# PUDUCHERRY ENVIS HUB

*(Environmental Information System)*

Host Centre : Puducherry Pollution Control Committee
Supported by Ministry of Environment, Forest & Climate Change
Government of India, New Delhi

## Perspective of Fiddler Crabs in Puducherry Mangrove Ecosystem

Status of Environment & Related Issues in Puducherry

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# Introduction

Fiddler crabs are intertidal animals that live in mangrove forests, tidal creeks, sandbars, mudflats or occasionally, stone or boulder beaches. They can occur in huge numbers, with thousands of individuals living in small, adjacent territories. Males and females live intermixed and each individual has its own burrow and a small area of surface sediment around it. The burrow is extremely important. It is a refuge during high tide and during low tide, it is a source of water for keeping the gills wet, it is an escape from predators, it is the site of mating and incubation. The space around the burrow is used for feeding and courting. (Crane, 1975; Montague, 1980; Koch et al. 2005)

Fiddler crabs (Brachyura, Ocypodidae, formerly known as genus Uca, now represented in several genera (Shih et al. 2016), There are 106 described species (102 living, 4 extinct), encompassing eleven genera and two subfamilies within Ocypodidae (Gelasiminae and Ocypodinae) (Rosenberg, 2001; Shih et al. 2016). The group is distributed worldwide (Crane, 1975; Rosenberg, 2001) and is subdivided in two major clades, Atlantic-East Pacific (AEP) and Indo-West Pacific (IWP), estimated to have undergone differentiation around 17 million years ago (Sturmbauer et al. 1996; Shih et al. 2016).

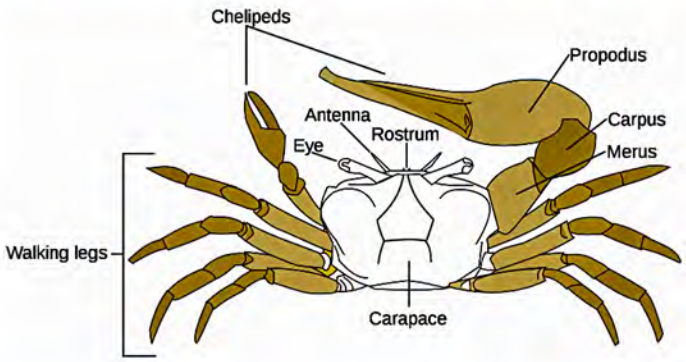
Fiddler crabs are named for the distinctive waving movements made by the males with their enlarged claw during courtship. The motion resembles a musician playing a fiddle or violin. Each species has a distinct waving motion.

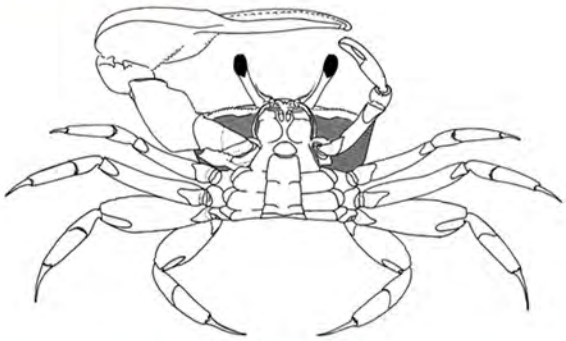
## Classification

| | | |
|---|---|---|
| *Kingdom* | : | *Animalia* |
| *Phylum* | : | *Arthropoda* |
| *Class* | : | *Crustacea* |
| *Sub-class* | : | *Malocostraca* |
| *Order* | : | *Decapoda* |
| *Infraorder* | : | *Brachyura* |
| *Superfamily* | : | *Ocypodoidea* |
| *Family* | : | *Ocypodidae* |
| *Genera* | : | *Afruca, Austruca, Cranuca, Gelasimus, Leptuca, Minuca, Paraleptuca, Petruca, Tubuca, Uca, Xeruca.* |

**Ring-legged Fiddler Crab, *Austruca annulipes***
**Left Side: Male; Right Side: Female**

# General Morphological Characteristics



1. Multicellular, complex cells with structures enclosed in membranes.
2. Exoskeleton (external skeleton), segmented body & jointed appendages.
3. Branched and segmented appendages.
4. 20 body segments (rarely 21), divided into a head, thorax and abdomen.
5. "Ten footed", five pairs of appendages attached to the thorax.
6. Abdomen is small and entirely hidden under the thorax.
7. One enlarged claw in males.
8. Square body.

