

ESA 2024 Entomology Games

Easy Questions

Q: Due to delayed development, some periodical cicadas will not emerge at the same time as the rest of their brood, and will wait a full year to emerge with a subsequent brood. What word was used by C.V. Riley and C.L. Marlatt, and is still used today, to describe these late-emerging cicadas?

A: Stragglers

Q: Many insect species exhibit polymorphism: having multiple distinct forms that often reduce intraspecific competition. What is the term for the type of polymorphism in which these distinct forms are produced by differences in environmental conditions, and NOT by genetic differences?

A: Developmental or polymorphism or polyphenism

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A: Puddling or mud-puddling

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A: Autotomy

Q: Acetamiprid, the active ingredient in the insecticide Assail, belongs to what class of insecticides? This class of insecticides also includes other compounds that end in the suffix -prid, such as Thiacloprid and Imidacloprid.

A: Neonicotinoids

Q: Some of the Halloween genes, such as shade and shadow, are essential for the production of what molting hormone in insects? We will accept either the name of the hormone itself or the name of the prohormone that is its precursor.

A: Ecdysone or 20-hydroxyecdysone

Q: What is the name of the common laboratory technique in toxicology in which a substance has its concentration decreased in a stepwise manner to produce a geometric progression of concentration?

A: Serial dilution

Q: When Rachel Carson discussed the effects of DDT in the book *Silent Spring*, what word did she use to refer to the increased concentration and potency of toxins caused by accumulation of DDT in fatty tissue, as it goes up the food chain from invertebrates to vertebrates?

A: Biomagnification

Q: Although this phenomenon is not always thought of as a form of biological control, it is often treated as such in the context of herbivorous insect pests, and was famously discussed by Reginald Painter in his studies of Hessian flies' ability to feed on different types of wheat with

different levels of success. Name this phenomenon, which appears in the title of Painter's influential 1951 book.

A: Insect resistance in crop plants

Q: What form of biological control is redacted from this study on the use of natural enemies as biological control agents in situations where existing populations of natural enemies are not large enough to be effective? This is considered one of the three main forms of biological control, along with classical and conservation.

A: Augmentative or augmentation

Q: What is the scientific name of the species that is known for its use in insect pest control, but was recently found by Sui et al. to also suppress harmful infections of *Sclerotinia* fungi on sunflower plants? This species, which is also a fungus, was first studied in 19th-century Italy, and its scientific name includes the surname of Agostino, the entomologist credited with discovering its entomopathogenic properties.

A: *Beauveria bassiana*

Q: What is the scientific name of the South American moth that was once revered in the Caribbean and Australia as a biological control agent, but is now considered an invasive species that threatens many types of *Opuntia* and other beneficial cacti native to Texas and Mexico?

A: *Cactoblastis cactorum*

Q: The classic 1959 *Hilgardia* paper by Stern et al. defined Economic Injury Level as "the lowest [BLANK] that will cause economic damage". What two-word term, redacted from the graph pictured here, fills in the blank?

A: Population density

Q: Saskatchewan engineer Mohana Das developed the DeepVeg machine learning model for early detection of leaf damage caused by flea beetles on what economically important crop? This cruciferous crop was originally bred from cultivars of *Brassica napus* and *Brassica rapa* at the University of Manitoba, and this crop's most common name is a portmanteau that references its country of origin.

A: Canola

Q: The chemical compound (Z)-9-Tricosene is used in traps to attract males in what insect order? The compound is a sex pheromone released by some females in this order, and its common name muscalure references the scientific name of a large family in this order.

A: Diptera

Q: A pesticide formulation that contains a liquid active ingredient, an organic solvent, and an agent that enables mixing with water, is commonly referred to by what two-word term, which on pesticide labels is usually abbreviated EC?

A: Emulsifiable concentrate

Q: The initialism HIPV stands for what term that describes a type of compound important in studies of plant-insect interactions?

A: Herbivore-induced plant volatile

Q: MWP is a viral plant disease, vectored by mealybugs, that heavily damages pineapples. The 'W' in MWP stands for what word, referencing the specific type of damage done to the pineapple plant?

A: Wilt (Mealybug Wilt of Pineapple)

Q: Hand picking tomato hornworms off of plants is an example of what type of IPM strategy?

A: Mechanical or physical control

Q: There are two words often used interchangeably in IPM and agriculture research, that actually have separate, distinct meanings. The newest edition of the textbook Entomology and Pest Management defines the first word as "the deleterious effect of pest activities on the host" and defines the second word as "measurable loss of host utility". Name BOTH of these common words.

