Digitization of the Data on Indian Freshwater Crabs: 1 Travancoriana Schirnerae Bott, 1969 (Decapoda: Gecarcinucidae)

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Abstract
This resent research article is on the digitized form of valuable data on freshwater crab, Travancoriana schirnerae Bott, 1969. The data acquired from various sources, such as, internet articles, published research articles and databases about the species has been organized in the form of a web portal open for access for a wider audience. The data collected are categorized into 15 user friendly heads such as, Species name, Anatomy, Life Cycle, Moulting, Spawning, Diseases, Fossils, Fisheries and Industries, Nutritive value, Internet links, Books and resources, Barcoding, General Biology, References of resources and General Aspects, under the title named resources. Digitization will ensure to provide background information to all those are interested to continue further in research in this area and this forms the major objective of the paper.

Key-words: Travancoriana Schirnerae, Gecarcinucidae, Data Digitization, Storage and Retrieval, Freshwater Crab.

1. Introduction

Crabs belong to the order Decapoda. The body is divided into cephalothorax and abdomen. The cephalothorax is broad and covered by chitinous exoskeleton – the carapace. The abdomen is highly reduced and flexed and kept under the sternum. The cephalo-thoracic regions bear 13 paired appendages, namely, antennules, antennae, mandibles, maxillulae, maxillae, first maxillipeds, second maxillipeds, third maxillipeds, 1 st to 5 th pereiopods and abdominal appendages. Carapace is highly
expanded. It is one of the important taxonomic characters. Its structure is peculiar for a particular taxon. The abdomen is generally sexually dimorphic: narrow in males and broader in females.

Several regions on the surface of carapace can be identified. They are frontal (fr), orbital (orb), protogastric (pg), hepatic (Hep), mesogastric (mg), metagastric (mtg), urogastric (ug), cardiac (crd), intestinal (int), epibranchial region (Eb), mesobranchial (mb) and metabranchial (mtb). The shape of carapace varies with taxa: transversely ovate; transversely hexagonal; hexagonal; pentagonal; pyriform; circular; sub-circular; transversely subovate; triangular; longitudinally ovate; squarish; longitudinally rectangular; trapezoidal; transversely rectangular.

The number of extant species of fresh water crabs in the world are around 1400 (World Register of Marine Species: http://www.marinespecies.org/aphia.php?p=taxdetails&id=106673). They inhabit different ecological niches including trees. Serious studies on taxonomy, eco-biology of different species are available and considering the vast assemblage of data and varied habitat preferences, consolidation of biological data on different species has become highly complicated. For easy storage and retrieval of data digitized methods are highly recommended and an initiation of digitization of data on crabs has been done here. The present paper deals with the digitization of one species of freshwater crab, namely, *Travancoriana schirnerae* Bott, 1969 from India. The authors presume that digitization will be easy and user friendly, if appropriate data storage and retrieval system is developed that will enable the biologists and others who are interested to utilize for further research and management of the resources. Such interdisciplinary research work is the need of the hour.

2. Experimental

Data was collected from various sources such as from web portals, Internet articles, published research articles and reports, available databases (doi.org, marinespecies.org, crabdatabase.info, indiabiodiversity.org, wikipedia.org, ncbi.nlm.nih.gov, archive.org, etc.,) and the same has been made use of in the present publication. As an user friendly approach the data collected based on the references (Pati and Thackeray, 2018; Bott, 1969; Bahr and Yeo, 2007; Rajesh et al., 2017; Raghavan and Moorkoth, 2014a; Gopal and Raghavan, 2019; Raghavan and Moorkoth, 2013b; Raghavan et al., 2015; Raghavan and Moorkoth, 2015a; Raghavan and Moorkoth, 2015b; Raghavan and Moorkoth, 2013a; Pati and Thackeray 2018; doi.org, marinespecies.org, crabdatabase.info, indiabiodiversity.org, wikipedia.org, ncbi.nlm.nih.gov, archive.org) on the species has been categorized under 15 heads, namely, Species name, Anatomy, Life Cycle, Moulting, Spawning,
Diseases, Fossils, Fisheries and Industries, Nutritive value, Internet links, Books and resources, Barcoding, General Biology, References of resources and General Aspect. The programme of digitization and presentation of digitized data are depicted below.

