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NEWSLETTER

Volume 31 Issue No.2 April 2020



10TH INTERNATIONAL SYMPOSIUM FOR FISH PARASITOLOGY

AUSTRALIAN SOCIETY FOR PARASITOLOGY

ANNUAL CONFERENCE

CAIRNS, AUSTRALIA

5-8 JULY 2021

CAIRNS 2021

In light of COVID-19, the 2020 ASP & ISFPX Conference has been postponed. We are pleased to announce that the 10th International Symposium on Fish Parasites and the annual meeting of the Australian Society for Parasitology will now be held in Cairns, Australia from 5 - 8 July 2021.

Cairns boasts wonderful weather in July, with temperatures between 17-26 °C and very little rain, and is on the doorstep of both the Great Barrier Reef and the tropical north Queensland rainforest. We look forward to seeing you in Cairns in 2021!

Barbara Nowak & Thomas Cribb Conference Co-chairs





ISFPX.ORG



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The

Parasitology

Australiar Society

for



NEWSLETTER

Volume 31 Issue No.2 April 2020

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From the President's Desk

Dear Members,

Here we have another beautiful newsletter, I would like to start by introducing our front cover - a really cute artic lemming, an ideal picture for Easter issue. This picture (and more to see in this newsletter) accompanies an interview with Dr Olivier Gilg from the Université de Bourgogne Franche Comté, France about his parasitology research on these amazing animals. This research was recently published in IJP:PAW. We thank Olivier for the interview and the beautiful images in this issue. While we have been working on Greenland fish and their parasites, I never had the opportunity to travel there, hope one day it will be possible as it looks incredibly attractive.

COVID-19 has been at the centre of our lives for a few months now. It is a hugely challenging time for everyone. I would like to acknowledge ASP members who are involved in COVID-19 response – on the frontline or doing research or developing or doing testing or being involved in advisory groups and other support roles.

Congratulations to Professor Alan Cowman's team at WEHI in partnership with global pharmaceutical company MSD, have developed a novel class of antimalarial compounds that can effectively kill malaria parasites. While COVID-19 is the centre of our attention, we should not forget about neglected diseases, many of them parasitic, which devastate people in many parts of the world. This newly developed class of antimalarial compounds will be an effective treatment to reduce the impact of this disease. Targeting novel process or pathway and multiple life stages as well as the difficulty to induce resistance makes these compounds incredibly promising. Interestingly, there are some interesting stories of antiparasitic treatments showing promise for COVID-19, we are all hoping for a successful one coming soon.



I am writing this letter from home and while my working space here is much smaller, I'm working as hard as always, although missing my out of office activities (and my office). We are now all familiar with the realities of working from home and some of us with the additional challenge of doing this while looking after their families. Now it is even more important to stay in touch and come up with ways we can connect with others virtually from our homes. I am most grateful for all the enthusiastic support from the ASP Executive and ASP Council, in particular Lisa Jones, also for putting this newsletter together.

Australian Society for Microbiology (ASM) started an initiative of to putting together a database of qualified people who are willing to be called upon in case of a potential staff shortage to assist with COVID-19 testing (or any other requests required) at hospitals or any other diagnostics lab across Australia. Earlier this week Australia's Learned Academies has launched COVID-19 Expert Database. Both

PRESIDENT

From the President's Desk continued

links are provided on ASP website.

As all of you know 2020 ASP & ISFPX Conference has been postponed to 5th - 8th July 2021 (Cairns, still the same venue) due to COVID-19 outbreak. Our 2020 AGM will be held online, the date will be confirmed soon. I would like to thank Lisa Jones for renegotiating with the venue and organizing the AGM. We have confirmed that our invited speakers will be still available in 2021. I'm really looking forward to this conference. For those interested in fish parasitology, we are still going ahead with the special issue of IJP which was going to coincide with the ISFPX. I would like to thank Brian Cooke and Maria Meuleman who have been working really hard on this issue. Thanks

also go to all ASP members who have been acting as reviewers for papers in this IJP issue, often on a short notice.

This newsletter contains a lot of other interesting stories. For example, please see profile on ASP member Dr Priyanka Barua, who, after training in Melbourne has returned to her homeland of Bangladesh where she is an Assistant Professor in the Department of Zoology at the University of Dhaka. Isabelle Henshall a PhD student at the University of Adelaide reports on a visit to the London School of Hygiene and Tropical Medicine supported by JD Smyth Award. Samantha Emery of WEHI describes her visit to Professor Staffan Svärd at Uppsala University in Sweden and to the IGCC Conference in Rouen, France,



funded by ASP Network Travel Award. Dr Maria Ortega-Pierres dedicates a Giardia issue of Advances in Parasitology to three ASP members - Peter and Jacquie Upcroft and Andrew Thompson and describes their contribution to this field. Congratulations to ASP undergraduate prize winners at JCU and CSU, hope we will see some of you at ASP conferences as Honours or PhD students. Great outreach activities in Tasmania and ACT are also reported in the newsletter. Hope all of ASP members will enjoy reading this newsletter.

Finally, I would like to wish everybody Happy Easter. This may not be the Easter we planned but nevertheless we should enjoy the break as much as possible. I usually spend Easter with my family in Poland but this year can only hope that I will be able to be with them in 2021. The photo shows painted eggs – old Polish tradition for Easter, while these are not parasites, they represent potential hosts so still relevant to ASP. This photo was sent to me by Green Patrol – a small group of students from Primary School in Trzebnica Poland. Those 20 girls are very concerned about future of the environment worldwide. Following Australian bushfires they run awareness campaign about the impact of the bushfires on our wildlife. As a result of that campaign and their fundraising activities they donated \$500 for Australian wildlife. Now the girls are sending everybody their Easter wishes – Happy Easter Australia. Very inspiring in these difficult times.

So Happy Easter everybody, stay home, stay safe and stay connected.

Best regards,

Barbara Nowak

www.parasite.org.au www.facebook.com/ASParasitology www.twitter.com/AS_Para

SOCIETY NEWS

ASP member profile - Priyanka Barua

After training in Melbourne, Dr Priyanka Barua has returned to her homeland of Bangladesh where she is an Assistant Professor in the Department of Zoology at the University of Dhaka.

Dr Priyanka Barua has been an ASP member since 2014 and graduated last year from the Department of Medicine in the University of Melbourne where she investigated the immunity to malaria in children. She was in Rogerson's lab based at the Peter Doherty Institute of Infection and Immunity (PDI) in Melbourne.

Her PhD was supervised by Professor Dr Stephen Rogerson and Dr James Beeson and she found that nutrient supplements did not affect immunity to malaria, but malaria episodes did. Severe malaria episodes were caused by parasites expressing specific surface proteins, and antibody to these varied with children's blood groups. Professor in the Department of Zoology, University of Dhaka, Bangladesh. After coming back to her homeland (Bangladesh), she started her own small projects in collaboration with international (icddr,b) and national organizations (Biotechnology Research Center, University of Dhaka).

Being a parasitologist at heart, she is very interested to continue working on malaria immunity as well as expanding her field of expertise in other neglected tropical diseases (e.g. Dengue), emerging zoonotic diseases (New China coronavirus, Avian influenza) etc. that has been affecting people's wellbeing worldwide.

Currently she is very interested to learn more about molecular techniques e.g. DNA barcoding, and bioinformatics. She hopes to have her own lab one day. Priyanka is still interested in travel, books, literature, people and animals and we look forward to hearing more about her research in upcoming publications!



Currently she is working as an Assistant



EXPERT DATABASE

REGISTER NOW



The Australian Academy of Science has launched a national COVID-19 Expert Database. The database is championed by Australia's Chief Scientist, Dr Alan Finkel AO.

They are calling on experts from a broad range of fields who can contribute to the national and global effort to tackle and recover from COVID-19 to register on this

database.

In this rapidly evolving situation, the database is designed to be a national resource used by decision-makers including governments, parliamentarians, the federal and state and territory medical officers, chief scientists across Australia, the research sector, the business sector, the Australian Health Protection Principal Committee, the National COVID-19 Coordination Committee, and the media.

Read more and register at:

https://www.science.org.au/covid19/ experts

RESEARCHER NEWS

An exciting new class of antimalarial compounds

Professor Alan Cowman's team at WEHI in partnership with global pharmaceutical company MSD, have developed a novel class of antimalarial compounds that can effectively kill malaria parasites.

