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12

13

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17

18 **Text:**

19 **Importance of aquaculture and its biological invasion risks**

20 Aquaculture plays a critical role in alleviating malnutrition and poverty¹ and stands as the world's fastest growing food sector², especially
21 in developing countries³. Global aquaculture production increased by over 600% from 1990 to 2020⁶, accompanied by a diversification
22 of farmed species, reaching 425 species in 2021⁴. Notably, the number of crustacean species reared commercially has risen from 30 to
23 at least 49 between 2017 and 2020^{5,6}. Many farmed species are non-native in their farmed regions, a trend first observed in 2000 in
24 developing countries such as Cuba, India, Philippines, Chile and Brazil, where 60–95% of all production is non-native species⁷. The
25 growing number of farms and/or farm sizes, along with non-native species farming, increases the risk of intentional or accidental release
26 into the wild³. This is likely to increase propagule pressure⁸ as was seen with the redclaw crayfish (*Cherax quadricarinatus*) which
27 escaped from captivity or abandoned farms and established wild populations in many regions⁹. Farmed species are selected for traits
28 which exacerbate their establishment and spread in the wild¹⁰ such as rapid growth, broad diet and resistance to parasite¹¹.

29 Biological invasions, involving human-related introduction, establishment, expansion and potential impact of species outside of their
30 native ecosystem, pose a significant threat to biodiversity and ecosystem functions¹². For example, the red swamp crayfish (*Procambarus*
31 *clarkii*) introduced for aquaculture, is now a global invasive species¹³ which transmits diseases¹⁴ and predate on and competes with
32 native species, thereby altering food webs and habitat structures¹⁵. Notwithstanding biological invasions occasional benefits, they do not
33 outweigh their massive economic impacts¹⁶, estimated to be at least USD 423 billions in damage and management¹², also affecting
34 aquaculture itself¹⁷. The signal crayfish (*Pacifastacus leniusculus*) and the European green crab (*Carcinus maenas*), collectively inflict
35 damages totaling US\$271 million¹⁷.

36 We suggest that the rapid development of farms and farmed species is likely to increase the risk of biological invasion¹⁸ unless new
37 biosecurity protocol are developed in parallel¹⁹. While the causal links between aquaculture and biological invasions has been extensively
38 studied for specific countries or species^{20–23}, substantial gaps remain not least in the case of crustaceans, which are significant both as
39 major aquaculture species and as invaders. Therefore, we focus on farmed crustaceans, although our conclusions apply to other
40 taxonomic groups involved in aquaculture. We show why some farmed crustaceans pose an increasing risk of biological invasions and
41 how this risk can be mitigated. Here, we assess commercially farmed crustaceans classifying them by country (native-non-native) and
42 invasive history (lack or presence of invasions historically). Using these classifications, we recommend biosecurity and management
43 strategies while highlighting the gaps in our current understanding.

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47 **Distribution of farmed and invasive crustaceans**

48 To compile a comprehensive list of farmed crustacean species, we used the most up to date aquaculture dataset of the Food and
49 Agriculture Organization of the United Nations²⁴ (FAO) and supplemented it with our own literature research. For identifying the
50 invasive crustacean species, we cross referenced multiple invasive alien species databases²⁵⁻²⁸ ensuring we removed duplicates and
51 validated scientific names using GBIF. Our final dataset includes 63 crustacean species (Appendix I & II) which have been farmed in
52 126 different countries globally (Table 1; Appendix III). Here, non-native species are defined as a species outside its natural range in the
53 country where it is farmed. Of these countries, 111 have farmed at least 1 non-native species with 64 farming exclusively non-native
54 species and 15 that farm only native species (Table 1). The whiteleg shrimp (*Penaeus vannamei*) is the most widely farmed species,
55 cultivated across 54 countries. The signal crayfish has only been farmed in non-native countries whereas the giant mud crab (*Scylla*
56 *serrata*) has been farmed only in native countries (Appendix III). Out of the 63 farmed species, 22 are considered invasive worldwide
57 impacting at least 77 countries (Table 1; Appendix I & IV). Here, we define invasive as actual or probable negative ecological or
58 economic impact documented in at least one population worldwide. The red swamp and the spiny-cheek (*Faxonius limosus*) crayfishes
59 are invasive in over 20 countries (Table 2). There are several pathways by which crustaceans have been shown to spread including ballast
60 water, pet trade and hull fouling (Table 2). However, it is established that aquaculture is a major driver/pathway in invasion crustaceans
61 with at least 19 of the 22 invasive species introduced through aquaculture (Table 2, Appendix V), 14 of those affecting at least 30
62 countries (Table 1; Appendix IV). Causes of their introduction include unintentional escape (e.g. when used as fish food²⁹), intentional
63 release from crustacean aquaculture^{30,31} or transfer through “hitchhiking” on other species as was the case with the Chinese mitten crab
64 (*Eriocheir sinensis*)³²⁻³⁴. It is important to note that these results are likely underestimated due to the incomplete reporting of both
65 farming and invasions.