3. Results and Discussion

Classification for the species is: Infraorder- Brachyura Latreille, 1802; Section- Eubrachyura Saint Laurent, 1980; Subsection- Heterotremata Guinot, 1977; Superfamily- Gecarcinucoidea Rathbun, 1904; Family- Gecarcinucidae Rathbun, 1904 (Latreille, 1802; Saint Laurent, 1980; Guinot, 1977; Rathbun, 1904).

We do have significant web portals such as doi.org which furnishes Digital Object Identifier (DOI) services along with registration (doi.org). Marinespecies.org website supplies an authoritative and comprehensive list of names of the marine organisms. This marinespecies.org website provides the valid names of the species along with the other names that are in use, hence making this website a register which could serve as guide to interpret the taxonomic literature (marinespecies.org). Crabdatabase.info website serves as the database where we can find the crab species along with beautiful pictures of the species as proofs; it also provides taxonomic position of the species along with the Synonym (crabdatabase.info). In the indiabiodiversity.org website we can find the species with accepted name, along with the classifications. We can also get the occurrence record of the species (indiabiodiversity.org). The ncbi.nlm.nih.gov, the national center for biotechnology information advances science and health website provides access to biomedical and genomic information (ncbi.nlm.nih.gov). Archive.org, the internet archive website is a digital library where we could find the oldest artifacts in digital form (archive.org).

In our work we collected all essential information about the freshwater crab *Travancoriana schirnerae* Bott, 1969 from various available sources and bring them under one database. A digitized form as a web portal for everyone to access.

The data collected are categorized into 15 user friendly topics as resources, namely, Species name, Anatomy, Life Cycle, Moulting, Spawning, Diseases, Fossils, Fisheries and Industries, Nutritive value, Internet links, Books and resources, Barcoding, General Biology, References of resources and General Aspects. Also the web portal will provide the taxonomy, diagnosis and publications of the species.
3.1. Working Principle of Digitization of Data

This section provides the design of web portal to store the information about the Indian Freshwater crab, *Travancoriana schirnerae* Bott, 1969. The data collected under 15 heads mentioned above are shown as screen shots to explain how the digitization progresses. This paper provides the design of the two main web pages of the web portal, namely, “Species Detailed page” and “Resource detailed page”, say, for the species *Travancoriana schirnerae* Bott, 1969. The “Species Detailed page” will provide the image of the species along with Diagnosis. We can also find the Taxonomy of the species, 15 resources list and publications done on the species. Along with a space to leave comment. In “Resource detailed page”, we can find the information provided under each resource respectively.

1. New User Registration Process

New user clicks on the Register link in the login page. Fill all fields with the correct information, namely- Email ID, Password, Confirm Password, Mobile, and Qualification and clicks on the Register button in the New Registration popup. An acknowledgment message is displayed if registration is perfectly done - "Successfully Registered". Provision for change of password is also provided. The user once registered can login to the web portal.

2. Login Process

Login can be done by using the registered Email ID and password.

3. Searching for the Species

Once logged in the user will be directed to the search page. The search page gives a list of species from which desired species, here, "*Travancoriana schirnerae* Bott, 1969" can be searched by entering the search key, here "*Travancoriana schirnerae* Bott, 1969" and click on “Search” icon or choose the search value from the filter and click on “Go” button.
4. Search Result

The Thumbnail of the species will be displayed in the “Result” section. It contains few words about diagnostic characters of the species and can further be navigated in the “Read more” option, where the user can access the full information about the species.

5. Navigation to the Species Detailed Page

Click on the “Read more” button in the thumbnail, will direct to the “Species detailed” page with the following related information. Visit to desired information on the following aspect is choice based and by clicking on each section the following details will be available.

a. Photo gallery
b. Taxonomy
c. Resources
d. Diagnostic Characteristics
e. Publications
   a) Click on the option "Photo Gallery" to view the available images of the species (from various sources with acknowledgement)
   b) "Taxonomy" section provides the descriptive taxonomy of the species for identification purpose.
   c) "Resources" section is vast and is categorized into 15 heads already mentioned, will appear as hyperlinks. Again choice based and navigates to each resource.
   d) "Diagnostic characteristics" section will provide diagnosis of the species.
   e) Publications accommodate publications about the species.

