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VISJ Editors
visjeditor@gmail.com

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From the Editor

Welcome again to the Veterinary Invertebrate Society Journal. We have a series of exciting articles including a report on Partula snail health screening that will prove helpful for those that may wish to apply health screening to mollusc species. The Partula snail breeding program run at the Zoological Society of London (amongst others) has proven to be a valuable example of an invertebrate conservation success story. Further to this, we have an article from a Brazilian vet that covers a Pseudomonas presentation within centipedes. This provides more information on the role of bacterial infection in invertebrate disease.

This issue has some significant changes from previous issues. The academic and clinical articles within this issue have been put through a formal peer review process that has involved at least two clinical/academic referees. This represents a step forward for the journal as it has allowed us to ensure the validity and quality of the articles produced. We feel this allows our society to provide an important service to the progress of invertebrate medicine and its application to improve welfare of invertebrates.

Often it is challenging for invertebrate cases and clinical research to be published due to the novel nature of the field, especially as research funding can be limited and thus submission fees can represent a significant barrier for those with publishable data and case reports.

We will be changing the way that the journal will be distributed. From this issue going forward, the journal will initially only be available to members of the society and associated organisations. After a period of four months, the journal will be openly available to non-members.

This move has been taken after some debate within the steering committee as it is important for us to provide an open and free source of invertebrate knowledge but we feel that membership should provide some key benefits for those that invest in the society. This compromise ensures that the journal will remain open to all those with a stake in invertebrate medicine.

This publication was revived from the old VIS newsletter as an attempt to provide an avenue where cases and research could be shared with invertebrate focused veterinarians and stakeholders in invertebrate care. This has been, and will continue to be, an incremental process through which we as a society will work towards the goal of providing high quality expertise with the mind of assisting invertebrate conservation and improving invertebrate welfare. Peer review represents a positive move for this journal and we hope to further utilise this for future articles. Should any members of the society feel comfortable with helping us provide peer review, then do get in touch via email with the editor (visjeditor@gmail.com).

Veterinary Invertebrate Society Steering Committee

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The Committee are happy to provide advice. Please contact us through the communication channels shown below.


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Report on the British Bee Veterinary Association and Veterinary Invertebrate Society Meeting

Vets, vet students and others interested in invertebrate medicine gathered on 19th May 2018 at the University of Surrey.

The meeting was kindly sponsered by Vita Bee Health and Pinmoore Animal Laboratory Services.

Giles Budge began with honeybee diseases: foulbrood and chronic bee paralysis virus. He summarised strategies of antibiotic therapy, hive destruction and shook swarming for foulbrood, then discussed current research and the role of these diseases in the UK honey industry. His work included the use of genomics to evaluate the geographical identify of different sub-strains within both the uk and beyond, and the use of this to determine spread of foulbrood

Andrew Stephenson presented the care and diseases of captive ants, predominantly leaf cutter ants. He emphasised the importance of good stockmanship to maintain the health of the animals, as well as the practical challenges when rearing a social insect. Andrew also covered the method through which ant colonies are collected and the considerations taken in regard to their ethical collection

Helen Lambert of the Crustacean Compassion Organisation highlighted how the slaughter of invertebrates for food could be perceived by the public, and the ethics that go into considering welfare issues related to slaughter.

Marie Kubiak illustrated the common disease presentations of pet invertebrates, including theraphosid spiders, stick insects and snails, and gave the veterinary approach to invertebrate species. Marie covered some key primary treatments and management considerations in regards to preventing and treating disease in invertebrates.

Joe Halstead of Agrigrub discussed black soldier fly larvae production and its environmentally sound method of producing protein for animal feed. He discussed the role of live insects in aquaculture and potentially within poultry systems.

Sarah Pellett presented a lecture detailing her pilot study on the microbiology of faeces of multiple different invertebrate species and discussed the preliminary results for bacteria that could contribute to disease and harm public health.

The meeting was the first joint meeting between the VIS and the BBVA. Despite being on the day of the royal wedding, the meeting was able to attract more attendees than previous meetings of both societies. Many different invertebrate species were covered and this provided a great opportunity to apply different perspectives on current issues of invertebrate health and disease in insect production.

The next meeting is being provisionally planned for next year, possibly in the spring.

Report on the BIAZA Terrestrial Invertebrate Working Group Meeting

There was a three day meeting with the British and Irish Association of Zoos and Aquarium (BIAZA) Terrestial Invertebrate Working Group meeting at Askham Bryan College. This was attended by zookeepers, stakeholders in invertebrate conservation, students and some members of the society.

The meeting included several workshops which covered theraphosid sexing, browse identification and ZIMS for bugs. Several conservation projects were also presented covering the Desertas Wolf spider project and the Tansy beetle action group. Native conservation projects were of focus, with several species being discussed. These all proved to be very engaging and emphased the importance of taking invertebrates seriously, not only from a conservation point of view but also from a veterinary perspective as well. There seems to be a great deal of potential for veterinary input to aid conservation efforts.

