

# 2022 Entomology Games

## Behavior & Ecology

**Q:** The Swedish word for 'play' is the source of what behavioral term for an aggregation of male insects or other organisms displaying for females?

**A:** Lek

**Q:** What type of pollination is a specific form of sonication in which bees use vibrations to remove and collect pollen from flowers, resulting in unintentional fertilization of the flowers?

**A:** Buzz pollination

**Q:** Due to shorter season length and lower food availability, smaller-bodied insects are often found at higher latitudes than larger-bodied insects. This violates what ecological principle, which was described by a German biologist in 1847, and states that species of larger body size are found at higher latitudes in cooler environments?

**A:** Bergmann's rule

**Q:** What two insect orders contain species that comprise the main diet of pileated woodpeckers? The prey species in these orders are commonly found in logs and dead trees, and the woodpeckers excavate deep holes to reach the wood-dwelling larvae inside.



**A:** Hymenoptera & Coleoptera

**Q:** What family of wasps will squeak audibly in response to threats, using stridulatory plates on the abdominal tergites? If the warning is ignored, they can deliver a painful sting.

**A:** Mutillidae

**Q:** In order to prevent overheating, some Odonata will raise their abdomens with the tip pointing at the sun to minimize the surface area exposed to the sun. This posture is commonly named after what type of architectural structure? An Egyptian-style monument with scarab hieroglyphs, called Cleopatra's Needle, is a famous example of this type of architectural structure.

**A:** Obelisk / obelisking

**Q:** What group of allelochemicals includes chemical signals that act as repellents and benefit the signal's producer, not the perceiving organism?

**A:** allomones

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**Q:** Which category of sociality is defined as having members of the same generation co-occurring in a colony, but with no reproductive division of labor, and no brood care at all? This degree of social behavior has traditionally been considered more "primitive" than quasisocial behavior, but more "advanced" than subsocial behavior.

**A:** communal behavior

**Q:** Many mammal species are known for eating ants, but what endangered marsupial in the genus *Myrmecobius* is one of the few mammals that feeds exclusively on termites?



**A:** Numbat

**Q:** According to a recent paper in the Annual Review of Entomology, there are four primary ways that insects generate vibrational signals. Three of these are stridulation, tremulation, and tymbalation. What is the fourth way of generating vibrations? The name of this behavior is also associated with Anne Lantree, who in the 1960s was a member of a British group that called themselves The Honeycombs.

**A:** Drumming [The Honeycombs was a band, Anne Lantree was their drummer]

**Q:** In this photo, a soldier of the ant species *Cephalotes varians* is shown exhibiting what behavior, defined as closing the nest by a specially adapted body part?



**A:** phragmosis

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**Q:** Some Hymenoptera exhibit a mating behavior where a winged male will use a genital-locking mechanism to carry a wingless female during mating. This facilitates dispersal of the female to a new location for eventual oviposition. What two-word term was first used by Howard Evans in 1969 to describe this combination of transportation and mating behavior?

**A:** phoretic copulation

**Q:** The spittlebug species studied by Silva et al. has multiple color forms within the same population. Both color-form phenotypes are maintained because one is correlated with higher fertility, and the other is correlated with reduced parasitism. When multiple phenotypes are maintained within a population by contending selective pressures, it is usually referred to as what type of polymorphism?

**A:** balanced

**Q:** What insect mating behavior, sometimes associated with lekking behavior, involves groups of males aggregating on high ridges or other exposed promontories to wait for females?

**A:** hilltopping

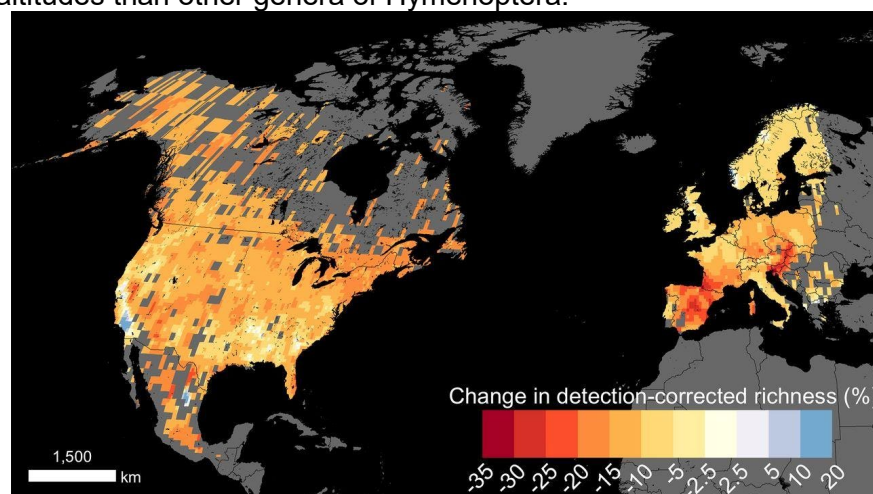
**Q:** In March 2022, overblown news articles claimed that giant spiders were soon expected to rain from the sky across the East Coast. The Joro spider, *Trichonephila clavata*, was the cause of this news hype. What is the term for the common dispersal technique used by the Joro spider, involving the release of silk to catch air currents and help it become airborne?

**A:** ballooning or kiting

**Q:** Large bands of Mormon crickets can often be seen moving en masse in the western US. The crickets at the front of the band consume seeds, leaves, carrion, and feces, but these food sources are usually depleted before the crickets at the back of the band have a chance to eat. What do those crickets eat instead?

**A:** other Mormon crickets

**Q:** Soroye et al.'s 2020 population dynamics study used a database with over half a million occurrence records to study the recent loss of biodiversity in what well-known insect genus? The map pictured here only shows species-richness changes in North America and Europe because this genus of pollinators is typically found in temperate climates, often at higher latitudes and altitudes than other genera of Hymenoptera.



**A:** *Bombus*

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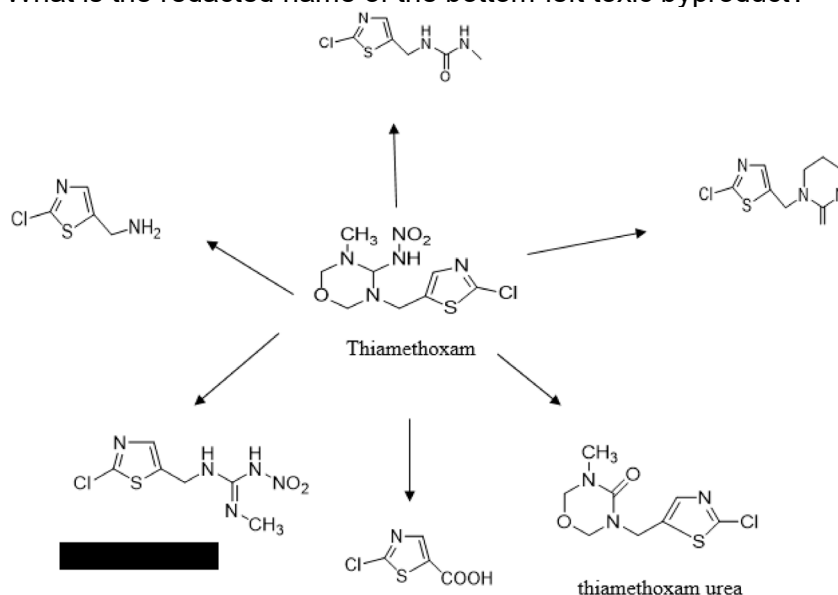
**Q:** Caterpillars of the species *Thaumetopoea pityocampa* exhibit what notable dispersal behavior? This behavior is the source of their common name, the pine processionary.

**A:** They move in a single-file line, head-to-tail

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## Biochemistry & Toxicology

**Q:** This diagram from Borsuah et al. depicts byproducts of the photocatalytic degradation of thiamethoxam. What is the redacted name of the bottom-left toxic byproduct?



**A:** Clothianidin

**Q:** In most insects, what is the most abundant class of yolk protein precursors that accumulate within insect oocytes during development?

**A:** Vitellogenins

**Q:** The compound poly( $\beta$ -(1–4)-N-acetyl-D-glucosamine) is better known as what?

**A:** chitin

**Q:** What is the most common form of nitrogen waste excreted by terrestrial insects?

**A:** Uric acid

**Q:** Group 5 of the IRAC insecticide classification system contains a class of insecticides that are nicotinic acetylcholine receptor allosteric modulators that act on site I, causing hyperexcitation of the nervous system. Name this class of insecticides.

**A:** Spinosyns

**Q:** Screenings of field populations of red cotton bugs in Pakistan demonstrated resistance to several insecticides that are modulators of nicotinic acetylcholine receptors. They were also resistant to emamectin benzoate, which has what other mode of action? This mode of action is characteristic of all avermectins.

**A:** a glutamate-gated chloride channel allosteric modulator

**Q:** IRAC Group 11 insecticides include subgroup 11a and subgroup 11b, both of which are microbial disruptors of insect midgut membranes. Subgroup 11a includes subspecies of *Bacillus thuringiensis* and the many insecticidal proteins they produce. What other *Bacillus* species is included in subgroup 11b?

**A:** *Bacillus sphaericus*

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**Q:** Permethrin is an insecticide commonly used to repel and kill mosquitoes. What is its mode of action?

**A:** sodium channel modulator

**Q:** In the red imported fire ant, a gene known as general protein-9 (or Gp-9) is a major marker of queen social form. To which family of genes does general protein-9 belong?

**A:** odorant-binding protein gene family (OBP)

**Q:** Insects may specialize on host plants that are poisonous to other herbivores, and often incorporate those toxins into their tissues as a defense against predation. What is the term that describes this selective uptake of plant secondary metabolites?

**A:** sequestration

**Q:** Probit analysis is frequently used in determining the LD50 of toxins. What type of response variable is taken by probit analysis?

