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A PRELIMINARY NOTE ON THE MOSQUITO FAUNA (DIPTERA : CULICIDAE) OF SOUTHERN COASTAL DISTRICTS OF ORISSA

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INTRODUCTION

The family Culicidae consists of 41 genera and 3500 species known all over the world. Of these, 320 species of 37 genera of mosquitoes are reported from India. Barraud (1934) studied the Indian mosquito fauna and recorded 250 species of Culicinae with type localities in greater India. The mosquito fauna of coastal Orissa was first studied by Fry (1912) and reported the presence of 5 anopheline species. After a gap of over three decades Rodenwaldt recorded 21 sps. of Anopheles mosquitoes (Diptera : Culicidae) from the coastal belt of Orissa. Subsequently Nagpal and Sharma (1983) recorded 32 species of mosquitoes belonging to six genera from coastal districts of Orissa. Later Dash *et al.* (2000) reported 8 sps. of Culicinae and 14 spp of Anopheline mosquitoes from Chilika Lake area; Rajavel *et al.* (2005a, b) reported 74 species belonging to 12 genera and 20 subgenera from Jeypore hill tracks of Orissa and fortythree species of mosquitoes belonging to 21 subgenera and 13 genera, from mangrooves of Bhitarkanika.

The need for the identification of the mosquitoes is urgently required because some of the mosquito species are the vectors of important tropical diseases including malaria, dengue, filariasis, etc. Although the organizations such as National Centre for Malaria Research (NIMR), Regional Medical Research Centre (RMRC, Bhubaneswar), Vector Control Research Centre (VCRC) and National Institute of Communicable Diseases (NICD) are doing a handful work on mosquito biology, but the taxonomy of Indian mosquito is far from complete. The need to identify and inventorise the mosquito species from the Orissa state is very essential because the state is known to experience a series of epidemics of mosquito-borne diseases. Keeping in view of the major outbreaks of cerebral malaria, filariasis, chikungunia, dengue and other vector borne diseases an attempt has

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been made here by the authors to report the mosquito fauna collected from the unexplored shoreline habitats of Puri, Khurda and Ganjam District.

COLLECTION OF MATERIALS

The mosquitoes were collected from Puri district i.e., Kushabhadra Estuary, Satpara, Alipara, Rambhartya Island, Giquala. Khurda district : Chhedapadar, Bidharpur, Rajni Reserve Forest, Balugaon Ganjam district : Berhampur, Gopalpur. The collections were made with sucking-tubes and aspirators. The indoor collections of resting mosquitoes were made by spray of pyrethrum solution in a closed room on white cotton bed-sheets. Human bait collection methods were also employed in outdoor situations by flashing light. Only adult mosquitoes were collected and preserved for identification. A total of 140 examples of mosquito specimens were collected during this preliminary survey and identified with reference to Christophers (1933), Barraud (1934), Nagpal *et al.* (2005), Iyengar and Menon (1955).

RESULTS AND DISCUSSION

The current higher level of classification, taxonomic citation of species studied, their distribution, breeding sources and biology in relation to disease vector status were provided in order. The taxonomic arrangement of species in the paper follows the work of Bram (1967), Rajavel *et al.* (2005), Illango (2006), Tewari *et al.* (1987), Nagpal and Sharma (1995). The species marked with asterisk were collected and observed in the present study.

SYSTEMATIC ACCOUNT

Family CULICIDAE

Subfamily ANOPHELINAE

Genus *Anopheles* Meigen

1. *Anopheles aconitus* Donitz

1902. *Anopheles aconitus*, Donitz, 1902 *Zeitschrift Fur Hygiene und Infektionskrankheiten*, 41 : 15-18.

Recorded : Coastal plains of Orissa.

Distribution : India : Widely prevalent except Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan.

Remarks : Species breeds in clean-water tanks with grassy edges, ponds, streams, water drains, river bed pools and rice fields (at least 45 cm long).

2. *Anopheles aitkenii* James

1903. *Anopheles aitkenii* James, In : Theobald, *Mon. Cul.*, 3 : 22-23.

Recorded : Mayurbhanj, Keonijhar, Koraput districts of Orissa.

Distribution : India : Widely prevalent in Andaman Islands, Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Sikkim, Tamilnadu, Uttar Pradesh and West Bengal.

Remarks : Breeds in a variety of places such as small pools and seepages in the jungle, tea garden drains which are shaded by tea plants, swamps, marshes, channels, river, rock pools, streams heavily shaded with trees, wells etc.

3. *Anopheles annularis* Vander Wulp

1884. *Anopheles annularis* Van der Wulp. *Notes from the Leyden Museum*, 6 : 248-256.

Recorded : Singhbhum, Chilika lake area, Puri, Keonjhar, Koraput of Orissa.

