Beetle Pests in Sri Lanka: Current Challenges, Knowledge and Emerging Threats to Agriculture and Biodiversity

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Abstract

Beetles represent a significant portion of Sri Lanka's biodiversity, with 115 families (ca. 3,033 species) documented, making them the largest faunal group on the island. The larval and adult phases of about 75% of beetle species are phytophagous and considering their significant damage to economically important crops for agriculture. Substantial agricultural yield is lost each year due to rapid insect infestations could significantly impact national food availability. It is extremely necessary to document insect pests in the country fundamental to pest management strategies. This review focuses on enhancing the understanding of major beetle pest species that affect crops such as vegetables, fruits, grains, coconut, rubber, rice and tea. The review encompasses 60 species from 14 families, with a predominant presence of pests from the Chrysomelidae, Scarabaidae, Curculionidae, Cerambycidae and Meloidae families. Recent field observations suggest significant damage to cashew plants in Wanathawilluwa. Phytophagous beetles significantly impact vegetable crops in the Solanaceae and Cucurbitaceae families by feeding on soft tissues. Larvae contribute to damage by attacking roots and stems, causing necrosis. Within families Coccinellidae, Carabidae, and Cicindelidae, many beetles exhibit predatory behaviours, while some demonstrate phytophagous tendencies as opportunistic feeders. Beetle pests in families Curculionidae, Cerambycidae, and Scolytidae are predominantly associated with woody crops. Understanding the economic pest status of these beetles and their sporadic population dynamics is crucial due to past outbreaks in neighbouring countries, highlighting potential risks to agriculture and ecosystems.

Keywords: Beetle, Pests, Agriculture, Crops, Phytophagous

I. INTRODUCTION

Coleoptera commonly known as Beetles are the most diverse group of animals on earth. They encompass almost 25% of all defined animals (Powel, 2009; Sharma, et al., 2019). The diversity of beetles is very wide with a cosmopolitan distribution; they are found in all habitats with a few in marine settings, except in extreme environments (Banerjee, 2014; Springer, 2009). Sri Lanka, a tropical island exhibiting remarkable biological diversity thus is designated as one of the world's biodiversity hotspots along with the Western Ghats of India (Myers et al., 2000). According to the numerical records, 3,033 species of coleopterans belonging to 115 families are documented from Sri Lanka (Bambaradeniya, 2006).

The larval and adult phases of about 75% of beetle species are phytophagous (Gullan & Cranston, 2010). Since most beetles are herbivores, and then considering their significant damage to economically important crops for agriculture, forestry, and household settings, are often deemed as one of the most destructive groups of pests worldwide (Gilliott, 1995; Patole, 2017; Kailash, et al., 2015). The percentage of beetle species that are pests is relatively low. However, they are particularly significant in tropical countries like Sri Lanka, where the environment and cropping conditions favor their development. The country's agricultural sector accounts for approximately 7% of the national Gross Domestic Product (GDP), with more than 30% of the country's population employed within the agriculture sector (ITA, 2024). Addressing the increasing food demand driven by population growth is a paramount global concern, but the substantial agricultural yield is lost each year due to rapid insect infestations (Bandara & Harshana, 2019). Insect pests inflict damage on crops at different growth stages, leading to annual losses ranging from 25% to 30%, which could significantly impact national food availability (Bandara & Harshana, 2019). Thus,

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research must focus on major insect pests and their outbreaks which is fundamental for the implementation of pest management strategies (Bandara & Harshana, 2019).