6. Leave a comment

The user can leave his/her comment here for improvement. Also encourage to provide additional information for inclusion in the content about the species.

7. Logout Process

The user exits through "Logout" button.
For making the process more clear, images of the prototypes of the web pages are given below.

Fig. I - Registration Screen

Fig. II - Login Screen
Fig. III - Search Page with Keyword Search Method

Fig. IV - Search Page with Filter Search Method
In “Species Detailed page”, Diagnosis of the species information is recorded in the “Diagnostic Characters” section. The most important diagnostic characters with which the species could be identified are included in this section.

Fig. V - Species Detailed Page with Diagnostic Characteristics

![Image of Travancoriana schirnerae](image)

**Travancoriana schirnerae Bott, 1969**

**Diagnostic Characteristics**

Carapace broader than long, dorsal surface slightly convex in frontal view; flat posteriorly; smooth except postorbital cristae, epigastric cristae and lateral margins; postorbital and epigastric cristae distinct, confluent; external orbital angle broadly triangular, with long outer margin, ca. 4 times length of inner margin; epibranchial tooth small, blunt, cleft clearly visible. Suture between thoracic sternites 2–3 visible as broad groove not reaching lateral margins; suture between sternites 3–4 visible as broad groove and reaching lateral margins. Male abdomen T-shaped in large males; sixth segment distinctly longer than broad. Longer than telson. G1 straight, with long, cone-shaped terminal segment, ca. 0.5–0.4 times length of subterminal segment. G2 with long distal segment, ca. 0.5–0.6 times length of basal segment (Mohamed Bahir and Darraan Yasu, 2007).

**Taxonomy**

**Resources**

**Publications**

**Leave a comment**

Diagnotic Characteristics

“Carapace of *Travancoriana schirnerae* Bott, 1969 is broader than long, dorsal part is little convex at frontal view and is found to be flat posteriorly. It is smooth except the postorbital cristae, the epigastric cristae and at the lateral margins; The postorbital and the epigastric cristae are distinct and confluent; the external orbital angle seems to be broadly triangular, with a long outer margin, ca. 4 times length when compared to the inner margin; the epibranchial tooth is small, blunt and the cleft clearly visible. Suture between thoracic sternites 2–3 visible as broad groove but not reaching the
lateral margins; suture between sternites are 3–4 visible as broad groove and reaching the lateral margins. Abdomen of male species is T-shaped in larger males; sixth segment is distinctly longer than broad, longer than telson. G1 is straight, with a long, cone-shaped terminal segment, ca. 0.3–0.4 times length of subterminal segment. G2 with long distal segment, ca. 0.5–0.6 times length of basal segment (Bahir and Yeo, 2007)

In “Species Detailed page”, Taxonomy of the species is recorded in the “Taxonomy” section.

Fig. VI - Species Detailed Page with Taxonomy Section
In “Species Detailed page”, 15 resources are listed in the “Resources” section. Clicking on each resource will navigate to the corresponding “Resource detailed page”.

In “Species Detailed page”, publications done on the species are recorded under the “Publications” section.
Diagnostic Characteristics
Carapace broader than long, dorsal surface slightly convex in frontal view, flat posteriorly, smooth except postorbital cristae, epigastric cristae and lateral margins; postorbital and epigastric cristae distinct, confluent; external orbital angle broadly triangular, with long outer margin, ca. 4 times length of inner margin; epibranchial tooth small, blunt, cleft clearly visible. Suture between thoracic sternites 2–3 visible as broad groove not reaching lateral margins; suture between sternites 3–4 visible as broad groove and reaching lateral margins. Male abdomen T-shaped in large males; sixth segment distinctly longer than broad, longer than telson. G1 straight, with long, cone-shaped terminal segment, ca. 0.3–0.4 times length of subterminal segment. G2 with long distal segment, ca. 0.5–0.6 times length of basal segment (Mohomed, Bahir and Derren Yeo, 2007).

