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NOTES ON GEOGRAPHIC DISTRIBUTION

First record of *Cheilomenes sexmaculata* (Fabricius, 1781) (Coleoptera, Coccinellidae) from Honduras

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Abstract. *Cheilomenes sexmaculata* (Fabricius, 1781) (Coleoptera, Coccinellidae), a ladybug of Asian origin, has been recently reported in the Americas. Here, we record it for the first time in Honduras. In 2023, 26 specimens were collected on corn (*Zea mays* L. (Poaceae)), sorghum (*Sorghum bicolor* (L.) (Poaceae)), and sunflower (*Helianthus annuus* L. (Asteraceae)) in Francisco Morazán. The series included five color types: quadriplagiata group types D-1, F-2, and I, and diversijunata group types L-2 and N. Diagnosis, photographs of the adults, and the male genitalia are presented to aid in the identification.

Key words. Biological control, Central America, introduction, invasive, pest, phenotype, polyphagous

Treminio S, Veroy K, Orozco J (2025) First record of *Cheilomenes sexmaculata* (Fabricius, 1781) (Coleoptera, Coccinellidae) from Honduras. Check List 21 (3): 539–543. https://doi.org/10.15560/21.3.539

INTRODUCTION

Cheilomenes sexmaculata (Fabricius, 1781) (Coleoptera, Coccinellidae), commonly known as Six-spotted Zigzag Ladybug, is a polyphagous predator of soft-bodied insects (Agarwala and Yasuda 2000; Aguilar-Menacho et al. 2024; Safeer et al. 2024). The species is native to Asia and Australia (Poorani 2002) but has extended its distribution due to climate change and human-mediated introductions (Kawakami et al. 2014; Romanowski et al. 2020) to America, and more recently Europe (Migeon et al. 2023).

Despite the common name, not all adult beetles have six spots or a zigzag pattern on their elytra. Based on coloration, 23 phenotypes (Sasaji and Akamatsu 1979; Matsuka et al. 1985) have been placed into four distinct phenotypic groups: quadriplagiata (Q), unifasciata (U), diversijunata (D), and sexmaculata (S) (Kawakami et al. 2013). Dark types (10) are exclusive to group Q, while light types (13) are distributed in the remaining three groups (Kawakami et al. 2013). In its native range, group S is widely distributed at low latitudes, Q is limited to an area near the north, and U and D appear in between S and Q groups (Kawakami et al. 2013).

In the Americas, *C. sexmaculata* was first found in Chile in 2000 (González 2008). Since then, it has made its way north: Peru in 2010 (Cornejo and González 2015), Venezuela in 2011 (Angulo et al. 2011), Colombia in 2013 (Kondo et al. 2015, González et al 2024), Ecuador in 2014 (Cornejo and González 2015), and Curaçao in 2017 (Assour and Behm 2019). For Central America, the species was found in 2019 in Panama (Romanowski et al. 2020) while in North America it was found in Mexico in 2021 (Rodríguez-Vélez 2022). Despite being introduced to the United States (Oklahoma) as a biological control of the aphid *Schizaphis graminum* (Rondani, 1852), the species has not become established (Cartwright et al. 1977).

Although coccinelids are mostly considered beneficial and are often introduced purposefully for pest control, they also represent risks (Assour and Behm 2019; Rodríguez-Vélez 2022). Due to its broad dietary range, *C. sexmaculata* may displace native predator species and have an impact on non-target arthropods. For example, *Harmonia axyridis* (Pallas, 1773), Multicolored Asian Lady Beetle, another invasive coccinellid species, was introduced in several countries as a biological control agent and has caused a disastrous impact on non-target arthropods, on fruit production, and as a household invader (Koch and Galvan 2008). Agarwala and Yasuda (2000) provided a full list of species *C. sexmaculata* has been found to prey on.

The citizen-science platform iNaturalist (2025) shows multiple photographic sightings of a species identified as *C. sexmaculata* in Honduras since 2019 in the departments of Cortés, Lempira, Olancho, El Paraíso, Comayagua, Valle, and Choluteca. Unfortunately, vouchers for these records do not exist and, therefore, the identifications are difficult to verify. Due to their phenotypic variation, other species, like *Micraspis discolor* (Fabricius, 1798) and *Chilocorus nigrita* (Fabricius, 1798), among others, can be confounded with *C. sexmaculata* when only photographs are available (Singh et al. 2016). This work documents the presence of *C. sexmaculata* in Honduras for the first time and discusses the phenotypes found.