The fall armyworm (*Spodoptera frugiperda*) (Order Leoidoptera) was the worst pest infestation in the country's history which led to a substantial yield loss in 2018 over six months in corn (Hettiarachchi, et al., 2024; Wijerathna, et al., 2021; Perera, et al., 2019). Over 50% of the cultivation (54,416 hectares) has been infested in Uva, Eastern, and North Central provinces (Perera, et al., 2019). In 2020, a sporadic increase in crop-damaging yellow-spotted grasshoppers (*Aularches miliaris*) was recorded in the North Western Province in coconut and rubber cultivations (Rodrigo, 2020). A similar outbreak was reported on coconut plantations in Gampaha, Kegalle, Kandy, Kalutara, Colombo, Kurunegala, Ratnapura, Puttalam, and even the southern province of *Aleurodicus dispersus* (Spiralling whitefly) in 2019, resulting in considerable net yield loss (Silva, 2022). Rice, the primary food crop grown in Sri Lanka, is predominantly affected by the brown plant hopper (*Nilaparvata lugens*), leading to annual imports of milled rice ranging from 20,000 to 600,000 tonnes (Bandara & Harshana, 2019). There is an equal tendency to spike the beetle population to an endemic proportion in terms of past experience with the sudden emergence of some beetle species and the sporadic increase of the population in regional countries during past decades. Nevertheless, this scenario is expected to further intensify mainly due to climate change (Bentz et al., 2010; Jakoby et al., 2019). Recent researches have shown that such outbreaks have increasingly challenged traditional responses, and highlight the need for a more comprehensive management framework (Hlásny et al., 2021). Therefore, it is extremely timely and necessary to document insect pests in the country, starting with a particular class or order and then expanding to other classes and orders. This review focuses on efforts made to understand some of the major coleopteran pests in the country, providing detailed accounts of their host plants, distribution, and the nature of the damage they cause.

II. COLEOPTERAN PESTS OF MAJOR CROPS

The faunal communities within the Chrysomelidae, Cerambycidae, and Curculionoidae families are frequently deemed pests, primarily targeting agriculturally vital vegetable crops. Beetles of the family Scarabaeidae exhibit phytophagous tendencies with a diverse array of feeding behaviors. For instance, Dynastinae primarily feed on stems or roots, Cetoniinae consume sap, fruit, and flowers, Rutelinae target foliage, fruit, and flowers, while Melolonthinae feed on foliage. The soil-dwelling larvae of chafers predominantly consume live roots and have the potential to kill seedlings, mature plants by reducing the drought tolerance (Jackson & Klein, 2006). The prevailing observation indicates that the majority of species in coleopteran families, Coccinellidae, Carabidae, Cicindelidae primarily engage in predation, preying upon other insects and associated organisms serving as natural enemies. While numerous species exhibit phytophagous tendencies, many are opportunistic feeders, consuming a diverse array of food sources, damaging by sucking the sap from the flowers, buds, pods, tender shoots and reduce the market value of the products (Carvalho, et al., 2010; Cornelisse, et al., 2013).

A. Coleopteran Pests of Vegetables, Fruits, and Grains

Leafy vegetables constitute a vital element of the Sri Lankan diet and have been subjected to commercial cultivation. Flea beetle, *Chaetocnema* spp. (Chrysomelidae) has been recorded as an economically significant pest of green leaves (Table 01), serving as a primary threat to Mugunuwanna (*Alternanthera sesilis* L.) (Wahundeniya et al., 2005; Marasinghe and Nishantha, 2018). Flea weevil, *Tachyerges* spp. (Curculinoidae), has been identified as a new pest of leafy vegetables, Mukunuwenna (Hackston, 2020). This pest has been identified as an occasional threat to leafy vegetables across three districts, with particularly high leaf damage observed in the Gannourwa area during July-August 2017. Laboratory studies show that it can also damage various other leafy vegetable crops (Table 01) (Kumari, et al., 2022). A sweet potato flea beetle, *Chaetocnema confinis* Crotch. (Chrysomelidae) was discovered, causing extensive damage to Kankun (*Ipomoea aquatica*) in

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the Gannoruwa area during January-February 2018, reaching 100% crop loss. The damage initially appeared as whitish streaks on the leaves, progressing to yellow and brown discoloration, ultimately resulting in the complete destruction of the crop. Feeding studies confirmed that this species did not damage Mukunuwenna. These findings validate the existence of the invasive flea beetle species, *C. confinis*, within Sri Lanka, that not previously been documented (Kumari, et al., 2022).

