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More Animal Shorts

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An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://psychologywritings.synthasite.com/. See also material at https://archive.org/details/orsett-psych.

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1. "LAZY GEOFF" ANIMALS

The use of tracking devices placed on individual animals to record their movements has found examples of individuals who just sit still (nicknamed "Lazy Geoff" by researchers on social media) (Marshall 2022). These individuals are not "sit-and-wait" predators or those who have slow lifestyles, like sloths, they are moving species that do not.

One possible explanation is personality type, that these individuals are "shy" (low on exploration and/or boldness) (Marshall 2022) [1]. "Behavioural type" is preferred in animal studies to personality, and it describes consistency of behaviour by an individual animal over time or in different contexts [2]. It can be tested by "behavioural reaction norms" (BRN) - the speed at which an individual performs a behaviour common to the mean of the species. For example, snails withdraw into their shell as a means of defence at the stimulus of a threat, and the length of time before emerging when the threat is removed can be used as a measure of boldness-shyness. Bolder individuals will reappear sooner than shy ones.

Body condition could be a key variable here. The "asset-protection principle" (Clark 1994) proposes that prey individuals in good condition take fewer risks in order to protect themselves for future reproductive success. "Alternatively, individuals in good condition are predicted to behave more boldly if good condition affords enhanced escape behaviour" (Toscano et al 2023).

One problem in using behavioural consistency across situations and times as the measure of "personality" is that some animals show behavioural plasticity (ie: flexibility in response to different situations). So, if an animal is bolder in one situation than another, for example, is that because of flexibility to the situation or that the behaviour is inconsistent? Variance partitioning is a statistical technique to distinguish the individual variation in behaviour. For example, using this technique with open access data on the movement of thirty-five African elephants over periods of longer than a year, Hertel et al (2020) found individual differences in daily movement distance that could range from averages of 9.5 km to 19 km.

[1] Reale et al (2007) proposed five major behavioural traits - activity, exploration, boldness, aggressiveness, and sociability.

[2] Generally, individual differences in movement can be due to life stage, sex, internal state (eg: hunger; motivation to find a partner), genetic make-up, and developmental history (Hertel et al 2020).

Another possibility is physiology, ie: different metabolic rates and activity levels. However, the relationship between metabolic rate and activity is not clear-cut (Mathot et al 2019).

There is evidence for a third possibility that it is living near to humans. Not necessarily fear of humans, nor barriers to movement, like busy roads, but there is no need to move. Simply, that there is loads of food in cities for urban-dwelling animals, and "they don't need to go very far" (Dani Rabaiotti, Institute of Zoology in London, in Marshall 2022).

Using GPS-tracking data from a database [3], Tucker et al (2018) analysed the movements of 803 individual animals from 57 mammalian species. Movement for animals living in areas of high human footprint were two to three times smaller than animals living in low human footprint areas. "Human footprint" was measured by the "Human Footprint Index" (HFI), which ranges from 0 (natural environments) to 50 (high-density built environments). The HFI includes built environment, crop and pasture land, human population density, roads, railways and waterways, and nighttime light. The researchers included in their analysis variables of sufficient resources, diet, and body size, which can all influence movement. Movement was measured from GPS locations for each individual animal at nine time scales (from one hour to ten days).

So, animals living in areas of high HFI (36 or above) moved shorter distances over all time scales than animals living in low HFI areas (HFI = 0) (eg: 3.3 vs 6.9 km over ten days). The difference was only significant for scales of eight hours and more.

It appeared that individual animals in high HFI areas moved less than their species mean (an individual-behavioural effect), and the species as a whole in high HFI areas moved less distances than in low HFI areas (a species-occurrence effect) (Tucker et al 2018).

Tucker et al (2018) concluded: "The reduction of mammalian movements in areas of high HFI likely stems from two non-exclusive mechanisms; 1) movement barriers such as habitat change and fragmentation; 2) reduced movement requirements due to enhanced resources (eg: crops, supplemental feeding and water sources)" (p469). Both factors work together as in red deer in Slovenia who have smaller home ranges due to supplemental feeding and the barrier of roads (Tucker et al 2018).

The impact on movement is important because 50-70%

[3] "Movebank" (https://www.movebank.org/cms/movebank-main).

of the Earth's land surface is estimated to have been modified by human activities (Tucker et al 2018). "Animal movements are essential for ecosystem functioning as they act as mobile links and mediate key processes such as seed dispersal, food-web dynamics including herbivory and predator-prey interactions, and metapopulation- and disease dynamics" (Tucker et al 2018 p469).

References

Clark, C.W (1994) Anti-predator behaviour and the asset-protection principle Behavioural Ecology 5, 159-170

Hertel, A.G et al (2020) A guide for studying among-individual behavioural variation from movement data in the wild Movement Ecology 8, article 30

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Mathot, K et al (2019) The covariance between metabolic rate and behaviour varies across behaviours and thermal types: Meta-analytic insights Biological Reviews 94, 3, 1056-1074

Reale, D et al (2007) Integrating animal temperament within ecology and evolution Biological Reviews 82, 2, 291-318

Toscano, B.J et al (2023) Among-individual behavioural responses to predator risk are invariant within two species of freshwater snails Ethology 129, 6, 269-279

Tucker, M.A et al (2018) Moving in the Anthropocene: Global reductions in terrestrial mammalian movements Science 359, 466-469

2. NEWSPAPER ARTICLES AS DATA

Hui and Chan (2024) reported the use of a variety of sources (but primarily newspaper articles) to produce a dataset of 131 years on the Eurasian otter (Lutra lutra in the Hong Kong Special Administrative Region. Scientific studies began in the 1990s.

Otter-related newspaper articles were found from Hong Kong newspapers (n = 108) covering 1890 to 2020, along with government documents, and general literature about local wildlife.

A pattern emerged of the start of decline of the otter population in the 1930s, which was much earlier than previous research (McMillan et al 2019), with a further decline in the 1960s. McMillan et al (2019) collected local knowledge via interviews, but was limited to the 1950s onwards through a lack of "community memory" before that (Hui and Chan 2024).

Hui and Chan's (2024) study was limited to newspapers and editions that had been digitised, and reported accounts could not be verified. Also "it is impossible to quantify differences in observation effort in space and time, which is likely to have resulted in some biases in the distribution pattern and perceived otter abundance" (Hui and Chan 2024 p391). The causes of the decline cannot be established with this method.

Table 2.1 summarises the key strengths and weaknesses of using newspapers for information about animal populations in the past.

STRENGTHS	WEAKNESSES
1. Covers long periods of time and wide geographical areas.	1. Dependent on what is reported and written about.
2. Provides a longer view than individual researchers can produce.	2. Depends on newspapers being archived, and/or digitised, which allows easy searching.
3. A good way to capture historical aspects (eg: what was important at a particular time).	3. The information in the articles is not necessarily that which is important to researchers.
4. Relative cheap method of research.	4. Not possible to verify particularly older information.