**A:** Binomial / Binary

**Q:** Insects were recently found to have incorporated more than 1,400 genes from bacteria, fungi, plants, and viruses into their own genomes. These stolen genes have helped insects in many ways, including to neutralize toxins. What order was found to be the most prolific gene thief, with an average of 16 transferred genes per species?

**A:** Lepidoptera

**Q:** Malaria parasites are known to manipulate host odors to make the host more attractive to mosquitoes. A similar phenomenon was recently found for the dengue virus. What odorant compound was found to be emitted in higher quantities by patients sick with dengue and serves as a mosquito attractant?

**A:** Acetophenone

**Q:** Playing a critical role as an energy source, what is the principal sugar circulating in insect hemolymph?

**A:** trehalose

**Q:** What chemical compound is an active ingredient some dermatologists use for wart removal, and is commonly known in the medical field as beetle juice, which is a more taxonomically accurate name than its other common name, Spanish fly?

**A:** cantharidin

**Q:** 2021 saw the 100th anniversary of what pesticide application method, which was developed in response to an outbreak of the catalpa sphinx moth? This method is still used today, but now with products that tend to be liquid in formulation.

**A:** crop dusting

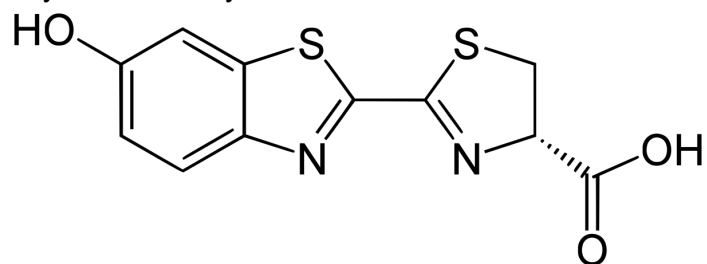
**Q:** In June 2022, Anja Weidenmüller et al. published work demonstrating impaired social thermoregulation in buff-tailed bumble bees (*Bombus terrestris*) due to what widely used non-insecticide agrochemical?

**A:** glyphosate

**Q:** In a two-step reaction, this compound is adenylated by ATP and magnesium, then oxidized, resulting in emission of a photon as it returns to its ground state. What is the name of this

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compound that is found in fireflies and other bioluminescent insects? Do NOT give the name of the similarly named enzyme that catalyzes the reaction.



**A:** luciferin



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## Biological Control

**Q:** Augmentative biological control can be further subdivided into two strategies: one describes the release of an overwhelming number of natural enemies, while the other describes the periodic release of natural enemies to maintain their population. What are the appropriate terms for BOTH techniques?

**A:** Inundation and inoculation

**Q:** Since 2003, the derodontid beetle *Laricobius nigrinus* has been released as a classical biological control agent in the eastern US, to control the winter generation of what insect pest species?

**A:** Hemlock wooly adelgid (*Adelges tsugae*)

**Q:** A 2022 PNAS paper by LeBrun et al. suggested that the fungus *Myrmecomorba nylanderiae* may be an effective biocontrol agent against what insect species?

**A:** tawny crazy ant, *Nylanderia fulva*

**Q:** Stink bugs are normally considered to be crop pests, but some predatory species can be beneficial biological control agents. In some parts of the US, Colorado potato beetle has been controlled by releases of the two-spotted stink bug and what other predatory pentatomid in the genus *Podisus*?

**A:** Spined soldier bug (*Podisus maculiventris*)

**Q:** There have been 5 ESA Plant-Insect Ecosystems Science Policy Field Tours since 2017. Two have been themed after pollinators, one after insecticide resistance, one on invasive species, and the 2022 field tour took place in Washington State, centered on what integrated pest management-based topic?

**A:** Biological Control

**Q:** The chrysomelid genus *Galerucella* has been highly successful in controlling what invasive weed in wetlands throughout the United States?

**A:** Purple loosestrife (*Lythrum salicaria*)

**Q:** In 1905, the USDA initiated its first large-scale biological control program, sending entomologists to Europe and Japan to look for natural enemies of two moth species in what family of Lepidoptera?

**A:** Erebidae [*Lymantria dispar* and *Euproctis chrysorrhoea*]

**Q:** *Neoseiulus californicus* is a predatory mite used to control populations of the spider mite *Oligonychus perseae* in agricultural settings. This is mainly to prevent *O. perseae* from damaging what host plant, which has the scientific name *Persea americana*?

**A:** avocado

**Q:** What type of parasitism occurs when an insect deposits its eggs in the nest of another insect, diverting the host resources to their offspring?

**A:** brood parasitism

**Q:** The invasive weed Scotch broom (*Cytisus scoparius*) can be controlled by the insect *Exapion fuscirostre* in some settings. What family of insects does this biological control agent belong to?

**A:** Brentidae; common name is the Scotch broom seed weevil.



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**Q:** Kheirodin et al. used molecular gut content analysis at a field site in Georgia to survey the common natural predators that contributed to control of silverleaf whitefly. The largest contributors were fire ants, and species in what genus of Hemiptera? This predatory genus in the family Anthoridae is perhaps better known for being a biological control agent of thrips.

**A:** *Orius*

**Q:** Since 2010, Mark Hoddle's lab has been releasing the parasitoid *Tamarixia radiata* in California, as part of a program to manage *Diaphorina citri* populations and prevent the spread of huanglongbing or citrus greening disease. What invasive species is interfering with this classical biological control program by engaging in intraguild interactions with the parasitoid and its host?

**A:** Argentinian Ant, *Linepithema humile*

**Q:** What two-word term, redacted from the pictured article, has historically been used to describe the way a predator's rate of prey consumption changes alongside the changing density of its prey?

BioControl (2022) 67:161–172  
<https://doi.org/10.1007/s10526-021-10127-1>



## Predator [REDACTED] and the biocontrol of aphids and mites

John P. DeLong · Stella F. Uiterwaal

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**Abstract** Biocontrol with predators is a key tool for controlling agricultural pests and preserving the productive efficiency of crops. Determining which predators to use for biocontrol often involves measuring their [REDACTED]—the relationship between foraging rate and prey abundance, yet

### Introduction

Biocontrol predators are used to control herbivorous pest populations on crops by increasing pest mortality and reducing their abundance (Memmott et al. 2000; Stiling and Cornelissen 2005; Singh 2014; Anwer

**A:** functional response

**Q:** The multicolored lady beetle, *Harmonia axyridis*, was deliberately introduced into the US for biological control of aphids, but has since been implicated in the tainting of wine and is now considered a nuisance. Name one other detrimental impact commonly attributed to *Harmonia axyridis*.

**A:** Invading homes and other structures to overwinter; emitting an acrid odor; secreting yellow fluids that can stain surfaces; causing allergic reactions and biting

**Q:** The eulophid parasitoid wasp *Edovum puttleri* was successfully mass-released by the New Jersey Department of Agriculture to control Colorado potato beetle in eggplant. However, this biological control program was suspended in the mid-1990s, allegedly due to the increased popularity of what insecticide?

**A:** Imidacloprid

**Q:** *Aphidius* wasps are often used in aphid biological control programs. These parasitoid wasps normally leave round, smooth exit holes in the aphid mummies, but sometimes greenhouse

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managers see uneven, jagged holes in the aphid mummies instead. The presence of these jagged holes indicates a significant threat to the effectiveness of the control program. What is the source of this threat?

**A:** Presence of hyperparasitoids that are parasitizing the *Aphidius* wasps

**Q:** What is the scientific name of the encyrtid egg parasitoid that has been released in the US to help manage the emerald ash borer? This species was described in 2005, and its specific epithet was inspired by the genus name of the emerald ash borer.

**A:** *Oobius agrili*

**Q:** This genus of small, black lady beetles is native to North America, especially in the mid-Atlantic and Midwestern United States. It prefers to feed on Tetranychidae and is sometimes referred to as the spider mite destroyer. What is this coccinellid genus?

**A:** *Stethorus*

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## Economic & Applied Entomology

**Q:** In May 2022, the Peterboro Basket Co. in New Hampshire announced that they would be closing after 168 years. The company specializes in woven baskets, primarily produced using wood from Appalachian white ash trees. An insect pest has contributed to reduced availability of basket-making materials and this is one of the factors that led to the company's decision. What is the common name of the insect pest?

**A:** emerald ash borer (*Agrilus planipennis*)

**Q:** In a 2021 paper in the Journal of Insect Science, Willard Robinson documented the first discovered stopover site of the economically important *Apis dorsata* in a mango orchard in Thailand, with their fidelity to this site having implications for land conservation. Shown here, what is the term for the form of temporary nest that the colony creates at this resting site?



**A:** bivouac

**Q:** *Epilachna varivestis* and *Epilachna borealis* are two pest species in the US that belong to what family of beetles, which is normally considered to be beneficial?

**A:** Coccinellidae

**Q:** Pacheco et al. recently published a report of their successful CRISPR-mediated genome modification of what economically important Hemipteran species? The results can hopefully be used to limit this leafhopper's ability to transmit *Xylella fastidiosa* to grapes and other host plants.

**A:** Glassy-winged sharpshooter (*Homalodisca vitripennis*)

**Q:** Varroa mites can be managed through a non-chemical method that utilizes the placement and subsequent removal of specific types of frames in hives. What is the name of this selective method that attracts Varroa mites?

**A:** Drone Brood Trapping / Drone Brood Removal

**Q:** The California Endangered Species Act now protects four species of bumble bees, representing the first insects to be protected under this state law. However, the bees are not protected as insects, but rather as another type of organism. What organism's definition in this law has a loophole that allows the bees' protection?

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**A:** fish

**Q:** Over the last 45 years, this aphid pest has spread from the Palearctic to southern Africa, Central America, and western North America. This aphid is native to parts of eastern Europe and can inject a toxin during feeding that inhibits chlorophyll production, resulting in heavy damage to certain grain crops. What is the common OR scientific name of this aphid pest?