Mohamedsaid (1979), studied the taxonomy of blister beetles (Meloidae) together with seasonal and geographic distribution and compared the meloid fauna of the island with rnainland India. *Mylabris pustulata* (Thunberg) is recorded as the most commonly collected species of Meloidae in Sri Lanka (Mohamedsaid, 1979). The species are geographically distributed throughout the island with the greatest abundance in regions receiving between 50-100 inches of rainfall annually, with peaks of abundance in April, June, and August (Mohamedsaid, 1979). According to Singh, et al., (1968) adult beetles recorded as a serious pest of cucurbitaceous crops and soybeans. Bhagwat (1995), surveyed Pigeon pea variety pests in Sri Lanka, covering six districts in farmers' fields and on Mahailluppallama research station and observed *Mylabris* sp. and Jewel beetles (*Sphenoptera* sp.) (Buprestidae) damaging pigeon pea stems seriously. Thuvaraka and Pakeerathan (2023), studied on eco-friendly management of hadda beetle, (*Henosepilachna* spp.) (Coccinellidae) which is a significant insect pest in brinjal cultivation across northern Sri Lanka. This polyphagous pest targets economically vital crops of the Solanaceae and Cucurbitaceae families (Table 01). *Epilachna vigintioctopunctata*, another phytophagous coccinellid, commonly known as the Epilachna beetle or cucurbit beetle, is a significant pest of cucurbitaceous and solanacaeous crops in Sri Lanka. Both the adult and larva of this beetle feed on the epidermal tissues of leaves, often stripping them down to the midrib, which can lead to the death of the plant (Karunaratne & Arukwatta, 2009). Mayadunnage, et al. (2007), conducted an extensive survey of predatory coccinellid beetles in vegetable-growing areas in the Mid Country, Sri Lanka, and recorded 15 different species belonging to 12 genera.

Abeywardhana and Dangalle (2021), conducted a survey on Arboreal Tiger Beetles (Cicindelidae) in Lowland Crop Cultivations in Sri Lanka, marking the first documentation of such beetles in crop cultivations in the country. Among the notable findings, *Derocrania scitiscabra* was the most commonly encountered species in betel leaf cultivation in the dry zone of Aralaganwila. Additionally, other species of the genus *Derocrania* were found in fruit farms in Vellankulam, and were observed in cinnamon and pepper cultivations in Waulpane (Table 1). Furthermore, observations by Jaskula (2013), indicate that tiger beetles may exhibit vegetarian feeding behavior during periods of low prey availability, admitting both suitable prey and vegetarian food sources. Additionally, reports indicate that species of the *Neocollyris* and *Tricondyla* genera lay their eggs on young branches of Arabic coffee and Liberian coffee trees, suggesting a potential reliance on specific plant species in Sri Lankan crop cultivations for their life cycle completion (Abeywardhana, et al., 2021). The larval stage of *Holotrichia serrata*, (sugarcane white grub), is recognized as a significant threat to sugarcane crops in Sri Lanka. In September 2012, an epidemic of this beetle was noted in soybean, cotton, and pigeon pea environments in Vidarbha, India (Dadmal, et al., 2013). Besides sugarcane, it poses a significant threat to various vegetables (Table 1). Observations in Sri Lanka have revealed that the grubs feed on the tap roots of teak seedlings, causing affected plants to wither and eventually perish, widely recorded from Sabaragamuwa province (Bandara, 1990; Bunalski, 1995). *Holotrichia reynaudi*, *Holotrichia rufoflava*, species of dung beetles recorded from the island, especially from Western and North Western provinces, and is considered as major pests on Peanuts, *Arachis hypogaea* in India (Kumar, et al., 2020; Bunalski, 1995). *Adoretus versutus*, commonly referred to as the rose beetle, originates from Oriental regions and is prevalent in numerous Asian countries, including Sri Lanka. The larvae of these beetles pose a threat to the roots of wild turmeric. Capable of triggering outbreaks, this pest can cause extensive defoliation across various crops (Table 01). A notable case occurred in Vanuatu, where the rose beetle was introduced in 1982 on Efate Island and inflicted significant damage in 1988 and 1989 on Espiritu Santo Island (Beaudoin, 1992). The Sri Lankan weevil, *Myllocerus undecimpustulatus*