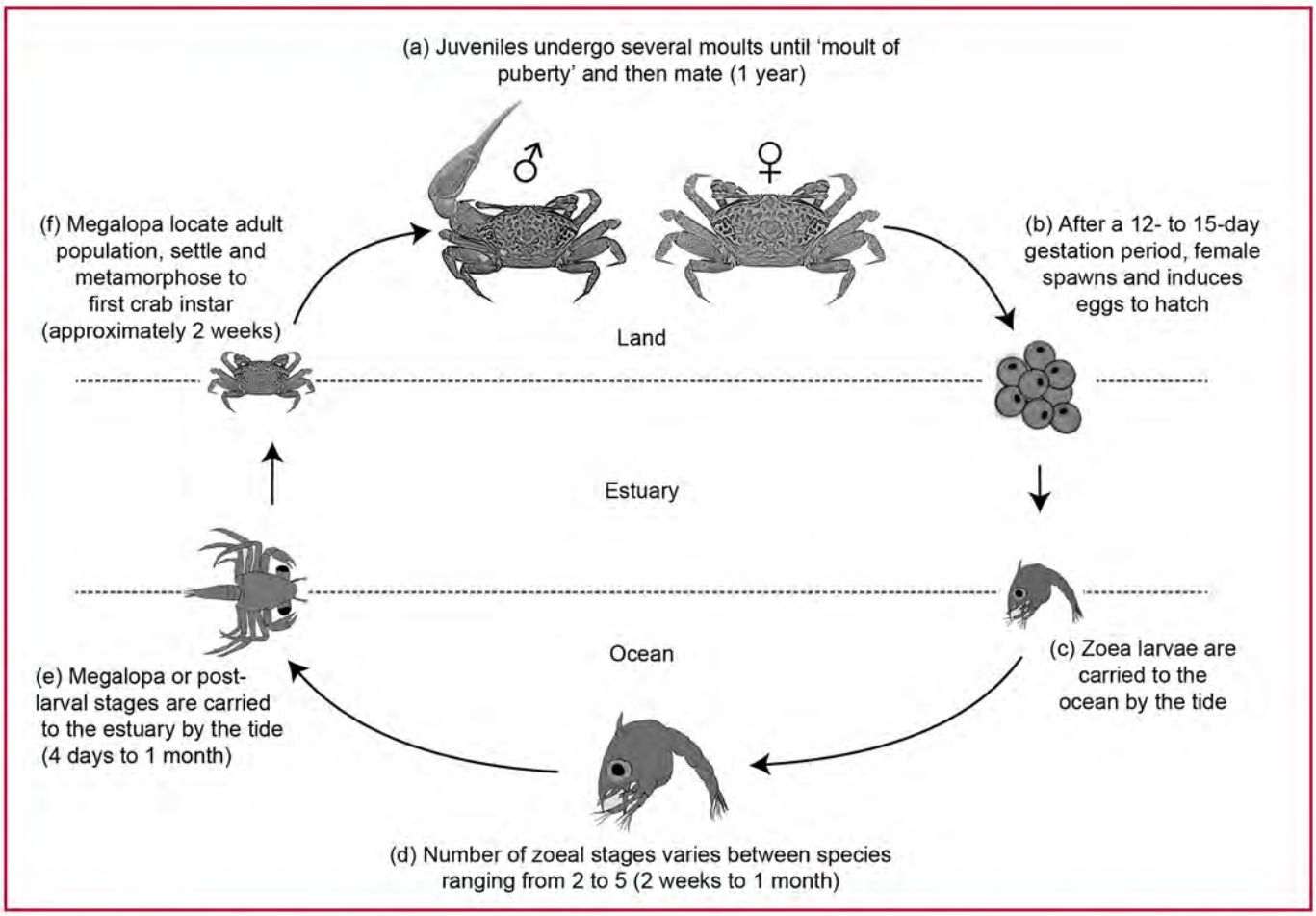
# Sexual Dimorphism

**Motley Fiddler Crab (*Austruca variegata*) Left Side: Male, Right Side: Female**

Males have highly asymmetrical claws (chelipeds), with the major claw greatly enlarged (up to five times in length) relative to both the male's own minor claw and the female's two symmetrical minor claws. The major cheliped may constitute up to 48% of an adult male's body mass and is considered a classic example of sexual selection (Yamaguchi, 2001; Rosenberg, 2001, 2002).

