IAVS

BULLETIN 2020/3

CONTENTS

Robinia pseudoacacia

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Date of Publication: August 2020

ISSN 2415-184X (Online)

DOI 10.21570/BUL-202003

DOI - 10.21570/BUL-202003-1

The diary of a vegetation scientist during the COVID-pandemic in Brazil

by Alessandra Fidelis

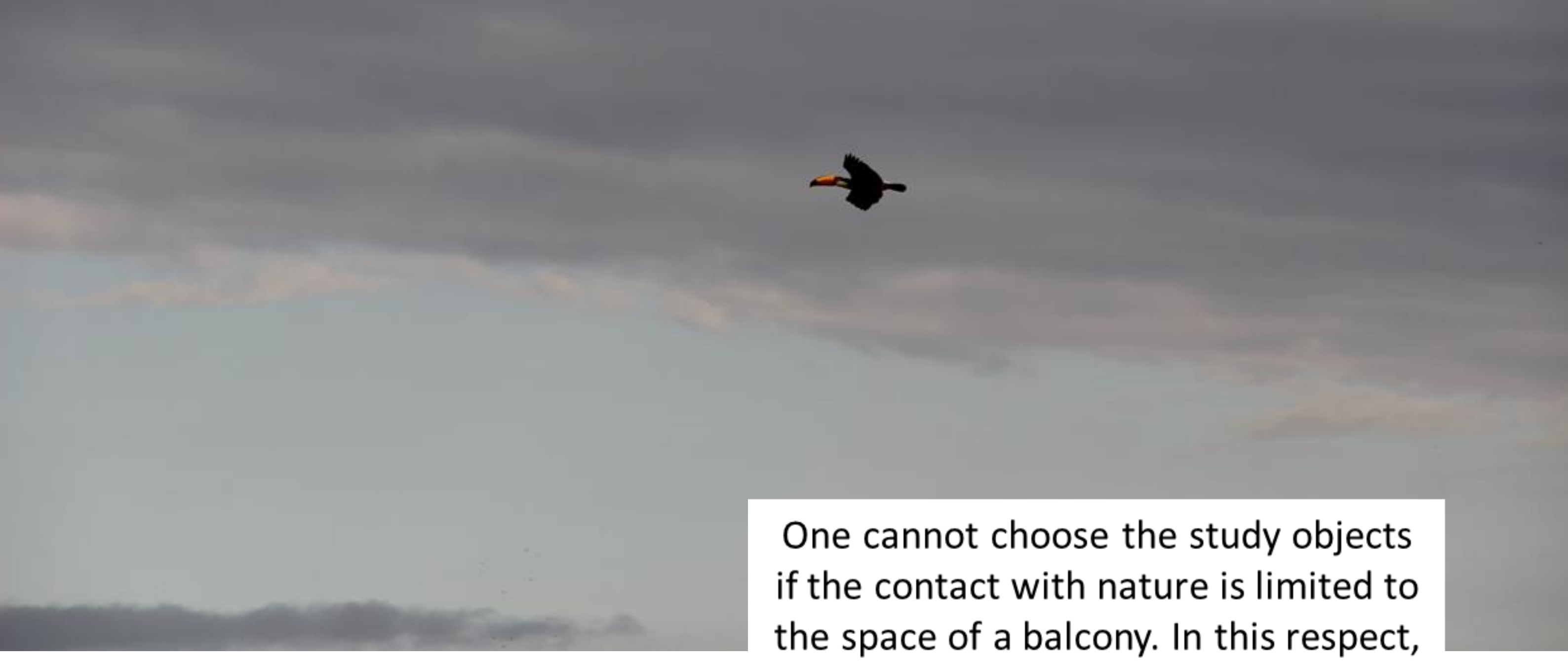
We are in July, 2020. At this time, I should be attending the IAVS Annual Symposium in Vladivostok, on a nice excursion, visiting a new type of vegetation, or having a vacation in a warm and scenic place. If at home, I could be setting a fire in my fire experiments in Central Brazil, sampling vegetation, or collecting seeds. However, this is not the reality. I have been in quarantine for more than four months now. With no direct contact with my family, friends nor students. Working from home (have I said how much I hate a home office?), with no possibility of going to the field, my lab is closed, and all activities have been suspended. All my students are working from home, manipulating their data and writing papers, which in fact is a good thing.

For some living in the Southern Hemisphere, this time of the year is associated with very active fieldwork, although it is winter. I work with a seasonal vegetation that usually burns in the dry season and causes vegetation dynamics to change a lot. We usually perform vegetation sampling in our permanent plots twice a year: during this dry season and also in the wet season. We had just finished our sampling during the wet season when the COVID-pandemic hit us. One of my student could not do her vegetation sampling because all parks and other protected areas were closed. So now, we have to discuss how we are going to utilize her data.

The COVID-pandemic timing for us working in seasonal systems could not be worse. We from parts of the Southern Hemisphere are locked at home and cannot do any fieldwork, at least in Brazil. Working in seasonal systems means we probably will not have 2020 data from our long-term measurements and experiments. Also, seeds we collected during the rainy season will probably not be suitable for germination trials when we get them back to the lab. So we will have to wait for the next rainy season to re-sample seeds. We have crossed our fingers that all the biomass we sampled just before the quarantine will still be intact enough for sorting when we return to our lab activities.

As a field ecologist fieldwork is part of my routine. Although I cannot go to the field as often as I would like to, I usually participate in at least 3-4 long (and several short) field excursions to our experimental plots each year. Going to the field is when I develop the best ideas for new projects. It helps me to understand and interpret the patterns we see in the tables and figures of our publications. It is when I achieve a better notion of how my students are doing (both professionally as well as mentally). It is where we have lots of fun and learn a lot from each other. Finally, everytime I come back from fieldwork I have the feeling I am rested and can be productive.

Working at home is a nightmare for me. Although I have tons of data to analyze, and a never ending list of papers to write (even some still from my PhD – sorry Valério!), I miss going into the field. I feel it will be difficult to be productive like I was at the beginning of the quarantine. After I came back from South Africa, where I attended a workshop, a meeting, and went a lot into the field (February-March 2020), I was working from home productively. I wrote two papers, revised all the papers from my students, had online meetings, etc. But



Shifts in focus

One cannot choose the study objects if the contact with nature is limited to the space of a balcony. In this respect, the nature of São Paolo offers many beautiful study objects.

Research deficit

If we focus on a balcony ecosystem, the other ecosystems, such as cerrado, will remain unexplored, at least during this COVID year.

as time passed, I felt I could no longer work on the computer all day without a break. What is more, my work doubled during this period. Online meetings increased a lot and I had the feeling that I was always on online meetings - it is a strange feeling to talk to my computer screen all the time. I am an Associate Editor for three journals and the number of manuscripts I have received in the last four months is incredible. The difficulties in finding reviewers is causing me sleeping problems, because I know that everyone is overwhelmed by work right now.

My routine has also changed a lot in the four months of quarantine. Since we are currently at the active center of the COVID-pandemic, I avoid going out to exercise. So I exercise at home. I doubled the number of plants I have at home (that is a positive thing) and started bird watching from my balcony, learning which bird species they are (I am very bad at identifying birds!) as well as their feeding preferences (caquis and bananas are the winners!). I only now realize that toucans are coming to the square in front of my building and making a lot of noise. The hummingbirds visit my balcony, looking for my passion fruit and other interesting plants. I am observing the changes in plant phenology from my balcony. Everytime I go to the market or to the lab (once a week), I am amazed by how beautiful some trees are, especially the *Handroanthus* and *Tabebuia* species (Bignoniaceae). Now it is the time for pink ones, but the yellow ones started to bloom earlier this year.

I have now realized that being a vegetation scientist is the best profession ever. I am paid to go to the field, to visit places that have beautiful landscapes, to study plants, and, at the same time, have so much fun. This period of the COVID-pandemic has shown me how precious it is to do fieldwork, eventhough it can be so tiring sometimes. Even when it is too sunny, too hot, or too cold. Even when there are insects bitting you, or when you have to look for snakes and watch out for where you step. Even when it takes 2 days to reach your field sites. Everytime you will be surprised by some new plant you find in your plots. Or by the time of the year when everything is blooming and your plots are so colorful. Or by the end of the day, when the macaws are flying over you head going back to their nests on the palm trees close to your field site. Or when you move from one plot to another, from one site to another, stopped by a *gabiroba* (*Campomanesia adamantium)* or *cajuzinho* (*Anacardium humile)* shrub, to eat their delicious fruits, and then continue sampling the vegetation. Or when, after a hard days work, you have time to swim in the river or waterfall close to your sampling plots and relax listening to the water.

A view from the balcony.

Meet MCI, the newly appointed Secretariat for IAVS

by Caroline Gutierrez

As from April 2020, the administration of IAVS has moved from FASEB to MCI Brussels, based in Brussels, Belgium.

Located at the heart of Europe, MCI Brussels delivers world class association management, consultancy, and congress organisation services to clients across the world. MCI thrives on excellence and delivers services that reflect the company's motto that "When people come together, magic happens".

MCI Brussels takes pride in the diversity of its team, with more than 20 different nationalities and over 22 different languages spoken in the office.

The new faces of IAVS are Jeroen van Liempd and Caroline Gutierrez. An additional person will join the team in September, but Caroline will be your primary contact until then. Here are a few words to know her better:

A French native having spent part of my childhood in Canada, I followed my Dutch boyfriend to Belgium 16 years ago. A wedding and 3 kids later, we are still fond of living at the heart of Europe in the land of comics, chocolate and nonsense!

I love travelling and sharing the world with my family, hiking, skiing, and of course, to not betray my roots, sipping a glass of good wine whilst enjoying a good novel or movie!