Attendees of the Veterinary Invertebrate Society and British Bee Veterinary Association Joint meeting.

Image Credit: Steve Trim

Spider sexing is a relatively common query to vets by theraphosid keepers, particularly with a spider of unknown origin. Owners often want to know the gender of spiders as this will determine breeding use and ultimately life expectancy. Experienced keepers will be adept at determining gender but often notive keepers may want guidance on this process. Pictures of the process are included here.

ZIMS is under-utilised in respect to invertebrate species. There are significant challenges with respect to how to measure population in invertebrates especially in colonies. The workshop was very informative to the zookeeper perspective of ZIMS. A practical application of the data collected in respect to the Desertas wolf spider was presented by Tyrone Capel. Anaesthesia and treatment of invertebrates are conducted in zoological collections but the data is not recorded in ZIMS. There is a great opportunity to distribute this expertise should exotic vets choose to engage more with ZIMS in regards to invertebrate patients.

Sarah Pellet presented a talk on Prolapse in Snails, including a case report of a minor prolapse that responded to medical management. Benjamin Kennedy gave a talk on an invertebrate case series and discussed the role of microscopy, general anaesthesia and histopathology in evaluating presence of disease in invertebrates.

Caroline Howard presented a lecture on the opportunity for invertebrates to be used to engage with the LBGT+ community particularly in regards to snails. This proved to be a entertaining and enlightening insight to how invertebrates can be used to engage with the public.

The BIAZA TIWG meeting has proven to be of a consistently high quality and an open meeting which acts as a forum for those with a stake in invertebrate care and health.

Upcoming Meeting with VIS Representation

The following meetings will have representation within the society.

British Veterinary Zoological Society Meeting
Friday 9th November – Sunday 11th November 2018

Several members of the society will be lecturing on exotic topics. There will be some specific letures on invertebrate medicine.

The steering committee will be having a formal meeting after this meeting has concluded to discuss plans for the coming year. If there are any issues that the membership would like to address then do please get in touch.

Maxwell Knight, the original "nature detective" and Second World War MI5 agent.
Saturday 24th November 2018 1 - 6 pm

Organised by the Coopers, This meeting will be held at Birkbeck College. It will recount and reassess the life and work of Maxwell Knight.

British Tarantula Society Lectures 2019
Saturday 2nd March 2019

Benjamin Kennedy will be lecturing on invertebrate medicine and further representing the society to a group of stakeholders in invertebrate care.

Royal Entomology Society Entomophagy Special Interest Group
Tuesday 2nd – Wednesday 3rd April 2019

This meeting concerns the commercial sale and use of insects as a protein source. Members of the VIS will be attending

International Conference on Avian Herpetological and Exotic Mammal Medicine (ICARE) 2019
Sunday 28 April - Thursday 2 May 2019

Several members of the society have submitted abstracts for this meeting and our secretary is involved in the steering committee of ICARE.

Chrysolina graminis (Tansy Beetle) of which a population is kept within Askham Bryan College

Image Credit:
User:Zakhx150 Wikimedia
Tansy Beetle (Chrysolina Graminis) in York, UK

CASE REPORT - *Pseudomonas aeruginosa* INFECTION IN THREE GIANT CENTIPEDES (*Scolopendra v. viridicornis*) KEPT IN CAPTIVITY

Thiago M. Chiariello
Laboratory of Arthropods, Butantan Institute, São Paulo, Brazil.

Abstract

This case report describes the clinical development of a Pseudomonas aeruginosa infection in three giant centipedes (Scolopendra v. viridicornis) kept in captivity. The bacteria Pseudomonas aeruginosa was identified after hemolymph culture with 99.9% of accuracy by the API 20E (bioMérieux, Inc., Hazelwood, MO). The three centipedes presented with anorexia, lethargy and paresis of part of the body that evolved to death before a treatment attempt.

This case report describes the clinical conditions of three giant centipedes (Scolopendra v. viridicornis) kept in captivity, presenting with a Pseudomonas aeruginosa infection.

Initial Presentation

Two wild-caught adult females of Scolopendra v. viridicornis, kept in captive conditions for two years in the Arthropod Laboratory from Instituto Butantan, São Paulo, Brazil, presented with anorexia, lethargy and paresis of the cranial third of the body, including paresis of the mouth appendages, legs and antennae. The caudal two thirds were grossly normal, responding to external stimuli (e.g. touch with forceps) but moving the legs at a reduced speed. Due to the paresis, the animals were dragging their heads over the substrate when walking through the enclosure, resulting in the loss of part of the antennas.

At the same time, a third female centipede similarly presented with anorexia and lethargy, however paresis on the last segments instead was noted. A 'dragging' motion of the anal legs was noted (Fig. 1).
In all three animals, there was a darkening of the exoskeleton of all the legs and other parts of the body that have lighter colors, such as the both sides of the body, and the ventral area.