**A:** Russian wheat aphid (*Diuraphis noxia*)

**Q:** The alfalfa weevil, *Hypera postica*, is common throughout the US. It was first detected in the early 1900s in what landlocked US state?

**A:** Utah

**Q:** A certain type of soft, white clay is used in the manufacture of porcelain and fine china. This versatile material is also used for insect control in organic agriculture. Its common name is derived from the name of a small Chinese village, and its trade name is a verb that describes what the product can do to plants to protect them. Give the common name OR the trade name of this product.

**A:** Kaolin clay, Surround

**Q:** According to a 2022 review of essential oils in the Journal of Economic Entomology, what plant family contains the essential oils that are most effective in controlling urban pests?

Examples of essential oils extracted from this plant family include tea tree oil, eucalyptus oil, and clove oil.

**A:** Myrtaceae

**Q:** What is the common name of the economically important tarsonemid mite *Polyphagotarsonemus latus*? This common name explicitly refers to a morphological character, but it could also refer to the mite's host preferences.

**A:** broad mite

**Q:** With an influx of new invasive species in Washington State, the WSDA has responded with periodic news blasts relating to each invasive insect - with alliterative and quippy titles. What is the scientific name of the insect that is the subject of the WSDA's Beetle Blasts?

**A:** *Popillia japonica*

**Q:** Insects in the family Psychidae, some of which are economically important pests of woody ornamentals, are given what common name that describes the unique structures created by their larvae?

**A:** bagworms

**Q:** The term corn rootworm refers to three species of *Diabrotica* that occur in the United States. What are the three 'directional' common names of these species?

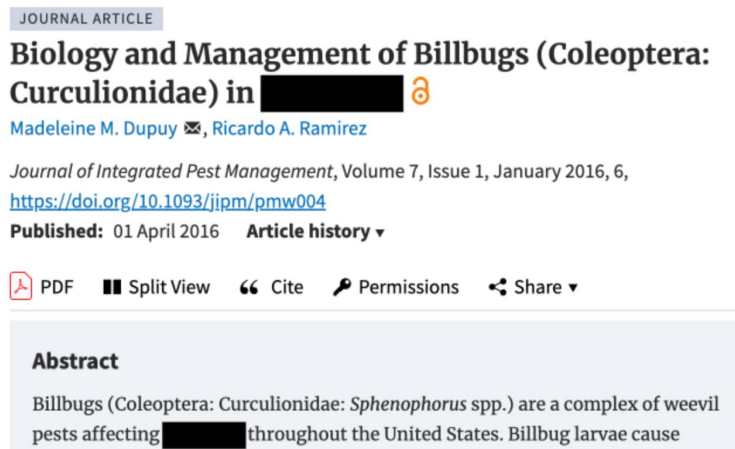
**A:** Northern, Western and Southern corn rootworm

**Q:** This cosmopolitan insect was first introduced into North America from Southeastern Europe and is now found wherever apples are grown. It can feed on the surface of apples, creating damage called a sting, which is ironic because this pest is NOT in Hymenoptera. What is the name of this serious pest of apples in the family Tortricidae?

**A:** Codling moth or *Cydia pomonella*

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**Q:** As emphasized in the pictured study by Dupuy and Ramirez, what type of non-agricultural plant commodity is frequently damaged by billbugs? Examples of this commodity include tall fescue and some members, but not all members, of the family Poaceae.



**A:** Turfgrass

**Q:** *Conotrachelus nenuphar* is a beetle species native to North America whose females lay their eggs in a variety of pome and stone fruit. Which of these fruits is mentioned in the official common name of this species?

**A:** Plum [Plum curculio]

**Q:** A volunteer training program was started in 1973 by Washington State Extension Agents. The program's curriculum can include entomology training, especially in relationship to growing plants. This program can now be found in all US states and 8 Canadian Provinces. What is the name of this program?

**A:** Master Gardener Program, or Extension Master Gardeners

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## IPM & Insect/Plant Interactions

**Q:** In 2020, Egan et al. proposed a new IPM framework, called IPPM, that enhances compatibility between traditional IPM practices and an additional aspect of crop management. The first P in IPPM still stands for 'pest'. What other entity, represented by the second P, is being managed in an IPPM framework?

**A:** Pollinators [Integrated Pest and Pollinator Management]

**Q:** Cecidology is not exclusive to entomology, but the two overlap considerably. Cecidology is defined as the study of what?

**A:** Plant galls

**Q:** Zekeya et al.'s 2022 field study suggested that fungal biopesticides were more effective than pheromone traps for controlling a certain major pest of tomato and solanaceous crops. What is the scientific name of this small lepidopteran pest, which is native to South America but has definitely, categorically, unquestionably spread to many other parts of the world?

**A:** *Tuta absoluta* or *Phthorimaea absoluta*

**Q:** First found in Pennsylvania in 2014, this insect now has established populations in 11 states and is a threat to eastern wine grape production. What is the name of this invasive fulgorid pest?

**A:** *Lycorma delicatula* or spotted lanternfly

**Q:** In 1983, a scientist with the Canadian Forest Service developed a trap made to resemble a tree trunk for monitoring woodboring beetles. What is the name of this trap?

**A:** Lindgren funnel trap

**Q:** Groundnut bud necrosis virus, or GBNV, can infect and significantly damage multiple crops, including peas, cowpeas, and soybeans. The predominant vector of this tospovirus is a non-holometabolous insect in what family?

**A:** Thripidae (*Thrips palmi*)

**Q:** The terms dichotomous, descriptive, and fixed can all be used to describe specific types of what IPM concept, defined as "the population density at which control action should be initiated to prevent an increasing pest population from reaching the economic injury level"?

**A:** economic threshold

**Q:** The EPA divides biopesticides into three major classes: Microbial pesticides, biochemical pesticides, and a third class referred to by the acronym PIP. What does PIP stand for? As an extra hint: neither of the P's in PIP stand for 'pesticide.'

**A:** Plant-incorporated-protectants (PIPs)

**Q:** Wet spots on tree bark, and tree trunks leaking an oozy mixture of gummy sap and small wood particles, are indicators of an infestation of what insect species, which is considered the most destructive pest of stone fruits in many US states, and which overwinters as a partially-grown larva under the bark? Mating disruption tactics are often used to manage both this pest and its 'lesser' sister species.

**A:** *Synanthedon exitiosa*, peach tree borer

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**Q:** What method of cultural control involves protecting a target crop by growing other plants, that are more appealing to insect pests, alongside the target? Specific examples of this form of cultural control include "perimeter," "sequential," "dead-end," and "push-pull."

**A:** trap cropping

**Q:** The state of California is largely responsible for producing the majority of the nation's figs. What invasive species, which is already a pest in Europe, North Africa, and the Middle East, was detected in Southern California figs in 2021? Unlike some other fig pests, this invasive insect exclusively reproduces on figs.

**A:** Black fig fly, *Silba adipata*

**Q:** Some beekeepers try to limit mite populations in their hives by breeding honeybee lineages that are selected for increased participation in what behavior? This behavior involves physical removal of mites, and bees can either do it individually or collaboratively with other members of the hive.

**A:** grooming behavior

**Q:** The USDA recommends that a certain biological control agent NOT be released in areas that are home to the endangered southwestern willow flycatcher. This is because the biological control agent is a beetle that feeds on saltcedar trees, which is where flycatchers make their nests. What is the official common name of this chrysomelid beetle, with the scientific name *Diorhabda elongata*?

**A:** Mediterranean tamarisk beetle

**Q:** 2022 is the 50th anniversary of an executive order that formally instructed the U.S. government to develop and promote the use of IPM practices. Which U.S. president issued this executive order?

**A:** Richard Nixon

**Q:** What type of trap was originally developed as a housefly trap in Europe in the late 19th-century, but is now used for survey work with fruit flies? This trap is typically baited with either Torula yeast, or a combination of ammonium sulfate and hexanol.



**A:** McPhail trap

**Q:** The use of plant resistance to manage insect pests in the US dates back to the late eighteenth century, when resistance to what dipteran agricultural pest was observed in the "Underhill" variety of wheat?

**A:** Hessian fly, *Mayetiola destructor*



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**Q:** In 2011, the USDA awarded what was at the time its largest ever Specialty Crop Research Initiative grant, totaling over \$10 million. The grant was awarded to members of an IPM Working Group for the control of what invasive species? This species was first collected in the US in Pennsylvania in 1998, and its nymphal instars are known to feed on a wide range of host plants using piercing-sucking mouthparts.

**A:** Brown marmorated stink bug or *Halyomorpha halys*

**Q:** In 2021, Puig et al. discovered two new mealybug vectors for a mosaic virus in the *Badnavirus* genus that can infect what economically important tree? Some mealybugs can also transmit a swollen shoot virus to this tree, which has significantly impacted growers of this tree in western Africa.

**A:** Cacao/Cocoa (*Theobroma cacao*)

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## Medical, Urban, and Veterinary Entomology

**Q:** Name the family and the genus that vectors *Loa loa*, an eye worm endemic to Central and West Africa.

**A:** Tabanidae, *Chrysops*

**Q:** La Crosse virus, an encephalitic virus most commonly found in the upper midwest, mid-atlantic, and southeastern US, is primarily vectored by what insect species?

**A:** *Aedes triseriatus*, Eastern treehole mosquito

**Q:** A 2018 PNAS study identified heneicosane as the first known royal-recognition pheromone for which economically important species?

**A:** subterranean termite, *Reticulitermes flavipes*

**Q:** Urticaria is a medical condition associated with skin irritation caused by defensive hairs, which are also known as urticating setae. These setae can be found on immatures of what insect order?

**A:** Lepidoptera

**Q:** Which species of *Plasmodium* accounts for the majority of malaria cases worldwide?

**A:** *Plasmodium falciparum*

**Q:** Transmission of *Bartonella* bacteria responsible for causing bartonellosis in humans and other animals occurs through inoculation of frass. *Bartonella* DNA has been detected in many blood-feeding arthropods, but only three orders contain species that are confirmed competent vectors of *Bartonella*. Name two of these three orders.