Table 2.1 - Strengths and weaknesses of using newspapers as sources of information about animal populations over time.

References

Hui, M.K.Y & Chan, B.P.L (2024) Analysis of a 131-year longitudinal dataset of the Eurasian otter Lutra lutra in Hong Kong: Implications for conservation Oryx 58, 3, 387-395

McMillan, S.E et al (2019) Fish farmers highlight opportunities and warnings for urban carnivore conservation Conservation Science and Practice 1, article e79

3. DOMINANCE HIERARCHIES OF HENS CHANGE

Many animals have dominance hierarchies and these are relatively stable [4]. Changes in individual rank do occur either due to positive mobility (eg: the dominant individual dies and everybody moves up without changing the hierarchical order) or active mobility (with the reordering of individual ranks) (Gretchen et al 2023).

Hierarchies have an orderliness (known as transitivity) where there is a linear hierarchy and the higher individual will always win over the lower one, and a steepness (the extent of the difference between closely ranked individuals). "The higher the steepness of a hierarchy, the greater the probability that a higher-ranking individual wins against lower-ranking individuals" (Gretchen et al 2023 p1).

The "Elo rating system" (eg: Neumann et al 2011) was developed to measure changes in rank (originally among chess players). It is a statistical method based on the observation of all interactions between individuals in a group. Gretchen et al (2023) applied this to data on 418 laying hens (Gallus gallus domesticus) in six different groups in Switzerland. Observations were made when the hens were young (10-12 weeks of age) and mature (24 weeks old). Interactions around feeding troughs and a high quality food source (grapes) were scored (table 3.1). There were nearly 4500 interactions observed in total.

WINS	LOSSES
Aggressive peck - peck towards another bird's head and neck region. Chase - runs after another bird in aggressive manner. Threat - looks at another bird by raising head and appears ready to make towards her.	Crouching - crouches low and remains still in front of other bird. Avoidance - suddenly lowers head and walks/runs away after attention from another bird. Fights - retreating hen.

(Source: Gretchen et al 2023 table 1)

Table 3.1 - Behaviours scored during interactions.

Rank stability was expected, but "in all groups high

[4] Dominance hierarchies in chickens was first reported in a German article by Schjelderup-Ebbe in 1922 (Gretchen et al 2023).

winning success during the young period did not directly associate with high rank in the mature period" (Gretchen et al 2023 p5). This suggested rank instabilities in the hierarchies across the lifespan.

One possible reason was that hierarchy order is not established until older than assumed. "Even though hens can challenge higher-ranking individuals once ranks are established, it happens seldomly and the animals appear to generally interact as their ranks would predict..., a phenomenon described as 'social inertia' by Guhl (1968)" (Gretchen et al 2023 p8).

But two of the groups showed "social inertia" when young. It is possible that outside events disrupted the hierarchies between the two observation periods (eg: rehousing), or genetic differences in the age of maturation. Early maturation (based on age at first egg) is associated with dominance. "Due to laying hens having been continuously selected for a variety of traits including early onset of egg laying, docility, and social factors..., maturation may have disrupted social hierarchies in a manner distinct between previous and current laying hen strains" (Gretchen et al 2023 p8).

References

Grethen, K.J et al (2023) Coup in the coop: Rank changes in chicken dominance hierarchies over maturation Behavioural Processes 210, 104904

Guhl, A.M (1968) Social inertia and social stability in chickens Animal Behaviour 16, 219-232

Neumann, C et al (2011) Assessing dominance hierarchies: Validation and advantages of progressive evaluation with Elo-rating Animal Behaviour 82, 911-921

4. FEMALE ALTERNATIVE REPRODUCTIVE TACTICS

Alternative reproductive tactics (ARTs) is a term used to describe "discrete variations in a reproductive behaviour that occur within the same sex in a population of the same species" (Wang et al 2024 p937). In situations of intense competition, individuals who will not succeed in the orthodox way will find an alternative way to reproduce. For example, where large males fight for dominance and access to females, an ART would be a small male who "sneaks" a mating opportunity while the males fight, or males who evolve to look like females in order to pass the "mate guard". ARTs are traditionally viewed in relation to males, but Wang et al (2024) argued that this is not necessarily accurate, and they listed the diverse forms of female ARTs:

i) Intraspecific parasitism - Taking the resources necessary for reproduction from females of the same species (eg: brood parasitism where one female, who has no nest of her own, places her egg(s) in the nest of another female to feed and raise).

ii) Polymorphism and different reproductive behaviours - eg: white-throated sparrow females are genetically determined with white- or tan-coloured median crown stripes. The former are more aggressive, and have higher mating rates, but provide less parental care than the latter.

iii) Copying mate choice - Some females (eg: deer mouse) choose a mate by copying the (odour) preference of other females rather than choosing independently based on familiarity, say.

iv) "Male mimic" - Some females resemble the colour and physical appearance of males (eg: some damselflies), and the advantage is less harassment from males.

v) Breeding alone or in groups/colonies - eg: several mouse species can shift between breeding alone or in groups/colonies.

vi) Parthenogenesis - Some females can reproduce sexually and/or asexually (eg: tropical night lizard).

vii) Sex allocation - Some insects can produce either only sons or only daughters.

ARTs can "potentially evolve whenever there is fitness to be gained by pursuing divergent reproductive behaviours" (Wang et al 2024 p941). Male ARTs, however, tend to be related to fertilisation, whereas female ARTs "can occur in all breeding stages" (Wang et al 2024 p941). ARTs may be genetically determined, or influenced by the environment (eg: food supply; stress caused by dominant female that suppresses reproduction of subordinates and survival of their offspring), while female physical condition (eg: body mass; parasite load) is important in birds, say, as it "not only influences the choice between nesting and non-nesting but also influences whether a female deserts her offspring or provides care" (Wang et al 2024 p941).

There are cases of making the "best of a bad job". For example, in brood parasitism, the stranger egg may be rejected, or breeding communally has less offspring survival when breeding alone is the norm (Wang et al 2024).

Reference

Wang, D et al (2024) Female alternative reproductive tactics: Diversity and drivers Trends in Ecology and Evolution 39, 10, 937-946

5. GROUPS ARE BOTH GOOD AND BAD FOR PREY

Four main, not mutually exclusive, hypotheses have been proposed to explain how group living impacts predator-prey interactions (Hammer et al 2023):

i) "Many eyes hypothesis" - More eyes in a group to scan for predators than an individual by themselves. Earlier detection of predators for larger groups than individuals alone should be expected.

ii) "Dilution effect hypothesis" - "Most predatory species can only capture a single prey at a time, and thus the chance that each individual prey will be the target of predation reduces with increasing group size" (Hammer et al 2023 p2). This predicts that individuals in a group will be slower to flee than individuals alone.

iii) "Selfish herd hypothesis" - In a group an individual can move to the centre and so position others between themselves and predators. Individuals in the centre of the group will have less risk than those of the periphery.

iv) "Distracted prey hypothesis" - Being in a group can have disadvantages like distractions which reduce the detection of prey. It is predicted that, thus, individuals will be slower to flee in a group than when alone.

