Peer Community In Zoology

How the noble false widow spider Steatoda nobilis can turn out to be a rising public health and ecological concern

Etienne Bilgo *based on peer reviews by* ***Michel Dugon*** *and 2 anonymous reviewers*

Hambler, C. (2020) The 'Noble false widow' spider Steatoda nobilis is an emerging public health and ecological threat. OSF Preprints, ver. 4, peer-reviewed and recommended by Peer Community in Zoology. https://doi.org/10.31219/osf.io/axbd4

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"*The noble false widow spider* Steatoda nobilis *is an emerging public health and ecological threat*" by Clive Hambler (2020) is an appealing article discussing important aspects of the ecology and distribution of a medically significant spider, and the health concerns it raises. By contrast to previous studies (Dunbar *et al.*, 2018; Warell *et al.*, 1991; Bauer *et al.*, 2019; BBC 2013, 2018), this article, with its extensive media and scientific literature review, shows that *S. nobilis* (Thorell, 1875) is now an important health concern in Britain. Indeed, the author shows that the population of this spider has significantly increased, at least since 1990, in both southern Britain and Ireland where it has remained greatly under-recorded. In these areas, *S. nobilis* is now often the dominant spider on and in buildings, in places in which there is a high a risk of bites, some of which are likely to be severe, in humans, with these bites largely under-recorded. According to Clive Hambler "*There is thus a possibility of bites being left without adequate rapid treatment and monitoring - with a low but non-trivial risk of necrosis or sepsis*". The author points that one of the reasons for the lack of awareness of the risk is that arachnologists typically have a conflict of interest between the conservation of the species they study and raising concerns about spiders. This may lead them to understate the risk. Clive Hambler therefore calls for a closer, appropriately weighted attention to the frequency and risk of bites, based on all the information available, rather than being "*dismissive of the possibilities of bites and impacts simply because many media reports contain major errors or alarmism*". He also argues that the British Arachnological Society's guidance on "false widow spiders" "*needs substantive revision, both in terms of the likelihood of bites and the severity of effects*." Indeed, the author demonstrates that many inaccuracies have been published (see Table 3 of his manuscript) and, for each, he provides a correction and/or an alternative opinion. At the end of this

MS (see Table 4), he provides testable speculations and hypotheses. As he rightly points out, testing is very important to fuel the debate, because "*It will be very difficult to get a balanced and proportionate debate and response for such a confused and emotive issue, especially with the many misleading popular reports*." He also suggests that research will require interdisciplinary collaboration between experts in many domains, including pathologists, immunologists, clinicians, ecologists, arachnologists, psychologists, physiologists, climatologists and epidemiologists. This preprint is clearly descriptive and speculative, but well-written, interesting and certainly useful in terms of a review of the biology, ecology, potential dangerousness and distribution of *S. nobilis*, particularly for future studies. There is no doubt that arachnologists, the medical community and the media will be interested in this article, which is intended to sound the alarm. Naturalists in general will also be interested in this manuscript because it is an original and successful attempt to increase knowledge about a particular taxon based on diverse information sources. The structure of the MS is a bit odd, with a certain toing-and-froing between the ecology/biology/distribution of the spider and the risks, dangerousness and venom of bites, but this is not problematic, as shown by the reviews of the manuscript - three reviews (available below) were written, two by specialists in this noble false widow (Michel Dugon and another researcher who wished to remain anonymous). Despite the controversy surrounding certain of the statements made in this article, I therefore strongly recommend it and look forward to seeing the identified research priorities addressed.