**A:** Phthiraptera/Psocodea, Siphonaptera/Mecoptera, Diptera

**Q:** In February 2022, the CDC approved recommendations for use of a newly licensed vaccine for travelers to parts of Europe and Asia. This vaccine protects against a rare but serious disease that attacks the central nervous system and is transmitted primarily by *Ixodes ricinus* and *Ixodes persulcatus*. What disease is this vaccine for?

**A:** Tick-borne encephalitis

**Q:** Many vector-borne diseases are maintained in animal populations by enzootic vectors. What is the term for the vector species that transmits the pathogen from an animal reservoir to humans?

**A:** bridge vector

**Q:** Spheksophobia is defined as the fear of what?

**A:** wasps

**Q:** What term is used for the technique where disease-free insects are used to detect blood-inhabiting parasites?

**A:** xenodiagnosis

**Q:** What urban pest is the most widespread and abundant species in the genus *Blattella*?


**A:** German cockroach (*Blattella germanica*)

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**Q:** Lice have recently been shown to be an indirect source of ancient human DNA. According to the redacted title, what specific material associated with the lice provides this excellent source of human DNA?

JOURNAL ARTICLE

## Ancient Human Genomes and Environmental DNA from the [REDACTED] 2,000-Year-Old Head Lice Nits

Mikkel W Pedersen , Catia Antunes, Binia De Cahsan, J Víctor Moreno-Mayar, Martin Sikora, Lasse Vinner, Darren Mann, Pavel B Klimov, Stuart Black, Catalina Teresa Michieli ... [Show more](#)  
[Author Notes](#)

*Molecular Biology and Evolution*, Volume 39, Issue 2, February 2022, msab351,  
<https://doi.org/10.1093/molbev/msab351>  
**Published:** 28 December 2021

**A:** the cement that glues nits to the hair

**Q:** A 2022 Entomology Today article reviewed the re-expansion of an important parasitic species. After being driven out of the northeastern US in the early 20th century, this species has since returned and is overrunning many areas in Eastern and North Central branch states, due to recent climate change and land-use changes. Recommended mitigation practices include getting rid of invasive plants such as Japanese barberry, and controlling local deer populations. What blood-sucking arthropod species is the article describing?

**A:** *Amblyomma americanum*, the lone star tick

**Q:** There are three types of macronutrients that humans can derive from insects used as a source of food. Name any two of these general classes of macronutrients.

**A:** carbohydrates, fats, protein

**Q:** The following three arthropods all parasitize the same animal: *Haemaphysalis leporispalustris*, *Cuterebra buccata*, and *Spilopsyllus cuniculi*. What animal do they infest?

**A:** rabbits

**Q:** The aptly named avian vampire fly, *Philornis downsi*, has parasitic larvae that feed both internally and externally on nestling birds, including Darwin's finches on the Galapagos islands. In what family is the avian vampire fly?

**A:** Muscidae

**Q:** The malaria parasite undergoes developmental change and reproduces within the mosquito vector. What is the term for this type of biological transmission?

**A:** cyclopropagative transmission

**Q:** Chagas disease is transmitted by kissing bugs in the genera *Triatoma*, *Rhodnius*, and what third genus?

**A:** *Panstrongylus*

# 2022 Entomology Games

## Morphology & Physiology

**Q:** Some insects lay a single egg which results in dozens or even hundreds of offspring. What is this phenomenon called?

**A:** polyembryony

**Q:** Name the anatomical organ described as follows: One of two exocrine glands found in myrmicine ants that is a source of trail pheromones, but whose contents have also been found to differ between reproductive and subordinate individuals in the colony, and as a signal of queen health.

**A:** Dufour's Gland

**Q:** Advanced wing control in insect flight is achieved by the contraction of two major indirect flight muscles. Which of these primary indirect muscles is responsible for moving the wing UP after contraction?

**A:** Dorsoventral / dorsal-ventral muscles

**Q:** What organ is responsible for secretion of vitellogenins, lipophorins, and storage proteins?

**A:** fat body

**Q:** What two words respectively refer to ant colonies that have only one queen, and ant colonies that have multiple queens?

**A:** Monogyne and polygyne

**Q:** Samantha Anyuor is currently researching the viability of termites as a marketable food product in Africa. According to her surveys of people that practice entomophagy, the most commonly eaten types of termites are what winged members of the reproductive caste?

**A:** Alate termites

**Q:** Only two species of beetles (the coffee berry borer, *Hypothenemus hampei*, and its congener *H. obscura*) are known to undergo paternal genome elimination, wherein all of the paternally-inherited chromosomes in males are reduced to heterochromatin and are not inherited by any offspring. Females do not undergo this process. Functionally, this sex determination system can be described by what term, more commonly associated with eusocial hymenopterans?

**A:** Haplodiploidy. Even though the males are genetically diploid, only their maternal chromosomes are functional and inherited.

**Q:** Weisman et al. discovered that some green lacewings produce two distinct types of silk from two different parts of the body. The silk associated with oviposition is produced from the colleterial gland in the female reproductive tract. In contrast, the silk used to make cocoons is produced from what other structure?

**A:** malpighian tubules

**Q:** On what insect developmental stage would you find one or more aeropyles?

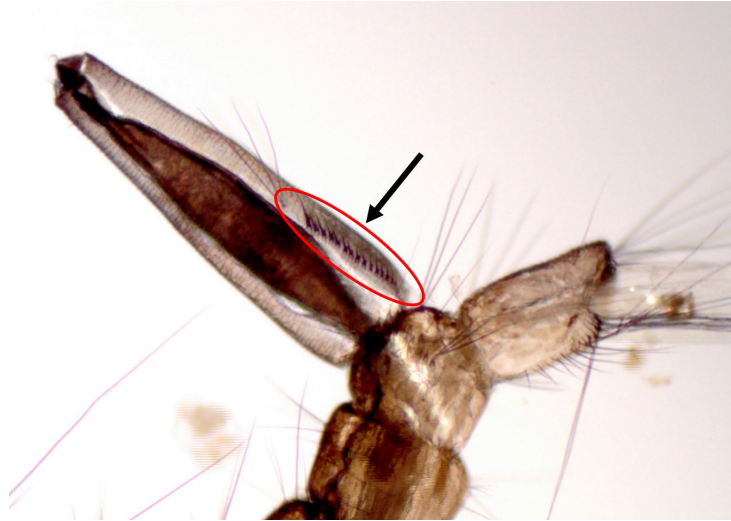
**A:** egg

**Q:** Some female flies have a non-retractable sheath associated with the ovipositor. This sheath is a modification of the 7th sytergosternite and is visible outside the body, regardless of whether the fly is ovipositing. What is the name of this ovipositor sheath?

**A:** oviscape

## 2022 Entomology Games

**Q:** An important characteristic for identification of larval mosquitoes is shown here. What specific term, from the Latin for 'comb,' refers to these structures on the siphon? The adjective form of this term can be used to describe some 'comb-like' moth antennae.

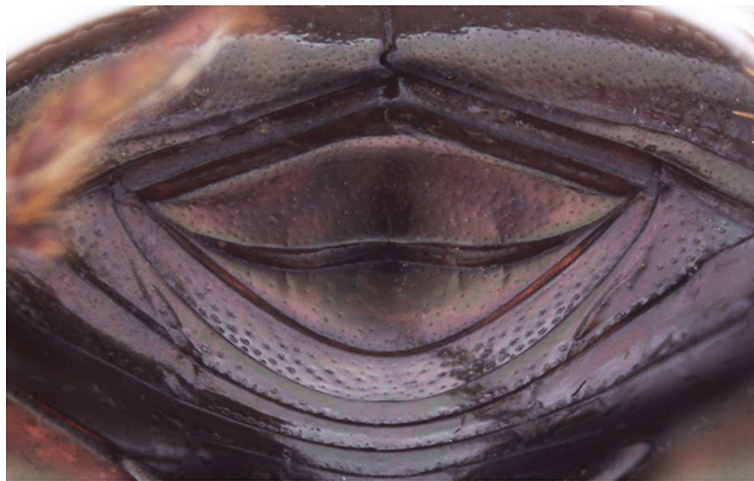


**A:** Pecten

**Q:** Juvenile hormone is synthesized by which endocrine gland?

**A:** Corpus allatum (Corpora allata)

**Q:** In 2022, Costa-Silva et al. described the new scarab species *Agamopus joker*. They named it after the famous DC Comics supervillan because of the shape of the sulcus pictured here, that makes it look like a clown's smile. This sulcus is located on what abdominal morphological structure?



**A:** pygidium

**Q:** What term is used to describe a gynandromorphic insect that is divided into its female and male halves exactly along the longitudinal body axis?

**A:** bilateral gynandromorph

**Q:** Dipterans possess a pair of halteres that replace the hindwings. What other insect order has haltere-like structures that replace the forewings?

**A:** Strepsiptera

## 2022 Entomology Games

**Q:** Many species of eruciform larvae have exactly 5 pairs of prolegs, but in what suborder do all the larvae have a minimum of 6 pairs of prolegs? This suborder's larvae are further distinguished from lepidopteran caterpillars by the absence of crochets on the prolegs.

**A:** Symphyta / sawflies

**Q:** The tiny row of hook-like setae that connect hymenopteran hindwings to forewings are known by what name, derived from the Latin word for 'hook'?

**A:** hamuli / hamulus

**Q:** What are the singular AND plural terms for the three lobed morphological structures present under the tarsi in this image?



**A:** pulvillus / pulvilli

# 2022 Entomology Games

## Systematics & Evolution

**Q:** Rasteral patterns are series of hairs or spines found on the terminal abdominal segment of certain insect larvae. These patterns are commonly used as diagnostic characters to identify species of what form of insect larva?

