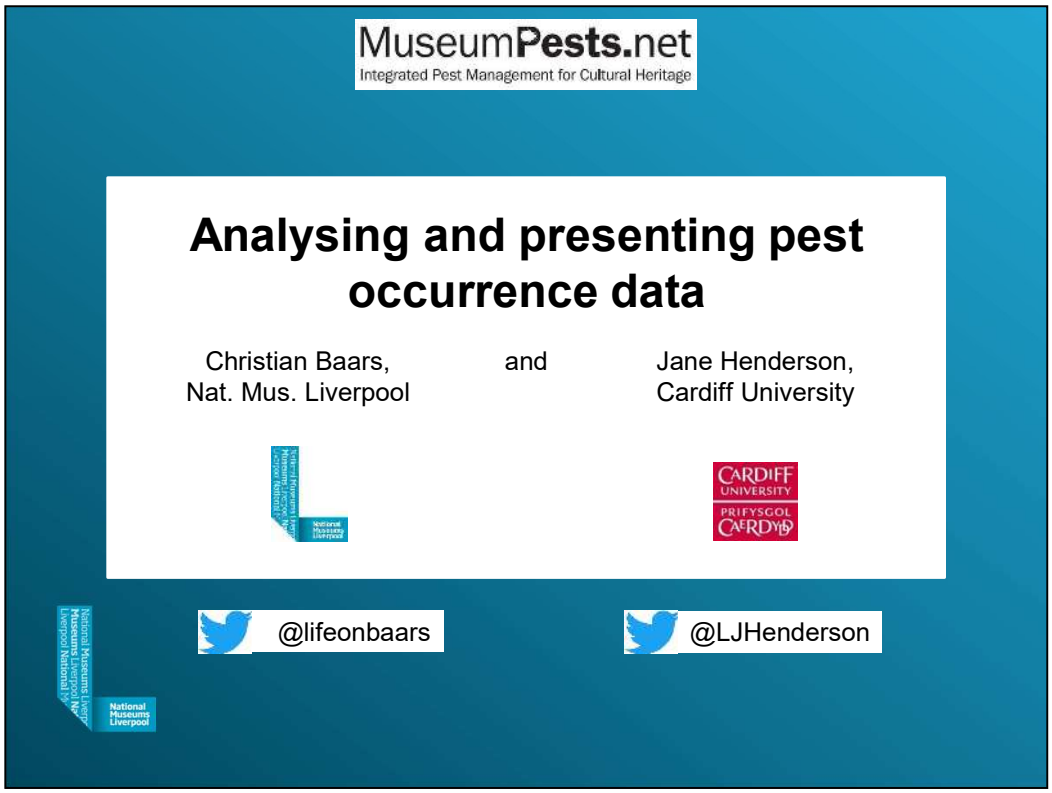
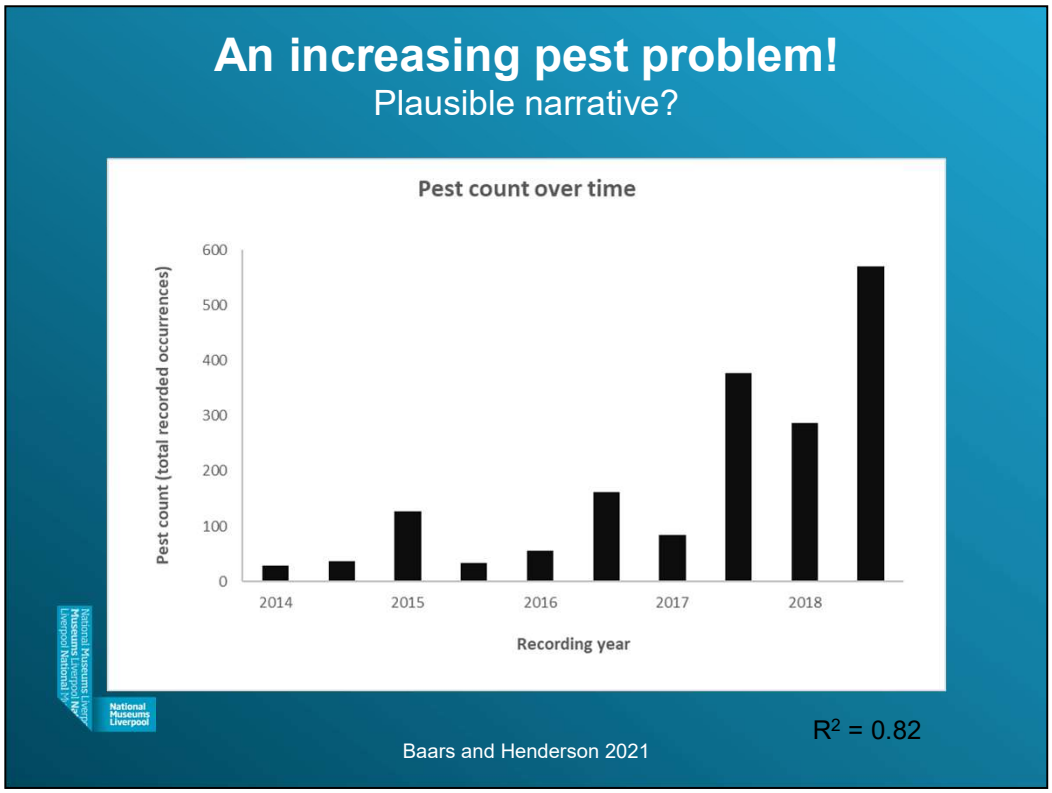