History

Each centipede of the Arthropods Laboratory were kept in the same conditions, in 400 x 270 x 133 mm (1.6 gallon) individual plastic terraria, with holes on the sides and lid to provide ventilation. The substrate was composed of top soil previously sterilized at high temperatures. Humidity was controlled through spraying every three days to assure a high humidity level (60 – 70%) and to avoid dehydration due to physiological characteristics of centipedes, but care was always taken to not soak the substrate (Chiariello, 2015; Chitty, 2012; Lewis, 2007). Temperature control was reliant on ambient room temperature and was constantly maintained at 24ºC (+/- 0.5ºC). The feeding schedule was biweekly and consisted of cockroaches (Blaberus discoidalis) and crickets (Gryllus gryllus) that were bred within a feed population within the Laboratory of Arthropods. When the prey item was not taken it was removed from the enclosure the next day.

Terrarium hygiene was performed weekly which involved exchanging and cleaning the water recipient, removing the prey remains and faeces from the substrate surface. Monthly, each centipede was anesthetized with carbon dioxide and milked for venom collection using an electro-stimulation device placed direct in the forcipules. The general health status of all the animals was routinely observed during terrarium maintenance. This would include: responses to external stimuli, appearance of the exoskeleton, checking for ectoparasites, and monitoring food intake. Centipedes can refuse food at advanced stages of illness.

Diagnostics

A hemolymph sample of 0.03mL was collected via cardiac puncture for bacterial culture, from the two animals that were presenting paresis on the first third of the body (Chiariello, 2015; Braun, Heatley, Chitty, 2006). At direct observation, the hemolymph samples had a normal appearance and coloration, as well as normal coagulation time. The bacteria Pseudomonas aeruginosa was identified after culture in the two samples with 99.9% of accuracy by the API 20E (bioMérieux, Inc., Hazelwood, MO). No sensitivity tests were performed.

Treatment and Management

Upon onset of clinical signs, the affected animals were immediately isolated to an observation terrarium, with white paper towel as substrate to facilitate the observation of the droppings. Humidity was increased, water was offered ad libitum and a heat pad was introduced to one side of the terrarium to establish a temperature gradient with a high temperature area (28ºC). All centipedes moved immediately to the warmer side of the terrarium indicating a behavioural fever, this kind of behavior has already been described in other Myriapods and insects (Gerlach, Lawrence, Canning, 2005). Diarrhea was noted in one terrarium and no droppings were observed in the terrarium of the centipede that was presenting paresis in the last segments.

Discussion and Conclusion

This is the second time that a Pseudomonas sp. infection is described in centipedes from the Scolopendra genus kept in captivity, but the first case was reported in Peruvian centipedes (Scolopendra

gigantea) and was related to sudden death in one adult and over 40 neonates, associated with a fungal infection. (Swanson & McCowan, 1999). In this presented case report, all centipedes began to show clinical signs and died in a period of one week, starting with anorexia and the darkening on the coloration of legs and body, and evolving into complete paresis of the first third of the body in two animals, and the final segments of a third centipede. The animals were still alive when hemolymph was sampled, but both centipedes died before the culture results, with no attempt to treat, as well as the third animal that did not have its hemolymph sampled. Necroscopic and histologic examination were not performed due to rapid autolysis of the bodies.

The bacteria Pseudomonas aeruginosa is widely present in the environment, including water and soil, and the centipedes are constantly exposed to it and other opportunistic pathogens. However in normal conditions these arthropods are able to combat any threat. The case described in this report may be occurred for several reasons. The most likely is an immunosuppression caused by stress factors of the captivity environment and the captivity routine, such as lack of temperature and humidity control, excessive manipulation during the venom milking by electro-stimulation, which occured once a month, and the electric shock itself, and many other factors that centipedes did not have to deal with in its natural habitat. Stress is a known cause of immunosuppression in vertebrates, and has been described in some invertebrates as well (Adamo, 2012).

The paresis of only the first or the last third of the animals' bodies could be indicative of a nervous system compromise caused by the bacterial infection. The nervous system of the centipedes is comprised of a dorsal brain connected to a double ventral nerve cord, along which there are a pair of ganglia per segment associated to the peripheral and visceral nerves system. (Lewis, 2007) The bacterial impairment of a section of the nerve cord could result in the loss of functionality of the correspondent body functions. In this case this was the entire motor response of the first part of the segments of two animals, and the last segments of the third centipede. This theory is supported by studies that had shown that the ganglia are independent centers for local control, and that there are different groups of fibers that are connected to the nerve cord and are responsible for conducting the mechanical stimulation in the anterior or posterior half of the animal. (Case, 1920; Babu, 1964) No behavioral or physiological changes were noted in the week before the animals began to present clinical signs, suggesting that the disease evolved in a short period or that it was chronic and observable signs were only noticeable when already in an advanced stage. As cited above, centipedes usually show signs of disease only at an advanced stage of illness, highlighting the importance of a rigorous observation of the animal whenever possible, and to perform periodic checkups.

