

# Risk Assessment and Recommendations for Foresters Exposure to Hymenoptera

## Background

- Ants, bees, hornets, wasps, and yellow jackets (Order Hymenoptera) are a serious concern to outdoor workers as venom from their stings has the potential to cause life-threatening allergic reactions.



Photos of Honey Bee, Red Velvet Ant, and Paper Wasp, respectively. (www.pestworld.org)

## Purpose of the Study

- Assess current occupational safety training regimes and impacts of Hymenoptera stings on forestry workers across the United States.
- Develop an educational brochure as a potential tool to train outdoor workers and reduce risk of Hymenoptera exposure.

## Methods

- Study period: March 21, 2017 – April 14, 2017
- Study tool: Survey developed in Qualtrics
- 1,999 participants were sent a link to the 29 question survey through an email. A reminder email was sent two weeks later, and three and a half weeks after the initial email was sent, the survey was closed to responses.
- An educational brochure was developed as a potential tool for training on how to avoid Hymenoptera exposure.

## Participant Recruitment

- Candidate selection was generated through online research of forestry employees and members of major government, public corporations, private corporations, clubs, service organizations, and professional organizations.
- Participants represented 39 US states representing each region and division of the US.
- Participants were placed into 4 groups (West, Midwest, Northeast, and South) based on the US region in which they were employed.

## Data Analysis

- Statistical analysis software used: SPSS
- Chi-Square Tests of Independence were conducted to assess if there was a significant difference between:
  - Incidence of a participant being stung while at work and whether or not the participant received Hymenoptera safety related training
  - Participants receiving Hymenoptera safety related training and participants carrying a medical first aid kit with supplies to treat Hymenoptera stings
  - Participant having a known allergy to Hymenoptera and carrying a medical first aid kit with supplies to treat Hymenoptera stings
- A significant difference was determined when  $p < 0.05$ .

## Results

- 552 outdoor workers responded to the survey, but 78 responses were excluded for too few questions answered.
- 474 participants were included in the data analysis (24% response rate).
- The participants were from the following regions:
  - South: 198 (41.8%)
  - West: 94 (19.8%)
  - Northeast: 132 (27.9%)
  - Midwest: 60 (12.7%)

## Results, Continued

### Chi-Square Tests

- Allergic individuals were more likely to carry a medical first aid kit that includes supplies to treat Hymenoptera stings ( $p = 0.000$ )
- Participants receiving Hymenoptera safety training were more likely to carry a medical first aid kit that included supplies to treat Hymenoptera stings ( $p = 0.000$ )