Hammer et al (2023) investigated these four hypotheses in breeding King penguins (Aptenodytes patagonicus) who face attacks by giant petrels and brown skuas on eggs and young chicks. "These predators will harass incubating and brooding adults sometimes causing them to flee and abandon their eggs. Breeding birds then face three choices: to stay and fight, risking injuries that could be fatal; to flee cumbersomely by walking with their egg or offspring on the top of their feet and cluster closer to neighbours; or to abandon reproduction and flee entirely by walking rapidly (often includes tripping and flipper beating against the ground...)" (Hammer et al 2023 p2). Two key measures were collected - "Alert Distance" (AD) (distance at which the bird detects an approaching threat) and "Flight Initiation Distance" (FID) (distance at which the bird begins to flee from the approaching threat).

The predictions of the four hypotheses above (table

5.1) were tested with an experimenter approaching individually 200 incubating penguins on Possession Island, Crozet Archipelago (southern Indian Ocean, French South and Antarctic Lands) during 2011-2012.

	ALERT DISTANCE (AD)	FLIGHT INITIATION DISTANCE (FID)
Definition	"focal animal tilting its head or stretching its neck in the direction of the experimenter" (p4)	"focal animal attempting to walk away with egg on its feet" (p4)
Many eyes	Earlier in group than alone (ie: > metres)	Not studied/no prediction
Dilution effect	Not studied/no prediction	Slower in group than alone (ie: < metres)
Selfish herd	Higher for individuals on periphery than those in centre	
Distracted prey	Delayed in groups compared to alone (ie: < metres)	

Table 5.1 - Predictions of four hypotheses for AD and FID.

Support was found for the "distracted prey" and "many eyes" hypotheses. In the former case, "birds engaged in aggressive conflicts with neighbours were less likely to flee, and that increasing relative local neighbour density at low and medium overall colony density resulted in a decrease in bird AD..." (Hammer et al 2023 p1). The researchers explained these findings: "In this species, territorial defence of incubation and brooding territories is high..., and the 'distracted prey' hypothesis suggests that time spent processing social cues and engaging in social interactions with conspecifics may undermine the ability to perform anti-predator behaviours such as vigilance and flight... It appears that for king penguins, social aggression may be a strong distraction from the ability to decide when to initiate flight" (Hammer et al 2023 p8).

The average AD was 7.31 metres as the experimenter approached from a starting point of eighteen metres from a focal animal, but the AD increased with increasing relative local neighbour density, thereby supporting the "many eyes" hypothesis.

Reference

Hammer, T.L et al (2023) Disentangling the "many eyes", "dilution effect", "selfish herd", and "distracted prey" hypotheses in shaping alert and flight initiation distance in a colonial seabird Behavioural Processes 210, 104919

6. WILD VS DOMESTICATED

Domesticated animals show some differences to wild animals of similar species (eg: reactivity to fear and stress). This seems logical as domesticated animals must tolerate human handling, cope with the environment provided, and reproduce in captivity.

Gjoen et al (2023) tested whether domesticated species of chicken are less fear and stress prone than wild species. Forty 16 day-old chicks from two different breeding lines were used - Red Junglefowl (RJF) (Gallus gallus) (wild species) and White Leghorn (WL) (Gallus gallus domesticus) (domesticated species).

The reaction of the chicks were tested alone and in pairs in an arena with a novel object (a desk fan with red ribbons attached) (ie: the fan was turned on for thirty seconds). A number of behaviours were scored, including freeze, object investigation, and willingness to feed from the feeder close to the novel object.

Overall, RJF chicks were more stressed and fearful of the novel object than WL chicks, but the former were more explorative (eg: spent more time in proximity of the novel object). All chicks showed less fear in pairs than alone, especially the RJF ones. WL chicks were faster to reach the food than RJF ones.

The findings fitted with the domesticated hypothesis that domesticated animals are less fearful and stressed than wild counterparts, but explore less, and are more motivated to feed. "It is possible that the WL breeds' features such as growth, feed intake and reduced fear of humans, increases their propensity to prioritise food above seeking safety" (Gjoen et al 2023 p6).

This study also showed the importance of social partners in stressful situations.

Similar studies with other animals have found that dogs are less fearful of novel objects than wolves, but that wolves explore more than dogs in new situations, for instance (Gjoen et al 2023).

Reference

Gjoen, J et al (2023) Domestication and social environment modulate fear responses in young chickens Behavioural Processes 210, 104906

7. POLAR BEAR EXPOSURE TO PATHOGENS

Exposure to diseases is changing with the climate warming. "In the Arctic, where warming is occurring at nearly four times the global rate, infectious diseases present a growing concern to both wildlife managers and human communities. Environmental factors, such as temperature, precipitation, and hydrology, can affect parasite and pathogen life cycles, while concomitant shifts in animal movements and migratory patterns create new opportunities for pathogen exchange. For instance, increased use of terrestrial habitats by marine-dominant species such as polar bear (Ursus maritimus) and Pacific walrus (Odobenus rosmarus divergens) may promote contact between species that were historically segregated. Similarly, northward range shifts in some migratory birds and mammals have the potential to change community dynamics and therefore disease ecology" (Rode et al 2024 p2).

In order to quantify the change, baseline data are needed, but these are limited for Arctic regions. However, Rode et al (2024) made use of faecal and blood samples of polar bears in the Chukchi Sea (between Russia and Alaska, USA) since 1987. The samples were divided into two periods - "historical" (1987-1994) (from 115 adult females) and "contemporary" (2008-2017) (from 232 sub-adults and adults of both sexes) (figure 7.1). Samples were taken from temporarily immobilised bears.

The researchers had three objectives:

1 - Whether pathogen exposure had changed over time (based on faecal parasites and serum anti-bodies).