I have worked with associations for the past 10 years, helping organizations grow and achieve their ambitions. I tremendously enjoy working with volunteers and feel humbled by their dedication to a greater cause and their natural leadership within their field.

My main project for IAVS in the next month will consists in creating a new virtual community - and I'm very excited! With no meeting this year, I will have to wait to meet IAVS members in person, but you can always reach out to me via email!

New options for IAVS membership

by Susan Wiser

Starting in 2020, IAVS has adopted new options for membership to help us retain members and to make membership more accessible to vegetation scientists who are not from wealthy countries.

We introduced a 3-year membership option to make it easier, and slightly cheaper, for members to stay in the association. Although we have always waived membership fees for vegetation scientists from countries with per-capita income below US$10,000, we now waive fees for students from with per-capita income between US$10,000 and 25,000 and give a discount of ~40% to non-students from these countries.

If your membership has expired, you can renew at www.iavs.org

Individuals may apply to the Global Sponsorship Committee for waiver of the IAVS membership fee. Vegetation scientists with low personal income can apply for this free membership. Eligibility is based on average per-capita income in the respective country in the respective year and the personal situation. See http://iavs.org/Membership/Financial-Support.aspx for more details.

DOI - 10.21570/BUL-202003-2

Invasive plants from the perspective of vegetation ecologists: Results of the IAVS Survey

by Monika Janišová

with a contribution of Christian Berg, Emanuela Carli, Olga Chusova, Gabriella Damasceno, Thilo Heinken, Ivan Jarolímek, Anna Kuzemko, Jana Májeková, Yoshi Minami, Katarína Skokanová, Nikolay Sobolev, and more than 200 IAVS members

Nice and colorful plant community developed in the abandoned place in Graz, Austria. It consists nearly completely of the neophytes: *Catalpa bignioides*, *Solidago canadensis*, *Buddleja davidii*, *Erigeron annuus*, *Populus canadensis*, …

Plant invasions and their consequences represent a major problem in the present world, a strong threat to the biodiversity of our planet, and at the same time, one of the most frequently researched natural phenomena. That's why I selected this topic for a short survey among the IAVS members. The aim of the survey was to find out how vegetation scientists, based on their expert knowledge and rich field experience, perceive the issue. The summary of their response should help answer the following questions: i) What is the recent situation with plant invasions in different continents? ii) What are the most dangerous invasive species in individual countries and regions? iii) How do vegetation scientists perceive the problem and which species and threats do they consider as most problematic?

The survey on plant invasions took place in autumn 2019 and received responses from 210 IAVS members from 46 countries (Fig. 1). Each respondent could suggest up to three dangerous invasive plants in her/his region, and identify its effects upon the local environment.

In total, 182 plant species of 59 families were mentioned in the survey. Among the plant families, *Poaceae* was most frequent (33 species), followed by *Compositae* (24 species), *Leguminosae* (19 species), *Rosaceae* (11 species) and *Pinaceae* (6 species). See Table 1 and Fig. 2 for details.

Among the species and species groups (aggregates) the most frequently mentioned species were *Fallopia japonica* agg. (56 votes), *Robinia pseudoacacia* (29), *Ailanthus altissima* (28), *Solidago canadensis* agg. (26) and *Ambrosia artemisiifolia* (23) (Table 1).

Negative effects of invasive plants mentioned by the respondents include mainly uncontrollable spread, outcompeting native plants, modification of habitat properties and changes of ecosystem processes and functions (Table 2).

Thank you for your participation, sharing your experience, and the nice photos of invasive plants!

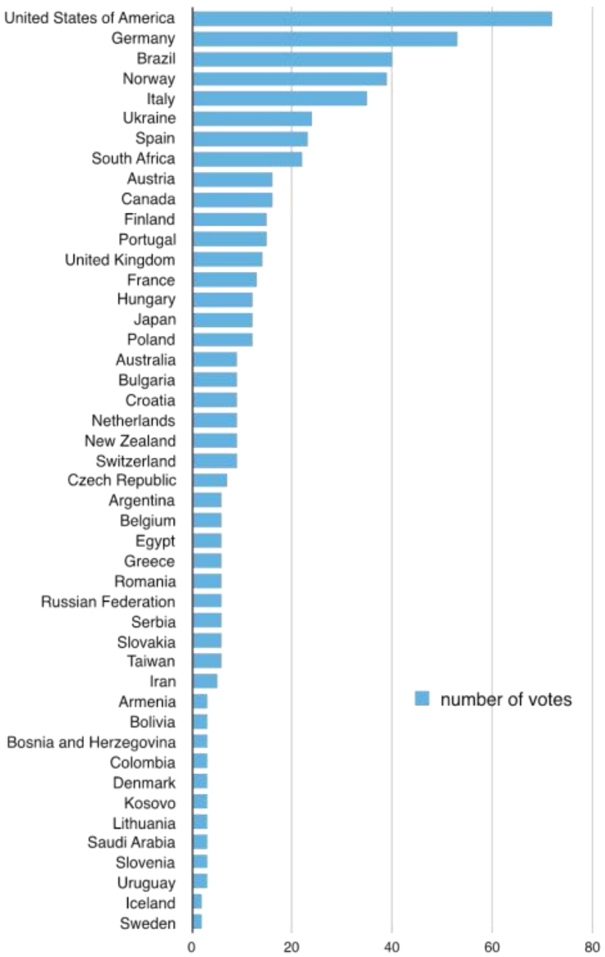


Fig. 1 Countries of the survey participants in decreasing order of the participant numbers.

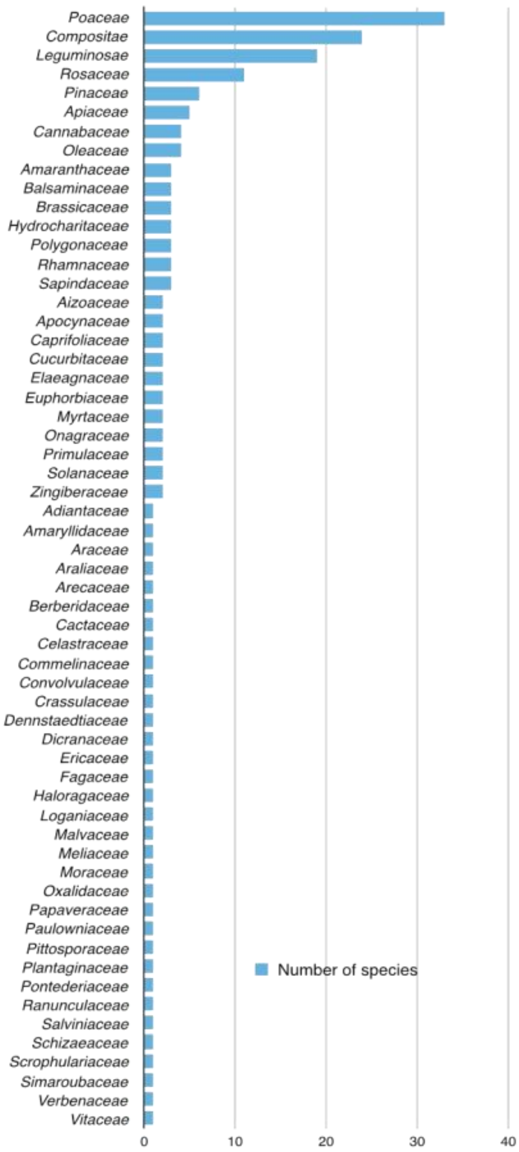
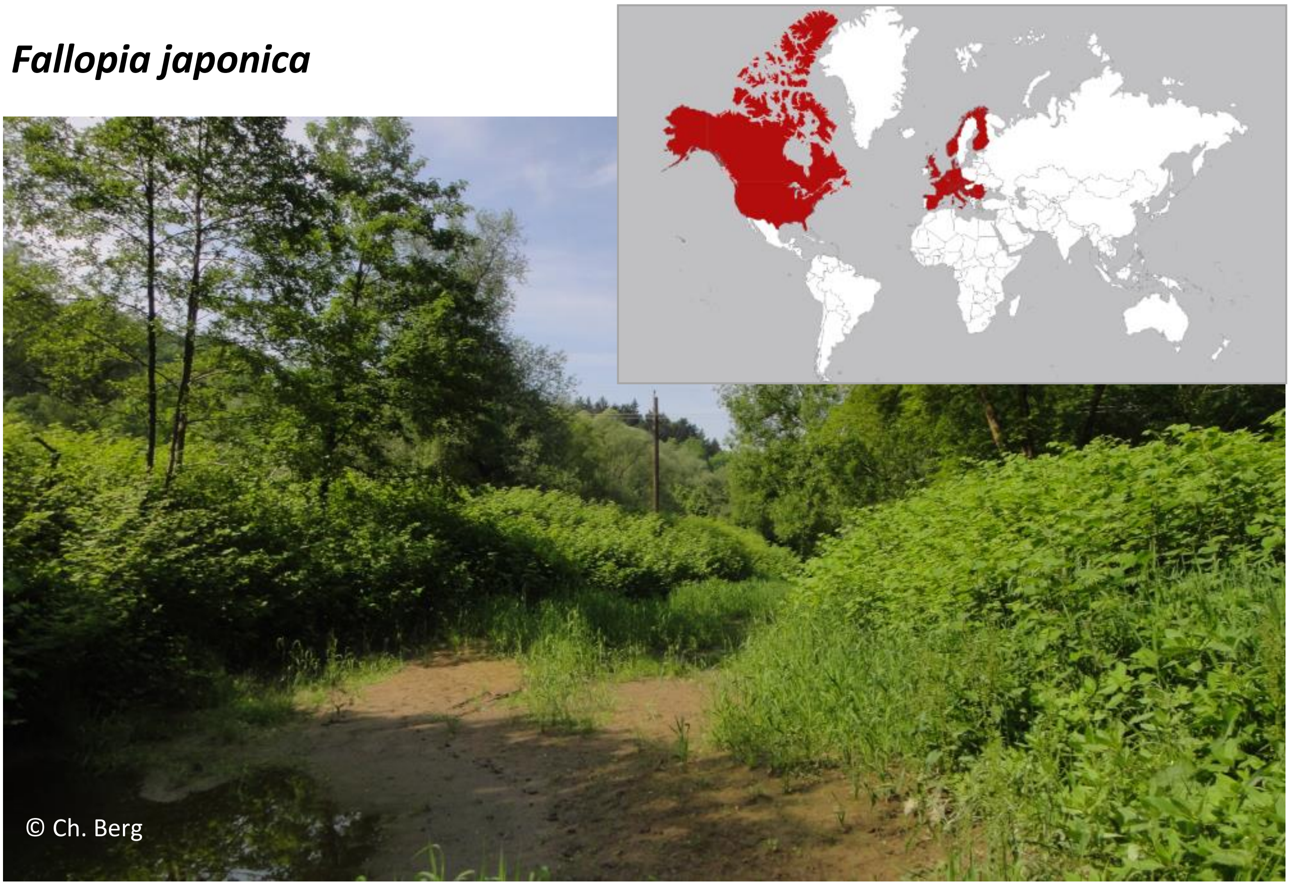