References:

[1] Hambler, C. (2020). The "Noble false widow" spider Steatoda nobilis is an emerging public health and ecological threat. OSF Preprints, axbd4, ver. 4 peer-reviewed and recommended by PCI Zoology. doi: [10.31219/osf.io/axbd4](https://dx.doi.org/10.31219/osf.io/axbd4)

[2] Dunbar J.P., Afoullouss S., Sulpice R., Dugon M.M. (2018) Envenomation by the noble false widow spider Steatoda nobilis (Thorell, 1875) - five new cases of steatodism from Ireland and Great Britain. Clin Toxicol (Phila). 56(6):433-435. doi: [10.1080/15563650.2017.1393084](https://dx.doi.org/10.1080/15563650.2017.1393084)

[3] Warrell D.A., Shaheen J., Hillyard P.D., Jones D. (1991) Neurotoxic envenoming by an immigrant spider (Steatoda nobilis) in southern England. Toxicon. 29(10):1263-5. doi: [10.1016/0041-0101(91)90198-Z](https://dx.doi.org/10.1016/0041-0101(91)90198-Z)

[4] Bauer, T., Feldmeier, S., Krehenwinkel, H., Wieczorrek, C., Reiser, N. and Dreitling, R. (2019) Steatoda nobilis, a false widow on the rise: a synthesis of past and current distribution trends. NeoBiota 42: 19–43. doi: [10.3897/neobiota.42.31582](https://dx.doi.org/10.3897/neobiota.42.31582)

[5] BBC (2013). False widow spider bites footballer Steve Harris. http://www.bbc.co.uk/news/uk-england-devon-24470023 Accessed 1 November 2018.

[6] BBC (2018). False widow spider infestation schools to remain shut. https://www.bbc.co.uk/news/uk-england-london-45761046 Accessed 19 December 2018.

Reviews

Evaluation round #1

DOI or URL of the preprint: **10.31219/osf.io/6gv74**

Authors' reply, 15 October 2019

Dear Recommender, Etienne Bilgo,

Many thanks for your time considering this paper. Please note the title has been revised in response to a reviewer's comments.

I have uploaded a document with all my responses to the Reviewers' comments. (The revision, now available online, is too extensive to use 'track changes').

Hyperlinks to the Supplementary Material Online are now provided in the text.

Best wishes, Clive Hambler

Download author's reply

Decision by Etienne Bilgo, posted 13 September 2019

I recommend this article but it merits a revision

Preprint DOI: 10.31219/osf.io/6gv74 The false widow spider Steatoda nobilis is a notable invasive species

Dear Hambler,

Thank you for submitting your Preprint to PCI. After careful consideration, we feel that it has merit but some major revision is needed. Therefore, we invite you to submit a revised version of the manuscript that addresses the points raised during the review process.

Kind regards, Dr. Etienne Bilgo

Reviewed by anonymous reviewer 1, 01 August 2019

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Reviewed by anonymous reviewer 2, 18 August 2019

This is a fascinating and thought-provoking paper that discusses aspects of ecology, distribution and health concerns of a medically significant spider across multiple disciplines. Much of what the author discusses are important topics and would encourage further, and much needed discussion among the wider community.

While the author is setting out their case to identify contrast or comparisons between media headlines and bite stories with scientific journal papers, the author also seems to at times reference scientific literature and media interchangeably as though they were all fact-based research. This needs to be addressed throughout the manuscript.

This paper is about Steatoda nobilis, but throughout the paper the spiders are sometimes referred to simply as "a false widow", but since there are several other Steatoda species in the UK, it should be clarified and specifically referred to as Steatoda nobilis each time.

Page 1, Line 1: Title should include The "Noble" false widow …

Page 1, Line 21: While necrosis and bacterial infection is possible, there is no current evidence in the peer reviewed literature suggesting that anaphylaxis is associated with false widow spider envenomation. If it is the case that one such incident has been documented, especially when the specimen was identified by an expert (the author) then it should be presented in much fuller detail as a case report, especially since the author is trying to make the case for anaphylaxis being a potential and serious risk.

Page 2, Line 35: Typo – Steatoda

Page 2, Line 69: This is more urgent than many realise, too often are bite victims asking spider groups on social media for medical advice, and too often are they given it from spider enthusiasts who have no medical experience and qualify themselves because they like spiders, rather than being advised to contact a GP.

Page 3, Line 101: An additional reference should be included for the spread of Steatoda nobilis in Ireland is: Dunbar, J.P., Schulte, J., Lyons, K., Fort, A. and Dugon, M.M. (2018) New Irish record for Steatoda triangulosa

(Walckenaer, 1802), and new county records for Steatoda nobilis (Thorell, 1875), Steatoda bipunctata (Linnaeus, 1758) and Steatoda grossa (C.L. Koch, 1838). Irish Naturalists' Journal 36: 39-43.