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Biography

Thiago M. Chiariello graduated in Veterinary Medicine from Universidade Metodista de São Paulo, Brazil, in 2010. He has specialized in exotic animal medicine and worked with terrestrial invertebrate medicine and husbandry since 2011, with a two years post-graduated internship in the Laboratory of Arthropods from Instituto Butantan, São Paulo, Brazil. He is the current veterinary surgeon of the Laboratory of Arthropods from Instituto Butantan since 2014.

Figure 1

Scolopendra viridicornis presenting paresis in the last third of the body. The green dotted line indicates the beginning of the committed segments, and the green arrows indicates the legs with paresis. Note that the paralyzed legs are positioned almost parallel to the body, while the other ones, with no paresis, are positioned perpendicular to the body.

Pre-release Health Screening of *Partula* Polynesian Tree Snails at ZSL London Zoo

Helen Donald[1], Edmund Flach[1] & Mark Stidworthy[2]
1. Zoological Society of London, Regent's Park, London, NW1 4RY, United Kingdom
2. International Zoo Veterinary Group Pathology, Station House, Keighley, BD21 4NQ, United Kingdom

Since the early 19th century, biologists have been fascinated by the adaptive variation of *Partula*, a genus of terrestrial, viviparous arboreal snails inhabiting the volcanic islands of the Pacific Ocean. They have been intensively studied in terms of their divergence and speciation and are, arguably, as important as Darwin's finches in the study of evolution. However, researchers realized in the 1970s and 80s that a genus-wide extinction was in progress. The now well-cited reason for this rapid decline was predation by the Florida rosy wolfsnail (*Euglandina rosea*), introduced in 1974 as a biological control agent of the giant African land snail (*Achatina fulica*), itself an alien species. Within little more than a decade at least 45 species of *Partula* and related genera were extinct (IUCN, 2018) leading it to be described as the most rapid extinction event known to date (Gerlach, 2014). Nowadays, only five of the estimated 117 original species still exist in the wild in French Polynesia (Gerlach, 2014) whilst the *Partula* Global Species Management Programme, established in 1986, holds 15 species/sub-species in captivity in 15 European and North American zoos.

Wildlife translocations for conservation aim primarily to restore animals to historic ranges or to reinforce small, fragmented populations (IUCN/SSC, 2013). Since animals are a complete biological package comprising not just the host, but also all of its associated macro- and micro-parasites (Davidson & Nettles, 1992), these should be considered in terms of their contribution to a healthy ecosystem (Rideout *et a*l., 2016). Diseases they cause can be important for ecosystem health, but usually only when combined with other driving factors that they may threaten a species' survival. In contrast, alien parasites may inadvertently be introduced during wildlife translocations and some of these have caused major epidemics with impacts at the ecosystem level (Sainsbury & Vaughan-Higgins, 2012). One final problem is that animals raised in captivity may have increased susceptibility to infection due to relaxed selection for resistance as a result of treatment to eliminate pathogens (Smith *et al*., 2009). Therefore, any proposed translocation should consider how to translocate animals with their native parasites (Rideout *et al*., 2016) whilst focusing on the management of pathogens likely to have an undesirable impact on the recipient ecosystem, in particular generalist pathogens not known at the destination site (IUCN/SSC, 2013). This is achieved by conducting a Disease Risk Analysis (DRA); a structured, evidence-based process that aims to determine the potential impact of infectious and non-infectious disease on ecosystems, wildlife, domestic animals and people (Jacob-Hoff *et al*., 2014).

The DRA for the proposed reintroductions of *Partula* species was carried out in 2013 (*Dalziel et al*., 2013). This found no significant pathogens that had to be prevented at all costs, but did outline potential risks (diseases and environmental) to the reintroduction (Wilson, 2012). A health screening programme was therefore set up to check for potentially pathogenic parasites and also to provide the evidence to enable the Official Veterinarian (OV) to sign with confidence the Animal & Plant Health Agency's (APHA) Export Health Certificate (dictated by the Veterinary Authority of French Polynesia's import requirements). The results from this screening have also increased our understanding of health and disease in *Partula* species.