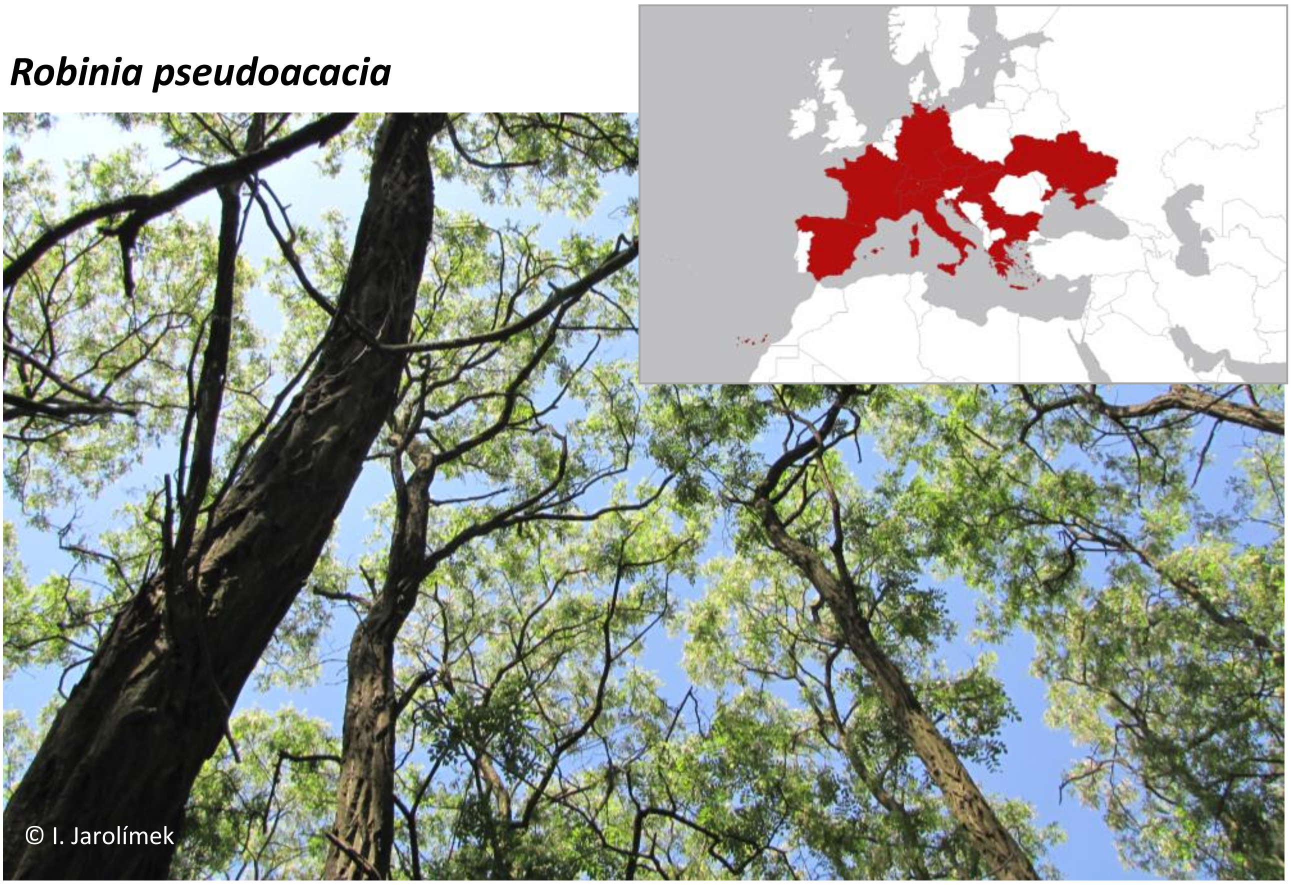
Fig. 2 Plant families most represented in the IAVS survey votes for the most dangerous invasive species.

Fallopia japonica



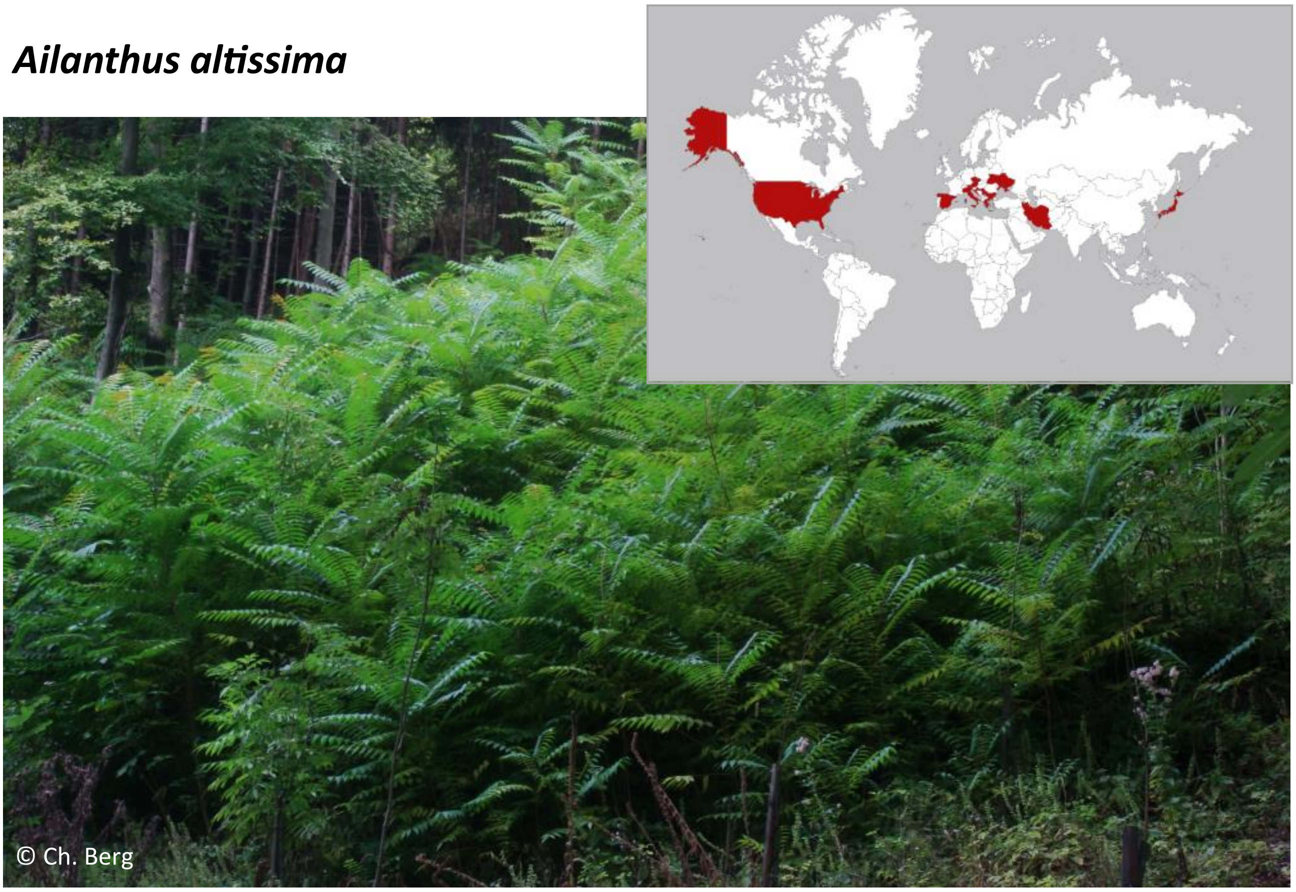
Countries where *Fallopia japonica* agg. was indicated as one of the most dangerous invasive plants by the IAVS members. *Fallopia japonica* agg. is native in East Asia.

Robinia pseudoacacia



Countries where *Robinia pseudoacacia* was indicated as one of the most dangerous invasive plants by the IAVS members. *Robinia pseudoacacia* is native in North America.

Ailanthus altissima



Countries where *Ailanthus altissimus* was indicated as one of the most dangerous invasive plants by the IAVS members. *Ailanthus altissimus* is native in East Asia.

Ambrosia artemisiifolia

Countries where *Ambrosia artemisiifolia* was indicated as one of the most dangerous invasive plants by the IAVS members. *Ambrosia artemisiifolia* is native in North, Central and South America.