Analysing and presenting pest occurrence data

Baars and Henderson

There are many tools assisting preventive conservators and pest managers in monitoring and identifying pests. This generates a considerable amount of data which are recorded in various ways, forming one essential element of Integrated Pest Management (IPM). We have considered the outcomes being sought from pest monitoring – management buy-in, better resourcing of preventive conservation, improvements to collections care – and whether data analysis and presentation currently offer the necessary tools to achieve these. This especially considers poorly-resourced institutions without access to specialist software. We propose a greater focus on the needs of the target audiences of pest management messaging, highlighting the importance of introducing standardised data collection, appropriate data analysing, and consideration of user needs when presenting findings. One crucial aspect is the way data are analysed: presenting pest data in relation to either floor area or number of pest traps introduces unintended biases which may skew interpretation. For this reason, we have proposed the use of a Pest Occurrence Index (POI) which is a function of the pest count, floor area and the number of pest monitors as well as the length of time pest monitors are exposed between pest counts, as all of these affect the number of pests caught in a defined space. This presentation outlines the benefits of calculating POI and presenting standardised pest monitoring findings in a way that removes unintended bias.



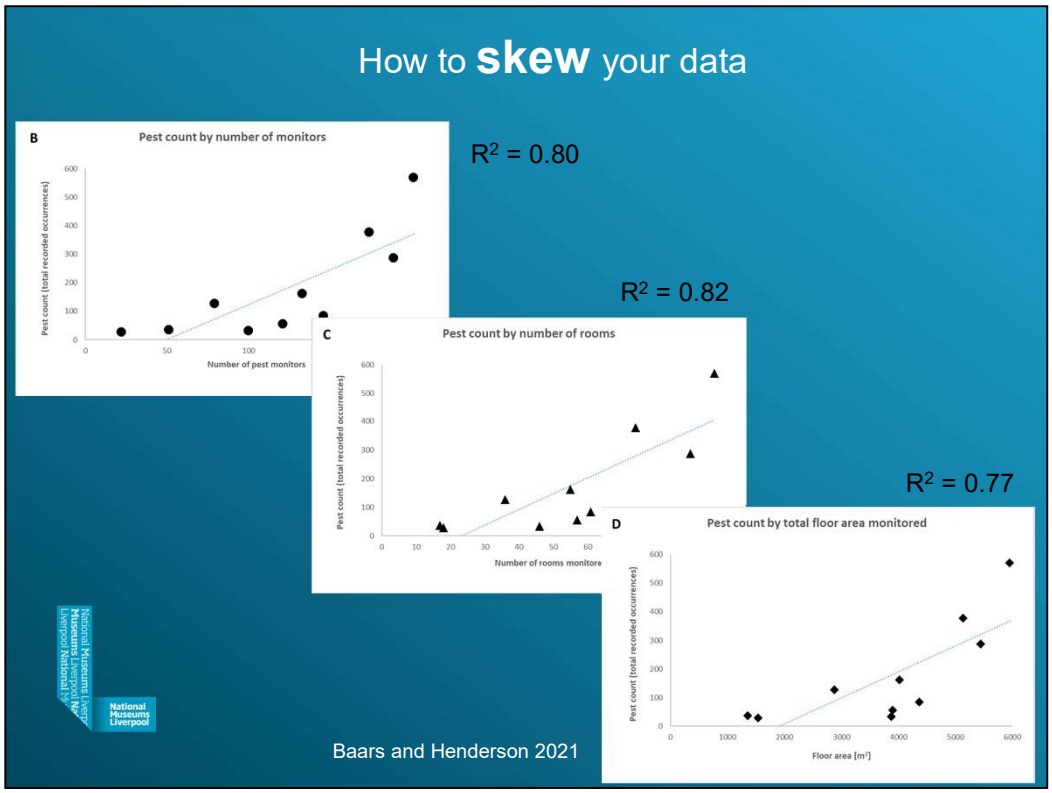
Why do you monitor pests? What do you want to know? Usually: either to detect a potential problem, or as quality control – is my IPM programme working? Secondary aim: persuade management that money spent on preventive conservation is better value than having to deal with a large calamity.

