

February 7, 2025

**Mark Novak**

Department of Integrative Biology  
[mark.novak@oregonstate.edu](mailto:mark.novak@oregonstate.edu)  
<https://novaklabosu.github.io>

Dr. Volker Rudolf  
Editor in Chief  
The American Naturalist

Dear Dr. Rudolf,

My co-authors and I would be grateful to you for considering our manuscript — *In defense of the original Type I functional response: The frequency and population-dynamic effects of feeding on multiple prey at a time* — for publication. We are submitting our manuscript to *The American Naturalist* because it speaks to both empiricists and theoreticians on a topic that is foundational to myriad lines of research. That topic is the challenge of understanding and describing how consumer feeding rates respond to variation in resource abundance (i.e. their functional response).

All ecologists are taught about the simplest of functional response model, the so-called linear Type I response, which describes feeding rates as increasing linearly with resource abundance. They nonetheless differ greatly in the degree to which they consider this model to be "unrealistic" versus "sufficient". While empiricists consider it unsuitably non-mechanistic and irrelevant, most theoreticians consider it necessarily simple and approximately appropriate. Holling's original (rectilinear) Type I is dismissed by both camps, with most compromising on the Type II model for which searching and handling are assumed to be mutually exclusive activities. The overarching message of our manuscript is that empiricists should not dismiss either of the linear functional responses as being unrealistic, and that theoreticians must draw more bounded conclusions when presuming the linear Type I to be appropriate.

We support this main message through an integration of empirical (statistical) and mathematical insights. Our manuscript thereby entails three parts: First, we derive a simple "multiple-prey-at-a-time" functional response model to represent predators for which searching and handling need not be mutually exclusive; they can continue to search while handling an arbitrary number of already-captured prey. We use this model to clarify the empirical relevance of the two Type I models, delineating the conditions under which they can in fact be mechanistically-reasoned descriptions of predator feeding rates even when handling times are long. Second, we use the model to demonstrate statistical evidence for the occurrence of functional response linearity in a substantial number (35%) of 2,598 compiled experiments, and to demonstrate support for the hypothesis that larger predator-prey body-mass ratios affect greater functional response linearity. Third, by incorporating the model into a classic consumer-resource population-dynamics model, we show how multi-prey feeding can lead to dynamics unanticipated by current theory, including long-term transients between bistable fixed-points and limit-cycles. The integration of the three parts of our manuscript leads to a novel prediction: that these unanticipated dynamics are most likely to occur under conditions reflecting top-heavy food webs where functional responses are effectively linear.

We believe that the foundational relevance of our manuscript will receive strong interest from the wide variety of ecologists and evolutionary biologists working on the characterization and consequences of consumer-resource interactions. Further, since the manuscript addresses both empiricists and theoreticians alike, we consider *The American Naturalist* to be a particularly good venue for its dissemination.

As per *The American Naturalist* requirements, all data and code are accessible on GitHub and have been posted to a permanent repository on FigShare. We also affirm that the manuscript is not under consideration by any other journal and that all authors have read and approved it for submission. Finally, please note that our manuscript has already undergone careful evaluation by three expert reviewers — [Frédéric Barraquand](#), [Wojciech Uszko](#), and [Matthieu Barbier](#) — through the [Peer Community in Ecology](#) process. Their reviews and Dr. Barraquand's positive "recommendation" of our manuscript are attached and available at <https://ecology.peercommunityin.org/articles/rec?id=702>. We hope that their collective enthusiasm may be considered in your own evaluation of our work.

On behalf of my co-authors, Kyle Coblenz and John DeLong, I thank you very much for your consideration.

Sincerely,



Mark Novak