Current reintroduction efforts began in 2015 when populations of three *Partula* species from six collections (in Europe and the USA) were moved to the Zoological Society of London (ZSL), London zoo and held in quarantine along with some of the zoo's own populations. Health-screening was carried out (see below) prior to export to Tahiti for release into a reserve (Goodey & Flach, 2015). The following year a second round of screening was performed at ZSL prior to export, with Edinburgh zoo (Royal Zoological Society of Scotland) and Artis zoo, the Netherlands, carrying out their own screening (with Artis also dealing with snails from US collections). All three zoos have continued to screen in subsequent years and many other zoos have adopted similar screening of their collections prior to animal transfers. We report here on the 12 *Partula* species/sub-species that been screened at ZSL over the four years, 2015-8 (Table 1, Goodey & Flach, 2015, Goodey *et al*., 2016, Hulbert *et al*., 2017, Donald & Flach, 2018). These snails have been exported for reintroduction in Tahiti, Mo'orea and Raiatea in French Polynesia and subsequently monitored by the Partula Programme field biologist Dr Trevor Coote.

Screening protocol

The only practical ways to assess the health of such small snails are: a) to monitor their activity (including food intake), b) to test fresh faecal samples collected from their tanks, c) to examine and test whole snails, both naturally dead and culled and d) analyse patterns of mortality. The keepers were asked to report on any abnormal behaviours and to share

population censuses in order to cover a) and d), but the bulk of the screening dealt with b) and c).

Three serial faecal samples were taken from each tank and examined microscopically as fresh wet preparations in saline and also as Modified Ziehl Nielsen (MZN)-stained smears. A fourth sample was examined if large numbers of parasites or acid-fast bodies were encountered. One faecal sample per tank was submitted for routine bacterial culture (Colombia 5% horse blood agar plates incubated at 25°C for 48 hours) and significant colonies were sub-cultured and then characterized by standard methods (colony morphology, microscopic appearance and Gram-staining characteristics, plus biochemical reactions: oxidase testing followed by the appropriate API test kit (bio-Merieux)).

Freshly dead snails were examined and tested as soon as possible after detection. All others were fixed in 70% ethanol and archived. In addition, healthy adult snails were selected at random and culled by exposure to isoflurane for a minimum of an hour. This ensured retraction into the shell and complete loss of response to stimuli. The number of individuals culled depended on the population of the tank and the number of snails that died naturally and were fresh enough for examination and testing. The aim was for 5-10% of the adult population to be screened, but no snails were culled from tanks containing fewer than 15 individuals.

Snails were weighed, measured (standard shell and aperture lengths and widths) and a note taken of the chirality of the shell, following Pearce-Kelly *et al*. (2007). The body was then extracted from the shell by gentle levering with forceps or, more commonly, by breaking the shell and extracting the body. The body was weighed and examined externally for any gross abnormalities. The tip of the apex was removed and impression smears of the cut surface (including intestinal cross-sections) stained with MZN and examined microscopically. The body was opened with a sterile scalpel blade and a coelomic swab taken for bacteriological culture. The internal organs were too small to examine grossly, so the emphasis was on fixing the carcass as soon as possible, having removed a small piece of foot tissue for freezing as a source of DNA. The carcass and amputated apex were fixed in 70% ethanol in 2015 and 16, but in 2017 and 2018 10% buffered formalin was used due to enhanced histopathological detail; especially for visualization of *Cryptosporidium*-like bodies. The fixed snails were submitted to the Royal Veterinary College for processing and staining (H&E, Gram's, ZN and Luna-Peterson (L-P), with additional periodic acid-Schiff (PAS) since 2017), and then forwarded to the International Zoo Veterinary Group Pathology Service for histopathological examination and reporting. In a few instances histopathology was carried out by Romain Pizzi of the Royal Zoological Society of Scotland.

Table 1. The *Partula* species detailed in this report.

Species	Original range	IUCN classification (Coote 2009)
Partula affinis	Tahiti	Critically endangered
Partula dentifera	Raiatea	Extinct in the wild
Partula hebe bella	Raiatea	Extinct in the wild
Partula hyalina	Multi-island, endemic to Tahiti	Vulnerable
Partula mirabilis	Mo'orea	Extinct in the wild
Partula mooreana	Mo'orea	Extinct in the wild
Partula nodosa	Tahiti	Extinct in the wild
Partula rosea	Huahine	Extinct in the wild
Partula suturalis vexillum	Mo'orea	Extinct in the wild
Partula taeniata nucleola	Mo'orea	Subspecies extinct in the wild
Partula tohiveana	Mo'orea	Extinct in the wild
Partula tristis	Raiatea	Extinct in the wild

Results

Nematodes, often alive, plus flagellated and ciliated protozoa were commonly observed in faecal samples, but have been found frequently in the past and are considered normal intestinal inhabitants. Acid-fast circular cysts, 4 to 5 microns in diameter, were also very common in the MZN-stained smears. They have been observed regularly since at least 2006 (Flach et al., 2008) and, although initially thought to be responsible for a population die-off, this has not been substantiated. Specific testing for *Cryptosporidium parvum* was negative so for many years they were thought to represent microsporidia, but are now thought to represent the *Cryptosporidium*-like protozoa that have been observed histologically, although further identification is still pending. Occasional smaller cysts were possibly microsporidia. Faecal bacteriology yielded mixed flora in almost all cases, and no significant pathogens were identified.