# *Life Cycle and Reproductive Behavior of Fiddler Crabs*

Fiddler crabs live rather brief lives of no more than two years (up to three years in captivity). Males wave their enlarged claw to attract females for mating. When a female is ready to mate (i.e. she has ripe ovaries), she will leave her own burrow and wanders through the population of waving males. She visits several males before selecting a mate (up to 24). A visit consists of a direct approach to the male, he then darts into his burrow, the female follows him in, spends a few seconds underground and then reappears to continue wandering. When the female accepts the male as a mate, she does not reappear, but rather the male emerges about 5 minutes later and gathers up sand to plug the burrow entrance. He plugs it from the inside, sealing him and the female underground. Mating occurs in the terminal chamber of the burrow and the following day, the male emerges. He reseals the burrow entrance with the female underground. The male then leaves the area and wanders around to find an empty burrow or to fight another male for its burrow. The female remains underground for the following two weeks while she incubates her eggs. She does not emerge to feed during this time.




**Representation of the life cycle of Fiddler Crabs depicting the location of individuals at each stage of development. The time in parentheses indicates the approximate duration for a particular life stage (adapted from Hyman 1920 and Herrnkind 1968)**

Females time mating so that egg release coincides with a Spring tide. The eggs are released during a nocturnal high spring tide so that the tiny, swimming larvae are washed far out to sea. They develop out there for several weeks and then wash into shore. They settle out of the water column when they detect the odour of adult crabs of their own species. They undergo a final moult to become minute little crabs, and then start their lives on the mudflats.

**Eggs:** Fertilized female fiddler crabs carry hundreds to thousands of eggs under their abdomen. These are sometimes known as "sponge" crabs.

**Zoea:** When the eggs are ready, the mother goes into the water and allows the eggs to hatch into microscopic free-swimming larvae. The early stage larvae are known as zoea.

**Megalopa:** The larvae live in the open water as part of the plankton. As they grow and go through a number of molt stages. Older larvae are known as megalopa.

**Crab:** At the end of the final larval stage, the larvae molt into immature crabs. The amount of time spent as a swimming larvae (hatching to true crab stage) varies among species, but ranges from a few weeks to a few months. The crabs return to land and begin to grow; juvenile male and female crabs look alike. As they grown larger and turn into adults, the secondary-sexual characteristics (e.g., the asymmetric claws) begin to develop. Adult crabs mate and the cycle starts over (Hyman, 1920 and Herrnkind, 1968).

## *Ecological Function of Fiddler Crabs*

The fiddler crabs, being a dominant intertidal macro benthic fauna components' contribute significantly to ecosystem functioning by their repeated burrowing and re-burrowing activities which enhance the aeration of soil, reshuffle textural components of different layers of sediments and promote nutrient recycling. These biogenic processes collectively termed as 'bioturbation', is the

disturbance of sediment layers, act as major modulators of microbial activities and accelerate biogeochemical processes in the land-water interface.

The dense burrows can also improve aeration and aid in the local transport of nutrients within coastal tidal flats. Therefore, these fiddler crabs have been deemed "ecological engineers" or "bioturbators" and as well as unreplaceable roles in the aeration, nutrient cycling and energy flow in tidal-flat ecosystems (Citadin et al. 2016; Gittman & Keller, 2013; Jones et al. 1994; Katz, 1980; Thomas & Blum, 2010; Wang et al. 2010).

## *Feeding Habits*

Fiddlers are deposit feeders and scavengers, ingesting a variety of food, including detritus (decayed organic matter), nematodes (small worms with unsegmented cylindrical bodies), bacteria, fungi, algae, and decaying animal matter.

