Hover-flies (Diptera : Syrphidae) of the Coromandel Coast in Andhra Carnatic, Peninsular India

KUMAR GHORPADÉ, K. DURGA PRASAD* and SABBITHI PAVAN

*Department of Agricultural Entomology, University of Agricultural Sciences, Dharwar 580 005 (Karnataka); and *Plot 22, Road No. 2, Dairy Officers' Colony, Vijayawada 520 008 (Andhra Pradesh).*
E-mail: kumar.ghorpade@yahoo.in

Introduction

The first author (KG) had begun studying Syrphidae in 1968 while pursuing bachelor's and then master's degrees at the Agricultural College in Bangalore (see Ghorpadé, 1994). He published his first paper (Ghorpade, 1973a), and submitted his Masters' thesis (Ghorpade, 1973b, 1974) on Syrphidae of Bangalore. The second author (KDP) had then collected some Syrphidae at Potunuru (nr Eluru, W. Godavari District) in coastal Andhra Pradesh for KG's research. The last author (SP) recently sampled Syrphidae for KG near Rajahmundry (E. Godavari Dt), and his field work has resulted in adding sufficient data for writing this faunistic paper.

The biogeographical area which forms the focus of this note is the coastal strip from the delta of the Godavari River south to the limit of Andhra Pradesh at the southern extremity of the Pulicat lagoon. Mani (1974: 20) wrote that "Coromandel is a corruption of Cholo Mandal, named after the Chola Kings of South." He characterized the Eastern Littoral Region as being "strikingly different from the Western. The lowland is much wider here and much of it is also true coastal plain in its structure, with infacing coestas in Cretaceous and Tertiary epeirogenetic deposits." Three large rivers (Godavari, Krishna, Penner) drain into the Bay of Bengal here. The flora of coastal Andhra has been documented by Venkateswarlu (1944), Sastry & Rao (1973), and Venkanna (1991), besides others cited by these authors. Desai (2000) may be consulted for coastal sand dune vegetation. The 'Sacred Groves' in the coastal districts of W. Godavari (13), Krishna (7), Guntur (14), Prakasam (47) and Nellore (83), totalling 164, have also been listed (Anonymous, 1996: 37-38, 44-45, 60-63, 65-68, 86).
Pullaiah and co-authors have published a four volume *Flora of Andhra Pradesh* during 1997. The Protected Areas located in the coastal portions of these five districts are the Kolleru WLS (freshwater lake), Krishna WLS (mangroves), and the Nelapattu & Pulicat Bird Sanctuaries (brackish water lagoons). In addition, the Coringa WLS (mangroves) is located just north of the Godavari delta. The Zoological Survey of India published 8 parts (1993-2008), on the *Fauna of Andhra Pradesh* in their State Fauna Series, and Part 3 was on Insects (2007; 544 pp.). The Z.S.I. also published on the fauna of the Godavari (2001; 166 pp.) and Krishna (2009; 298 pp.) estuaries, but all these have not been consulted.

Historically, our target area was once a Deccan Sultanate of Golconda, ruled by the Shia Kutb Shahis in the 16th Century (W. Godavari, Krishna and Guntur districts), as well as a part of the mighty Hindu Kingdom of Vijayanagar, land south of the Raichur Doab and the Gundlakamma River (Prakasam and Nellore Districts). During the British Raj (1772-1947) it became part of their Madras Presidency, and post-independence it formed part of the Telugu-speaking linguistic state Andhra Pradesh, of the Indian republic.

Physiographically and floristically, this is low-lying land (coastal to < 600m altitude), covered largely with paddy and sugarcane fields, and dotted with palmyra (*Borassus flabellifer*), coconut (*Cocos nucifera)* and date (*Phoenix humilis*) palms. The original flora consisted mainly of *Acacia* spp., *Albizia amara, Cissus quadrangularis, Hardwickia binata, Phenolobium hexapetalum, Pterospermum suberifolium and Sapindus emarginatus* (see also Sastry & Rao, 1973; Venkanna, 1991). This is an almost completely deforested country, now just with small disturbed patches of tree savanna west of Guntur and some thickets north of Nellore, in which latter town the noted pioneering British ornithologist Dr Thomas Claverhill Jerdon (1811-1875) was stationed after 1836 as a Surgeon Major in the Madras Army. The Coromandel Coast already had Danish, Dutch, French and British settlements by the late 18th Century. Drs Patrick Russell (of the viper fame; 'An account of Indian serpents collected on the Coast of Coromandel,' 1796) and William Roxburgh ('Plants of the Coast of Coromandel,' 1795-1819) were living at Samalkot (E. Godavari Dt.), and they had Johann Gerhard Koenig (1728-1785), the famous early European naturalist in India, and Linnaeus' student, visiting them (see Ghorpadé, 1997).

The Syrphidae is a large (6,000± world spp.) family with striking flies of much diversity, and about 500 species have been found in our subcontinent so far. KG is engaged in a revision of the FAUNA volume of Brunetti (1923) and is currently doing generic revisions, mainly of the subfamily Syrphinae (cf Ghorpade, 1981b, 1981c, 1982, 1984, 1994, 2007, 2009b; Thompson & Ghorpade, 1992; Mengual & Ghorpadé, 2010). He has also compiled (Ghorpade, 1981a) the recorded prey of predacious species in this subregion and is presently working on an illustrated *Introductory Handguide to Indian Hover-flies (Diptera: Syrphidae)*, besides collaborating on a large *Conspectus of Oriental and Papuan*

Syrphidae with specialists located abroad to update the catalogue of Knutson et al. (1975).

Faunistic papers on the Indian subregion Syrphidae are few and far between, when compared to the many lists of our butterflies (Lepidoptera : Rhopalocera; see Varshney, 1977; Gaonkar, *in prep.*). Enrico Brunetti (1907, 1917) had first published an impressive, annotated, faunistic checklist of all Diptera taken in the then Simla District (Himachal Pradesh), which treated around 40 species of Syrphidae, including unidentified and new ones. After this "Father of Indian Dipterology," a few others have written on the hover-fly fauna of some Indian regions, like NE. India (Brunetti, 1913a,b; Joseph & Ramachandra Rao, 1972a,b; Joseph & Parui, 1973, 1977b; Joseph & Ray, 1976; Joseph & Sharma, 1976; Datta & Chakraborti, 1985, 1986b, Mitra et al., 2008b); Khasi Hills (Senior-White, 1922; Biswas et al., 1975), S. India (Ramakrishna Ayyar & Krishna Ayyar, 1933; Cherian, 1934; Usman & Puttarudriah, 1955; Joseph & Parui, 1986; Datta & Chakraborti, 1986a), W. Himalaya (Singh et al., 1955; Mani, 1962, 1968; Nayar, 1968a,b; Mitra et al., 2003, 2009); Agra (Nayar & Nayar, 1965); Delhi (Anand et al., 1967; Anand, 1986); Gujarat (Patel & Patel, 1969); Madhya Pradesh & Chhattisgarh (Gokulpure, 1972; Mitra et al., 2007), Kashmir (Lambeck & van Brink, 1973; Datta & Chakraborti, 1984), Chhota Nagpur (Joseph & Parui, 1977a), Chandigarh (Singh et al., 1985), Thar Desert (Parui & Mitra, 2000), Calcutta (Mitra et al., 2008a), and the Great Nicobar I. (Mitra & Parui, 2010). The Zoological Survey of India's State Fauna series may also carry some lists of Syrphidae but have not been consulted. Of neighbouring countries, the Syrphidae of Sri Lanka (see Kieser, 1958) are well worked, as are those of Afghanistan and Nepal. But, the hover-flies of Pakistan, Bhutan, Bangladesh, Burma, the Maldives, and the Chagos Archipelago are still poorly known and sampled. Faunistic papers on Syrphidae of Europe and North America are numerous and the recent one of Thompson (1981), on the West Indian flower flies, is an excellent model to follow.