Similar acid-fast cysts were detected commonly in apex smears of dead and culled snails, and mixed bacterial flora cultured from coelomic swabs. Histological findings from dead snails were of very limited value due to autolytic changes, hence the importance of the culled snails for diagnostic examinations. To date, no histopathological changes of concern have been noted. Microsporidia and nematodes have often been seen, but with no cellular reaction to their presence. In 2016 *Cryptosporidium*-like organisms were encountered in *Partula* snails at Chester zoo that had been fixed in formalin (Lopez & Stidworthy, personal communication) and since the use of formalin fixation they have been reported regularly and without associated pathological changes. Microsporidia have also been detected in wild-caught *Partula* specimens fixed

in ethanol from three species (*P. affinis*, *P. hyalina* and *P. nodosa*) from the early 1900s which were donated by museums, but it was not possible to prove that *Cryptosporidium*-like organisms were absent because of the ethanol fixation.

Since 2015, a total of 7060 snails from the captive-breeding populations have been released into the wild and it appears that the reintroduced populations are slowly establishing and breeding (Coote *et al*, 2017). Looking forward, further research to identify the microsporidia and *Cryptosporidium*-like organisms is essential. Detailed demographic data to determine baseline age-specific and seasonal mortality rates for *Partula* species would also be extremely useful.

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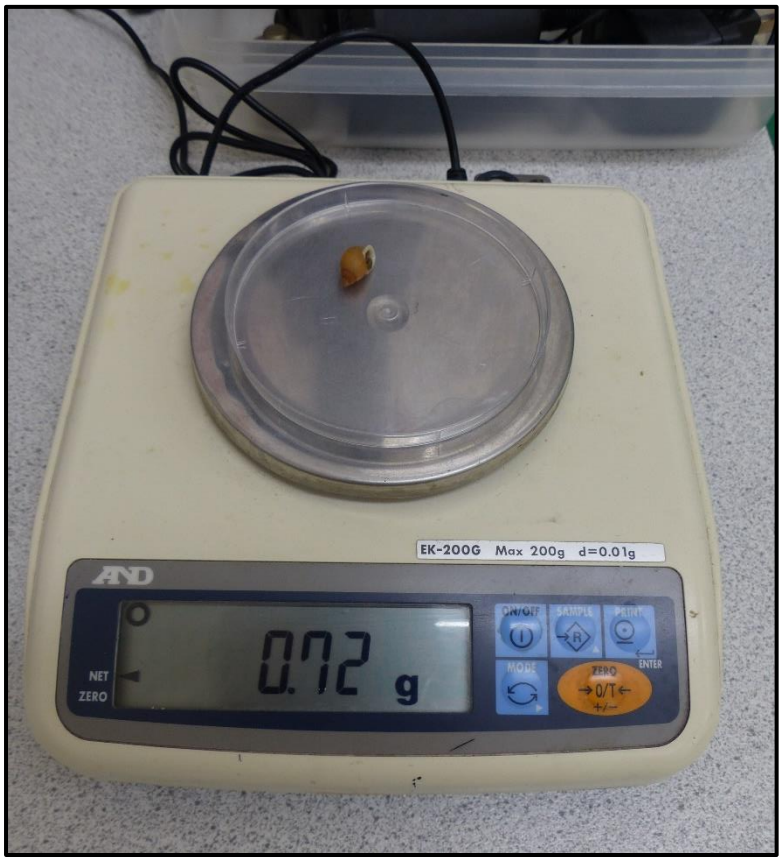
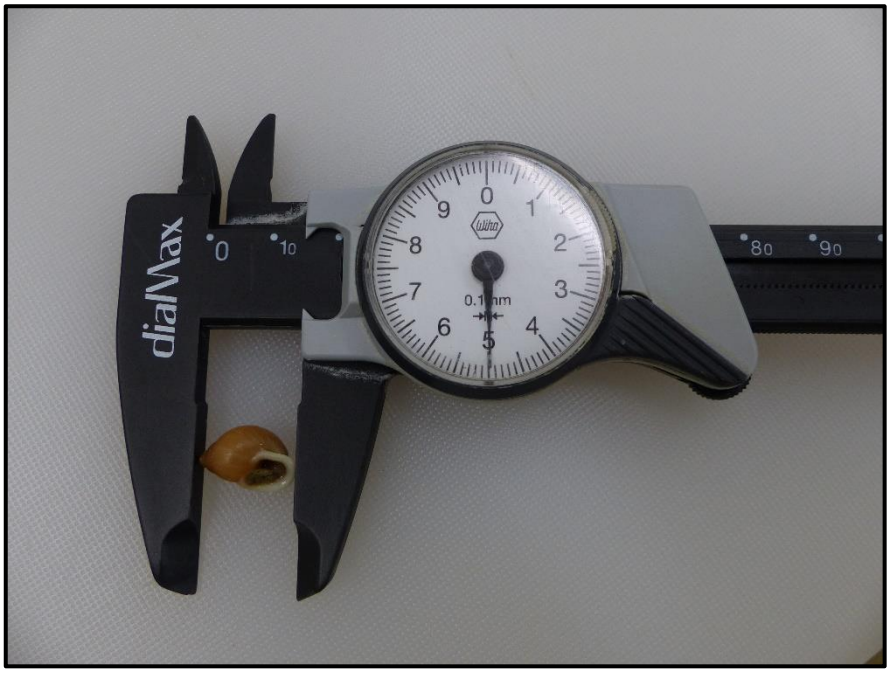
Submission of a snail for examination

