

History of Carcinology of the Lower Indus Basin

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Abstract

The paper enlists publications made on taxonomy of crustaceans found in the Lower Indus basin and provides information on the published scientific work done on various groups of crustaceans.

Keywords: Carcinology, Lower Indus basin, bibliography,

Introduction

History of carcinological studies for the lower Sindh dates back to work of Henderson (1893). In this way the history can be divided into two phases: Pre-partition (first from 1893 to 1947) and post partition (1947 to date). During first phase, in the then British India mostly the British naturalists like Henderson (1893), Alcock (1895, 1896, 1898, 1899, 1900, 1910), Alcock and Mcardle (1902), Kemp (1917) and Kohli (1822) and some locals got interested in the Crustaceans of this region. Some research surveys like “John Murray Expedition”, and Indian Marine Surveyer “Investigator” touched Karachi and collected specimens. Then, in the second phase, starting from the inception of Pakistan, crustaceans attracted attention of the Pakistani scientists, in all probability due to their importance in the local fisheries. Several post-partition national and international expeditions surveyed Karachi and Indus Delta fan. The geographical analysis of the region provided by Pithawala (1936) and animal biodiversity by Mirza (1998).

The importance of the work done on the Pakistani coast has been emphasized by the top most carcinologists in the field and many non-Pakistani carcinologists also surveyed the area and contributed to the faunal list (Bruce, 1986; Keenan et al., 1998; Manning, 1988; Markham, 1980; Schotte, 1995; Trimizi and Manning, 1968; Wagele, 1984). A symposium on River Indus was held in 1994 under the auspices of the Linnean Society of London (Meadows and Meadows, 1999).

The second phase of carcinological studies in Pakistan commenced with the establishment of the Zoological Survey Department of Government of Pakistan in 1949. From modest start serious studies on decapod and stomatopod Crustacea did not begin until after 1958, first at the Department of Zoology, University of Karachi, and then at the Invertebrate Reference Museum, later renamed and reorganized as the Marine Invertebrate Reference Collection and established as a part of the Zoology Department then independently as Marine Reference Collection & Resource Centre (MRC). In the beginning the work at the centre was very slow, but it has gained momentum with better facilities and now contains a good representative crustacean collection from the Karachi

Sindh coast and a few random samples from the Balochistan coast. The collections are preserved both wet (in alcohol) and dry. MRC has now grown into a nucleus of taxonomic research activities with several monographs, books and illustrated keys, imparting research leading to M.Sc., M.Phil. and Ph.D.

Other institutes who joined in these studies include the Centre of Excellence in Marine Biology, Marine Fisheries Department, National Institute of Oceanography, Institute of Marine Sciences, Zoology Department (University of Karachi), Pakistan Agricultural Research Council, Pakistan Council for Scientific and Industrial Research and Freshwater Biology and Fisheries (University of Sindh, Jamshoro).

The carcinological studies in Pakistan are mainly taxonomic. The taxonomic information on Pakistani Crustacea is scattered in different publications, and not all are easily available. This citation is an attempt to put together the published information on the subject and region.

A review of literature shows that some works on morphology, anatomy, larval development, breeding and fecundity, zoogeography, parasitism, associations, ecology, bionomics, distribution, food, fisheries, biochemistry, nutritive value, bioassay, biotechnology and pollution have also been carried out in Pakistan but only the work done on taxonomy is listed in Table-I. The groups are arranged in a phylogenetical order, following classification synopsis (Martin and Davis, 2001).

Table-I. Review of scientific literature on Crustacea from Pakistan

HABITAT	TAXON	REFERENCE
Riverine and terrestrial	Class Branchiopoda Subclass Sarcostraca Order Anostraca	Qadri and Baqai (1956), Jafri and Mahar (2002)
	Subclass Phyllopoda Order Diplostraca Suborder Spinicaudata	Qadri and Baqai (1956)
	Suborder Cladocera	Ali <i>et al</i> (1983), Arora (1935), Biswas (1971), Iqbal and Baqai (1976), Jafri <i>et al</i> (1999), Leghari <i>et al</i> (1999)
	Class Maxillopoda Subclass Branchiura	Jafri and Ahmed (1991), Kazmi (2003d)
	Subclass Copepoda	Ali <i>et al</i> (1983), Baqai and Ishrat (1973), Baqi <i>et al</i> (1975), Jafri (1995), Jafri and Mahar (2003a, 2003b), Jafri <i>et al</i> (1999), Leghari <i>et al</i> (1999).
	Class Ostracoda	†Ahmed and Baryar (1984), Ali <i>et al</i> (1983), †Baryar and Ahmed (1984, 1985), Jafri <i>et al</i> (1999, 2000), Leghari <i>et al</i> (1999)