From Peninsular India, land south of the Tapti—Godavari Rivers, a total of about 76 species (in 36 genera) have been recorded so far (Ghorpadé, unpublished data). Earlier Ghorpade (1973b, 1974) had worked the fauna of Bangalore and found 20 species in 15 genera (many more have been collected since). This present contribution is the first detailed faunistic paper on Indian Syrphidae by KG.

This present faunistic list deals with 22 species (in 13 genera), of which 16 species of 10 genera are here confirmed, from collections of around a hundred specimens sampled by us from the Coromandel Coast of Andhra.

Systematic List

Family SYRPHIDAE
Subfamily SYRPHINAE
Tribe Paragini

Paragus auritus Stuckenberg, 1954

Material examined: 3 ex. Potunuru, nr Eluru, 3.ix.1975, K. Durga Prasad (1♂, 1♀); 12km N. Eluru, 17.viii.1985, K.D. Ghorpade B361 (1♂).

This species is mostly confined to the wide coastal and adjacent inland plains of eastern India, from West Bengal to Tamil Nadu, and has also been recorded from Sri Lanka and Nepal. This distribution coincides with the curious east coast range of the ladybird beetle, *Micraspis univittata* (Hope) of the Coccinellini, which also extends to Nepal. But, KG has found *P. auritus* on the Western Ghats also. See Thompson & Ghorpadé (1992: 10-11, map 5) for details of diagnostics, locations, prey (of larvae) and flower (adult visitors) records. KG identified specimens taken at Aska (Ganjam Dt, Orissa) present in the Tamil Nadu Agricultural University (TNAU), Coimbatore, collection. KG has also collected specimens at Coimbatore and Yercaud in Tamil Nadu. The larvae prey especially on root aphids of paddy (*Oryza sativa*), ragi (*Eleusine coracana*), jowar (*Sorghum vulgare*), sweet potato (*Ipomoea batatas*) and cotton (*Gossypium* spp.) Adult *auritus* flies are the stoutest in body and lightest in colour of all our *Paragus* species, and fly all round the year. New record for Andhra Pradesh, but still not collected from Pondicherry on the Coromandel Coast.

Paragus serratus (Fabricius), 1805

Material examined: 4 ex. Potunuru, nr Eluru, -.xi.1972, K. Durga Prasad (1♀); same locality, 3.ix.1975, K. Durga Prasad (1♂, 2♀).

This was an earlier, 'lumped,' polytypic species which Stuckenberg (1954) split and segregated as four distinct species, of which he described three as new. See also Thompson & Ghorpadé (1992: 14-16, map 6) for more collected material and other details. This is the smallest and palest of our *Paragus* species, and partial to the hot, dry plains, though KG has taken a single male at Mudigere (982m) on the Western Ghats, in November. It extends in the north-west frontier to Kashmir and through Pakistan to Afghanistan. It is necessary to caution here that most published records from this subcontinent of '*P. serratus*' by non-specialists could be misidentifications for other *Paragus* species found here (cf Cherian, 1934; Ghorpade, 1981a: 64; Joseph & Parui, 1986: 162), and need to be confirmed based on study of voucher specimens, if they still exist in collections. It flies throughout the year all over this subcontinent except at altitudes above 1000m or so in very humid areas. Ghorpade (1973b) found it visiting flowers of *Bidens pilosa, Mangifera indica* (mango) and *Tridax procumbens* around Bangalore.

Paragus yerburiensis Stuckenberg, 1954

Material examined: 6 ex. Potunuru, nr Eluru, 3.ix.1975, K. Durga Prasad (1♀); same locality, 7.xii.1975, K. Durga Prasad (2♀); same locality, 22.i.1994, K. Durga Prasad (2♂);

Gannavaram airport, nr Vijayawada, 28.xii.2005, K. Ghorpade D513 (1♂).

See notes under *P. serratus* above and in Thompson & Ghorpadé (1992: 16-18, map 7) for more details. Fletcher (1916) had listed '*serratus*' as being reared from larvae feeding on aphids infesting '*Cajanus indicus*' (red gram) on 23rd November 1906 at Samalkot. KG found specimens in the TNAU Collection with the above data and 'Y.R.' [= Y. Ramachandra Rao ?], and confirmed them as being this species of *Paragus*, which is the darkest, with much black on the abdomen and thus easily separable. It clearly prefers low elevations and does not ascend mountains, though KG has taken specimens from Ponnampet (Coorg) and Yercaud (1370m), in April. It also flies round the year all over India except in the dry north-west frontier. All species of *Paragus* fly close to the ground, and are found around the height of grasses, herbs and low shrubs (see also Gilbert, 1990; Ghorpadé, 2007: 19).

Tribe Bacchini

Melanostoma univittatum (Wiedemann), 1824

This common plains species has curiously not been taken from this area by any of us so far. Brunetti (1915: 209) mentioned male and female specimens of this species that he recognized present in the Indian Museum (ZSI, Calcutta) from 'Coromandel.' He also listed (Brunetti, 1923: 51) specimens examined from 'Coromandel, 2500 ft.' It must occur in this target area.

Xanthandrus sp. ***?indicus*** Curran, 1933

Material examined: 1 ex. Amalapuram, Godavari Dt., 16-18.ix.1921, Ramakrishna (1♀).

This is an exciting find. Species of *Xanthandrus* are very rare in our subcontinent, only this and *X. ceylonicus* Keiser from Sri Lanka being known so far. KG caught another, probably undescribed, species in the Mawphlang Sacred Grove near Shillong (Meghalaya) in May 1985. Even the present female specimen from Amalapuram, collected by Ramakrishna Ayyar, may be a new species. *X. indicus* was taken at Rahatgaon near Hoshangabad (Madhya Pradesh) in August 1926, reared from larvae found 'predacious on larvae of *Hyblaea puera*' (Curran, 1933: 46), the Pyralid moth pest of teak. KG has seen the holotype male in FRI, Dehra Dun but the allotype female is in the AMNH, New York and needs to be studied and compared with this Amalapuram female to determine correct identity. The tribal name was Melanostomatini (or Melanostomini) earlier.