undatus Marshall (Curculionidae), native to Sri Lanka, was initially recognized as causing damage to the leaves of winged bean, *Psophocarpus tetragonolobus* (Shanthichandra et al., 1990). The weevil considered as a pest of more than 20 crops. The larvae feed on plant roots for approximately one to two months. It is unclear which plants serve as hosts for the larvae, but they have been successfully reared in laboratory conditions using pepper, eggplant, cotton, carrot, and sweet potato roots. The leaf-feeding adults exhibit a wide host range, including native, ornamental, vegetable, and fruit species (Neal, 2013) (Table 01). Another *Myllocerus* species, *Myllocerus viridanus*, grey weevils, (Curculionidae), constitute a significant pest native to Sri Lanka and India, with a broad spectrum of host plants (Table 01) (Butani, 1979). Thangavelu et al. (1974), documented severe outbreak on *Corchorus olitorius* L., a type of green leaves used in Ayurveda, originating from Tamil Nadu. Additionally, it has been established as a pest of Moringa (*Moringa pterygosperma* Gaertn) (Kotikal & Math, 2016).

B. Coleopteran Pests of Coconuts

The coconut is an economically significant crop that plays a crucial role in social and cultural activities in Sri Lanka. It is cultivated in 92 countries globally, with Sri Lanka ranked as the fourth-largest producer (Winotai, 2014). Beetle pests have emerged as a significant threat to coconut cultivation by damaging flowers, feeding on nuts, roots, and seedlings (Table 01). The coconut leaf miner (*Promecotheca cumingii*) (Hispidae), first recorded as a beetle pest of coconuts in Sri Lanka in 1970 (Perera, 1979), was initially observed in Dehiwala but soon spread to other areas in the Western, Southern, and Northwestern Provinces. Although it is controlled by natural enemies, occasional outbreaks have been recorded. Apart from coconuts, *P. cumingi* has been reported to attack arecanut, swamp palm, sago palm, royal palm, and oil palm, although in Sri Lanka it has only been detected on coconut, oil palm, and royal palm (Perera, 1979) The Plesispa beetle, scientifically known as *Plesispa reichei* (Chrysomelidae), was first reported in 1997 from Badalgama in Gampaha District, and it has since become widespread throughout the coconut triangle (CRI, 2006). The Red Palm Weevil was first discovered in the early 20th century in South and Southeast Asia. In Sri Lanka, it is a significant pest that causes severe damage to young coconut palms aged 3–10 years. Reports indicate that around 10% of young coconut palms in the country are lost each year due to its attacks (Table 01) (Kumara, et al., 2015). The *Oryctes rhinoceros*, (Scarabaeidae), commonly known as the rhinoceros beetle or coconut black beetle, targets developing fronds of tropical palms across Asia (Kumara, et al., 2015).

C. Coleopteran Pests of Tea

Xyleborus fornicatus Eichh., a twig-boring ambrosia beetle (Scolytidae), was first documented as a tea pest in 1868. It inflicts two types of damage: primary injury through the construction of galleries in stems, which can cause branch breakages, and secondary injury from wood rot, ultimately weakening the tea plants (Walgama, 2012). *Euwallacea perbrevis* Schedl, known as the shothole borer (Curculionidae), has been a significant pest of tea in Sri Lanka and India for more than a century. It is also economically important as a pest of avocado. Since the early 1900s, Sri Lankan tea growers have been plagued by this insect, which creates galleries inside the wood of the terminal branches of the tea crown (Liao, et al., 2023).

D. Coleopteran Pests of Rubber

The larvae of the Cockchafer beetle, *Melolontha* spp. (Scarabaeidae), pose a significant threat to rubber cultivation by feeding on rubber roots. Grub infestation reached endemic propotions during 2002 in Awissawella area destroying young rubber clearings which have spread to the Ratnapura, Kegalle and Kalutara districts presently. They consume lateral roots and can also damage the cortex of the taproot, leading to shoot dieback (Gurusinghe, 2019).

E. Coleopteran Pests of Rice

According to Perera and Karunaratne (2015), grain losses during storage, primarily caused by various agents of grain deterioration, range from 4% to 6%. Among these losses, 80% are attributed to insect infestations (Table 1). In Sri Lanka, rice weevil (*Sitophilus oryzae*), grain moth (*Sitotroga cerealella*), and red flour beetle (*Tribolium casteneum*) are identified as highly damaging pests of stored paddy and rice, and *Sitophilu* spp., is recognized globally as the most significant pest affecting stored paddy and rice (Perera & Karunaratne, 2015) which two species have been recognized in Sri Lanka (DOA, 2024). Pathak and Khan (1994), listed *Coccinella repanda*

(Thunberg) (Coccinellidae), a ladybird beetle as feeding on rice plants in Sri Lanka (Table 01).