**A:** Scarabaeiform

**Q:** According to Huangfu et al.'s recent study of stalk-eyed fruit fly biology, eye stalks have been reported in nine dipteran families to date. Name any three Diptera families that have at least SOME species with stalked eyes.

**A:** Diopsidae, Drosophilidae, Micropezidae, Ulidiidae, Perisclididae, Platystomatidae, Richardiidae, Tephritidae

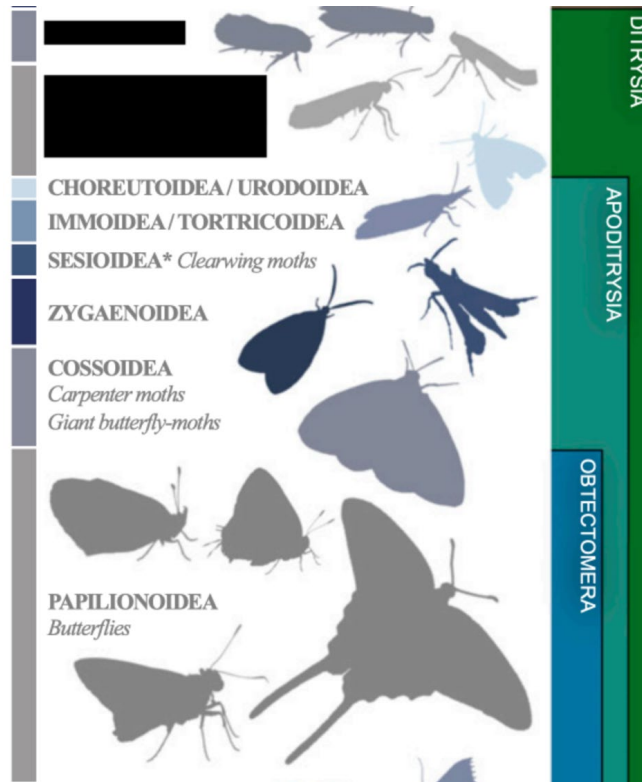
**Q:** A 1981 Nature article referred to *Rhyniella*, an extinct genus from the Devonian period, as "the earliest known insect." However, thanks to the discovery of a "special locomotory appendage", this genus is now classified as a member of what non-insect hexapod order?

**A:** Collembola

**Q:** As part of ESA's Better Common Names Project, the species *Lymantria dispar* recently received what new common name?

**A:** spongy moth

**Q:** The vast majority of Lepidoptera species belong to the subclade Ditrysia, and the vast majority of Ditrysia species belong to the subclade Apoditrysia. In the current classification, there are only 3 superfamilies of Lepidoptera that belong to Ditrysia, but not Apoditrysia. Name any one of those superfamilies.



**A:** Tineoidea, Gracillarioidea, Yponomeutoidea



# 2022 Entomology Games

**Q:** Many non-Dipteran insects have official ESA common names that refer to them as 'flies.' According to ESA guidelines, what is the linguistic distinction between the common names of these non-Dipteran 'flies' and the common names of actual Diptera?

**A:** In dipteran common names, the word 'fly' appears on its own (e.g. face fly is two words), but in non-dipteran common names, 'fly' is part of a larger compound word (e.g., butterfly is one word)

**Q:** In a 2022 NPR interview, German ecologist Daniela Roessler discussed her research on the sleeping behavior of what family of spiders, whose retinal movements suggest that they might experience REM sleep? Some spiders in this family are named after other animals that experience REM sleep, like the peacock.

**A:** Salticidae

**Q:** The parasitoid mymarid wasp *Dicopomorpha echmepterygis* is famous for being the smallest known insect. It specializes on parasitizing the eggs of a single host species in what insect order? This order is not in Holometabola, but in some phylogenies it has been found to be the sister group to all other Holometabola.

**A:** Psocodea / Psocoptera

**Q:** With over 850 species, what genus of Apidae is the largest genus of kleptoparasitic "cuckoo bees"? This genus gets both its common name and scientific name from the 'roaming' or 'wandering' behavior that it exhibits when searching for nests of other bee species.

**A:** *Nomada* / Nomad bees

**Q:** In 2022, Tahami et al. discovered new species of *Zygentoma* living in Iranian caves. In 2009, Mendes et al. discovered a new species of *Zygentoma* living in Brazilian fire ant nests. These new species of *Zygentoma* all belong to what cosmopolitan family, whose members can be distinguished from Lepismatidae by the absence of eyes?

**A:** Nicoletiidae

**Q:** Though there are several mantis species present in the United States, ESA only recognizes common names for six species in the order. These common names are all comprised of a single word followed by the word 'mantid.' Name any two of the six words that precede 'mantid' in an official ESA common name.

**A:** Australian (*Tenodera australasiae*), Burmeister (*Orthodera burmeisteri*), Carolina (*Stagmomantis carolina*, the sole native species in this list), Chinese (*T. aridifolia sinensis*), European (*Mantis religiosa*), Narrowwinged (*T. augustipennis*).

**Q:** What adjective appears in the official common names of *Phoracantha semipunctata* and *Anoplophora glabripennis*? This adjective is also commonly used to describe the entire family of Coleoptera that both these species belong to.

**A:** longhorned

**Q:** The most common species of the genus *Piophil* is known by what tasty common name?

**A:** cheese skipper

**Q:** The genus *Ellychnia* is an unusual genus that uses pheromones for communication, instead of the communication method used by most other genera in its family. This genus belongs to what family of Coleoptera?

**A:** Lampyridae

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**Q:** Cynthia Longfield, the first woman to join the Entomological Society of London, had species in the genera *Coryphaeschna* and *Agrionoptera* named after her. Both of these genera belong to what insect order?

**A:** Odonata

**Q:** In 1913, Canadian entomologists Edmund M. Walker and Takatsuna B. Kurata discovered the only extant family of what insect order? In some recent classifications, this order is treated as a suborder of Notoptera, alongside its sister taxon Mantophasmatodea.

**A:** Grylloblattodea

**Q:** The corn earworm is currently in the genus *Helicoverpa*, but when it was first described, it was originally placed in what other genus of Noctuidae?

**A:** *Heliothis*

**Q:** What superfamily contains the families Achilidae, Issidae, Derbidae, Delphacidae, and Flatidae?

**A:** Fulgoroidea

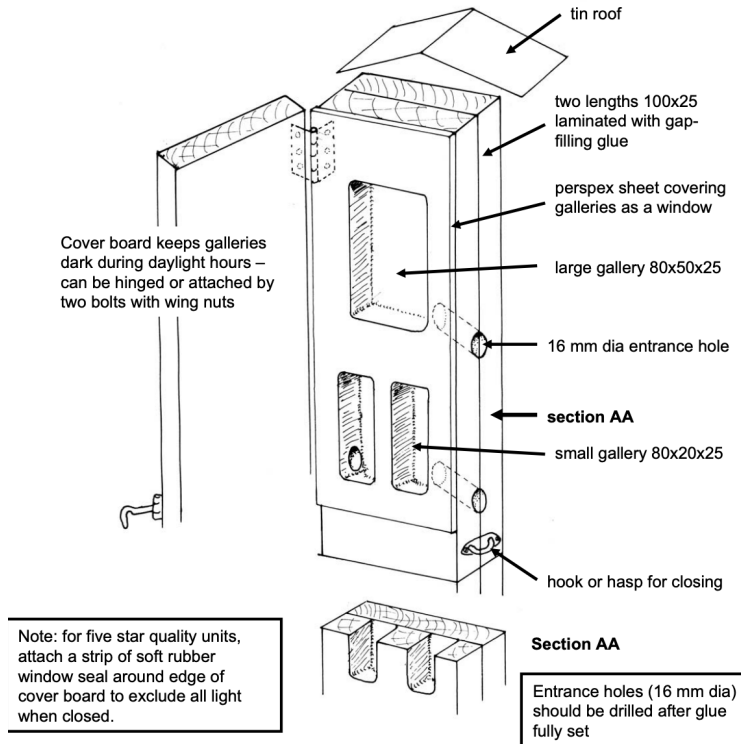
# 2022 Entomology Games

## Bonus: Culture & Current Events

**Q:** In the classic children's book Charlotte's Web by E.B. White, what is Charlotte's last name?

**A:** Cavatica; taken from the scientific name for barn spider, *Araneus cavaticus*

**Q:** Young New Zealand naturalists can earn a "Kiwi Guardians" medal by building the pictured insect habitat in their backyard. What is the common name of the insect that this home intended for?



**A:** The weta

**Q:** In the movie Jurassic World: Dominion, the villainous BioSyn corporation resurrects and genetically engineers a Cretaceous species of what extant insect order? In real life, this order first appears in the fossil record during the Carboniferous period.

**A:** Orthoptera

**Q:** In the fourth season of the Netflix show Stranger Things, villain Henry Creel, also known as "One" (#001), collected what species of arthropod as a child?

**A:** black widow / *Latrodectus mactans*

**Q:** In the Hasbro game Operation, what is the entomological name of the piece that can be removed from Cavity Sam's torso?

**A:** Butterflies in Stomach

**Q:** An article titled "Could Claude Monet See Like a Bee" speculates that the French artist could perceive UV light after getting cataract surgery. Once he was able to see the UV nectar guides that attract insect pollinators, he began using overtones of purple when painting what type of flower in the genus *Nymphaea*?

**A:** Water lilies

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**Q:** This astral cloud contains the star R136a1, which is the most massive individual star known. It is fittingly located in a nebula named after Theraphosidae, which contains some of the most massive terrestrial arthropods known. What is the name of this nebula?



**A:** Tarantula Nebula

**Q:** In 2016, the dragonfly logo seen here was adopted by Nordica, the national airline of what European country? The 2022 European Congress of Lepidopterology was held in this country, located south of the Gulf of Finland and east of the Baltic Sea.



