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The stinger is used as a defense tool (Insecta: Hymenoptera).

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Colonies react to predators or invaders, which is why some animals tend to associate with these insects, benefiting from this defense. These associations range from other Hymenoptera, as recorded between social wasps and ants, and also between some wasps and birds. Predation is the main factor in wasp nesting failure, which requires different defense strategies, including nesting near colonies of social wasps, as first observed (Figure 1).

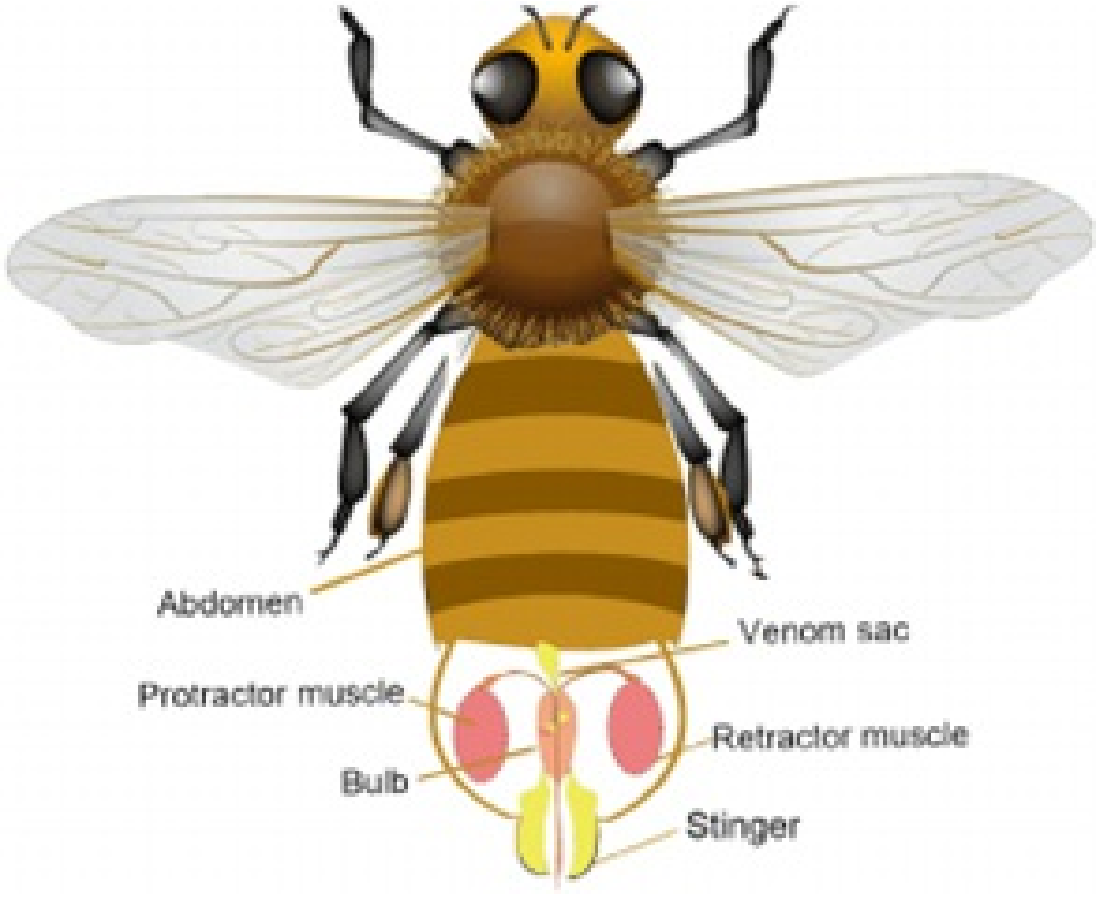

Figure 1. Anatomy of the honeybee's stinger apparatus. The stinger resides in the sting chamber inside the last abdominal segment (not to scale). The sting apparatus mainly comprises the protractor/retractor muscles, the bulb, the

stinger, and the venom sac. The protractor muscles drive the stinger to penetrate the wound and the retractor muscles are used in the reverse manner to pull the stinger back into the sting chamber. During penetration, the venom is pumped into the stinger from the bulb, which is also known as the venom reservoir. Source: DOI 10.1371/journal.pone.0103823.g001.