Table 01: Coleopteran pests of major Agricultural crops in Sri Lanka

Species Name	**Family**	**Host Plants**	**Nature of Damage**	**Reference**
Protaetia alboguttata (Vigors)	Scarabeidae	Karonda (*Carissa carandas)*, Star fruit (*Averrhoa carambola)*, Brinjal	Feed on the flesh of the fruit by gouging with the horn in the front of the head and burying 3/4th of mouth parts into the fruit, Feed on tender shoots, flowers and flower buds during early morning,	(Jayanthi, et al., 2017)
Red pumpkin beetle *Aulacophora foveicollis* (Lucas)	Chrysomelidae	Cucumber, Bitter gourd, Sponge gourd, Ash gourd, Pumpkin, Melon	Feed on the leaf blade, perforate giving appearance of lace, eventually defoliated, Flowers and fruits are eaten and cut, larvae attack the roots and stems causing necrosis	(Khursheed and Raj, 2020)
Coccinella transversalis	Coccinellidae	Beans, Cotton, Mustard, Brinjal, Groundnut, Cabbage	Adults and nymphs cause damage by sucking the sap from the flowers, buds, pods, tender shoots	(Mayadunnage, et al., 2007), (Rajan, et al., 2018)
Rose beetle *Adoretus versutus*	Scarabeidae	Cashew, Taro (*Colocasia esculenta*), *Citrus* sp., Ginger, Cowpea, Radish	Perforate the leaf lets starting from the middle without destroying the ribs, make depressions in the border of the areas eaten, feed in the early hours of the night	(Beaudoin, 1992)
Mango ash weevil *Myllocerus discolor*	Curculionidae	Maize, *Citrus* sp., *Sorghum bicolor*, Brinjal, Soyabean	Feed on leaves, nibbling the leaves from the margins and eaten away small patches of leaf lamina	(Das and Das, 2016)
Myllocerus subfasciatus	Curculionidae	Brinjal	Damage leaves forming characteristic leaf notch symptoms, The grubs are subterranean and cause root damage resulting in wilting, drying and death	(Shanmugam, et al., 2018)
Apogonia blanchardi	Scarabeidae	Greengram, Cocova	Feed on the leaf from the peripheral region	(Calcetas, et al., 2021)
Pulse beetle *Callosobruchus chinensis*	Chrysomelidae	Bean, Black gram, Chickpea, Pigeonpea, Pea, Cowpea	Lay eggs on green pods and the larva bore through pod and feed on the developing seed, the insects continue to feed, emerge to adults and cause further infestation in harvested yields	(Arora, 1977; Singhal, 1986; Sirinivasan, et al., 2008)