**A:** Estonia

**Q:** The Broadway musical Jagged Little Pill was nominated for 15 Tony Awards in 2021. According to the one-word title of a popular song from this jukebox musical, what adjective describes "a black fly in your chardonnay"?

**A:** Ironic

**Q:** What species, normally found only in Asia, was sighted in Washington state this past summer? This titanic species is thought to have escaped from an illegal cocoon-selling operation.

**A:** Atlas moth (*Attacus atlas*)

**Q:** This R2D2-inspired beetle illustration is from artist Richard Wilkinson's book Arthropoda Iconicus, a fun blend of nature and pop culture. Although the taxonomic information seen here

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may be acceptable in a galaxy far far away, on Earth it violates multiple rules of the International Code of Zoological Nomenclature. Name any one of the errors in the scientific naming of this fictitious insect.



*Roboduobus Deoduobus*

Family: *Animamartera*. Genus: *Astromachinae*

**A:** Specific epithet should be lowercase, family name should end in "-idae", family name should not be italicized, two generic names given without indicating which one is the senior synonym

**Q:** In the 1990s, visual artist Maria Fernanda Cardoso created a traveling art exhibition that displayed live specimens of the genus *Ctenocephalides* inside a highly decorative 'big top' tent. What was the name of this art exhibition?

**A:** [Cardoso] Flea Circus

**Q:** The 1984 song Centipede was a Billboard-charting hit for the oldest sibling in a certain musical family. Its success partially stemmed from the fact that her much more famous younger brother produced the song and sang backing vocals. What last name is shared by these two singers?

**A:** Jackson (Rebbie and Michael)

**Q:** What European filmmaker, who died in 2021, directed the 1966 musical "Rita the Mosquito" and its sequel "Don't Sting the Mosquito"? This director was mostly unknown in the US until 1977, when she became the first woman nominated for a Best Director Oscar, for her World War II comedy-drama "Seven Beauties".

**A:** Lina Wertmüller

**Q:** The Sarnia Sting became the first team in the history of its league to have a female player, when they selected Taya Currie in the 2021 draft. The Sting, whose mascot is a wasp holding a certain piece of sports equipment, is in a North American league that plays what sport?

**A:** Ice hockey [mascot is holding a hockey stick]

**Q:** In 2018, The US Mint released their first-ever gold coin with a pink hue. This commemorative coin, designed by Emily Damstra, depicts a tiger swallowtail as a symbol of hope in the fight against what?

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**A:** breast cancer

**Q:** One of the villains in the Kirby video games is a butterfly-winged knight (spelled k-n-i-g-h-t) described as a "fluttering dream eater." Although this knight has wings that are orange, not blue, he is named after what type of butterfly?



**A:** Morpho

**Q:** The insignia for the SpaceX Crew-4 mission to the International Space Station features the "free-flying Dragon capsule", in addition to other symbolic elements. The insignia features an agile, flying insect in what order?

**A:** Odonata

**Q:** Despite the popularity of "We Don't Talk About Bruno," what other song from the 2021 movie Encanto received an Oscar nomination for Best Original Song? This song's Spanish title directly translates as "two little caterpillars".

**A:** Dos Oruguitas

**Q:** This bee logo appears on many products sold by what fashion house, which was founded over 100 years ago in Florence, Italy?

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**A:** Gucci

**Q:** Most of the movie Jumanji: Welcome to the Jungle takes place inside a video game where each character has specific strengths and weakness. One of the characters, Jefferson "Seaplane" McDonough, always sleeps next to citronella candles because he will die instantly if he's bitten by a mosquito. What American singer-turned-actor portrayed this character?

**A:** Nick Jonas

**Q:** What British sci-fi TV series, created by Russell T. Davies, features an extraterrestrial species called 'weevils'? This series premiered in 2006 as a spin-off of Doctor Who, and its title is, fittingly, an anagram of 'Doctor Who'.

**A:** Torchwood

**Q:** What 1980s battery-powered children's toy was described as "the world's cuddliest night-light" and was named after a certain insect larva?



**A:** Glo Worm

**Q:** Sherlock Holmes deduces that entomologist James Stapleton is the murderer in what novel by Arthur Conan Doyle?

**A:** The Hound of the Baskervilles



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**Q:** *Woman In the Dunes* is the English title of a 1964 movie about an amateur entomologist who goes on a beach expedition to collect tiger beetles, only to be held prisoner by the local villagers. What country submitted this film for consideration as Best Foreign Language Film at the Oscars? The film was one of the final five nominees that year, along with films from Sweden, Israel, Italy, and France.

**A:** Japan

**Q:** The University of Nebraska football team is currently called the Cornhuskers, but from 1892-1899, they were known by what insect-related name? This name was meant to reference the insectivorous birds native to Nebraska, as well as the entomophagous diets that were a necessity for some poverty-stricken Nebraskans at the time.

**A:** Bugeaters

**Q:** The Spring 2022 issue of *American Entomologist* included Gary and Melissa Miller's article *Cultural Entomology from the Golden Age of Postcards*. One of the postcards in this article, pictured here, includes a quartet of what genus of beetle serenading a fifth beetle from its window? This beetle genus is in the same family as *Phyllophaga* and *Cotinis*, though it presumably emerges at a slightly earlier time of year.



**A:** *Melolontha* (May beetle)

**Q:** What alcoholic beverage is composed of honey, water, and a medicinal shrub known as gesho? This beverage is considered the national drink of Ethiopia and is a honey wine, similar to mead.

**A:** Tej or Honey Tej

**Q:** The woman pictured on the left, who passed away in 2018, is an American designer whose namesake luxury fashion house has released many insect-themed purses and accessories. Her brother-in-law (on the right) is a comedian who also voiced Sparx the dragonfly in one of the Spyro video games. What last name do these people share?

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**A:** Kate and David Spade

**Q:** Insects in what order were responsible for flight delays at Heathrow Airport in London, England during summer 2021, due to their nest materials blocking vital plane systems such as the one pictured here?



**A:** Hymenoptera (both wasps and bees)

**Q:** Undefeated boxer Laila Ali was occasionally known by what nickname, which was partially inspired by an Italian opera and by a quote from her famous father?

**A:** Madame Butterfly

**Q:** *Dragonfly in Amber* is the second book in what series of novels by Diana Gabaldon? It is also the title of the Season 2 finale of the tv show adapted from these novels.

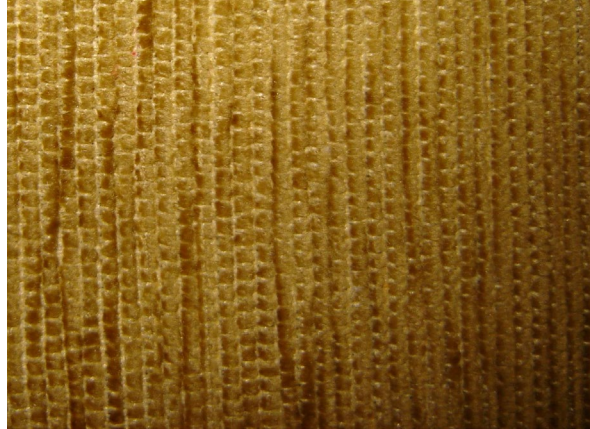
**A:** Outlander

**Q:** *Anthills of the Savannah* was the final novel written by what Nigerian author, best known for his 1958 magnum opus *Things Fall Apart*?

**A:** Chinua Achebe

**Q:** What type of fabric literally means caterpillar in French, because the individual pieces are thought to look like fuzzy caterpillars?

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**A:** Chenille

**Q:** As of July 2022, the IUCN lists eight insects as endangered or critically endangered in the Canadian land region. Name any two of these insects.

**A:** *Bombus affinis* (rusty patched bumble bee), *Bombus suckleyi* (Suckley cuckoo bumble bee), *Bombus variabilis* (variable cuckoo bumblebee), *Hesperia dacotae* (Dakota skipper), *Hesperia ottoe* (Ottoe skipper), *Danaus plexippus ssp. plexippus* (migratory monarch butterfly), *Oarisma poweshiek* (Poweshiek skipperling), *Nicrophorus americanus* (American burying beetle)

**Q:** In 2021, Japanese entomologist Dr. Kon Chunosuke was introduced as a new character in what classic Disney theme park attraction? This coincided with the 2021 release of a movie based on this theme park attraction, which featured a cursed conquistador covered in honeybees as one of its villains.

**A:** Jungle Cruise

**Q:** What singer is the eponym of a newly described millipede species in the genus *Nannaria*? The new species is known only from Tennessee, the state that this singer moved to as a teenager to pursue her career in music. Derek Hennen named the species after her because he enjoyed listening to her music while completing his dissertation on the phylogenetics of Polydesmida, an order of millipedes that he knows all too well. Name this singer.

**A:** Taylor Swift

**Q:** "Bee better" is one of the slogans of Bombas, a clothing company whose name is derived from the bumblebee genus. Their business model has expanded over the years, but when they were first founded, they only sold what product?

**A:** Socks

**Q:** What is the subtitle of the next film in the "Ant-man and the Wasp" series, which is scheduled to be released in February 2023?

**A:** Quantumania

**Q:** In the 2022 movie Top Gun: Maverick, Tom Cruise flies an F/A-18 fighter jet whose official name contains the name of what insect? This insect name also appears in the names of an AMC car manufactured in the 1970s, and a Dodge hybrid SUV model scheduled for release in 2023.

**A:** Hornet

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**Q:** The main cover art of the 2017 album "*Flower Boy*" features multiple bees flying over a field of sunflowers. This Grammy-nominated album is the fourth studio album of what rapper, who would later win a Grammy for his fifth album *Igor*?

**A:** Tyler, the Creator

**Q:** Only two European countries have won the FIFA Women's World Cup: Germany and what other country, whose national soccer team is nicknamed The Grasshoppers? This country maintains large insect collections in its capital city and at the University Museum of Bergen.