Solidago canadensis agg.

Countries where *Solidago canadensis* agg. was indicated as one of the most dangerous invasive plants by the IAVS members. *Solidago canadensis* agg. is native in North America.

Solidago canadensis agg. (Asteraceae) invades mainly abandoned fields but frequently invades natural grasslands as well where it forms monocultures and is a serious threat for local biodiversity.

Table 1 Top dangerous plant invasive species from the perspective of IAVS survey participans ordered separately for each continent

AFRICA (29 votes, South Africa and Egypt)	
Acacia spp. (incl. *A. mearnsii* and *A. saligna*)	7
Lantana camara	4
Campuloclinium macrocephalum	3
Eichhornia crassipes	2
Eucalyptus spp. (incl. *Eucalyptus camaldulensis*)	2
ASIA (24 votes, Japan, Taiwan, Iran and Saudi Arabia)	
Ailanthus altissima	2
Azolla filiculoides	2
Leucaena leucocephala	2
Mikania micrantha	2
Prosopis juliflora	2
Sicyos angulata	2
AUSTRALIA (incl. New Zealand, 18 votes)	
Hyparrhenia hirta	2
Pinus spp. (incl. *Pinus contorta*)	2
EUROPA (374 votes, most European countries)	
Fallopia japonica agg.	51
Robinia pseudoacacia	29
Solidago canadensis agg.	26
Ailanthus altissima	24
Ambrosia artemisiifolia	23
Heracleum mantegazianum & *H. sosnowskii*	21
Impatiens glandulifera	19
Amorpha fruticosa	12
Picea sitchensis	10
Rosa × *rugosa*	10
Acacia spp.	9
Cortaderia selloana	9
Lupinus spp.	9
Prunus serotina	9
Carpobrotus spp.	8
Crassula helmsii	6

NORTH AMERICA (88 votes, U.S and Canada)	
Microstegium vimineum	7
Bromus inermis	4
Bromus tectorum	4
Fallopia japonica agg.	4
Lonicera maackii	4
Phragmites australis	4
Alliaria petiolata	3
Ligustrum sinense	3
Ailanthus altissima	2
Berberis thunbergii	2
Cenchrus ciliaris	2
Centaurea solstitialis	2
Cytisus scoparius	2
Ligustrum japonicum	2
SOUTH AMERICA (55 votes, mainly Brazil and Argentina)	
Pinus spp. (incl. *Pinus elliottii, P. taeda*)	11
Brachiaria decumbens & Bracharia spp.	9
Eragrostis plana	6
Melinis minutiflora	4
Ulex europaeus	4
Cynodon dactylon	2
Hovenia dulcis	2
Ligustrum lucidum	2
Panicum maximum	2
Pinus taeda	2

Table 2 Top dangerous plant invasive species indicated by the IAVS survey participans, invasion details, invaded habitats, region of origin and list of countries affected by the invasion.

Species (aggregate)	Family	Number of votes	Uncontrolled spreading, space occupation, forming monocultures	Displacement of native plant species	Negative effect of other organisms than plants	Habitat modification or destruction	Change in natural processes and	Mechanical damage of constructions	Dangerous for human health	Habitat type endangered	Region of origin	Countries where the species is considered as a dangerous invader
Fallopia japonica agg.	*Polygonaceae*	56	x	x	x	x	x	x		riparian and coastal habitats	East Asia	Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Canada (British Columbia), Croatia, Czech Republic, Denmark, Finland, France, Germany, Italy, Kosovo, Netherlands, Norway, Poland, Romania, Serbia, Slovakia, Slovenia, Spain, Switzerland, United Kingdom, United States of America (New York)
Robinia pseudacacia L.	*Leguminosae*	29	x	x	x	x	x			termophilous forests and grasslands	North America	Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, Kosovo, Serbia, Slovakia, Spain, Switzerland, Ukraine
Ailanthus altissima (Mill.) Swingle	*Simaroubaceae*	28	x	x	x	x	x	x		sand dunes, coastal habitats	East Asia	Armenia, Austria, Bulgaria, Croatia, Czech Republic, Greece, Iran, Italy, Japan, Serbia, Spain, Ukraine, United States of America (Tennessee)
Solidago canadensis agg.	*Compositae*	26	x	x		x	x			abandoned grasslands	North America	Austria, Croatia, Czech Republic, Germany, Hungary, Netherlands, Norway, Poland, Russian Federation (Central Russian plain), Slovakia, Slovenia, Sweden, Switzerland, Ukraine
Ambrosia artemisiifolia L.	*Compositae*	23	x	x		x	x		x	agricultural and ruderal habitats	North, Central and South America	Armenia, Austria, Bosnia and Herzegovina, Croatia, France, Germany, Hungary, Italy, Romania, Serbia, Slovenia, Switzerland, Ukraine
Heracleum mantegazzianum Sommier & Levier & *H. sosnowskyi* Manden.	*Apiaceae*	22	x	x					x	riparian and coastal habitats	Caucasus	Czech Republic, Denmark, Finland, Germany, Lithuania, Norway, Russian Federation (Leningrad region, Moscow region, Central Russian plain), Switzerland, United States of America (New York),
Impatiens glandulifera Royle	*Balsaminaceae*	19	x	x			x			riparian habitats	Himalayas	Czech Republic, Finland, Germany, Norway, Slovakia, Switzerland, United Kingdom
Acacia spp. *	*Leguminosae*	19	x	x	x	x	x			grasslands	Australia	Australia, Italy, Portugal, South
Pinus spp. **	*Pinaceae*	14	x	x			x			sand dunes, coastal habi-	North America	Brazil, New Zealand, South Africa
Amorpha fruticosa L.	*Leguminosae*	12	x	x		x	x			riparian and grassland habitats	North America	Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Italy, Romania, Ukraine

* incl. *A. saligna* (Labill.) Wendl., *A. mearnsii* De Wild., *A. dealbata* Link, *A. cyclops* G.Don, *A. longifolia* (Andrews) Willd., *A. melanoxylon* R.Br.

** incl. *P. elliottii* Engelm., *P. taeda* L., *P. contorta* Douglas ex Loudon.

Table 2 Continuation

Species (aggregate)	Family	Number of votes	Uncontrolled spreading, space occupation, forming monocultures	Displacement of native plant species	Negative effect of other organisms than plants	Habitat modification or destruction	Change in natural processes and ecosystem functions	Mechanical damage of constructions	Dangerous for human health	Habitat type endangered	Region of origin	Countries where the species is considered as a dangerous invader
Picea sitchensis (Bong.) Carrière	*Pinaceae*	10	x	x			x			sand dunes, coastal habitats	North America	Norway
Rosa × rugosa Thunb.	*Rosaceae*	10	x	x			x			sand dunes, coastal habitats	East Asia	Denmark, Finland, Norway
Brachiaria decumbens Stapf *	*Poaceae*	9	x	x			x			savanna, natural forest	South Africa	Bolivia, Brazil
Cortaderia selloana (Schult.) Asch. & Graebn.	*Poaceae*	9	x	x			x			urban and grass-land habitats	South America	France, Portugal, Spain
Prunus serotina Ehrh.	*Rosaceae*	9	x	x		x	x			heathland, grass-land, forest	North and South America	Hungary, Germany, Netherlands, Poland
Lupinus spp. **	*Leguminosae*	9	x	x		x				semi-natural grasslands	North America	Finland, Norway, Sweden, Iceland
Carpobrotus edulis (L.) N.E.Br. ***	*Aizoaceae*	9	x	x		x				coastal habitats	South Africa	Italy, Portugal, Spain
Microstegium vimineum (Trin.) A.Camus	*Poaceae*	7	x	x	x					forest	South and East Asia	United States of America (Connecticut, Illinois, Maryland, Tennessee, North Caroli-na, Southern Illinois, West Virginia)
Crassula helmsii (Kirk) Cockayne	*Crassulaceae*	6	x	x						aquatic habitats	Australia and New Zealand	Belgium, Germany, Netherlands, United Kingdom
Eichhornia crassipes (Mart.) Solms	*Pontederia-ceae*	6	x	x	x		x			aquatic habitats	South America	Egypt, Iran, Italy, Portugal, United States of America (Puerto Rico)
Eragrostis plana Nees	*Poaceae*	6	x	x		x	x			grassland	South Africa	Brazil, Uruguay
Lantana camara L.	*Verbenaceae*	6	x	x	x	x	x			grassland, forest edge, suburban countryside	Central and South America	Argentina, Japan, South Africa
Buddleia davidii Franch.	*Loganiaceae*	5	x	x		x				open and urban habitats	East Europe	France, Italy, Spain, Switzerland, New Zea-land

*incl. *Brachiaria* spp.