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Xyleborus perforans	Curculionidae	Jackfruit, Citrus spp., Cashew, Coconut	Bore into the xylem of the plant, and carry with them symbiotic fungi which grow in the galleries, and upon which the adults and larvae feed	(Rabaglia, et al., 2020; Winotai, 2014)
Scymnus latemaculatus	Coccinellidae	Mustard, Cabbage, Cauliflower, Potato, Turnip, Bottle gourd, Brinjal, Okra, Wheat	Both grubs and adults feed on upper surface of the leaves	(Janakiraman and Booth, 2021), (Ali, et al., 2018)
Henosepilachna septima	Coccinellidae	Bitter gourd , Ribbed gourd, Bitter Melon	Both grubs and adults feed on leaves, stem and fruit throughout the crop stages and results in skeletonizing the leaves	(Naz and Inayatullah , 2013), (Ganga, et al., 1985)
Sri Lankan weevil *Myllocerus undecimpustulatus undatus Marshall*	Curculionidae	*Citrus* sp., Pepper, Strawberry, Eggplant, Cotton, Carrot, Sweet potato	Feed on leaves inward from the leaf margins causing the typical leaf notching. When the leaf material is almost completely defoliated, where the weevil has fed along the leaf veins	(Neal, 2013)
White grub *Holotrichia serrata*	Scarabaeidae	Peanut, Pegion pea, Arecanut, Potato, Jack fruit, Soybean, Sugarcane, Tobacco, Rubber, Rice	Feed on plant roots, causing yellowing, do not show immediate symptoms of damage resulting lifespan yield losses	(Bhattacharyya *et al.*, 2017)
Grey weevil *Myllocerus viridanus*	Curculionidae	Cashew, Ranawara *(Cassia auriculata L.)*, Tora (*Cassia tora* L.), Key lime (*Citrus aurantifolia)*, Sweet Potato, Drumstick, Curry leaves, Eggplant	Feed on leaves nibbling the margin and eating away small patches of leaf lamina and larvae feeds on the fibrous rootlets of the host plant	(Rajan and Ghosh, 2019) (Butani, 1979)
Flea beetle *Chaetocnema spp.*	Chrysomelidae	Mugunuwanna, (*Alternanthera sessilis linn*.) Thampala (*Amaranthus candatus*), Nivithi (*Spinacia oleracea*), Koora thampala	Damage upon the leaves by chewing, resulting formation of small round holes which appears as windows due to the presence of epidermis	(Kumari, et al., 2022).
Flea weevil *Tachyerges spp.*	Curculinoidae	Mugunuwanna, Thampala, Koora thampala	The adult prefers younger leaves for feeding, while the larvae create mines in mature leaves	(Kumari, et al., 2022)
Flower feeder *Mylabris pustulata*	Meloidae	Wax gourd , Field pumkin, Chinese Okra, Sponge Gourd (*luffa aegyptiaca*), , Peanuts, beans, Pumpkin, Okra, Zea mays, Mango	Feeding on buds, flowers, fruits, pollen tender leaves which leads to affect the fruit setting	(Rao, 1954), (Sharma and Singh, 2016), (Raju, et al., 2016) (Joshi and Gaur, 2019)

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Mylabris thunbergii	Meloidae	Okra, peanut, Pigeon pea, Ceylon spinach (*Talinum fruticosum),* Blackgram (Vigna mungo), Cowpea (*Vigna unguiculata*), Greengram	Feeding on leaves, floral parts; petals, pollen, stigma secretions, and tender developing pods	(Durairaj and Ganapathi, 2003)
Hadda beetle *Henosepilachna vigintioctopunctata* F.	Coccinellidae	Tomato, Potato, Eggplant	Both the adult and larval stages feed on the epidermal tissues of leaves, flowers, and fruits	(Jamwal *et al.*, 2017) (Thuvaraka and Pakeerathan, 2023)
Cashew-tree borer *Plocaederus ferruginea*	Cerambycidae	Cashew	Grubs feed on cambium tissues stopping sap flow	(Wijetunge, et al., 2016)
Stem boring grey beetle *Apomecyna saltator*	Cerambycidae	Minor pests of cucurbitaceous vegetable crops	Grubs bore the stems and make tunnel inside, Adults feed on the soft portions of the stem	(Fernando & Abhayawardena, 1991; Kumar, et al., 2022)
Mango stem borer *Batocera rufomaculata*	Cerambycidae	Mango, Durian, Jackfruit, Mulberry, Papaya, Apple	Grubs enter stems, creating tunnels that dry shoots and entire trees, resembling burned foliage in severe cases, significantly reducing yield	(Atapattu, 2015; Magar, et al., 2022)
Banana pseudostem weevil *Odoiporus longicollis* Oliver	Curculionidae	Monophagous pest of Banana plants	Larvae feed on pseudostem by tunnelling. In most of the cases the larvae goes deep into the pseudostem, adults are found to feed under the leaf sheaths	(Justin, et al., 2008)
Cherry stem borer *Aeolesthes holosericea* Fabricius	Cerambycidae	Cherry, Mulberry Apricot, Crab apple, Guava, Peach, Pear, Plum and Walnut etc.	Newly hatched grubs consume bark and create zigzag galleries before boring into and feeding on the sapwood.	(Patole, 2017)
Derocrania scitiscabra	Cicindelidae	Coconut cultivation mixed with pepper, Betel cultivation	Exhibit vegetarian feeding behavior during periods of low prey availability	(Abeywardhana, et al, 2021; Jaskula, 2013)
Derocrania concinna Derocrania schaumi Tricondyla granulifera	Cicindelidae	Fruit farm consisting of Mango and Cashew		Abeywardhana, et al, 2021)
Coffee stem borer *Xylotrechus quadripes* Chevrolat	Cerambycidae	Coffee	The larvae bore into the coffee stem, killing the young plants	(Patole, 2017)
Coffee-berry borer *Hypothenemus hampei* Ferrari	Scolytidae	Robusta and Arabica Coffee	Adult female attacks coffee berries and bore a hole into the coffee berry and then make galleries in the seeds where the eggs are deposited	(Patole, 2017)