A: Injury and damage

Q: Estelle Martin's 2024 survey of Florida gopher tortoise burrows revealed that medically relevant mosquito genera use the burrows as overwintering sites. This survey was the first step in a larger study to test whether gopher tortoises carry West Nile Virus. What mosquito genus was the most abundant in the surveyed tortoise burrows?

A: *Culex*

Q: "The Challenge of Invisible Bug infestations" is the subtitle of an article by Nancy Hinkle about what affliction? This affliction, sometimes known as Ekbom syndrome, is characterized by people believing they are infested with insects that are not actually there.

A: Delusory parasitosis or delusional parasitosis

Q: Mackenzie Tietjen developed a new diagnostic assay for identifying the South American and Caribbean populations of what species of Diptera? The assay is not needed for North American populations because this calliphorid fly's North American populations have already been eradicated using the sterile insect technique.

A: primary screwworm/New World screwworm (*Cochliomyia hominivorax*)

Q: In early 2024, Puerto Rico declared an epidemic after reporting over 500 human cases of what virus, typically transmitted by *Aedes aegypti*?

A: Dengue

Q: A 2020 study from evolutionary biologist Karin Kjernsmo proposed that camouflage may be the primary function of what type of coloration? Her finding was very counterintuitive because this form of structural coloration, found in many Coleoptera and Lepidoptera, is characterized by vivid, intensely chromatic colors that constantly shift with changing angles of view.

A: Iridescence

Q: Of the two main categories of pheromones, which category refers to pheromones that have an immediate effect on the behavior of the recipient?

A: Releasers

Q: What is the most abundant protein in the cells of insects and other eukaryotes? This protein forms microfilaments in the cytoskeleton and forms the thin filaments in myofibrils.

A: Actin

Q: Name any one of the compounds redacted in this list of energy sources used for insect flight.

A: Trehalose, proline, phosphoarginine

Q: Melissopalynology is the study and analysis of a specific aspect of honey, in order to classify honey based on the taxonomy of the bees that made it, the location it was made in, and the taxonomy of the plant that was visited by the bees. What microscopic structures found in the honey are the main focus of melissopalynology?

A: Pollen grains

Q: What superfamily contains the families Pyrgotidae, Piophilidae, and Ulidiidae? This superfamily also contains one of the most species-rich families of acalyptrate flies, the fruit fly family.

A: Tephritoidea

Q: What insect order has the largest number of eusocial species?

A: Hymenoptera

Q: Though they're not literally found in Antarctica, what insect order was historically divided into suborders Antartoperlaria and Arctoperlaria? This non-holometabolous order is believed to be sister to the rest of Polyneoptera, and is known for living in mainly temperate, freshwater habitats.

A: Plecoptera

Medium Difficulty Questions

Q: Forest ecologist Diana Six developed a classification of the forms of what insect morphological structure, which she divided into three main types: Pit, sac, and setal brush? This coleopteran structure is also classified with regards to whether it is internal or external, and whether it secretes substances relevant to fungus containment.

A: Mycangium

Q: This redacted figure is from a 2024 study that used high-speed cameras to investigate why flying insects gather at artificial light. The study found that insects do not steer directly towards the light. They instead exhibit a [BLANK]-tilting response tilting a portion of their body and flying around the light in a small loop. What word fills in the blank?

A: Dorsal side or dorsum

Q: This family was thought to be entirely phytophagous, until Thomas Eisner observed *Elytroleptus ignitus*, a species native to Arizona, feeding on the species of Lycidae that it mimics.

Elytroleptus ignitus belongs to what family, which is in the same order as Lycidae and is often an effective mimic due to similar shape of the elytra and similar length of the antennae?

A: Cerambycidae

Q: Behavioral ecologist Rosalind Humphreys argues that "tonic immobility" is the more appropriate term to use when referring to what insect behavior? Unlike other more-common terms, "tonic immobility" does not make any assumptions regarding how the predator responds to the insect performing this defensive behavior.

A: Feigning death or thanathosis

Q: Honeybees and some other eusocial insects exhibit a form of division of labor called temporal polyethism, meaning that the type of task performed by a worker bee is correlated with what?

A: The age of the worker

Q: A Floridian species of what ant genus was recently observed performing life saving surgery on nestmates, by cleaning or amputating wounded legs in order to prevent the spread of infection?

A: *Camponotus* or carpenter ants

Q: Buprestid beetles in the genus *Melanophila* have special receptors, located in thoracic pit organs, which help them locate what natural phenomenon that has been occurring with increasing frequency over the last few decades? *Melanophila* are one of the few animals that benefit from being near this phenomenon, as they have evolved to only mate when in its presence.

A: Forest fires or wildfires

Q: The insect behavior known as 'brood pumping' is most commonly observed in what family? Brood pumping is associated almost exclusively with males in this family, and involves males performing a series of 'push-up' movements to promote water flow and oxygen diffusion through the membranes of the eggs that are in their care.