Distribution : India : Commonly found in Bihar, Coastal Orissa, and West Bengal.

Remarks : Mixed dwellings during day. Also found at outdoor in small numbers.

4. *Anopheles culcifacies* Giles

1901. *Anopheles culcifacies* Giles, *Entom. Month. Mag.*, 37 : 196-198.

Recorded : Balangir, Balighai, Bhadrak, Chatikona, Cuttack, Ganjam, Jeypore, Kesinga, Phulbani, Sambalpur of Orissa.

Distribution : India : Throughout the country except Andaman & Nicobar Islands.

Remarks : It rests in cattle sheds and houses during the day. They were also collected from Straw, mud cakes etc., near stables and from dense vegetation under the bushes and tree holes.

5. *Anopheles fluviatilis* James

1902. *Anopheles fluviatilis* James, *Sci. Mem. govt. Indian n.s.*, 2 : 106.

Recorded : From Jeypore, Koraput, Mayurbhanj districts of Orissa.

Distribution : India : Widely distributed.

Remarks : Mostly adults rest at human habitats than cattle sheds in day time. It also rests in outdoors.

6. *Anopheles jeyporiensis* James

1902. *Anopheles jeyporiensis* James, *Sci. Mem. govt. Indian n.s.*, **2** : 106.

Recorded : Reported from Jeypore hills of Orissa after which it has been named.

Distribution : India : Recorded from Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Orissa, Rajasthan, Sikkim, Tamilnadu, Uttar Pradesh, Uttaranchal, West Bengal.

Remarks : Adults found largely in cattle sheds but also inside houses. Found at altitudes between 2000 to 6000m.

Subgenus *Ceilia* Theobald7. *Anopheles (Ceilia) karwari* (James)

1902. *Anopheles karwari* (James), In : Theobald, 1903. *Mon. Cul.*, **3** : 102-104.

Distribution : India : Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chennai, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Rajasthan, Tripura, Uttar Pradesh, Uttaranchal, West Bengal.

Remarks : Breeds mainly in seepages. Not regarded as vector of Malaria.

8. **Anopheles maculatus* Theobald

1901. *Anopheles maculates* Theobald, *Mon. Cul.*, **1** : 171-174.

Recorded : All over Orissa.

Materials Examined : 1 ex., E, Sulia Colony, Khurda Dist., 28.i.2006, Coll. S. Dash.

Distribution : India : Widely distributed.

Remarks : Prefers bright sunlit breeding places and shade has a deleterious effect. Breeding is more pronounced in pre and post monsoon months.

9. *Anopheles majidi* Young and Majid

1928. *Anopheles majidi* Young and Majid, *Ind. Jour. Med. Res.*, **16** : 469-471.

Recorded : Koraput district, Orissa.

Distribution : India : Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Meghalaya, Mizoram, Orissa, Tamilnadu, Tripura, West Bengal.

Remarks : Breeds in grassy slow-running streams, breeding also recorded from open drains in tea gardens and fallow rice fields.

10. *Anopheles minimus* Theobald

1901. *Anopheles minimus* Theobald, *Mon. Cul.*, **1** : 186-88.

Recorded : All over Orissa, Mostly in Jeypore Hills.

Distribution : India : Widely distributed in Arunachal Pradesh, Assam, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura. It has sporadic distribution in Andhra Pradesh, Bihar, Karnatak, Kerala, Orissa, Tamilnadu, in the foothills of Uttar Pradesh, West Bengal.

Remarks : It also breeds in burrow pits, rice fields and seepages. The species prefers shady places.

11. *Anopheles moghulensis* Christophers

1924. *Anopheles moghulensis* Christophers, *Ind. Jour. Med. Res.*, **12** : 295-301.

Recorded : From all over Orissa.

Distribution : India : Recorded from Andhra Pradesh, Bihar, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamilnadu.

Remarks : Rests in human dwellings and occasionally in cattle sheds.

12. **Anopheles nigerimus* Giles

1900. *Anopheles nigerimus* Giles, *A handbook of the Gnats or Mosquitoes giving the Anatomy and Life History of Culicidae*, 1-374.

Material Examined : 2E, Gopalpur, Ganjam Dist., 21.i.2006, Coll. S. Dash.

Recorded : From all over Orissa especially from coastal Orissa.

Distribution : India : Occurs throughout except Himachal Pradesh.

Remarks : Breeds in standing water with good aquatic vegetation.

13. *Anopheles pallidus* Theobald

1901. *Anopheles pallidus* Theobald. *Mono Cul.*, **1** : 132-134.

Recorded : From all over Orissa.

Distribution : India : Cosmopolitan.

Remarks : Mixed dwellings.

14. *Anopheles pseudojamesi* Strickland and Chowdhury

1927. *Anopheles pseudojamesi*, Strickland and Chowdhury. *Ind. Med. Gaz.*, **62** : 240-243.