66 67 **Impacts of invasive farmed crustaceans**

68 These 22 invasive crustaceans farmed in aquaculture originate from diverse regions and environments including marine, brackish, and
69 freshwater (Appendix I). Their introductions into non-native regions have resulted to multiple and severe impacts (Table 2). For instance,
70 the European green crab and Chinese mitten crab outcompete and prey on native species, leading to native population declines;
71 consequently, they are listed among “100 of the worst invasive alien species”³⁵. Four of these 22 species are also listed on the European
72 list of invasive alien species of concern, the spiny-cheek crayfish, the red swamp crayfish, the signal crayfish, and the Chinese mitten
73 crab³⁶.

74 The types of impacts and associated mechanisms of these invasive crustaceans are diverse (Table 2). Tiger prawn (*Penaeus monodon*)
75 and red swamp crayfish are vectors of viral diseases such as the white spot syndrome baculovirus³⁷. Crayfish also transmit crayfish
76 plague caused by the oomycete *Aphanomyces astaci*, listed among the 100 worst invasive alien species globally³⁵. Some crustaceans are
77 considered ecosystem engineers^{15,38} that can significantly impact the structure of invaded habitats, thereby affecting other species and
78 altering ecosystem dynamics. The European green crab reduces eelgrass biomass by damaging rhizomes and plant shoots while
79 burrowing for shelter and prey³⁹. Similarly, the red swamp crayfish alters water quality, increasing turbidity and reducing dissolved
80 oxygen levels⁴⁰. These invasive crustaceans can also impact economic activities such as aquaculture, fisheries and agriculture¹⁷. The
81 burrowing behaviour of the common yabby (*Cherax destructor*) can jeopardize dam walls, thus affecting farmers⁴¹. In Lake Naivasha,

82 local fishermen estimated that the red swamp crayfish reduced their catch's food provisioning by up to 30% due to crayfish-induced
83 damage to fishing nets⁴². Thus, the risk on human activities results in massive economic consequences since four crabs - *C. sapidus*, *C.*
84 *maenas*, *E. sinensis* and *P. pelagicus* - and three crayfish species – *P. clarkii*, *P. leniusculus* and *F. limosus* - farmed in aquaculture rank
85 among the costliest invasive crustaceans¹⁷.

86

87 **A preliminary classification of the risks of invasion of farmed crustacean species**

88 Despite the acknowledged risks, there is still no global picture of the risk posed by farmed crustacean species in aquaculture. As a first
89 step to address this gap, we propose a simple but widely applicable classification system based on two primary criteria: (1) the species
90 documented global invasion history, and (2) whether the species is farmed outside its native regions. This system creates four possible
91 outcomes, which we used to create a preliminary risk index ranging from limited risk (A) to high (D) (Figure 1). Species farmed in their
92 native range are of low concern if escaped populations establish outside the farm (category A), but of medium concern if they are invasive
93 in other (non-native) range (category B). Conversely, species farmed outside their native range and never reported as invasive (category
94 C) have a high risk of becoming invasive if they escape and establish. The highest concern is for species farmed outside their native
95 range and with a documented invasion history (category D).

96 As a preliminary decision and in the absence of more in-depth risk assessments, we suggest applying appropriate management measures
97 of the 63 farmed crustacean species based on their classification. Species with the lowest risk classifications (category A & B), which
98 total 39 species, can continue to be farmed in their native regions, focusing biosecurity efforts on international transport. The seven
99 species farmed in non-native countries (category C), require appropriate biosecurity and monitoring measures to prevent escapes from
100 farms or transports. For the 17 species classified in the highest-risk category (D), farming in non-native regions must be avoided.

