A Decade of Risk: A meta-analysis of risk-sensitive foraging over the last 10 years

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Background

Risk-sensitive Foraging Theory:
This theory was developed to determine a forager's choice between a constant option (risk-averse) and a variable option with the same average value (risk-prone) (see Fig. 1).

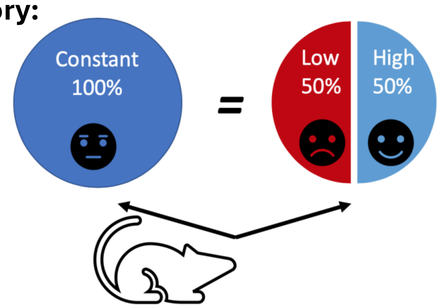

Figure 1. A typical example of a risk-sensitive foraging study

Daily Energy Budget Rule:
Numerous models have been proposed to describe an animal's sensitivity to risk. For example, the daily energy budget rule predicts that an animal in a calorie deficit will be risk-prone, and animal in positive energy budget will be risk-averse (see Fig. 2).

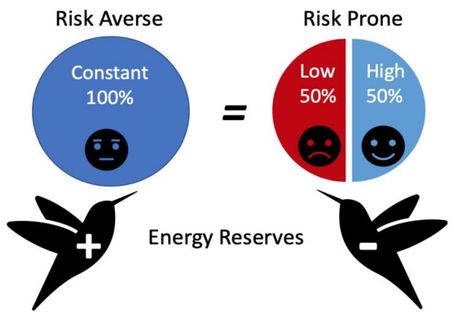

Figure 2. A common depiction of the Daily Energy Budget Rule

Purpose:

- Many studies have been conducted on risk-sensitive foraging since the 1980s.
- Despite continued study of risk-sensitivity, no study has examined the trends of these findings over the past decade.
- Given this, our study explored the different types of reward manipulation used in past research,
- We assessed which species were used studies to study risk,
- And we examined the models that were most supported.

Methods

- Articles were found using keywords relating to "risk-sensitive foraging".
- A total of 92 articles from 2013-2023 were collected from PsycInfo and PubMed.
- Only 19 publications fit the criteria of a risk-sensitive foraging study, with some including multiple experiments. In total, 27 experiments from the 19 studies were analyzed.
- Articles were then coded for information related to species, major findings, theories supported, etc.

Results

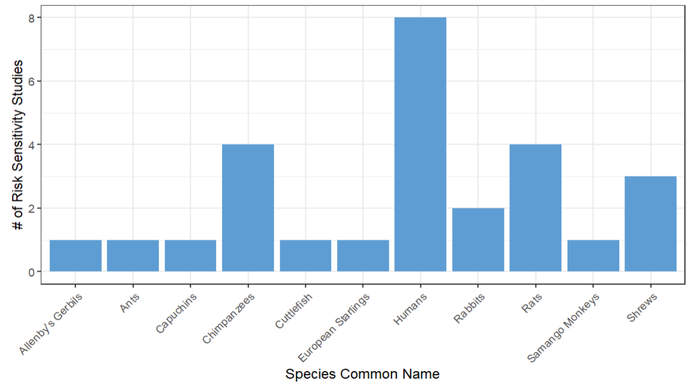

Figure 3. This figure represents the number of studies showing risk-sensitivity grouped by species. The majority of studies in the last decade have focused on humans and other mammals, but few studies have focused on birds, insects, and fish.

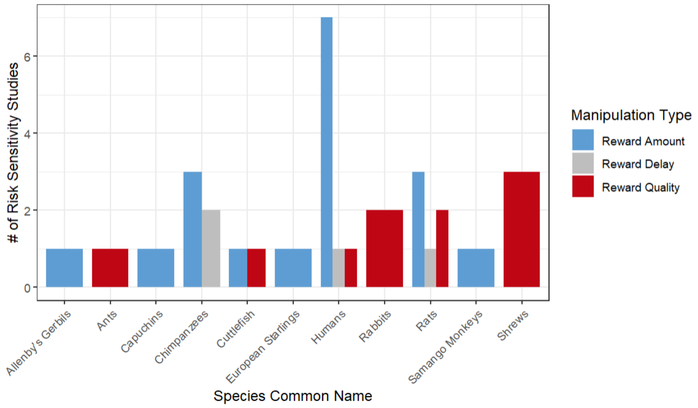

Figure 4. Bars in the figure above represent the number of studies grouped by species based on manipulation type. Reward amount was used most frequently, with delay being used only among mammals.