Tribe Syrphini

Asarkina belli Ghorpadé, 1994

Material examined: 1 ex. Amalapuram, Godavari Dt, 16-18.ix.1921, Ramakrishna (1♂).

This was named and described by Ghorpadé (1994: 8) as a new species based on specimens taken in Karnataka, Andhra Pradesh and Sri Lanka (q.v.). The species name was proposed in honour of T.R.D. Bell (1863-1948), well known for his work on butterflies and an inspiring naturalist (see Kinnear, 1948), who was stationed at Dharwar as a District Forest Officer from November 1884 and retired at Karwar in 1920. This species of *Asarkina* seems fairly uncommon and probably flies only in forested, humid habitats all round the year (?) in southern India, except maybe in the coldest months (January to March). KG has identified specimens from the ghats' ridge west of Jog Falls, from Nagody in S. Kanara Dt (collected by T.V.R. Ayyar), and from the Bellahunsi—Hampasagaram road in Bellary Dt (taken by T.B. Fletcher) in Karnataka, as well as from the Kanneliya forest in Sri Lanka. Amalapuram is located very near the seacoast in the Godavari delta, on land between the Goutami and Vasishtha Godavari branches, with some littoral mangrove forests, and this appears to be an interesting location for rarer flies and should be surveyed more intensively (see also under *Xanthandrus*, supra).

Asarkina incisuralis (Macquart), 1855

Material examined: 14 ex. Potunuru, nr Eluru, -.xi.1972, K. Durga Prasad (3♀); same locality, 3.ix.1975, K. Durga Prasad (1♂); Rayudupalem, nr Eluru, 24.vii.1975, K. Durga Prasad (1♂); Naguldevpadu, nr Eluru, 17.ix.1975, K. Durga Prasad (5♂); 35km SSE. Rajahmundry, 2.xi.2010, S. Pavan E83 (1♀); same locality, 6.xi.2010, S. Pavan E86 (2♂); same locality, 8.xi.2010, S. Pavan E87 (1♀).

This predacious species is found all over our subcontinent (Ghorpadé, 1994) except in the most dry and arid habitats. Larvae of *Asarkina* are known to feed on spittle bug nymphs (Hemiptera : Cercopidae) in W. Africa (Musa, 1975). But prey of the seven known Indian species (Ghorpadé, 1994: 7-8) are still undiscovered. It was misidentified earlier as *ericetorum* (Fabricius) which is an African species (see Ghorpadé, 2009b: 8). Cherian (1934) listed it from 'Godavari.' KG found specimens in TNAU, Coimbatore taken by 'T.V.R.' [= T.V. Ramakrishna Ayyar] at Samalkot from 21-24.ix.1912, and identified by E. Brunetti as '*Asarcina ericetorum* F.' in 1921. The USNM, Washington, DC Collection has 7♂, 4♀ taken from near Potunuru, and gifted to that museum by KG. It flies all round the year but is more abundant in the post-monsoon and cold seasons. *Asarkina* species are also dwellers of the understorey among long grass and weedy growth below trees, and males hover in swarms some 5-10ft above ground in tree shade. Flies were noticed coming to flowers of *Ageratum conyzoides*, *Bidens pilosa* and *Tridax procumbens* near Bangalore (Ghorpade, 1973b).

Ischiodon scutellaris (Fabricius), 1805

Surprisingly, none of us took specimens of this most common predatory hover-fly of the Indian plains, in the

limited time we have spent searching for and collecting hover-flies here. One male from Potunuru is in the USNM, Washington, DC Collection, gifted by KG. Brunetti (1915: 217) mentioned seeing a specimen in the Indian Museum, Calcutta taken 'on launch off Coconada, Madras coast, 15-iv-08 [Paiva]' which location is Kakinada (E. Godavari Dt), very near Samalkot in the Godavari delta. In 1842 the French entomologist Macquart had named it *Syrphus coromandelensis* and described it as new based on a male taken on this coast. Brunetti (1923: 99) commented under this species that 'There is little doubt that *coromandelensis*, Macq., is synonymous. . .' Krishnamoorthy & Dharmaraju (1960) recorded it from Bapatla as part of the named insect collection that the Agricultural College there, near the Krishna river delta, was building up (see also Ghorpade, 1981a: 70) and reported it feeding on radish (*Raphanus sativus*) aphids. KG found specimens in TNAU, Coimbatore reared from larvae taken by 'Y.R.' at Samalkot on 23.xi.1906, feeding on red gram shoot aphids. KG examined 1♂ labeled 'Vizagapatam, Artham, 19.xii.1925, R. Senior-White,' 'BM 1928-290' in the NHM, London collection. One ♂ and 3♀ from Samalkot, 23.xi.1906, Y.R., on red gram shoot aphids are in the TNAU, Collection and were examined by KG. It has also been collected in the Kurnool and Cuddapah Districts in the Rayalseema of Andhra Pradesh. Ghorpade (1973) saw these flies visiting *Mangifera indica* flowers near Bangalore and they generally fly close to the ground.

Sphaerophoria macrogaster (Thomson), 1869

Material examined: 2 ex. Potunuru, nr Eluru, 12.i.1994, K. Durga Prasad (1♂); same locality, 22.i.1994, K. Durga Prasad (1♂).

This small yellow and black hover-fly is common and abundant all over the Indian plains, and lower hills, except on the high mountains where other species of *Sphaerophoria* replace it (see Ghorpadé, 2009b: 12). However, KG has collected it at Shillong (1961m) on the Khasi Hills, and at Kookal (2000m) on the Palni Hills. Earlier, it was misidentified as *S. indiana* Bigot (cf Ghorpade, 1981a: 73; Datta & Chakraborti, 1986: 55). It occurs throughout the year. New record for Andhra Pradesh.

Subfamily ERISTALINAE
Tribe Eristalini

Dolichomerus crassa (Fabricius), 1787

Material examined: 5 ex. Naguldevpadu, nr Eluru, 17.ix.1975, K. Durga Prasad (2♂, 2♀); 35km SSE. Rajahmundry, 8.xi.2010 , S. Pavan E87 (1♀).

Cherian (1934) listed it from Amalapuram as a *Megaspis* (which is now a synonym of *Phytomia*). KG examined specimens in TNAU labelled as reared from pupae found in cow dung. Joseph & Parui (1986: 161) listed one specimen taken in Silent Valley, Kerala. Datta & Chakraborti (1986: 63-64) figured its male terminalia based on a male taken in Ernakulam Dt, Kerala. This fully black, stout eristaline syrphid, with red legs (and a distinct tooth on hind femur), is found throughout India all year round, except on the more high and moist highlands. This distinctive, striking species is currently 'lumped' in *Phytomia* by foreign specialists but KG prefers to retain its singularity pending molecular analysis. It was noted freely visiting flowers of *Guizotia abyssinica* by Ghorpade (1973b) at Bangalore, and also in large numbers recently at Dharwar (Karnataka).