	Class Malacostraca Order Isopoda	Barnard, 1936, Kazmi (2003b,d, 2004), Kazmi <i>et al</i> (2000)
	Order Decapoda	Alcock (1910), Husain (1974), Johnson (1973), Kazmi and Kazmi (2003), Kazmi and Kazmi (2006), Kazmi <i>et al</i> (2001, 2005), Kazmi and Perveen (2005), Qadri (1960), Tiwari (1962, 1963), Yaqoob (1986), Zuberi (1990).
Marine	Class Branchiopoda	Kazmi (2003b), Sultana <i>et al</i> (1991)
	Class Maxillopoda: Subclass Copepoda:	Ali (1995, 1997), Ali-Khan (1992, 1993a, 1993b, 1995, 1998), Ali-Khan and Ali-Khan (1982, 1984), Bindra (1924), Fleminger and Hulsmann (1973), Ghani and Ali (1996, 2003), Ghani and Seemi (1999), Grice and Hulsmann (1967), Globolov and Grobov (1970), Haq and Rehman (1973), Haq (1973), Kazmi (2001b, 2003, 2004), Kazmi and Muniza (1994, 1997a,b, 1998, 2005), Kazmi and Naushaba (2000), Khan and Kamran (1975), Khan (1976a, 1977a,), Khan <i>et al</i> (1975), Masihuzzaman (1975), Muniza and Kazmi (1995), Niazi <i>et al</i> (1973, 1975), Rehman (1973, 1974), Siddiqui and Bilqees (1995), Sadiq (1996), Saraladevi (1977), Saraswathi (1973), Sewell (1948), Tirmizi and Sadiq (1995).
	Subclass Cirripedia	Annandale (1909), Javed and Mustaquim (1994), Kazmi (2001, 2004), Kruger (1912), Mustaquim and Javed (1993), Moazzam and Rizvi (1978, 1982), Rizvi and Moazzam (2006), Moazzam and Moazzam (2005), Stubbing (1936)
	Class Ostracoda	Kazmi <i>et al</i> (1995), †Hasnain and Khan (1976c), Khan (1989).
	Class Malacostraca Subclass Phyllocarida Order Leptostraca	Kazmi and Tirmizi (1989, 1992)
	Subclass Hoplocarida Order Stomatopoda	Baig (1954), Kazmi (2004), Kazmi and Kazmi (1987), Manning (1988), Moazzam and Moazzam (2006), Tirmizi and Kazmi (1980), Tirmizi and Manning (1968), Tirmizi (1994).

	Subclass Eumalacostraca Order Mysidacea	Kazmi <i>et al</i> (1992, 1999), Kazmi and Tirmizi (1995a), Nayeem <i>et al</i> (1992), Tattersall (1939),
	Order Cumacea	Khan and Khan (1975), Khan (1976),
	Order Amphipoda	Ahmed (1976), Bano and Kazmi (2004, 2005), Kazmi and Bano (2003, 2005), Javed (1987, 1990), Nayeem <i>et al</i> (1993)
	Order Isopoda	Anwarullah (1971), Barkati and Tirmizi (1990), Boyoko and Kazmi (2005), Bruce (1986), Bruce and Javed (1987), Chopra (1923), Ghani (1995, 1996), Ghani and Ali (1998, 2001), Ghani and Shireen (1995, 2000), Ghani and Tirmizi (1993b), Javed (1990a), Javed and Ahmed (1987, 1988a, 1988b), Javed and Yasmeen (1989, 1992, 1995, 1999), Javed and Yousuf (1995a, 1995b, 1996, 1997), Karim (1975), Kazmi (2001a, 2003b), Kazmi and Boyko (2005), Kazmi and Bourdon (1997), Kazmi and Markham (1999), Kazmi and Tirmizi (1994), Kazmi and Yousuf (2003, 2006), Kazmi <i>et al</i> (2000, 2002), Markahm (1980), Markham and Kazmi (1998), Nooruddin (1960), Qazi (1959), Schotte (1995), Shireen (2000, 2001), Shireen and Ghani (2000), Wagele (1984), Wegoescu (1980), Yasmeen and Javed (2000, 2001), Yousuf and Javed (2002).
	Order Tanaidacea	Kazmi and Siddiqui (1992, 2001)
	Order Euphausiacea	Brinton and Gopala Krishna (1973), Fatima (1983), Kahn (1980), Tattersal (1939), Tirmizi (1995).