Different species of birds and social wasps have already been recorded in associations, however, no association between the flatbill, *Tolmomyias sulphurescens* (Spix, 1825), and the social wasps *Polybia paulista* (Vonlhering, 1896) and *Apoica gelida* Vecht, 1972, has been registered. The relationship between birds and social wasps is still not entirely clear, some studies show benefits for birds, such as the one in Costa Rica, showing that the wrens *Campylorhynchus rufinucha* (Lesson, 1838), when associated with colonies of *Polybia reject* (Fabricius, 1798), had nesting success almost twice as high as those that nested without wasps (Figure 2).

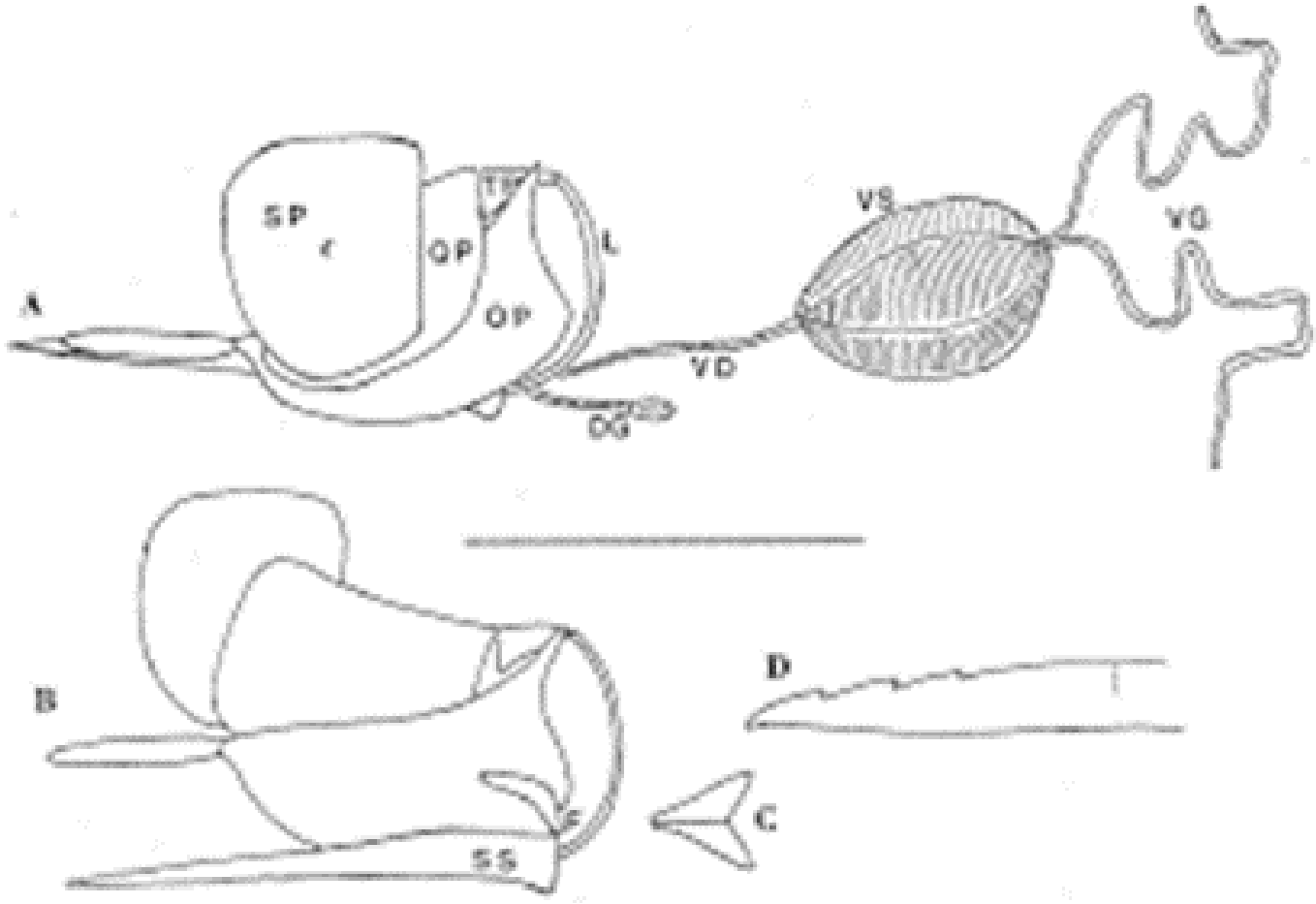

Figure 2. Venom apparatus of *Ropalidia horni* Sonan, 1938, to show characteristics common to the Vespidae. (A) Side view from the left of the intact venom apparatus with soft tissues removed except for the muscles surrounding the venom sac. (B) Side view from the left of the stinger, with components in place but splayed. (C) Furcula in top view. (D) Type of a lancet. Scale bar = 1 mm for (A–C), approximately 0.1 mm for (D). DG = Dufour's gland. F = furcula. OP = oblong plate. QP = quadrangular plate. SP = spiral plate. SS = sting shaft. TP = triangular plate. VD = venom duct. VG = venom gland. VS = venom sac. From Macalintal and Starr. Source: Insects 2021, 12(8), 729; https://doi.org/10.3390/insects12080729.