Eristalinus arvorum (Fabricius), 1787

No specimens of this widespread Indian species were taken by us here. However, Cherian (1934) had listed it from Amalapuram (E. Godavari Dt) but these specimens were not found in the TNAU Collection by KG who saw other identified specimens present from Nandyal (Andhra Pradesh), Coimbatore, Yercaud, Koilpatti (Tamil Nadu), and Taliparamba (Kerala). Larvae breed in dirty water drains and adults come freely to flowers of many wild and cultivated plants. This is a widely distributed plains eristaline, found all round the year. Brunetti (1915: 228) wrote that this *Eristalinus* 'species is the commonest of the Indian ones and occurs apparently all over the country . . . has been found by Dr. Annandale breeding in rotting seaweed in brackish water at Lake Chilka, Orissa, in February and November.' Specimens from 'Coromandel' were in the MNHN, Paris museum (Hervé-Bazin, 1923). Joseph & Parui (1986: 161) reported it from Silent Valley (Kerala). Flies were seen coming to flowers of *Guizotia abyssinica* (nigerseed) and *Mangifera indica* at Bangalore (Ghorpade, 1973b). This species was placed earlier in the large genus *Eristalis* which has now been split into several distinct genera (see Thompson, 2003). *Eristalinus* species have black-spotted yellow eyes and are biodiverse in the Oriental tropics, occurring throughout the year, with a possible break during the dry summer months.

Eristalinus obliquus (Wiedemann), 1824

Material examined: 1 ex. 35km SSE. Rajahmundry, 2.i.2010, S. Pavan E17 (1♂).

This is also a frequent and wide ranging species in the Indian plains, flying all year round. Flies of *Eristalinus* come to many flowering herbs, shrubs and trees, as well as to cultivated crop and garden flowers. Ghorpade (1973b) specifically recorded this species visiting *Anacardium occidentale* (cashewnut), *Guizotia indica, Mangifera indica* and *Tridax procumbens* flowers around Bangalore. *E. obliquus* seems less abundant in this coastal tract and is commoner elsewhere on the mainland of peninsular India.

Eristalinus obscuritarsis (de Meijere), 1908

Material examined: 24 ex. Potunuru, nr Eluru, -.xi.1972, K. Durga Prasad (3♂, 3♀); same locality, 12.vii.1975, K. Durga Prasad (1♂); same locality, 16.vii.1975, K. Durga Prasad (3♂, 4♀); Naguldevpadu, nr Eluru, 31.vii.1975, K. Durga Prasad (1♀); 12km N. Eluru, 17.viii.1985, K.D.

Ghorpade B361 (1♂); Kolleru Lake, 18.viii.1985, K.D. Ghorpade B362 (1♂, 2♀); 35km SSE. Rajahmundry, 6.xi.2010, S. Pavan E86 (1♂), same locality, 8.xi.2010, S. Pavan E88 (2♂, 2♀).

KG examined specimens of this species from Samalkot held in the TNAU collection, Coimbatore. It has also been taken at Nandyal in Kurnool Dt (see Cherian, 1934: 699) in Andhra Pradesh. Datta & Chakraborti (1986a: 58) figured male terminalia of a specimen taken in Kerala. Their decision not to treat *obscuritarsis* as a synonym of *laetus* (Wiedemannn) as Knutson et al. (1975: 348) had proposed, is supported by KG until holotypes are studied. Adult flies were found coming to flowers of *Guizotia abyssinica* and *Mangifera indica* near Bangalore (Ghorpade, 1973b).

Mesembrius bengalensis (Wiedemann), 1819

Material examined: 4 ex. 35km SSE. Rajahmundry, 2.xi.2010, S. Pavan E83 (1♂), same locality, 8.xi.2010, S. Pavan E87 (1♂, 1♀); same locality, 9.xi.2010, S. Pavan E88 (1♀).

KG also examined a male in the TNAU Collection taken in December (?) 'in a Gogu field' at Samalkot by 'Y.R.' Datta & Chakraborti (1986a: 60-61) recorded it from 'Mullayarm, Tamil Nadu' in June and figured its male terminalia. Flies of this genus are inhabitants of marshy areas and have thus adapted to paddyfields.

Mesembrius quadrivittatus (Wiedemann), 1819

Material examined: 20 ex. Potunuru, nr Eluru, -.xi.1972, K. Durga Prasad (1♂); same locality, 1.viii.1975, K. Durga Prasad (1♀); same locality, 12.viii.1975, K. Durga Prasad (1♂); same locality, 10.viii.1976, K. Durga Prasad (1♂); same locality, 12.viii.1976, K. Durga Prasad (1♂); same locality, 3.ix.1976, K. Durga Prasad (1♂); same locality, 10.xii.1976, K. Durga Prasad (2♂, 1♀); same locality, 22.i.1994, K. Durga Prasad (2♂); 35km SSE. Rajahmundry, 2.xi.2010, S. Pavan E83 (3♂, 2♀), same locality, 8.xi.2010, S. Pavan E87 (2♂, 2♀).

Like the above species, with which it is sympatric, *M. quadrivittatus* is fairly common all year round in marshes and flooded paddyfields. Its males do not possess the tooth on the middle femora as those of *M. bengalensis* do, compared to which *quadrivittatus* seems more abundant in the Andhra Carnatic.

Phytomia argyrocephala (Macquart), 1842

Material examined: 3 ex. Naguldevpadu, nr Eluru, 31.vii.1975, K. Durga Prasad (1♂, 1♀); Potunuru, nr Eluru, 12.viii.1975, K. Durga Prasad (1♀).

KG examined specimens of this species in the TNAU Collection taken at Amalapuram. Cherian (1934) listed it only from Coimbatore. Specimens examined by KG in TNAU had labels indicating that larvae were taken in rotting vegetable matter. This is a stout fly with a predominantly orange abdomen and is common all year. Ghorpade (1973b) collected it from *Crotalaria juncea* (sunnhemp) and *Guizotia abyssinica* flowers near Bangalore.

Phytomia errans (Fabricius), 1787

No specimens of this species were taken by us here, but Cherian (1934) had listed it from Amalapuram, and credited the identification to 'the Director, Imperial Institute of Entomology, London.' This, however, may have been a misidentification for *argyrocephalus* (q.v., vide supra), and so the presence of *errans* here needs to be confirmed, although it is a widespread Indian species and should definitely occur here also. Datta & Chakraborti (1986a: 61-62) recorded it from Kerala and Tamil Nadu in December and figured its male terminalia. KG found specimens from Nandyal, in Kurnool district, in the TNAU Collection. Labels indicated that these flies came to flowers of mango (*Mangifera indica*) and safflower (*Carthamus tinctorius*) and that larvae inhabited 'manure heaps.' Ghorpade (1973b) took flies visiting nigerseed (*Guizotia abyssinica*) flowers at Bangalore.

