

Biosystematic Survey of Ladybird Beetles (Coleoptera: Coccinellidae) in the Eastern Region of Chaharmahal and Bakhtiari Province, Iran

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Abstract
Ladybird beetles (Coccinellidae) are important components of terrestrial agroecosystems because many species prey on aphids and other soft-bodied arthropods. This study documented the coccinellid fauna of the eastern part of Chaharmahal and Bakhtiari Province, southwestern Iran, with sampling focused on Borujen County during 2024. Specimens were collected from agricultural fields, orchards, rangelands and urban green spaces using insect nets and hand collection. Samples were preserved in 70% ethanol, and identification was based on external morphological characters and, where required, microscopic examination of genital structures using published taxonomic keys. Five species belonging to four genera within the subfamily Coccinellinae were reported: *Coccinella septempunctata*, C. undecimpunctata, *Adalia bipunctata*, *Hippodamia variegata* and *Propylaea quatuordecimpunctata*. The paper dataset reported relative frequencies of 36.7%, 30.0%, 14.28%, 10.0% and 10.0%, respectively; these rounded values sum to slightly more than 100%, so the underlying counts should be checked before final submission. *Coccinella septempunctata* was the most frequently recorded species, followed by C. undecimpunctata. The findings provide a preliminary baseline for the regional ladybird fauna and suggest that common predatory species may contribute to natural regulation of aphid populations in cultivated habitats. However, the short sampling period, incomplete reporting of effort and lack of molecular confirmation limit inference about long-term community structure. Standardized multi-season surveys and voucher-based taxonomic verification are recommended.

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1. Introduction

The family Coccinellidae (Coleoptera) comprises a diverse group of beetles occupying agricultural, semi-natural and urban habitats. Many species are predators of aphids, scale insects, mites and other small arthropods, and consequently can contribute to the natural suppression of crop pests. Other coccinellids have different feeding habits, making reliable identification important when assessing their ecological role. Species-level inventories are therefore useful both for documenting regional biodiversity and for informing integrated pest management.

Species occurrence and relative abundance can vary with habitat structure, host-plant availability, prey density, climate and sampling season. In mountainous regions such as the Zagros, local elevation and the mosaic of cultivated fields, orchards, rangelands and settlements may create a range of conditions for coccinellid communities. Borujen County in Chaharmahal and

Bakhtiari Province includes these habitat types and provides a useful setting for a preliminary faunistic assessment.

Although ladybird beetles have been studied in several parts of Iran, the source paper identifies a need for more systematic documentation from eastern Chaharmahal and Bakhtiari. The present study aimed to (i) identify the coccinellid species collected in the study area, (ii) describe selected diagnostic morphological characters, and (iii) summarize the relative abundance pattern reported for the collected material. The study is treated as a regional inventory rather than a test of pest-control efficacy.

2. Materials and Methods

2.1. Study area and sampling habitats

Field work was conducted during 2024 in Borujen County, in the eastern part of Chaharmahal and Bakhtiari Province, Iran. Sampling stations included agricultural fields (including wheat, alfalfa, maize, potato and other crops), orchards, rangeland vegetation and urban green spaces. Localities named in the paper include Borujen, Gandoman, Boldaji, Faradonbeh, Sefid Dasht and surrounding villages. Exact coordinates, station-level dates and sampling effort were not consistently available in the supplied manuscript and should be added from field records before submission.

