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New State Record and Range Extension of Three Butterfly Species from Gujarat, India

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ABSTRACT. – The present study reports a new state record and range extension of three butterfly species: Indian Blue Mormon *Papilio polymnestor* (Cramer, 1775), Blank Swift *Caltoris kumara* (Moore, 1878), and Large Branded Swift *Pelopidas subochracea* (Moore, 1878) from the state of Gujarat, India. These butterflies are recorded during a three-year-long survey from January 2018 to December 2020 in Ankleshwar – an industrial town in Gujarat, India. The presence of three species provides an additional occurrence record from the known geographic distribution, i.e., 560 km to the North, from the previously known records. These sighting records signify previous sampling gaps and suggest further surveys to make a baseline database and implement effective conservation initiatives to protect the butterfly fauna in this area.

KEYWORDS: conservation, distribution, geographical range, skipper, swallowtail

INTRODUCTION

Biodiversity knowledge is vital for assessing the overall health of ecosystems and the development of proper conservation plans, especially in ecologically sensitive groups such as butterflies (Lepidoptera, Rhopalocera) (Chowdhury and Soren, 2011). Butterflies are pivotal in the stability of food webs as herbivores (Rusman et al., 2016), pollinators (Mukherjee et al., 2015), hosts of parasitoids (van Nouhuys and Hanski, 2002), and prey of predators (Rusman et al., 2016). Numerous species act as biological indicators of environmental health and ecological changes (Thomas, 2005; Posha and Sodhi, 2006; Koh, 2007) due to their sensitivity to habitat fragmentation and climate change (Kunte, 2000). Indian Blue Mormon *Papilio polymnestor* Cramer, 1775 is a butterfly of the family Papilionidae. The species prefer forested areas up to 2130 m and fly from January to December (Kehimkar, 2016). *Papilio polymnestor* is widely distributed in India being recorded from Jharkhand, Madhya Pradesh, Chhattisgarh, Dadra and Nagar Haveli, Maharashtra, Goa, Karnataka, Telangana, Kerala, Tamil Nadu, West Bengal, and Sikkim (Kehimkar, 2016; Saji et al., 2021). Blank Swift *Caltoris kumara* (Moore, 1878) belongs to the family Hesperiidae. The species prefer forested areas up to 1950 m and fly from January to December (Kehimkar, 2016). In India, *Caltoris kumara* is found in Maharashtra, Kerala, Tamil Nadu, Karnataka, West Bengal, Sikkim to Arunachal Pradesh, and Uttarakhand (Kehimkar, 2016; Singh, 2020; Saji and Ogale, 2021). Large Branded Swift *Pelopidas subochracea* (Moore, 1878) also belongs to Hesperiidae. The species prefer forested areas up to 2400 m and fly from March to November (Kehimkar, 2016). In India, *Pelopidas subochracea* is recorded from Maharashtra, Karnataka, Kerala, Himachal Pradesh to Assam, and Sikkim to Arunachal Pradesh (Kehimkar, 2016; Saji, 2021). Despite this large distribution, local populations of these species are scarce throughout their range. The current faunistic note presents the new state record and range extension for *Papilio polymnestor*, *Caltoris kumara*, and *Pelopidas subochracea* from Gujarat, India.

MATERIALS AND METHODS

The study was carried out in Ankleshwar, an industrial town in the Bharuch district of Gujarat (Fig. 1). The city is well-known for the GIDC (Gujarat Industrial Development Corporation) and has over 1500 chemical plants that produce pesticides, other chemicals, pharmaceuticals, textiles, and paints. The current findings are the result of a long-term (January 2018 to December 2020) butterfly faunal survey project in Ankleshwar (Sidat and Bhatt, 2020). The Pollard walk method (Pollard, 1977; 1991) was used for recording the butterfly species during all seasons, namely winter (December-February), summer (March-May), monsoon (June-September), and post-monsoon (October-November), except for heavy rains and high winds. Depending on the season, field observations were conducted in the early mornings from sunrise to 11:00 hrs and in the evenings from 4:00 hrs to sunset. Ten belt transects were uniformly spaced over the study site. Each transect had a fixed path, length, and width. All transects were visited once a month, and butterfly species were documented from both sides of the trail for 5 m to ensure a consistent observation area. Transects were walked steadily, with shortstops made along the way for proper documentation and