In preclinical testing, the compounds were effective against different species of malaria parasites, including the deadly *Plasmodium falciparum*, and at multiple stages of the parasite lifecycle. The compounds target a previously unexplored parasite pathway and could overcome existing issues of parasite drug resistance, an ongoing and increasingly urgent problem.

The researchers hope that drugs based on these early compounds will soon enter phase 1 clinical trials.

The research, a collaboration between the Walter and Eliza Hall Institute and global pharmaceutical company MSD, was published in *Cell Host & Microbe*.

Professor Alan Cowman, an international malaria expert and deputy director at the Walter and Eliza Hall Institute, led the Australian research team, alongside MSD scientist and US team lead Dr David Olsen.

"This is an exciting new class of antimalarial compounds that could fill a critical and widening gap in our efforts to control and eliminate malaria," Professor Cowman said.

"In preclinical testing, the lead compound WM382 inhibited growth of the malaria parasite in the host and prevented transmission back to the mosquito. These results indicate that this class of compounds is very promising as a potent new treatment for malaria. We hope that drugs based on these compounds will soon progress to human phase I clinical trials."

WM382 not only killed malaria parasites in the blood, it also killed parasites in the liver and prevented parasites in the blood being transmitted to mosquitoes, he said.

"This novel class of compounds has



Above: Alan Cowman (second left) with senior members of the research team

the potential to not only cure people with malaria, but also prevent transfer of the parasite to the mosquito and, consequently, halt further transmission of the disease. This is an exciting prospect, as current antimalarial drugs kill the malaria parasite in the blood but do not fully prevent transmission," Professor Cowman said.

A major problem with current antimalarial drugs is that malaria parasites evolve and develop resistance to the drugs over time.

"Much like antibiotic resistance, malaria resistance is an emerging crisis," Professor Cowman said. "Effective antimalarial drugs are not just critical for the infected individual, they are also critical for breaking the cycle of infection and an important way for us to reach our goal of eliminating malaria from highly endemic regions."

Once parasite resistance emerges, it can quickly spread through a region, or even globally. "In some areas, parasites are resistant to all three frontline malaria treatments. So novel drugs are urgently needed," he said.

In recent years, the focus of international efforts to develop new malaria drugs have centred on two criteria; they must target a novel process or pathway to avoid preexisting resistance to current drugs; and they must be active at multiple stages of the parasite lifecycle.

Professor Cowman said WM382 successfully met both of these criteria.

"An exciting feature of WM382 is that it kills the malaria parasite in a very different way to current antimalarial drugs. In preclinical testing, malaria parasites that were resistant to the lethal effects of current antimalarial drugs were fully susceptible to WM382. It was also very difficult to induce resistance to this compound in malaria parasites in the lab. This is uncommon in drug discovery, and is a positive sign, as it suggests it will be harder for malaria parasites to acquire resistance in the field," Professor Cowman said.

Story and image courtesy of WEHI

RESEARCHER NEWS

A dedication by Dr. Maria Guadalupe Ortega-Pierres

Volume 107 of Advances in Parasitology, guest edited by Dr. Maria Guadalupe Ortega-Pierres, is a special edition on Giardia and Giardiasis. Here we reproduce Dr. Ortega-Pierres' dedication, which pays tribute to three ASP luminaries.



During the preparation of this special thematic issue (Volume 107) on *Giardia* and Giardiasis, I often reflected deeply on the topic areas and the contributions made by the many dedicated scientists and research teams around the world. We are grateful to all of them for their excellent contributions.

There are some people who stand out as sustained and exceptional ambassadors, researchers, teachers, supervisors and mentors. These people include **Dr. Jacqueline A. Upcroft** and **Professor Peter Upcroft** as well as **Professor R.C. Andrew Thompson**, who have contributed enormously over decades to the *Giardia*/ Giardiasis field.

I dedicate this volume specifically to them, to recognize their outstanding research achievements, excellence through their talent, knowledge and expertise in this field. Their scientific activities and global engagement have been coupled with exceptional commitments to addressing a broad spectrum of environmental concerns and long-standing records of supporting public health and wildlife conservation as well as next-generation scientists.

I also reflected profoundly on the wonderful country in which they live, Australia, and the enormous challenges that this country has been facing in recent times, with fires ravaging vast expanses of land and national parks, destroying homes, farms, families, livelihoods and natural treasures (fauna and flora). Our thoughts go out to the communities and the areas affected by this catastrophe, and we hope that substantially heightened attention is paid, particularly by politicians, to climate and associated environmental changes and its impacts.

It gives me great pleasure to dedicate this volume to three outstanding scientists who live in that marvellous country, Australia.

Left: Dr. Maria Guadalupe Ortega-Pierres Below: Advances in Parasitology 107 Bottom: J.Upcroft, P.Upcroft, A.Thompson







OUTREACH

Taking parasitology to a Launceston primary school

240 children from Mowbray Height Primary School in Launceston enjoyed a day learning about fish parasites.

This event was aimed to serve children at early childhood age (6- 8 years old) at MHPS. With parasite theme, the event was designed to raise children's awareness and interest in Science especially in Parasitology. The event was greatly welcome by both MHPS teachers and children.

Before attending our main sections, children were introduced to parasites and parasite scientists by their teachers who read the book "My mum is a parasite scientist. That's RAD" (sponsored by Professor Katherine Andrews) for them. A 15 min section was run for every early childhood class and students can learn more about parasites with images, models and interesting fast facts. Scientific books and prizes were given to some future talented parasitologists who showed good observation skills and were able to utilize provided information to identify different parasites in fish (amoebae, blood flukes, isopods and copepods).

The main activity of the event was Aquatic Animal Health wet lab where students worked as teams of vets (6 - 8 kids per team) and diagnosed parasitic diseases. A kiddie pool was filled with water and populated with floating fish "infected"



by the four parasites of focus. One kid in each team was randomly selected as a fish farmer who was given fishing poles with magnetic lures and sampled fishes. The rest of the team acted fish parasitologists who worked together to identify the parasites. Two teams with more correct identification got changes to select a number of prizes from the ASP prize collection including microscopes, science kits, books, fish shaped umbrellas and lollipops.

The ASP event was very successful with 240 children and 10 teachers attended. The ASP sponsorship for this event was used to purchase the ASP prize collection and lunches for volunteers. This event was advertised by MHPS newsletters and welcome by all early childhood students. Many children experienced their first exposure to fish parasites and clearly demonstrated the absorption of their new knowledge. The interactive participation in activities helped to foster curiosity about parasitology. We received very good feedback from all the participants. Both teachers and early childhood children fell in love with the event and asked to attend this event again in the future.

The ASP banner was displayed. ASP and Professor Katherine Andrews at Griffith University were greatly appreciated for their effort to make Parasite Science accessible for early childhood students and inspire them a love with Science and Parasitology that they can take with them into future.





OUTREACH

The ASP at InterACTive Science

ANU Parasitologists ran a parasite themed stall at InterACTive Science, a STEM showcase and the headline event in the ACT's National Science Week festivities of 2019. Christina Spry reports.

The event was open to the general public and attended by a few thousand people. People of all ages were in attendance the day-time session was predominantly attended by families, and the evening "After Dark" session was attended by adults of a wide range of ages.

The funds were used to develop new exhibits and to update the exhibits from previous Parasitology stalls run during National Science Week. The new exhibits included: (i) an interactive smart-phone guiz that aimed to teach visitors about the benefits of parasites; (ii) videos showing parasites in action; and (iii) a competition to guess the number of "parasites" compared to "red and white blood cells" in an edible sample. As in previous iterations of the stall, visitors also had the opportunity to brave the parasite mystery box to discover what a parasite feels like, and to see a range of real parasites. The funds were also used to purchase edible prizes for inquisitive visitors to the stall and an overall prize (two movie tickets) that helped us to attract and engage visitors to the stall.

As part of the "After Dark" session, we additionally introduced visitors to antiparasitic drugs and the natural products from which some can be found. We had glow-in-the dark quinine bottles on



display and sold Gin and Tonic's (on a costrecovery basis). The funds were used to purchase tonic water, a UV light and a oneoff liquor license for the event.

InterACTive Science was promoted by the ACT National Science Week committee. This included an advertisement on the National Science Week website and on Facebook. The ASP banner was on display during the event.