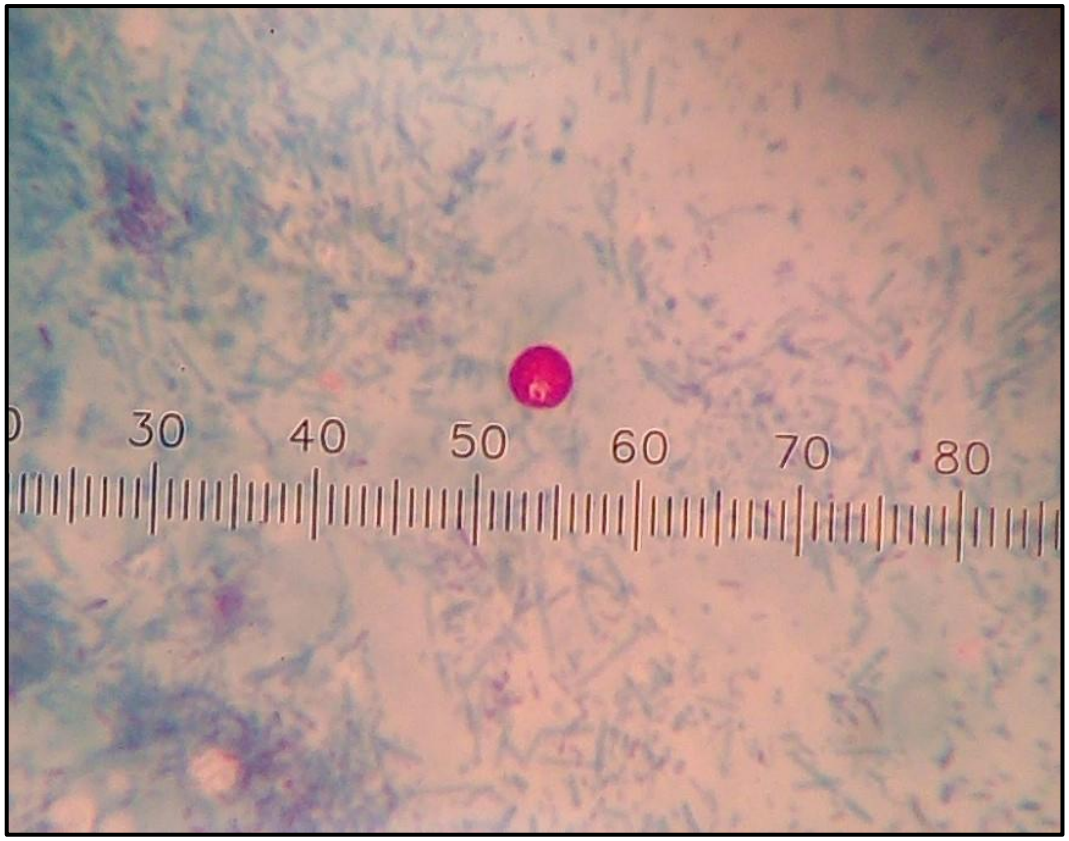


Snail examination – weighing



Snail examination – measuring

Apex impression smears before staining



Acid-fast cysts in an apex smear stained with MZN. Magnification x1000

Guidelines for Authors – Veterinary Invertebrate Society Journal

Aims and Scope of Journal

The Veterinary Invertebrate Society Journal endeavours to be a point of reference for vets and academics for current and upcoming research into invertebrate medicine, welfare and conservation. There will be a focus on the practical application of veterinary principles and research to invertebrate species. This journal is an open access journal with no publication or submission fees. Before open publication, the journal is accessable by members of the veterinary invertebrate society.

The journal accepts submissions of clinical case reports, original research papers, review articles and short communications.

Authorship

Authors should only be listed if they have made a significant contribution to the data and work involved in any submission. One author should be nominated as the corresponding author. The contact details of this author will be present alongside the published paper. As a rough guide contributors should have contributed at least 15% of the work to be an author or else should be recognized in the acknowledgements. Authors may be asked to produce a short biography for the membership to go alongside the article.