Recorded : Coastal plains of Orissa.

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Maharashtra, Meghalaya, Orissa and West Bengal.

Remarks : Breeds in rainwater pools, tanks and swamps, Adults rest in houses and cattle sheds.

15. *Anopheles sergetii* (Theobald)

1907. *Anopheles sergetii* (Theobald), *Mon. Cul.*, **4** : 68-69.

Recorded : In Orissa recorded from Koraput Dist.

Distribution : India : Recorded from Jabalpur (Madhya Pradesh) and Koraput (Orissa).

Remarks : Rests in human dwellings and cattle sheds but sometimes in underground aqueducts.

16. *Anopheles sinensis* Wiedemann

1828. *Anopheles sinensis* Wiedemann, *Aussereuropaisch Zweifflugelige Insekten*, Vol. **1**, 608 pp.

Recorded : From all over Orissa especially from Koraput District.

Distribution : India : Assam, Delhi, Manipur, Meghalaya, Mizoram, Orissa, Punjab and Tamilnadu.

Remarks : The main breeding ground is the rice fields.

17. **Anopheles subpictus* Grassi

1899. *Anopheles subpictus* Grassi, In : Grassi, Bigami and Bastianelli, 1899. alti dell, *Accademic Nazionale dei Lincei. Rendiconti*, **8** : 100-104.

Material examined : 2 exs. E, Chedapadar, Dist. Khurda 27.i.2006, Coll. S. Dash.

Recorded : From all over Orissa.

Distribution : India : Occurs in all main lands.

Remarks : Breeds in flowing stagnant waters, clear or turbid waters, water with or without vegetation, shaded or slightly shaded places, wells, burrow pits, channels, lake margins, ponds, tanks, ground pools, fallow and freshly flooded rice fields, cement cisterns, tree-holes, fresh or brackish waters.

18. *Anopheles tessellates*, Theobald

1901. *Anopheles tessellates* Theobald, *Mon. Cul.*, **1** : 175.

Recorded : All over Orissa.

Distribution : India : Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Rajashtan, Sikkim, Tamilnadu, Tripura, Uttar Pradesh, Uttaranchal, West Bengal.

Remarks : Mixed dwellings cattlesheds and outdoors rests particularly on the lower part of the walls.

19. **Anopheles theobaldi* Giles

1901. *Anopheles theobaldi* Giles, *Entomol Month mag.*, **37** : 196-198.

Material examined : 2E, Alipada, Dist. Puri, 24.i.2006. Coll. S. Dash.

Recorded : All over Orissa.

Distribution : India : It is found all over the country but concentrated mainly in central and western part of Peninsula.

Remarks : Forest species and basically a stream breeder, also breeds in ponds, tanks, rice fields and riverbed pools.

20. **Anopheles vagus* Donitz

1902. *Anopheles vagus* Donitz., *Zeitschrift fur Hygiene and Infektionskrankheiten*, **41** : 15-88.

Material examined : 3 exs. E, Chedapadar, Dist. Khurda 26.i.2006, Coll. S. Dash.

Recorded : From all over Orissa.

Distribution : India : Throughout the country except Delhi, Himachal Pradesh, and Punjab.

Remarks : Adults rest indoors in cattle sheds and mixed dwellings. Cattle sheds are regarded more attractive. Outdoor resting to a limited extent.

21. *Anopheles varuna*, Iyengar

1924. *Anopheles varuna* Iyengar, *Ind. Jour. Med. Res.*, **12** : 23-29.

Recorded : Jeypore Hills, Orissa.

Distribution : India : Andaman Islands, except Himachal Pradesh, Haryana, Jammu and Kashmir. Lakshadweep, Punjab, Rajasthan, throughout India.

Remarks : Breeds profusely in freshwater tanks, ponds, rice fields, drains, irrigation channels, wells etc., with algal and other aquatic vegetation.

Genus *Armigeres* Theobald

Subgenus *Armigeres* Theobald

22. *Armigeres subalbatus* (Coquilett)

*1898. *Armigeres subalbatus* (Coquilett), *Proc. U.S. Nat. Mus.*, **xxi**, p. 302.

Material examined : 7E, Nuanai Muhan, Dist. Puri, 23.i.2006, Coll. S. Dash.

Recorded : From all over Orissa.

Distribution : India : Cosmopolitan.

Remarks : Resting on vegetations, coconut shell, bamboo, septic tanks.

23. *Armigeres (Armigeres) theobaldi* Barraud

*1908. *Armigeres (Armigeres) theobaldi*, Barraud *Rec. Ind. Mus.*, **iv**, p. 5.

Specimen examined : 4E, Giqala, Dist. Puri, 24.i.2006. Coll. S. Dash.