I believe this outreach event benefited the ASP by promoting parasitology and the research of local members of the ASP to the general public. At the parasite-themed stall, guests discovered the diversity of parasites and met local parasitology researchers. Inspiring / terrifying the general public with parasitology was, as always, great fun and fostered a sense of appreciation towards parasitology research. The ACT Parasitology stall has a reputation as being one of the most interactive and engaging stalls at such events, leaving visitors with a fond association with the ASP.

Science in ACTion was also an opportunity to strengthen our collegial community of parasitologists in Canberra. The project brought together academics and students that don't interact on a daily basis to not only volunteer during the event, but also for previous brainstorming sessions and to

prepare for and make the new exhibits. Excitingly, this included quite a few students that were new to our parasitology community. As in previous years, I was impressed by the new ideas for expanding our stall and the commitment of all to bring these ideas to life in time for the event.

Overall, the parasitology stall at InterACTive Science promoted the society to the general public and brought together local ASP members of different career stages from across the large ANU campus.



Left: ANU's College of Science

Virtual Parasitology with Parasites VR

Parasites VR is a virtual reality experience for parasitology teaching. This experience is designed for all ages from children to tertiary students and has been used for outreach as well as teaching purposes. It was developed by Mr Evan Dekker and Dr Sarah Preston at Federation University with funding from the ASP.

The interactive scenario allows users to identify the different parasites (endoparasites and ectoparasites) that can infect a single host (cow). Users are instructed to find 4 different parasites as well as identify where the eggs are found for endoparasites. Following the identification of the parasites, users are then instructed to treat the animal for the parasites by applying an anthelmintic. The virtual reality experience was developed by Mr Evan Dekker and Dr Sarah Preston at Federation University. They encourage any feedback on the program and are currently using the experience for scholarly research. They are seeking student feedback on the experience so please contact us if you would like your students to participate in the research project survey.

Parasites VR manual

You can download the manual, which takes you through all aspects of Parasites VR – required software, equipment set up, roles, objectives and all aspects of the experience itself from the ASP Education Commitee and Resources section of our website:

https://www.parasite.org.au/education/ asp-education-committee-and-resources/ parasites-vr/

Additional components

Installer file for the VR experience: https://cloudstor.aarnet.edu.au/plus/ s/5ZU5C7IJGI0vLzk SteamVR (required to use installer): https://store.steampowered.com/ app/250820/SteamVR/

Oculus Quest port of the Parasites VR experience: <u>https://cloudstor.aarnet.edu.au/plus/</u> <u>s/5EiP3HZHYJNZlyP</u>

Video alternative

For those who do not have the capacity to implement the VR, a video of a user using the VR program is available at the link below. This could be used for online teaching.

https://fedflix.federation.edu.au/media/ Parasites+VR/0_fmzy708p

Below: Sarah Preston



IJP

INTERNATIONAL JOURNAL FOR PARASITOLOGY

Recent IJP papers by ASP members

Madeline G. Dans, Greta E. Weiss, Danny W. Wilson, Brad E. Sleebs, Brendan S. Crabb, Tania F. de Koning-Ward, Paul R. Gilson,

Screening the Medicines for Malaria Venture Pathogen Box for invasion and egress inhibitors of the blood stage of Plasmodium falciparum reveals several inhibitory compounds,

International Journal for Parasitology, Volume 50, Issue 3, 2020, Pages 235-252, ISSN 0020-7519, https://doi. org/10.1016/j.ijpara.2020.01.002.

(http://www.sciencedirect.com/science/ article/pii/S0020751920300333)

With emerging resistance to frontline treatments, it is vital that new drugs are identified to target Plasmodium falciparum. One of the most critical processes during parasites asexual lifecycle is the invasion and subsequent egress of red blood cells (RBCs). Many unique parasite ligands, receptors and enzymes are employed during egress and invasion that are essential for parasite proliferation and survival, therefore making these processes druggable targets. To identify potential inhibitors of egress and invasion, we screened the Medicines for Malaria

www.journals.elsevier.com/internationaljournal-for-parasitology

Editor In Chief: Brian Cooke

Facebook: <u>www.facebook.com/IJPara</u> Twitter: @IJPara Instagram: ijpara Venture Pathogen Box, a 400 compound library against neglected tropical diseases, including 125 with antimalarial activity. For this screen, we utilised transgenic parasites expressing a bioluminescent reporter, nanoluciferase (Nluc), to measure inhibition of parasite egress and invasion in the presence of the Pathogen Box compounds. At a concentration of 2 μ M, we found 15 compounds that inhibited parasite egress by >40% and 24 invasion-specific compounds that inhibited invasion by >90%. We further characterised 11 of these inhibitors through cell-based assays and live cell microscopy, and found two compounds that inhibited merozoite



International Journal for Parasitology continued



maturation in schizonts, one compound that inhibited merozoite egress, one compound that directly inhibited parasite invasion and one compound that slowed down invasion and arrested ring formation. The remaining compounds were general growth inhibitors that acted during the egress and invasion phase of the cell cycle. We found the sulfonylpiperazine, MMV020291, to be the most invasionspecific inhibitor, blocking successful merozoite internalisation within human RBCs and having no substantial effect on other stages of the cell cycle. This has significant implications for the possible development of an invasion-specific inhibitor as an antimalarial in a combination based therapy, in addition to being a useful tool for studying the biology of the invading parasite.

Catherine A. Gordon, Lutz Krause, Donald P. McManus, Mark Morrison, Kosala G. Weerakoon, Mairead C. Above: Dale Seaton of Elsevier and Brian Cooke, Editor-in-Chief of International Journal for Parasitology on Day 1 of MAM 2020 Conference in Lorne where they gave their very interesting presentation on how to publish a scientific article at the ECR workshop.

Connor, Remigio M. Olveda, Allen G. Ross, Geoffrey N. Gobert,

Helminths, polyparasitism, and the gut microbiome in the Philippines,

International Journal for Parasitology, Volume 50, Issue 3, 2020, Pages 217-225, ISSN 0020-7519, https://doi. org/10.1016/j.ijpara.2019.12.008.

(http://www.sciencedirect.com/science/ article/pii/S002075192030031X) Polyparasitism, involving soil-transmitted helminths and Schistosoma blood flukes, is common in low to middle income countries. These helminths impact on the gut environment and can cause changes to the gut microbiome composition. Here we examined the gut microbiome in individuals with polyparasitism from two human cohorts in the Philippines utilising DNA sequencing-based profiling. Multiple helminth species infections were high with 70.3% of study participants harbouring at least two parasite species, and 16% harbouring at least five species. Increased numbers of helminth co-infections, in particular with the gutresident soil-transmitted helminths, were significantly associated with increased bacterial diversity; however no significant parasite-gut microbiome associations were evident for individuals infected only with Schistosoma japonicum. In general, a healthy gut is associated with high bacterial diversity, which in these human cohorts

International Journal for Parasitology continued

may be the result of helminth-mediated immune modulation, or due to changes in the gut environment caused by these parasitic helminths.

Kathryn P. Greenwood, Simon A. Reid,

Clustering of cryptosporidiosis in Queensland, Australia, is not defined temporally or by spatial diversity,

International Journal for Parasitology, Volume 50, Issue 3, 2020, Pages 209-216, ISSN 0020-7519, https://doi. org/10.1016/j.ijpara.2019.11.010.

(http://www.sciencedirect.com/science/ article/pii/S0020751920300308)

Cryptosporidiosis, caused by infection with Cryptosporidium spp., is a globally distributed disease that manifests as diarrhoea for which there is no effective treatment. The protozoan parasite Cryptosporidium is difficult to detect and control, and can lead to severe disease in young children and the immunocompromised. Individual outbreaks across Australia have predominately been reported in urban areas associated with recreational water, but investigation of spatiotemporal distribution of disease is limited. This study evaluated the spatial and temporal patterns of clusters of notified cases of cryptosporidiosis in the north-eastern Australian state of Queensland, which has the highest average notified cases nationally. A spatiotemporal analysis in SaTScan of 12,263 notified cases from mid 2001 to mid 2015 identified 79 statistically significant disease clusters (P < 0.05). Analyses of annual incidence and disease cluster formation across the state illustrated the substantial randomness of clustering with no clear geographic distribution. Outbreaks were observed temporally across all latitudes and in rural and urban settings, with the majority of clusters centred in major and regional cities. Whilst clusters appeared in areas of high incidence, high incidence itself was not a predictor of clusters. Clusters generally formed during the hottest months between



January and April, and cases were primarily children aged 0 to <5 years. Spatiotemporal analysis at a statewide level is an important indicator of regional disease patterns and can act as a trigger for targeted epidemiological investigation.