A: Belostomatidae or giant water bugs

Q: In her review of insect egg parasitoids, Nina Fatouros mentions Hemiptera and Blattodea as two examples of insect orders with non-herbivorous species that are targeted by egg parasitoids. Name one other insect order that she also cites as containing non-herbivorous species that are targeted by egg parasitoids.

A: Megaloptera, Mantodea, Neuroptera, Odonata

Q: What two-word term describes carboxylesterase, acetylcholinesterase, cytochrome p450s, and other catalysts that play major roles in insecticide resistance by enabling insects to better withstand damage from otherwise poisonous chemicals?

A: Detoxification enzymes or detoxifying enzymes

Q: What chemical, whose 2D structure is pictured here, is a broad-spectrum insecticide and acaricide that is marketed under the names Taurus and Termidor when used for termite control, and under the name Frontline when used for tick control?

A: Fipronil

Q: People with shellfish allergies may also be allergic to insect food items. What protein, sometimes abbreviated TM, is present in invertebrate muscle tissue and is the main allergen responsible for this food sensitivity?

A: Tropomyosin

Q: What insect superfamily is the subject of this graph from Tara Dirilgen's literature review of recent trends in insecticide research?

A: Apoidea

Q: The name of what steroid compound has been redacted from this figure in Krueger et al.'s study of the impact that different *Asclepias* host plants can have on development of nymphalid caterpillars exposed to insecticide? In general, the tropical species of *Asclepias* contains higher amounts of this compound, and the species known as swamp milkweed contains lower amounts.

A: Cardenolide

Q: A 2024 study from the Saha lab showed that the honeybee olfactory system could be used to detect what type of cancer? The bees' neuronal circuitry was sophisticated enough to smell the biomarkers in human breath that were indicative of both small-cell and non-small cell forms of this type of cancer.

A: Lung cancer

Q: Over the years, we've asked many questions about the IRAC Insecticide Mode of Action classification, but that's not the only classification IRAC has to offer. Per their website, the carbamate pesticides listed here are not only effective against insects and arachnids, they can also be used against what other invertebrates?

A: Nematodes

Q: First synthesized by Herman Wachs in the 1940s using safrole as a precursor, what chemical is used as a synergist to enhance the performance of pyrethroids and natural pyrethrins?

A: Piperonyl butoxide or PBO

Q: What pathway involves converting a certain sugar into two pyruvate molecules, and also involves both the consumption and production of ATP? In insects, and most other organisms, this pathway is the first step of cellular respiration.

A: Glycolysis

Q: The phenomenon where application of sub lethal rates of Carbaryl increase populations of aphids is known as

A: Hormesis or hormoligosis

Q: A 2024 article in the journal *Nature* described *Syntretus perlmanni*, a new species of braconid that is the first wasp known to be a parasitoid of adult flies, as opposed to immature flies. Its dipteran host belongs to a genus that is currently being targeted in some control programs by the parasitoid wasp *Ganaspis brasiliensis*. What genus of fly do these wasps parasitize?

A: *Drosophila*

Q: The Wilkins' Bunting is a rare bird that was indirectly saved from extinction by the intentional introduction of *Microterys nietneri*. This biological control agent parasitized the scale insects that were damaging the only species of fruit the Wilkins' Bunting would eat. What family of parasitoid wasps does this biological control agent belong to?

A: Encyrtidae

Q: The Dillman lab recently described a new species of entomopathogenic nematode and named it after Dr. Dillman's undergraduate mentor Dr. Byron Adams. This newly discovered nematode belongs to what genus?

A: *Steinernema*

Q: The microsporidian *Ovavesicula popilliae* has been used as a biological control agent against both the larval and adult stages of what insect species?

A: Japanese beetle (*Popillia japonica*)

Q: The equation pictured here can be used to model the functional response of predators to prey density. In this equation, what does the term T_s represent?

A: Search time

Q: Chen and Fadamiro's 2018 review of this genus states that it contains 17 species of potential biological control agents that can parasitize either *Solenopsis richteri* or *Solenopsis invicta*. What is the name of this parasitoid genus of phorid flies that is commonly known as decapitating flies?

A: *Pseudacteon*

Q: The chrysomelid beetles *Galerucella pusilla* and *Galerucella californiensis* have been successfully used in the US to control what invasive plant?

A: Purple loosestrife or *Lythrum salicaria*

Q: The biological control agents *Larrea bicolor* and *Ormia depleta* are both used to control what insect family that heavily damages grass roots as it digs its way through sod farms, pastures, and golf courses?