Distribution : India : Cosmopolitan.

Recorded : Only from Orissa till now.

Remarks : It breeds in bamboo stalk.

Genus *Culex* Linnaeus

Subgenus *Culex* Linnaeus

24. *Culex (Culex) bitaeniorhynchus* Giles

1901. *Culex bitaeniorhynchus* Giles, *Entom.*, **xxxiv** (July) : 196.

Recorded : From all over Orissa.

Distribution : India : Widely distributed.

Remarks : Breeds in Irrigation canal, pond, ground pool, paddy field, slow-moving stream with algae.

25. *Culex (Culex) cornutus* Edwards

1922. *Culex cornutus* Edwards, *Ind. Journ. Med. Res.*, **X** : 283.

Recorded : From all over Orissa especially from Jeypore Hills.

Distribution : India : Occurs in all main lands.

Remarks : The adults rest on the vegetation.

26. ***Culex (Culex) fuscocephalus*** Theobald

1907. *Culex fuscocephalus* Theobald, *Mon. Cul.*, **4** : 420.w.

Recorded : From all over Orissa especially from Bhitarkanika and Jeypore Hills.

Distribution : India : Widely distributed.

Remarks : Breeds in ground pool, paddy field, adults rests in human dwelling.

27. ***Culex (Culex) gelidus*** Theobald

1901. *Culex (Culex) gelidus* Theobald, *Mon. Cul.*, **ii**, p. 180.

Recorded : From all over Orissa.

Distribution : India : Widely distributed.

Remarks : Breeds mainly in ground pools having weeds, marshy tracks and cement tanks. Adults rests mainly in cow sheds.

28. ***Culex (Culex) mimulus*** Edwards

1915. *Culex mimulus* Edwards, *Bull. Ent. Res.*, **V**, p. 284.

Recorded : From all over Orissa, especially from Jeypore Hills.

Distribution : India : Widely distributed but mainly concentrated in Uttar Pradesh, Uttarakhand and Assam.

Remarks : Breeds in rainwater pool, pond, stream and riverbed pool with algae. Adults rest in vegetation.

29. ****Culex (Culex) quinquefasciatus*** Say

1823. *Culex quinquefasciatus* Say, *J. Acad. nat. Sci. Phila.*, **3** : 10.

Material examined : 14E, Balugaon, Dist. Khurda, 27.i.2007, Coll. S. Dash.

Recorded : Common throughout Orissa.

Distribution : India : Widely distributed.

Remarks : Found in human dwelling and cattle sheds.

30. **Culex (Culex) sinensis* Theobald

1903. *Culex sinensis* Theobald, *Mon. Cul.*, **iii**, P. 180.

Material examined : 4E, Gopalpur, Dist. Ganjam 21.i.2006, Coll. S. Dash.

Recorded : From coastal Orissa.

Distribution : India : Widely distributed.

Remarks : Inhabits pond banks.

31. *Culex (Culex) sitiens* Wiedeman Aussereur

1828. *Culex sitiens* Wiedeman Aussereur, *Zweifl. Insec.*, **i**.

Recorded : Common in coastal areas of Orissa.

Distribution : India : Cosmopolitan in Distribution.

Remarks : Breeds in swamp pool, coir retting pit. Adults rest in vegetation and crab hole.

32. *Culex (Culex) tritaeniorhynchus* Giles

1901. *Culex tritaeniorhynchus* Giles, *Journ. Bomb. Nat. Hist. Soc.*, **xiii**.

Recorded : Common throughout Orissa.

Distribution : India : Cosmopolitan in Distribution.

Remarks : Breeds in irrigation canal, pond, ground pool, paddy fields.

33. **Culex (Culex) vishnui* Theobald

1901. *Culex vishnui* Theobald, *Mon. Cul.*, **1** : 355.

Material examined : 11E, Balugaon, Dist. Khurda, Gopalpur, Dist. Ganjam, 28.i.2006 and 19.i.2006 respectively, Coll. S. Dash.

Recorded : From rice fields, ponds and cement tanks of Orissa.

Distribution : Widely distributed in India.

Remarks : It breeds in ground pools, rice fields, salt marshes etc.

34. *Culex (Culex) whitei* Barraud

1923. *Culex whitei* Barraud, *Ind. Journ. Med. Res.*, **xi**.

Recorded : From shorelines of Orissa.

Distribution : India : Mainly found in the north-eastern region.

Remarks : It breeds in ground pools.

35. *Culex (Culex) whitmorei* (Giles)

1904. *Culex whitmorei* (Giles) *J. trop. Med.*, 7 : 367.

Recorded : Hilly areas of Orissa.

Distribution : India : Widely distributed.

Remarks : Breeds in ground pool and cement tank. Adults rest in vegetation.

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