Biological Recording

Phenology: Polar Area Charts

Phenology charts come in all sorts of styles, we are familiar with the histogram as the plainest but there are a number of others. These range from side-by-side bar charts through horizontal bar charts which compare several species to diagrams which botanists use to monitor seasonal changes.

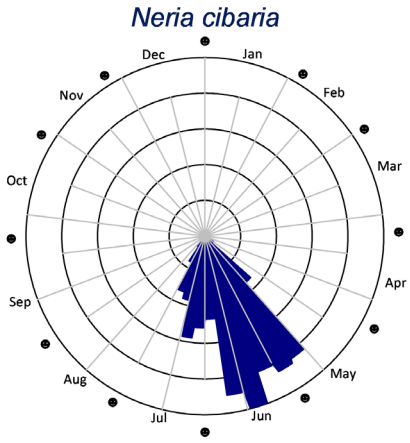
Circular diagrams too, both annular and radial depictions. An example of the latter is a hand-drawn method used most effectively in schools to record any kind of seasonal change: phenology wheels. Examples of annular depictions can get crazily complex, so much so that an art form has developed from it: phenology clocks.

Despite the propensity of popular charting applications to give us confusing embellishments rather than actual functions, Excel does have some useful functions in this area. The basic bar chart gives us the regular histogram but the circular charts are of interest too. The prospect of turning that horizontal axis on the histogram into a circle depicting the year intrigues. No doubt several workers have had a look at the polar area diagrams but on discovering that it produced an unintelligible spiky shape, abandoned the idea.

In a disappointing year for my recording scheme, as the season progressed and the land baked, I began to explore the polar area diagrams further to see if this depiction could be improved, enabling me to determine which species might still be on the wing later in the season.

Fantail phenology

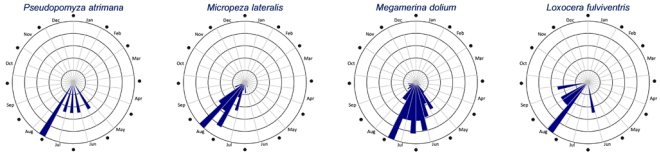
Thus was born the fantail phenology chart, a polar area chart adapted to represent the values as sectors of varying radius:



Sectors based upon week intervals, the maximum value is determined and all other sectors represented as a fraction of that. Accordingly at least one sector always meets the circumference.

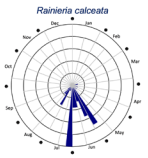
Actual values are omitted, reducing any interpretation simply to familiarity with an analogue annual clock dial; the shape tells it all.

So what species in the Micropezids do remain to be found from July onwards? A quick glance at all my prepared charts and the following were easily selected:

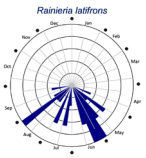


So the place I need to find now is a woodland with sandy soil and lots of broome, some steaming piles of grass cuttings, a few flowery rides and an adjacent reed bed.

I'm guessing it's going to be a good year for *Rainieria calceata* too. I've observed it as active in hot weather and it will disperse widely, unlike the Calobatinae which prefer cooler humid conditions.

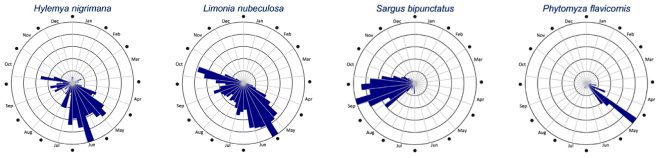


Could extend its range in the UK this year, it likes the sun and has a propensity to disperse widely.



The European sister species has a prolonged flying period across a wide range of climatic zones.

Howard Bentley and Laurence Clemons provided lists of other Diptera species for which fantail phenology charts might be informative (I chose *Hylemyia* & *Limonia*). Andy Chick suggested *Sargus bipunctatus* for an autumn species and Barry Warrington found a spring species (*Phytomyza flavicornis* adults, just 42 records) - many thanks to them all.



All data from NBN Atlas downloads

Method

Full instructions are provided within the .xlsm Excel file downloadable at https://tinyurl.com/ya7yyhb4 Data may be obtained from NBN Atlas or from other sources if you happen to have access to recording scheme data. Datasets consisting of mixed species can be analysed rapidly. It may be sluggish with large datasets but I've had no problems with 10,000 records though I'd worry about using it for *Episyrphus balteatus* which must be getting on for ten times that figure.

If readers consider this chart style of value then in due course I shall be proposing it as an addition to the phenology options in Recorder 7, currently under development.

References

An article detailing methods is under preparation. It is currently lacking a sufficient range of examples so I would be glad of any additions or comments.

In the meantime, if you use the method for your own work, please cite the temporary:

Sumner, D. P. (2018). Phenology and Polar Area Charts (Fantail Phenology). (in preparation), (5), 1–8.

For further reading on the subject of visual perception and charts, the many writings of Steven Few are most informative, several are accessible at http://www.perceptualedge.com/library.php

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