A: Gryllotalpidae

Q: What insect family was the target of the *Rhizoglyphus* mites that CV Riley shipped overseas in an attempt to use biological control to save France's wine industry?

A: Phylloxerae

Q: For the last couple decades, Leyla Kaufman and other Hawaiian entomologists have been monitoring a successful biological control program to save the endemic Wiliwili tree from extinction. In this program, the targeted invasive species *Quadrastichus erythrinae* and the introduced biological control agent *Eurytoma erythrinae* both belong to what insect order?

A: Hymenoptera

Q: The EPA occasionally allows for Emergency Exemptions for unregistered use of pesticides, as per the guidelines written in the Federal Insecticide, Fungicide, and Rodenticide Act. Which section of FIFRA authorizes the EPA to do this?

A: Section 18

Q: "watery saliva" and "sheath saliva" are two types of secretions containing different enzyme profiles that can damage crop plants in different ways. The vast majority of pests that secrete both watery and sheath saliva belong to what insect order?

A: Hemiptera

Q: It's hypothesized that the southern pine beetle (*Dendroctonus frontalis*) is guided to pine trees by another species of bark beetle that is widespread in the southeastern US. This beetle arrives to the tree earlier and uses aggregation pheromones to signal that it's a suitable host for southern pine beetles. What is the name of this other bark beetle, which is in the same genus as southern pine beetle and has a common name that references its dark coloration and a fluid derived from pine tree resin?

A: Black turpentine beetle, *Dendroctonus terebrans*

Q: What genus of invasive parasite was detected in Queensland, Australia in February 2024, resulting in lockdown measures to minimize the parasite's indirect impact on Australian agriculture? Officials recommend a simple alcohol wash protocol that can be used by both amateur and professional beekeepers to test for further appearances of this ectoparasitic genus.

A: *Varroa*

Q: At the 2023 Antlion Pit Competition, Emily Bick and Dev Mehrotra won first place for inventing what cost-effective pest monitoring device that uses ultra-sensitive microphones to detect the subtle sounds of insect feeding?

A: Insect eavesdropper

Q: "Old Pest, New Problem" is the partial title of a Tuesday symposium co-organized by Jocelyn Smith, Matthew Carroll, and Kelsey Fisher. According to the symposium's full title, the "old pest" is European corn borer, and the "new problem" is what? Over the last couple decades, this problem has also been documented in at least ten other insect pest species, including fall armyworm and corn earworm.

A: Bt resistance

Q: Referring to a general type of feeding habit, what compound word appears in the official common names of the sawfly *Fenusa pumila*, the gracillariid moth *Phyllonorycter crataegella*, and the chrysomelid beetle *Baliosus nervosus*? This compound word also appears in the common names of many economically important flies in family Agromyzidae.

A: Leafminer

Q: If left unchecked, what insect pest can cause soybean yield losses of up to 60%, and can reduce biomass of its eponymous host plant by almost 33%? These estimates were obtained from studies done after this pest species was first detected in the US in 2009.

A: Kudzu bug (*Megacopta cribraria*)

Q: Studies of rice crops that were damaged by borers and other insect pests usually reference what colorful term, that was coined by economic entomologist Mano Pathak to refer to an incompletely emerged panicle that does not produce grain as a result of insects damaging the rice plant's vascular tissue?

A: Whitehead

Q: Grasshoppers are common pests of guayule, a commercially-grown southwestern plant that has been used by indigenous Mesoamericans (and is still used today) as a source of what? As an extra hint, the correct answer rhymes with a common name applied to many species of grasshopper.

A: Rubber (rhymes with "lubber")

Q: The aphid species *Sarucallis kahawaluokalani* was first described from Hawaiian specimens that were feeding on what ornamental plant? This plant, in the genus *Lagerstroemia*, is part of the aphid's common name.

A: Crapemyrtle

Q: Communication, Pest Management, Planning & Organization, and Knowledge & Resources, are the four major components of an IPM model proposed by what entomologist? It is by far the most cited work written by this entomologist, who published it in 2019 in the Journal of Integrated Pest Management with the title "the New Integrated Pest Management paradigm for the modern age."

A: Dr. Surendra K. Dara

Q: The coconut rhinoceros beetle is, unsurprisingly, a serious pest on coconut, but it is also a pest on what other economically important plant in the same family as coconut?

A: Oil palm (*Elaeis guineensis*)

Q: As a noun, this word refers to a certain article of clothing. As a verb, this word refers to a type of damage that some larvae do to stems, roots, or twigs, which interrupts nutrient transport and leads to plant damage or death. Its etymology comes from an old word meaning 'encircle', referencing the ring of plant tissue damaged by the feeding insects. What is this word?