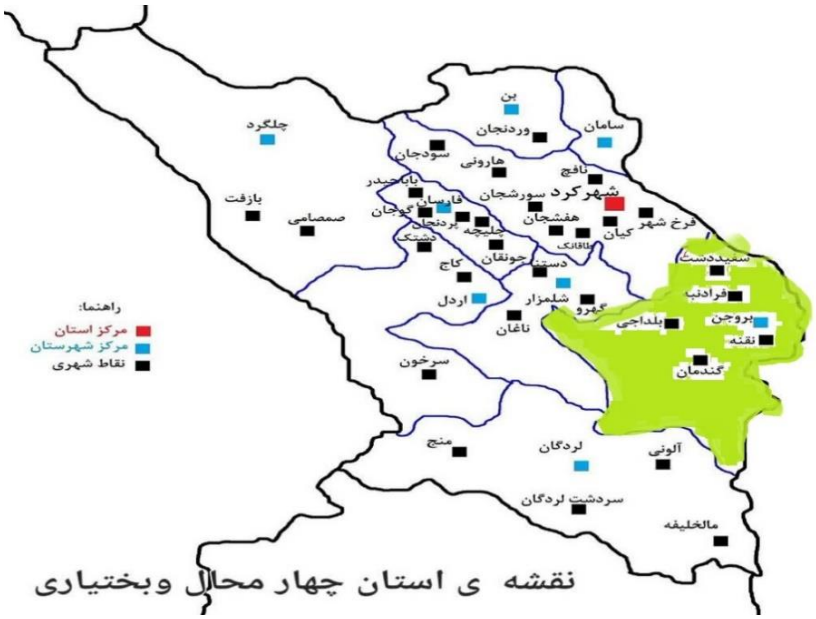


Fig 1: Study-area map reproduced from the paper. The highlighted area indicates the principal survey region; map labels and cartographic source should be checked before publication.

2.2. Collection and Preservation

Specimens were collected using insect nets and manual collection from vegetation in crop fields, orchards and other surveyed habitats. The paper describes sweeping along diagonal transects and at field margins. Specimens were preserved in 70% ethanol and labelled with locality and habitat information. For future reproducibility, the final manuscript should state the number of visits per station, duration of each visit, net-sweep count, exact dates and total number of specimens.

2.3. Morphological Identification

Identification was based on external characters, including body shape and size, colour pattern of the pronotum and elytra, antennal and mouthpart characters, legs and visible abdominal structures. The source paper also describes preparation of genitalia slides where necessary, using 10% potassium hydroxide and microscopic examination. Identification keys attributed in the paper to Gordon and related coccinellid taxonomic literature were consulted. Species names and author citations should be checked against an authoritative current taxonomic catalogue, and voucher specimens should be deposited in a named institutional collection.

2.4. Relative Abundance

The paper classified species according to their reported relative frequencies and cited a threshold-based scheme in which frequencies above 30% were considered super-dominant, 15–30% dominant and 5–15% less frequent. Because the original specimen counts and a complete station-by-species matrix were not available in a machine-readable form, percentages are reported as given in the source rather than recalculated. The reported percentages require reconciliation with the underlying counts before publication.

3. Results

3.1. Species Composition

Five species of Coccinellidae were reported from the surveyed localities. All were assigned in the paper to the subfamily Coccinellinae and represented four genera (Table 1). The species list comprises two species of Coccinella and one species each of Adalia, Hippodamia and Propylea.

Table 1: Coccinellid species reported from the eastern region of Chaharmahal and Bakhtiari Province.

Subfamily / genus	Species	Diagnostic field character noted in source
Coccinellinae / Coccinella	*Coccinella septempunctata*	Typically red-orange elytra with seven black spots
Coccinellinae / Coccinella	*Coccinella undecimpunctata*	Red-orange elytra with eleven black spots
Coccinellinae / Adalia	*Adalia bipunctata*	Pronounced colour-pattern polymorphism; commonly two dark elytral spots
Coccinellinae / Hippodamia	*Hippodamia variegata*	Small, elongate-oval body with variable dark markings
Coccinellinae / Propylea	*Propylea quatuordecimpunctata*	Yellow-and-black chequered elytral pattern

3.2. Species-level observations

Coccinella septempunctata was described as a widespread species in the study area and was collected from agricultural habitats including cereal and forage fields and orchards. Its distinctive red to orange elytra bearing seven black spots provide a useful external identification character. In the dataset summarized by the paper, this species had the highest reported relative frequency (36.7%) (Figure 3 A).



Fig 3: Dorsal view of Coccinella *septempunctata*

Coccinella undecimpunctata was the second most frequently reported species, at 30.0%. The source describes it as occurring in crop fields and urban green spaces. Its elytral spot pattern was used as a principal external diagnostic feature. As spot patterns can vary in appearance and may be difficult to assess in damaged specimens, identification should be supported by a combination of characters (Figure 4)



Fig 4: Dorsal view of *Coccinella undecimpunctata* was

Adalia bipunctata accounted for a reported 14.28% of the material. The paper notes substantial colour-pattern polymorphism in this species, including variation in the number and prominence of dark markings. This variability reinforces the importance of using structural characters in addition to colour pattern when identifying specimens.