The females have both their small claws adapted for feeding. The male cannot use his large claw for feeding; therefore, he must use the small claw much more rapidly in order to eat the same amount as a female during the same period of time. Despite this feeding disadvantage, male fiddlers are usually larger than females.

Fiddler crabs feed during the falling tide and are most active at low tide when the greatest area of exposed mud flats exists. As the tide rises, the fiddlers retreat to their burrows and seal the entrance with a mud ball plug. Fiddlers may range as far as 50 yards from their burrows while feeding.

When feeding, the fiddler crabs takes sandy material into its mouth (buccal cavity) and uses specialized spoon-shaped setae on its maxillipeds to scour the algae and other organic matter off the sand grains. As the sand grains are cleaned, the crab forms the grains into "feeding balls" or "pseudo-feces" which are discarded. Often large concentrations of pseudo-feces occur around the openings of the burrows of sand fiddlers. Similar balls, usually larger, are formed with material that the crab brings to the surface when excavating a burrow.

# Conclusion

Fiddler crabs are a charismatic group of globally distributed brachyuran crabs, popular with both scientists and amateur naturalists due to their colorful markings. Fiddler crabs play a vital role in the ecology of mangroves forest. They decompose the leaf litter and increase the availability of nutrient for other fauna and flora. Crabs act as a bioturburater which involves the nutrient cycle from mudflats and mangroves. As a result, fiddler crabs provide a variety of benefits to both the environment and humans. Also it aids in the attraction of tourists and the growth of Puducherry tourism. So, we must protect these valuable fiddler crabs.

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# *Puducherry ENVIS Hub Environment Events*

## Azadi Ka Amrit Mahotsav Celebration

As a part of the "Azadi Ka Amrit Mahotsav" celebration, Puducherry ENVIS Hub of Puducherry Pollution Control Committee (PPCC) organized the following activities during the Iconic Week of 4th October to 10th October, 2021.

### The following activities were undertaken:

1. Green Pledge to avoid the use of single use plastic (SUP) at Indira Gandhi College of Arts and Science, Puducherry.
2. Infographics release.
3. Awareness drone video on SUP at Government Institution.
4. Green Pledge circulated to the Government Departments and Government Institutions in the U.T. of Puducherry.
5. Theme based Painting Competition–cum–Art Exhibition among college students.
6. Fish Sculpture from Plastic Waste.
7. Planting of Tree Sapling.
8. Awareness cum infotainment event (Puppet show) on 'Eliminating the use of Plastics to avoid marine Pollution'.
9. Beach Yoga at Eden Beach, Chinnaveerampattinam, Puducherry.
10. Beach Safety Drive Workshop.
11. Quiz Competition at Indira Gandhi College of Arts and Science, Puducherry.
12. Plastics Free Campaign at Indira Gandhi College of Arts and Science, Puducherry.
13. Plastics Free campus Board inauguration.
14. Pledge taken by the Officials and Staff of the DST&E and Autonomous Bodies.
15. Media Coverage.

**Green Pledge on avoid the use of Single Use Plastic (SUP)** was taken by the Official & Staff of Puducherry Envis Hub and Faculties & Students of Indira Gandhi College of Arts and Science, Kathirkamam, Puducherry on 08.10.2021.

**Awareness poster and booklet** were released on 08.10.2021 at Indira Gandhi College of Arts and Science, Kathirkamam, Puducherry, in order to raise awareness to avoid the use of single use plastic materials.

**Video shot** from a bird's view on single use plastics were taken at Indira Gandhi College of Arts and Science (IGCAS), Kathirkamam, Puducherry on 08.10.2021. Official & Staff from Puducherry ENVIS Hub and Faculties & students from IGCAS actively participated in the event.

**Public Awareness Meeting:** A public awareness meeting was convened at the Eden Beach,Chinna Veerampattinam (Blue Flag Certified Beach) with the Chief Guest, The Chief Secretary to Government of Puducherry presided over the function in the presence of the Secretary (Science, Technology and Environment), the Director (Tourism) and the Procurement Consultant, SICOM, New Delhi.