The curious thing is that, despite its importance to the environment, little is known about the genetic and biological aspects and characteristics of this species. It is also curious to know that this aversion that wasps have can be attributed to the almost total lack of knowledge about their real importance. In addition to the real risks they cause to human health, the neurotoxic potential, among other particularities, makes the creation of educational projects to raise awareness of this community one of the most important tasks in the fight to preserve these animals for future generations.

Some authors also report benefits obtained by birds, however, in some studies social wasps did not obtain gains or losses, characterizing this association as a case of commensalism. There is also research that shows that birds have not been successful in nesting close to colonies of social wasps, as in the work carried out by, where it was demonstrated that certain birds known as waxbills (Estrildidae) did not benefit from nesting close to wasp colonies. Highlighting the need for more work in this relationship (Figure 3).

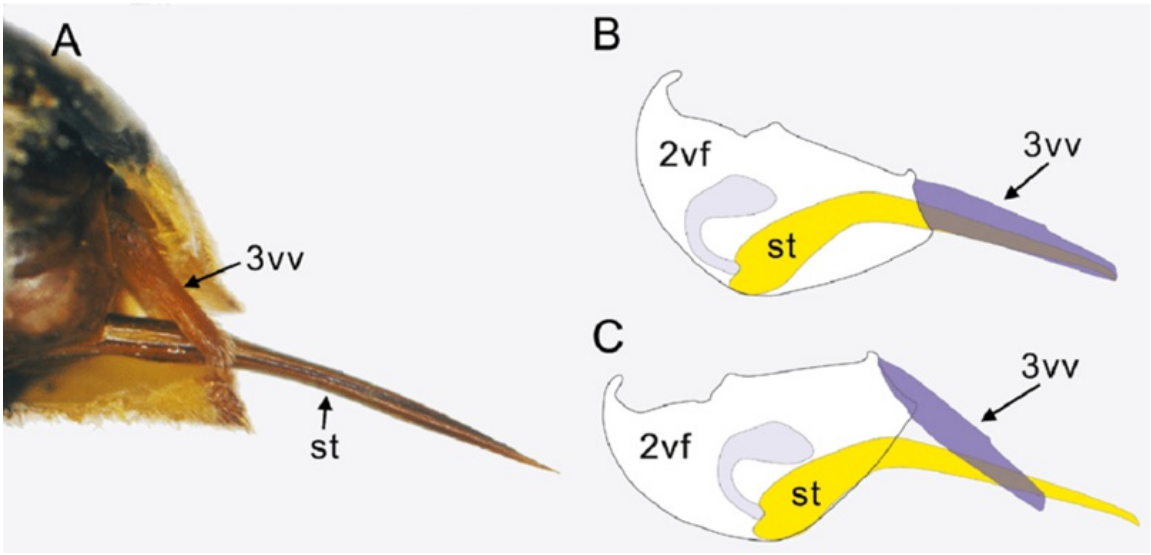

Figure 3. Extreme positions of the 3rd valve (3vv) during stinging in*Polistes dominulus* (Christ, 1791) (Vespidae), lateral view. A, C: Position of 3vv when the sting is extended. B: Position of 3vv when the sting is at rest. Source: https://www.researchgate.net/figure/Extreme-positions-of-the-3-rd-valvulae-3vv-during-stinging-in-Polistes-dominulus_fig4_355381439.

Some studies have managed to show evidence of the benefits of bird-associated social wasps in that the first colonies of wasps of the genus Polistes were found in the same cavity as *Plocepasser mahali* (Smith, 1836), and the second colonies of *Belonogaster lateritia* Gerst, 1857 were found in the bottom of the nests of*Philetarius socius* (Latham, 1790). Where wasps preyed on flies attracted to bird droppings, several birds eat wasps, and with them around, you won't have to worry about getting stung. Sometimes a bird will also eat wasp nests. [1-8].

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