** incl. *L. polyphyllus* Lindl., *L. nootkatensis* Sims

*** incl. *C. acinaciformis* (L.) L.Bolus

Table 3 Alphabetical list of invasive plants considered as dangerous (continuation of previous table including plants with less than 5 votes)

Acer negundo L.	*Aceraceae*	3
Acer platanoides L.	*Aceraceae*	1
Acer pseudoplatanus L.	*Aceraceae*	3
Achyranthes bidentata Blume (syn. *Achyranthes japonica*)	*Amaranthaceae*	1
Adiantum capillus-veneris L.	*Adiantaceae*	1
Aegopodium podagraria L.	*Apiaceae*	1
Agropyron cristatum (L.) Gaertn.	*Poaceae*	1
Alliaria petiolata (M.Bieb) Cavara & Grande	*Brassicaceae*	3
Allium paradoxum (M.Brieb.) G. Don	*Amaryllidaceae*	1
Alternanthera philoxeroides (Mart.) Griseb.	*Amaranthaceae*	1
Ampelopsis glandulosa var. *brevipedunculata* (Maxim.)Momiy.	*Vitaceae*	1
Andropogon gayanus Kunth	*Poaceae*	1
Anthoxanthum odoratum L.	*Poaceae*	1
Anthriscus sylvestris (L.) Hoffm.	*Apiaceae*	1
Archontophoenix cunninghamiana (H.Wendl.) H.Wendl. & Drude	*Arecaceae*	1
Ardisia crenata Sims	*Primulaceae*	1
Argemone ochroleuca Sweet	*Papaveraceae*	1
Artemisia vulgaris L.	*Compositae*	1
Arundo donax L.	*Poaceae*	3
Asclepias syriaca L.	*Apocynaceae*	3
Avena barbata Pott ex Link	*Poaceae*	1
Azolla filiculoides Lam.	*Salviniaceae*	2
Baccharis halimifolia L.	*Compositae*	4
Bassia indica (Wight) A.J.Scott	*Amaranthaceae*	1
Berberis thunbergii DC.	*Berberidaceae*	2
Bidens pilosa L.	*Compositae*	1
Bothriochloa ischaemum (L.) Keng	*Poaceae*	1
Brassica tournefortii Gouan	*Brassicaceae*	1
Bromus inermis Leyss.	*Poaceae*	4
Bromus tectorum L.	*Poaceae*	4
Bunias orientalis L.	*Brassicaceae*	4
Calamagrostis epigeios (L.) Roth	*Poaceae*	1
Campuloclinium macrocephalum (Less.) DC.	*Compositae*	3
Campylopus introflexus (Hedw.) Brid.	*Dicranaceae*	3
Celtis australis L. L.	*Cannabaceae*	1
Celtis occidentalis L.	*Cannabaceae*	2
Celtis sinensis Pers.	*Cannabaceae*	1
Cenchrus ciliaris L.	*Poaceae*	3
Centaurea solstitialis L. (incl. *Centaurea* spp.)	*Compositae*	3
Cirsium vulgare (Savi) Ten.	*Compositae*	2
Clematis vitalba L.	*Ranunculaceae*	1
Convolvulus arvensis L.	*Convolvulaceae*	1
Conyza canadensis (L.) Cronquist	*Compositae*	2
Coreopsis lanceolata L.	*Compositae*	1
Corynephorus canescens (L.) P.Beauv.	*Poaceae*	1
Cotoneaster bullatus Bois (incl. *Cotoneaster* spp.)	*Rosaceae*	2
Cynodon dactylon (L.) Pers.	*Poaceae*	2
Cytisus scoparius (L.) Link	*Leguminosae*	4
Echinocystis lobata (Michx.) Torr. & A.Gray	*Cucurbitaceae*	1
Egeria densa Planch.	*Hydrocharitaceae*	1
Ehrharta calycina Sm.	*Poaceae*	1
Elaeagnus angustifolia L.	*Elaeagnaceae*	4
Elaeagnus umbellata Thunb.	*Elaeagnaceae*	1
Elodea canadensis Michx. (incl. *Elodea* spp.)	*Hydrocharitaceae*	3
Eragrostis curvula (Schrad.) Nees	*Poaceae*	1
Eragrostis lehmanniana Nees	*Poaceae*	1
Erigeron annuus (L.) Pers.	*Compositae*	2
Eucalyptus camaldulensis Dehnh. (incl Eucalyptus spp.)	*Myrtaceae*	2
Euonymus alatus (Thunb.) Siebold	*Celastraceae*	1
Euphorbia esula L.	*Euphorbiaceae*	1
Foeniculum vulgare Mill.	*Apiaceae*	1
Frangula alnus Mill.	*Rhamnaceae*	1
Genista monspessulana (L.) L.A.S.Johnson	*Leguminosae*	1
Gleditsia triacanthos L.	*Leguminosae*	2
Grindelia squarrosa (Pursh) Dunal	*Compositae*	4
Gymnocoronis spilanthoides (D.Don ex Hook. & Arn.) DC.	*Compositae*	1
Hedychium coronarium J.König	*Zingiberaceae*	1
Hedychium gardnerianum Sheppard ex Ker Gawl.	*Zingiberaceae*	1
Hieracium aurantiacum L.	*Compositae*	1
Hieracium pilosella L.	*Compositae*	1
Hovenia dulcis Thunb.	*Rhamnaceae*	2
Humulus scandens (Lour.) Merr. (syn. *Humulus japonicus*)	*Cannabaceae*	1
Hydrocotyle ranunculoides L.f.	*Araliaceae*	3
Hyparrhenia hirta (L.) Stapf	*Poaceae*	2

Table 3 Continuation

Impatiens noli-tangere L.	*Balsaminaceae*	1
Impatiens parviflora DC.	*Balsaminaceae*	3
Imperata cylindrica (L.) Raeusch. (and other warm season non-native grasses)	*Poaceae*	1
Jacobaea maritima (L.) Pelser & Meijden subsp. *maritima*	*Compositae*	1
Lagarosiphon major (Ridl.) Moss	*Hydrocharitaceae*	1
Lespedeza juncea var. *sericea* (Thunb.) Lace & Hauech (syn. *Lespedeza cuneata*)	*Leguminosae*	1
Leucaena leucocephala (Lam.) de Wit	*Leguminosae*	3
Ligustrum japonicum Thunb.	*Oleaceae*	3
Ligustrum lucidum W.T.Aiton	*Oleaceae*	2
Ligustrum sinense Lour.	*Oleaceae*	3
Linaria genistifolia subsp. *dalmatica* (L.) Maire & Petitm	*Plantaginaceae*	1
Lonicera maackii (Rupr.) Maxim.	*Caprifoliaceae*	4
Lonicera morrowii A.Gray	*Caprifoliaceae*	1
Ludwigia peploides (Kunth) P.H.Raven	*Onagraceae*	1
Lygodium spp.	*Schizaeaceae*	1
Lysimachia punctata L.	*Primulaceae*	1
Melaleuca quinquenervia (Cav.) S.T.Blake	*Myrtaceae*	1
Melia azederach L.	*Meliaceae*	1
Melinis minutiflora P.Beauv.	*Poaceae*	4
Mikania micrantha Kunth	*Compositae*	2
Morus alba L.	*Moraceae*	1
Myriophyllum aquaticum (Vell.) Verdc.	*Haloragaceae*	2
Nassella spp.	*Poaceae*	1
Nicotiana glauca Graham	*Solanaceae*	1
Oenothera drummondii Hook.	*Onagraceae*	1
Olea europea L.	*Oleaceae*	1
Oplismenus undulatifolius (Ard.) Roem. & Schult.	*Poaceae*	1
Opuntia humifusa (Raf.) Raf.	*Cactaceae*	1
Oxalis pes-caprae L.	*Oxalidaceae*	2
Padus serotina (Ehrh.) Borkh.	*Rosaceae*	1
Panicum maximum Jacq. (syn. *Megathyrsus maximus*)	*Poaceae*	3
Panicum repens L.	*Poaceae*	1
Paulownia tomentosa Steud.	*Paulowniaceae*	1
Pennisetum clandestinum Hochst. ex Chiov.	*Poaceae*	1
Pennisetum setaceum (Forssk.) Chiov.	*Poaceae*	1
Phalaris arundinacea L.	*Poaceae*	1
Phragmites australis (Cav.) Trin. ex Steud.	*Poaceae*	4
Pistia stratiotes L.	*Araceae*	1
Pittosporum undulatum Vent.	*Pittosporaceae*	1
Poa angustifolia L.	*Poaceae*	1
Prosopis glandulosa Torr.	*Leguminosae*	1
Prosopis juliflora (Sw.) DC.	*Leguminosae*	3
Pseudotsuga menziesii (Mirb.) Franco	*Pinaceae*	2
Pteridium aquilinum (L.) Kuhn	*Dennstaedtiaceae*	2
Pyracantha coccinea M. Roem.	*Rosaceae*	1
Quercus rubra L.	*Fagaceae*	1
Rhamnus cathartica L.	*Rhamnaceae*	1
Rhododendron ponticum L.	*Ericaceae*	2
Rosa multiflora Thunb.	*Rosaceae*	1
Rubus fruticosus L.	*Rosaceae*	1
Rubus hedycarpus subsp. *armeniacus* (Focke) Focke	*Rosaceae*	3
Rubus ulmifolius Schott	*Rosaceae*	1
Rudbeckia laciniata L.	*Compositae*	1
Rumex acetosella L.	*Polygonaceae*	1
Saccharum spontaneum subsp. *aegyptiacum* (Willd.) Hack.	*Poaceae*	1
Senecio glastifolius L.f.	*Compositae*	1
Senecio inaequidens DC.	*Compositae*	1
Sicyos angulata L.	*Cucurbitaceae*	2
Silybum marianum (L.) Gaertn.	*Compositae*	1
Solanum elaeagnifolium Cav.	*Solanaceae*	2
Sorghum halepense (L.) Pers.	*Poaceae*	2
Spartium junceum L.	*Leguminosae*	1
Spiraea douglasii Hook.	*Rosaceae*	1
Spiraea tomentosa var. rosea (Raf.) Fernald	*Rosaceae*	1
Symphyotrichum lanceolatum (Willd.) G.L.Nesom (syn. *Aster lanceolatus*)	*Compositae*	1
Tradescantia fluminensis Vell.	*Commelinaceae*	2
Triadica sebifera (L.) Small	*Euphorbiaceae*	1
Tsuga heterophylla (Raf.) Sarg.	*Pinaceae*	1
Ulex europaeus L.	*Leguminosae*	4
Verbascum thapsus L.	*Scrophulariaceae*	1
Verbesina encelioides (Cav.) Benth. & Hook.f. ex A.Gray	*Compositae*	1
Vicia cracca L.	*Leguminosae*	1
Vincetoxicum nigrum Moench	*Apocynaceae*	1
Waltheria indica L.	*Malvaceae*	1

Allium paradoxum (*Amaryllidaceae*), native to Asia may be regarded as "local invasive" around Berlin, now increasing dominance in other parts of Germany.