There is a lot of information in the IPM literature on:

- What are pests?
- Objects at risk from pest attack
- How to find pests
- Monitoring pests
- Preventing pests
- Pest treatments

But not much information at all to tell you what to do with the data once collected. What about the data? What do they mean? What does this graph mean?

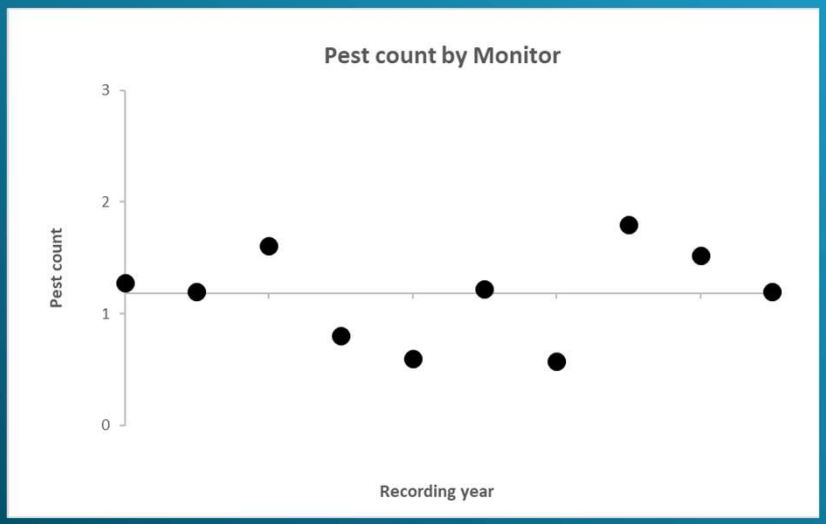
Using the same data in all graphs in this presentation.



Unintentional bias.

No matter how you present the data, there is a strong correlation between the effectiveness of the pest monitoring programme and the numbers of pests found.

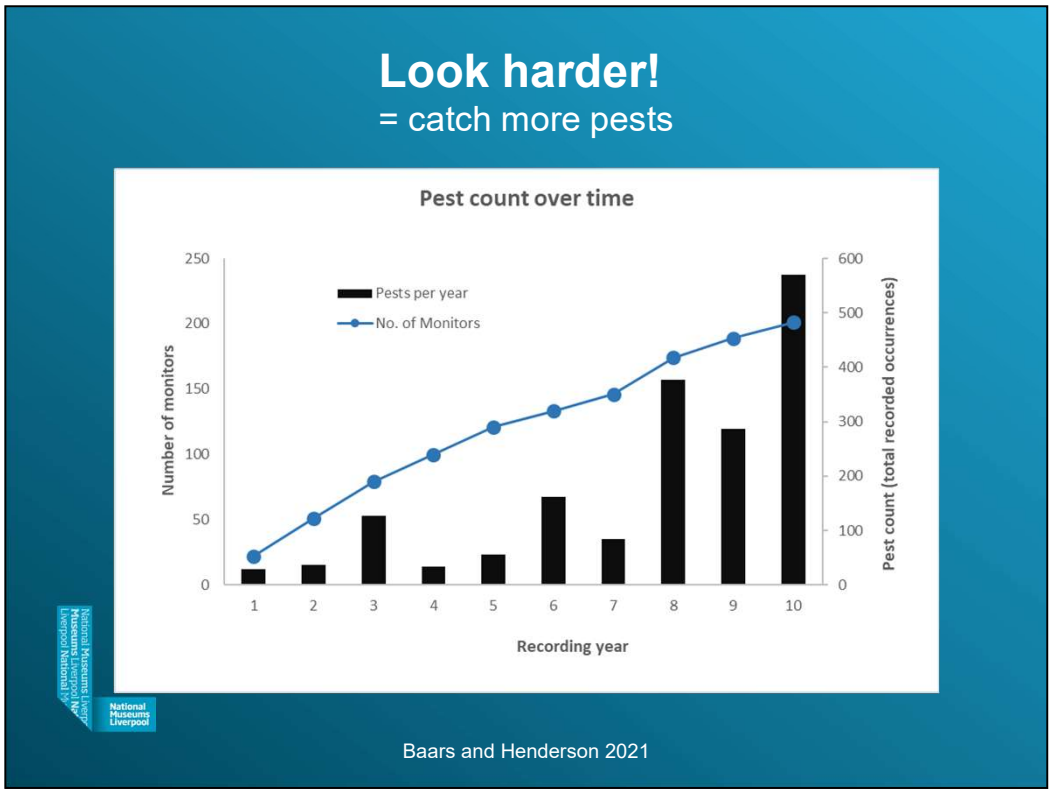
Trying to explain a temporal distribution