OPEN ACCESS

Academic editor: Juan Pablo Botero
Received: 18 February 2025
Accepted: 22 April 2025
Published: 15 May 2025

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METHODS

The specimens were collected from January to May 2023 using entomological nets, and yellow traps covered with automotive grease as an adherent in El Zamorano, Francisco Morazán, located at 14°00'35"N, 087°00'40"W. The average temperature during the study period was 22.6 °C and the average relative humidity was 71%.

The collected specimens were preserved in 70% ethanol in the field and were then taken to the laboratory for study under a Leica EZ4 stereomicroscope. The identification was done by using the original diagnosis provided by Mulsant (1850) and the description of the male genitalia of Ślipiński (2007). The nomenclature for the color morphs follows Sasaji and Akamatsu (1979) and Matsuka et al. (1985), cited by Kawakami et al. (2013).

Photographs were taken using a Canon EOS Rebel T5i camera mounted on a Leica EZ4 stereoscope. Composite images were obtained by using PICOLAY (Cypionka 2025). Individual images were edited using Photo Assist on a Samsung Galaxy S23+ and organized in plates in Microsoft Powerpoint v. 2401. A distribution map of *C. sexmaculata* in Central and South America was elaborated based on the locations and corresponding references cited above in the introduction and from the new records in Honduras using SimpleMappr (Shorthouse 2010) and Microsoft Powerpoint v. 2401.

Voucher specimens are deposited at the Insect collection of Zamorano University Honduras (EAPZ). Voucher numbers for the material examined are shown in the results.

