



Salt-loving shrimps threatened by salinisation?

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Background

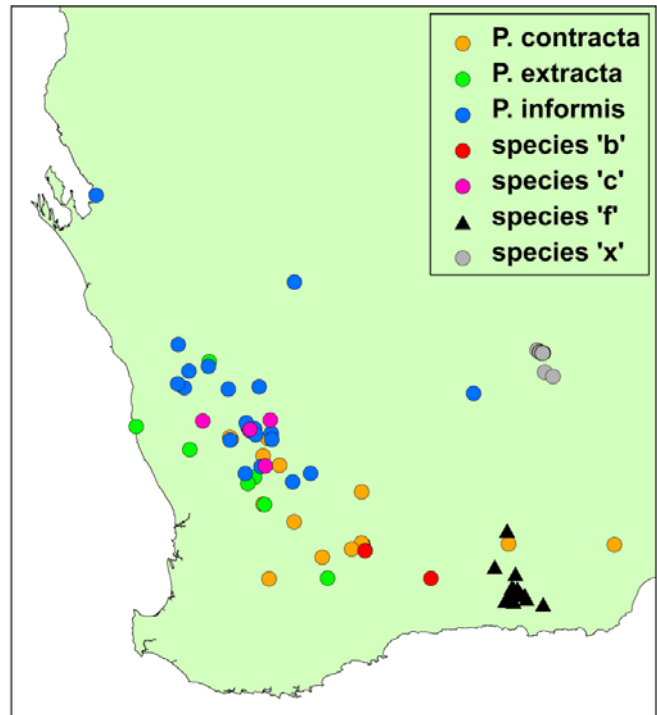
The south-west of Western Australia is one of the global hotspots for inland crustacean diversity. Anostracans (fairy shrimp and brine shrimp) are one of the groups that contribute to this status. Australia has more halophilic (salt-loving) species than elsewhere, which isn't surprising given the very large number and range of salt lakes on the continent. Most of these belong to the endemic brine shrimp genus *Parartemia*, of which 14 of the 19 known species occur in Western Australia, including 10 which are endemic and another which has most populations in this State. Several of the Western Australian species are known from only one or a few lakes, frequently with restricted distributions in the Goldfields and/or Wheatbelt regions. These rarer species are undescribed. Most of the remaining species are better known and occur across partly overlapping ranges in the south-west and inland, but some species are becoming less common.



Findings

- We recently reviewed the conservation status of this genus following observed decline in some species. Tolerance to salinity varies between species but exceeds 200 g/L (~5½ x seawater) for most species. It might be expected that their ranges would have expanded in the salinising Wheatbelt. However, not only are *Parartemia* (and some other halophilic invertebrates) rarely colonising secondarily saline wetlands, some are disappearing from naturally saline lakes affected by altered hydrology.
- Surveys have failed to find three of the five known populations of *P. extracta* in the northern Wheatbelt, although two new populations were discovered. Most localities are within the intensive agricultural zone so this species is under threat. Similarly, *Parartemia* species 'c' is known only from relatively low salinities (≤ 120 g/L) at four locations, but recent surveys have failed to confirm the persistence of these populations.
- The acid tolerant *P. contracta* was listed as a Priority One species in 1995 because it was known from only two locations. Although it is now known to be more widely distributed, some populations of this and other widespread species, such as *P. informis*, are now absent from Wheatbelt lakes in which they were known to occur.

- It is not clear why *Parartemia* are absent from most secondarily saline wetlands or why they are disappearing from some degraded naturally saline ones. Many affected lakes are of suitable salinity, but others are too dilute or too saline (or too saline at the wrong times – e.g. for the more salt-sensitive juveniles). Some of the salinised wetlands now remain flooded for longer periods or have become permanent, whereas *Parartemia* mostly occur in intermittent wetlands. Nonetheless, at least some *Parartemia* can give birth to live nauplii and are multivoltine during a filling event, so should tolerate prolonged inundation. *Parartemia* also lay drought resistant cysts (resting ‘eggs’) and these need a period of drying before they hatch. Multivoltine populations may eventually die out and without a period of drying recolonisation from the egg bank cannot occur. Some salinised lakes have also acidified which eliminates most *Parartemia*. *Parartemia contracta* and species ‘b’ and ‘f’ inhabit naturally acidic salt lakes and *P. serventyi* is acid tolerant. Some of these have been recorded in secondarily acidic wetlands. Ability to disperse, competition from salt tolerant species (at lower salinities) and predation by waterbirds may also be factors in their absence in secondarily saline wetlands. It is also unclear whether spread of the introduced *Artemia* species has, or will, affect *Parartemia*.



Known localities of species mentioned in the text

- Species and populations in the Goldfields are not threatened by salinisation, but some lakes are being mined or being used to dispose of mine wastewater (e.g. Lake Carey, which is the only known locality for species ‘x’). This activity normally only affects a small area of a playa lake and rare episodic flood events would probably dilute any impact. However, the cumulative and long term impacts are unknown. Discharge of acid mine water is of particular concern.
- Other halophilic endemic invertebrates, such as ostracods and *Coxiella* snails, may also be threatened by degradation of natural salt lakes but these are not so well known.

Management Implications

- Processes associated with rising saline groundwater threaten the naturally saline systems which support many of endemic aquatic invertebrates of the inland south-west, including *Parartemia*.
- The conservation status of several *Parartemia* should be assessed against IUCN and DEC threatened and priority criteria. However, better information on the distribution of *Parartemia* and their ecological requirements is required to more confidently assess conservation status and the likely impacts of threats.
- For species found to meet threatened or priority criteria, known populations need to be monitored and protected in the face of such a broadscale threat as salinisation. Disposal of agricultural drainage water is a potential threat and endemic halophiles need to be considered during drainage assessment procedures.
- Surveying for the relatively conspicuous *Parartemia* is straightforward and specimens can be preserved in alcohol. Even *ad hoc* collections will be useful to understand the distribution and status of *Parartemia* in Western Australia.