**Painting competition** on the theme 'I am saving my beach,' was held on 08.10.2021. 23 Students from Bharathiar Palkalaikoodam (a multi-art institution), Puducherry participated in the competition. Cash prize and certificates were awarded to the first three winners and two consolation prizes were also given. All the participants were given a certificate of participation.

**Art Exhibition:** The paintings done by the art students from Bharathiar Palkalaikoodam, Puducherry on the theme 'I am saving my beach,' were exhibited in a multipurpose room at the Eden beach. The exhibition was inaugurated by the Chief Secretary on 08.10.2021 and was open for all beach visitors and tourists for three days.

**Fish sculpture to create awareness on avoiding beach littering:** A large size fish sculpture was raised at the Eden Blue Flag Beach. The structure was made with materials include plastic bottles collected from the beach. The sculpture was placed to create awareness among the beach visitors and the tourists about the ill effects of improper plastic littering at the beach.

**Tree sapling Planting:** Around 10 Sea-grape (***Coccoloba uvifera***) saplings were planted at the beach by the Chief Guest and other dignitaries to increase the green cover at the beach.

**Puppet Show:** In continuation of the public awareness meeting presided by the Chief Secretray, Kalai Sangamam Fine Arts, a performing arts group from Puducherry made a puppet show on the theme "Protecting Marine Environment by Eliminating Single Use Plastic Littering".

**Beach Safety Drive:** The Beach Safety Drive was conducted by a team of Beach Youth Guard. The participants were instructed on various beach safety measures, the safety protocols to be followed at the beach and while getting into / surfing at the sea. The participants were also presented with the safety nomenclatures, the significance of various flags hoisted at the beach etc.

**Beach Yoga:** 75 participants participated in the Beach Yoga event. Three yoga trainers instructed the participants on the Yoga practice. The event created awareness on practicing Yoga in daily life and brought awareness among the public on how a clean beach with a serene environment can be effectively made use in practicing Yoga.

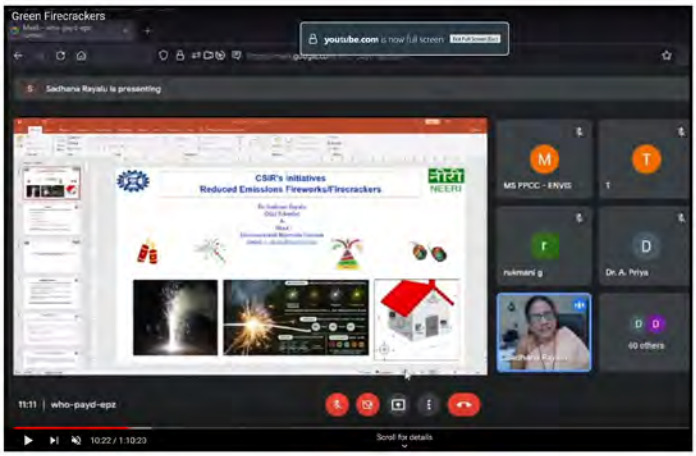
**Quiz Competition:** Conducted Quiz Competition on the theme 'Avoid the use of Single Use Plastic' on 09.10.2021 at Indira Gandhi College of Arts and Science, Kathirkamam, Puducherry.

**Plastic Free Campus declaration at Indira Gandhi College of Arts and Science, Puducherry** Puducherry ENVIS Hub & PPCC made a big initiative on Plastic Free Campaign at Indira Gandhi College of Arts and Science, Puducherry on 09.10.2021. The Lecturers and Students actively participated in the cleaning campaign on the campus. It created awareness among the students about Solid Waste Management and reduced the plastic use. An average of 25kg plastic material were collected inside the campus.

**Plastics Free campus inauguration at Indira Gandhi College of Arts and Science, Puducherry.** Dr. V. Arjunan, Principal, IGCAS, Puducherry inaugurated plastic free campus board at Indira Gandhi College of Arts and Science, Puducherry on 09.10.2021.

**Green Pledge on SUP taken by the Officials and staff of DSTE and Autonomous Bodies.** Green Pledge against single use plastics was taken by the officials and staff of DST&E and its autonomous bodies.