Grindelia squarossa (*Asteraceae*), native to western and central North America is invasive in the Lugansk region, Kreminna, Ukraine. This individual was recorded on sand near the railway station, 7 August 2015.

Cirsium vulgare (native in Europe, W Asia and NW Africa) and *Rudbeckia laciniata* (native to N America; both *Aster-aceae*) are invading the natural communities in Hokkaido, northern Japan.

Elaeagnus angustifolia (*Eleagnaceae*), native to western and central Asia, is invasive in the Lugansk region, Svatovo, Ukraine. Chalk outcrops on the right bank of the Krasna river, 12 August 2015.

Carpobrotus edulis (*Aizoaceae*), native to South Africa has escaped from cultivation and has naturalized in many other regions throughout the world. On the Mediterranean coast, *Carpobrotus* has spread out rapidly and now parts of the coastline are completely covered by this invasive species. The pictures show populations in the Pontine Archipelago, Italy, where conservationists removed it by manual eradication, and subsequently recorded several rare species in the region such as *Matthiola tricuspidata* (rare in Lazio region) and *Mesembryanthemum nodiflorum* (native *Aizoaceae*).

Erigeron annuus (*Asteraceae*), *Solidago canadensis* (*Asteraceae*) and *Heracleum sosnowskyi* (*Apiaceae*) are wide-spread invaders in the Moscow region, Russia.

Cerrado ecosystem invaded by *Urochloa brizantha* (*Poaceae*) native in tropical South Africa. The picture was taken in a natural reserve Reserva De Itirapina, Brazil.

Asclepias syriaca (*Asclepiadaceae*) one of the most aggressive invader in Central Ukraine. Dry grasslands of the Dnieper River valley, Kyiv region.

DOI - 10.21570/BUL-202003-3

Ching-Feng Li *alias* Woody (1970–2019) – Silent Peak from Taiwanese mountains

By Milan Chytrý

Sad news spread across the international community of vegetation scientists at the end of November 2019 when Ching-Feng Li (李靜峯), known to most of us as Woody, passed away. A ruthless disease took a good friend from many people and created a gap in vegetation research of East Asia that will be difficult to close.

Woody was born on 11 November 1970 in Pingtung, southern Taiwan, and grew up in Taipei. Being born as the fourth child in a busy family with a very active and sociable father, he was given the name Ching-Feng (靜峯), meaning Silent Peak. However, to all his friends in Taiwan, he has been known by the nickname Wu-Mu (五木), which means five trees, a metaphor for a forest . For his international friends, he used the nickname Woody as an English equivalent of Wu-Mu.

Both his official name and nickname perfectly characterized what he liked most: forests and wild nature in the mountains of Taiwan. While most people in Taiwan live in modern cities in the lowlands along the western and northern coast, a larger part of the island is covered by high, rugged, forested mountains. The beauty of these mountains probably led the 16th-century Portuguese sailors to call the island 'Ilha Formosa' (Beautiful Island). Large areas of mountain forests remain unlogged, in places containing very large trees of *Chamaecyparis formosensis*, *Chamaecyparis obtusa* var. *formosana*, *Cunninghamia konishii*, *Taiwania cryptomerioides* and other species.

Experience from mountain hiking in Taiwanese forests led Woody to study forestry at the Department of Forestry, Faculty of Agriculture, National Taiwan University in Taipei (Bachelor studies 1989–1994, Master studies 1994–1997). During his studies, he was influenced mainly by his supervisor, Professor Horn-Jye Su, the author of classical studies on altitudinal zonation of Taiwanese forest vegetation. Woody got excited about vegetation ecology and graduated with the master the-

Woody' unforgettable smile. IAVS Symposium in Mokpo, South Korea, July 2012.

sis "*Vegetation succession of the Machilus-Castanopsis zone in the north-western region of Taiwan*".

After compulsory military service (1997–1999), Woody was appointed to the Institute of Wildlife Conservation, National Pingtung University of Science and Technology (1999–2003). Forests near Pingtung City are tropical, very different from the subtropical mountain forests occurring over much of the island. Here he could use his excellent knowledge of not only plants and vegetation but also animals, working on seed dispersal by frugivorous birds in a tropical forest, the ecology of mandarin ducks and surveying mammals and birds.

In 2003, the Forestry Bureau of Taiwan initiated an ambitious and well-funded National Vegetation Inventory and Mapping Program, which involved several universities across the island. The aim was to perform detailed vegetation mapping and plot sampling, which would provide baseline information for sustainable use and conservation of Taiwanese forests. The National Vegetation Database of Taiwan was established in the same year. Woody was appointed at the Department of Forestry of National Taiwan University as a Research Assistant for vegetation survey within this program. Here he closely collaborated with Professor Chang-Fu Hsieh and was also influenced by other excellent vegetation ecologists in the project team, especially Professors Sheng-Zehn Yang, Ching-Long Yeh and Tze-Ying Chen.

I first met Woody when I visited Taiwan in 2004 as a member of an international group of experts invited to discuss the concepts and methods of the National Vegetation Inventory and Mapping Program. In 2006, he came for a one-year research visit to our Vegetation Science Group at Masaryk University in Brno, Czech Republic, to work on the development of the National Vegetation Database of Taiwan. Before the end of his internship, he asked me whether I could supervise his PhD project. In this project, he aimed at the synthesis of the diversity of Taiwanese mountain forest vegetation

Woody during field sampling in Wu-Jie, near Puli, Taiwan, October 2013.

based on the National Vegetation Database and his own field experience. I was happy to agree because I knew him as a motivated, hard-working and already quite experienced researcher. He started his PhD studies at Masaryk University in 2007, working in close collaboration with David Zelený, then Scientific Researcher in our group, with whom he developed a lifelong friendship.

Although Woody's main goal was to develop a comprehensive vegetation classification of Taiwanese forests, he was always intrigued by general ecological questions related to these forests. His favourite topics were the effects of the mountain cloud zone on forest vegetation and the patterns of species diversity across elevational gradients, for which Taiwan, with its elevation range from 0 to 3952 m a.s.l., provides a textbook example. He quickly learned techniques for the analysis of large vegetation-plot databases, including GIS analyses and R programming. He used these techniques not only for the analysis of the Taiwanese vegetation dataset but also for teaching several courses of vegetation data analysis in Brno, Rome and Taiwan, mostly co-taught with David Zelený. He was extremely meticulous when analyzing vegetation data, often spending weeks checking hundreds and thousands of vegetation plots one by one.

The most amazing experience was to join Woody on fieldwork in his ecosystem. I will never forget our trip with Woody, David and two Taiwanese colleagues in the Wanda Valley, a remote area in Central Taiwan. We started in the early morning by crossing a river in a place where the bridge was destroyed by a recent typhoon and buried by alluvial gravel. Then we walked for the whole day on steep and unstable slopes, bypassing numerous hundreds-meter-long landslides, running away from a nest of "killer bees" (*Vespa mandarinia*, the world's largest hornet) through dense bamboo growth, carefully avoiding patches of the tall grass *Miscanthus chinensis*, which could be resting places of Formosan black bear (*Ursus thibetanus formosanus*). We ate our lunch using chopsticks made in situ from the shoots of the local bamboo species with a long name that took me quite some time to remember (*Yushania niitakayamensis*). After the lunch, we enjoyed a coffee

Woody with David Zelený having a short rest stop during fieldwork in the Wanda Valley, Central Taiwan, October 2007.

from a metal moka pot that Woody always carried with him to the field, no matter that in such mountain terrain, every gram of equipment in the backpack is felt. Then we were rushing to come to a place suitable for camping before dusk, which happens suddenly at this low latitude. We were lucky that there were no heavy rains on this field trip; this is more the exception than the rule in Taiwanese mountains.

I admired Woody's knowledge of plants in the field. The Taiwanese flora contains more than 4300 species, including nearly 600 trees, more than 400 shrubs and about 250 woody lianas. At most sites, forest stands are composed of many tree species growing together. In the mountain cloud zone, most tree species are laurophyllous: unrelated species have very similar simple leaves, stems and crown shapes. Vegetation sampling in such forests is nearly impossible without long-term training. I was astonished to see Woody looking upwards with binoculars, moving through our vegetation plots and identifying one tree individual after another, and then climbing up trees to collect epiphytes or cut identifiable pieces of tree twigs. I at least helped with recording the herbs and soil sampling.

During his stay in Brno, Woody also did a lot of fieldwork in Europe, especially vegetation sampling of Czech forest and grasslands with David Zelený and other colleagues and students of our department. It was always a pleasure to be with him in the field. On one rainy evening during our bus excursion for botany students to France, we had to build tents in a lawn soaked with water. Everybody was wet, it was rather cold, and the mood was not good. We were looking for a place to hide from the rain, when suddenly, Woody appeared with his unforgettable smile with a camping pot full of shrimps, offering us to taste how he prepared them in field conditions. The unexpected delicacy that emerged out of the blue in the middle of misery immediately caused the mood to rise in the group by several orders of magnitude.