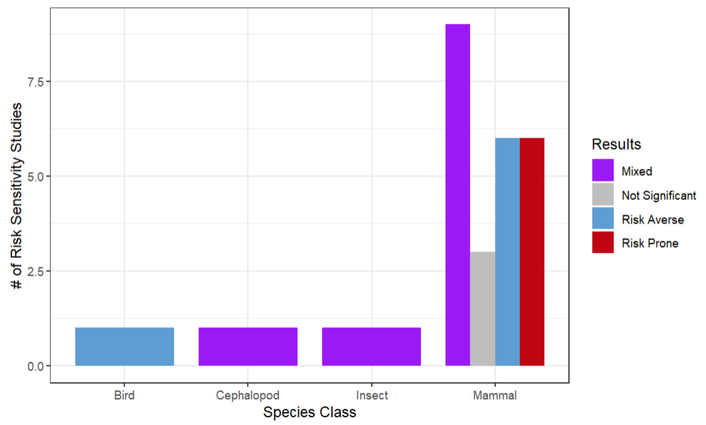

Figure 5. This figure depicts the observed choice bias grouped by taxonomic class. Results have been primarily mixed with mammals being the most frequently studied.

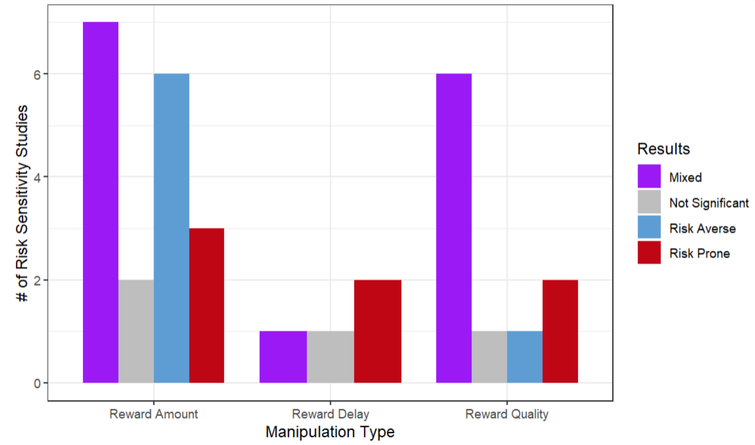

Figure 6. Bars represent the frequency of choice bias in relation to manipulation. Studies of reward amount and quality resulted in mixed results whereas reward amount resulted in risk-aversion.

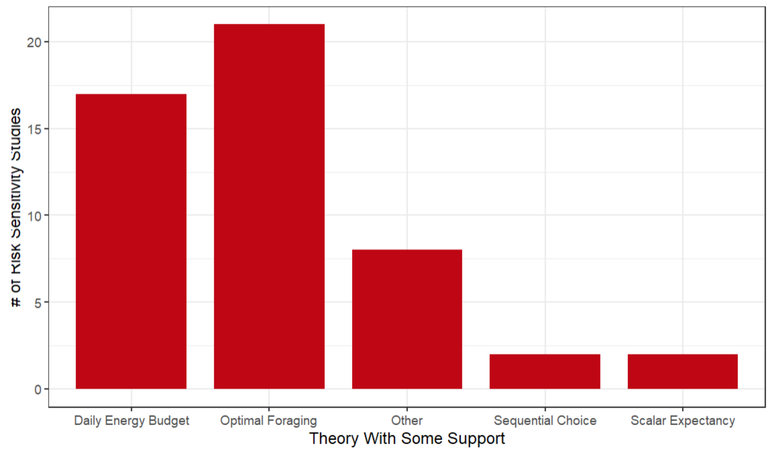

Figure 7. This figure shows the frequency of support for theories/models of risk-sensitive foraging. Results revealed an overwhelming support for optimal foraging and daily energy budget, with little on sequential choice and scalar expectancy.

Discussion

- The findings indicate that humans and other mammals were frequently the subjects of risk-sensitive foraging studies.
- Studies in the past decade lack manipulations of delay to reward, indicating the need for future research.
- Studies often reported mixed results with animals being both risk-averse and risk-prone.
- In light of our findings of risk-sensitive foraging, future directions should focus on bird and insect as subjects, considering there is little research on those taxonomic classes across this topic of interest.