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Peacock – The Rise and Fall of a Symbol?

For many readers who strongly believe in the evolutionary power of sexual selection, the discussion of a peacock's aposematic features will be of crucial importance as the peacock train has been an enduring symbol of sexual selection.

Readers should note from the beginning that the term "peacock" refers only to a male. Females of the same species are known by the name "peahen", and the overall species name is "peafowl". Therefore a peacock is a male peafowl, and in this section we will be predominantly discussing the evolutionary importance of the peacock's tail (correct terminology for their tail is "train").

Through the works of Charles Darwin, the amazing size and dazzling colours of the peacock train became the most prominent symbol of the power of sexual selection. The peacock's visual features were considered so unnecessary for survival, even harmful, that it was believed that the only reason for the peacock sporting the huge train was to entice the female peahens with their beauty. According to this model, a more impressive train ensures the better chances of its bearer in having many offspring. Amotz Zahavi famously dedicated a book to the "handicap principle", where he argued that for a signal of sexual selection to be "honest", it must actually be a hindrance to the bearer. Zahavi placed a picture of a peacock on the cover of the book as the best and undisputed example of a beautiful but harmful morphological addition to a male body.

Before we discuss the possible aposematic nature of some of the peacock's features, we must recall that the morphological and behavioural elements that are routinely discussed as the designing features of sexual selection via female choice (colourful and big sized body, exaggerated morphological additions, various sounds, smells, strange behaviours), are absolutely identical to the designing features used by the aposematic warning display. Therefore **any scholar dealing with animal species with colourful bodies, ostensibly unnecessary morphological additions or strange behaviours and smells should always take into account that both sexual selection and aposematic strategy use the same visual, audio, olfactory and behavioural signals**.

Unfortunately, as aposematism and warning display have never been properly acknowledged in biological science, plenty of aposematic signals from a vast array of species have never been properly studied. As a result, the model of sexual selection via female choice is virtually reigning unchallenged in discussions on the evolution of the colours, sounds, smells and behaviours of thousands of species, ranging from insects to humans.

This disregard toward the aposematic strategy of natural selection flowered from Charles Darwin. When writing about the amazingly beautiful display of colours and additional morphological features on many animal species, Charles famously wrote: 'To suppose that the females do not appreciate the beauty of the males, is to admit that their splendid decorations, all their pomp and display, are useless; and this is incredible' (Darwin, 2004:557). It is clear from these words that the great scholar did not even consider the possibility that the "beauty and splendid decorations" could all be potent tools to scare away predators and competing rival males.

Because of his one-sided approach, Darwin was sometimes puzzled by the strange features of sexual selection in some species. For example – why, in some species, are females just as distinctly coloured as their male counterparts? Or – why, in species where a male can win a female's affection by physically defeating a competing male, do males still retain these beautiful colours and unusual features that hinder their fighting abilities? The answers to these questions start to become clearer if we take into account that the appearance of colours, morphological additions and strange behaviours may instead be to intimidate rivals and predators. For example, the presence of distinct colouring on both sexes most likely means that their colours are primarily to scare away predators and competitors, avoiding unnecessary physical violence and injuries. The initial notion of natural selection as a total and all out struggle of each living organism against all other living organisms, of different and the same species, is hopelessly out-dated. We need to acknowledge that **avoiding physical conflict is a crucially important strategy in the survival of most animal species**. A complex system of ritual fights with elaborate and intimidating displays serves this strategy in an integral manner. This was the crucial point neglected in the writings of Darwin, and the same point is still absent in the writings of most of his contemporary proponents on the sexual selection model.

Now let us return to the discussion of peacocks and their unique look, asking ourselves the crucial question: Was it developed to garner female attention or to scare away rivals and predators? Or was it possibly formed to serve both purposes?

Before proceeding further, let us first assess the peacock's AI (Aposematic Index).

Visual signals

A peacock (the male peafowl) with an opened tail is one of the most spectacular sights of the natural world. First of all it is huge, reaching a height of 1.5 meters and three meters in width, making peacock one of the largest birds of our planet. The colours of the peacock's body and tail are also possibly one of the most visually impressive sights of our world. Even with a closed tail, a peacock's colourful body and crowned head are amazingly impressive. As if this were not enough, a peacock's opened tail has plenty of eyespots. Eyespots, as we remember, are often used for intimidating predators and competitors. Visually, peacocks are one of the most potent aposematic species on the planet.