A: Girdle

Q: A mite species in the genus *Aculops* and an aphid species in the genus *Phorodon* are significant pests on what plant genus? Ahmed et al. reported dozens of insects feeding on this plant genus in Florida for the first time, in a 2023 paper that included the key words 'industrial' and 'medical' (but as of 2023, not 'recreational')

A: Cannabis

Q: The insects seen here, which are currently wreaking havoc on Tunisia's prickly pear industry, are in the same genus as another insect that is considered beneficial. What genus does this insect belong to?

A: *Dactylopius*

Q: For most of the 20th century, what method was considered the most effective way to control both northern and western corn rootworm in the US? Unfortunately, changes in egg diapause and oviposition behavior have rendered this cultural control method less effective than before.

A: Crop rotation

Q: With over 1,200 host plant species in 80 families, what pathogen in the family Bromoviridae has one of the widest host ranges of any plant virus? This virus is partially named after the plant it was first discovered in, and it can be transmitted by aphids and some beetles in genus *Diabrotica*.

A: Cucumber mosaic virus (CMV)

Q: What insect order contains the widespread species whose phenology is pictured here? Like many species in this order, it is omnivorous, and is considered a beneficial natural enemy in American apple and pear orchards even though nymphs cause some damage to fruit during the canopy phase, after they leave the maternally-defended nest at the end of the nesting phase.

A: Dermaptera

Q: What two-word phrase is used in the 2003 textbook "Concepts in Integrated Pest Management" to describe the process of obtaining information "from bottom to top" in order to make effective management plans in an IPM program? The first word in this phrase has been redacted in orange in the metaphorical depiction of the process shown here.

A: Decision staircase or decision steps

Q: A new phylogenetic study of termites suggests there are several undescribed *Reticulitermes* species living in California. However, there are currently only two California *Reticulitermes* species that are prominent enough to have official ESA common names. What is the common name of either of those species?

A: Western subterranean termite, arid land subterranean termite

Q: Although common bed bugs are not known to vector any diseases, some Madagascar bed bugs were recently found to contain bacteria in the genus *Francisella*, and thus might be capable of vectoring what disease? This disease's symptoms include fever and skin ulcers, and in the US, this disease is usually spread to humans by ticks and deer flies that vector the type species of *Francisella*.

A: Tularemia

Q: Bravecto, which contains the active ingredient fluralaner, is marketed as an insecticide that primarily targets what insect order? Bravecto is most effective against this insect order when administered topically or orally, and in 2014 the FDA approved its use for treatment against ectoparasitic ticks and this insect order.

A: Siphonaptera

Q: An article by Jessica Stanhope and Philip Weinstein called "Note to chew on" is about the damage that a certain insect family can do to musical instruments. This holometabolous family is unofficially called "bow bugs" because it will eat the horse hairs on violin bows, and one

particular species of *Anthrenus* was found eating parts of a clarinet. What is this urban pest family in order Coleoptera?

A: Dermestidae

Q: The confusing statement "WHO has concerns about a WEE problem in Argentina" is meant to convey that the W.H.O. (World Health Organization) has concerns about a problematic rare human outbreak of what mosquito-borne virus that was reported in Argentina in 2023?

A: Western Equine Encephalitis virus

Q: In the US, what is the only genus of mosquitoes with eggs that are laid singly, directly on water, and that have air-filled sacs called floats?

A: *Anopheles*

Q: Give the official common name or scientific name of the most common tick species found in Arizona. This tick can vector the agents of multiple diseases, including canine babesiosis, canine ehrlichiosis, and Rocky Mountain spotted fever.

A: Brown dog tick, *Rhipicephalus sanguineus*

Q: Whereas African trypanosomiasis is spread by insects in order Diptera, family Glossinidae, the disease American trypanosomiasis is spread by insects in a different order and family. Name BOTH the order and family of these insect vectors of *Trypanosoma cruzi*.

A: Hemiptera, Reduviidae

Q: The scientific name of the scrub typhus pathogen, *Orientia tsutsugamushi*, literally means "insect sickness" in Japanese. Ironically, the vector of this so-called "insect sickness" is not an insect; it is what family of mites?

A: Trombiculidae

Q: Operation PX was a failed attempt by the Japanese military to attack the US with bioweapons that spread a specific disease. The disease they planned to use during Operation PX is most commonly vectored by an insect whose family starts with the letter P and whose genus starts with the letter X. What is the name of this bacterial disease that notably infects the lymphatic system?

A: Bubonic plague (vectored by *Xenopsylla cheopsis*, family Pulicidae)

Q: What morphological term, derived from the Latin word for 'necklace', refers to the antennae of some cecidomyiid flies and most Isoptera that have flagellomeres shaped like beads?