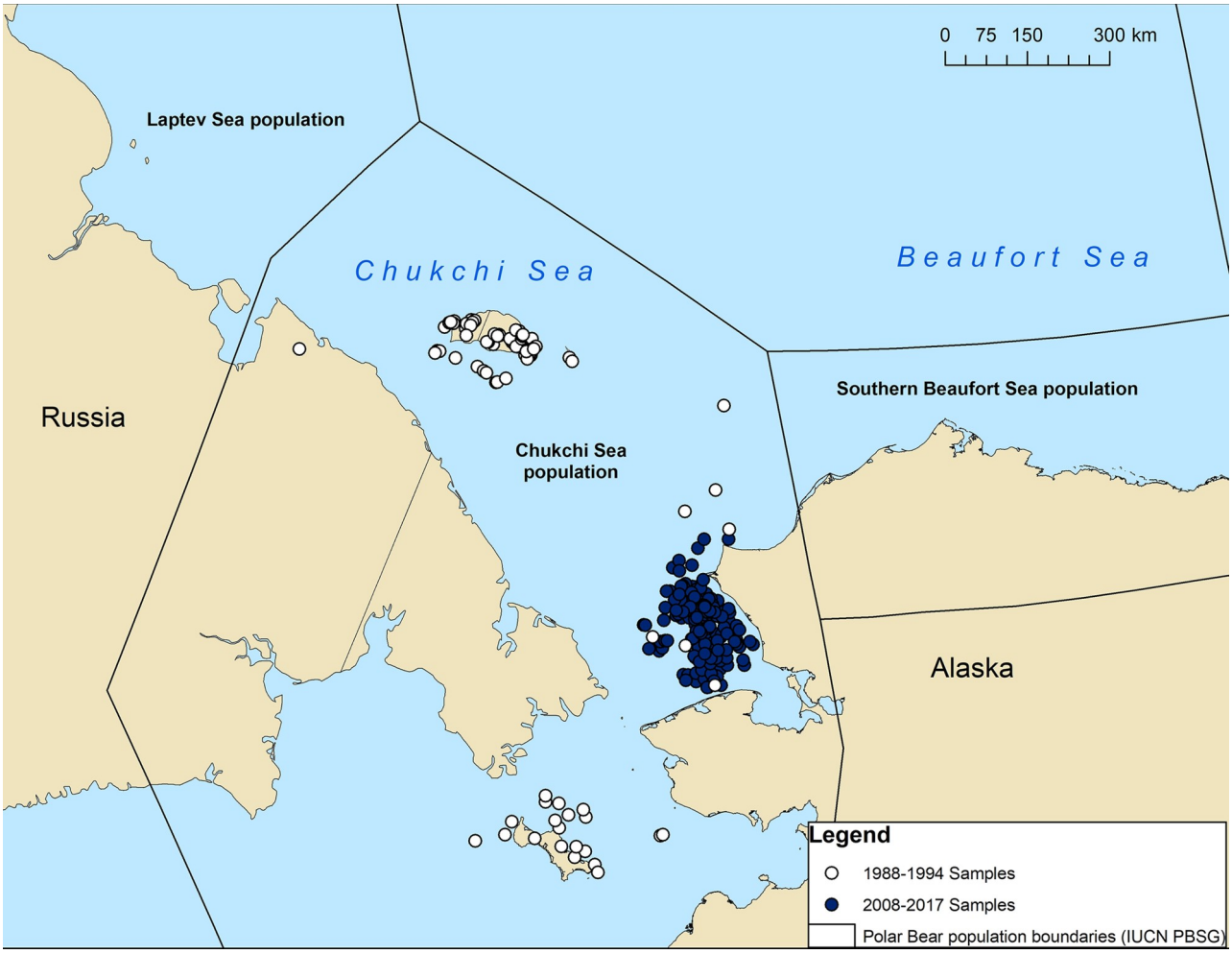
2 - Identify the factors influencing individual exposure to pathogens (eg: diet; sex; age).

3 - Whether exposure produced an immune response (based on blood samples from the contemporary sample).

Concerning Objective 1, serum anti-bodies for six pathogens were found in both time periods, and five of them were significantly higher in contemporary than historical samples (eg: Toxoplasma gondii (parasite) [5]; Neospora caninum (parasite) [6]; Francisella tularensis

[5] Common in marine and terrestrial environments (Rode et al 2024).

[6] "Canids are the only definitive hosts but caribou have also tested seropositive" (Rode et al 2024 p13).



(IUCN PBSG = International Union for the Conservation of Nature Polar Bear Specialist Group)

(Source: Rode et al 2024 figure 1)

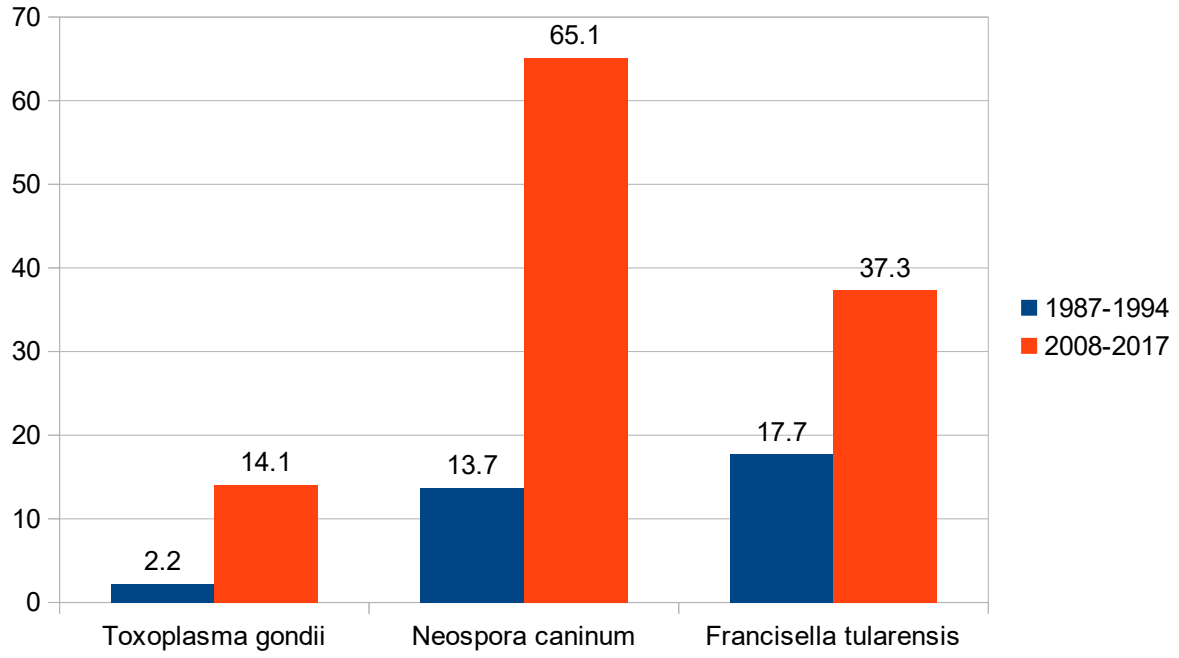
Figure 7.1 - Locations of polar bears when sampled.

(air-borne bacterium) [7]; figure 7.2).

"Exposure was related to diet for several pathogens indicating increased exposure in the food web" (Rode et al 2024 p1). This finding relates to Objective 2. Other factors like summer land use (based on radio-collar tracking) showed no difference. Females had a higher prevalence of three pathogens compared to males, but this "could be associated with terrestrial denning" (Rode et al 2024 p1).