Taxonomy
Resources
Publications
Arath Raghavan, Sudha Devi, Monocoth Kumath Smita and Bhadravathi Keshappa Chandrashekhar Sagar, 2015. Light and electron microscopic studies of the Y ovum of the freshwater crab Travancoriana schirnerae. Journal of Microscopy and Ultrastructure.

Arath Raghavan, Sudha Devi, Monocoth Kumath Smita, Naray Gopal and Sedha Dasiah, 2018. Effect of eyestalk ablation on mandibular organ activity in the freshwater crab Travancoriana schirnerae. International Journal of Fisheries and Aquatic Studies, 8(2): 184–189.

Aswani Ayamuth and Sudha Devi Arath Raghavan, 2020. Proline of serum alanine in relation to female reproductive cycle in the freshwater crab, Travancoriana schirnerae Bott, 1969 (Crustacea, Gecarcinidae). Development Reproduction & Development.

Latha Naddakki Padmanabhaiah, Sudha Devi Arath Raghavan and Chandrasekhar Sagar Bhadravathi Keshappa, 2017. Ultrastructure of haemocytes of the freshwater crab Travancoriana schirnerae. Turkish Journal of Fisheries and Aquatic Sciences, 17(2):231–243.

Latha Naddakki Padmanabhaiah and Sudha Devi Arath Raghavan, 2016. Impact of eyestalk ablation on androconial gland activity in the freshwater crab Travancoriana schirnerae Bott, 1969 (Decapoda: Gecarcinidae). Brazilian Journal of Biological Sciences, v. 3, no. 5, p. 121-134.

Latha Naddakki Padmanabhaiah, Sudha Devi Arath Raghavan, 2016. Impact of unilateral eyestalk ablation on major biochemical parameters of muscle of the freshwater crab Travancoriana schirnerae Bott, 1969 (Decapoda: Gecarcinidae). Brazilian Journal of Biological Sciences, v. 3, no. 6, p. 341-350.

Latha Naddakki Padmanabhaiah, Sudha Devi Arath Raghavan and Aswani Ayamuth, 2017. Impact of methioprene on gonad of the freshwater crab Travancoriana schirnerae Bott, 1969 (Decapoda: Gecarcinidae); Brazilian Journal of Biological Sciences Vol. 4, No. 7, p. 165-179.

Leave a comment

All the publications are included in the References below.
3.2. Data Collection for the 15 Resources

All the collected data are represented as screenshots to explain how the digitization displays the information on “Resource detailed” screen followed by the content of the page.

1. Species Names

In this section original description and Synonym is given.

a. Original description- The species first reported reference details will be provided here.
b. Synonym- Includes the various names under which the species was known/ used by various scientists.

Fig. IX - Resource Detailed Page with Species Name

![Image of Resource Detailed Page]

a) Original Description

Bott, R. (1969). Flußkrabben aus Asien und ihre Klassifikation (Crustacea, Decapoda). *Senckenbergiana biologica*. 50(5-6): 359-366.

b) Synonym: Nil

Genus: *Travancoriana* Bott, 1969; Species: *Travancoriana schirnerae* Bott, 1969.

2. Anatomy

All information on Anatomy and related aspects will be discussed here.
The Male Reproductive System

The male reproductive system of *Travancoriana schirnerae* Bott, 1969 consists of paired testes with vasa deferentia which is divided into the anterior, the middle and the posterior regions. The testes were creamy white, elongated and lobulated structures which are positioned in cephalothoracic region. The paired vasa deferentia, were creamy white in colour, which arose from posterior ends of testes and they are extended posteriorly in the form of a thick coiled tubules. The posterior vas deferens found to be narrowed which form a thin ejaculatory duct that pierced the 5th pereiopod muscles to open at the base of the coxa through external penis. The wet weight of testis in the adult males were (80-160 mg and 220-400 mg respectively). The GSI value is 0.155-0.316 and the VD factor was to be 101-254 (Raghavan and Moorkoth, 2014a).