A: Moniliform

Q: A 2024 study in the journal *Food Chemistry* showed that mealworms and crickets exposed to UV light could synthesize the prohormones ergocalciferol and cholecalciferol. These prohormones are collectively better known by what name?

A: Vitamin D

Q: The approximately 5,000 terrestrial species in what order have a thorax divided into seven segments called pereonites, and an abdomen divided into six segments called pleonites. Whereas

insects are characterized by one pair of antennae, species in this arthropod order have two pairs of antennae.

A: Isopoda

Q: The southern chinch bug, *Blissus insularis*, has two morphs. The brachypterous morph is named after its reduced wing development. What is the other morph, which is named to reflect the chinch bugs' larger, fully developed wings that make it better able to disperse compared to the brachypterous morph?

A: Macropterous

Q: *Brunneria borealis* is a wingless mantis species widespread in the southern and eastern US. It's unusual in that, unlike most insect species, a female was designated as the holotype instead of a male. But a much more unusual thing about this species is that it's the only mantis known to obligately do what?

A: Reproduce via parthenogenesis

Q: Chrysopidae is the only family of Neuroptera with some species that have what sensory structure? In Chrysopidae this structure is found at the base of the wing, and by definition, this structure is comprised of a membrane, an air-filled sac, and a chordotonal organ.

A: Tympanum or tympanal organ

Q: Insects in the extinct orders *Geroptera* and *Palaeodictyoptera* have two pairs of fully developed wings, but they also have a third pair of reduced wings, or 'winglets', on what part of the body? This is a part of the body that never has wings in extant insects.

A: Prothorax

Q: In 1965, Gottfried Fraenkel and Catherine Hsiao reported their discovery of what cuticle-mediating hormone, which they named after the Greek word for 'tan skin'?

A: Bursicon

Q: The sponging/lapping mouthparts of some Diptera, the probing/sipping proboscis of most Lepidoptera, and the piercing/sucking mouthparts of most Hemiptera are all suctorial structures collectively referred to as what type of mouthparts?

A: Haustellate mouthparts

Q: What antennal structure articulates with the head capsule and is the most basal of the three main segments of the antenna?

A: Scape

Q: What is the portmanteau name of the collaborative project led by USDA apiologists and geneticists with the goal of assembling and annotating the DNA sequences of 100 important species of pollinators, for use in future research on conservation and apiculture?

A: Beename or Beename 100

Q: One of the main principles of the International Code of Zoological Nomenclature is that, when a taxon name is established, derived names at the same group level are also automatically

and simultaneously established. For example, since the family name Hesperidae was established by Latreille, Latreille is automatically given credit for establishing subfamily Hesperinae and tribe Hesperini. What is the name of this principle of zoological nomenclature?

A: Principle of Coordination

Q: Dominic Evangelista's 2024 phylogeny of Blattodea treats the sensu stricto definition of this family as being polyphyletic with Blatellidae. However, a few years earlier, Blatellidae had been designated as a junior synonym of this family. In fact, if you try to search for Blatellidae on Wikipedia, it will instead redirect to the page for this family. Name this family, whose status is apparently still a matter of contention among cockroach taxonomists.

A: Ectobiidae

Q: *Atteva aurea*, the Ailanthus webworm, was recently placed in family Attevidae after previously being a member of what other family? Whereas *Atteva aurea* is mainly orange, many species in this other family of Lepidoptera are mainly white and are called ermine moths.

A: Yponomeutidae

Q: *Xenos vesparum*, the first known species belonging to this order, was originally placed in Hymenoptera in the 1790s, because this order did not exist until William Kirby created it in 1815. Currently, *Xenos vesparum* is considered a member of family Xenidae and suborder Stylopodia, which are both subtaxa in what order?

A: Strepsiptera

Q: The myriapod *Pneumodesmus newmani* is an extinct ancestor of millipedes and is the oldest terrestrial arthropod to have a full-body fossil preserved in the fossil record. Name either of the geological periods that this arthropod is believed to have lived in, based on the age estimates of the fossil.

A: Silurian or Devonian period

Q: This amber-preserved specimen in the extinct family Palaeotanyrhinidae belongs to what extant insect order?

A: Hemiptera

Q: This genus of beetles contains roughly 130 species ranging from the southwestern US to Ecuador, including a few species here in Arizona. They exhibit a variety of beautiful colors, particularly green, gold, and metallic silver. What is the name of this scarabaeid genus, commonly known as jewel scarabs?

A: Chrysina

Q: In 2024, Brad Balukjian described many new species in this family and gave them Tahitian-language names to raise awareness for the need of preserving biodiversity in French Polynesia. Many of the new species are described as having greenish hemelytra, with red at the apex of the cuneus. What family do these new species belong to?

