

Marine invasive alien crustaceans of India

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Mini Review

An invasive species is one which has been introduced from one geographical location to another through human agency and upon establishment has a tendency to spread (invade), causing damage to the environment, man-made structure and human health or economy. An introduced (also referred to as alien, exotic, non-indigenous or non-native) species becomes invasive when it outcompetes native species for various resources such as space, light, water or food. The new environment may offer fewer able competitors, thereby allowing the invader species to multiply quickly (Wikipedia). The invasives are widely distributed in all types of ecosystems and posing a serious threat to native biodiversity leading to the extinction of native species. Wilcove *et al.*¹ considered invasive species as the second major cause of extinctions of native and endemic species around the world. According to an estimate in 2001, the economic loss caused by invasive species to agriculture and forestry in India is to the tune of 91 billion dollar a year Hiremath & Krishnan.² The magnitude of invasions may be apparently local, but the drivers of bio-invasion are global. According to the Convention on Biological Diversity (CBD), there is a need for “compilation and dissemination of information on alien species that threaten ecosystem, habitats, or species, to be used in the context of any prevention, introduction and mitigation activities (CBD, 2000)”.

Invasion of a species (bio-invasion) from one bio-region to another takes place in two ways. They may be intentional (such as aquacultural/agricultural purposes etc.) or unintentional (such as through ship's ballast water discharge and fouling of ship hulls).

India has 13 major and 200 non-major ports. About 95% of India's trade by volume and 70% of value takes place through maritime transport. Ships are considered as the major factor for translocation of alien species from one bio-region to another. In this respect, harbours

serve as a gateway for the introduction of species. Information on marine invasive species from Indian maritime system is very meagre. During the last one decade, quite a good number of crustacean species has been reported as ‘introduced’ to Indian waters by ballast water (Table 1). This consists of 5 species of decapods, 6 species of isopods, 9 species of amphipods, 7 species of cirripedes and 5 species of copepods. Only one species of decapod, namely, *Litopenaeus vannamei* has been introduced to Indian water for aquaculture purposes. The invasive status of some of these species, however, are yet to be determined. So far, no ecological impact of these species to native ecosystems are ascertained. However, the possibility that they could be undergoing a lag phase cannot be ruled out. This is the first comprehensive list on crustacean invasive species from Indian maritime ecosystems.³⁻¹¹

Table 1 List of alien crustaceans recorded from Indian water and their threat stop

| Sl. No. | Group and Species | Family | Native/Exotic/Cryptogenic | Threat Status | Source |
|------------------|---|----------------|---------------------------|---------------------------|----------------------------|
| Decapoda | | | | | |
| 1 | <i>Penaeus (Penaeus) monodon</i> (Fabricius, 1798) | Penaeidae | Native | Not suspected | Anil et al. ⁴ |
| 2 | <i>Litopenaeus vannamei</i> (Boone, 1931) | Penaeidae | Exotic, Introduced | Not suspected | Dev Roy. ⁵ |
| 3 | <i>Charybdis (Charybdis) feriata</i> (Linnaeus, 1758) | Portunidae | Native | Suspected harmful species | Anil et al. ⁴ |
| 4 | <i>Charybdis (Charybdis) hellerii</i> (A.Milne Edwards, 1861) | Portunidae | Native | Known harmful species | Anil et al. ⁴ |
| 5 | <i>Scylla serrata</i> (Forsk., 1775) | Portunidae | Native | Not suspected | Anil et al. ⁴ |
| Isopoda | | | | | |
| 6 | <i>Cirolana hardfordi</i> (Lockington, 1877) | Cirolanidae | Exotic | Not suspected | Anil et al. ⁴ |
| 7 | <i>Ciliccia latreillei</i> Leach Limnoriidae, 1818 | Cirolanidae | Exotic | Not suspected | Anil et al. ³ |
| 8 | <i>Paradella diana</i> (Menzies, 1962) | Sphaeromatidae | Exotic | Not suspected | Anil et al. ⁴ |
| 9 | <i>Sphaeroma serratum</i> (Fabricius, 1787) | Sphaeromatidae | Exotic | Not suspected | Anil et al. ⁴ |
| 10 | <i>Sphaeroma walkeri</i> | Sphaeromatidae | Native | Not suspected | Anil et al. ⁴ |
| 11 | <i>Synidotea laevidorsalis</i> (Benedict, 1897) | Idoteidae | Exotic | Not suspected | Anil et al. ⁴ |
| Amphipoda | | | | | |
| 12 | <i>Monocorophium acherusicum</i> (Costa, 1853) as <i>Corophium acherusicum</i> Costa, 1853 | Corophiidae | Exotic | Not yet assessed | Shyamasudari. ⁸ |