Elevated white blood cell count was found in the contemporary blood samples, which suggested a "possible immune response to some pathogens" (Rode et al 2024 p1).

[7] This is "considered to be primarily of terrestrial origin" (Rode et al 2024 p12).



(Data from Rode et al 2024 table)

Figure 7.2 - Percentage of bears showing evidence of three selected pathogens at two time periods.

This covered Objective 3.

Similar studies of polar bears (eg: in Western Hudson Bay; Pilford et al 2021) have also found these pathogens, some at higher rates (eg: Toxoplasma gondii), some at lower (eg: Neospora caninum) (Rode et al 2024).

References

Pilford, N.W et al (2021) Long-term increases in pathogen seroprevalence in polar bears (Ursus maritimus) influenced by climate change Global Change Biology 27, 4481-4497

Rode, K.D et al (2024) Increased pathogen exposure of a marine apex predator over three decades PLoS ONE 19, 10, e0310973 (Freely available at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0310973)

8. BOLD CRABS

Ectotherms are animals whose body temperature varies with the environment (as opposed to endotherms who internally regulate their core body temperature). Ectotherms seek heat (eg: basking in the sun), but this also increases their risk to predation. Individual animals may also vary on the continuum of bold-shy in terms of their "personality". "This means that bolder animals may choose higher temperatures in natural conditions that allow them to engage in behaviours at a faster pace but also expose them to more risk, whereas shyer animals that choose cooler temperatures exhibit a slower lifestyle with less risk or are more reactive..." (Sakich et al 2023 p1).

Boldness in this context has been called a "thermal type" or a "thermal behaviour syndrome" (Goulet et al 2017). Sakich et al (2023) asked the question of "whether thermal preference is a behavioural trait, or simply under influence of boldness" (p1). These researchers offered three possible scenarios:

i) Thermal preference has no relationship to boldness (ie: risk-taking) behaviours.

ii) Thermal preference and boldness behaviours are positively correlated (ie: bolder individuals prefer warmer places).

iii) Boldness causes the thermal preference.

Sakich et al (2023) investigated these possibilities with the Caribbean hermit crab (Coenobita clypeatus) (figure 8.1) in field and laboratory experiments.

Field Experiment

Thirty-one crabs captured on beaches in Belize were scored as "sun" or "shade" based on the position when captured. The anti-predator behaviour of withdrawal into the shell and how soon they emerge was tested by waving a head above the crab ("overshadowing") and flipping the crab on its back.

Crabs captured in the sun showed a significantly shorter duration of startle response than "shaded" crabs. This meant a shorter time to emerge from the shell and start to move; behaviour taken as a sign of boldness (ie:

(Source: Grook Da Oger; public domain)

Figure 8.1 - Caribbean hermit crab.

crabs captured in the sun were bolder).

Laboratory Experiment

Thirty captive crabs were allowed to find their thermal preference in an apparatus that varied the

temperature between 18 and 35 °C. Crabs were scored based on their preference. Then the crabs were tested at five different environmental temperatures - 15, 20, 25, 30 and 35 °C in a randomised order. The researchers summarised the procedure: "First the crab was flipped so that the aperture of its shell was facing upwards. A stopwatch was then used to measure the latency for the crab to both right itself and subsequently make a clear locomotory movement (to the nearest 0.01 s). If the crab did not achieve this within 300 s, then 300 s was recorded as its time for this behaviour... Thirty seconds after the end of the flip response assessment, a hand was waved overtop of the focal crab to induce a startle response. A stopwatch was then used to record the latency for the crab to both emerge from its shell and subsequently make a clear locomotory movement (to the nearest 0.01 s). As with the righting response assessment, if the crab did not achieve this within 300 s, then 300 s was recorded as its time for this behaviour" (Sakich et al 2023 p4).

Individuals quicker to return to "normal" were classed as bolder. Boldness rating was consistent across the different environmental temperatures, whereas thermal preference had no relationship to startle and flip response times. The researchers interpreted the findings as support for option (iii) above. They explained: "Behaviours that correspond to the Shy-Bold Continuum relate to situations perceived as risky but that are not novel (situations that would include reaction to humans). It appears that hermit crabs may perceive the exposed, warm, and sunny locations as risky, since the individuals that are found in these locations are bolder" (Sakich et al 2023 p6). Note that in the apparatus, bold crabs did not show a preference for higher temperature (ie: option (ii) above).

Sakich et al (2023) made it clear that "the crabs that were bolder at colder temperature were also frequently the crabs that were bolder at warmer temperatures, and vice versa. However, temperature still had a pronounced effect on the magnitude of boldness behaviours, with higher temperatures decreasing both flip and startle responses" (p7).

It is likely that thermal preference is not a behavioural trait (at least in this species), argued the researchers.

References

Goulet, C.T et al (2017) Repeatability and correlation of physiological traits: Do ectotherms have a "thermal type"? Ecology and Evolution 7, 2, 710-719

Sakich, N.B et al (2023) Hot crabs with bold choices: Temperature has little impact on behavioural repeatability in Caribbean hermit crabs Behavioural Processes 210, 104916

9. CAPTIVE IBEX AND SEXUAL INTEREST

The "female effect" describes the reproductive response of males to oestrous females (eg: increased testosterone secretion in rams and bucks) (Lacuesta et al 2023). But the response of individual males is impacted by their position in the social hierarchy. For example, "the presence of a dominant ram inhibits the display of sexual behaviour of subordinate rams, and the absence of the of the dominant ram triggers opportunistic matings of subordinate males" (Lacuesta et al 2023 p1).

Then there is the "male effect" where the male's social status influences the response of females. "In this sense, high social ranked goats ovulate and get pregnant earlier than low social ranked ones, probably due to bucks' mating preferences" (Lacuesta et al 2023 p1).

Lacuesta et al (2023) studied nine captive Iberian ibex (Capra pyrenaica) (figure 9.1) bucks in Spain for the "female effect". The bucks were divided into two groups, and each group was exposed to a domestic goat (Capra hiraus) in oestrous for thirty minutes, three times during the breeding and non-breeding seasons. The behaviour of the bucks was observed, and blood samples were taken before and after the introduced goat.

There were no sexual interactions with the goat, but the bucks showed some agonistic interactions to establish social hierarchy, including "attempt to butt" (defined as "two individuals stood on their hind legs and deviated when when they tried to hit their heads"; p2) and "crash with horns" (defined as "two individuals crashed with their horns"; p2). Testosterone concentrations in the blood did not change, but cortisol concentrations did increase with the presence of the goat (suggesting stress).