A: Miridae

Q: This family includes the only insect that is known to live in the La Brea Tar pits, as well as the only insects that are known to live in California's alkaline Mono lake. What is the name of this family that contains the petroleum fly and alkali fly?

A: Ephydridae

Hard Questions

Q: Volvation, the act of rolling into a defensive ball, is a behavior commonly observed in isopods that is also present in some insects. Most species in what family of Hymenoptera have a highly sclerotized integument and a concave abdomen that enables them to perform volvation when threatened?

A: Chrysididae or cuckoo wasps

Q: J. Alan Renwick and Frances Chew studied oviposition behavior in Lepidoptera and described the sequence of behaviors that lead up to oviposition. They name two behaviors performed by gravid females that take place after searching for an oviposition site, but before landing on the newly located oviposition site. What is the name they use for either of these behaviors?

A: Orientation or encounter

Q: Earlier this year, a group of South Korean coleopterists published a new method for studying what specific behavior associated with many Scarabaeidae and other insects? The method involves tagging live beetles with aluminum foil and then using a metal detector to more effectively observe this behavior.

A: Underground movement or burrowing

Q: The silken webs produced by many species of micromoths serve as protective barriers against abiotic factors, plant defenses, predators, pathogens, and parasitoids. However, when May Berenbaum and her grad student Ellen Greene studied the webs produced by the parsnip webworm, they found that the webbing serves another purpose, in an intraspecific context. What other beneficial function of the webbing did they discover?

A: Resource partitioning or reducing aggressive interactions between parsnip webworm larvae on the same host plant

Q: The cellular structure that enables *Aedes aegypti* to detect carbon dioxide is divided into three subunits, numbered 1, 2, and 3. What two-letter initialism is used to name all of these subunits? These two letters are short for a phrase that broadly describes the subunits' function with regards to CO₂ detection.

A: GR

Q: The insecticide oxazosulfonyl was once thought to be a sodium channel blocker, but in 2024, scientists at Syngenta demonstrated that it is instead a VACHT inhibitor. It binds to VACHTs, causing cholinergic synaptic transmission block resulting in nervous system shutdown and paralysis. What three-word phrase does VACHT stand for?

A: Vesicular acetylcholine transporter

Q: Orthene 97 is commonly used in the southeastern US to control some insect pests of cotton. What organophosphate is the active ingredient of Orthene 97?

A: Acephate (dimethyl N-acetylphosphoramidothioate)

Q: *Melaleuca*, the genus of tree that produces tea tree oil, is also the source of an oil with terpenes that were recently found to be toxic to *Aedes* mosquitos. In addition to its insecticidal properties, it has been used in southeast Asia as a topical counterirritant, and is one of the ingredients in some formulations of Tiger Balm. What is the name of this oil, which comes from the Malay word for "white wood"?

A: Cajeput oil

Q: Samuel Schmid's 2024 study of invasive alligatorweed and Kelly Carruther's 2023 study of invasive Brazilian peppertree both proposed management plans involving herbicide use and insect biocontrol agents. In both studies, the proposed insect biocontrol agent belonged to what order?

A: Thysanoptera

Q: What is the genus of the parasitoid that was introduced to the US in the 1990s as a biological control agent of the pink hibiscus mealybug? This genus of encyrtid wasp has also historically been used as a biological control agent of the citrus mealybug.

A: *Anagyrus*

Q: In order for USDA-APHIS-PPQ to officially approve a candidate weed biocontrol agent for release, approval must first be given by US Fish and Wildlife, Tribal Councils, and what other organization, comprised of 15 federal and state agencies overseen by USDA-APHIS? We will accept either the full name or the three-letter acronym of this organization.

A: TAG (Technical advisory group)

Q: According to Australian entomologist Emma Aspin, the two most common natural enemies of what moth pest species are the endoparasitoid wasp *Dolichogenidea tasmanica* and the ectoparasitoid wasp *Goniozus jacintae*? This Australian moth species is a major pest on Australian grapes, but when it spread to the US in the 21st century it became better known for damaging a different food plant.

A: Light brown apple moth or LBAM (*Epiphyas postvittana*)

Q: Though it has since been adapted for multiple families of insects, this black pyramid trap was designed by W. Louis Tedders specifically to monitor the emergence of adults in what insect family?

A: Curculionidae

Q: The mealybug *Paracoccus marginatus* and the tephritid *Anastrepha curvicauda* (formerly in genus *Toxotrypana*) can feed on multiple host plants, but they are best known for feeding on what fruit that appears in both of their common names?

A: Papaya (*Carica papaya*)

Q: Many genera in the family Thripidae contain economically important pest species, such as genus *Thrips* and genus *Frankliniella*. What other genus of Thripidae contains both the avocado thrips and the chili thrips?