The journal has a philosophy of promoting young authors and researchers so welcomes submissions from veterinary and university students.

Authors should disclose if they have any conflicts of interest in regard to data expressed or conclusions taken.

Manuscript Submission and Peer Review

Manuscripts should be submitted directly to the editor via email through either Bkennedy2@rvc.ac.uk or Vetinvertsoc@gmail.com). This journal does not have any submission fees. As this journal is primarily published online, there are no figure or table fees. Type of submission (as detailed further on in this document) should be detailed during submission.

The editor has full responsibility for the review process. At least two academic or clinical reviewers will be selected should peer review be applicable to the article submitted.

The peer review process will be double blinded and authors may be required to revise the manuscipt dependent on the comments made by reviewers. Additional reviewers may be utilised for additional review if revision involves significant change to the manuscript.

Readership

This journal will initially be published to paid members of the Veterinary Invertebrate Society. After a period of four months, the journal will be published online through social media, the society website and through a mailing list. Following this period, access to the journal will be free and not dependent on membership.

Manuscript Formatting

The manuscript font should be “Ariel” of size 12 point with single spacing. Text should be aligned to the left. Formatting that may be used includes bold, italics, superscript and subscript. Avoidance of personal pronouns is expected (i.e. “We”, “I” and “our”). American and British english may be used but it is expected that this be consistent throughout the manuscript. It is expected that submitted articles will be written in clear english and will be spell and grammar checked before submission.

The Harvard referencing style is used within this journal (e.g. Vega, F.E., 2008. Insect pathology and fungal endophytes. Journal of invertebrate pathology, 98(3), pp.277-279).

Abbreviations must be explained and elaborated on within the text. Numbers between one and nine should be expressed in words unless they are used with respect to units or mathematical symbols (e.g. 3 grams or 2%).

Articles should be submitted with a title page. This should include the manuscript title, authors and organisation affiliation of all authors.

Tables and figures should be referenced in the text and have a descriptive legend that can be understood alone.

Drugs should be stated by their generic names with the trade formulation in brackets with the manufacturer (e.g. meloxicam (Metacam, oral suspension for cats, Boehringer Ingelheim)). This nomenclature will also apply to diagnostic tests and laboratory equipment where appropriate.

Genus and species names should be italicised when scientific names are used. Due to the variable and dynamic taxonomic status of invertebrates, it is recommended to cite the species authority when discussing taxa as this will make it clear which species is being discussed.

Apart from opinion/end piece articles, all submissions should include a 250 word abstract.

Article Types

The maximum length of articles are expressed below.

Article Type	Word Length
Original Research Paper	3000
Opinion/End Piece Article	700
Short Communication	1000
Case Reports and Series	1500
Review Article	3000

The following articles types will be included in the journal

Opinion Pieces/End-piece Articles

These articles are more informal and opinion-based though appropriate references are expected when factual discussion is undertaken. These articles are designed to inform the journal readership on a specific area within invertebrate medicine.

Short Communication

Short communications should provide novel information on current research or clinical cases. They differ from Original Research Papers in their scope and involvement. These submissions should typically involve some novel information or species which have not been reported on previously. New information should be placed in the context of existing literature. Headings should include: Short communication and references.

Case Reports and Series

Case reports will focus on a specific invertebrate species with a core clinical focus. This can involve a novel disease, treatment, diagnostic process or follow up of previously reported presentation.

These should be formatted as: Initial Presentation, History and Clinical exam, Diagnostics, Treatment, Discussion, Acknowledgements, and References.

Original Research Papers

Original research papers should report the results of original research that have not been reported elsewhere. Authors should contact the editor if there is a query to what constitutes existing preliminary reports (i.e. presentation or prior publication), though generally if research has been previously reported at a conferenece in preliminary form as an abstract of less that 250 words then it would still be acceptable for this research to be published in this journal.

Original research papers should be formatted as: Introduction, Materials and Methods, Results, Discussion, Conclusions, Acknowledgements and References.

Review Article

A review should report on the current research and discussion around a specific disease or relevant clinical area. It is advisable that a specific invertebrate family or species is the focus of an article, as the entirety of invertebrates as a group can be diverse and challenging to discuss easily. Their format will be similar to original research papers

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Article Submission – The Journal of the Veterinary Invertebrate Society welcomes articles on all aspects of invertebrate health, medicine and welfare. We favour articles that involve practical application of veterinary principles to invertebrates and their care.

We seek clinical case reports, original research findings, review articles, meeting reviews and short communications. We intend to produce a journal of a high standard and so we may choose to reject an article that is poorly written or not up to an reasonable academic standard. Peer review will be provided as appropriate to the article submitted. This journal is published in the english language. There are no submission fees for this journal.

Please do not hesitate to contact the editor for guidelines (published in this issue) should you wish to submit an article. Contact: **visjeditor@gmail.com** or **Vetinvertsoc@gmail.com**

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