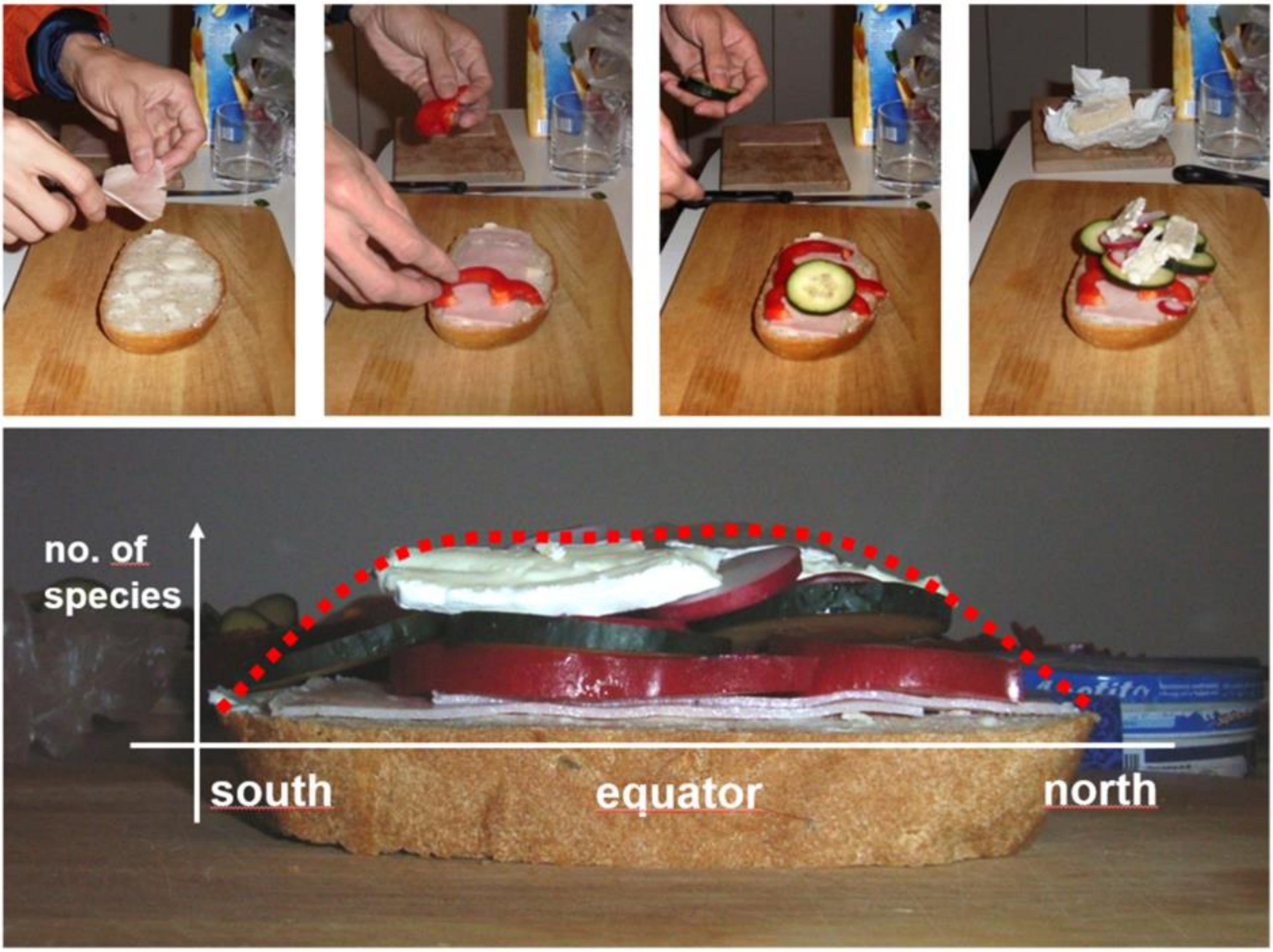
For several years, Woody also assisted in teaching the Field Course of Geobotany for Czech and international students at Masaryk University. He mentored MSc and PhD students of vegetation ecology from Taiwan who were coming for study visits to Masaryk University. He was an excellent teacher, with the ability to explain even complicated issues clearly in a simple language. His oral presentations were always brilliant, combining scientific content with pleasant humour. Just one example for all: the sandwich model he used to explain the mid-domain effect in one of his presentations (see a figure below). No wonder that he won the prize for the best oral presentation of a young scientist at the 55th IAVS Symposium in Mokpo, South Korea, in 2012.

Woody finished his PhD thesis "Diversity of mountain forest vegetation in Taiwan" in 2013. It contained the new classification system of Taiwan forests, developed based on a careful analysis of the National Vegetation Database of Taiwan, supplemented by an expert system for automatic classification of vegetation plots. The main paper from this thesis (Li et al. 2013, *Applied Vegetation Science*, https://doi.org/10.1111/avsc.12025) is a milestone in vegetation classification in East Asia. After graduation, he stayed at Masaryk University until 2015, working as a Research Assistant and later as Scientific Researcher on different topics including beta diversity of vegetation and ecology of the cloud forest.

In 2015, both Woody and David decided to move to Taiwan and continue their academic careers there, to be closer to the ecosystem they studied. For almost a year, Woody was working as Postdoctoral Research Fellow at the Tsing Hua University in Hsinchu with Professor Anne Chao. Then, in 2017, Woody got a position of Project Assistant Professor and a year later the standard Assistant Professor at his *alma mater*, School of Forestry and Resource Conservation (previously Department of Forestry) at the National Taiwan University. Here he established the Ecological Restoration Lab and taught dendrology, vegetation ecology and statistics. He frequently organized field excursions, mentored several undergraduate and graduate students, and continued studies of Taiwanese mountain forests. At the same time, he kept active contacts within IAVS, attending its symposia and participating in various discussions. In 2018, he became the Chair of the IAVS Vegetation Classification Working Group. However, the IAVS Symposium in Bozeman, MO, in July 2018, was the last he attended.

In October 2018, Woody was diagnosed with lung cancer. He did not give up and fought bravely with the disease. Undergoing therapy, he kept teaching and organizing field courses until May 2019. He registered for the IAVS Symposium in Bremen in July 2019, but rapid worsening of his health condition did not allow him to come. Then, sad news arrived that his suffering ended on 29 November 2019.

Woody was Silent Peak not only by his name but by his whole personality. He liked people around him, but he never talked too much about himself and his problems; rather he listened to others. He also listened to nature, to trees and other plants, and he learned from them. He was always very modest, friendly, and helpful. But behind his smiling face, there was an outstanding ecologist who made landmark contributions to understanding the ecology of Taiwanese forest vegetation. His soul lives somewhere among the big trees in the cloud belt of Taiwanese mountains.



Woody was an excellent lecturer who was able to explain complicated things using examples from real life. These pictures from one of his presentations illustrate the mid-domain effect as an explanation of the latitudinal gradient in species diversity. The bread represents the bounded domain (the Earth from the South Pole to the North Pole), and food types represent individual species. The ranges of many species overlap near the Equator, creating high diversity in the Tropics. Photos by Woody, assisted by Rui-Han Chien, Cheng-Tao Lin, Guo-Zhang Michael Song and David Zelený (2008).

DOI - 10.21570/BUL-202003-4

Fieldwork celebration

Every year vegetation scientists are eagerly awaiting the growing season, which is significantly different from their life in other periods of the year. For most of us the fieldwork is a bridge to our study system, the essential contact we need to better understand ecosystems and ecosystem processes. It is not only this professional relationship that is important - we also enjoy being in the fresh air, working with colleagues and the beauty of nature that surrounds us. Often, we experience funny events but also embarrassing ones, which we laugh at after some years. The regular section on fieldwork celebration in the IAVS Bulletin was established for all of you who would like to share the fieldwork moments or stories.

Can my men be of any help?

by Rense Haveman

Wageningen, The Netherlands

Working at military ranges may not be what most vegetation scientists consider to be an ideal field work, however, it can be challenging at times. Finding yourself amidst unexploded ammunition in the target area of a Dutch artillery firing range, not knowing how you reached that particular place, with an adrenaline level above what you have previously experienced before, and panicking about how to find your way back out of this "mine-field", only because you were distracted by the *Violion caninae* vegetation, is one of those challenging moments. But the best field-work story I remember is more funny than frightening.

It must have been in the late 1990's when I visited the marine base at the Wadden island of Texel for the first time. It is located in the north-western part of the Netherlands, at the edge of the European continent and border of the North Sea and Wadden Sea. The base is on a large intertidal system of sandflats, flow channels and islands. It lies on a very young landscape which only came into being after a sandflat, "Onrust", formed at the southernmost part of the island around 1910. The area consists of young dunes with *Honckenyo-Elymetea* foredunes, *Koelerion* dune grasslands and high dune scrubs, as well as young dune slacks with species rich communities, mainly belonging to the *Junco baltici-Schoenetum nigricantis*, *Phragmition australis*, and *Caricion nigrae* associations. Our visit was aimed at a first quick survey of the vegetation of the area. This first survey was necessary as we were planning a complete vegetation mapping project for the area, and we needed to know what to expect. Our visit took place early March, and we had nice weather.

Suddenly I saw something I didn't expect, and I fell to my knees to check if the plant I saw was really what I thought it was: *Mibora minima*! This species had never been found before in the Wadden Sea area, and this would be a novelty. Indeed, after closer inspection, we found three specimens of this tiny grass, in full bloom. After some "ah's" and "ohh's", and taking pictures, we decided to make a relevé of the pioneer grassland where *Mibora* grew. After we finished, we crawled through the vegetation of a larger area, hoping to find more of this South-Atlantic species. Completely absorbed by our self-imposed task, we didn't notice our surroundings, until a loud deep voice shouted: "*Can my men be of any help?*" We looked up, terrified, and we saw at least a dozen men standing in line at the end of the *Phleo-Tortuletum* field, with a sergeant in front, looking at us. He said "*My men can help you find what you're looking for!*"

Completely surprised, and seeing the serious soldiers in a row waiting for one command to help us search, we tried our best not to laugh, despite the humorous situation. After we explained what we were doing, the sergeant dismissed his men, clearly disappointed that he couldn't be of any help. I don't know what they were thinking: maybe they thought some asylum opened its doors, giving freedom to some lunatics. It wouldn't surprise me, as somehow it was our own thought about them.