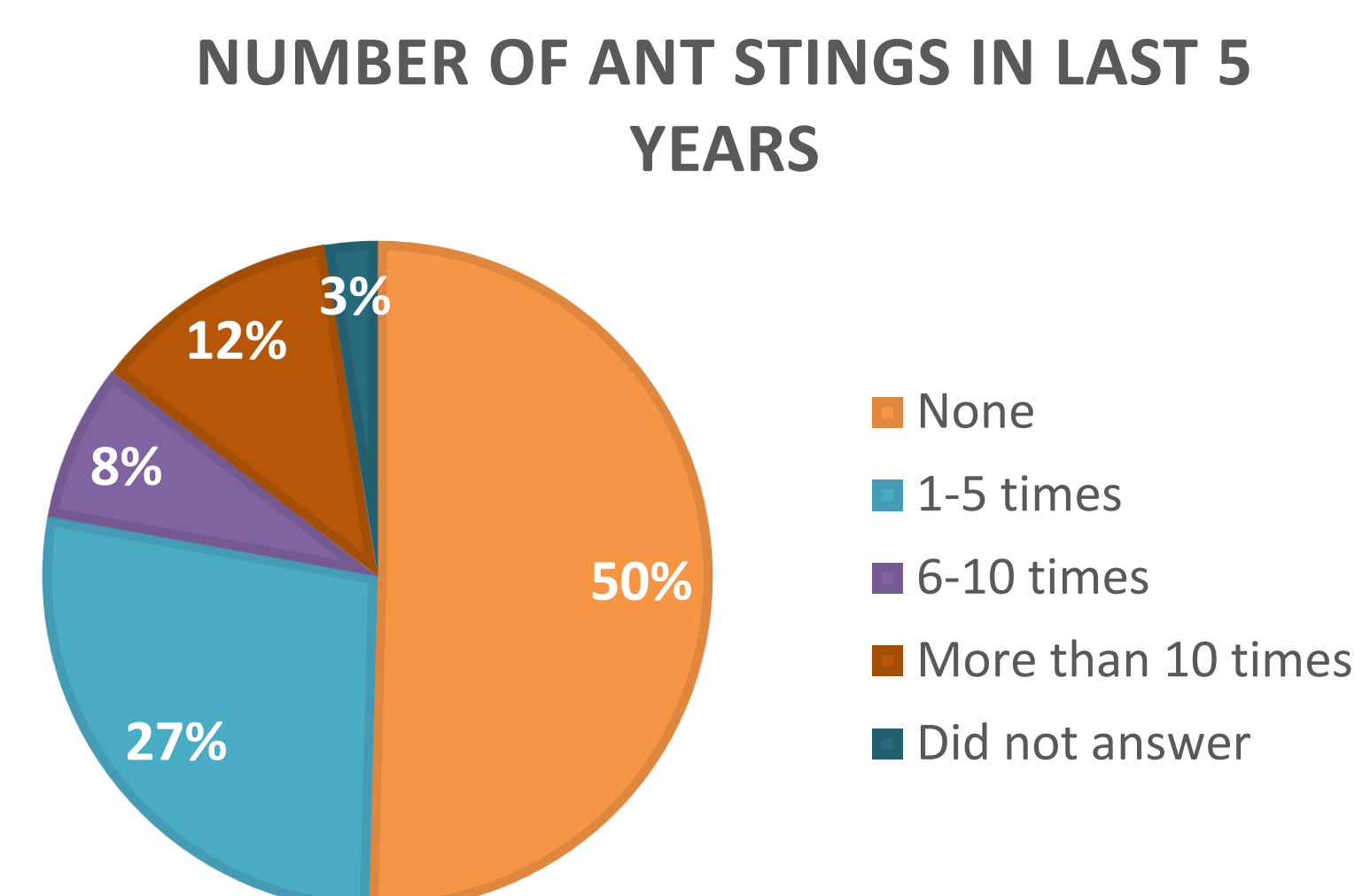


Figure 1. Number of reported ant stings in last 5 years (all regions).