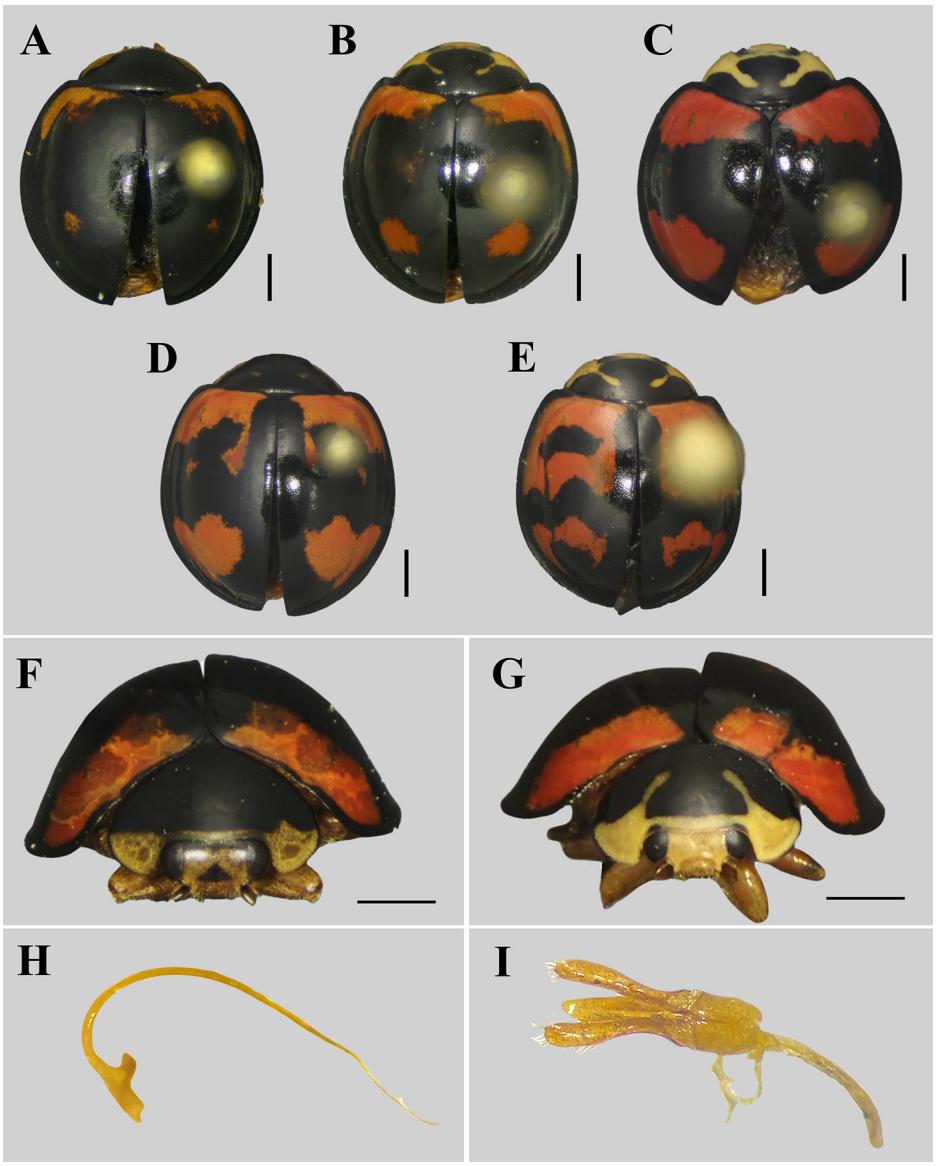

Figure 1. *Cheilomenes sexmaculata* (Fabricius, 1781) from Zamorano, Honduras. **A–C.** Dark types: (**A**) Type D-1; (**B**) Type F-2; (**C**) Type I. **D, E.** Light types: (**D**) Type N; (**E**) L-2. **F.** Female, frontal view. **G.** Male, frontal view. **H.** Male genitalia: penis (sipho). **I.** Male genitalia: phallobase, dorsal view. Scale bars = 1 mm.

RESULTS

***Cheilomenes sexmaculata* (Fabricius, 1781)**
Figures 1, 2

New records. HONDURAS — **Francisco Morazán** • San Antonio de Oriente, EAP Zamorano; 14°00'N, 087°00'W; 26.I.2023; S. Treminio leg.; Corn crop; 1♀, EAPZ53.270 • Same locality as preceding; 7.II.2023; Corn crop; 1♂, EAPZ53.274 • Same locality as preceding; 27.II.2023; Sunflower; 1♂, 2♀, EAPZ53.296 • Same locality as preceding; 3.III.2023; Sorghum crop; 1♀, EAPZ53.305 • Same locality as preceding; 17.III.2023; Yellow trap; 1♀, EAPZ53.311 • Same locality as preceding; 13.IV.2023; Corn crop; 1♀, EAPZ53.312 • Same locality as preceding; 12.V.2023; Corn crop; 6♀, 12♂, EAPZ53.322.

Twenty-six specimens, 14 males and 12 females, were collected. The beetles were found mainly on corn (*Zea mays* L.) (Poaceae), and in smaller amounts on sorghum (*Sorghum bicolor* (L.)) (Poaceae) and sunflower (*Helianthus annuus* L.) (Asteraceae). All these crops had a high presence of aphids during the collection.

Among the specimens collected, five color morphs were identified, three belonging to the quadriplagiata (Q) group types D-1, F-2, and I (Figure 1A–C) and two to the diversijunata group (D) type L-2 and N (Figure 1D, E). Of the 26 specimens found, 24 belong to dark color types (D-1, F-2, and I) and two to light types (L-2 and N).

Identification. According to Mulsant (1850), and the description of the male genitalia of Ślipiński (2007), *C. sexmaculata* can be identified by the following characteristics: Length ~5.1 mm, width ~4.8 mm, body rounded and moderately convex, males with completely yellow head (Figure 1G), females with head radially black with a yellow spot in the center and a small black spot inside it (Figure 1B); the clypeus is semicircular and emarginate; the antennae are short and with 11 segments; the apical segment of the maxillary palps is triangular (securiform); males with black pronotum with yellow anterior border and yellow lateral projections towards the middle (Figure 1A); females with black pronotum with yellow anterior border (Figure 1F). Male genitalia with penis stout and T-shaped at the base (Figure 1H); phallobase symmetrical (Figure 1I).

DISCUSSION

This is the first record of *Cheilomenes sexmaculata* (Figure 1) in Honduras and the second record for Central America, after Panama (Romanowski et al. 2020). There is no information about the introduction and spread of *C. sexmaculata* in Honduras or its impact on the native fauna. Based on the proximity to the other Central American nations (Figure 2), the similarity of their ecosystems and climates, and the recent Mexican record (Rodríguez-Vélez 2022), it is expected that *C. sexmaculata* is present in the rest of Central America.

