ECOLOGY OF ANOPHELINES OF PAKISTAN AND THEIR DISTRIBUTION
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BACKGROUND: Malaria is the 2nd most prevalent disease and has been a major cause of morbidity in country. Pakistan with an estimated burden of 1.6 million cases annually has been categorized by WHO in group-3 countries of the EMRO Region (low to moderate prevalence). In 2012, 290,780 microscopically confirmed cases were reported from all public sector centers across the country. Approximately 19.9 (9.5%), 31.2 (18.7%) and 121 (72.1%) million people are living in highly, moderately and low endemic areas of the country respectively. Weak knowledge on ecology of anophelines is one of the major challenges for the control of malaria in country. A few investigations in country also revealed that the instability of malaria is due to overwhelming preferences of mosquitoes for bovine host.

OBJECTIVES: To determine the distribution of various Anopheles species in different ecological regions and to describe their behavior in each stratum of Pakistan.

MATERIALS AND METHODOLOGY:
1. Country was divided into 8 ecological zones (Map 3)
2. Both adults and larvae were collected from each stratum. Routine entomological surveillance data (secondary source) from 2006-2011 was also analyzed
3. Adults mosquitoes were collected through:
   - White sheet spray catch method
   - Mouth and mechanically operated aspirators
   - Window traps etc
4. Larvae were collected from all potential breeding places
5. All relevant data (collection time, type of room, habitat type, water quality) was also noted.

RESULTS:
- A total 24 Anopheles spp. were recorded, of which 18 spp. were reported from each of the two warm semi-arid zones i.e. summer rain and winter-rain areas
- An. culicifacies and An. stephensi showed a wide range of tolerance to different ecological conditions. However, An. multicocil, An. splendens and An. superpictus exhibited a marked association with very cold and cold humid climatic conditions of the country
- An. subpictus also showed highest level of tolerance to hot arid (dry) and hot arid (very dry) areas of the country
- For breeding preferences, An. culicifacies, An. stephensi, An. flavivialis, An. annulatus, An. maculatus and An. nigripennis showed a significant association with clean water habitats of rural settings of the country. However, An. subpictus and An. stephensi also exhibited a wide range of tolerance to organically polluted habitats
- An. culicifacies, An. stephensi, An. flavivialis, An. annulatus and An. maculatus showed endophytic resting and anthropophilic feeding behavior mainly in sleeping rooms
- An. culicifacies, An. flavivialis, An. annulatus and An. maculatus exhibited peak densities only during post monsoon season, whereas An. stephensi, An. subpictus and an. pulcherrimus in addition also showed reasonably high densities during spring months.

CONCLUSIONS: An. culicifacies and An. stephensi showed a wide range of tolerance to different ecological conditions of the country. All species showed confirmed and suspected malaria showed a noteworthy association with agriculture-related clean water habitats. However, An. subpictus and An. stephensi also exhibited a wide range of tolerance to organically polluted habitats. They also showed endophytic resting and anthropophilic feeding behavior mainly in sleeping rooms.