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Audio signals

When peacock's beauty is discussed, it is often overlooked that apart from their visually-screaming attire peacocks also make a huge, literally 'screaming' call as well. The volume and persona of a peacock's call are very far from the beauty of its tail, reminding one more of the screaming of some alien species from a horror movie. This call is often described as a negative side to having a peacock as a pet, as the call is much stronger than a rooster's call and can easily disturb the peace of a whole neighbourhood. Their most common calls are a loud *pia-ow* or *may-awe*. The frequency of calling increases before the Monsoon season and may be delivered in alarm or when disturbed by loud noises. In forests, their calls often indicate the presence of predators such as the tiger (Whistler, 1949:401-410; Ali & Ripley, 1980:123-126). Apart from these loud calls, peacocks also make rattling sounds when displaying their train.

Olfactory signals

I have not found any information indicating that peacocks have any constant body odour, but when grabbed by humans (and we could assume, by predators as well) they defecate on them, and according to people lucky enough to have of these beautiful birds the smell of peacock droppings is quite strong. I have never had the pleasure of having this magnificent bird as a pet, but we can read the testimony of a person who has some first-hand experience. When he took the peacock for the first time in his hands, the peacock defecated on his clothes, and according to him: "…the smell of peacock shit is the worst of all the shits I've ever smelled, cats included. It's true! Peacock poo is bad to match the sound..." Such a strong smell from a mostly non-predatory bird, together with the habit of defecation when constrained against its will, suggests that peacocks also use an olfactory aposematic signal.

Behavioural signals

Aposematic species usually walk slowly, and do not run upon seeing a predator. They instead often behave aggressively, even moving towards an antagonist that is bigger and stronger. Peacocks also walk slowly and are not easily frightened to run away or fly away. They often come close to humans and are sometimes known to follow them, which can actually be intimidating considering their size. Peacocks in the wild are not even frightened by the sight of tigers. George Schaller wrote: "The peafowl at Kanha [National Park in India] were not greatly alarmed by the proximity of a tiger. One cock walked past a tigress at a distance of thirty-five feet; on another occasion, when a tigress suddenly stood up in the grass thirty feet from a cock, the bird merely looked up, then continued to forage" (Schaller, 1984:279). These are typical aposematic behavioural signals. Females (peahens) also actively use their (albeit much smaller) tail to scare away competitors or predators.

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Darwin noticed how peacocks open their tails when pigs entered the yard but made, in my opinion, the wrong conclusion: "evidently [peacock] wishes for a spectator of some kind, and, as I have often seen, will show off his finery before poultry, or even pigs' (Darwin, 2004:444). Well, if I was to choose out of these two reasons as to why peacocks open their tail when a pig enters the same yard, (1) to show off the beauty of their colourful tail to a pig, or (2) to defend his territory from the intruder - I would choose the latter option.

So, contrary to the opinion (or even the belief) of the long list of distinguished scholars from Darwin to Zahavi, who were/are sure that the peacock's legendarily impressive tail was designed by the forces of sexual selection, I am coming to the conclusion that the **primary force behind the beauty and size of the peacock was natural selection trough the mechanism of warning display (aposematism)**.

Of course, as I have already mentioned several times, these two forces of evolutionary change are not necessarily mutually exclusive. On the contrary, the same signals that can scare away predators and rivals can also attract mates. However, when choosing the primary force behind these signals I opt for natural selection – scaring away rival males and predators and replacing violent fights with ritualized display must essentially be the primary reason behind the dazzling beauty of a peacock.

Unfortunately we cannot ask the peacocks and peahens about the main reason behind their beauty, but there are other ways to check the relative importance of these two evolutionary forces. Why do scholars need to be guessing whether the peacock train is for sexual selection of for some other reason? Scholars should merely observe peafowl behaviour and see if the males with more beautiful trains have more success with the females!

Sexual selection in peafowl: studies

Amazingly, scholars were so sure about the sexual nature of the attractiveness of a peacock's dazzling display that they did not even consider it necessary to test this tacitly agreed idea with an objective and solid field study. It was only in the beginning of the 1990s that Marion Petrie, Tim Halliday and Carolyn Sanders published the results of their study on peacocks' mating behaviour. According to their results, as it was expected, females were choosing males with bigger trains and with the biggest number of eyespots. Unfortunately the study was not large enough (researchers studied only one Lek of 10 males for very limited time. A Lek is a congregation of males).

In the second half of the 1990s, a seven year-long study was conducted in Japan to verify the Petrie/Halliday/Sanders finding with a larger sample and ground the sexual nature of the peacock's attributes into popular thinking with solid field results. During seven mating seasons, observed from 1995 to 2001, researchers from the Graduate School of Arts and Sciences at the University of Tokyo, under the leadership of Mariko Takahashi, studied a free-ranging population of Indian peafowl

at Izu Cactus Park in Shizuoka, Japan. They naturally expected to find confirmation of the power of sexual selection in a peacock's morphology.