101 Selecting species for aquaculture that minimise biological invasion risks while boosting economic potential is crucial. Therefore, it is
102 essential to prioritise farming species within their native regions (A & B)¹⁰, particularly for open pond water farming. However, it is
103 important to note that even native species can have detrimental impacts if released in large quantities (REF Geslin ?). Farming species
104 outside their native region may only be safe if not only species are reared in enclosed structures but also if current and future
105 environmental conditions are unfavourable to their invasiveness. The current and future risks of establishment of non-native species can
106 be predicted with tools such as species distribution models. Thus, conducting local or national spatial prediction analyses before
107 establishing farms may allow the building of non-native farming while lowering the risk that species becomes invasive⁴³. Biosecurity
108 and early response (following regular monitoring) are the most effective ways of managing non-native species^{12,44}. The most basic
109 approaches include: (i) farming sterile or unisex individuals, (ii) isolating farms with closed structures away from natural aquatic habitats,
110 (iii) implementing clean-up protocols and special attire to prevent the spread of eggs and contaminants, (iv) using adequate equipment
111 such as nets to prevent individual escape (e.g., through predation), including equipment maintenance to prevent long-term breakdowns
112 and (v) regularly monitoring surrounding regions^{45,46}. Risks are further reduced through tailored risk assessments^{20,47,48} and updating
113 laws³¹ and regulations at different scales^{20,49,50}. For example, the four species in the European list of invasive alien species³⁶ are forbidden
114 to be farmed⁵¹.

115

116 **Filling knowledge gaps for safer aquaculture**

117 We acknowledge that in many cases the long-term negative consequences of biological invasions may be disregarded because of the
118 immediate social and economic benefits of aquaculture or a lack of awareness of the impacts. Our objective here was to highlight these
119 consequences and promote responsible choices in aquaculture, such as selecting native species or implementing specific biosecurity
120 measures, to collectively progress towards sustainable aquaculture with a reduced role in biological invasions. The classification we
121 proposed serves this objective by informing about the risks posed by farmed aquaculture crustacean species. While based on current
122 knowledge, it could be refined as more gaps in our understanding are addressed. Firstly, not all countries farming these crustaceans are
123 currently present in the FAO dataset²⁴. Examples include Venezuela and Brazil which are not present in the FAO despite farming the
124 tiger prawn, also invasive there⁵². The efficient reporting of newly farmed species to the FAO dataset also varies, mostly by country.
125 Secondly, there are species level gaps in the dataset, one example being the brine shrimp (*Artemia franciscana*) which is not included in
126 FAO as of now. Additionally, the FAO often provides information at higher taxonomic levels such as genus or family, thus complicating
127 the identification of all farmed crustaceans, including potentially invasive ones. For instance, the *Metapenaeus* genus may include one
128 of two invasive alien species of this taxonomic group.

129 Our study may also underestimate the extent of farms located in non-native regions due to uncertainties in the native regions of some
130 species. This is a problem particularly acute in very large countries (e.g., Australia, Brazil, Russia, USA, China) where farming is
131 reported at the national level, whereas a species is native to specific parts of the country. For example, the smooth marron (*Cherax cainii*)
132 is native to parts of Australia but invasive in others. Further, delays in detecting invasive species in the wild and in quantifying their
133 impact hinder our ability to categorize species as invasive accurately. Finally, information on unregistered or illegal farms is lacking⁹,
134 making it difficult to assign accurate risk categories to some species. Consequently, we cannot rely solely on this dataset to assign a risk
135 category to a given species. Our classification is presented more to illustrate our proposal, enhance understanding of invasion risks
136 related to farmed species crustacean species, assist in prioritizing containment strategies, and inform the selection of future farming
137 locations and species. This approach is also relevant for other farmed aquatic groups like molluscs or fish.

138

139 **Author's contribution:**

140 The conception of this study benefited from the collective insights of all authors. EM conducted data collection and crafted the initial
141 draft of the manuscript. BL and FC contributed essential oversight, ensuring a thorough review of the document. All authors engaged in
142 meticulous scrutiny, participating in refining the manuscript through multiple iterations, ultimately leading to unanimous approval for
143 publication.