Robert Poulin, Bronwen Presswell, Fátima Jorge,

The state of fish parasite discovery and taxonomy: a critical assessment and a look forward,

International Journal for Parasitology, 2020, Available online 6 March 2020. ISSN 0020-7519, https://doi.org/10.1016/j. ijpara.2019.12.009.

(http://www.sciencedirect.com/science/ article/pii/S0020751920300345)

Efforts to find and characterise new parasite species in fish hosts are crucial not just to complete our inventory of Earth's biodiversity, but also to monitor and mitigate disease threats in fisheries and aquaculture in the face of global climate change. Here, we review recent quantitative assessments of research efforts into fish parasite discovery and taxonomy. We address broad questions including: Are efforts aimed at finding new parasite species targeted at geographical hotspots of fish biodiversity, where there should be more parasite species to be found? Is the application of molecular tools to study parasite genetic diversity deployed strategically across regions of the world, or focused disproportionately on certain areas? How well coordinated is the search for new parasite species of fish among workers specialising on different higher helminth taxa? Are parasite discovery efforts in any geographical area consistent over time, or subject to idiosyncrasies due to the waxing and waning of highly prolific research careers? Is the quality of taxonomic descriptions of new species improving over time, with the incorporation of new tools to characterise species? Are taxonomic descriptions moving away from a focus on the adult stage only toward attempts to characterise the full life cycle of newly-discovered helminth species? By using empirical evidence to answer these questions, we assess the current state of research into fish parasite discovery and taxonomy. We also explore the far-reaching implications of recent research on parasite microbiomes for parasite taxonomy. We end with recommendations aimed at maximising the knowledge gained per fish sacrificed, and per dollar and time invested into research on fish parasite biodiversity.

Nichola Eliza Davies Calvani, Madoka Ichikawa-Seki, Russell David Bush, Syseng Khounsy, Jan Šlapeta,

International Journal for Parasitology continued

Which species is in the faeces at a time of global livestock movements: single nucleotide polymorphism genotyping assays for the differentiation of Fasciola spp.,

International Journal for Parasitology, Volume 50, Issue 2, 2020, Pages 91-101, ISSN 0020-7519, https://doi. org/10.1016/j.ijpara.2019.12.002.

(http://www.sciencedirect.com/science/ article/pii/S0020751920300072)

Fasciolosis, caused by Fasciola hepatica and Fasciola gigantica, is a globally distributed zoonotic disease of livestock. While F. hepatica and F. gigantica have temperate and tropical distributions, respectively, parasite sympatry occurs in parts of Asia and Africa. A growing protein demand has the potential to facilitate the translocation of parasites from endemic to non-endemic areas, via associated international livestock movements. Such is the case in Southeast Asia, where livestock trade from F. hepaticaendemic countries into China and Vietnam may account for detection of F. hepatica hybrid/introgressed forms. Of particular importance is Lao People's Democratic Republic, which acts as a major livestock thoroughfare for the region. Our ability to understand the impacts of livestockassociated Fasciola spp. movements on local animal and human health is hindered by a lack of ante-mortem diagnostic tools allowing species differentiation. Molecular tools have been developed for Fasciola spp. differentiation, however those rely on access to pure DNA from adult specimens, limiting their application to post-mortem use. Our aim was to detect and differentiate F. hepatica from the endemic F. gigantica in local smallholder cattle in a region of Southeast Asia with frequent livestock trafficking. To do this we designed and validated ante-mortem molecular assays for Fasciola spp. differentiation targeting single-nucleotide polymorphisms (SNPs) within ITS1 and IsrRNA. We then deployed these SNP genotyping assays to diagnose Fasciola spp. infection in 153 local cattle from 27 villages in Northern Laos. We

demonstrate the presence of F. hepatica DNA, confirmed by qualitative Sanger and quantitative Illumina amplicon sequencing of ITS1 and IsrRNA, and highlight the shortfalls of Sanger sequencing for Fasciola spp. identification due to the preferential amplification of F. gigantica nucleotides in mixed DNA samples. The outlined protocol enables rapid surveillance of faecal samples for the presence of Fasciola species eggs, their co-infection and/or infection with F. hepatica/F. gigantica hvbrids.

Larissa Calarco, Joel Barratt, John Ellis,

Detecting sequence variants in clinically important protozoan parasites,

International Journal for Parasitology, Volume 50, Issue 1, 2020, Pages 1-18, ISSN 0020-7519, https://doi.org/10.1016/j. ijpara.2019.10.004.

(http://www.sciencedirect.com/science/ article/pii/S0020751919303005)

Second and third generation sequencing methods are crucial for population genetic studies, and variant detection is a popular approach for exploiting this sequence data. While mini- and microsatellites are historically useful markers for studying important Protozoa such as Toxoplasma and Plasmodium spp., detecting nonrepetitive variants such as those found in genes can be fundamental to investigating a pathogen's biology. These variants, namely single nucleotide polymorphisms and insertions and deletions, can help elucidate the genetic basis of an organism's pathogenicity, identify selective pressures, and resolve phylogenetic relationships. They also have the added benefit of





possessing a comparatively low mutation rate, which contributes to their stability. However, there is a plethora of variant analysis tools with nuanced pipelines and conflicting recommendations for best practise, which can be confounding. This lack of standardisation means that variant analysis requires careful parameter optimisation, an understanding of its limitations, and the availability of high guality data. This review explores the value of variant detection when applied to non-model organisms such as clinically important protozoan pathogens. The limitations of current methods are discussed, including special considerations that require the end-users' attention to ensure that the results generated are reproducible, and the biological conclusions drawn are valid.

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IOURNALS



www.journals.elsevier.com/international-journal-forparasitology-drugs-and-drug-resistance/

Editors In Chief: Andrew Kotze & Kevin Saliba

Facebook: www.facebook.com/IJPDDR/

Here are some highlights from recent research published in IJP: Drugs and Drug Resistance. These articles were selected for you by the Editors-in-Chief of IJP: Drugs and Drug Resistance: Dr. Kevin Saliba from the Australian National University, Research School of Biology, Acton, Australia and Dr. Andrew Kotze, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Queensland Bioscience Precinct, Australia.

1

Diana Caridha, Brian Vesely, Katrien vanBocxlaer, Byron Arana, Charles E. Mowbray, Sima Rafati, Silvia Ulianae, Rosa Reguera, Mara Kreishman-Deitrick, Richard Sciotti, Pierre Buffet, Simon L. Croft

Route map for the discovery and preclinical development of new drugs and treatments for cutaneous leishmaniasis

International Journal of Parasitology: Drugs and Drug Resistance, 2019, Volume 11, pages 106-117

"A highly-informative, yet succinct, article about the drug discovery process, at various levels, for cutaneous leishmaniasis. A must read if you work, or plan to work, in this area!"

https://www.sciencedirect.com/science/ article/pii/S2211320719300788

2

Jane E. Hodgkinson, Ray M. Kaplan, Fiona Kenyon, Eric R. Morgan, Andrew W. Park, Steve Paterson, Simon A. Babayan, Nicola J. Beesley, Collette



Above: Binucleate form of a trophozoite of D. fragilis, stained with trichrome Image courtesy of DPDx (Centers for Disease Control and Prevention).