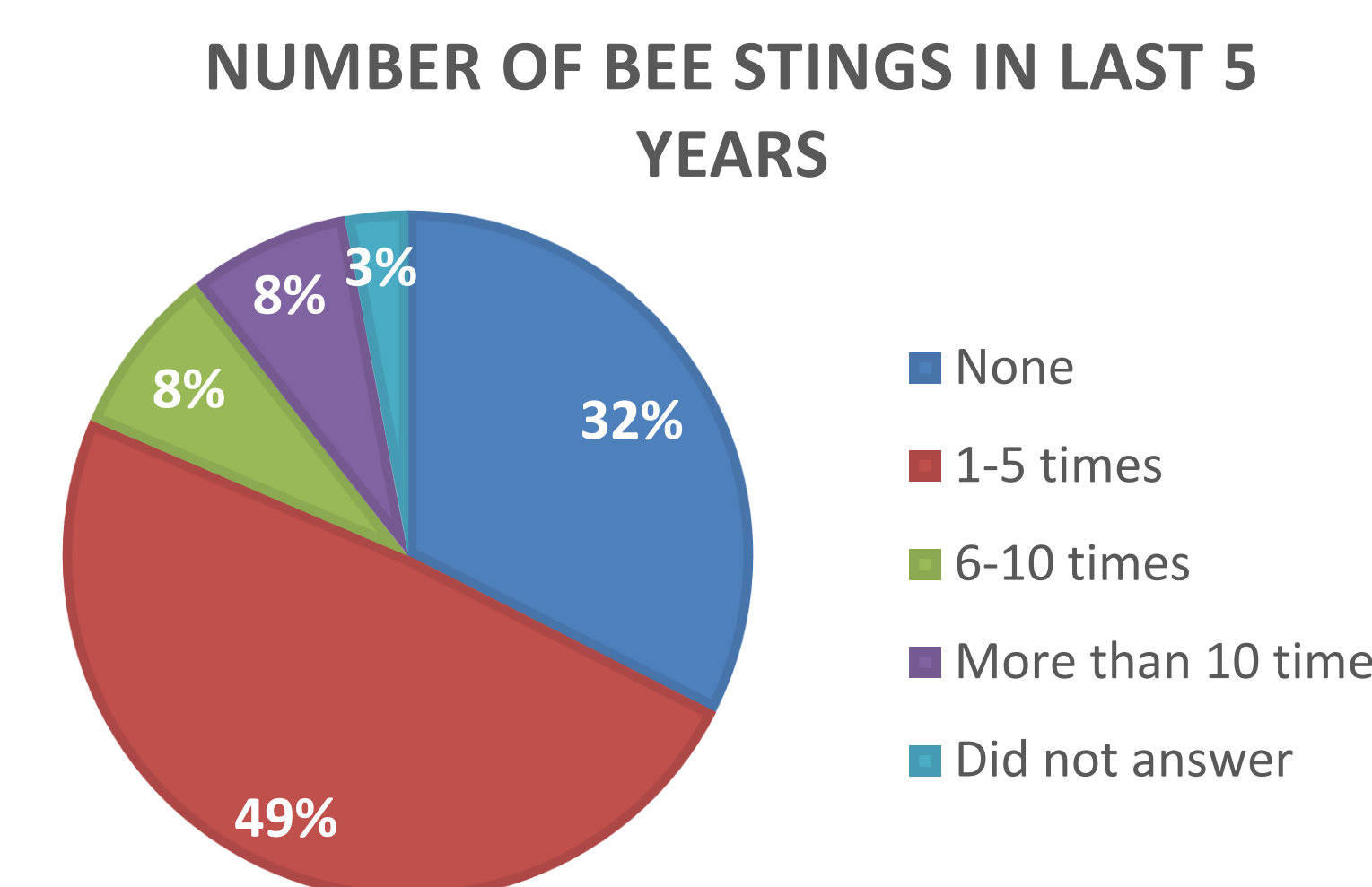


Figure 2. Number of reported bee stings in last 5 years (all regions).