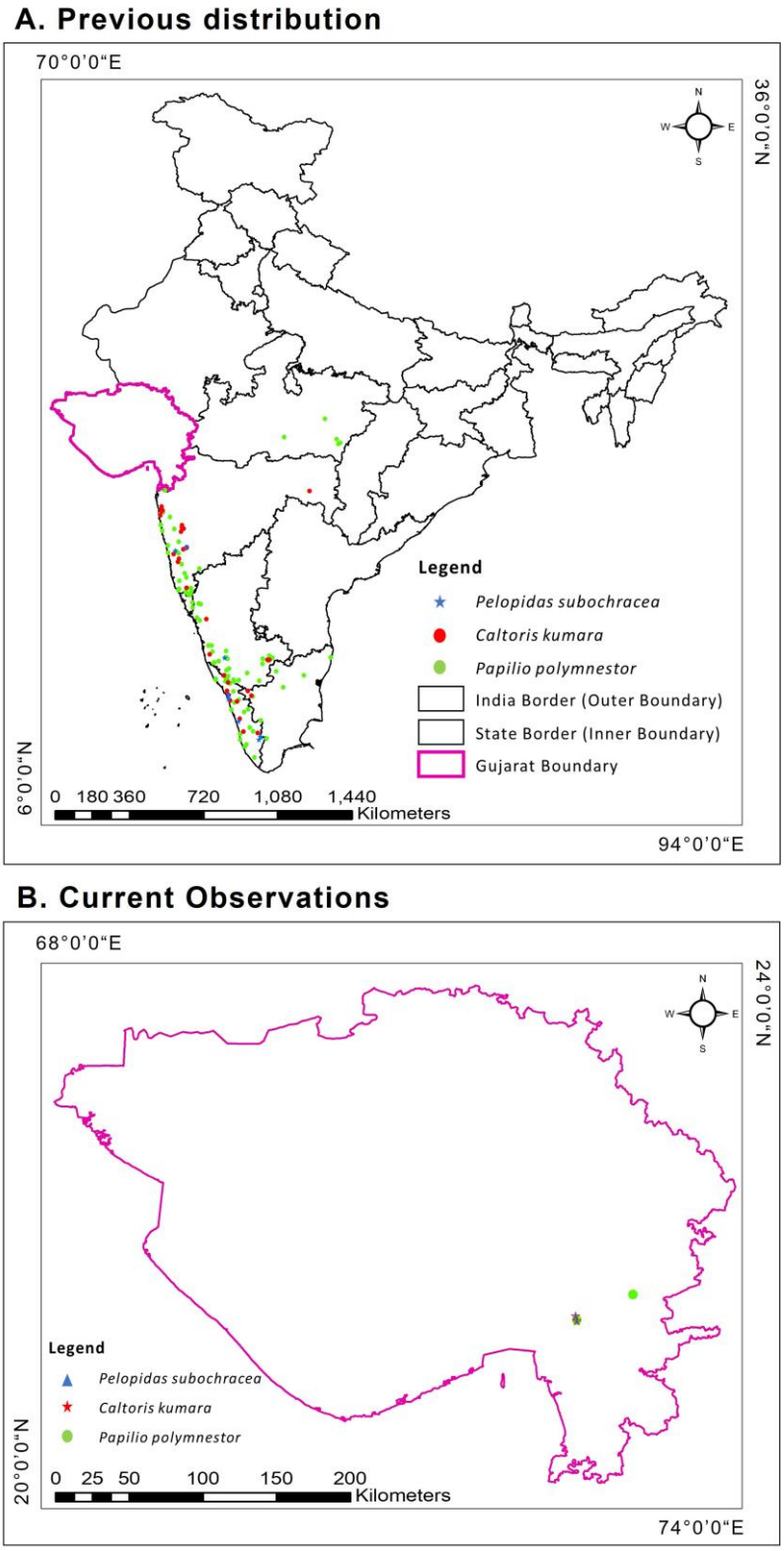

FIGURE 1. The previous distribution and current observations of *Papilio polymnestor*, *Caltoris kumara*, and *Pelopidas subochracea* in India.

identification. Visual observation of butterfly species was made using Olympus 8–16×40 DPS binoculars (Olympus Imaging India Pvt. Ltd., Mumbai, India). Photographs of butterflies and their habitats were captured using Canon EOS 550D and Canon EOS 60D cameras equipped with a Canon 18–135 mm lens (Canon Inc., Tokyo, Japan). Butterflies were identified using literature (Evans, 1932; Wynter-Blyth, 1957; Gay et al., 1992; Lewington, 1999; Kunte, 2000; Parasharya and Jani, 2007; Singh, 2011; Kehimkar, 2016).