Page 4, Line 115: I agree as I also found in August of 2017 during a short visit to Oxford that they were very abundant and collected dozens of specimens on a walk from St Hilda's College to my hotel on Abingdon Road 1, even in the pubs on high street, sitting in the beer gardens I was able to collect multiple specimens.

Page 7, Figure 1: These photos are very useful for highlighting habitat.

Page 9, Line 274: In the two paragraphs previous, it says "2000 alleged bite reports revealed by the National Health Service Trusts between 2014 and 2018". Now there is a giant leap to predicting that millions will be bitten in the near future. While I strongly agree that this species is proliferating at an alarming rate, and bite cases are certainly under reported and undoubtedly only going to increase, it's too extreme to suddenly jump to suggesting that millions will be bitten.

Page 11, Table 1: While the victims claimed to have seen a spider, this is only acceptable that a spider was involved, this is not enough evidence to confirm that at least five of these were False widow spiders at all. For example, in table 1 there are statements such as "Evidence it may be false widow - Patient thinks may have been false widow" followed by "Victim or media imply medical confirmation of a spider bite? - Yes: reported diagnosis of necrotising fasciitis secondary to a spider bite". This does not constitute a species confirmation. Self-identification of the species by a victim with no experience in arachnology, or even a description that is similar to the species is not acceptable, especially when on many occasions some colour and pattern morphs are so diverse one can resemble Zygiella x notata and equally other specimens can resemble Amaurobius similis. There must be a specimen captured or a clear photo taken of the specific spider that bit the victim otherwise we can't develop a true and accurate table of symptoms by this species. I would accept that the identification made by the author should be considered as a reliable confirmation of the species and that further investigation into the potential for Steatoda nobilis venom to induce anaphylaxis is warranted. It should be noted that puncture wounds are most likely undetectable from Steatoda nobilis, at least in most cases. The author's assessment of these cases as the correct identification because Steatoda nobilis is often relatively distinctive and now very abundant - and because there are very few other likely candidates for the injury in these cases cannot hold ground especially in light of what is said earlier in the previosu paragraph. However, in my experience a victim's description cannot be relied upon and while some genuine cases will be missed due to the nature of the events, an expert opinion must be made from a collected specimen or photo. It's possible, very likely and also evident that in a panic a victim might start a Google search and unintentionally associate and muddle the Google search with the true events.

Page 12, line 331: I disagree that Table 1 is evidence of confirmed Steatoda nobilis spider bites.

Page 13, Line 359: I agree, while some sources say that females are sedentary and males may wander at certain times, I have found dozens of times, large females wandering on walls, walking across footpaths etc..

Pages 13, Line 374: I think given all previous bites reported in the medical literature it is safe to assume that both males and females do wander and find themselves in beds.

Pages 13, Lines 379 to 382: I agree this is very likely why most bites are recorded from victims who were in bed.

Page 14, line 399: It would be preferable to have a hypolink so the videos can be accessed directly by clicking the link. I was not able to find these videos.

Page 15, Line 449: I agree that much genuine bites must have gone unreported. Very strict guidelines to confirmation, especially the photo or specimen should continue. This has to be the case because from my experience alleged victims will erroneously claim what are obvious insect bites, scrapes, bacterial infection where no spider was ever even seen, or any bite ever felt etc... so while media reports appear to associate deaths and amputations with the spider they need to be corroborated with a specimen or photo. Often it is our experience that media will publish stock photos beside victims that implies this was the spider.

Page 16, Line 474: Add closing bracket to reference.

Page 16, line 481: This reference is to a media report on treating cancer cells with Steatoda nobilis venom

but this article is completely absent of data.

Page 17, Line 521 to 530: I agree that this should be studied more, the absence of evidence supporting bacterial carriage seems to stem from the lack of research on this area. Steatoda nobilis appears to have never been studied for this and should therefore be researched before dismissing it just because bacteria may be unlikely for some other species.