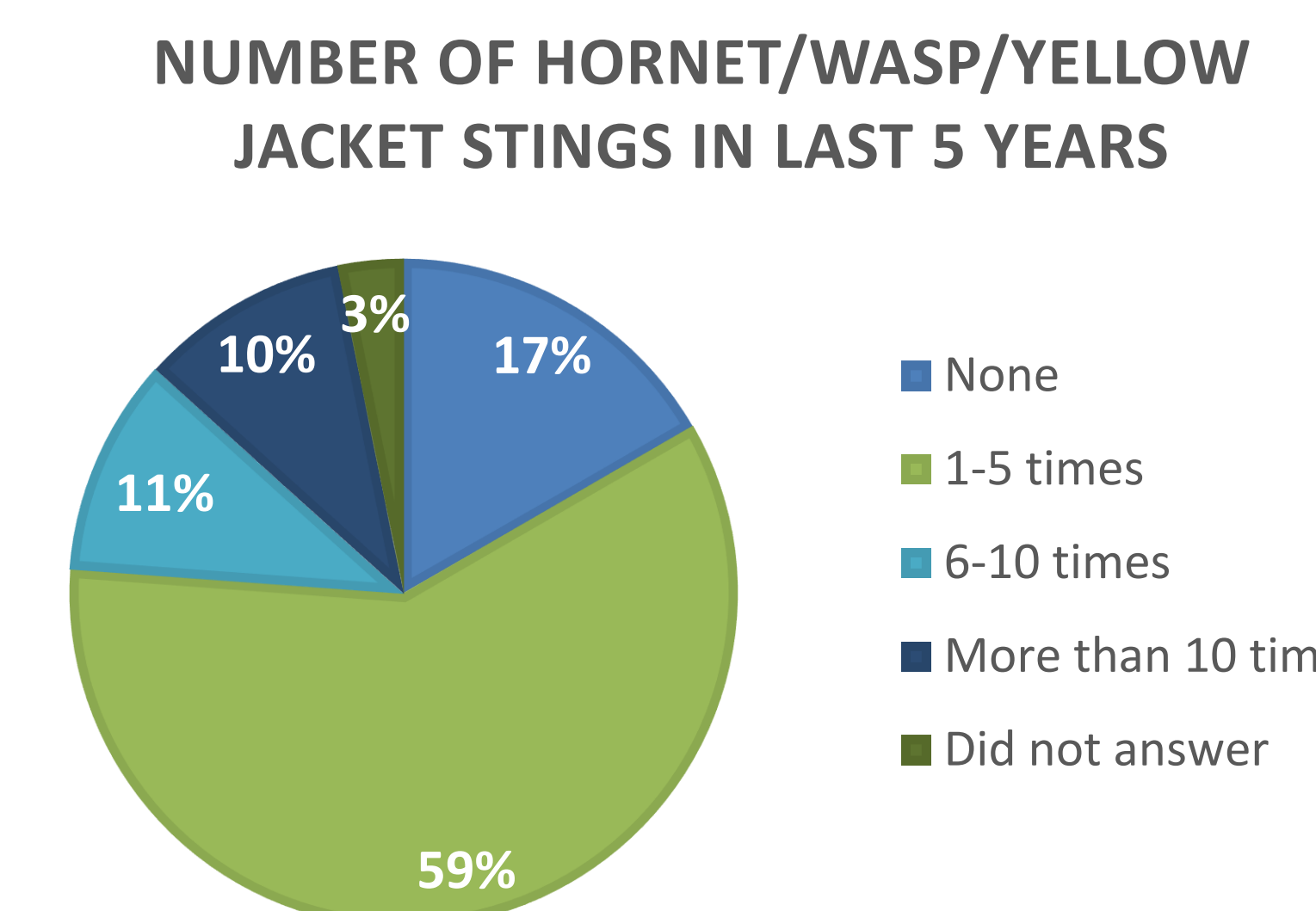


Figure 3. Number of reported hornet, wasp, and yellow jacket stings in last 5 years (all regions).

### Incidence of Hymenoptera stings

- Ant stings are a primary concern in the South with over 75% of participants reporting being stung in the last five years but 35% or less reporting this in other regions.
- Bee and hornet/wasp/yellow jacket stings are a concern in all four regions with over 60% of participants reporting being stung in each region.

### Symptoms Associated with Stings

- Ant stings predominately caused either no reaction (25.6%) or a local skin reaction (68.5%) in participants.
- Bee stings mainly caused local skin reactions (76.1%) or no reaction (11.0%).
- Hornet/wasp/yellow jacket stings similarly caused local skin reactions (76.3%) but also caused the most large local reactions (10.0%).

### Protective Measures Taken to Limit Hymenoptera Exposure

- Most participants wore long pants (70.3%) and long-sleeved shirts (53.0%) to avoid Hymenoptera exposure.
- Other protective measures included wearing light-colored clothing (20.3%), gloves (21.5%), applying insect repellent (33.5%), and not wearing cologne or perfume (25.7%).