Tribe Merodontini

Eumerus albifrons Walker, 1852

Species of this genus, which fly close to the ground, fly close to the ground were not found by any of us in this area but a 'new' species described by Brunetti (1915) as *halictiformis* (a synonym now) from a pair taken at 'Puri on the Orissa coast, 1-5-viii-10 [Annandale]' and deposited in the Indian Museum (ZSI, Calcutta), should occur here.

Tribe Milesini

Syritta indica (Wiedemann), 1824

Material examined: 7 ex. Rayudupalem, nr Eluru, 24.vii.1975, K. Durga Prasad (2♂, 2♀); 35km SSE. Rajahmundry, 8.xi.2010, S. Pavan E87 (3♂).

The world revision of *Syritta* by Lyneborg & Barkemeyer (2005) has made correct species identifications easy now. *Syritta* was earlier known from about five species names in our subcontinent: *pipiens* (Linnaeus), *indica* (Wiedemann), *orientalis* Macquart and *rufifacies* Bigot, during Brunetti's time (1907-1923) and also when the Oriental Catalog (Knutson et al., 1975) was compiled. Keiser (1958) described *triangulifera* from Sri Lanka as a *Syritta* but Lyneborg & Barkemeyer (2005: 213) found it misplaced and probably a *Calcaretropidia*, which occurs in Madagascar. *S. rufifacies* was synonymised with *indica* by Knutson et al. (1975: 365) and is found in India, Sri Lanka and Nepal, east through the Indochinese peninsula to Taiwan. Datta & Chakraborti (1986a: 64) reported it from Kerala and figured its male terminalia. *S. pipiens* is a widespread Palaearctic species entering our subcontinent only in the extreme north-west frontier: cold deserts and mountains (Afghanistan, Baluchistan through Pakistan to Kashmir and Uttarakhand). Datta & Chakraborti (1984: 252) took many specimens in Kashmir

and also gave flower records for adult flies (q.v.). *S. fasciata* (Wiedemann) and *S. stylata* Lyneborg & Barkemeyer are closely related, the former ranges from eastern and southern Africa through the Middle East to Gujarat (Deesa) and Uttarakhand (Mussoorie). The distribution of *stylata* is peculiar and interesting, probably being a Pleistocene Ice Age relic, now isolated and surviving on the high mountains of peninsular India. Its specimens have been taken on the Nilgiri, Anaimalai and Shevaroy Hills and also on lower ghats in Karnataka and Kerala. One female cited from 'C. Punjab, xii.1955, P.S. Nathan' (Lyneborg & Barkemeyer, 2005: 106) is mislabelled (as these authors surmised) for Central Provinces, perhaps some location on the higher Satpuras (Pachmarhi ?). Datta & Chakraborti (1986a: 65) misidentified their material as *pipiens* from Top Slip on the Anaimalais, not 'Coimbatore.' *S. orientalis* is another widespread species, ranging from India and Sri Lanka through the Indochinese peninsula and the Malay archipelago (= East Indies) to Australia and the Pacific Ocean islands. Two other species, *latitarsata* Macquart and *vittata* Portschinsky just enter Pakistan from ranges in north Africa and the Middle East [above notes by KG, ex Lyneborg & Barkemeyer, 2005].

Cherian (1934: 699) misidentified *pipiens* from Madanapalle, Bellary and Coimbatore. KG found 21 *Syritta* specimens in the TNAU Collection which he could not then identify as any of the above species, lacking good keys or authentic named specimens for comparison. Specimens from Madanapalle and Nandyal (Andhra Pradesh) were present in TNAU and larvae were taken from rotting ash gourd, papaya and other fruits. Flies were caught on flowers of mango (*Mangifera indica*) and coffee (*Coffea arabica*). Ghorpade (1973b) also misidentified his Bangalore specimens as *pipiens* and took *Syritta* flies on flowers of *Bidens pilosa, Guizotia abyssinica, Mangifera indica, Sonchus oleraceus, Tridax procumbens*, and *Triticum vulgare* (wheat).

Syritta proximata Lyneborg & Barkemeyer, 2005

Material examined: 6 ex. Rayudupalem, nr Eluru, 24.vii.1975, K. Durga Prasad (2♂, 1♀); Potunuru, nr Eluru, 12.viii.1975, K. Durga Prasad (1♀); Naguldevpadu, nr Eluru, 14.viii.1975, K. Durga Prasad (2♂).

Lyneborg & Barkemeyer (2005: 131) listed 1♂ paratype from 'Andhra P., Fayndupalem, 24.vii.1975, leg. Prasad' which they had borrowed from the USNM Collection gifted by KG. The locality name is a mistake for Rayudupalem. The holotype male of *proximata* was collected by KG at Bangalore in October 1980 (Colln # A899), and other specimens examined by these authors are from all over 'Dravidia' (including Sri Lanka). One male was taken in Rajasthan at Udaipur (printed wrongly as 'Udsipur' in Lyneborg & Barkemeyer, 2005: 132). The specimens examined by Lyneborg & Barkemeyer (2005: 131-132) from 'India, N.E.,' given for both Delhi and Calcutta (!), are probably mislabeled (see Ghorpade, 2007: 5 for reasons). This species is curiously sympatric with *S. indica* (Wiedemann) in southern India.

Milesia gigas Querin, 1834

Hippa (1990: 109) mentioned this species which was named and described based on a single male specimen taken on the 'côte du Coromandel,' with no exact locality specified. Hippa misinterpreted this as being on the 'west coast of Indian Peninsula.' The original publication by Querin also included 'an excellent coloured illustration in natural size.' But this type specimen has never been located nor have any other specimens from this area been collected. *M. gigas* Querin is preoccupied by *M. gigas* Macquart, 1834 from Java (and by *gigas* Rossi, 1790), so Hippa (1990: 102) proposed *M. gigantea* as a new name for the Javan species (q.v.). This Coromandel *gigas* (new name also required, as it is unlikely to be conspecific with the Javan species) was presumably a relic, inhabiting the dry evergreen forest on this coast which has now been almost wholly obliterated by human agency. I (KG) have included this rare species in this paper only to bring attention to this fact and hoping that specimens can be found flying in surviving and restored (e.g., near Pondicherry) forested habitats on this coast.

Subfamily MICRODONTINAE
Tribe Microdontini

Microdon unicolor Brunetti, 1915

Species of this subfamily are some of the most peculiar and morphologically spectacular among the Syrphidae. Cheng & Thompson (2008) compiled a generic conspectus and wrote: 'adults are rarely encountered as they do not go to flowers and remain close to their breeding sites. The known larvae are predators of ant brood, and, hence, found in ant nests . . .' None of us found any species of this taxon in this area but Brunetti (1915: 255) described this violet black species as new from a single male taken near 'Puri, Orissa, 6-xi-12 [Gravely].' Ghorpade (unpublished data) has seen species of *Microdon* (s.lat.) going to flowers of grass species and being trapped in Yellow Pans, which resemble flower colour and so attract insects.