Baars and Henderson 2021

$R^2 = 0.01$

Looking at pest occurrence per monitor it turns out that the average pest count per monitor has hardly changed at all during the observational period.

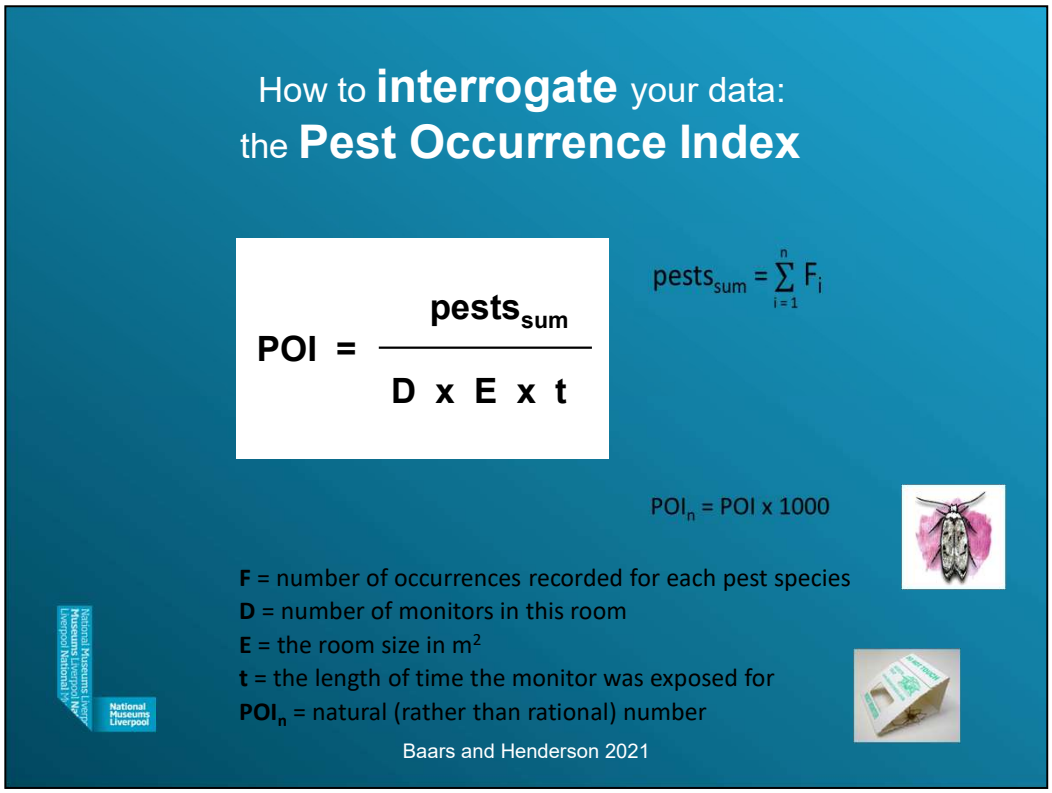


Some pest managers are aware that the number of monitors does of course have an effect on the numbers of pests detected and will calculate bot the total number of pests and the number of pests per monitor, kind of as an indication whether an increase in a pest population is ‘real’.

What we are witnessing is not a dramatic increase in the size of the pest problem, but merely an increasingly sophisticated pest monitoring programme.

Seems obvious. But what is that problem with that?

Does this help us interpret the pest problem? If there even is one?