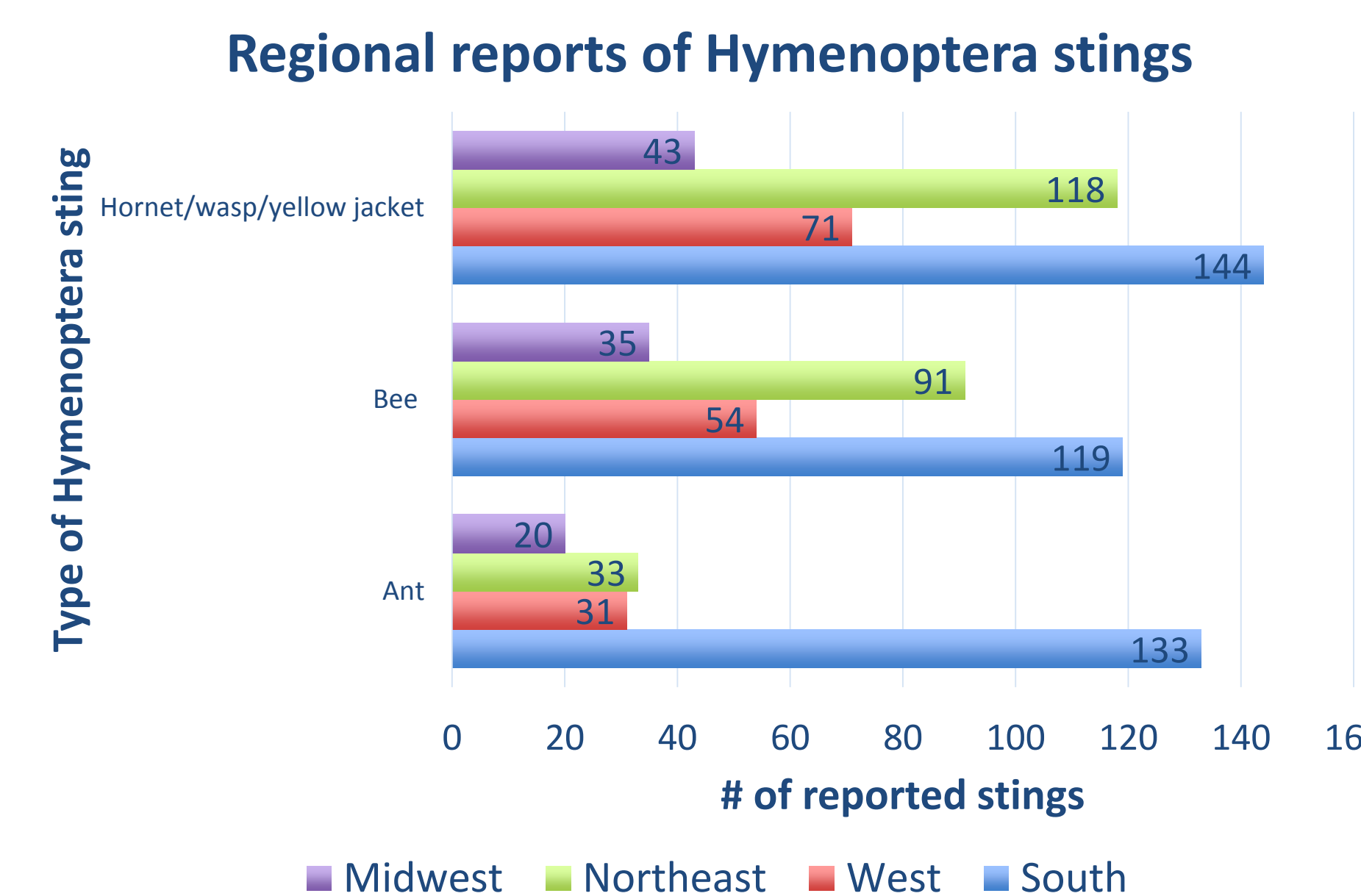


Figure 4. Comparison of types of Hymenoptera stings by region.

## Results, Continued

### Safety Training Topics

- Most participants (69.4%) reported not receiving any Hymenoptera safety related training from their employers.
- Of the 27.8% of participants who did report receiving Hymenoptera safety related training, 95.3% reported that this training lasted less than 1 day.
- Topics covered in training included:
  - Risk of exposure to Hymenoptera
  - Insect identification
  - Adverse effects of Hymenoptera stings
  - What should be done when stung/bitten
  - What should be done to prevent stings/bites
  - Other

