getting "shot" (it's not that bad really but a memorable experience for everybody). Africanized honeybees can be very nasty, but we never encountered them here or as a problem, yet.

Well, they are already behind us, up North in Florida…. But I remember here vividly army ants running across our house, too.

Yes, they can enter our buildings, and we see them around weekly, or so. But they move fast and disappear again quickly. While we know examples where they ravage the kitchen and take advantage of "the sugar," locals recommend just to let it happen. Blocking their way brings bad omen, so people say. We did well with that advice. By the way, they are a fascinating "organism" *per se*. You will also find species associated within in the vicinity, like a mixed flock of insect-eating birds.

Ah, it just comes to me that the bot flies always make for great stories. These should be mentioned too in our list.

Oh yes, I know them first hand from Ghana, with a subsequent botfly larvae extraction in Canada (because I just noticed the larvae while flying back over the Atlantic. Quite an experience and a long wait time with a larvae winking at me from my hand in the plane).

Funny, we know of people who got bitten on their bald head. It made for a great laugh (but very painful and kind of dangerous so close to the brain).

I remember a few cases of infected mosquito bites at the station; do you know details?

We have not seen those here, but I heard you and a student had those? Hm, probably some sort of outlier events; I would say.

What about spiders, the classic question?

Usually those are not an issue. Some people say that poisonous species might get encountered at night walks. But we never had any issues (nor have we ever detected those ones).

…or scorpions?

Sure, we see them a lot; usually in houses. But we never had a bite ever. Still, we suggest cleaning and checking your boots and cloths before you wear them (Figs. 11.8, 11.9, 11.10 and 11.11).

And what about chiggers?

Yes, we see such cases sometimes. They seem to appear on grassland, associated with lizards. They are common in the southern US as well. Chiggers can be painful,

Fig. 11.8 A beautiful spider in La Suerte, Costa Rica

but it's quite harmless, and after some basic skin treatment they tend to go away after 2–3 weeks….

More relevant are malaria and dengue fever. While I am not aware of cases at the station, Costa Rica regularly has a few instances. I believe these are linked with sewage, and when insects are connected with open kitchen places and where many people are located. It makes for a higher likelihood for a successful cycle; malaria rarely breeds in the remote woods.

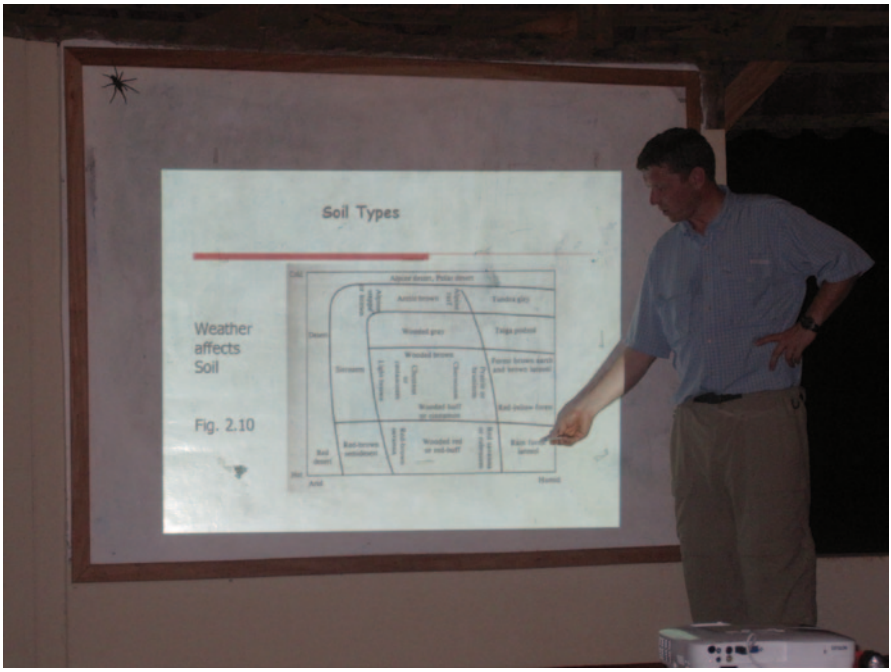

Fig. 11.9 Spiders are around, like this tarantula in the classroom during a lecture (see *upper left corner* of the black board); Ometepe, Nicaragua

Fig. 11.10 A beautiful scorpion in Ometepe, Nicaragua

Fig. 11.11 A pseudoscorpion in Ometepe, Nicaragua

Oh man; let's stay lucky. My last set of questions pertain to insect declines and the global biodiversity crisis we are in: how should it be addressed, and how studied to be effective?

I have no good idea on that.

To finish this interview off, considering we are in such a crisis situation with species conservation, should we give animal right considerations to insects, and how they are treated and perceived by mankind?

Not really, insects are not like mammals, and they have a different nerval system. We see them as highly resilient. So I see no need to treat them like higher beings, mammals or close to humans even. I think we will have insects left for quite a while?

Dr. Bugs, thanks very much for your time, the details and this interview.