Hippodamia variegata and *Propylea quatuordecimpunctata* were also recorded. The paper reported 10.0% for *H. variegata* and 10.0% for *P. quatuordecimpunctata*, although a separate summary table appears to list only some species in its habitat-specific comparison. The raw records should be checked to confirm the station distribution and exact relative frequency of each species (Figures 5 & 6).



Fig 5: Lateral view of *Hippodamia variegata*



Fig 6: Lateral view of *Propylea quatuordecimpunctata*.

3.3. Relative frequency pattern

According to the percentages presented in the paper, *C. septempunctata* was the most frequent species, followed by *C. undecimpunctata*. *A. bipunctata* was intermediate in frequency, whereas *H. variegata* and *P. quatuordecimpunctata* were reported at lower frequencies. The reported values (36.7, 30.0, 14.28, 10.0 and 10.0%) total 100.98%, indicating a small but material inconsistency likely caused by rounding, transcription or calculation. Figure 2 visualizes the values as reported; they should not be treated as corrected estimates until specimen counts are checked.

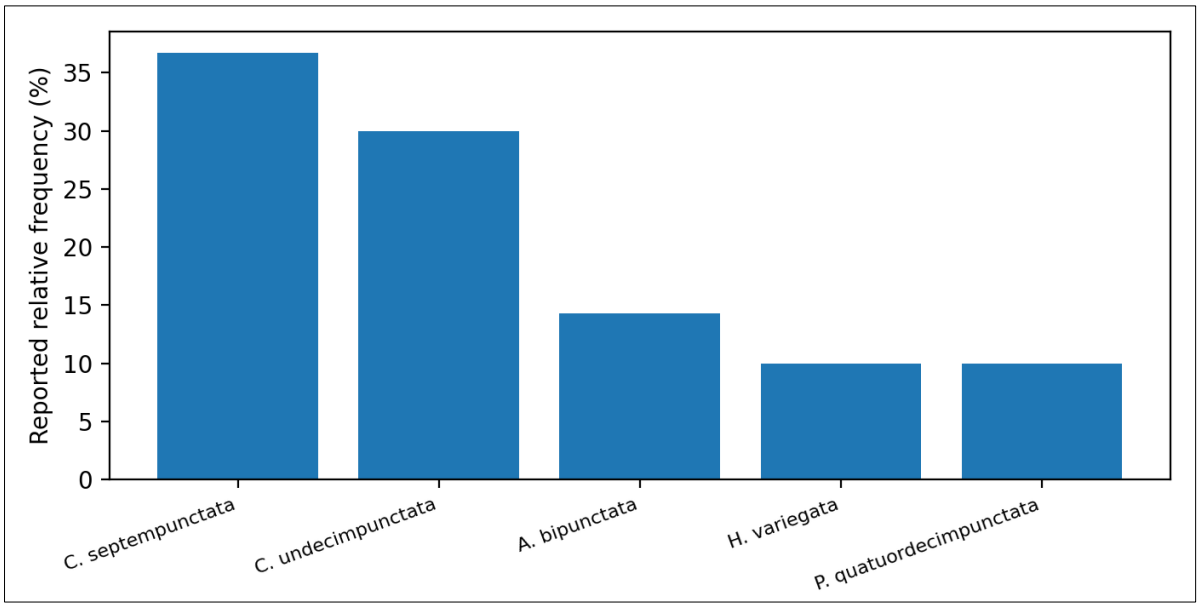


Fig 7: Relative frequencies reported in the paper. Values are reproduced as provided and sum to 100.98%; verify against raw counts before submission.

4. Discussion

This preliminary survey documents five coccinellid species from four genera in the surveyed part of Borujen County. The species list is dominated numerically by Coccinella, represented by C. septempunctata and *C. undecimpunctata*. The observed pattern is consistent with the ecological importance often attributed to predatory ladybirds in agricultural landscapes, but the present data support a descriptive interpretation only: prey density, feeding rates and crop damage were not measured directly.

4.1. Dominance of Coccinella species

Coccinella septempunctata had the highest reported relative frequency (36.7%), and C. undecimpunctata ranked second (30.0%). Both were recorded across managed habitats, suggesting that these species may exploit prey resources associated with crops and planted vegetation. C. septempunctata is widely recognized as an aphid predator, so its relatively frequent occurrence makes it a candidate for further study in local integrated pest-management programmes. Nevertheless, abundance alone does not demonstrate that the species reduced pest populations at the sampled sites. Demonstrating biological-control impact would require concurrent measurements of aphid abundance, predator activity, crop context and pesticide exposure.