	<p>Order Decapoda</p>	<p>Ahmed (1985), Ahmed and Khan (1971), Ahmed and Moazzam (1982), Ahmed <i>et al</i> (1973), Ahsanullah (1965), Alcock (1895, 1896, 1898, 1899, 1900), Alcock and Mcardle (1902), Bianchi (1985), Chace (1988), Collins <i>et al</i> (1984), Das and Chopra (1940), Davies and Ghani (1993), Deb (1987), Dore and Frimboldt (1987), Fatima (1983, 2000), Ghani (1999, 2000, 2002), Ghani and Ali (1996), Ghani and Davies (2000), Ghani and Tirmizi (1991a, 1991b, 1991c, 1992, 1993, 1995a, 1995b), Hashmi (1963, 1964), Henderson (1893), Holthuis (1980, 1991), Hussain (1974), Jafri <i>et al</i> (2000), Karim (1985, 1987), Kazmi (1971a, 1971b, 1974, 1988, 1997, 2001, 2003b,c, 2004), Kazmi and Kazmi (1973, 1979, 1987, 1992, 2004), Kazmi and Manning (2003), Kazmi and Qureshi (1974), Kazmi and Siddiqui (1992, 2001, 2006), Kazmi and Tirmizi (1990, 1995b, 1999), Kazmi and Yousuf (2005), Kazmi <i>et al</i> (1973, 1975, 1990, 1991, 2000, 2001), Keenan <i>et al</i> (1998), Kemp (1917), Khan (1975a, 1976b, 1977b), Khan and Ahmad (1975), Kholi (1992, 2004), Moazzam and Rizvi (1985), Moazzam <i>et al</i> (2003), Mustaquim (1972), Mustaquim and Rabbani (1976), Niazi and Hoque (1974), Nayeem <i>et al</i> (1993), Qadri (1960), Siddiqui and Kazmi (2003), Siddiqui and McLaughlin (2003), Siddiqui <i>et al</i> (2004), †Stoliczka (1871), Tirmizi (1962, 1967, 1968, 1970a, 1970b, 1974, 1976, 1977, 1978, 1980), Tirmizi and Ahsanullah (1966), Tirmizi and Bashir (1973), Tirmizi and Ghani (1978, 1982a, 1982b, 1983, 1986, 1988a, 1988b, 1992a, 1992b, 1994a, 1994b, 1996), Tirmizi and Kazmi (1969, 1979, 1980, 1982, 1983, 1984, 1987, 1988, 1990, 1995, 1996), Tirmizi and Siddiqui (1979, 1982), Tirmizi and Serene (1971), Tirmizi <i>et al</i> (1982, 1985, 1986, 1989), †Tiwari (1962), Wagner (1986), Wood-Mason and Alcock (1891), Zuberi (1990)</p>
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† Fossil record

The table indicates that more work is done in the marine littoral ecozone as compared to riverine tract ecozone. It is also evident that two taxon i.e. Decapoda and Isopoda. are well documented.. The geographical range of marine crustaceans recorded from Pakistan clearly indicate that very few are endemic, some are cosmopolitan species, but they are wide spread throughout the western Indian Ocean, Red Sea and gulfs: Arabian/Persian Gulf and Gulf of Aden and only very few extend to Mediterranean through the Suez canal or to Pacific and Atlantic region.

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