OPERATIONAL AND SCIENTIFIC NOTES

MOSQUITO PRODUCTIVITY OF CRAWFISH PONDS AND IRRIGATION CANALS IN LOUISIANA RICELANDS[1,2]

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Farmland in the southcentral and southwestern portions of Louisiana is composed of a multicropped, multiland usage agroecosystem that includes rice, soybean, fallow rice fields used as pastures, permanent pastures, riceland irrigation canals and, within the last 20 years, commercial crawfish ponds. Ricelands in general were documented in the early 1940s as a primary larval habitat for several species of mosquitoes, notably *Anopheles* and *Psorophora* (Carpenter 1941, Horsfall 1942). In recent years rice fields and pastures within this agroecosystem have been assessed quantitatively regarding mosquito egg and larval production (Meek and Olson 1976, Chambers et al. 1979, Andis and Meek 1984, Williams et al. 1984). Other aquatic habitats remaining in the riceland area that are potential sites for mosquito larval development include irrigation canals and commercial crawfish ponds. Currently there are no published data on mosquito productivity for either habitat. Since 1980, however, two separate studies have been conducted in Louisiana to assess the impact of irrigation canals and crawfish ponds on total mosquito population.

Irrigation Canal Study. This two-year project was located in Vermilion Parish, Louisiana, using two separate canals approximately 8 km apart. Aquatic sampling of the first canal system was conducted from February through November, 1980. The second canal was sampled from April through July, 1981, when the adjoining rice field was harvested and both the field and the canal were drained. Only a portion of each canal system was chosen for the study. The sampling area in the first year canal was 0.6 km long with a mean canal width of 2.3 m. This area was located along the upper tributary of the canal system and adjacent to a productive rice field. The sampling area in the second year canal was 0.3 km long with a mean canal width of 5.6 m and was also situated adjacent to a productive rice field. Each sampling area was divided into 5 equal sections and each section was sampled weekly. Two aquatic samples were taken randomly from each section, one near the canal bank and one in the center of the canal.

In 1980, a 106 cm long polyvinyl chloride irrigation pipe (700 cm^2 opening) was used to sample the canal. During 1981, a 106 cm long Plexiglas box with a 1,000 cm^2 opening was used as the sampling device. This design was modified from the one used by Farlow et al. (1978). Each sampler was fitted with 2 metal handles on the upper outside surface at one end (top) and had beveled edges at the other end (bottom) to permit a firm penetration of the canal substrate and inhibit water intrusion while the aquatic sample was being collected. Sampling involved the removal of all free water and a portion of the bottom substrate within the sampler. This was accomplished by using a manually operated, portable bilge pump fitted with a 100-mesh nylon organdy bag attached to the outlet end of the bilge hose. About 2–3 cm of bottom sediment was removed and placed into the nylon bag using a 450-ml plastic cup attached to a 1 m wooden dowel. The bag containing the sample was rinsed in the surrounding water to remove excess soil and other filterable debris. The sample was removed from the bag and placed into a 0.95-liter glass container filled with ca. 470 ml of 95% ethyl alcohol, and the container was sealed prior to being transported to the laboratory for additional processing

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(Andis et al. 1983). In the laboratory each sample was subjected to a salt flotation process (Horsfall 1946), and all fish and macroinvertebrates were removed for identification and counting.

Water depths in the irrigation canals varied according to the size of the canal embankment and the volume of water the farmer preferred to maintain in his canal system at any given time. However, average water depths over all sampling dates and all sampling sites along the canals were 15.8 cm (4.1–61.4 cm) for the first year study and 27.0 cm (0.0–77.0 cm) for the second year study.

The collection of 208,747 aquatic organisms from 409 samples over the 2-year study included 5 phyla, 11 classes, 22 orders, 57 families and 72 genera. Ostracoda, Cladocera and copepods composed about 80% of the total collected organisms. In the Class Insecta, more specimens of Chironomidae (7.9%) were collected than any other insect family. Corixidae composed 3.6% of the organisms followed by Ephemeroptera (1.7%) and Ceratopogonidae (1.4%). The remaining insect representatives accounted for <1% of the collected organisms.