Overall, this is a fascinating paper but needs some reworking before being published. There are too much personal predictions supported by little or no data for a fact-based research article. "I explicitly speculate and present testable hypotheses and 74 predictions - which researchers with appropriate resources and skills might follow up", Might it be more suitable to present these predictions in a table rather than throughout the main text? I think careful consideration and distinction should be made between what's fact-based research and what's media or anecdotal reporting when discussing in main text and for referencing.

I think for this paper it might be important to reference "Faundez EI, Tellez F. Primer registro de una mordedura de Steatoda nobilis (Thorell, 1875) (Arachnida: Araneae: Theridiidae) en Chile. Arquivos Entomoloxicos. 2016;15:237–240." As it represents the only bite case outside of Ireland and the UK, and demonstrates that even where they were not yet known (numbers are certainly very low) bites can occur, so it's not only when population size has reached its carrying capacity that we will see a rise in bites, as evident in Chile.

There are interesting points made regarding distribution and abundance. The author should construct their observations into a dataset and present clearly in a table and/or map.

The comments on Steatoda paykulliana are reasonable, while Maretics work would not meet the standards of an ethics committee today, the work was carried out 40 to 50 years ago and highlight some interesting results. This is certainly a neglected area and urgently requires research.

I recommend that the author considers a revised version of the manuscript taking on board the recommendations above.

Reviewed by Michel Dugon, 16 August 2019

This manuscript present personal observations, predictions and thoughts on the spread, potential invasiveness and potential medical importance of the alien Noble false widow spider Steatoda nobilis. The manuscript can be divided in three main sections: 1) Current distribution and recording in Britain, 2) Incidence of bites, associated risks and societal response, 3) Ecology and invasiveness.

Section 1

In the first section, the author aims to demonstrate that Steatoda nobilis is on the rise in Britain and has been largely under-recorded. I definitely agree with this, and this claim is largely backed by the few peer-reviewed articles on the topic. In this MS, new data is given in the form of unstructured personal observations made over the past two decades in different parts of Britain. While these are interesting and worthy of consideration (and I personally find them very interesting), one could argue that personal observations hardly qualify as structured data produced using a rigorous approach and methodology. I think however that there is space and scope for unstructured observations as they presented in this section.

Section 2

In the second section, the author proceeds to review bite incidence and associated medical risks in view of the (rare) existing scientific literature and media reports (often quoting tabloids, where such unconfirmed bite reports are most likely to be published). The author warns against the quasi-automatic dismissal of such reports by arachnologists and speculates that at least 6 media-borne cases (out of 50) over the past 15 years are extremely likely to be true spider bites. I would argue that it is extremely difficult to diagnose a spider bite based uniquely on symptoms, without having the specimen available for identification. For example, in case #1 (St Albans), the victim describes a spider "3 inches" in leg span found amongst fruits (according the BBC report). This vastly exceed the maximum size for a Steatoda nobilis, which is presented in the report as the most likely candidate. In case #2, the victim recalls seeing a small spider but did not feel any sharp prick / burning sensation immediately after the bite, which is a symptom consistent in all demonstrated cases of

