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Web damage during prey capture in *Hyptiotes paradoxus* (C.L.KOCH 1834) (Uloboridae)

Samuel ZSCHOKKE

Abstract: Web damage during prey capture in *Hyptiotes paradoxus* (C.L.KOCH 1834) (Uloboridae) *H. paradoxus* - well known for its characteristic triangular web - has frequently been described to always completely collapse its web when catching prey. The aim of the present article is to show that this is not the case, and to discuss how the myth of the obligate complete collapse of the web has arisen and why it survived so well.

Key words: Araneae, triangle spider, prey capture, meme

INTRODUCTION

We are often faced with the problem that we cannot research everything ourselves and we therefore have to rely on published descriptions by others. Unfortunately, these descriptions are sometimes not very accurate or even incorrect, especially descriptions that have been copied from yet other descriptions. Repeated copying inevitably leads to errors – we are all familiar with the telephone game where children sit in a circle and the first child whispers a phrase into the ear of the second one, and this one repeats what it has understood into the ear of the third one, and so on until finally the last one says aloud what it has understood - usually something not even remotely resembling what the first child had started with. In science we have to deal with similar problems; WALTER (1999) describes nicely how the originally inaccurate description of the prey spectrum of *Eresus cinnaberinus* was altered and became even less correct over time with repeated copying.

The aim of the present article is to show the similar fate of the description of the web damage during prey capture in *Hyptiotes paradoxus*, to do away with the misconception that *H. paradoxus* will always completely collapse its web when catching prey, and discuss why nevertheless many descriptions refer to such a complete collapse.

H. paradoxus is one of only two orb-weaving uloborid spiders in Central and Northern Europe (HEIMER & NENTWIG 1991). It is usually found on

dry twigs and branches of spruce where it builds its characteristic triangular web (cf. Fig. 1).

THE LEGEND IS FORMED

Probably the first descriptions of the prey capture in a *Hyptiotes* species can be found in WILDER (1874; 1875). Describing the prey capture in *Hyptiotes cavatus* (Hentz), the American sister species of *H. paradoxus*, he notes that "generally, an entire net is destroyed in making a single capture" (WILDER 1874, p. 270). KEW in his paper on the "snares or snap-nets" of *Hyptiotes* (KEW 1900) simply reviews and quotes WILDER on this subject. GERHARDT (1924) is the first to describe the prey capture of *H. paradoxus*. He writes that the web becomes useless with *almost every* prey capture and has to be rebuilt ("Es ist eine ausgesprochen unökonomische Einrichtung, dass auf diese Weise das Netz fast jedesmal beim Fang einer Beute unbrauchbar wird und neu angefertigt werden muss", p. 116). WIEHLE (1927) refers to GERHARDT's description but writes that the web has become useless with *every* prey capture ("... denn bei jedem Fang ist das Netz unbrauchbar geworden", p. 524). He is thus the first to write that the web is destroyed with *every* prey capture. Descriptions written in the following years do not repeat this mistake. REUKAUF (1931) writes quite correctly that the web, which has been damaged more or less during prey capture, will be renewed in the following night ("Das bei dem Fang mehr oder weniger schadhaft gewordene Netz wird in der nächsten Nacht erneuert", p. 695). NIELSEN (1932) describes one prey capture in detail where "the web was completely destroyed" (p. 63) but he adds that this is probably not always the case. PETERS (1938) explicitly corrects WIEHLE by writing that the web does not become useless with every prey capture, on the contrary, it can be used several times for the capture of small prey animals ("... das Netz nicht etwa bei einmaligen Gebrauch stets unbenutzbar wird, sondern dass es zum Fang kleinerer Beutetiere mehrmals verwendet werden kann", p. 57). This statement left arachnologists with conflicting descriptions of the two great experts on spider webs of that period, WIEHLE and PETERS. Interestingly, almost all subsequent descriptions of the prey capture in *Hyptiotes* that describe the fate of the web refer to an inevitable complete collapse of the web. This error is even printed in the otherwise generally reliable books by WITT et al. (1968) "This web has to be rebuilt after each prey capture" (p. 34) and FOELIX (1996) "Obviously, the web becomes so damaged during the capture that a new one has to be constructed after each

catch" (p. 131). It is therefore not surprising that most popular books written in the second half of the 20th century (CROMPTON 1950; SAUER & WUNDERLICH 1985; BAEHR & BAEHR 1987; BELLMANN 1992) erroneously describe an obligatory complete collapse of the web. The only exception is SAVORY (1952) who cautiously writes "Of some species of Hyptiotes it is said that the web can be used only once in this manner before it is renewed." (p. 137).

OWN OBSERVATIONS

I first observed prey capture in *Hyptiotes* sp. during an excursion to Corsica some years ago, when I failed to demonstrate to my fellow students that the spider would completely collapse its web when catching prey. We tried various prey sizes, but we could never observe a complete collapse. In 1998, I collected *H. paradoxus* from the wild near Basel and brought them to the laboratory where four of them (1♂ and 3♀) constructed webs in perspex frames (30 cm x 30 cm x 5 cm). In my laboratory feeding experiments, I used exclusively fruit flies *Drosophila* sp. for my observations and again, I could never observe a complete collapse of the web. On several occasions, I fed one fruit fly after another into one web. Figure 1 shows such a sequence where a female *H. paradoxus* caught three fruit flies with the same web. The web gets progressively more damaged with each prey capture, but even after having caught three fruit flies, the web could still be used to catch more flies.