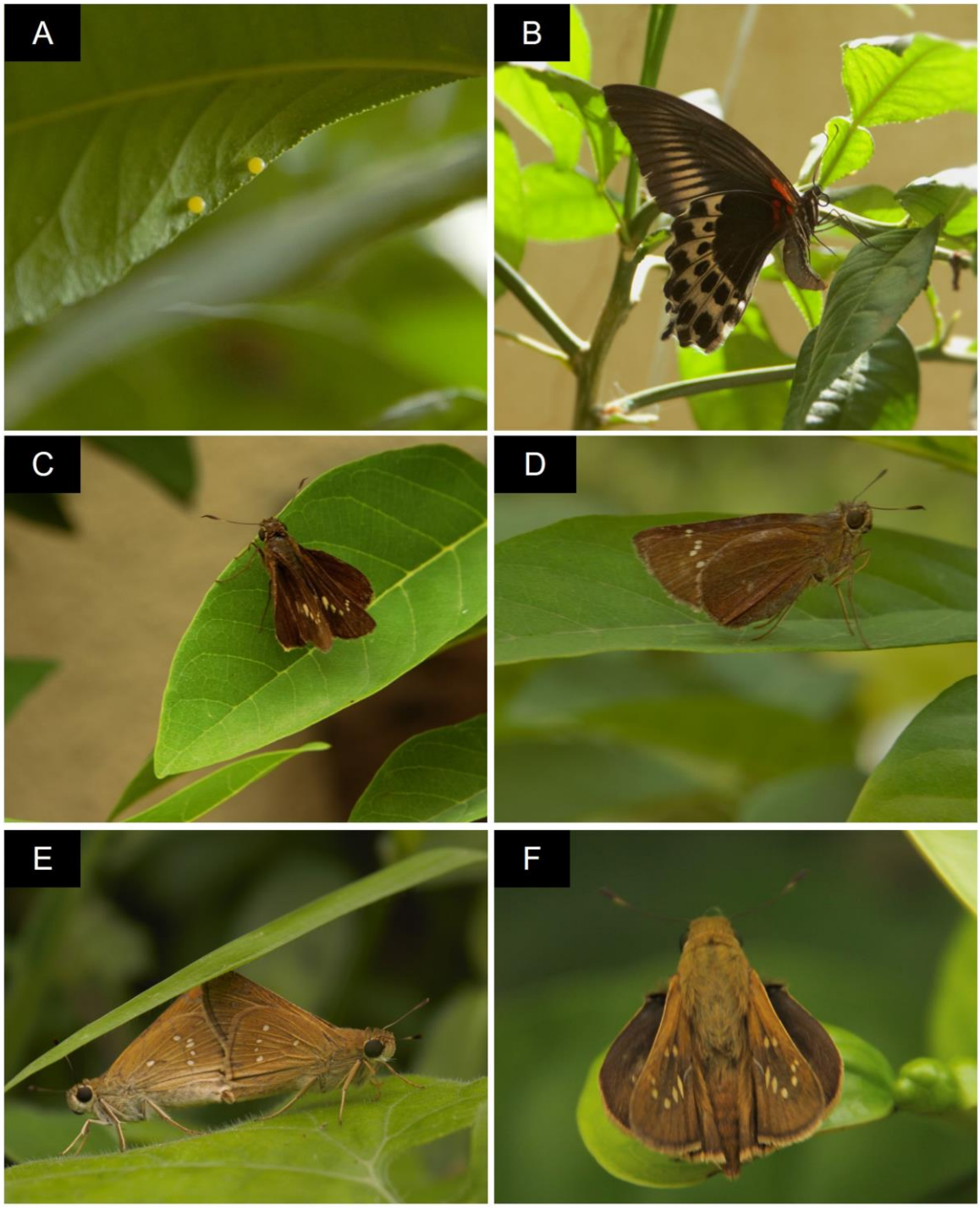

FIGURE 2. Butterfly species recorded in Gujarat, India. A. *Papilio polymnestor* eggs, B. *Papilio polymnestor*, C-D. *Caltoris kumara*, E-F. *Pelopidas subochracea*.