**A:** Norway

**Q:** Giant ticks are killed and brought back to life by the titular demonic characters (voiced by Keegan-Michael Key and Jordan Peele), in what stop-motion animated film, released on Netflix in October 2022?



**A:** Wendell & Wild

**Q:** What out-of-this-world band with an entomologically-inspired name had a 2001 hit with their cover of Michael Jackson's "Smooth Criminal"?

**A:** Alien Ant Farm

**Q:** The video game *Death Stranding* features an edible animal that is usually referred to as a bug, even though it has 8 legs and looks more like a tardigrade. This bug is named after a metabolic process commonly associated with tardigrades and some extremophilic Chironomidae. Give the name of either the fictional bug OR the real metabolic process.



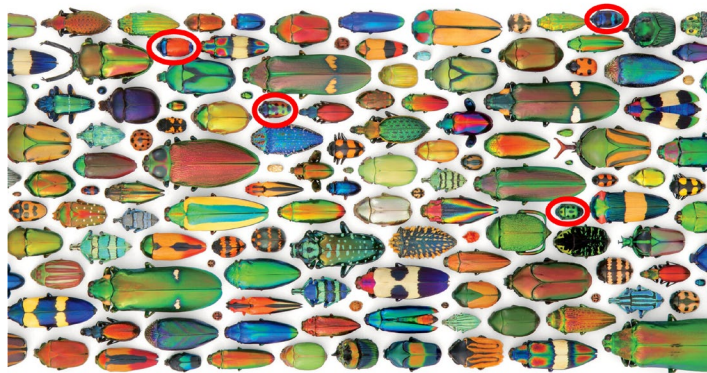
**A:** Cryptobiotite or cryptobiosis

**Q:** The artist Christopher Marley is known for creating brilliant displays that highlight the beauty and diversity of life on earth. One of his signature series is called the "Coleoptera Mosaics," yet



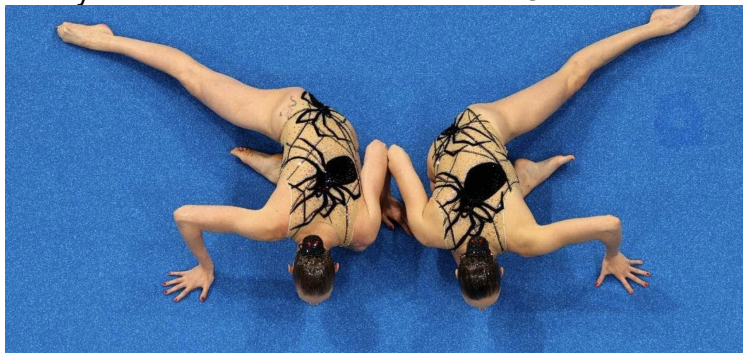
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some non-coleopterans sneak into pieces from this series. What other order does Marley admit to using in his "Coleoptera" works?



**A:** Hemiptera

**Q:** Russian athletes Svetlana Kolesnichenko and Svetlana Romashina donned these spider-themed outfits before giving a gold-medal-winning performance in what sport at the Tokyo Summer Olympics? The name of this sport was changed in the years between the Rio and Tokyo Olympics; you may answer with either the old name OR the new name.



**A:** Artistic swimming / synchronized swimming

**Q:** NASA currently maintains a team of three free-flying robots that work alongside people on the International Space Station to conduct routine tasks and research. The robots are known as Honey, Bumble, and Queen. What is the name of this robot system as a whole?

**A:** Astrobees

**Q:** This professional baseball team with an arthropod team name played in the National League from 1889-1899. In their final season, they infamously set a record for worst season, with only 20 wins and 134 losses, a record that remains unbroken in Major League Baseball to this day. What is the full name (city AND team name) of this hapless team?

**A:** Cleveland Spiders

**Q:** Louis Bourgeois' giant spider sculpture Maman has been copied and placed on permanent display in many locations around the world, including what famous museum in Spain? This museum, pictured here, is part of a worldwide foundation of museums that share the same name, including a famous museum in New York City.

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**A:** The Guggenheim Museum [Bilbao]

**Q:** The Lady of the Cicada Shell is a supporting character in what classic work of literature, whose title character is the son of a Japanese emperor? This story was written by Lady Murasaki in the early 11th century and is considered by many to be the world's first novel.

**A:** The Tale of Genji

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## Bonus: History & People

**Q:** Although he was born on the island of Nevis and has Caribbean heritage, Ernest Melville DuPorte is considered one of the pioneering entomologists of what non-Caribbean country? He wrote the classic textbook "Manual of Insect Morphology" after a long career of teaching in this country, and in 1977 he became a fellow of this country's entomological society.

**A:** Canada

**Q:** The first Entomology Games was held at a North Central Branch meeting, with Tom Turpin as Gamesmaster. In what year was this first competition held?

**A:** 1982 - this year marks the 40 year anniversary of the Entomology Games

**Q:** In the early 1880s, what Cuban physician published a manuscript that was later translated into English with the title "The Mosquito Hypothetically Considered as the Agent Transmitter of Yellow Fever Poison"?

**A:** Carlos Finlay

**Q:** Chloe Jelley, Elif Kardas, Teagan Mulford, and Jillian Schat were this year's winners of a certain SysEB student biodiversity award. This award is named after what married couple, one of whom served as ESA president in 2002? Shared last name is sufficient.

**A:** J.E. and Jean M. McPherson

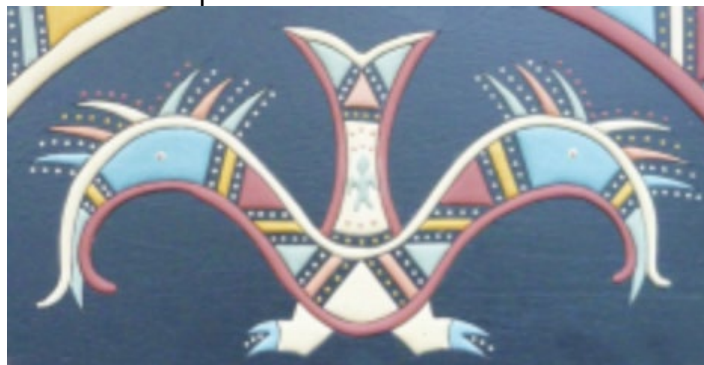
**Q:** What University of Florida professor is internationally recognized for his contributions to neurotoxicology, insecticide resistance and new molecules for vector control, and was named an ESA Fellow in 2021?

**A:** Dr. Jeffrey Bloomquist

**Q:** What specific award did Karl von Frisch win in 1973 for his work studying the behavior of honey bees?

**A:** The Nobel Prize in Physiology or Medicine

**Q:** The monstrous two-headed caterpillar Kuluwajak plays an important role in the mythology of the Wayana people, most of whom live in French Guiana and what South American country? This country is also home to the many real caterpillars that Maria Sibylla Merian illustrated in her 1705 publication on insect metamorphosis.



**A:** Suriname

**Q:** As a grad student in the 1960s, this entomologist published a paper on the first isolation, identification and synthesis of the male boll weevil pheromone. He would go on to have a



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successful career working for the USDA in Florida, and would later lead the Penn State Center for Chemical Ecology. Who was this accomplished chemical ecologist and ESA fellow?

**A:** James (Jim) Tumlinson [1938-2022]

**Q:** In Greek mythology, a king of Libya instructed his 50 daughters to kill the 50 sons of a rival to the throne. Though this story is not well remembered today, the name of the king is almost certainly familiar to North American entomologists. Who was this mythological monarch?

**A:** Danaus

**Q:** According to the Entomological Society of Canada, only one region of Canada has voted to make an insect one of its official symbols. They chose the white admiral butterfly, which has been collected along the east coast of the James Bay, with pinned specimens preserved in the Laval University Entomological Collection. This butterfly is the symbol of what Canadian province or territory?

**A:** Quebec

**Q:** Two major entomological organizations, the Entomological Society of America and American Association of Economic Entomologists, merged in 1953. Who was the first president of the new combined organization?

**A:** Charles Palm

**Q:** What longtime Ohio State entomologist, and former ESA president, passed away in August 2022 at the age of 94? He published dozens of taxonomic papers on Tenebrionidae, but he is probably best known for co-writing later editions of the classic textbook "An Introduction to the Study of Insects."

**A:** Charles A. Triplehorn

**Q:** One common symptom of lupus is a large red facial rash that covers part of the nose and cheeks. This rash is formally called a malar rash or malar flush, but because of its characteristic shape, it is also known by what other entomological name?

**A:** Butterfly rash

**Q:** The 26th International Congress of Entomology was held this year in Helsinki, Finland. In what city, and in what year, was the first ICE meeting held?

**A:** Brussels, Belgium in 1910

**Q:** The Bishop Museum in Honolulu, Hawai'i was the previous publisher of an ESA journal. Which journal transferred hands from the Bishop Museum to ESA in 1986?

**A:** *Journal of Medical Entomology*

**Q:** In a March 2022 Entomology Today blog post, Joanie King, Morgan Thompson, and Jaclyn Martin wrote short biographies for four women that they proposed be designated "Mothers of" certain subfields of entomology, based on their significant contributions to those subfields. Name any one of these four women AND their respective "Mother of" title proposed in the article.

**A:** Margaret James Strickland Collins - Mother of Termite Ecology; Clara Southmayd Ludlow - Mother of Medical Entomology; Eleanor Anne Ormerod - Mother of Agricultural Entomology; Mary Talbot - Mother of Myrmecology

**Q:** What 75-year-old company, which specialized in selling insect-collecting equipment and other entomological supplies, announced it was closing in early 2022?