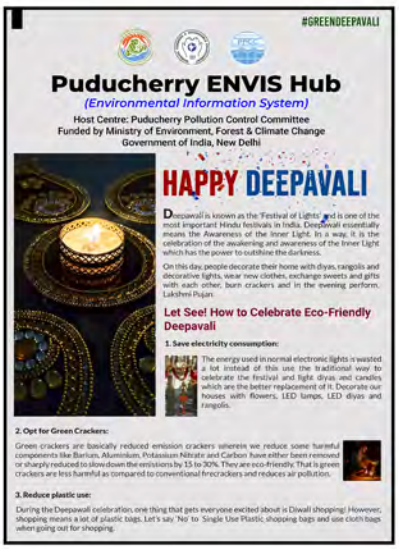
# CELEBRATION OF GREEN DIWALI ON 03.11.2021




## Webinar:

Dr. Sadhana Rayalu, Chief Scientist, Environmental Material Division, CSIR – National Environmental 00Engineering Research Institute (NEERI), Nagpur delivered expert talk on the topic 'Green Fire Crackers' on the eve of Green Diwali held on 03.11.2021. She highlighted the new initiatives of reduced emissions fireworks/firecrackers.

## Awareness Posters & Booklets



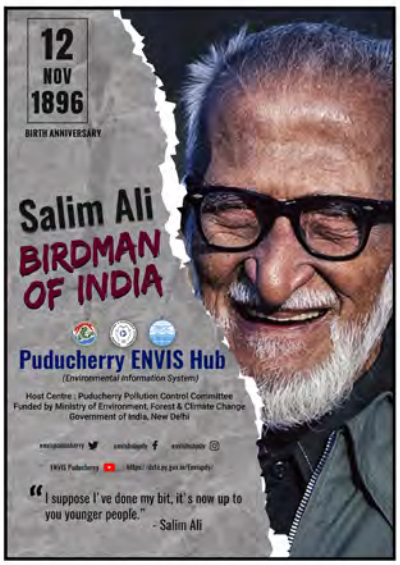

## Released Infographics on Green Diwali

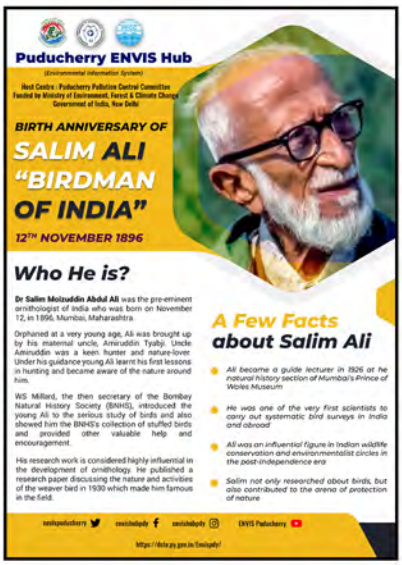
# CELEBRATION OF DR. SALIM ALI'S BIRTH ANNIVERSARY 2021

**Webinar:**

**Dr. Mahendiran, Senior Scientist, Division of Wetland Ecology, Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, Tamil Nadu, India** delivered expert talk on the topic 'Biography of Birdman and conservation of Wetland birds in India' on the eve of Dr. Salim Ali's Birth Anniversary held on 12.11.2021. He highlighted the importance of conservation of birds.

## Awareness Posters & Booklets




## Released Infographics on Dr. Salim Ali's Birth Anniversary 2021

# CELEBRATION OF NATIONAL POLLUTION CONTROL DAY ON 23.12.2021

Puducherry ENVIS Hub conducted Guest Lecture & Quiz Competition for the PG Students and Ph.D Scholars of ICMR – Vector Control Research Centre on National Pollution Control Day on 23.12.2021. Thiru. P. Vipin Babu, Scientist-cum-ENVIS Coordinator, PPCC delivered expert lecture on 'Environmental Pollution'.

**Guest Lecture by Thiru. P. Vipin Babu, Scientist-cum-ENVIS Coordinator, PPCC**

**Puducherry ENVIS Hub conducted Quiz Competition for the PG Students and Ph.D Scholars of ICMR – Vector Control Research Centre**

**“ We must protect wildlife and our planet. Because we are all part of the natural environment. Without wildlife, there would be no life.”**

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