Referee report on manuscript: A single changing hypernetwork to represent (social-)ecological dynamics

The manuscript aims at proposing a new way of representing ecosystems, through the lens of evolving hypergraphs. Quoting the authors, the manuscript does "not present new models and new results, rather than exemplify the proposed concepts with our past basic and applied studies." So it is neither a review of the topic, as the references mainly focus on the authors' own works.

A first part of the manuscript is devoted to introducing the (previously proposed by the authors) concept of Ecological Network (EN), whose main characteristics lies in that its is a comprehensive view of various social-ecological systems acting on shared components (species or other entities). According to the authors, the concept of Ecological Network encompasses approaches such as multilayer, multiplex or multilevel graphs, and goes beyond those concepts as no assumption is made on the shape of this EN (could be modular, layered, nested or anything else).

From this point, the authors argue that this EN should in fact be replaced by the more general concept of hypergraph, this way including potential higher-order interactions. More specifically, the authors argue that such hypergraph is represented by a Petri net, which is a bipartite representation of any hypergraph.

In a third part, the authors sketch links between this concept (of EN) and the studying of the dynamics of the ecosystem. This part is not clear to me. Finally, the authors argue that considering evolving hypernetworks is the promising thing to do, and their framework called EDEN is a way to do that.

In summary, this manuscript is a presentation to Ecologists of previously developed concepts by the same authors. It does not contain any novel methodological contribution, nor apply those to new datasets. It's rather a manifesto for the use of these concepts in studying ecological systems.

Major comments:

- Fig 2: The caption says "When a non-circular representation (b) is allowed, here with an appropriate display algorithm (Kamada and Kawai 1989), certain variables and processes become more central (here, termite workers Wk) and others less central (here, competitors Ac)." Graph visualization is known to be misleading and network statistics may help in quantifying for instance how much a node is "central". This phrasing seems to suggest that visualization makes it possible to determine the central character of a node. Later (end of page 8, top of page 9), one can read "With an appropriate graph layout (Fig. 2b), algorithms and graph analyses (Kamada and Kawai 1989), it is possible to produce representations that help in understanding node properties (e.g., whether they influence or are influenced by other nodes) [...]" suggests in the same way that visualization is sufficient for network analysis. As the manuscript is aimed at non-specialist, I believe the authors should be more careful and better warn the reader about potentially naive interpretations.

- Fig 3: It is unfortunate that symbols used in part b) are not explained. The authors refer to: "Pommereau et al 2022 for explanations of each symbol indicating how token should circulate in the hypernetwork." This harms understanding and if the aim of this manuscript is not (at least in part) to explain hypergraphs and their usage I do not see what purpose it serves.

- Fig 4: I don't understand how the objects represented here are relied to Petri nets and the evolving hypernetworks. Again, by remaining too superficial the authors are at risk of not properly conveying their ideas.

Minor comments and typos :
- page 10, line 265: Appendix 1 refers to what? In fact, section "Appendices" mentions the existence of 2 different appendices, which I did not find. On page 12, line 330, there is also a reference to an Appendix 2.
- same place: "An EN ecosystem interaction network". As EN is already short for "ecosystem network", this should be rephrased.
- In the same way, a github link to a software called "ecco" is given, whose exact link with the current manuscript remains unclear.