Amazingly for the Japanese researchers as well as a big section of scholars, researchers came to the sensational conclusion that the female peahens were indifferent to the peacocks' tail size, and that brilliant colouring and tail condition did not correlate with the reproductive success of their bearers.

The publication of the results of this study, as expected, stirred heated debate. According to an article in Discovery News, "The feather train on male peacocks is among the most striking and beautiful physical attributes in nature, but it fails to excite, much less interest, females, according to new research. The determination throws a wrench in the long-held belief that male peacock feathers evolved in response to female mate choice. It could also indicate that certain other elaborate features in galliformes, a group that includes turkeys, chickens, grouse, quails and pheasants, as well as peacocks, are not necessarily linked to fitness and mating success" (Viegas, 2008).

Creationists also benefited from this unexpected result, suggesting that if sexual selection was not behind the peacock's tail, then what else could be the reason for this 'unnecessary beauty' if not the will and aesthetic sense of the Creator? Petrie and her French colleagues actually wrote a rebuttal of the revealing Takahashi et al. study (Loyau et al., 2008). They suggested that, first of all, more observations were needed to come to final conclusions, and secondly they proposed that a phenomenon known as 'plasticity of female choice' can be involved. When translated into plain English, this term means that peahens possibly change their taste in choosing males much like humans do, and that contemporary peahens are not as interested in the size and beauty of the classic peacock train as their grandmothers were.

I agree with Marion Petrie and her French colleagues in that more observations are needed to come to final conclusions, but in regards to the "plasticity of female choice" I do have some doubts. It seems quite difficult to believe that, after tens and hundreds of thousands (possibly even millions) of years of female excitement for their male counterparts' trains that suddenly, before the close of the 20th century during a 4-5 year period in the 1990s (between the studies of Marion Petrie and Mariko Takahashi), that they suddenly lost interest towards the peacock's dazzling display.

I strongly suggest to those who will be studying the reasons behind the beauty of peacock tail not to discount the possibility that a peacock's tail's amazing size and beauty, with an immense number of large eyespots (over 150), together with their loud calls, smelly droppings, and fearless behaviour can be a set of warning and intimidating signals to their rivals and predators.

Academics are notoriously difficult and reluctant in accepting new ideas and even new facts. The groundbreaking Japanese study of Takahashi sometimes gets simply neglected (see, for example, a recent article by Patricia Brennan from the Department of Ecology and Evolutionary Biology, Yale University, Brennan, 2012).

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Proponents of sexual selection in peacocks also try to draw on a number of previous short-term studies as well: "The authors seem to ignore the fact that three previous independent studies have found relationships between mating success and train morphology. Rather than consider what is unusual about their study, they conclude that peahens in general do not prefer males with elaborate trains" declared Marion Petrie (Barras, 2008).

Well, as I can understand, the biggest difference between the previous studies that Petrie mentions and the Japanese study is evidently clear: Japanese scholars spent a much longer amount of time in observing the behaviour (seven years as opposed to one). Furthermore, unlike the previous studies, Japanese scholars did not change the peacocks' appearance by erasing their eyespots. We should be grateful that the Japanese team of scholars, despite the fact that they were confused by their findings (they expected their results to merely confirm previous studies), still published their alarming results. It is, unfortunately, a quite common and sad practice among academics that studies with negative/undesirable results are almost never brought to a wider audience.

It would be natural to expect that a bigger study of the peacock train and its importance for sexual selection is currently under way, in an eager bid to prove the Japanese results wrong. Losing this iconic argument will take a heavy toll on the proponents of sexual selection, but will we ever hear of the outcome of such studies if the new results confirm the conclusions of the Japanese study?

Conclusion

If we take into account that to look bigger (and more colourful) is one of natural selection's favourite strategies to scare away predators and competitors and avoid unnecessary physical confrontations, the idea that the peacock train was primarily designed by the forces of natural selection in order to scare away rivals and predators seems very plausible.

Another suggestion: scholars who are interested in researching the power of sexual selection should first acquire a solid knowledge of aposematic signals and strategies, as both aposematism and sexual selection thrive on virtually the same set of morphological and behavioural features. Therefore, completely ignoring one of the two great evolutionary strategies designed by the evolutionary forces is an unwise and detrimental research strategy.

The problem is far from being resolved, as only one long-term study is not enough to settle such an important question. We can say that the old axiom is currently viewed with a healthy dose of scepticism, and for a good reason. The tail of a peacock, arguably the greatest symbol of the power of sexual selection, might in turn become the symbol of the decline of the importance of the theory of sexual selection.