Britton, Umer Chaudhry, Stephen R. Doyle, Vanessa O. Ezenwa, Andy Fenton, Sue B. Howell, Roz Laing, Barbara K. Mable, Louise Matthews, Jennifer McIntyre, Catherine E. Milne, Thomas A. Morrison, Jamie C. Prentice, Neil D. Sargison, Diana J.L. Williams, Adrian J. Wolstenholme, Eileen Devaney

Refugia and anthelmintic resistance: Concepts and challenges

International Journal of Parasitology: Drugs and Drug Resistance, 2019, volume 10, pages 51-57 "The authors review the role of refugia in the management of anthelmintic resistance. They discuss the principles of refugia, and aspects of its use in the field across three different host-parasite systems."

https://www.sciencedirect.com/science/ article/pii/S2211320719300508

3

Arifin Budiman Nugraha, Bumduuren Tuvshintulga, Azirwan Guswanto, Dickson Stuart Tayebwa, Mohamed

IJP:DDR continued

Abdo Rizk, Sambuu Gantuya, Gaber El-Saber Batiha, Amany Magdy Beshbishy, Thillaiampalam Sivakumar, Naoaki Yokoyama, Ikuo Igarashi

Screening the Medicines for Malaria Venture Pathogen Box against piroplasm parasites

International Journal of Parasitology: Drugs and Drug Resistance, 2019, volume 10, pages 84-90

"The authors identified two compounds from MMV's Pathogen Box with potent, low nM, in vitro activity against a number of piroplasm parasites. The compounds were active against Babesia microti in mice and one of the compounds acted synergistically when combined with the established antipiroplasm agent diminazene aceturate."

https://www.sciencedirect.com/science/ article/pii/S2211320719300764

I. Fairweather, G.P. Brennan, R.E.B. Hanna, M.W. Robinson, P.J. Skuce

Drug resistance in liver flukes

4

International Journal of Parasitology: Drugs and Drug Resistance, 2020, volume 12, pages 39-59

"The authors provide a comprehensive review of drug resistance in liver flukes. They describe the current status of resistance, strategies to overcome resistance, and the vital role that diagnostics will play in managing resistance."

https://www.sciencedirect.com/science/ article/pii/S2211320719301435

5

Ander Burgaña, Rosa Abellana, Stanislav Zlatanov Yordanov, Rabee Kazan, A. Mauricio Pérez Ortiz, Cristina Castillo Ramos, Christian Garavito Hernández, Miriam Molina Rivero, Alessandra Queiroga Gonçalves, Emma Padilla, Josefa Pérez, Roger García-Puig, Tomas M. Perez-Porcuna

Paromomycin is superior to metronidazole in Dientamoeba fragilis treatment

International Journal of Parasitology: Drugs and Drug Resistance, 2019, volume 11, pages 95-100

"A large study demonstrating that paramomycin is more effective than metronidazole in all patients, except children under the age of 6 years, despite metronidazole being used almost four times more frequently"

https://www.sciencedirect.com/science/ article/pii/S221132071930140X

6

Roger K. Prichard, Timothy G. Geary

Perspectives on the utility of moxidectin for

the control of parasitic nematodes in the face of developing anthelmintic resistance

International Journal of Parasitology: Drugs and Drug Resistance, 2019, volume 10, pages 69-83

"Roger Prichard and Tim Geary examine the role that moxidectin may be able to play in order to allow macrocyclic lactone drugs to be used effectively for parasite control in the face of the resistance that has emerged to ivermectin. They highlight some areas of difference between the compounds that may be important for prolonging the usefulness of moxidectin for parasite control."

https://www.sciencedirect.com/science/ article/pii/S2211320719300594



www.journals.elsevier.com/international-journal-forparasitology-parasites-and-wildlife/

Editors: R.C. Andrew Thompson, Susan Kutz

Facebook: www.facebook.com/IJPPAW/

This International Journal of Parasitology: Parasites and Wildlife article selection highlights six of the journal's best recent publications. Each article was selected for you by Andrew Thompson, BSc, PhD, DIC. Professor Thompson is Co-Editorin-Chief of IJP: Parasites and Wildlife, and Emeritus Professor of Parasitology at Murdoch University, Murdoch, Australia.

1

Kate Suzanne Hutson, David Brendan Vaughan, David Blair,

First record of a 'fish' blood fluke (Digenea: Aporocotylidae) from a marine mammal: Cardicola dhangali n. sp.

International Journal for Parasitology: Parasites and Wildlife, Volume 10, 2019, Pages 23-28, ISSN 2213-2244, https://doi. org/10.1016/j.ijppaw.2019.06.009.

(http://www.sciencedirect.com/science/ article/pii/S2213224418301573)

We describe the first known blood fluke from a marine mammal, the dugong, Dugong dugon (Sirenia: Dugongidae), which represents a new species of aporocotylid, Cardicola dhangali n. sp. (Digenea: Aporocotylidae). Eggs presumed to be of blood flukes have been previously reported from dugongs. This exciting discovery raises questions regarding evolution and host-switching in the Aporocotylidae, which prior to this study were only known to infect actinopterygian and chondrichthyan fishes. The new species has male and female genital pores opening on the right side of the body, with the male genital pore opening posterior to the entire reproductive system and the testis is extra-caecal. The uterus is highly

convoluted, and the ovary is irregularly lobate. These features, together with the size and number of the tegumental spines per row, easily distinguish the new species from the most similar congeners Cardicola aurata Holzer et al., 2008, Cardicola chaetodontis Yamaguti, 1970, Cardicola currani Bullard and Overstreet, 2004, Cardicola forsteri Cribb et al., 2000, C. jiingurru Yong et al., 2016, and Cardicola palmeri Bullard and Overstreet, 2004, all of which infect actinopterygian fishes. Given that Cardicola is the most diverse and least host-specific of the marine aporoctoylid genera, it seems credible that a successful host-switch has occurred from an actinopterygian to D. dugon. Further sampling of sirenians and other marine mammals is warranted to gain a more comprehensive understanding of the evolutionary biology and biodiversity of the blood flukes (superfamily Schistosomatoidea Stiles and Hassall, 1898), but presents a substantial challenge with respect to their conservation status and large size.

AT: "This paper describes a new species of trematode, an aporocotylid, Cardicola dhangali, discovered in the heart of a dugong from Queensland, Australia. This exciting finding is the first known blood fluke from a marine mammal and may represent a host-switch event from a fish."

https://www.sciencedirect.com/science/ article/pii/S2213224418301573

2

Christopher Cleveleand, Kayla Garrett, Brianna Williams, Maureen Murray, Michael Yabsley

The wild world of Guinea Worms: A review of the genus Dracunculus in wildlife

International Journal for Parasitology: Parasites and Wildlife, Volume 7, Issue 3, December 2018, open access

AT: "One of the best-known parasites of humans is the guinea worm Dracunculus medinensis, for which eradication is considered feasible in the near future. However, recent research has demonstrated infections of D. medinensis in non-human hosts which will complicate control programmes. This review emphasizes our lack of knowledge about the life cycles of not just D. medinensis but other species infecting wildlife including D. insignis which is being used as a model parasite for studies to assist the Guinea Worm Eradication Program."

3

Kensuke Mori, Stefano Liccioli, Danielle Marceau, Alessandro Massolo.

A community analysis approach to parasite transmission in multi-host systems: Assemblages of small mammal prey and Echinococcus multilocularis in an urban area in North America

International Journal for Parasitology: Parasites and Wildlife, Volume 9, August 2019, open access

https://www.sciencedirect. com/science/article/pii/ S2213224418300944?via%3Dihub

IJP-PAW has a Facebook page, please check it out and like us and some of our articles so we can promote the journal and all of the wonderful research published through IJP-PAW

IJP:PAW continued

4

Lana Harriott, Matthew Gentle, Rebecca Traub, Rowland Cobbold, Riccardo

Geographical distribution and risk factors for Echinococcus granulosus infection in peri-urban wild dog populations

International Journal for Parasitology: Parasites and Wildlife, Volume 10, December 2019, open access

AT: "Increased wildlife disease surveillance has improved our understanding of the parasitological interactions between people and wildlife. There is a much greater parasite diversity than previously thought, and wildlife may not always be the source of zoonotic infections but often the unwilling recipients. Such interactions are becoming increasingly recognised with urbanisation. This has been the case with the cestode parasite Echinococcus multilocularis in parts of Europe where the life cycle involving foxes and wild rodents has spilled over into urban centres involving domestic hosts and creating a serious public health problem. Recent research in non-European countries has shown that species of Echinococcus maintained in wildlife cycles are also spilling over into urban areas. The transmission of both E. multilocularis and E. granulosus involving wildlife in urban areas of Canada and Australia respectively is an emerging issue that is investigated in these two articles."

https://www.sciencedirect.com/science/ article/pii/S2213224419301269

5

Lucy Robertson, Graham Clark, John Debenham, J.P. Dubey, Martin Kváč, Junqiang Li, Francisco Ponce-Gordo, Una Ryan, Gereon Schares, Chunlei Su, Anastasios Tsaousis

Are molecular tools clarifying or confusing our understanding of the public health threat from zoonotic enteric protozoa in wildlife? International Journal for Parasitology: Parasites and Wildlife, Volume 9, August 2019, open access

AT: "This paper is one of six invited reviews from a recently published Special Issue on "Emerging Zoonoses and Wildlife". Nine enteric protozoan parasites that infect wildlife and other hosts, including humans, are used as examples of how molecular tools have contributed to understanding cycles of transmission. Such tools have undoubtedly helped to determine the role of wildlife as reservoirs of zoonotic infections, but as molecular techniques become more discriminatory, they bring problems of interpretation."