It's the one and only time we were offered such practical help by the army in our field work. And *Mibora minima* disappeared from this location. Some years later we found it in the *Ammophila* dunes, and, in tens of thousands, in the *Phleo-Tortuletum* in other places in the same area. Our first finding at the marine base was a prelude to the establishment of the species all over the island.

Primary "white" dunes with *Elytrigia juncea* ssp. *boreoatlantica* and some first occurrences of *Ammophila arenaria* ssp. *arenaria* at the military base at Texel.

Mibora minima and *Tulustoma brumale* in a dune grassland belonging to the *Phleo-Tortuletum* association.

Making a relevé in a young dune grassland. Starring: Iris de Ronde.

Mibora minima.

DOI - 10.21570/BUL-202003-5

Sampling methodology

- *Do you use a reliable, well-developed methodology to investigate vegetation or to answer important questions related to vegetation, which you would like to popularise?*
- *Did you invent a new or unusual approach to study phenomena related to vegetation, which you would like to share?*
- *Do you find certain methods in vegetation science problematic that you would like to discuss and improve?*

If your answer to any of these questions is YES, then you may be an ideal person to contribute to our new forum devoted to methods, newly established as a regular section of the IAVS Bulletin.

Using tea bags to estimate the rate of soil organic matter decomposition in a Taiwanese forest

by David Zelený & Po-Yu Lin

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When we first began to study changes in forest vegetation along an elevation gradient in Taiwan, from lowland rainforest to mountain cloud forest, one consideration was how to measure the amount of nutrients in the soil. Cloud forests are known to be seriously nutrient-limited, mainly because of lower temperatures and higher relative air humidity, which result in water-saturated soils with slow rates of organic litter decomposition. Slow decomposition means lack of nutrients, where nutrients remain in the soil in the form of undecomposed organic matter (that is why walking in the cloud forests sometimes feels like stepping on pillows full of feathers). We analysed soil samples in the lab for a whole range of chemical compounds, but then we thought – if the lack of nutrients is caused by slow decomposition rate, shouldn't we directly measure decomposition? But how to measure the rate of decomposition in the field, especially if some of our sites needed days of hiking with a heavy pack in steep mountains?

A standard way of measuring decomposition rate is to collect mixed leaf litter from the vegetation under the study, prepare a set of litter bags, bury them in the field, and then in one- or two-week intervals, sample them one by one to build the decomposition curve. For this, we would need to visit each site multiple times in rather short intervals, which was logistically impossible. Then we came across the idea proposed by Keuskamp et al. (2013): replacing the litter bags by commercially available tea bags of two different teas, green tea and rooibos tea. The method sounded promising: we needed to bury teabags in the soil at the beginning, and then pick them up at the end of the decomposition period (around 90 days in our case). In summer 2018 we undertook the pilot study, where, on a subset of localities, we tested whether it actually worked. We found that it did look promising, and decided to give it a proper try. In 2019 we buried teabags on all 18 permanent sites within our elevation transect between 850-2100 m a.s.l., with six pairs of teabags buried in each 20 m x 20 m plot.

How does the method work? First, we actually needed to get the right tea, packed in a standardised way in non-decomposable nylon bags. The study of Keuskamp et al. (2013) was based on commercially available tea manufactured by British company Lipton, which is exported into the whole world. Getting these teabags in Taiwan was not that easy; Taiwanese do not drink rooibos at all, and green tea planted in Taiwanese mountains is much better than the one sold by Lipton (sorry, Lipton, but it is true), so the teabags needed to be imported from elsewhere. Once we got them, the teabags needed to be prepared. We dried them in the dryer to get rid of moisture and weighted each one of them before we sealed them into small plastic bags and prepared for the fieldwork. Teabags from nylon or polypropylene themself are almost identical, but the amount of tea inside may slightly differ among individual bags, that is why the weighting is necessary. In the field, we buried each pair of teabags in approximately 8 cm depth, close to each other (but not in the same place). The string of the tea with the label needs to be visible from outside, so that we could find the teabags again three months later. For sure, we also marked the string with red electrical tape, and recorded the detailed position of each pair of teabags into the map of the permanent plot. When we ran the pilot study, we used four replicates of tea pairs at each site. However, we found that especially in lowland sites, the tea bags got quite often broken – sometimes mechanically (by stones in the soil, by roots passing through), but often also by the soil fauna (ants and beetles seems to love the tea). That is why, in the final study, we used six replicates per plot, which seemed to be sufficient. Three months later, we revisited each site, and carefully dug the teabags out, one by one. It was interesting to see how fast the fine tree roots are growing. When we buried the bags, we had to dig the hole to put them in the soil, but when we want to pick them up, the soil surface was often completely overgrown by fine roots. In rare cases the teabags got broken when we were digging them out, some were broken already in the soil, but in general, we had quite a success. Back in the lab, we dried teabags in the dryer again, weighted the content and compared it with the weight before the experiment. Green tea decomposes much faster then rooibos tea, which is actually why these two need to be buried together. After three months, only a small amount of stabilised recalcitrant part of the green tea biomass remained in the bag, while rooibos still had a considerable amount of labile components. Using modified formulas from Keuskamp et al. (2013) and by averaging the results of unbroken teabags from each site, we were able to calculate the decomposition rate *k* and stabilisation factor *S* for each vegetation plot.

Figure 1. (a) New teabags prepared for the experiment. (b) Teabags buried in the soil, with tags visible on the surface. (c) After ca 90 days, teabags were dug out. (d) After drying 48 hours at 70°C, teabags were ready for weighting. (e) Each teabag was opened and the tea remnants weighted. (f) Measuring the weight of decomposed tea. The process of teabag excavation in Taiwanese lowland sub-tropical forest can be also seen on this video: https://vimeo.com/390990611/3ca00eca4f.

As we expected, the decomposition was strongly related to elevation, but also to soil depth and soil pH (see the Fig. 2 for results of analysis where we predicted the decomposition rate by other measured environmental factors in our sites). The decomposition rate is an important contribution to the set of environmental variables we measured in each site, along with other chemical, topographical and microclimatic variables and helps to explain the taxonomical and leaf trait changes in the forest vegetation among our sites.

What next? At the time of writing, we imported a big box of Lipton tea from a Dutch supermarket, and plan to bury them in our 1-ha cloud forest dynamics plot, to evaluate the soil organic matter decomposition on a much finer spatial scale. We also plan to share our data with some of the global initiatives:
http://www.teatime4science.org/,
https://www.teacomposition.org/,
http://www.bluecarbonlab.org/teacomposition-h2o/
to collaborate with other studies and allow comparison of our data with teabag decomposition measurements from other biomes and geographical locations. Some time ago, Lipton changed the type of the material it uses for teabags, from nylon mesh to nonwoven polypropylene (PP) material, which is claimed to be environmentally more friendly. So far it is not clear whether the results from new PP bags will be comparable with original nylon bags, but hopefully so. Indeed, plastic pyramid teabags are not environmentally friendly at all. While used paper teabags can be decomposed in the compost, slowly degrading plastic teabags are not suitable for that, and it is perhaps just a matter of time when the company will switch to other types of materials. Such a move will be environmentally much friendlier, but unfortunately, it will bring an end to this neat, handy decomposition method. Try it while you can!

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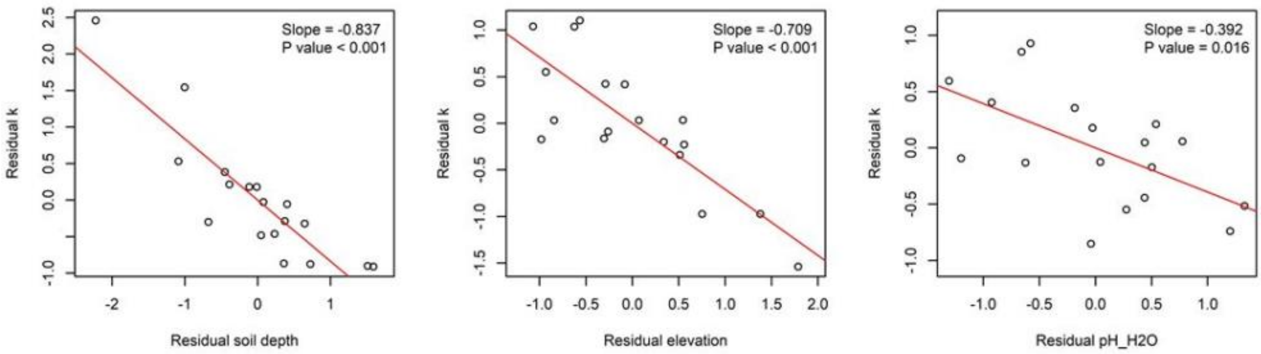

Figure 2. At each site where we measured the decomposition rate using the teabag method, we measured also a set of other relevant environmental variables (soil chemical properties, topography, available light). We were curious to know which of these variables might be good predictors of the decomposition rate *k* measured by teabags. We explored a wide range of different variables and ended up with soil depth, elevation and soil pH (measured in water) as important predictors of decomposition, all of them significantly negatively related to the decomposition rate *k*. Their relationship to *k* is visualized by multiple linear regression (see partial regression diagrams with all variables standardized to zero mean and unit of standard deviation).

Nice atmosphere during the Bremen Symposium in July 2019.

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IAVS Bulletin Article Submission

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