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Adoretus celogaster	Scarabaeidae	Coconut	Attack seedling leaf	(Winotai, 2014)
Phyllognatus dionysius F.	Scarabaeidae	Coconut	Attack mature plant leaves	(Winotai, 2014)
Oryctes rhinoceros L.	Scarabaeidae	Coconut, Oil palms, Date palms, Screwpine (*Pandanus*), Ornamental palms	Mature plant leaf eaters, reduced leaf area which influences nut production, with attack greater on tall, mature trees, from about 5 years of age onwards.	(Kumara, et al., 2015; Winotai, 2014)
Rhabdoscelus obscurus	Curculionidae	Coconut	Bore into the stem	(Winotai, 2014)
Asiatic red palm weevil *Rhynchophorus ferrugineus* Olivier	Curculionidae	Serious pest of Coconut, oil palms, date palms, sago, other species of Palmae	Feeding larvae bore into the crown of coconut and destroy it, outer leaves turn chlorotic and die, this gradually spreads to the innermost leaves, the trunk becomes tunneled and weakened	(Kumara, et al., 2015; Winotai, 2014)
Coconut leaf palm hispid *Plesispa reichei*	Chrysomelidae	Minor pest of coconut	Attack young palms around 3-4years old. both adults and larvae feed on young unopened leaflets and make feeding scars paralleled to the main vein, attack the tips of recently unfolded leaflets of mature plants	(Winotai, 2014)
Coconut weevil *Diocalandra frumenti* Fabricius	Curculionidae	Coconut palm, Date palm, Oil palms and Sorghum	The grubs attack all parts of the coconut palm particularly the roots, the leaves, and fruit stalks. As a result there is premature fruit fall	(Patole, 2017)
Rice root weevil *Echinocnemus oryzae*	Curculionidae	Rice	Both grubs and adult consume rice plants, grub stage reduce production by feed on roots. Adults in flooded or unflooded rice fields feed on young paddy leaves, leaving distinctive scars that run nearly parallel to the leaf veins.	(Mahala, et al., 2022)
Paddy black beetle *Heteronychus lioderes*	Scarabaeidae	Rice, Maize	Adult eat the subterranean stems and roots, impacted plants wilt and pass away. Upland rice is severely under attack.	(Mahala, et al., 2022; Sarkar, et al., 2014)
Rice Hispa *Dicladispa armigera*	Chrysomelidae	Rice	Grubs tunnel towards the leaf sheath, Adults initially remove chlorophyll in parallel white streaks along the main leaf	(Mahala, et al., 2022)

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			axis, starting from the leaf tips. Mature beetles prefer the leaf's upper surface, each adult consume approximately 25 mm^2 of leaf daily.	
Coccinella repanda Thunberg	Coccinellidae	Rice pollen, panicle	In the absence of prey, feed on leaves, panicle, leaving small chewed areas, and frequently damage developing grains.	(Pathak and Khan, 1994)
Grain weevil *Sitophilus granerius Sitophilus oryzae*	Curculionidae	Rice, Grain products	Infestation starts in the field. Eggs laid on rice seeds, hatch into tiny grubs which feed the grain	(DOA, 2024)
Red flour beetle *Tribolium castaneum*	Tenebrionidae	Grain products	Secondary pests, feed on dust and fines of stored grains by constructing tunnels	(Wijayaratne and Egodawatta, 2021)
Cowpea weevil *Callosobruchus maculatus*	Chrysomelidae	Grain products, Stored legumes and seeds	Infestation starts in the field, larvae bore into the pulse grains and feed on endosperms	(Anuradha, et al., 2023)
Rusty Grain Beetle *Cryptolestes ferrugineus*	Laemophloeidae	Barley flour, Oats, Sorghum, Wheat flour, Maize, Corn	Both larvae and adults feed on stored nuts by boring inside, spreading fungal infection	(Thube, et al., 2017; Bharathi, et al., 2023)
Cigarette Beetle *Lasioderma serricorne*	Anobiidae	Stored Tea, Herbal Products, Arecanut	Larvae feed directly on nuts and in severe infestation nuts can be pulverized. Infestation of this pest can be detected by noticing larval cocoons, dead adult beetles in stored products	(Wijesinghe, et al., 2016; Thube, et al., 2017)
Coffee bean weevil *Araecerus fasciculatus*	Anthribidae	Coffee berries, Cocoa, Arecanut	Recorded from fresh stored nuts containing moisture, Both adult and grub damage the nuts by making holes of 1.5-2.5 mm diameter	(Thube, et al., 2017)