The findings differed from previous research, and Lacuesta et al (2023) proposed that it "might be explained by the low adaptation of Iberian ibex to captive conditions. This species does not adapt easily to captivity, males respond nervously to any handling (unpublished observations), and thus, remain permanently isolated from females. The social organisation is highly stable, so the handling of the experiment itself, as the introduction of a female into the pen and during the test, triggered a great stress response, as it is suggested by the high initial cortisol concentrations" (p3). Increased cortisol concentration is known to affect

(Source: Jean-Paul Boerekamps uploaded to https://www.inaturalist.org/photos/357881421; public domain)

Figure - Iberian ibex.

sexual behaviour in bucks negatively (Lacuesta et al 2023).

Note that the introduced female was another species, and though male ibexes can mate with domestic goats, the "males may have not identified a domestic goat as a sexual partner. This is consistent with the increase in the number of agonistic interactions, without sexual interactions" (Lacuesta et al 2023 p3).

In the wild the breeding season of the Iberian ibex is short at approximately 43 days (with one to three sexual cycles). Lacuesta et al (2023) commented: "Probably, the short-term behavioural response of ibex males to oestrous females is evolutionarily less evident than in other species with longer breeding seasons characterised by many sexual cycles, such as wild and domestic sheep with up to 13 and 17 cycles, respectively..., or goat breeds with longer breeding seasons... For example, mouflon [wild sheep] matings may

occur beyond the rutting period, even with basal levels of testosterone, but to the best of our knowledge have not been reported in Ibexes. The Ibexes, with a very short rutting season, maybe require longer periods of contact with oestrous females to adapt and display a sexual response during the pre-rutting season" (p4).

The issue may well be that the Iberian ibex does not do well in captivity.

Reference

Lacuesta, L et al (2023) Sexual stimulation of captive Iberian ibex bucks (Capra pyrenaica): Effect of male social rank on the response to oestrous females Behavioural Processes 210, 104918

10. BOTTLENOSE DOLPHINS AND PASSIVE ELECTRO-RECEPTION

"Electro-reception – the ability to perceive weak electric fields – is found almost exclusively in aquatic or semi-aquatic species and can be either active or passive. While weakly electric fish (Gymnotiformes and Mormyriformes) generate electric discharges (electric organ discharges, EODs) with specialised electric organs for active electro-location or electro-communication... passive electro-receptive species can only detect electric signals from their environment" (Huttner et al 2023 p1).

Passive electro-reception (PE) can help in locating prey, finding a mating partner, avoiding predators, and orientation in the perception of geomagnetic fields (Huttner et al 2023).

PE is seen as evolving independently in many fish, some amphibians, and a limited number of mammals (eg: bottlenose dolphins) (Huttner et al 2023).

Huttner et al (2022) showed experimentally PE in four bottlenose dolphins (Tursiops truncatus) (figure 10.1), while Huttner et al (2023) developed the work to understand detection thresholds with the "Go/NoGo task". Two dolphins at Nuremberg Zoo, Germany ("Dolly" and "Donna"), had been trained to move when a particular stimulus was presented ("Go") or to not move at the presentation of another stimulus ("NoGo"). A "hit" was responding in the correct way to the stimulus, while a "miss" was the incorrect behaviour.

The stimuli were direct current (DC) or alternating current (AC) electric fields produced by an electric field generator at different levels. Detection thresholds were established for DC electric fields (2.4 µV cm^{-1} for "Donna" and 5.5 µV cm^{-1} for "Dolly") and AC fields ("Donna" responded to1, 5, and 25 Hz, while "Dolly" only 1 Hz). "Donna's" threshold was lower than "Dolly's" overall.

Based on calculations of the electronic fields emanating from prey fish (Bedore and Kajiura 2013), Huttner et al (2023) estimated that bottlenose dolphins could detect these electric fields at a distance of 3 - 7 cm, which would facilitate capture of bottom dwelling or buried (benthic) species at short distances [8]. Echolocation used by dolphins, however, is better for

[8] "Crater feeding" or "bottom grubbing" where dolphins bury themselves into the sediment to catch hidden fish has been reported (eg: Rossbach and Herzing 1997 in Bahamas).

longer distances (eg: 110 m away or fish buried 30 cm in the sediment) (Huttner et al 2023).

(Source: NASA; public domain)

Figure 10.1 - Bottlenose Dolphin.

References

Bedore, C.N & Kajiura, S.M (2013) Bioelectric fields of marine organisms: Voltage and frequency contributions to detectability by electro-receptive predators Physiological and Biochemical Zoology 86, 3, 298-311

Huttner, T et al (2022) Behavioural and anatomical evidence for electro-reception in the bottlenose dolphin (Tursiops truncatus) Anatomical Record 305, 3, 592-608

Huttner, T et al (2023) Passive electro-reception in bottlenose dolphins (Tursiops truncatus): Implication for micro- and large-scale orientation Journal of Experimental Biology 226, jeb245845

Rossbach, K.A & Herzing, L (1997) Underwater observations of benthic-feeding bottlenose dolphins (Tursiops truncatus) near Grand Bahama Island, Bahamas Marine Mammal Science 13, 3, 498-504

11. CUTTLEFISH COURTSHIP BEHAVIOUR

Male visual display attracts females both before and as part of courtship behaviour. The environment where the display takes place is important both in terms of heightening the body display, and in relation to risk of predators. In cephalopods, for example, "body pattern plays a significant role in reproductive communication, and when signalling to conspecifics, they chose a visually less complex, homogeneous background to enhance the contrast of their display against the background" (Nakayama et al 2024 pp1-2).

Nakayama et al (2024) reported controlled observations of the Andrea cuttlefish (Sepia andreana [9]) captured off the coast of Japan. Thirteen males and 43 females were used in combinations including 30 observations of a single male and a single female, and six observations of 2-5 males with 1-5 females in 2023. Eleven distinct behavioural components to male courtship were observed in 36 courtship events. Among these behaviours, two previously unknown aspects were seen:

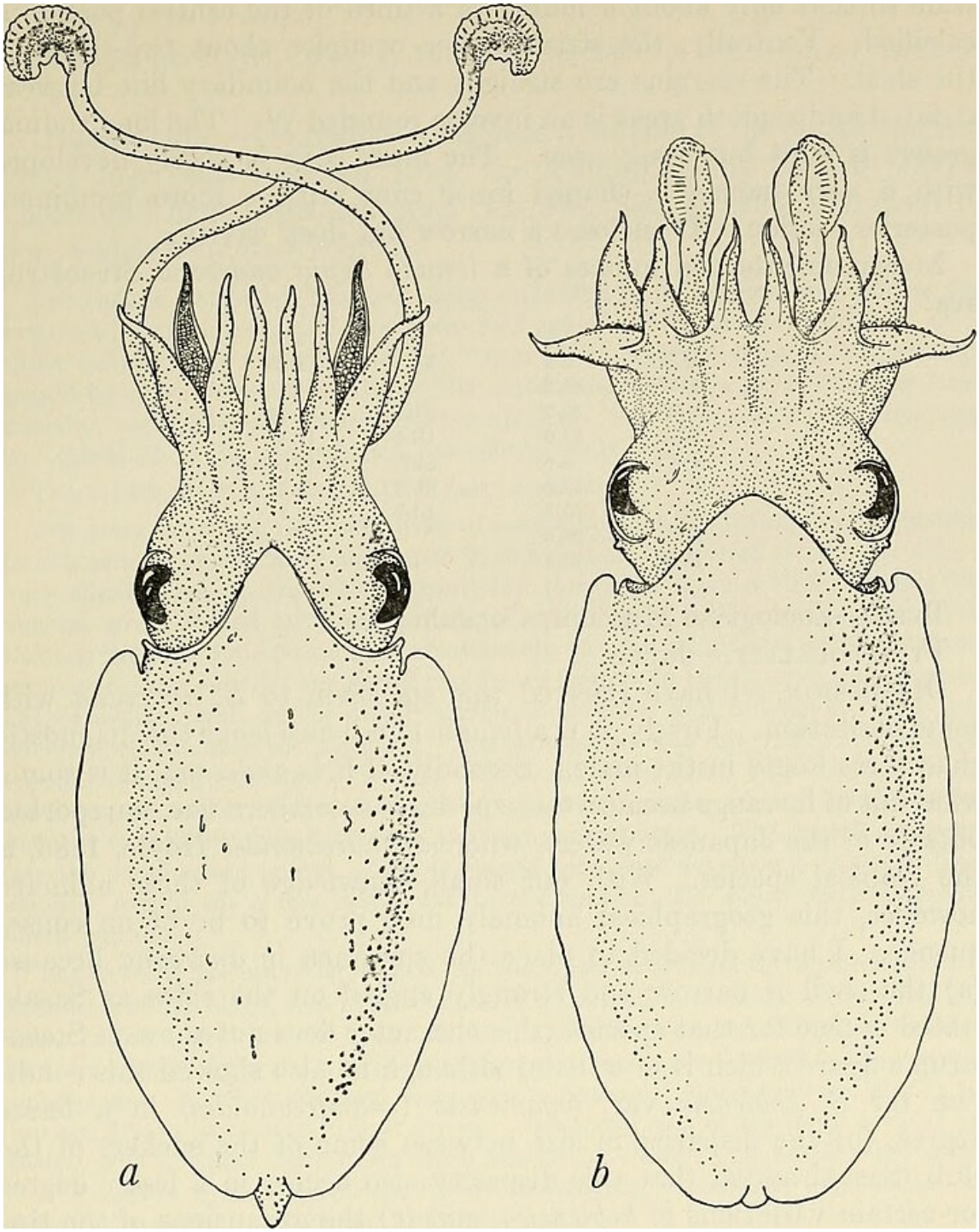
a) The use of the male's elongated arms to change visual appearance and to touch the female. There is sexual dimorphism in this species, and males have a pair of arms ("arms II") which are much longer than their other arms, and arms II of the females (figure 11.1).

b) The release of ink as part of courtship. Ink is usually released when attacked by predators or during aggressive interactions with other males. Nakayama et al (2024) explained: "This novel use of cephalopod ink could make the surroundings darker and more homogeneous, potentially serving as a temporary modification of the visual environment for courtship display" (p1).

Overall, the researchers observed two patterns of courtship:

Type 1 (seen in 19 of the 36 events).
In this case, "the male follows a female ('Following') and hovers above her ('Hovering') for a few seconds. He then shows 'Stretched iridescent display (SID)' in which he performs an exaggerated elongation of the body and arms while displaying iridescent colouration

[9] Information about this species at https://sealifebase.se/summary/Sepia-andreana.html.



(Source: Voss 1877; public domain)

Figure 11.1 - Drawing of male (a) and female (b) Andrea cuttlefish.

on the body, a dark stripe leading from the lateral mantle to arm III, and a pattern of dark bands across his

extended, long, sexually dimorphic arm II. The chromatic stripe and bands are exhibited only on the side toward the female" (Nakayama et al 2024 p3).

Type 2 (17 events).

This is more complex, and "after Following, the male induces the female to settle on the substrate by Hovering and directing the funnel to puff water jets over her. He occasionally passes diagonally over the female from her posterior to anterior and shows 'Lateral iridescent display (LID)' in which his roll-upped sexually dimorphic arms (arms II), arms III, and the base of the fin only on the side toward the female reflect white or blue structural colours, probably produced by iridophores. He then extends out his sexually dimorphic arms and strokes her mantle and head using the distal half of each of these arms ('Stroking'). Suckers on the distal half of the male's sexually dimorphic arm are rudimentary and sparse, probably in relation to the Stroking. His pair of arms I, the first pair of arms counting from the dorsal midline, are held up above the level of his head. Bands of darkened chromatophores are displayed on the sides of his specialised long arms, but iridescent structural reflection is not apparent except at the ends of these long arms. A dark line is displayed on the lateral mantle, just under the fin. During Stroking the male periodically retreats and swims behind the female with his sexually dimorphic arms extended but no longer in contact with the female ('Retreating'). When Retreating, he ejects a small ink blob that is smaller than his head and remains suspended above the female for a while ('Ink blob'). After Hovering, LID, Stroking, and Retreating, the male releases ink of a different consistency ('Ink backdrop') which is similar size as his entire body and soon diffuses near the male on the side facing away from the female. After releasing the ink backdrop two or three times serially, he then places himself between this backdrop and the female and shows a SID" (Nakayama et al 2024 pp3-4).

The other three behavioural components, which were common to both types, were "Approach", "Copulation", and "Rejection" (by the female).

There was no difference in the probability of successful copulation between the two types of courtship (1 with Type 1 vs 2 with Type 2). "This lack of difference can be attributed to the high rejection rate

of females for both types of courtship" (Nakayama et al 2024 p8).

Courtship behaviours, like these observed here, is highly ritualised and time-consuming. So, there must be benefits for such behaviour (ie: reproductive success). The male's display and courtship behaviour gives the female information about the quality of the male's genes (whether in his appearance, and/or stamina to perform the rituals, for instance). Such ritualised behaviour becomes even more important if females reject a high number of suitors (ie: high female choosiness).

