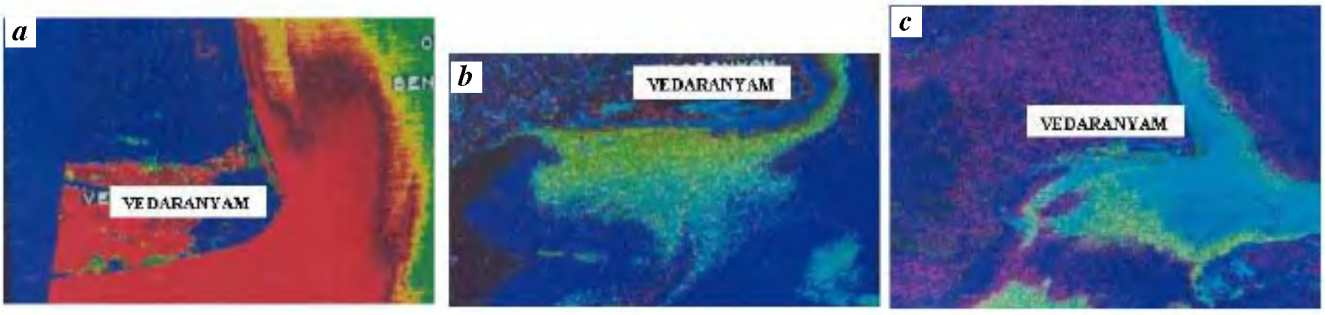

Figure 2. Sediment distribution (*a*) at the onset of southwest monsoon; (*b*) at the end of southwest monsoon; (*c*) during northeast monsoon.

Table 1. Data products used

Date of acquisition	Sensor	Bands	Season
13–06–1988	TM	3	Onset of southwest monsoon
28–09–1983	MSS	FCC 4, 2, 3	End of southwest monsoon
23–11–1989	MSS	FCC 4, 2, 3	During northeast monsoon

With the onset of southwest monsoon, sediments were disturbed considerably (Figure 2 *a*). Tidal flats at Vedaranyam acting as a source for sediment is clearly identified from the image. Daniel[5] observed that the sediments are discharged from tidal flats due to soil erosion. The retreat of seawater eroding the banks of tidal flats contains high amount of sediments in suspension. This appears bright red in colour around the mouth of tidal flats. As the sediments move towards the north due to the longshore currents, their concentration is reduced which is indicated by yellow colour in Figure 2 *a*. At the end of the southwest monsoon, initial disturbances are very much reduced. Sediments moving towards the north are obstructed by the projection at Vedaranyam (Figure 2 *b*). Therefore, it takes a turn near that tip and then follows the coastal configuration.

In contrast, during the northeast monsoon season, sediments transported from north are unable to take a bend around the Vedaranyam tip and hence dissipate a greater part of it (Figure 2 *c*). A portion of the sediment is moving towards the east and the rest of it moves downsouth of Vedaranyam along with the longshore currents.

From the conventional data seasonal sediment distribution patterns in near-shore/offshore are almost impossible to obtain. Satellites are the only source of providing such information. The present study proves that the satellites play a significant role in monitoring the sediment dynamics.

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Laboratory colonization of *Anopheles sundaicus*

Anopheles sundaicus Rodenwaldt, belonging to subgenus *cellia*, is an important vector of malaria over the range of its distribution. The distribution ranges from the Indian subcontinent through Southeast Asia including Myanmar, Thailand, Malaysia, Singapore, Indonesia and China[1]. In India it was an important vector of malaria in coastal areas of Andhra Pradesh, Orissa, Tamil Nadu, West Bengal and the Andaman and Nicobar islands[2–4]. However, during the DDT spraying era under the National Malaria Eradication Programme, this species disappeared from the eastern coast of India and is now limited to the coastal areas of Andaman and Nicobar Islands. In Andaman and Nicobar group of islands, this species presently plays a major role in malaria transmission[5].

A wide variation in the breeding habitats, resting and feeding behaviour of *An. sundaicus* has been reported in areas of its distribution and because of these differences this species was suspected to be a cluster of closely related species. Cytotaxonomic studies carried out on *An. sundaicus* populations from Thailand and Indonesia established this species as a complex of three isomorphic species (species A, B and C) identifiable on the basis of cytological and enzymatic variations[6,7]. More recently, studies on *An.*

sundaicus population from Andaman and Car Nicobar island revealed existence of a new cytogenetic variant, cytotype D^8.