The lightest color type of *C. sexmaculata* known from the Americas belongs to Group S and has been found in the low-latitude countries of Ecuador and Colombia (Chavez et al. 2017; Ramírez et al. 2018). The rest of the specimens in the Americas include both light and dark types from all the other groups (González

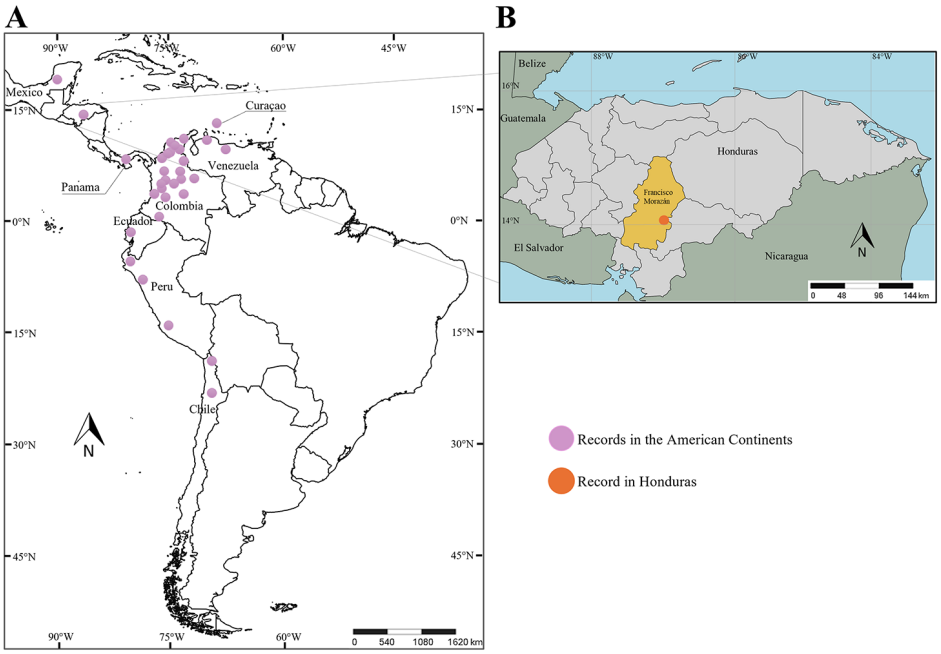

Figure 2. Distribution map of *Cheilomenes sexmaculata* (Fabricius, 1781) in the Americas. **A.** Distribution in the Americas. **B.** Distribution in Honduras.

2008; Angulo et al. 2011; Cornejo and González 2015; Kondo et al. 2015; Ramírez et al. 2018; Assour and Behm 2019; Romanowski et al. 2020; Rodríguez-Vélez 2022).

In the native range, dark types of *C. sexmaculata* increase their frequency at higher latitudes as a thermal adaptation to absorb more radiation, and light types are more common at lower latitudes as an adaptation to reduce thermal stress by reflecting radiation (Kawakami et al. 2013). Of the color morphs found in Honduras during the hot season, dark types (adapted to higher latitudes) were more abundant than light types (adapted to lower latitudes) as expected for the intermediate latitude Honduras is located. On the other hand, in India, at a similar latitude as Honduras, a study dealing with the frequency of the six color types present in the area during a year, light types were found to be more abundant during the hot season (Singh et al. 2016).

Although it seems like there is some phenotypic plasticity caused by temperature, Kawakami et al. (2015, 2018) argued that the phenotype is not affected by variations in temperature, but it is determined genetically. It is unclear if the types found in Honduras are the result of a founding event or an adaptation to the local conditions as per the groups defined by Kawakami et al. (2013).

ACKNOWLEDGEMENTS

This study was financially supported by the Pan-American Agricultural School, Zamorano (Honduras). The manuscript was improved by the comments of Takumasa Kondo and an anonymous reviewer.

ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

Funding

This study was financially supported by Pan-American Agricultural School, Zamorano (Honduras).

Author contributions

Conceptualization: ST, KV, JO. Data curation: ST, KV. Formal analysis: ST, KV, JO. Funding acquisition: JO. Investigation: ST. Methodology: ST. Resources: JO. Supervision: KV, JO. Visualization: ST, KV. Project administration: KV, JO. Validation: ST, KV, JO. Writing – original draft: ST, KV. Writing – review and editing: KV, JO.

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Data availability

All data that support the findings of this study are available in the main text.

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