https://www.sciencedirect.com/science/ article/pii/S2213224418301846

6

C.N. Hurst, J.D. Alexander, B.P. Dolan, L. Jia, L. Bartholomew

Outcome of within-host competition demonstrates that parasite virulence doesn't equal success in a myxozoan model system

International Journal for Parasitology: Parasites and Wildlife, Volume 9, August 2019, open access

AT: "Within-host competition can affect the outcomes of infections when parasites occupy the same niche and is a phenomenon that has been poorly investigated in wildlife. It is particularly significant when it involves two or more genotypes of the same species. In this article within-host competition and infection outcomes were examined in Chinook salmon exposed to two genotypes of the myxozoan parasite Ceratonova shasta. Virulence and host immune responses were assessed, and the results will help understanding infection outcomes in commercially and ecologically important salmonids in C. shasta endemic regions where mixed infections are commonplace."

https://www.sciencedirect.

com/science/article/pii/ S2213224418301287?via%3Dihub

Other recent publications from IJP:PAW

Olivier Gilg, Loïc Bollache, Eve Afonso, Glenn Yannic, Niels Martin Schmidt, Lars Holst Hansen, Jannik Hansen, Benoît Sittler, Johannes Lang, Nicolas Meyer, Brigitte Sabard, Vladimir Gilg, Anita Lang, Mathilde Lebbar, Voitto Haukisalmi, Heikki Henttonen, Jérôme Moreau,

Are gastrointestinal parasites associated with the cyclic population dynamics of their arctic lemming hosts?,

International Journal for Parasitology: Parasites and Wildlife, Volume 10, 2019, Pages 6-12, ISSN 2213-2244, https://doi. org/10.1016/j.ijppaw.2019.06.011.

(http://www.sciencedirect.com/science/ article/pii/S2213224419300744)

Below: arctic lemmings (see Glig et al and photo feaeture)





IJP:PAW continued

Many rodents, including most populations of arctic lemmings (genus Dicrostonyx and Lemmus), have cyclic population dynamics. Among the numerous hypotheses which have been proposed and tested to explain this typical characteristic of some terrestrial vertebrate communities, trophic interactions have often been presented as the most likely drivers of these periodic fluctuations. The possible role of parasites has, however, only seldom been assessed. In this study, we genetically measured the prevalence of two endoparasite taxa, eimerians and cestodes, in 372 faecal samples from collared lemmings, over a five year period and across three distant sites in Northeast Greenland. Prevalence of cestodes was low (2.7% over all sites and years) and this taxon was only found at one site (although in 4 out of 5 years) in adult hosts. By contrast, we found high prevalence for eimerians (77.7% over all sites and years), which occurred at all sites, in every year, for both age classes (at the Hochstetter Forland site where both adult and juvenile faeces were collected) and regardless of reproductive and social status inferred from the characteristics of

Below: translocated woylies (see Northover

et al)

the lemming nests where the samples had been collected. Prevalence of eimerians significantly varied among years (not among sites) and was higher for juvenile than for adult lemmings at the Hochstetter Forland site. However, higher prevalence of eimerians (Pt) was only associated with lower lemming density (Nt) at one of the three sites and we found no delayed density dependence between Nt and Pt+1 to support the parasite hypothesis. Our results show that there is no clear relation between lemming density and eimerian faecal prevalence in Northeast Greenland and hence no evidence that eimerians could be driving the cyclic population dynamics of collared lemmings in this region.

Amy S. Northover, R.C. Andrew Thompson, Alan J. Lymbery, Adrian F. Wayne, Sarah Keatley, Amanda Ash, Aileen D. Elliot, Keith Morris, Stephanie S. Godfrey,

Altered parasite community structure in an endangered marsupial following translocation,

International Journal for Parasitology: Parasites and Wildlife, Volume 10, 2019, Pages 13-22, ISSN 2213-2244, https://doi.



org/10.1016/j.jppaw.2019.07.001.

(http://www.sciencedirect.com/science/ article/pii/S2213224419300811)

Fauna translocations play an integral role in the management of threatened wildlife, though we are limited by our understanding of how the host-parasite community changes during translocation. During this longitudinal field-based study, we monitored gastrointestinal, blood-borne and ectoparasite taxa infecting woylies (Bettongia penicillata) for up to 12 months following two fauna translocations to supplement existing wild woylie populations in three different sites (Dryandra, Walcott and Warrup East) within the south-west of Western Australia. We aimed to (a) identify changes in parasite community structure of both translocated and resident woylies following translocation; and (b) evaluate the efficacy of ivermectin treatment in translocated hosts. Destination site and time since translocation had the strongest effects on parasite prevalence and mean faecal egg counts following translocation. Ivermectin treatment did not significantly reduce parasite prevalence or mean faecal egg counts in treated hosts.

Prior to translocation, parasite community composition differed significantly between woylies selected for translocation and resident woylies within each release site. Following translocation, the parasite communities of translocated and resident hosts converged to become more similar over time, with loss of parasite taxa and novel host-parasite associations emerging. This is the first study to examine changes to the broader parasite community in translocated and resident animals following translocation.

The dominant site-specific response of parasites following translocation reinforces the importance of incorporating parasite studies to enhance our fundamental understanding of perturbations in hostparasite systems during translocation, in particular the site-level drivers of parasite dynamics.

www.parasite.org.au

An interview with Olivier Gilg

We interviewed researcher Dr Olivier Gilg from the Université de Bourgogne Franche Comté, France about his parasitology research in arctic lemmings. Olivier was responsible for the beautiful photographs in this newsletter.

Olivier, please tell us a bit about yourself and your research. What do you enjoy the most about your research?

I'm an autodidact naturalist who slowly turned into an ecologist while travelling around the Arctic. Arctic ecosystems are so simple (few species, one short summer season) and so easy to explore (continuous daylight in summer, short vegetation allowing long distance observations) that you immediately get the feeling that it's the best (outdoor) place on Earth where you could possibly understand how "things work" (which I later translated into "how species interact").

Many naturalist only visit the Arctic once to "twitch" its few emblematic species or experience camping with polar bears around! Other fall in love with its landscape, wilderness, ice, particular light conditions, etc and will return for ever. I have spent all my summers in the Arctic for the past 30 years.

How did you get interested in arctic lemmings and why do you think it is important to study them?

When I first went to Greenland in 1990 with Benoît Sittler (co-author of the study), I was just a young birdwatcher who had been offered the unique opportunity to spend his summer counting and mapping (among other species...) snowy owl, barnacle geese, arctic foxes and muskoxen for an NGO (Groupe de Recherche en Ecologie Arctique). By then, lemming peaks still occurred every 4 years (lemming cycles have since vanished as documented in one of our paper in 2009) and I was lucky enough to discover the Arctic and its Tundra ecosystem during such a lemming outbreak year.

"Peak years" are like heaven for a naturalist: for several weeks in a row you just spend your days (and "nights", since daylight is permanent!) running from fox dens to snowy owl nests to count young, trap and mark them, collect faeces and pellets...

And when the field season finally ends, you realize that these insignificant brownish rodents that you initially just considered as a "food item" for the (more emblematic) predator species are actually the most important species for the dynamics of the entire terrestrial vertebrate community.

Are lemmings difficult to work with?

Not really. They live in small burrows which are very easy to locate and monitor

The collared lemming

Photographs from North East Greenland. Credit: Gilg & Sabard/ GREA. You can read more about this creature in the IJP:PAW pages of this newsletter and in the paper Are gastrointestinal parasites associated with the cyclic population dynamics of their arctic lemming hosts?

An interview with Olivier Gilg continued

(vegetation been sparse/discontinuous in the high-Arctic). Furthermore, we can trap them almost "exhaustively" on our plots, by placing our live traps directly in front of these burrow. So if you trap e.g. 100-150 burrows for 12h, we know from previous work that we get something very close to their density per ha.

The main problem arises during the crash phase of their population cycles, when their density can be as low as 1 individual per km²! In such years, even if trapping several 1000s burrow, you can't even be sure to trap a single lemming. We then use counts of their winter nests ("grass balls" they use to live and breed within the snow layer) to assess their relative abundance.

What made you decide to test the effect of endoparasites on the cyclic population dynamics of lemmings?