144

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Species	Number of countries		Invasion mechanisms	Impacts	Introduction pathways
	Farmed	Invaded			
Brine shrimp <i>Artemia franciscana</i>	12	13	Competition ⁵³	Displacement of native species ⁵³	Aquaculture, Pet trade, Solar saltwork industry ⁵³
Blue crab <i>Callinectes sapidus</i>	1	8	Competition ⁵⁴	Native species Human activities (fishing, aquaculture) ⁵⁴	Ballast water ³¹ , Unknown ⁵⁵
European shore crab <i>Carcinus aestuarii</i>	1	1	Competition Predation ⁵⁶	Potential on benthic fauna of intertidal areas ⁵⁷	Ballast water ⁵⁶
European green crab <i>Carcinus maenas</i>	2	5	Competition Predation Herbivory/grazing/browsing Interaction with other invasive species ^{58,59}	Threat to or loss of native species: decline of native population (e.g., bivalves) Habitat disruption ⁵⁸ Altered trophic level Modified gene pool or selective loss of genotypes Ecosystem change or habitat alteration Modification of natural benthic communities Greater vulnerability to invasions Damaged ecosystem services Impact on agriculture, human health, livelihoods, aquaculture/fisheries ⁵⁹	Aquaculture, Live food & Live bait, Pet, Research, Habitat material contaminant, Ballast water, Hull fouling, Land vehicles ³¹
Smooth marron <i>Cherax cainii</i>	6	1	Competition Parasitism Disease transmission ^{60,61}	Impact on native species Habitat alteration ^{60,61}	Aquaculture ⁶¹
Common yabby <i>Cherax destructor</i>	5	2	Competition Predation Pest and disease transmission Herbivory/grazing/browsing ⁶²	Food web dynamic changes Habitat alteration Infrastructure damage Negative impact on agriculture Reduced native biodiversity Threat to or loss of endangered species Threat to or loss of native species ^{62,63}	Aquaculture, Fisheries, Live food & Feed trade, Hunting, Angling, Sport or racing, Pet trade, Research ⁶²
Red claw crayfish <i>Cherax quadricarinatus</i>	49	12	Competition Predation ⁹	Impact on native fauna: population decline, species replacement Trophic web alteration Ecosystem service disruption (fisheries, irrigation systems)	Aquaculture, Fisheries, Live food & Feed trade, Hunting, Angling, Pet trade, Research, Natural dispersal ⁶⁴
Chinese mitten crab <i>Eriocheir sinensis</i>	3	18	Competition Predation	Aquaculture/fisheries: predation including target species for commercial (agriculture, aquaculture, fisheries) and recreational fishing Infrastructure damage: greater riverbank erosion and clogging of commercial water intake Damaged ecosystem services Impacts on human health, livelihoods	Aquaculture, Hitchhiker, Interconnected waterways, Live food & Feed trade, Pets and aquariums trade, Ballast water, Hull fouling ⁶⁵

				Damaging aquatic food chain of freshwater and estuarine habitats Ecosystem change or habitat alteration: modification of hydrology Threat to or loss of native species ⁶⁵	
Spinycheek crayfish <i>Faxonius limosus</i>	5	21	Competition Pest and disease transmission Herbivory/grazing/browsing Hybridization Predation ^{66,67}	Threat to or loss of native species: reduced native biodiversity (native crayfish populations) Threat to or loss of endangered species Modified gene pool or selective loss of genotypes Impact on native habitats Impact on fish community Decreased food resources and thus mollusc and amphibian occurrences Altered trophic levels Greater vulnerability to invasions Modification of hydrology Modification of natural benthic communities Ecosystem change or habitat alteration Infrastructure damage (destabilized riverbanks) Damaged ecosystem services Negative impact on aquaculture/fisheries ^{66,67}	Aquaculture, Aquarium trade, Fisheries, Hitchhiker, Hunting, Angling, Sports or racing, Live food & Live bait, Pet, Fishing equipment, Canal and artificial waterways ⁶⁷
Tahitian prawn <i>Macrobrachium lar</i>	2	3	Predation ⁶⁸	Displacing native species	Aquaculture ⁶⁸
Tahitian prawn <i>Macrobrachium nipponense</i>	5	2	Predation ⁶⁹ Competition ⁷⁰ Possible disease transmission ⁷¹	Displacing native species ⁷⁰	Aquaculture ²⁹
Giant river prawn <i>Macrobrachium rosenbergii</i>	53	7	Possible disease transmission Interbreeding with local species ⁷²	Displacement of native species	Aquaculture ^{30,72}
Brown shrimp <i>Metapenaeus monoceros</i>	1	2		Displacement of native species ⁷³	Suez Canal ⁷³
Signal crayfish <i>Pacifastacus leniusculus</i>	5	20	Competition Pest and disease transmission Predation ⁷⁴⁻⁷⁶	Modification of natural benthic communities Reduced native biodiversity Threat to or loss of native species (decline of native species <i>Austropotamobius pallipes</i>) ⁷⁶	Aquaculture, Stocking ^{31,76}
Northern Brown Shrimp <i>Penaeus aztecus</i>	1	2	Disease transmission ⁷⁷	Potential disease transmission for native species ⁷⁷	Aquaculture, Ballast water ⁷⁷