RESULTS

Systematics

***Papilio polymnestor* (Figs 2A, 2B):** Two individuals of *Papilio polymnestor* were observed. The first individual was sighted at 11:27 hrs on 4 August 2020, nectaring on *Ixora* sp. along Forest Rangers College garden, Rajpipla (21°51'30.94"N, 73°31'11.06"E), and the other individual was sighted at 10:18 hrs on 13 September 2020, laying an egg on *Citrus* sp. at a house garden, Ankleshwar (21°37'27.01"N, 72°59'37.57"E). *Papilio polymnestor* is a tailless black swallowtail butterfly measuring 120-150 mm wingspan. The hind

wings have a glistening bluish tinge. The species is closely like the Sri Lankan form *P. Polymnestor parinda* Moore except for the buff-coloured female form of the latter. It is often seen on forest paths and along streams. The male avoids shade and flies in sunny patches to look for nectar flowers with long corolla tubes and large nectar reserves. Usually, the female prefers shade and dense forest cover. The species flies 5 m above the ground and with great speed. It is common in forests with significant rainfall, where evergreen vegetation predominates. The species is also found in wooded urban areas.

Caltoris kumara **(Figs 2C, 2D):** An individual of *Caltoris kumara* was sighted near an agricultural hedge at 10:24 hrs on 3 September 2020 in Ankleshwar (21°36'58.87"N, 72°59'39.62"E). The species was found basking in the sunshine on a shrub leaf and came to visit the flowers. *Caltoris kumara* has a dark olive-brown upperside, forewings with six small semi-transparent yellowish spots in continuous series, and prominent brown scales on the underside hindwing. The species is found in the scrub jungle regions at low elevations and stays active early morning and late evening. It has a rapid and powerful flight.

Pelopidas subochracea **(Figs 2E, 2F):** Three individuals of *Pelopidas subochracea* were observed. Two individuals (male and female) were mating along roadside vegetation near suburban areas at 06:58 hrs on 24 July 2018 in Diva village of Ankleshwar (21°39'45.61"N, 72°58'54.64"E). The other individual was basking near roadside vegetation at 10:28 hrs on 26 August 2020 in Ankleshwar (21°36'58.87"N, 72°59'39.62"E). They were found to remain active during early morning and late evening and came to visit flowers. *Pelopidas subochracea* is easily identifiable with prominent white spots under the hindwing and one ina cell; some may be absent. The species is found in forested areas with high annual rainfall at low and high elevations.

DISCUSSION

Recording three species of butterflies from Gujarat is significant for updating the country's status and distribution of butterfly fauna. This addition is also vital to enrich the butterfly checklist of Ankleshwar, Gujarat. Our observations indicate that Ankleshwar sustains numerous rare butterfly species despite being surrounded by urbanized human habitations and industry. The main threat to these species' survival in the area is that their host and nectar plants grow primarily along roadsides and on the fringes of urban areas and industry. Urbanization significantly alters such habitats, and some localities may go extinct soon. Our findings show that *P. polymnestor*, *C. kumara*, and *P. subochracea* are primarily present in disturbed and anthropogenic habitats, which may facilitate the spreading of these species. Local species with restricted geographic distribution and presumably small populations are far more vulnerable to extinction than more widespread ones (Sodhi and Ehrlich, 2010). Prompt actions should be taken to protect their habitats.

The primary reason for the uncertainty about butterflies' status in this state is a lack of proper attention, a limited number of butterfly researchers, and a lack of awareness. New records indicate that more research on this faunal group is needed in this region. Such species at the site demonstrate the importance of conserving green patches around human habitations. Awareness camps, butterfly meet, walk, and seminars should be organized regularly. Giving locals basic butterfly knowledge can encourage them to promote "Butterfly ecotourism" in their area. It will assist in protecting the butterflies and their habitat while also providing them employment. In a nutshell, these records help update the status and distribution of the butterfly fauna in Gujarat. Further efforts are necessary to expand the number of known populations, assess their conservation status, and fill gaps in the known distribution of these species. Besides, studies should be conducted to increase knowledge of these species' biology to build effective conservation strategies.

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