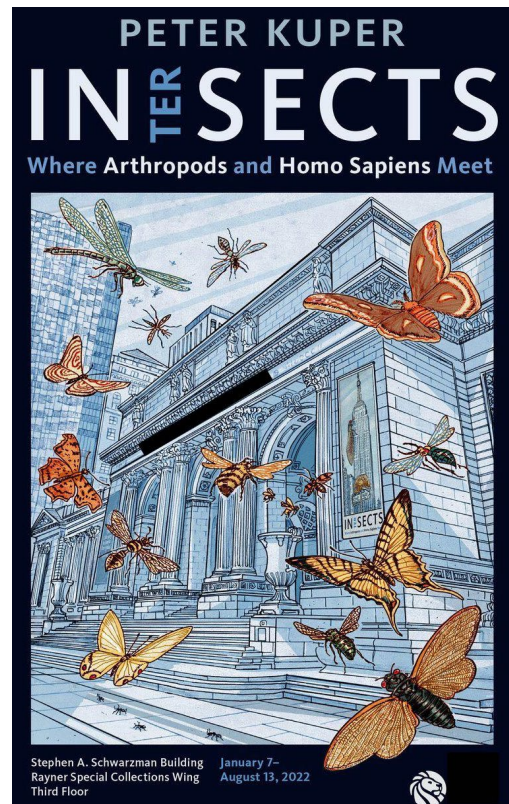
# 2022 Entomology Games

**A:** BioQuip

**Q:** Dr. Nannan Liu from Auburn University was elected as an ESA Fellow in 2022. She specializes in studying insect toxicology, and her most cited work is an article in the Annual Review of Entomology about insecticide resistance in what insect family?

**A:** Culicidae

**Q:** This poster highlights "INterSECTS: Where Arthropods and Homo Sapiens Meet", an exhibit that was featured at the main branch of what public institution earlier this year? This institution is the 2nd-largest of its kind in the US, with the largest located over 300 miles away in Washington DC.



**A:** New York Public Library (NYPL) [largest is the Library of Congress]

**Q:** Forensic entomologist Gail Anderson was the 2021 recipient of what award, given annually by the Entomological Society of Canada for outstanding achievement in Canadian entomology? Donovan Bailey, Jarome Iginla, and Tessa Virtue are other Canadians that have won a non-entomological award with the same name.

**A:** Gold Medal

**Q:** The Fall 2022 issue of American Entomologist has a short article about ESA's endorsement of a new IPM bill, introduced by Hawaiian congressman Kai Kahele. This bill will help farmers respond to new and emerging threats to what crop, which is Hawaii's largest non-seed crop agricultural commodity?

**A:** Coffee / *Coffea arabica*

**Q:** According to Oneida legend, parts of eastern US and Canada were once home to giant predatory mosquitos the size of trees, until the tribes native to those areas formed a war party to kill these monstrous insects. The war party was successful, but soon after, swarms of tiny

## 2022 Entomology Games

mosquitoes sprang forth from the spilled blood of the dead giant mosquitos. To this day, mosquitoes feed on humans as retribution for the assault on their ancestors. This legend has been passed down by what confederacy of indigenous peoples, comprised of the Oneida and five other tribes in the northeastern US?



**A:** Haudenosaunee or Iroquois Confederacy

**Q:** The opening plenary session, to be held in this room later today, will be a panel discussion among three entomologists representing the University of Toronto, Harvard, and Washington University in St. Louis. Name any two of those three entomologists.

**A:** Maydianne Andrade, Cassandra Extavour, Swanne Gordon

**Q:** The ceiling of the Royal Palace of Brussels hosted this art installation by Jan Fabre that was constructed from insect parts. What family of insect was used to create the piece?



**A:** Buprestidae

**Q:** The 'Honey War' was an 1839 dispute over the border between a US State and a territory that later became a US state. There were many 'bee trees' with active hives near the border, and both sides claimed they owned the honey and beeswax from those hives. Both states involved in the Honey War are part of ESA's North Central Branch. Name either of them.

**A:** Missouri, Iowa

## 2022 Entomology Games

**Q:** Julien Saguez, Wim Van Herk, Haley Catton, and Jacqueline Serrano organized a member symposium about Elateridae at this year's meeting. What word, perhaps more associated with websites like BuzzFeed, is the humorous title of this elaterid symposium?

**A:** Clickbait

**Q:** A statue of this entomologist was featured as part of the #IfThenSheCan exhibit, displayed at the Smithsonian in March 2022. She works at Corteva Agriscience and serves as an AAAS If/Then® Ambassador, a program recognizing "talented women STEM professionals across a variety of industries ... who serve as high-profile role models for middle school girls." Name this entomologist and educator.



**A:** Dr. Ronda Hamm

**Q:** Who was the first African American president of ESA?

**A:** Alvin Simmons

**Q:** In the last decade, many countries have adopted stricter regulations on collecting and exporting insects. This is mainly due to a recent protocol for sharing the benefits of genetic resources obtained from insects and other organisms. This protocol was named after what Japanese city, where it was first adopted in 2010?

**A:** Nagoya [protocol]

**Q:** The 2022 ESA presidential line is all-female for the first time in the society's history. Prior to this year's presidential line - which includes Jessica Ware as President and Michelle Smith as Past President - there have been 6 female ESA presidents. Name these six women.

**A:** Edith Patch, Dorothy Feir, Manya Stoetzel, Sharon Quisenberry, May Berenbaum, and Susan Weller

**Q:** In 2021, the European Union authorized the first edible insect to be placed on the European market, which allows its advertisement and safe consumption as a "novel food". What is this insect species?

**A:** *Tenebrio molitor* larvae



## 2022 Entomology Games

**Q:** This is the cover photo from the October issue of what ESA journal, whose current editors-in-chief are Melody Keena and Therese Poland? The photo is associated with a new article about the effects of fungal cues on the foraging behavior of weevils, as part of this journal's subsection on insect-microbial interactions.



**A:** *Environmental Entomology*

**Q:** This American entomologist began her career as an elevator operator at the Smithsonian in the 1940s, when discriminatory racial barriers prevented her from direct employment in the museum's curatorial and science work. She gained extensive knowledge of the museum's exhibits and became a "one-woman information bureau" to visitors before asking for and achieving a role in entomological work in the late 1950s. She went on to restore hundreds of thousands of insect specimens, classify thousands, co-identify 40 type specimens, and has a mite species named after her. Who is this entomologist?



**A:** Sophie Lutterlough

## 2022 Entomology Games

**Q:** In the Andean region of Ecuador, this moth is called tandacuchi and is seen as a messenger of death when it flies into a house. For this reason, it was featured in the 1988 novel *The Silence of the Lambs*, although it was replaced with a death's head hawkmoth when the book was adapted into a movie. What is the common name of this ominous moth?



**A:** Black witch

**Q:** If you're using your 2022 ESA World of Insects wall calendar, you've probably noticed that the November 2022 calendar page contains photos of a caddisfly in the genus *Athripsodes*, a fly in the genus *Coenosia* and a dragonfly with the common name green-striped darner. Name the family of any one of these three insects.

**A:** Leptoceridae, Muscidae, Aeshnidae

**Q:** Of the nine periodicals produced by ESA, which journal includes the phrase "Entomological Society of America" in its title?

**A:** *The Annals of the Entomological Society of America*

**Q:** ESA leads the Vector-Borne Disease Network, a stakeholder group of non-profit organizations that advocates for vector-borne disease research and funding. There are 31 members of this network, one of which is ESA. Name three other member organizations.

**A:** American Association of Veterinary Medical Colleges, *American Mosquito Control Association*, American Society of Tropical Medicine and Hygiene, Anastasia Mosquito Control District, Association of Public Health Laboratories, Association of State and Territorial Health Officials, Council of State and Territorial Epidemiologists, Delta Mosquito & Vector Control District, Florida Medical Entomology Laboratory, Georgia Mosquito Control Association, Global Vector Hub, Infectious Diseases Society of America, Lee County Mosquito & Hyacinth Control Districts, Midwest Center of Excellence for Vector-Borne Disease, Minnesota Department of Health, Mosquito and Vector Control Association of California, National Association of County and City Health Officials, National Association of Vector-Borne Disease Control Officials, National Environmental Health Association, National Pest Management Association, North Carolina Mosquito and Vector Control Association, Northeast Regional Center for Excellence in Vector-Borne Diseases, Pacific Southwest Center of Excellence in Vector-Borne Diseases, Puerto Rico Vector Control Unit, *Society for Vector Ecology*, Southeastern Regional Center of Excellence in Vector-Borne Diseases, New Jersey State Mosquito Control Commission, TickEncounter Resource Center at the University of Rhode Island, University of Idaho Center for Health in the Human Ecosystem, Western Gulf Center of Excellence for Vector-Borne Diseases

**Q:** There are two peer-reviewed journals currently being published by the Entomological Society of Canada. One is *The Canadian Entomologist*. What is the other one?

**A:** *Canadian Journal of Arthropod Identification*

# 2022 Entomology Games

**Q:** Dr. Sebastian Echeverri studies dancing, charismatic jumping spiders, a specific discipline that he called 'kinetic salticidology' during his interview on a 2021 episode of the Ologies podcast. Who is the host of this podcast?

**A:** Alie Ward

**Q:** The work of women in multiple fields of STEM, including entomology, often went unpublished in major journals and can be hard to find in libraries. What specific action has Jess Wade taken to highlight the contributions of women in entomology and other STEM fields?

**She's made 1,750 [REDACTED] for female scientists who haven't gotten their due**

'Not only do we not have enough women in science, but we aren't doing enough to celebrate the ones we have,' said physicist Jess Wade.



By Sydney Page

October 17, 2022 at 6:00 a.m. EDT



**A:** Writing Wikipedia articles

**Q:** Malort is an extremely bitter liquor whose name literally means 'moth herb' in Swedish. It is made by distilling what plant in the genus *Artemisia*? A different extract from this plant is known to have antimalarial properties, as discovered by Nobel-winning scientist Youyou Tu.

**A:** Wormwood

**Q:** Who is the current editor-in-chief of the Journal of IPM?

**A:** Eric Rebek