Understanding what drives rodent population cycles is a long-lasting quest





An interview with Olivier Gilg continued

for biologists. Among the many plausible hypothesis behind this "natural mystery", some have been extensively studied. Take lemming cycles for example, predator-prey interactions are currently believed to be the most likely drivers in Greenland. However, host-parasites interactions are also very serious candidates, although seldom investigated with long term and multi sites time series.

Since we monitor lemming dynamics on three different sites in NE Greenland, have access to a great collection of lemming faeces collected annually on these sites, and knew from a preliminary study that the prevalence of some endoparasite taxa (potentially harmful to lemmings) was very variable between sites or years, we hence had a good opportunity to test the "hostparasite interaction" hypothesis under ideal (i.e. pluriannual and multi sites) conditions.

Of course our study only presents results for a few parasite taxa (the main one

being an undescribed Eimeria), and many others should be studied in the future (also taking into account interactions between parasites).

How are you continuing your research at the present time, when the world is selfisolating due to the COVID-19 outbreak and what advice do you have for fellow field researchers?

Working on Arctic terrestrial vertebrates often means spending two months in the field followed by ten months in front of a computer. So to date (I'm on my "computer" period), it did not really impact my work, except for the relations with my students (now all through screens) and for some meetings and workshops that have all been cancelled. However, things might look very different in 3 months from now, depending if we manage to reach our remote field site or not. Many of our colleagues (for example working in the Canadian Arctic) have already cancelled their field season. And this is of course dramatic for teams like us monitoring biologic systems with strong seasonality (summer is very short so we cannot postpone our work). Furthermore, missing one year of data can strongly impact the quality and interest of our time series, especially when studying lagged effects like in our recent IJP:PAW paper. So as long as there will be a tiny chance to reach our study area and implement our protocols in 2020 we will invest all time and money we can to make this happen (provided this does not conflict with health concerns of course).

Thank you Olivier we look forward to hearing more about your research in the future!







NETWORK NEWS

News from the ASP Network for Parasitology



ASP Annual Conference

Regretfully, due to the worldwide COVID-19 outbreak, the ASP & ISFP Conference Organising Committee decided to postpone 2020 ASP & ISFPX Conference to July 2021 as the potential repercussions for the health of our members and delegates was too great. The 2020 ASP AGM will be held online and will be postponed to a later date (to be confirmed).

So, on behalf of the Organising Committee, we extend a warm invitation to attend the joint 10th International Symposium for Fish Parasitology (ISFPX) and 2021 Australian Society for Parasitology (ASP) Annual Conference which will now take place at the

Closing dates for ASP awards

ASP Fellowships 9 January 2021

ASP Researcher Exchange, Travel and Training Awards & JD Smyth 25 September 2020

John Frederick Adrian Sprent Prize 30 September 2022

Bancroft-Mackerras Medal for Excellence 30 September 2020

More information www.parasite.org.au Shangri-La Hotel Cairns, Australia from 5-8 July 2021. Please register and submit your abstract online www.conftool.org/parasitology2021/ abstract submission closes on Friday 22nd March 2021.

Register before the early bird deadline on 5th April 2021 for great value for money.

We hope that this conference will be a celebration of all things parasitological and anticipate that 400 Australian and international scientists will meet at the Conference to discuss the latest research and state-of-the-art technologies in parasitology. The program will include an outstanding mix of quality international and Australian scientists with the following confirmed invited speakers:

Opening address and public lecture

 Lexa Grutter (University of Queensland, Australia)

Elsevier Plenary Lecture Series - IJP Invited Lecturer

 Meta Roestenberg (Leiden University Medical Centre, Netherlands)

Elsevier Plenary Lecture Series - IJPPAW Invited Lecturer

 Elizabeth Warburton (University of Georgia, USA)

Elsevier Plenary Lecture Series - IJPDDR Invited Lecturer

 Jane Hodgkinson (University of Liverpool, U.K.)

Plenary Lecturer

 Tim Littlewood (Natural History Museum, U.K.)

Plenary Lecturer

 Sho Shirakashi (Kindai University, Osaka, Japan)

Plenary Lecturer

 Jerri Bartholomew (Oregon State University, U.S.A.)

Symposium Lecturer

 Tina Oldham (Norwegian Institute of Marine Research, Norway)

Symposium Lecturer

Clare Anstead (University of Melbourne, Australia)

Symposium Lecturer

• Mark Fast (University of Prince Edward Island, Canada)

Symposium Lecturer

• Shokoofeh Shamsi (Charles Sturt University, Australia)

Symposium Lecturer

 Ken MacKenzie (University of Aberdeen, U.K.)

Symposium Lecturer

 Tania de Koning-Ward (Deakin University, Australia)

Symposium Lecturer

 Mic Smout (James Cook University, Australia)

Symposium Lecturer

• Scott Carver (University of Tasmania, Australia)

Public lecture on the Photography of Marine Life in the Wild

• Jon Bryan (Jon Bryan Photography)

Horizon Scanning Workshop on Fish Parasitology workshop run by Nico Smit will take place on Wednesday 7th July 2021 at ISFPX & 2021ASP. This workshop has been sponsored by North-West University.

Network News continued

The Conference will open on Monday July 5, 5pm with the Opening Address and public lecture by Lexa Grutter (University of Queensland) followed by a Welcome Reception at the Cairns Aquarium sponsored by Virbac. Poster night will take place on Tuesday July 6 at the Shangri-La Hotel and the Conference dinner will take place on the last evening of the program, Thursday July 8 at Hemingway's Brewery Cairns Wharf. Early Career Researchers are invited to a breakfast event on the first morning, Tuesday 6th July 2021 and to a social event on Wednesday 7th July 2021. ECR's can add these events when registering for the Conference.

We would like to acknowledge the generous support of our 2021 ASP conference sponsors, thanks to Virbac, Elsevier Parasitology and the International Journal for Parasitology (IJP), IJP DDR and IJP PAW, North-West University and New England Biolabs.

We will offer a parents/carers and children room during the conference separate from the lecture theatres so that parents/ carers will be able to watch and listen to the conference presentations live online using their own devices. A prayer room will be available for delegates to use. Keep check the advice pages for updates on accommodation options nearby, post and pre conference tour options and other helpful advice https://www.isfpx.org/ accommodation/

The policy on gender equality is also on the Conference website https://www.isfpx. org/advice/policy/

Follow the conference on social media with the hashtags #2021ASP #ISFPX

Check the Conference website https:// www.isfpx.org/ for more information and we look forward to seeing you in Cairns in July 2021.

Congratulations to ARC Linkage Equipment grant winners!

Professor Geoffrey McFadden, The University of Melbourne along with; Professor Tony Bacic; Professor Staffan Persson; Dr Allison van de Meene; Professor Dougal McCulloch; Associate Professor Devi Stuart-Fox: Professor Sheila Crewther; Professor Andrew Hill; Professor Madeleine van Oppen; Dr Kim Johnson; Professor Shaun Collin were recently awarded \$1,050,000 for their ARC Linkage Equipment Grant "Crossing the biology meso-nanoscale divide by scanning electron microscopy." This project aims to establish complementary scanning electron microscope (SEM) facilities at The University of Melbourne and LaTrobe University to advance research into crops, disease, neurosciences and coral reefs. SEMs are rapidly evolving instruments that permit high resolution imaging of visible size samples such as parts of plants and animals. The potential innovations, applications and benefits to society are far reaching, with the facility expected to impact the development of drought and salinity tolerance in crops, production of fibres by plants, resilience of Great Barrier Reef corals to warming, advances in medicinal agriculture, control of important diseases of livestock and humans, and sensory processing and ocular disease. Congratulations to the team!

Network Mentorship Scheme

Network Mentorship Scheme Early career researchers are encouraged to apply to the Network Convenor (nick.smith@parasite. org.au), in strict confidence, for funding to participate in the Network Mentorship Scheme. The scheme allows young investigators to be paired with experienced, successful academics to discuss, plan, prioritise and set targets for their career. Typically, the early career researcher will fly to the institute of a senior parasitologist and spend a day there. Arrangements for professional development and progress to be reviewed by the pair annually can also be arranged. Importantly, mentors need not be from an individual's home institution but

can be drawn from across the Network. The scheme has proved very valuable for several young researchers and their mentors already and covers mentorship across all aspects of working in parasitology including research, teaching, leadership, communication and outreach and other areas of professional development.