Results indicated that the irrigation canals were not important larval habitats for riceland mosquitoes, although adjoining rice fields which were irrigated by the same canal had mosquito larval populations that were particularly abundant following the rice harvest with >10 larvae/sample of *Psorophora columbiae* (Dyar and Knab) (Andis et al. 1983). Only 139 larval mosquitoes (0.07%) were collected from the canals during the 2-year study. *Psorophora columbiae* accounted for the majority with 122 specimens. All were collected during the first year of the study with 112 *Ps. columbiae* larvae found on one sampling date in the shallow end (<5 cm) of the partially drained canal. Other immature mosquito species collected in the canals included *Anopheles quadrimaculatus* Say, *Culex salinarius* Coquillett and *Uranotaenia sapphirina* (Osten Sacken).

Commercial Crawfish Ponds. In February 1985, four commercial crawfish ponds and 4 commercial rice fields in Vermilion Parish, Louisiana, were selected as research sites for this study. Sampling strata were established along 3 parallel transects within each crawfish pond and rice field according to a sampling methodology designed by Andis et al. (1983). Sampling with the polyvinyl chloride pipe, previously described, began on March 15 on a semi-weekly basis. Crawfish ponds were sampled until they were drained by June 15, and rice fields were not sampled until flooded. This sampling period included the overlapping seasons for late crawfish production and early populations of riceland mosquitoes. The semi-weekly sampling of crawfish ponds resumed in October 1985 with the initiation of a new crawfish season but was terminated again at the end of October when populations of riceland mosquito adults fell below levels detectable using miniature light traps baited with dry ice. On any given sampling date, a maximum of 9 samples were taken per field (i.e., 72 samples). However, there were sampling dates in which less than the maximum number of samples were collected due to the drain/flood status of the rice fields and crawfish ponds (Huner and Barr 1984).

Aquatic macroinvertebrates collected in rice fields and crawfish ponds represented 2 classes of arthropods: Insecta and Crustacea. Population densities of the insects collected in these fields were similar to those found in canals, with Chironomidae and Corixidae present in more than 75% of the samples. Crustaceans, such as copepods, crawfish and the oppossum shrimp *Taphromysis louisanne* Banner, were commonly collected.

No mosquito larvae were found in the 486 samples taken from crawfish ponds during the March–June or the October sampling periods. Only 3 of 216 samples collected from rice fields in the March–June sampling period contained mosquito larvae. One sample had 9 *Ps. columbiae* larvae at 7 days post-flood during early-season rice and 2 samples had 2 and 3 larvae of *An. crucians* Weidemann. Low numbers of mosquito larvae in early season rice fields are not unusual (Chambers et al. 1979, Andis et al. 1983). Mosquito larvae tend to reach their greatest abundance in late season rice and following the rice harvest in June and July (Meek and Olson 1976). By this time, however, crawfish ponds have been out of production and drained for 1–2 months.

These data indicate that crawfish ponds do not provide suitable habitats for mosquito larvae in the riceland agroecosystem of southern Louisiana. This may be due, in part, to an insufficient seasonal overlap between crawfish production and abundant mosquito adults. In addition, water temperatures (16°C) in early spring could inhibit mosquito egg hatch even though eggs may be present along the contour levees and edges of the crawfish ponds and rice fields.

Aquatic predators also inhibit the increase in mosquito larval populations. Twenty-four species of insects and fish, documented in the literature as predators of mosquito larvae, were collected from crawfish ponds and irrigation canals. The lack of vegetation in these ponds exposed larval mosquitoes to predation.

In summary, the low numbers and sporadic occurrence of mosquito larvae in riceland irrigation canals and the undetectable levels of mosquito larvae in commercial crawfish ponds indicate that these habitats need not be considered in a comprehensive management program for riceland mosquitoes in southern Louisiana.

Due to the limited space, checklists of macroinvertebrates and fish collected in the irrigation canals and crawfish ponds have been purposely omitted. Individuals wishing to receive gratis copies of the checklists may contact the authors.

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