Discussion

This eastern Indian coastal tract is now devoid of any original vegetation, especially in the Andhra Carnatic portion, where conversion to arable land for agriculture has been rampant over human history. Witness the glaring fact that even of butterflies there have hardly been any surveys and samplings done in this poorly biodiverse area, except for the presence of a checklist of all named insects in the collection at the Bapatla Agricultural College (Krishnamoorthy & Dharmaraju, 1960; Krishnamoorthy et al., 1961). The only other butterfly lists we could find were those of Visakhapatnam (Subba Reddi & Meera Bai, 1985; Ramana et al., 2001; Raju et al., 2003) to the north in the Circars, and to the south, of Nagalapuram (or Pullicate, Palliakatti, Nagori) Hills, west of the Pulicat Lagoon near the Tamil Nadu border,

by Best (1954, 1977). On the Coccinellidae (Coleoptera) there have been reports of lady beetles from this coastal area by Subramanian (1924) and Mohan Rao (1958).

This present, preliminary faunistic list of Andhra Carnatic Syrphidae includes 16 species belonging to 10 genera which is sampling of the more abundant species that fly in this area. The absence of any high hills here prevents occurrence of the more colder habitat and montane species and genera. The environs of Amalapuram, towards the seacoast, are termed "*Konaseema*" in the local language, and comprise (vide SP) of lush vegetation and grassland, with coconut and cashewnut plantations and some surviving, minimally disturbed, mangroves (see Venkanna, 1991 for details and map of area), with an ambient average annual temperature of 19-28°C, and high humidity; the dry season comprising of 5-6 months only, from December (or January) to May, and with average annual rainfall of about 100cm, maximally in October. Agro-ecosystems here have not been intensively surveyed yet (except at Bapatla?) to locate the predacious Syrphinae by checking homopterous prey colonies on host plants for hover-fly larvae and pupae. Ramakrishna Ayyar probably collected at the Agricultural Research Station at Ambajipeta, on the western suburbs of Amalapuram. Species like *Episyrphus viridaureus* (Wiedemann), *Allograpta javana* (Wiedemann), and maybe *Allobaccha sapphirina* (Wiedemann) should be found here. Due to lack of native tree species diversity, other syrphid species may be absent, but city parks and home compounds with exotic or garden shrubs and trees should be searched. Gardens with flowering annuals will attract flies which visit for pollen and nectar. The banks of the Goutami Godavari are now lined with many commercial nurseries (vide SP). Some other eristaline species, like *Eristalinus quinquestriatus* (Fabricius), *Merodonoides multifarius* (Walker), and *Eumerus* spp. should also occur and be searched for here. It is very surprising that *Melanostoma univittatum* (Wiedemann) has also not been found by us here so far. However, the capture of *Asarkina belli* Ghorpadé and *Xanthandrus* sp. ?*indicus* Curran, at Amalapuram by T.V. Ramakrishna Ayyar in September 1921, is highlighted here.

Acknowledgements

We are grateful to Dr. Krushnamegh Kunte, Harvard University, Cambridge, MA (U.S.A.), and Dr. K.D. Prathapan, Kerala Agricultural University, Tiruvananthapuram, for their comments on the manuscript.

References

Anand, R.K. 1986. Records of syrphids predating on aphids in Delhi. *Recent Trends in Aphidological Studies*, pp. 197-200 (Proc. Second natn Symp., Modinagar).

Anand, R.K., Rai, S. & Sharma, V.K. 1967. Notes on hoverflies (Diptera: Syrphidae) from Delhi and adjoining areas. *Indian J. Entomol.*, 29: 307-308.

Anonymous. 1996. *Sacred and Protected Groves of Andhra Pradesh.* 96 pp., 3 Annex., 40 col. figs. WWF Andhra Pradesh State Office, Hyderabad.

Best, A.E.G. 1954. Notes on Butterflies of the Nagalapuram Hills, Eastern Ghats. *J. Bombay nat. Hist. Soc*., 52: 365-373.

Best, A.E.G. 1977. Additions and alterations to the list of Butterflies of Nagalapuram Hills published in Vol. 52 nos. 2 & 3—August-December 1954. *J. Bombay nat. Hist. Soc.*, 74: 189-190.

Biswas S., Lahiri, A,R. & Ghosh, A.K. 1975. A preliminary study of the insect fauna of Meghalaya. 2. Diptera, Syrphidae: eleven new records and notes on other species. *Proc. Zool. Soc., Calcutta,* 27: 23-27 [1974].

Brunetti, E. 1907. Notes on Oriental Diptera II. Preliminary report on a collection from Simla made in April and May 1907. *Rec. Indian Mus.*, 1: 166-170.

Brunetti, E. 1913a. Zoological results of the Abor Expedition, 1911-12, XI. Diptera. *Rec. Indian Mus,* 8: 149-190, 1 pl.

Brunetti, E. 1913b. New and interesting Diptera from the Eastern Himalayas. *Rec. Indian Mus.*, 9: 255-277.

Brunetti, E. 1915. Notes on Oriental Syrphidae: with descriptions of new species. Part II. *Rec. Indian Mus.*, 11: 291-256, 1 pl.

Brunetti, E. 1917. Diptera of the Simla District. *Rec. Indian Mus*., 13: 59-101.

Brunetti, 1923. *The Fauna of British India, including Ceylon and Burma.* Diptera. Volume 3. Pipunculidae, Syrphidae, Conopidae, Oestridae. xii+424 pp., 85 figs, 7 pls. Taylor & Francis, London.

Cheng, X.-Y. & Thompson, F.C. 2008. A generic conspectus of the Microdontinae (Diptera: Syrphidae) with the description of two new genera from Africa and China. *Zootaxa*, 1879: 21-48.

Cherian, M.C. 1934. Notes on some south Indian Syrphids. *J. Bombay nat. Hist. Soc*., 37: 697-699.

Curran, C.H. 1933. Three new Diptera from India. *Stylops,* 2: 45-48.

Datta, M. & Chakraborti, M. 1984. On a collection of Flower flies (Diptera: Syrphidae) with new records from Jammu and Kashmir. *Rec. Zool. Surv. India*, 81: 237-253.

Datta, M. & Chakraborti, M. 1985. Fauna of Namdapha (Insecta: Diptera). *Rec. Zool. Surv. India*, 82: 231-252.

Datta, M. & Chakraborti, M. 1986a. On collections of Flower flies (Diptera: Syrphidae) from south India. *Rec. Zool. Surv. India*, 83: 53-67.

Datta, M. & Chakraborti, M. 1986b. New records of Syrphidae from Darjeeeling (West Bengal) and Sikkim, India, with description of *Meliscaeva darjeelingensis* spec. nov. (Diptera). *Opusc. Zool. Fluminensia*, 6: 1-19.

Desai, K.N. 2000. Conservation and management of coastal sand dune vegetation. *Zoos' Print J*., 15(6): 281-282.

Fletcher, T.B. 1916. One hundred notes on Indian insects. *Bull. Agri. Res. Inst., Pusa,* 59: v+39 pp.