Since this important malaria vector could not be colonized earlier, our knowledge on its biology and physiology was rudimentary. Considering the importance of *An. sundaicus* as an efficient malaria vector, colonization has been attempted at our laboratory and here we report on the establishment of a cyclic colony of *An. sundaicus*.

For establishing a laboratory colony of *An. sundaicus*, nearly 500 wild caught gravid females were collected from Kimious and Malacca villages separately, representing both fresh and brackish water areas of Car Nicobar island. Car Nicobar is a small island of 127 km^2 among Nicobar group of islands and located between 6°10′N longitude and 22°94′E latitude in the Bay of Bengal, where relative humidity (RH) ranges from 70 to 90% and temperature 23–33°C throughout the year.

After morphological identification of adult *An. sundaicus*, females were held in a 30 cm × 30 cm × 30 cm cloth cage and kept in the insectary maintained at 28 ± 2°C and 75 ± 5% RH. Adults were offered fresh water-soaked raisins and 5% glucose soaked in cotton pads daily as a source of energy. Eggs were collected from mosquitoes in an ovitrap by placing a circular plastic bowl (5 cm height, 12 cm diameter) containing dechlorinated water and lined with filter paper. Eggs were held in plastic bowls for 48 h for hatching. After 24 h following hatching, newly hatched larvae were transferred to an enamel culture tray (30 cm × 25 cm × 5 cm) for rearing.

The larvae were fed on a mixture of dog biscuits and yeast tablets at a ratio of 3 : 1 (2–5 mg per rearing tray). Every alternate day the water from the culture tray was changed carefully until pupation. The pupae were separated from the larvae daily and placed in plastic bowls half filled with water. All pupae were sexed and recorded. These plastic bowls with pupae were placed in an adult-holding cage each day for emergence. Adults, after emergence were offered 5% glucose soaked in cotton pads and freshwater-soaked raisins daily. On day 5 after adult emergence, the females were offered pigeon as a source of blood meal and on day 4 after blood meal, an ovitrap was placed in the adult-holding cage for the collection of eggs.

The major obstacle encountered in the colonization process was the failure of the species to mate in the insectary as evidenced by the presence of high percentage of unembryonated eggs (> 90%) in F_1 generation and presence of uninseminated dead females from the adult cage evidenced by the examination of spermatheca. This observation prompted us to fix an automatic dawn and dusk machine with fixed photoperiod of 14 h light and 10 h dark. Presence of artificial dawn and dusk machine with a specific photoperiod in the insectary enhanced the percentage of mating gradually.

In first few generations, i.e. F_2–F_7, insemination rate in the colony held under artificial dawn and dusk machine with fixed photoperiod varied from 17 to 45% whereas in the control cage, insemination rate varied from 5 to 15%. It may be mentioned that in six months time the insemination rate progressively increased up to 80% in the established cyclic colony. The control cage was discontinued after five generations because of the production of a large number of unembryonated eggs due to poor mating.

Initially we were maintaining two separate colonies representing both freshwater and brackish water breeding populations. Once it was established cytologically that both these populations are identical, i.e. cytotype D^8, population of both these areas were pooled together and maintained as a single cyclic colony. In this process we have now successfully established a cyclic colony of *An. sundaicus* in the laboratory. Although in the first few generations adult mosquito colony was maintained on pigeon blood, it was subsequently replaced by rabbit as source of blood meal.

Once the cyclic colony was established, a few important aspects of biology of this species were also studied. The average number of eggs laid by a female was 74.5, hatchability was 77.8%, and the average duration of immature stages was 10 days. The mortality at each instar varied between 15 and 25%. However, the highest mortality was recorded in the first instar stage. The average male and female ratio in pupal stage estimated was 0.84 : 1.

As this vector species is readily reared in the laboratory and feeds well on small animals like mice, pigeon and rabbit even through para film membrane (artificial feeding) and lives relatively for longer period, it can be used as a laboratory vector model for carrying out various host–parasite interaction studies.

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