During my work with *Hyptiotes,* I have never observed a complete collapse of a *Hyptiotes* web. However, I cannot exclude that this may happen occasionally, especially with bigger or more struggling prey. Nevertheless, I can exclude with certainty that *Hyptiotes* always completely collapses its web.

DISCUSSION

Why has the inaccurate description that *Hyptiotes* will always completely collapse its web become so widespread during the last decades? Is it because WIEHLE – who was the first to publish this mistake – is generally considered to be accurate? I think it is more than this. DAWKINS (1989) introduced the term "meme" to describe a thought or concept that is passed on from one individual to the next (or to many others). Memes can be thought

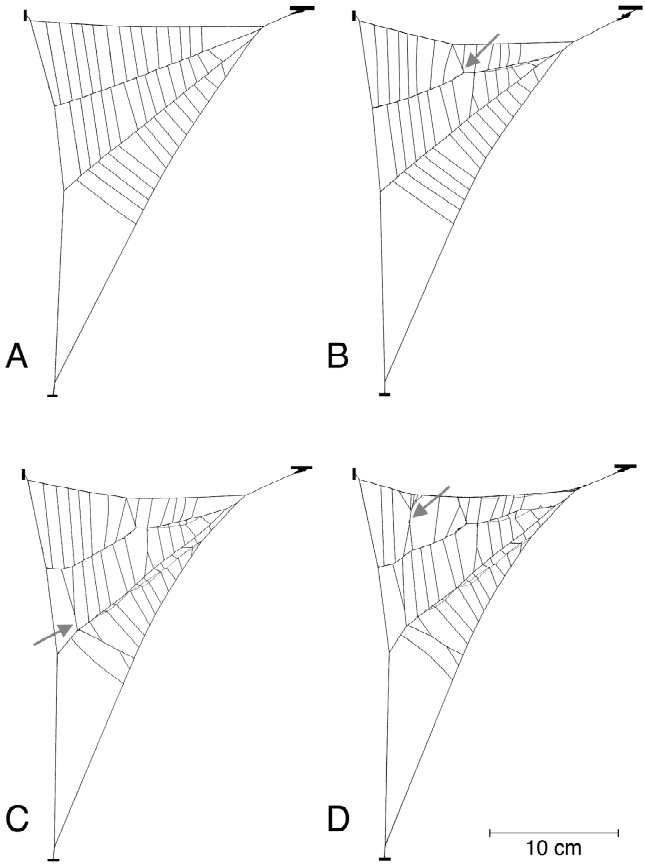

Fig. 1: Sequence of web condition after web construction (A) and successive prey captures (B-D) in a *Hyptiotes paradoxus* web in the laboratory. Arrows indicate the positions where the fruit flies were caught. Note the thin trailing thread the spider left behind on its way to and from the prey. A new fly was given when the spider had finished feeding on the previous one, which took about 2.5 hours.

Fig. 1: Zustand des Netzes von *Hyptiotes paradoxus* nach dem Bau (A) und nach den Fang von einer (B), zwei (C) und drei (D) Fruchtfliegen. Die jeweiligen Fangpositionen der Fliegen sind durch Pfeile gekennzeichnet. Die dünnen Fäden sind die Wegfäden der Spinne zur Beute hin und zurück zur Warteposition. Eine neue Fliege wurde jeweils in das Netz gebracht, wenn die Spinne die Vorherige vollständig verzehrt hatte, was etwa 2.5 Stunden dauerte.

to be the cultural equivalents of genes. As with genes, there are mutations of memes and invasions of new memes (ideas) into an existing population. Some memes come to fixation, others disappear and are replaced by others. Memes - like genes - have differential survival values (i.e. have different probabilities to survive in the meme pool). We can consider scientific concepts like DÜRER's rhinoceros, the prey spectrum of *Eresus cinnaberinus* (WALTER 1999) or the fate of the web of *Hyptiotes* after prey capture to be such memes. When we analyse the survival values of these memes, we find – in accordance with the prediction by DAWKINS (1989) – that memes with a high sensational value (e.g. "*Eresus cinnaberinus* feeds on fast and strong beetles" or "the web of *Hyptiotes* always collapses completely") survived better than their less spectacular alternatives.

When reviewing the publishing history of the fate of the *Hyptiotes* web after prey capture, it can be seen that the number of incorrect descriptions has increased over time. Before 1950, all but one description I could locate were correct, whereas almost all descriptions published since then are incorrect. Why is there this increase in incorrect publications?

It seems likely that researchers in the last century had to rely on their own observations because it was known that printed descriptions could not generally be trusted. As an example, the oldest description of the web of *Hyptiotes* known to me (AUSSERER 1867) describes the web to consist of three or four radii where it in fact *always* consists of four radii. In contrast, today's research is characterised with an ever-increasing complexity of the subject. This requires more use of literature data than ever before, which in turn - together with a high pressure to publish - is probably the cause for the observed increase in falsely copied descriptions.

ZUSAMMENFASSUNG

Es wurde oft beschrieben, dass das charakteristische dreieckige Netz von *H. paradoxus* beim Fang einer Beute vollständig zerstört wird. Diese Arbeit zeigt auf, dass dies meist nicht der Fall ist und diskutiert, wie sich der Mythos der obligaten vollständigen Netzzerstörung bildete, und wieso er sich so weit verbreiten konnte.

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Samuel ZSCHOKKE, Dept. of Integrative Biology,
Section of Conservation Biology (NLU), St. Johanns-Vorstadt 10,
CH-4056 Basel
e-mail: samuel.zschokke@unibas.ch