envenomation by S. nobilis (See Dunbar et al., 2017).
I agree with the author that bites are most likely under-reported, probably because most of them develop into benign envenomation which are not brought to the attention of the medical community. I also agree that in some rare instances, envenomation by Steatoda nobilis may results in debilitating systemic effects. The array of possible symptoms resulting from an envenomation by a false widow (steatodism) has only been partially characterised, and I am not sure that including unconfirmed cases would actually help the scientific and medical communities to characterise accurately this envenomation syndrome.
Below are some thoughts and comments addressing specifically this second section on envenomation and medical importance:
L.339: I would also mention Faúndez, E.I. & Téllez, F. (2016). First record of a Steatoda nobilis (Thorell, 1875) (Arachnida: Araneae: Theridiidae) bite from Chile. Arquivos Entomolóxicos, 15: 237-240. The first and only bite reported from Chile involves a mature male specimen.
L. 384: Steatoda is reported as "more aggressive than Latrodectus". Yes and no. If the author refers to Maretic papers on Steatoda paykulliana, I would agree that the latter is indeed fairly aggressive (defensive, should I say). Stating this about Steatoda nobilis could be misleading.
L.424-430 and L.432 440: Semantic is indeed important when scientists are communicating with the public.
L.476-477: Maretic crude experiments using S. paykulliana have never been repeated by another research group in a more controlled setup (e.g. using measured amounts of venom and considering symptoms in a time and dose-dependent manner). There is no literature (as far as I know) reporting specifically on envenomation by S. paykulliana, which tends to demonstrate that the medical importance of this species is probably limited in severity and number of occurrence. I could consider the idea that bites attributed to Latrodectus tredecimguttatus in the literature might in fact be due to S. paykulliana.
L.521-L.530: I agree with the author that the idea that spiders do not carry pathogenic bacteria needs to be challenged using rigorous studies.
L.549-L.560: rather extreme but not impossible. The author should stress that such complications, while possible would remain very rare. Other unconfirmed / speculative hypotheses are worth mentioning / exploring: venom variations leading to direct cell lysis, venom triggering an immune response leading to control cell death (Dunbar et al., 2019) and a synergic activity between the venom and pathogenic bacteria.
L.573-L.574: "15 cases in the media in which medics are reported to concur a spider bite is a possible cause": two things here: 1) the statement is explicitly highly speculative; 2) a majority (most?) medics actually lack training in recognising spider bite or any other envenomation site / syndrome / symptomatic.
L.581: This is really highly speculative and does not have any basis so far! I would advise correcting or removing this statement.
L.583 – L.589: yes - and this statement should stand tall before all the speculations L.532 – L.581.
L.603 – L.660: this section is very discussable. I would argue the following: Are the risks associated with the presence of S. nobilis greater than the risks associated with the presence of a common hymenoptera, e.g. a honeybee? Honeybees can (and do!) kill people every year all around the world. Honeybee venom is highly toxic, can potentially trigger anaphylaxis in a sizable part of the population and in rare cases, envenomation have been linked to secondary infections and necrotic wounds (especially in the case of multiple stings). Does it mean that honeybees should be considered a major health risk to the global human population? What is the medical importance of honeybees in the UK or in Ireland? Low, moderate or high? I agree however with the recommendations presented L.645 – 652.
L.717 onwards: would it be of interest to actually turn this section into a table with two columns 1) misinformation and 2) corrections? Just an idea!

Section 3

The section on species interaction is relevant and interesting. There is much work to be done in this area. Some statements however remain unsupported (E.g. L.861-863). I also support the interesting statements from L.946 onwards on the supposed origin of Steatoda nobilis. These topics (biogeography, ecology, behaviour,

and risk to endemic arthropods) need to be revisited or investigated).

Overall tone and vocabulary used in this manuscript:

After careful reading, I must admit that I agree with many of the points raised by the author in all three sections (I understand that some of my fellow arachnologists won't agree with me!). However, I must emphasize on the fact that this manuscript is highly speculative. It represents the opinion of the author and is partly based on informal, unstructured personal observations and unconfirmed information collected from unverified sources. A rapid scan through the corpus of expressions used throughout the manuscript demonstrate this point: "I predict" is used 11 times through the text, "I hypothesise" appears 6 times, "I argue" appears 8 times, "possible" 31 times, "personal" 27 times, "suggest" + "suggesting" 40 times. " (I suggest" alone appears 18 times) and "alleged" appears 19 times.

It will be the responsibility of the editorial team to decide if such a manuscript falls within the scope of the journal. I believe that there should be a place for such articles (e.g. an opinion column, preprints) but I'd be wary that some members of the public and a part of the media will use the most sensationalist parts of this manuscript and forget the carefully crafted, more pondered paragraphs dotting this article.

I understand that this article aims to be thought provoking and open to debate (and in that sense, it is successful) but some statements should be toned down or just eliminated (e.g. "I find it conceivable that millions and perhaps most people in southern Britain will be bitten by S. nobilis", L. 274).

I would urge the author to review parts of the manuscripts in view of the referees and editors comments, and I look forward to reading an amended version of it.