The Female Reproductive System

The female reproductive system of *Travancoriana schirnerae* Bott, 1969 consists of paired ovaries, oviducts, gonopores and spermathecae. The ovary seems to be H-shaped with an anterior and posterior lobes and are connected by a transverse bridge comprises of ovarian tissue, it is located in the cephalothorax (mid-dorsally). An oviduct arises laterally from the posterior part of each ovary which extends ventrally and it opens out through coxa of the third walking leg. A pear shaped spermatheca which is capable of storing spermatozoa received during the process of copulation was found to be proximally attached to each oviduct (Gopal and Raghavan, 2019).
3. Life Cycle

Life Cycle related information of the species are recorded in this section.

Fig. XI - Resource Detailed Page with Life Cycle

| Resources                                      | Travancoriana schirnerae Bott, 1969 |
|------------------------------------------------|--------------------------------------|
| Species Name                                   | Travancoriana schirnerae Bott, 1969 |
| Anatomy                                        | Travancoriana schirnerae Bott, 1969 |
| Life Cycle                                     | Travancoriana schirnerae Bott, 1969 |
| Mating                                         | Travancoriana schirnerae Bott, 1969 |
| Spawning                                       | Travancoriana schirnerae Bott, 1969 |
| Diet                                            | Travancoriana schirnerae Bott, 1969 |
| Feces                                          | Travancoriana schirnerae Bott, 1969 |
| Fisheries and Industries                       | Travancoriana schirnerae Bott, 1969 |
| Nutritive Value                                | Travancoriana schirnerae Bott, 1969 |
| Internet Links                                 | Travancoriana schirnerae Bott, 1969 |
| Books and Resources                            | Travancoriana schirnerae Bott, 1969 |
| Barcoding                                      | Travancoriana schirnerae Bott, 1969 |
| General Biology                                | Travancoriana schirnerae Bott, 1969 |
| References of Resources                        | Travancoriana schirnerae Bott, 1969 |
| General Aspects                                | Travancoriana schirnerae Bott, 1969 |

**Life Cycle**

**Mating:**

Usually males are reported to be larger than females. The possible reason for this may be that large males with bigger major chelipeds are more successful at acquiring mates (Wilber, 1987) and in handling females during copulation (Hartnoll, 1982). *T. schirnerae*, males copulate with the females they guard and do not guard the females they do not mate with, as documented by Wilber (1987) in stone crabs. In *T. schirnerae*, females usually remain seized in male burrows before mating as evidenced by the presence of mating pairs in burrows. Such burrow-mating systems are more advantageous to monogamy (Sufla Devi and Sreek, 2013).

**Breeding:**

*T. schirnerae* is an annual breeder with a short breeding season which extended from February and to May (summer) with peak in March. Breeding in summer months is thought to be advantageous to ensure embryonic development before rainy season (colder months) (Sufla Devi and Sreek, 2013).

**Growth Pattern:**

Males were found larger and heavier than females (CW: 4.86±0.40 and 4.56±0.35 cm and weight: 30.36±12.16 and 32.09±7.51 g respectively for males and females) (t=2.00 and 3.88 respectively, p<0.05). Males grow more rapidly than females as evidenced from the markedly larger molt increments in CW and weight (Sufla Devi and Sreek, 2015).

**The Mating**

Usually the males are reported to be larger than females. The length and width of the species were 23.0 and 2.3 mm respectively and of the gonad of any normal adult males were 20-26 mm in length and 2.0-2.5 mm in width. The possible reason for this may be that large males with bigger major chelipeds are more successful at acquiring mates (Wilber, 1987) and in handling females during copulation (Hartnoll, 1982). *T. schirnerae*, males copulate with those females which they guard. And those do not guard the females, do not mate with, by Wilber (1987) in the stone crabs. In *Travancoriana schirnerae* Bott, 1969, the females generally remain seized in the male burrows before the mating process as evidenced by the presence of mating pairs in the burrows. Such burrow-mating systems seem to be more advantageous to monogamy (Raghavan and Moorkoth, 2013b).