References

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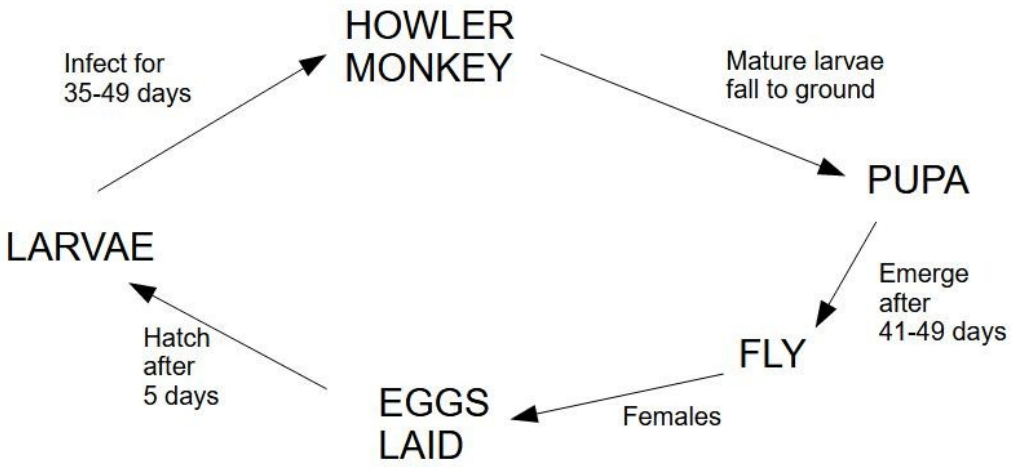
12. BOT FLY PARASITISM

Ortiz-Zarate et al (2024) began with this overview: "Parasitism is a symbiotic relationship where one organism (parasite) benefits at the expense of another (host). Proximately, parasites affect hosts through nutrient depletion, tissue damage, and changes in host behaviour, which may result in decreased body condition, immunosuppression, and secondary infections... Ultimately, parasites play a crucial role in ecological systems by influencing the population dynamics of host species... through impacts on growth..., reproduction..., and survivorship... Therefore, parasitism is a strong selective pressure, and its study is crucial for predicting the persistence of host species" (p2).

Some parasites must have a host to complete their life cycle, while others have free-living states (eg: release eggs into the environment).

The bot fly (Cuterebra baeri), for example, lays eggs in the soil, and the larvae parasite howler monkeys, in particular, for around 35-49 days. "Mature larvae leave the host through a pore, fall to the ground, and burrow into the soil for pupation..., with flies emerging after 41–49 days" (Ortiz-Zarate et al 2024 p2) (figure 12.1). Infected monkeys suffer from myiasis, seen as nodules in the thoracic and neck regions.



(After figure 1 Ortiz-Zarate et al 2024)

Figure 12.1 - Life cycle of bot fly.

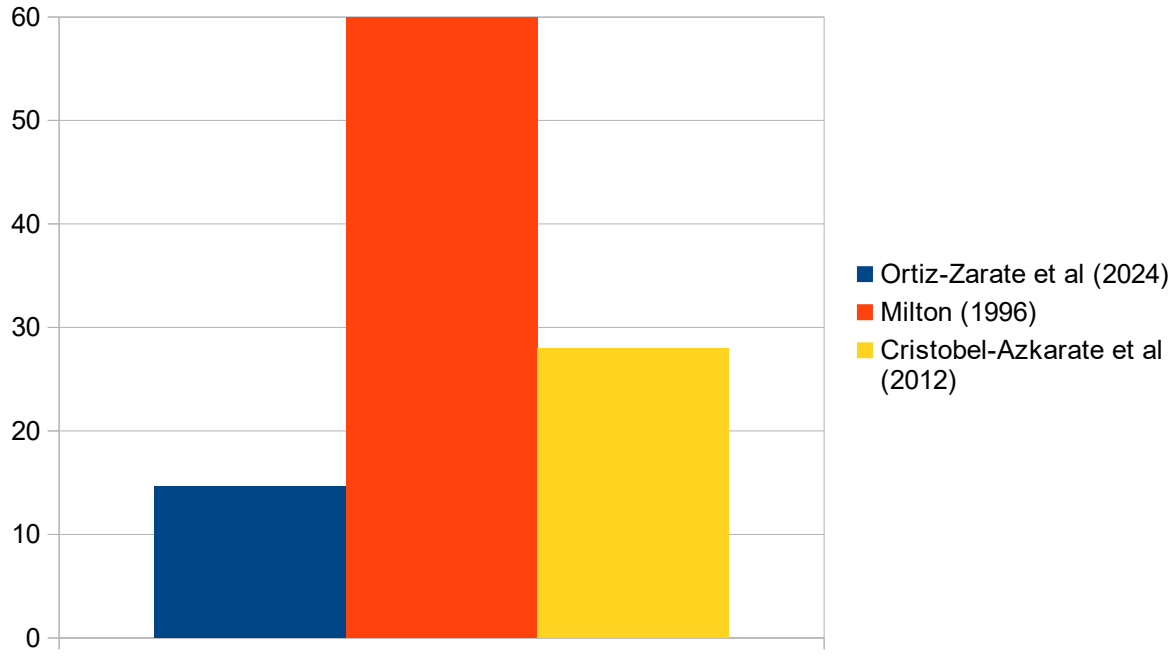
Ortiz-Zarate et al (2024) studied this parasite in mantled howler monkeys (Alouatta palliata) in Los Tuxtlas, Mexico. The monkeys in this forested area had been observed since 2002, and this study concentrated on two groups (totalling 17 adults) between July 2022 and April 2023.

Each group was followed for five consecutive days at different times during a total of 127 observation days. The presence of nodules was noted through binoculars, and scored as closed, opened, opened without parasite, or absent.

Fifteen of the seventeen adult monkeys were observed with at least one bot fly nodule during the study period; the majority in the neck region. There was no difference between the sexes. The peak infection times were February, April, and August-September. "The likelihood of nodule appearance increased when both mean and minimum temperature decreased in the 24–21 prior days to nodule appearance. It also increased with decreased rainfall in the 5–2 prior days to nodule appearance" (Ortiz-Zarate et al 2024 p1).

The main previous work on infection patterns in mantled howler monkeys came from a population on Barro Colorado Island, Panama (Milton 1996). Elsewhere between southern Mexico and Colombia, parasitism has been reported in some populations of howler monkeys (eg: Cristobel-Azkarate et al 2012), but not others (Ortiz-Zarate et al 2024).

Ortiz-Zarate et al's (2024) study had a smaller sample than previous studies (eg: 55-106 individuals; Milton 1996), and a lower overall prevalence (defined as "the number of infected individuals divided by the total number of individuals"; p4) of bot fly larvae (figure 12.2).



(Data from table 3 Ortiz-Zarate et al 2024)

Figure 12.2 - Prevalence of bot fly larvae (%) in three studies of howler monkeys.

References

Cristobel-Azkarate, J et al (2012) First report of bot fly (Cuterebra baeri) infestation in howler monkeys (Alouatta palliata) from Mexico Journal of Wildlife Diseases 48, 822-825

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Ortiz-Zarate, R.J et al (2024) Bot fly parasitism in mantled howler monkeys (Alouatta palliata): General patterns and climate influences American Journal of Primatology 86, e23680