Japanese king prawn <i>Penaeus japonicus</i>	17	4	Competition	Outcompeted native penaeid shrimp <i>Melicertus kerathurus</i> ⁷⁸	Aquaculture ⁷⁸
Tiger prawn <i>Penaeus monodon</i>	32	8	Competition Herbivory Parasitism ^{79,80}	Threatened native species Modification of natural benthic communities Modification of nutrient regime Impacts on aquaculture and fisheries	Aquaculture, Breeding, Food, Research, Smuggling, Stocking ⁸⁰
Green tiger prawn <i>Penaeus semisulcatus</i>	4	2	Disease transmission to Human ⁸¹	Human health ⁸¹	Aquaculture ⁸¹
Whiteleg shrimp <i>Penaeus vannamei</i>	54	3	Pest and disease transmission Competition for habitat and food ^{80,82}	Modified gene pool or selective loss of genotypes Modification of natural benthic communities Modification of nutrient regime Negative impact on aquaculture/fisheries Threat to or loss of native species ⁸⁰	Aquaculture, Food, Research, Smuggling, Stocking, Breeding ⁸²
Narrow-clawed crayfish <i>Pontastacus leptodactylus</i>	17	5	Competition ⁸³	Decline of the noble crayfish (<i>Astacus astacus</i>) in Eastern Europe ⁸³	Aquaculture, Fisheries ⁸³
Blue crab <i>Portunus pelagicus</i>	2	5	Competition Pest and disease transmission Predation ⁸⁴	Altered trophic level Modification of natural benthic communities Reduced native biodiversity Threat to or loss of native species ⁸⁴	Aquaculture, Interbasin transfers, Interconnected waterways ⁸⁴
Red swamp crayfish <i>Procambarus clarkii</i>	11	25	Competition Predation on insects and molluscs Disease transmission ⁸⁵	Reduced resources available for native species (e.g. destruction of macrophytes). Human activities (infrastructure, agriculture). Ecosystem change or habitat alteration Human health Threat to or loss of native species ⁸⁵	Aquaculture, Biological control, Live food & live bait, Pet, Hunting, Angling, Sports or racing ^{31,85}

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330 **Appendices:**

331

332 **APPENDIX I.** Invasive status and native regions of the 63 crustaceans farmed in aquaculture.

333 The majority of native region were found on SeaLifeBase⁸⁶.

334

335 **APPENDIX II.** Global distribution of the number of farmed crustaceans and invasive crustaceans farmed for
336 aquaculture for the 22 invasive farmed species. The rectangles shown at the centre bottom of this schematic map

337 represent the status of 43 regions (18 islands, 14 countries and 11 overseas territories) that are too small to be depicted.

338 Blue countries are those with no records of farmed crustacean invasion. The large number of countries with purple,

339 red or pink hues are those in which farmed species have become invasive because of aquaculture. Note that a species

340 can be invasive in a country even if it is not farmed within its borders. Consequently, a country may have invasive

341 species that exceed those farmed.

342

343 **APPENDIX III.** Species farming countries and status (native or non-native) of the 63 crustaceans farmed in

344 aquaculture.

345

346 **APPENDIX IV.** Invaded countries of the 22 invasive crustaceans farmed in aquaculture.

347 Countries where species are farmed and invasive are written in bold.

348

349 **APPENDIX V.** Classification of the 63 crustacean species farmed in aquaculture.

350 **Figure legends:**

351 **Figure 1** Species risk classification depending on the farming country (native or non-native) and invasive species status (invasive or
352 non-invasive) from lowest (A) to highest risk (D). The numbers in black in each category indicate the number of species involved from
353 the 63 crustaceans currently farmed for aquaculture. The colour gradient indicates the risk index.