Table Continued...

| Sl. No. | Group and Species | Family | Native/Exotic/Cryptogenic | Threat Status | Source |
|-------------------|---|----------------|---------------------------|-----------------------|---|
| 13 | <i>Jassa falcata</i> (Montague, 1808) | Ischyroceridae | Exotic | Not yet assessed | Shyamasundari. ⁸ |
| 14 | <i>Jassa marmorata</i> Holmes, 1905 | Ischyroceridae | Exotic | Not suspected | Anil et al. ⁴ |
| 15 | <i>Elasmopus rapax</i> Costa, 1853 | Maeridae | Exotic | Not yet assessed | Shyamasundari. ⁸ |
| 16 | <i>Quadrimaera pacifica</i> (Schellenberg, 1938) as <i>Maera pacifica</i> Schellenberg, 1938 | Maeridae | Exotic | - | Anil et al. ³ |
| 17 | <i>Paracaprella pusilla</i> Mayr, 1890 | Caprellidae | Exotic | Not yet assessed | Guerra-García, ⁷ |
| 18 | <i>Stenothoe gallensis</i> Walker, 1904 | Stenothoidae | Exotic | - | Anil et al. ⁴ |
| 19 | <i>Stenothoe valida</i> Dana, 1852 | Stenothoidae | Exotic | Not yet assessed | Shyamasundari. ⁸ |
| 20 | <i>Podocerus brasiliensis</i> (Dana, 1853) | Podoceridae | Exotic | - | Anil et al. ⁴ Shyamasundari. ⁸ |
| Cirripedia | | | | | |
| 21 | <i>Amphibalanus cirratus</i> (Darwin, 1854) as <i>Balanus amphitrite cirratus</i> | Archaeobalane | Native | Not suspected | Anil et al. ⁴ |
| 22 | <i>Amphibalanus eburneus</i> (Gould, 1841) as <i>Balanus amphitrite eburneus</i> | Archaeobalane | Cryptogenic | Not suspected | Anil et al. ⁴ |
| 23 | <i>Amphibalanus reticulatus</i> (Utinomi, 1967) as <i>Balanus reticulatus</i> Utinomi, 1967 and <i>Balanus amphitrite hawaiiensis</i> Broch | Archaeobalane | Exotic | Not suspected | Anil et al. ⁴ Anil et al. ³ |
| 24 | <i>Fistulobalanus pallidus</i> (Darwin, 1854) = <i>Balanus amphitrite stuttsburi</i> (Darwin) | Balanidae | Exotic | - | Wagh. ⁹ Anil et al. ⁴ |
| 25 | <i>Balanus trigonus</i> Darwin, 1854 | Balanidae | Native | Not suspected | Anil et al. ⁴ |
| 26 | <i>Megabalanus tintinnabulum</i> (Linnaeus, 1758) | Balanidae | Exotic | Known harmful species | Anil et al. ⁴ |
| 27 | <i>Megabalanus zebra</i> (Darwin, 1854) | Balanidae | Cryptogenic | Not suspected | Anil et al. ⁴ |
| Copepoda | | | | | |
| 28 | <i>Nannocalanus minor</i> (Claus, 1863) | Calanidae | Exotic | - | Gaonkar et al. ⁶ |
| 29 | <i>Cosmocalanus</i> sp. | Calanidae | - | - | Gaonkar et al. ⁶ |
| 30 | <i>Paracalanus</i> sp. | Calanidae | - | - | Gaonkar et al. ⁶ |
| 31 | <i>Tortanus</i> sp. | Tortanidae | - | - | Gaonkar et al. ⁶ |
| 32 | <i>Euterpina acutifrons</i> (Dana, 1847) | Euterpinidae | Exotic | - | Gaonkar et al. ⁶ |

Acknowledgments

None.

Conflicts of interest

None.

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