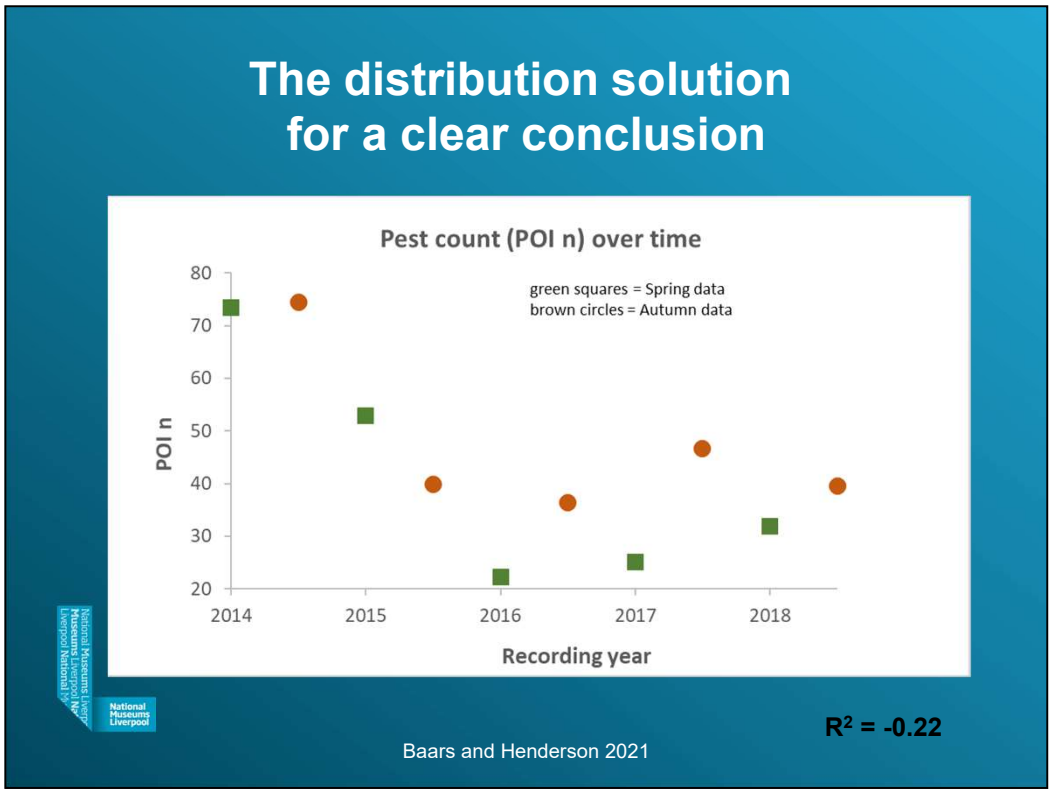
Interrogating and interpreting the data requires a small investment in data analysis.

The Pest Occurrence Index (POI) is a function of the pest count, floor area and the number of pest monitors as well as the length of time pest monitors are exposed between pest counts, as all of these affect the number of pests caught in a defined space.

The resultant POI is a rational number expressed as a decimal. It is widely known that many people have considerable difficulties with numbers expressed as decimals (Hiebert and Wearne 1986, Putt 1995, Lortie-Forgues et al. 2015). Because our emphasis is on communication in an easily understandable format to broad types of audiences who do not necessarily have specific mathematical expertise, the result of equation 2 is multiplied by a factor of 1000 to create a natural number for POI (POI_n).

The decision to introduce a factor is therefore communication-led with the intention of decreasing natural number bias.

Bring together psychology and maths – the only way it will work is through partnership.



Clear temporal interpretation: is my pest problem better or worse?

The numbers mean: during the first two years of the new IPM programme being implemented (not just monitoring, but a staff education programme, improved housekeeping in stores and galleries, the introduction of pest zones, collection spot checks and systematic checks) the pest numbers halved (!), indicating that the new measures were effective at reducing pest numbers in the building. Overlaid over this is a seasonal effect, with more insects being found during the summer months compared to the winter season.

Pest monitoring data can now be used as quality control of the IPM programme, AND also provides some additional information (e.g. seasonal differences).

As an informed manager, these are the data I need. At the same time, this is the sort of information I need to present to my leadership team: the resources (human and financial) we are expending on IPM are having a positive effect on pest numbers in the museum. Hence, the conclusion must be that we will continue to require the support, or we go back to where we were before we started. I can draw this information from this graph, but not the first bar chart in this presentation (which actually appears to suggest the opposite is the case, as the numbers seem to be going up steadily).