Researcher Exchange, Travel and Training and JD Smyth Postgraduate Student Travel Awards

As announced in a recent email to ASP members, the March 2020 round of the Researcher Exchange, Travel and Training and JD Smyth Postgraduate Student Travel Awards has been postponed until September 2020, if the situation allows. We can't fund travel whilst the COVID-19 outbreak is happening. We hope that all applicants will be able to adjust their plans to travel at a later time.

https://www.parasite.org.au/awards/jd-smythpostgraduate-travel-awards/

Reports from our Researcher Exchange, Travel and Training and JD Smyth Postgraduate Student Travel Award winners

Please read about our Travel Award recipients who have recently returned from their Researcher Exchange programs. Isabelle Henshall, PhD Candidate, Malaria Biology, at The University of Adelaide visited Prof. Robert Moon's Laboratory at the London School of Hygiene and Tropical Medicine for her malaria research. Dr Samantha Emery, Walter and Eliza Hall Institute reports on her Researcher Exchange to visit the laboratory of Professor Staffan Svärd at Uppsala University in Sweden for her Giardia research.

With best wishes,

Nick and Lisa

JD Smyth Postgraduate Travel Award Report

Isabelle Henshall, a PhD student at the University of Adelaide reports on a visit to the London School of Hygiene and Tropical Medicine.

My month working in Assoc. Prof. Robert Moon's laboratory at the London School of Hygiene and Tropical Medicine (LSHTM) has been an amazing experience and I thank the ASP for supporting me through the JD Smyth travel award. A focus of my PhD research is merozoite surface proteins on the invasive stage of *Plasmodium vivax* which have shown potential as vaccine candidates, using chimeric human red blood cell adapted *Plasmodium knowlesi* lines.

This opportunity to visit the Moon laboratory has been both a wonderful development opportunity as a young researcher and a chance to learn key laboratory techniques for my PhD research. Additionally, it has helped strengthen the collaboration between our laboratory and the Moon group.

The Moon group have extensive

experience adapting and growing P. knowlesi in human RBCs. One of the real benefits I gained from the researcher exchange was the ability to chat with the Moon laboratory about what culture conditions and techniques they found most effective for P. knowelsi culture and the key points at which it differs from culturing P. falciparum. Just as important was hearing about what conditions they had tested and found to be detrimental to P. knowlesi growth. Alongside general culture I also gained skills in live imaging of P. knowlesi RBC invasion and P. knowlesi transfection, making several lines while in London for my PhD work. I will be heavily utilising both of these techniques in my PhD going forward.

As well as gaining technical skills visiting the Moon group at LSHTM allowed me to interact with other malaria researchers in London, particularly those based at LSHTM. I found these interactions with researchers looking at diverse aspects of parasite biology, diagnostics and epidemiology invaluable as they broaden my understanding of different aspects of malaria research. The opportunity to interact with malaria researchers focused





Above: the London School of Hygiene and Tropical Medicine. Below left: Isabelle Henshall

on epidemiology and diagnostics was especially valuable. Particularly as the department I am based in for my PhD is focused on molecular biology so there is minimal opportunity to interact with researchers focused on public health aspects. Being able to talk to malaria researchers from different areas about my project and receiving their input was one of the aspects of this researcher exchange that I found incredibly valuable.

I am extremely grateful to both the Moon group for hosting me and also the ASP for their support through the JD Smyth Postgraduate Travel Award. I have certainly returned armed with new knowledge, skills, ideas and connections that will be invaluable for the rest of my PhD and career.

NETWORK NEWS

ASP Network Researcher Exchange, Training and Travel Award Report

Samantha Emery of WEHI describes her visit to Professor Staffan Svärd at Uppsala University in Sweden and to the IGCC Conference in Rouen, France.

In June this year I was fortunate to travel to the laboratory of Professor Staffan Svärd, an internationally recognised and respected protozoologist from the 13th June to the 22nd June. This travel was facilitated by an ASP Network Researcher Exchange, Training and Travel Award that supplemented laboratory funding for travel to Europe and accommodation. If not for the generosity of the ASP committee, I would not have been able to capitalise on the opportunity to spend time with Professor Staffan prior to this conference, his lab as well as liaise with colleagues from the wider Department of Cell and Molecular Biology at Uppsala University. I wish to humbly thank the ASP committee for consideration of my application, and contributing towards my ECR development toward new research and professional skills. I also wish to thank Professor Staffan Svärd for his time and ongoing support, and look forward to our ongoing collaborations.

As an early-career, post-doctoral researcher, it is becoming essential for me to be able to propagate relationships and collaborations in my own right. Further, it is necessary for me to present and share my postdoctoral research on an international stage, where it can be discussed and critiqued by leading researchers in my fields. During my time at Uppsala University, I was able to present an invited, Departmental seminar entitled "Use it or lose it – first insights into protein methylation and transferases



in Giardia parasites" (18-06-19) which I acknowledged the support of the ASP towards my researcher exchange. I was also able to discuss and collaborate with Professor Staffan towards an invited review ("APAR: Giardia and Giardiasis") for Advanced in Parasitology on 'omics approaches to host-parasite interactions in Giardia, submitted in late July. I was also able to comprehensively talk to researchers in the Svärd Giardia laboratory regarding protocols and laboratory technique for encystation and excystation of Giardia, as well as protocols on plasmid transfection for protein localisation and over-expression. I enjoyed the opportunity to socialise with the Svärd lab and particularly the experience of a dissertation and formal thesis defence by one of the PhD students in the lab, which is very different to the Australian PhDexamination model!

During my time at Uppsala University I was able to meet and talk in depth with Dr Courtney Stairs from the Ettema lab. Dr Stairs works on microbial diversity and evolution, particularly on deep-branching protists, and working on the origins of



Above: Samantha Emery and Staffan Svärd

their metabolism, both through evolution and lateral transfer. This was excellent timing in my research of evolution of protein modification systems to discuss my research with Courtney given her breadth and understanding of diversity in protist biology. I am hoping to remain in contact with Courtney in the future.

An important outcome of this grant was preceded my attendance at the 7th International Giardia and Cryptosporidium Conference (IGCC) in Rouen, France in late June. While ASP did not provide funding for IGCC, it meant] I was able further represent the ASP and acknowledge their contribution and support in two additional conference presentations at IGCC. IGCC was the first International conference I wholly presented my own post-doctoral research, demonstrating new skills, approaches and discoveries since my PhD, and establishing new connections with prominent Giardia research.

State News

Queensland

Griffith University

Griffith Institute for Drug Discovery

It has been a busy beginning to 2020 in the Tropical Parasitology and Parasite Biology Laboratories at Griffith University. Chris Hart has had his PhD conferred and has started his first post-doc (University of California, Davis). Prof Kathy Andrews has been appointed GRIDD Director and we have welcomed new PhD candidate, Jacinta McDonald. We will also welcome three new under-graduate research students to our laboratories over the next few weeks. With laboratory renovations in full-swing we are looking forward to a very productive year.

James Cook University

ASP Undergraduate prizes

The Australian Society for Parasitology Prize for 2019, awarded to the Veterinary Science student who has the highest mark in Parasitology, accumulated across the second and third years of study, was awarded jointly to **Jemimah Lucinda Young** and **Benjamin William Rub**. Congrtaulations to them both. Prof Kathy Andrews (right) of Griffith University at the Molecular Approaches to Malaria Conference in Lorne with Prof Denise Doolan of JCU

New South Wales University of Sydney

Vetinary Parasitology Research Group

Another **purr-fect** Zoom lab meeting done and dusted! It looked like bring-your-petto-work day as the Vetinary Parasitology Research Group enjoyed a lab meeting featuring their honorary feline and canine lab members!

As always, stay safe everyone. #stayhome

Charles Sturt University

ASP Undergraduate prizes

At CSU, the Australian Society for Parasitology Prize for 2019 has been awarded to **Danielle Polack** and **Alice Mitchell** both described by their Faculty as dedicated students and very worthy recipients of the award.





\$400

Undergraduate Prizes

The Australian Society for Parasitology is pleased to announce that it will be offering undergraduate student prizes of \$400 each to Australian Universities identified as offering a suitable course in parasitology, for presentation to the best undergraduate student in parasitology (highest passing mark/grade).

The course(s) must be taught by a financial member of the ASP (of more than one year standing), and must comprise at least 30% parasitology. Requests for 2020 prizes must be made by the eligible University to the ASP Treasurer by the 30th September 2020. Please complete the online application form:

www.parasite.org.au/awards/aspundergraduate-prizes/

Left: University if Sydney Veterinary Parasitology Research Group Zoom meeting

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