Gaonkar, H. ***in prep.*** *The Butterflies of the Indian region, including Bangladesh, Bhutan, Burma, India, Maldive Islands, Nepal, Pakistan and Sri Lanka.* Volume 1. [Manuscript 458 pp.]

Ghorpade, K.D. 1973a. The hover-fly *Allograpta javana* (Wiedemann), predacious on the Jowar shoot-bug *Peregrinus maidis* (Ashmead) together with its recorded hosts from India. *Sci & Cult*., 39: 400-401.

Ghorpade, K.D. 1973b. *A faunistic study of the hover flies (Diptera: Syrphidae) of Bangalore, southern India*. x+208 pp. [Unpublished M.Sc. (Agri.) thesis, Univ. Agril Sci., Bangalore]

Ghorpade, K.D. 1974. A faunistic study of the Hover-flies (Diptera: Syrphidae) of Bangalore, southern India [Abstract]. *Mysore J. Agril Sci*., 8: 636.

Ghorpade, K.D. 1981a. Insect prey of Syrphidae (Diptera) from India and neighbouring countries: a review and bibliography. *Trop. Pest Manag*., 27: 62-82.

Ghorpade, K.D. 1981b. *A taxonomic revision of Syrphini (Diptera: Syrphidae) from the Indian subcontinent*. xi+381pp., 91 figs, 21 maps [Unpublished Ph.D. thesis submitted to the University of Agricultural Sciences, Bangalore].

Ghorpade, K.D. 1981c. An anomalous *Episyrphus* (Diptera : Syrphidae) from Madagascar. *Colemania*, 1: 89-94, 5 figs.

Ghorpade, K.D. 1982. A new *Callicera* (Diptera : Syrphidae) from the northwest Himalaya. *Colemania*, 1: 163-167, 2 figs.

Ghorpade, K.D. 1984. A Taxonomic Revision of Syrphini (Diptera: Syrphidae) from the Indian subcontinent [Abstract]. *Mysore J. Agril Sci*., 16(3): 363.

Ghorpadé, K. 1994. Diagnostic keys to new and known genera and species of Indian subcontinent Syrphini (Diptera: Syrphidae). *Colemania, insect biosyst.*, No. 3, pp. 1-15.

Ghorpadé, K. 1997. This was a life: Dr. J.G. Koenig (29.xi.1728—26.vi.1785). *Indian J. Biodiversity*, 1: 185-188.

Ghorpadé, K. 2007. The genus *Agnisyrphus* Ghorpadé (Diptera—Syrphidae), peculiar to the Oriental Region, with notes on phylogeny, evohistory and panbiogeography. *Colemania*, No. 14, pp. 1-35, 3 figs, 1 pl., 1 map.

Ghorpadé, K. 2009b. Some nomenclatural notes on Indian Subregion Syrphini (Diptera—Syrphidae). *Colemania*, No. 15, pp. 3-13.

Gilbert, F. 1990. Size, phylogeny and life-history in the evolution of feeding specialization in insect predators. pp. 101-124, 10 figs. *In:* F. Gilbert [Ed.] *Insect Life Cycles: genetics, evolution and coordination*. Springer-Verlag, London.

Gokulpure, R.S. 1972. Further collection of the Syrphidae (Diptera) from central India. *J. Bombay nat. Hist. Soc.*, 68: 848.

Hervé-Bazin, J. (1923): Etudes sur les "*Lathyrophthalmus*" (Diptera, Syrphidae) d'extreme-Orient. *Annls Sci. Nat. Zoologie*, 6: 125-152.

Hippa, H. 1990. The genus *Milesia* Latreille (Diptera, Syrphidae). *Acta Zool. Fennica*, No. 187, pp. 1-226.

Joseph, A.N.T. & Parui, P. 1973. Diptera from NEFA and Assam foothills. Part III. Siang Frontier Division and North Lakhimpur. *Rec. Zool. Surv. India*, 67: 325-342.

Joseph, A.N.T. & Parui, P. 1977a. On a small collection of Diptera from Chota Nagpur, Bihar. *Rec. Zool. Surv. India*, 72: 227-238.

Joseph, A.N.T. & Parui, P. 1977b. Diptera from Arunachal Pradesh and Assam foothills. Part V. Tirap Division. *Rec. Zool. Surv. India*, 72: 333-339.

Joseph, A.N.T. & Parui, P. 1986. Diptera from Silent Valley. *Rec. Zool. Surv. India*, 84: 157-164.

Joseph, A.N.T. & Ramachandra Rao, R. 1972a. Diptera from NEFA and Assam foothills. Part I. Kameng Frontier Division and Assam foothills. *Rec. Zool. Surv. India*, 66: 63-74.

Joseph, A.N.T. & Ramachandra Rao, R. 1972a. Diptera from NEFA and Assam foothills. Part II. Kameng Frontier Division, Subansiri Frontier Division, North Lakhimpur and Assam foothills. *Rec. Zool. Surv. India*, 66: 103-128.

Joseph, A.N.T. & Ray, K.K. 1976. Diptera from Arunachal Pradesh and Assam foothills. Part IV. Lohit District, Lakhimpur District and Sibsagar District. *Rec. Zool. Surv. India*, 69: 275-290.

Joseph, A.N.T. & Sharma, H.S. 1976. New records of Syrphidae (Diptera) from Sikkim India. *Newsl. Zool. Surv. India*, 2(6): 252-254.

Keiser, F. 1958. Bietrag zur Kenntnis der Syrphidenfauna von Ceylon (Dipt.). *Rev. Suisse Zool.*, 65: 185-239.

Kinnear, N.B. 1948. OBITUARY. T.R.D. Bell. *J. Bombay nat. Hist. Soc*., 48: 167-171, 1 pl.

Knutson, L.V., Thompson, F.C. and Vockeroth, J.R. 1975. Family Syrphidae. pp. 307-374. *In:* M.D. Delfinado and D.E. Hardy [Eds] *A Catalog of the Diptera of the Oriental Region*. Volume 2, x+459 pp. University Press of Hawaii, Honolulu.

Krishnamoorthy, C. & Dharmaraju, E. 1960. Annual progress report of the scheme for building up named reference collection of insects at Agricultural College, Bapatla, Andhra Pradesh, for the year ending 30-6-1960. Department of Agriculture, Andhra Pradesh, Hyderabad. 53 pp.

Krishnamoorthy, C., Dharmaraju, E. & Lakshminarayana, K.V. 1961. *Final Report, Named Insect Reference Collection, Agricultural College, Bapatla.* Appendix, Part X, pp. 62-65.

Lambeck, H.J.P. & van Brink, J.M. 1973. Contribution to the knowledge of the taxonomy, faunal composition and

cytology of the Syrphid flies (Diptera: Syrphidae) of Kashmir (India). I. Taxonomic account and faunal composition. *Genen Phaenen*, 16: 87-100.