A: *Scirtothrips*

Q: The leaf damage seen here, characterized by bright yellow, angular spots developing on the leaves between the veins, was created by what insect pest species? This species typically feeds on the same host plant as *Monellia caryella*, but unlike that species, the nymphs in this aphid species are distributed equally between both leaf surfaces.

A: *Melanocallis caryaefoliae*

Q: What is the common or scientific name of the family that has been shown to reproduce faster when exposed to carbaryl, compared to untreated populations? Carbaryl also has the unwanted effect of killing this family's natural enemies, such as predatory beetles in the genus *Stethorus*.

A: Spider mites or Tetranychidae

Q: The NOW program is an IPM program active since 2021, that incorporates sterile insect technique, monitoring, and mating disruption for control of an insect pest on almonds and pistachios. What family contains the pest species that is the primary target of the NOW program?

A: Pyralidae

Q: This exotic scale insect was first detected in Florida in 2009, immediately sparking concern since it is a pest of citrus in Africa and the Middle East. It can feed on oranges, grapes, and the lebeck plant, but its official common name references a different ornamental plant that is also in its host range. What is the common or scientific name of this pest, which is in the same genus as the coconut mealybug?

A: Hibiscus mealybug (*Nipaecoccus viridis*)

Q: Most of the official USDA publications about detecting emerald ash borer in the US recommend examining the exit holes left by emerging adults to determine whether a tree has been infested. According to the USDA, the emerald ash borer exit holes are distinctly shaped like what?

A: The letter D

Q: In 1916, Brazilian physician Henrique da Rocha Lima described a bacterial pathogen that is named after two scientists (one American, the other Czech) who died from the diseases they were studying in the years leading up to World War I. What is the scientific name of this insect-vectorated bacterium?

A: *Rickettsia prowazekii* (named after Howard Ricketts and Stanislaus von Prowazek)

Q: In summer 2024, the CDC issued a travel advisory due to a little-known Neotropical virus that, like Zika, can cause microcephaly in newborns. This mosquito- and ceratopogonid-vectorated virus is known by what common name, derived from the Trinidad village where it was first discovered?

A: Oropouche

Q: What is the scientific name of the insect known in Peru as 'mirunta', in Brazil as 'berne', and in Mexico as 'moyoquil'? This insect is notorious in all of those countries, as well as many others in the Americas, for causing furuncular myiasis in humans.

A: *Dermatobia hominis*

Q: In 2011, an insect species native to Europe was discovered in Manhattan and has since rapidly spread to other urban areas in Long Island and New Jersey, with potential to spread as far as Massachusetts and Georgia. This urban pest, with the scientific name *Lasius emarginatus*, belongs to what family?

A: Formicidae

Q: What tick structure, found on the tarsi of the forelegs, is an olfactory structure that enables ticks to detect hosts and find mates?

A: Haller's organ

Q: This word describes the reproductive morphology of females in the delphacid subfamily Stenocraninae, in which there is a genital opening for mating and a separate opening for oviposition. A slight variation of this word describes the similar genitalic morphology found in a very large namesake clade of Lepidoptera. Name either of these morphological terms.

A: Ditrysic or ditrysian

Q: What ant secretory structures, located at the back of the thorax, produce a variety of antimicrobial compounds and proteins that can be used to clean the ants' infected wounds?

A: Metapleural gland

Q: What is the name of these tiny particles that are secreted by the malpighian tubules of Cicadellidae? After secretion, the leafhoppers spread these nanoparticles on their cuticle to make it more water-repellent.

A: Brochosomes

Q: When this family of Hymenoptera was first described by Howard Evans, it was treated as a tribe of Sphecidae and then later Crabronidae. It was elevated to family after the 2018 phylogeny published by Sann et al. revealed that it was the sister group to clade Anthophila. What is this family of predatory wasps, sometimes called aphid wasps, that is the closest living relative of bees?

A: Ammoplanidae

Q: Entomologists Lucas Rubio and Holger Braun recently described a new species endemic to Argentinian meadows that has an "extraordinarily broad-band ultrasound calling song". This new species, with the scientific name *Conocephalus tuyu*, belongs to what family?

A: Tettigoniidae

Q: Give the scientific names of BOTH species of cicada that are in the so-called "-decula group" of genus *Magicicada*.

A: *Magicicada tredecula* and *Magicicada septendecula*

Q: Allotriocarida is a subclade of Pancrustacea that contains insects, non-insect hexapods, and three other classes that are potential sister groups to Hexapoda. Name any one of these classes, whose names are redacted from the phylogeny seen here.

A: Remipedia, Branchiopoda, or Cephalocarida