III. CASE STUDY OF A BEETLE OUTBREAK IN A CASHEW PLANTATION IN WANATHAVILLUWA, SRI LANKA

Severe leaf damage to cashew plants was reported in Wanathawilluwa in late 2023. Sampling of adult beetles was carried out in two different sites (Acre 2 Area and Acre 10 Research Area) in the Cashew plantation, Wanathawilluwa in December 2023. Beetles were captured using two UV-light traps from dusk to sunrise (6:00 pm to 7:00 am). Beetles that were attracted to the light traps were stopped by transparent polystyrene plates and fell into a container where they were preserved (96% ethanol).

Approximately 500 adult beetle specimens were collected from two sites and identified majority as *Apogonia* sp. (ca. 432 specimens) (Figure 02), *Sophrops* sp (ca. 27 specimens) and few Sericini chafers (Figure 01). The damage was observed as eating of the cashew leaves from the edges, resulting in round-shaped margins (Figure 02). Fortunately, the population increase does not

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significantly affect cashew production in the area (personal communication).

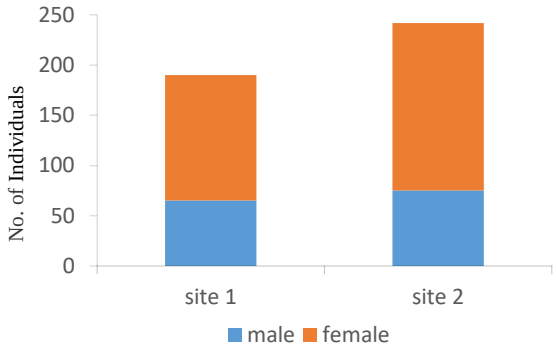

Figure 01: Beetle individuals sampled from site 1 and site 2

A B

Figure 02: **A**, Cashew leaf damage displaying distinctive round-shaped margins due to feeding, **B**, *Apogonia* sp. collected from Wanathawilluwa

IV. CONCLUSIONS

The review documents 60 beetle species from 14 families that are significant pests in Sri Lanka's agriculture, affecting crops like vegetables, fruits, grains, coffee, tea, rubber, and coconut. Notable families include Curculionidae (12 species), Scarabaeidae (9 species), Chrysomelidae (7 species), Coccinellidae (6 species), and Cerambycidae (5 species), along with Meloidae, Scolytidae, Cicindelidae, Anthribidae, Buprestidae, Anobiidae, Laemophloeidae, Tenebrionidae, and Hisphidae. Vegetable crops from the Solanaceae and Cucurbitaceae families are particularly vulnerable, while Curculionidae, Cerambycidae, and Scolytidae primarily target woody crops like cashew, fruits, coconut, tea, and stored grain products. A specific case study highlighted an outbreak of beetles in a cashew plantation in Wanathavilluwa, where the majority of identified pests were *Apogonia* species, followed by *Sophrops* species, and a few Sericini chafers. Beetles occur frequently in crop cultivations, highlighting their significant ecological role in the agricultural landscapes of Sri Lanka. Therefore, understanding their dynamics within these ecosystems is essential. Although most beetle genera are documented, the gaps in knowledge regarding their status as economic pests and the patterns of their sporadic population increases remain significant. This knowledge gap is particularly concerning given the tendency for beetle populations to spike to endemic proportions, as evidenced by past outbreaks in regional countries over recent decades. Thus, further research is crucial to develop effective management strategies and mitigate potential economic impacts on crop production in Sri Lanka.

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