Lyneborg, L. & Barkemeyer, W. 2005. *The Genus Syritta. A world revision of the genus Syritta Le Peletier & Serville 1828 (Diptera: Syrphidae).* 224 pp., 224 figs. Apollo Books, Denmark.

Mani, M.S. 1962. *Introduction to High altitude Entomology*. Insect life above the timber-line in the North-west Himalaya. xix+302 pp. Methuen & Co., London.

Mani, M.S. 1968. *Ecology and Biogeography of High altitude Insects.* xiv+527 pp. W. Junk b.v., The Hague.

Mani, M.S. 1974. Physical features. pp. 11-60. *In:* M.S. Mani [Ed.] *Ecology and Biogeography in India*. xix+773 pp. Dr W. Junk, b.v., The Hague.

Mengual, X. & Ghorpadé, K. 2010. The flower fly genus *Eosphaerophoria* Frey (Diptera, Syrphidae). *ZooKeys*, 33: 39-80.

Mitra, B., Banerjee, D., Mukherjee, M., Bhattacharya, K. and Parui, P. 2008a. *Flower visiting flies of Kolkata and surroundings.* 56 pp. Zoological Survey of India Handbook, Calcutta.

Mitra, B., Mukherjee, M. and Banerjee, D. 2008b. A check-list of hover-flies (Diptera: Syrphidae) of Eastern Himalayas. *Rec. Zool. Surv. India, Occ. Paper*, No. 284, pp. 1-47.

Mitra, B., Mukherjee, M. and Parui, P. 2007. New records of true flies (Diptera : Insecta) from Chhattisgarh and Madhya Pradesh. *Bionotes*, 9: 54-55.

Mitra, B. and Parui, P. 2010. Dipteran insects from the Great Nicobar Biosphere Reserve. *Bionotes*, 12: 54-55.

Mitra, B., Parui, P., Banerjee, D. and Mukherjee, M. 2003. First record of *Paragus bicolor* (Fabr.) from India (Diptera: Syrphidae). *Bionotes*, 5: 34.

Mitra, B., Parui, P., Mukherjee, M. and Bhattacharya, K. 2009. New record of some dipteran insects from Uttarakhand. *Bionotes*, 11: 92.

Mohan Rao, K.R. 1958. Ladybird beetles of Northern Circars and their role in maintaining balance of life. *Andhra Agril J.*, 5: 171-172.

Musa, J.L. 1975. The immature stages of *Asarkina ericetorum* (F.) (Dipt., Syrphidae) in northern Nigeria. *Entomologists' mon. mag*., 111: 109-110.

Nayar, J.L. 1968a. A contribution to our knowledge of high altitude Syrphidae (Cyclorrhapha: Diptera) from N.W. Himalaya. Part I—Subfamily Syrphinae. *Agra Univ. J. Res. (Sci.),* 16(3): 121-131, 5 figs.

Nayar, J.L. 1968b. A contribution to our knowledge of high altitude Syrphidae (Cyclorrhapha: Diptera) from N.W. Himalaya. Part II—Subfamily Eristalinae. *Agra Univ. J. Res. (Sci.),* 16(3): 27-31, 2 figs.

Nayar, J.L. & Nayar, L. 1965. Some interesting Syrphids of Agra. *Indian J. Entomol.*, 27: 240-241.

Parui, P. and Mitra, B. 2000. New record of some Dipteran insects from the Thar Desert. *Bionotes*, 2: 73.

Patel, J.R. & Patel, H.K. 1969. Some syrphids of Gujarat and their hymenopterous parasites. *Indian J. Ent.,* 31: 86-88.

Raju, A.J.S., Rao, S.P. & Ezradanam, V. 2003. Some ecological notes on the Butterflies of Visakhapatnam, Andhra Pradesh. *Zoos' Print J.,* 18(6): 1126-1128.

Ramakrishna Ayyar, T.V. & Krishna Ayyar, P.N. 1933. *Preliminary List of the Insect fauna of Coimbatore.* 197 pp. The Agricultural Department, Madras.

Ramana, S.P.V., Atluri, J.B. & Reddi, C.S. 2001. New additions to the Butterflies of Visakhapatnam. *Insect Environ.*, 6(4): 187.

Rossi, P. 1790. *Fauna Etrusca. Sistens insecta quae in provincilis Florentina et Pisana praesertim collegit*. Vol. 2, 348 pp., 10 pls. Liburni.

Sastry, A.R.K. & Rao, T.A. 1973. Studies on the flora and vegetation of coastal Andhra Pradesh, India. *Bull. Bot. Surv. India*, 15: 92-107.

Senior-White, R. 1922. Notes on Indian Diptera. I. Notes on the Diptera of the Khasia Hills. *Mem. Dept Agric. India,, Ent. Ser.*,7(9): 83-103.

Singh, A., Sodhi, N.S. & Gupta, V. 1985. A report on the syrphid fauna of Chandigarh and surrounding areas. *Res. Bull. Panjab Univ.*, 36: 191-194.

Singh, S., Gupta, V.K., Mathew, K. & Krishna, S.S. 1955. Entomological Survey of the Himalayas. Part XII. Second annotated Checklist of Insects from the North-west (Punjab) Himalayas. *Agra Univ. J. Res. (Sci.),* 4: 657-716.

Subba Reddi, C. & Meera Bai, G. 1985. Butterflies of Visakhapatnam, their seasonality and relative abundance. *Kingfisher* (Andhra Pradesh Natural History Society Newsletter), Special Issue, October 1985, pp. 1-2.

Subramaniam, T.V. 1924. Some Coccinellids of south India. *Proc. 5th ent. Mtg Pusa*, pp. 108-118.

Thompson, F.C. 1981. The Flower Flies of the West Indies (Diptera: Syrphidae). *Mem. Ent. Soc. Wash*., No. 9, pp. 1-200.

Thompson, F.C. 2003. *Austalis*, a new genus of flower flies (Diptera: Syrphidae) with revisionary notes on related genera. *Zootaxa*, 246: 1-19, 7 figs.

Thompson, F.C. & Ghorpadé, K. 1992. A new coffee aphid predator, with notes on other Oriental species of *Paragus* (Diptera: Syrphidae). *Colemania*, 5: 1-24, 19 figs, 7 maps [1988].

Usman, S. & Puttarudriah, M. 1955. A List of the Insects of Mysore including the Mites. *Bull. Dep. Agric. Mysore State, Ent. Ser.,* No. 16, pp. vi+194 [see pp. 150-151].

Varshney, R.K. 1977. Index Rhopalocera Indica. An Index of the Local-lists of Butterflies from India and neighbouring countries. *Rec. Zool. Surv. India*, 73: 159-177.

Venkanna, P. 1991. Present status of the estuarine flora of the Godavari and the Krishna. *J. Bombay nat. Hist. Soc.*, 88: 47-54, 2 figs.

Venkateshwarlu, V. 1944. The estuarial flora of the Godavary. *J. Bombay nat. Hist. Soc*., 44: 431-435, 3 pls.