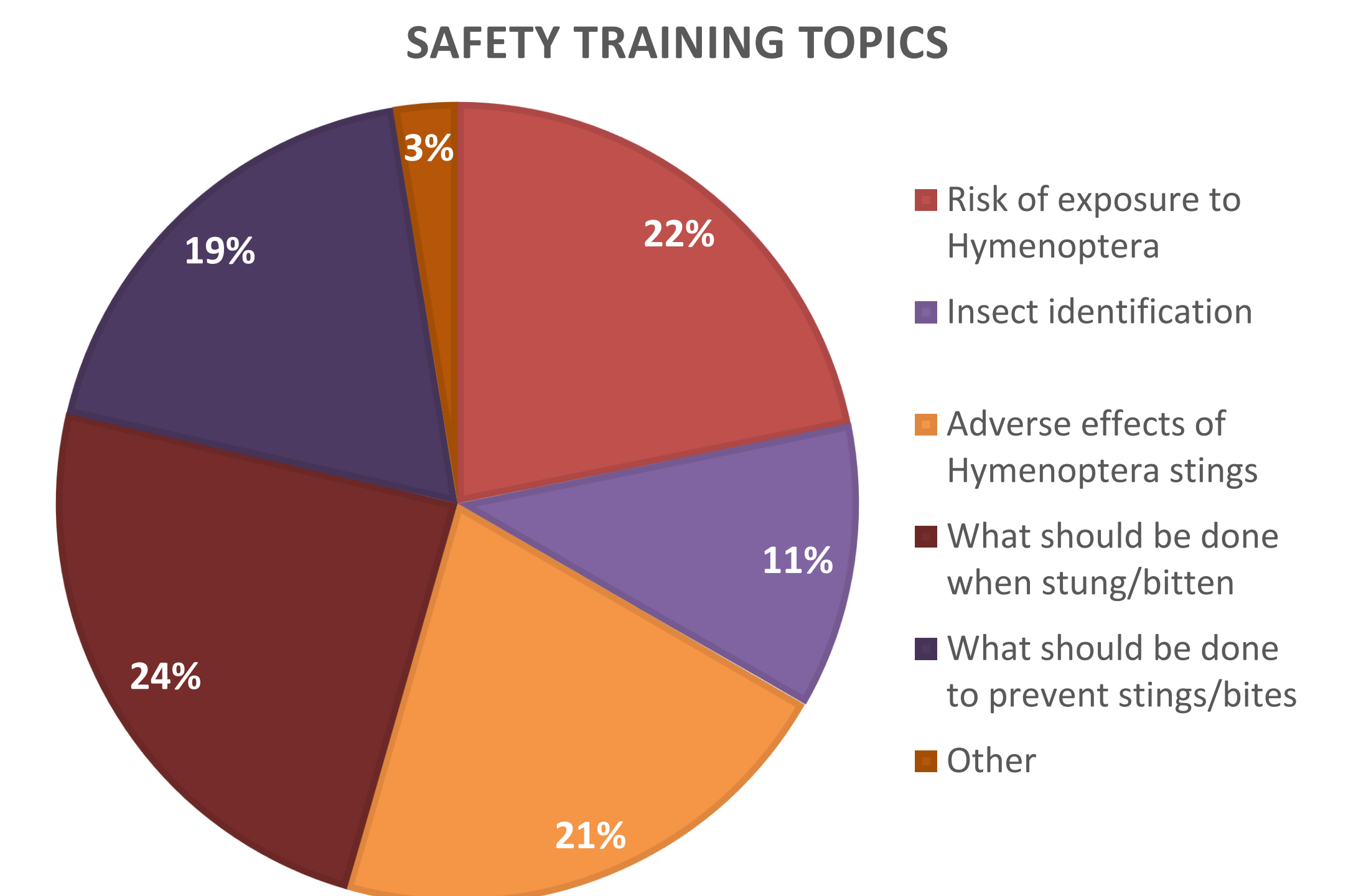


Figure 5. Topics covered in Hymenoptera related safety training provided by employers (all regions).

## Discussion

- More emphasis needs to be placed on training foresters/outdoor workers on the various types of Hymenoptera.
- Being able to correctly identify the types of Hymenoptera and their nesting habits and behavioral characteristics is crucial for foresters/outdoor workers.
- The educational brochure developed should be distributed to employees or something similar such as the NIOSH recommendations.
- Differences in the number of response rates per region should be considered when interpreting the results from this study.

## Future Studies

- Analysis of specific activities related to Hymenoptera exposure.
- More in depth analysis of specific types of Hymenoptera that are most commonly encountered in the various regions and states of the US as well as the typical immune responses these Hymenoptera cause when a worker is stung/bitten.

## Acknowledgments

- Special thanks to all foresters/outdoor workers who participated in this study.