**The Breeding**

*Travancoriana schirnerae* Bott, 1969 is found to be seasonal breeder with a short breeding season which extended from the month of February end to May (summer season) with a peak in the month of March. Breeding of the species is during the summer months is a thought to be
advantageous to ensure the embryonic development before the rainy season (colder) (Raghavan and Moorkoth, 2013b).

The Growth Pattern

Males were found to be larger and heavier when compared with the females (CW 4.6±0.49 and 4.5±0.39 cm and weight 36.56±12.16 and 32.09±7.50 g respectively for males and females) (t=2.00 and 3.88 respectively, p <0.05). Males tend to grew more rapidly when compared with the females as evidenced from markedly larger moult increments in the CW and in the weight (Raghavan and Moorkoth, 2015a).

4. Moulting

Moulting process of the species is recorded in this section.

Fig. XII - Resource Detailed Page with Moulting

The male and the female species seem to have similar moult cycles. The intermoult intervals are found to be different between the male and the female; intermoult intervals tend to be longer for the females, which are related to their higher energetic outlay for the reproduction process (Raghavan and Moorkoth, 2015a).

5. Spawning

Spawning information of the species is recorded in this section.
7. Diseases

Diseases information of the species is recorded in this section.
In this case, Data not found.

7. Fossils

Fossils related information of the species are recorded in this section.
In this case, Data not found.
8. Fisheries and Industries

Fisheries and Industries of the species information are recorded in this section.
In our case, Data not found.

9. Nutritive Value

Food/Meat/ Dietary value of the species are recorded in this section.
Travancoriana schirnerae Bott, 1969 is reported to be edible and serve as a cheap source of animal protein to the local people with poor malnourishment. The maturing ovary alone is being consumed by the natives. The meat is found to be low in fat, with rich protein and moderate source with free amino acids. The proportion of total protein, free amino acids, carbohydrate was higher in females when compared with the males (Raghavan and Moorkoth, 2013a).

Travancoriana schirnerae Bott, 1969 meat could be taken into account as an innovative source of essential fatty acids, which could be considered as a source of meat for the humans and as well as it could be used along with the animal feed for aquaculture industry (Raghavan et al., 2015).

The mean protein, oligo and polysaccharides, moisture, lipid, FAA and cholesterol contents of crab meat were found to be 19.39%, 0.38%, 0.51%, 83.02%, 369.5 mg, 1469 mg and 21.3 mg/100 g respectively (Raghavan and Moorkoth, 2013a).

10. Internet Links

Available Internet links of the species are listed in this section.

Fig. XVIII - Resource Detailed Page with Internet Links

| Travancoriana schirnerae Bott, 1969 |
|------------------------------------|

**Resources**

|      | Anatomy | Life Cycle | Moulting | Spawning | Nutritive Value | References of Resources | General Biology | General Aspect |
|------|---------|------------|----------|----------|-----------------|------------------------|-----------------|---------------|
| **Species Name** |         |            |          |          |                 |                        |                 |               |
| **Diseases** | Fossils | Fisheries And Industries |          |          |                 |                        |                 |               |
| **Books And Resources** | Barcoding | General Biology |          |          |                 |                        |                 |               |

**Internet Links**

1. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T134598A3984116.en
2. http://www.marinespecies.org/aphia.php?p=taxdetails&id=440578
3. https://www.crabdatabase.info/en/crab/brachyura/eubrachyura/heterometra/palaeocarcinidae/paracarcinidae/travancoriana-10048
4. https://indiahbiodiversity.org/species/show/224501
5. https://soil.org/pages/7260314
6. https://en.wikipedia.org/wiki/Travancoriana
7. https://www.biolib.cz/en/taxon/id1041118/
8. https://en.wikipedia.org/wiki/Travancoriana
9. https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?mode=Info&id=303956&lvl=1&sr=1&int=1&keep=1&srchmode=1&unlock

1. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T134598A3984116.en
2. http://www.marinespecies.org/aphia.php?p=taxdetails&id=440578
3. https://www.crabdatabase.info/en/crabs/brachyura/eubrachyura/heterotremata/geo
carcinucoidea/gecarcinucidae/travancoriana-10048
4. https://indiabiodiversity.org/species/show/224501
5. https://eol.org/pages/7260314
6. https://www.nl.wikipedia.org/wiki/Travancoriana
7. https://www.biolib.cz/en/taxon/id1061118/
8. https://wiki2.org/en/List_of_least_concern_arthropods
9. https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?mode=Info&id=303056&l
   vl=3&lin=f&keep=1&srchmode=1&unlock

11. Books/ Resources

Books and resources related to the species are listed in this section.