The difference between the two most frequent species may reflect differences in habitat use, prey availability, seasonal activity or detectability. The paper suggests that *C.*

septempunctata was particularly associated with agricultural fields and orchards, whereas *C. undecimpunctata* was also noted in urban green spaces. Because standardized effort and station-level counts were not supplied in the source text, these habitat associations should be regarded as preliminary observations rather than statistically tested preferences.

4.2. Morphological Variation and Identification

The recorded occurrence of A. bipunctata is relevant because this species is known for conspicuous colour-pattern polymorphism. Reliance on elytral spots alone can therefore lead to misidentification, especially where specimens are faded, damaged or show less common morphs. A robust biosystematic workflow should combine external morphology with genital characters when needed and should retain labelled voucher specimens. DNA barcoding could provide an independent line of evidence for difficult specimens, although it would complement rather than replace careful morphological documentation.

The other recorded species also possess recognizable elytral patterns, but these patterns should be interpreted as part of a broader character set. The paper reports examination of antennal, mouthpart, leg, abdominal and genital characters. In the final paper, species diagnoses would be stronger if accompanied by calibrated measurements, diagnostic images with scale bars, and explicit comparison with the identification key used. Any taxonomic claims that extend beyond the present locality inventory, such as a first provincial record, should be made only after checking published distribution records and authoritative catalogues.

4.3. Habitat Mosaic and Ecological Interpretation

The sampled landscape included croplands, orchards, rangelands and urban green spaces. Such habitat heterogeneity can support different prey communities and plant structures, potentially affecting the occurrence of predatory ladybirds. Crops such as wheat and alfalfa may provide aphid resources at particular times of year, while orchards and urban plantings can sustain alternative prey and refuges. These are plausible mechanisms, not relationships directly tested in this survey. Future sampling should measure vegetation, prey abundance, pesticide use and local microclimate to determine which factors best explain species distribution.

The study area's high-elevation, mountainous setting may also influence seasonal activity and phenology. However, the current study covers a single field season (2024) and does not quantify climatic covariates. Accordingly, climate should be discussed as a potential influence rather than as a demonstrated cause of the observed frequency pattern.

4.4. Comparison with Previous Work and Regional Significance

The paper places the findings within the broader context of Iranian coccinellid surveys and notes that predatory ladybirds have been documented in several agricultural regions of the country. The presence of *C. septempunctata*, *C. undecimpunctata*, *A. bipunctata*, *H. variegata* and *P. quatuordecimpunctata* is broadly plausible for an agricultural landscape, but a rigorous comparison requires verified primary references and comparable sampling designs. The references cited in the paper include several incomplete or potentially inconsistent bibliographic entries; these should be checked against the original publications before the manuscript is submitted. We have therefore avoided presenting unverified numerical comparisons with other provinces.

The main contribution of the study is the provision of a preliminary species inventory for the eastern part of Chaharmahal and Bakhtiari Province. A regional checklist can help direct future monitoring and identify candidate predators for further ecological study. The results should not yet be used to rank species for commercial release or to recommend a particular biological-control intervention, because prey suppression, non-target effects and performance under local conditions were not evaluated.

4.5. Limitations and Future Work

Several limitations should be acknowledged. First, the survey was conducted during one year, and seasonal or interannual changes in abundance may not be represented. Second, the supplied paper does not provide a complete, internally reconciled matrix of specimen counts by species, site, date and habitat. Third, the relative-frequency values sum to 100.98%, requiring correction from the original field records. Fourth, exact coordinates, sampling effort and deposition details for vouchers should be reported. Finally, molecular verification was not described as part of the study. Addressing these gaps through repeated standardized sampling, transparent count tables, image vouchers and optional DNA barcoding would improve reproducibility and taxonomic confidence.

5. Conclusions

The survey reported five ladybird beetle species—*Coccinella septempunctata*, C. undecimpunctata, *Adalia bipunctata*, *Hippodamia variegata* and *Propylea quatuordecimpunctata*—from the eastern region of Chaharmahal and Bakhtiari Province, Iran. *C. septempunctata* had the highest reported relative frequency, followed by *C. undecimpunctata*. These findings establish a preliminary baseline for local coccinellid diversity and highlight the value of predatory ladybirds in agroecosystems.

