Integrative Biology

Daniel Haag-Wackernagel
Department of Biomedicine
University of Basel

Group Members

Dr. Birte Boxler
(Postdoc)
Jose Lachat
(Research Associate)
Andreas Ochsenbein
(Technician)

Feral pigeons and fish mobbing a worm

A Science communication project: The "Basler Taubenaktion 2016"

The food basis is the ecological minimum factor for the feral pigeon *(Columba livia)* in the urban ecosystem. We could show, that a food reduction leads to a reduction of breeding success and finally to a decrease of the population (Stock & Haag-Wackernagel 2016). Pigeon feeding enlarges the ecological capacity. Overpopulation as consequence of a large food basis is linked with several problems summarized as the "pigeon problem". This includes stress for the pigeons as well as increased risk of disease and parasite infestation. For the city dweller, the pigeon problem mainly consists of the risk of diseases and parasite transmissions from feral pigeons to humans, as well as structural damages due to fouling with pigeon feces.

In a joint project of our research group with our University (department events), the Cantonal Police Basel, Basel City Gardeners, Medical Services of the Department of Health and the Animal Protection Society Basel and Agglomeration, we implemented the results of our research in the "Pigeon Action of Basel 2016". With a multilingual poster, a flyer and a brochure we tried to convince the public not to feed pigeons. Our pigeon action has been well perceived by the communication media and we hope that the impact of our public education campaign will contribute to the solution of the pigeon problem.

Host finding of the pigeon tick *Argas reflexus*

The medically and veterinary important feral pigeon tick *Argas reflexus* usually feeds on pigeons, but if its natural hosts are not available, it also enters dwellings to bite humans that can possibly react with severe allergic reactions. *Argas reflexus* is ecologically extremely successful as a result of some outstanding morphological, physiological, and ethological features. Yet, it was still unknown how the pigeon tick finds its hosts. In our study, different host stimuli such as living nestlings as well as begging calls, body heat, smell, host breath and tick feces, were tested under controlled laboratory conditions. Of all stimuli tested, heat played an important role in host-finding. To confirm our laboratory results under natural conditions, the heat stimulus was tested within a pigeon loft. Therefore, we set up electronically heated modules of the size and body temperature of pigeons and monitored the reaction of the ticks. The results showed that *A. reflexus* is able to find a host over short distances of only a few centimeters. Furthermore, it finds its host by random movements and recognizes a host only right before direct contact is made. With our findings, we hope to contribute to the control of *A. reflexus* in infested apartments, both to diagnose an infestation and to perform a success monitoring after disinfestation.

Fig. 1: With the Basler Taubenaktion we implemented the results of our research into public education.

Fig. 2: The pigeon tick *Argas reflexus* finds its hosts by their body heat.

Mobbing strategies of a fish against a sessile annelid predator

When searching for food, foraging fishes expose themselves to hidden predators. The strategies that maximize the survival of foraging fishes are not well understood. In an underwater wildlife study performed in the Lembeh Strait (Sulawesi, Indonesia) we describe a novel type of mobbing behaviour displayed by foraging Peters' monocle bream (*Scolopsis affinis*). The fish directs sharp water jets towards the hidden sessile annelid predator *Eunice aphroditois* (Bobbit worm). We recognized two different behavioural roles for mobbers (i.e., initiator and subsequent participants). The first individual to exhibit behaviour indicating the discovery of the Bobbit directed more water jets, absolutely and per time unit, than the subsequent individuals that joined the mobbing. We found evidence that the mobbing impacted the behaviour of the Bobbit, e.g., by inducing retraction. *S. affinis* individuals either mob alone or form mobbing groups. We suppose that this behaviour may provide social benefits for its conspecifics and in securing foraging territories for *S. affinis*. Our results reveal a sophisticated and complex behavioural strategy to protect against a hidden predator.

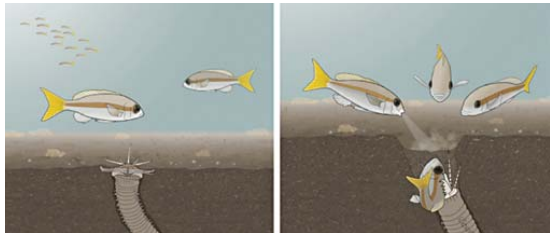

Fig. 3: Predation of *Scolopsis affinis* and subsequent mobbing of the Bobbit worm.
(a) The ambushing Bobbit is covered with sand and lures its prey with the protruding antennae; the jaws are under tension like an armed spring trap. (b) The Bobbit grasps and tears its prey into its burrow, and sand slips into the pit. Other *S. affinis* individuals approach and mob the Bobbit by blowing water jets into the pit.

Selected Publications

Stock, B., Haag-Wackernagel, D. (2014). Effectiveness of Gel Repellents on Feral Pigeons. Animals 4: 1–15.
Schreiber, T., Kamphausen, L., Haag-Wackernagel, D. (2015). Umwelteinflüsse und Gesundheitszustand bei Strassentauben *(Columba livia)*. Effects of the environment on health of feral pigeons *(Columba livia)*. Berl Munch Tierärztl Wochenschri 128 (1/2): 10–24.
Stock, B., Haag-Wackernagel, D. (2016). Food shortage affects reproduction of Feral Pigeons *Columba livia* at rearing of nestlings. Ibis. doi: 10.1111/ibi.12385.
Boxler, B., Odermatt, P., Haag-Wackernagel, D. (2016). Host finding of the pigeon tick *Argas reflexus*. Medical and Veterinary Entomology 30, 193–199.
Lachat, J., Haag-Wackernagel, D. (2016). Novel mobbing strategies of a fish population against a sessile annelid predator. Scientific Records. accepted.