Fig. XIX - Resource Detailed Page with Books and Resources

| Resources            | Travancoriana schirnerae Bott, 1969 |
|----------------------|-------------------------------------|
| Species Name         | Anatomy                             |
| Diseases             | Fossils                             |
| Books And Resources  | Barcoding                           |
| Life Cycle           | Fisheries And Industries            |
| Moulting             | General Biology                     |
| Spawning             | Nutritive Value                     |
|                      | Internet Links                      |
|                      | References of Resources             |
|                      | General Aspect                      |

Books And Resources

Book: S.D. A.Raghavan. Aspects of Biology of the Freshwater Crab: Travancoriana
   schirnerae, LAP LAMBERT Academic Publishing, 2017.

Thesis: N. K.Smija. Growth and reproduction in the freshwater crab Travancoriana
   schirnerae, Mary Matha Arts & Science College- Kannur University Created and
   maintained by INFLIBNET Centre, 2014.

12. Barcoding

NCBI URL of the barcoding information of species is recorded in this section.
### 13. General Biology

General Biology information for example the Color of the species information is recorded in this section.

#### The Colour Pattern

Adult male and female species has identical colour patterns. Three morphotypes have been recognized and found to be in yellow, intermediate and in purple (Raghavan and Moorkoth, 2015b).
15. Source of References of Resources

All the content references of the species are listed in this section.
All information’s are included in the below References.

Fig. XXII - Resource detailed Page with Reference of the Resources

| Resources              | Travancoriana schirnerae Bott, 1969 |
|------------------------|--------------------------------------|
| Species Name           | Anatomy                              |
| Life Cycle             | Moulting                             |
| Moultng                | Spawning                             |
| Diseases               | Fossils                              |
| Fisheries And Industries | Nutritive Value                     |
| Barcoding              | Internet Links                       |
| General Biology        | References of Resources              |
| General Aspect         |                                      |

1) Pati, S. K. and Thackeray, T., 2018. The freshwater Crab Genera Ghatialana Pati and Sharma, Guberatorianna Bott, and Ingtelehphusa Bott (Crustacea: Decapoda: Brachyura: Gecarcinucidae) Revisited, With Descriptions Of A New Genus and Eleven New Species. Zootaxa, 4440 (1): 001-073.

2) Bott, R. (1969). Flusskrabben aus Asien und ihre Klassifikation (Crustacea, Decapoda). Senckenbergische biologische. 50(5-6): 359-366.

3) Mohamed Bahir, M. and Darren Yeo, C. J., 2007. The Gecarcinucid Freshwater Crabs Of Southern India (Crustacea: Decapoda: Brachyura). The Raffles Bulletin Of Zoology, Singapore., 16: 309-354.

4) Rajesh, L., Smithy Raj, Pati, S.K. and Biju Kumar, A., 2017. The Freshwater Crabs (Decapoda: Brachyura) Of Kerala, India. Journal Of Aquatic Biology and Fisheries, Kerala., 5: 152-153.

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16. General Aspect

In this section the distribution of the species across India are given.
Distribution of the species *Travancoriana schirnerae* Bott, 1969 in India (Karnataka, Western Ghats, Kerala, Tamil Nadu, Andra Pradesh (Pati and Thackeray, 2018))

Fig. XXIV - Distribution of the Species *Travancoriana schirnerae* Bott, 1969 in India
4. Conclusion

The paper provides a web portal that covers all the valuable information collected from various sources about the Indian Freshwater crab, *Travancoriana schirnerae* Bott, 1969. The data collected has been conveniently classified or categorized into 15 areas mentioned already. It presents a background information to all those interested to continue further in research in this area. Future work to create such database continues for other species.

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