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References

1. Biranvand A, Fekrat L, Větrovec J, Ghobari H, Hamidi E, Zare Khormizi M, *et al*. Checklist and distribution of ladybirds (Coleoptera, Coccinellidae) in Iranian provinces. Zootaxa. 2024;5493(2):101-128. doi:10.11646/zootaxa.5493.2.1.
2. Abdolahi R, Nedvěd O, Nozari J. Ladybirds (Coleoptera: Coccinellidae) of Iran: 45 new records from 10 provinces. Acta Phytopathol Entomol Hung. 2017;52(2):205-214. doi:10.1556/038.52.2017.016.
3. Abdolahi Mesbah R, Nozari J, Allahyari H, Zare Khormizi M. Checklist and distribution of lady beetles (Coleoptera: Coccinellidae) in Iran. Iran J Anim Biosyst. 2016;12(1):1-35. Available from: https://ijab.um.ac.ir/article_27961.html
4. Biranvand A, Nedvěd O, Tomaszewska W, Canepari C, Shakarami J, Fekrat L, *et al*. An annotated checklist of Microweiseinae and Sticholotidini of Iran (Coleoptera, Coccinellidae). ZooKeys. 2016;587:37-48. doi:10.3897/zookeys.587.8056.
5. Biranvand A, Tomaszewska W, Nedvěd O, Zare

Khormizi M, Nicolas V, Canepari C, *et al*. Review of the tribe Hyperaspidini Mulsant (Coleoptera: Coccinellidae) from Iran. Zootaxa. 2017;4236(2). doi:10.11646/zootaxa.4236.2.6.
6. Shakarami J. Contribution to the knowledge of Coccinellidae (Coleoptera) of Iran. Orient Insects. 2019;53(2):231-250. doi:10.1080/00305316.2018.1482804.
7. Zare Khormizi M, Biranvand A, Shakarami J. The faunistic survey of lady beetles (Coleoptera, Coccinellidae) in the Mehriz region (Yazd Province), Iran. Bull Iraq Nat Hist Mus. 2013;12(4).
8. Biranvand A, *et al*. Diversity and distribution of Coccinellidae (Coleoptera) in Lorestan Province, Iran. Biodivers J. 2014;5(1):3-8.
9. Abdi AR, Sadeghi E, Talebi AA, Shojai M. Coccinellids fauna of Chitgar Park and determination of dominant species. Iran J For Range Prot Res. 2012;10(2):135-153. doi:10.22092/ijfrpr.2012.11145.

Books and General References on Ladybird Biology and Ecology

10. Hodek I, Honěk A. Ecology of Coccinellidae. Dordrecht: Kluwer Academic Publishers; 1996.
11. Hodek I, van Emden HF, Honěk A, editors. Ecology and behaviour of the ladybird beetles (Coccinellidae). Chichester: Wiley-Blackwell; 2012.
12. Dixon AFG. Insect predator-prey dynamics: ladybird beetles and biological control. Cambridge: Cambridge University Press; 2000.
13. Majerus MEN. Ladybirds. London: HarperCollins; 1994.
14. Gordon RD. The Coccinellidae (Coleoptera) of America north of Mexico. J N Y Entomol Soc. 1985;93(1):1-912.
15. Kovář I. Family Coccinellidae Latreille, 1807. In: Löbl I, Smetana A, editors. Catalogue of Palaearctic Coleoptera. Vol. 4. Elateroidea-Derodontoidea-Bostrichoidea-Lymexyloidea-Cleroidea-Cucujoidea. Stenstrup: Apollo Books; 2007. p. 568-631.

References on Biological Control and Ecological Importance

16. Obrycki JJ, Kring TJ. Predaceous Coccinellidae in biological control. Annu Rev Entomol. 1998;43:295-321. doi:10.1146/annurev.ento.43.1.295.
17. Seago AE, Giorgi JA, Li J, Ślipiński A. Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on molecular data. Mol Phylogenet Evol. 2011;60(1):137-151. doi:10.1016/j.ympev.2011.03.019.
18. Hodek I. Biology of Coccinellidae. Prague: Academia; 1973.

Additional Taxonomic and Distributional Resources

19. Tomaszewska W, *et al*. Phylogenetic relationships and classification of ladybird beetles (Coleoptera: Coccinellidae). 2021.
20. International Taxonomic Information System (ITIS). Coccinellidae Latreille, 1807: taxonomic information [Internet]. 2025 [cited 2026 Nov 13]. Available from: https://www.itis.gov/

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