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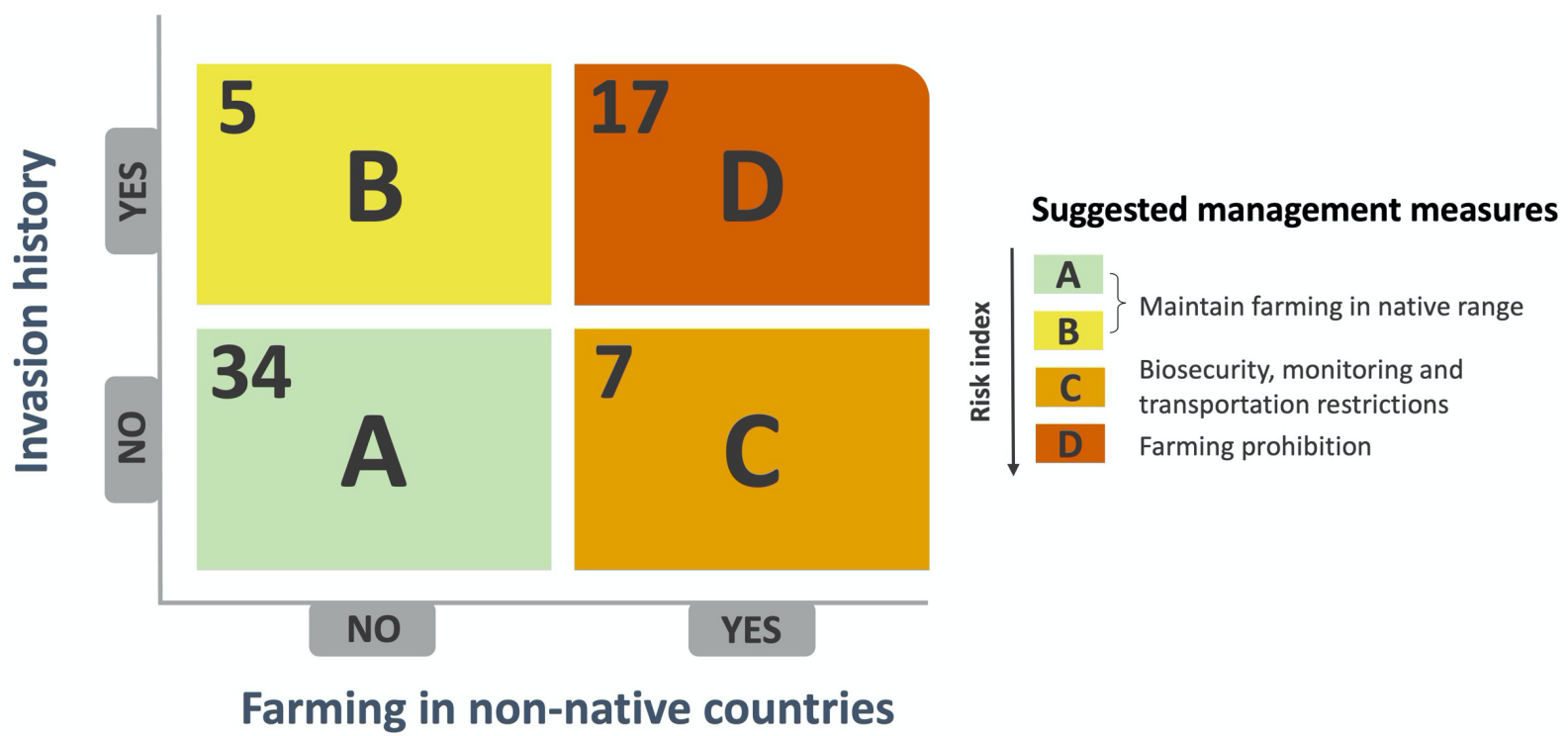
355 **Table legends:**

356 **Table 1** Overview of farming and invaded countries for the farmed crustacean species. Information related to farming encompasses all
357 farmed crustacean species (63 species), while data concerning invasion refers specifically to the 22 invasive farmed crustacean species.
358 Among these 22 invasive species, 14 have been documented as invasive in their farming countries.

359

360 **Table 2** Invasive crustaceans farmed in aquaculture.

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368 **Table 1**

		<u>Number of countries</u>	<u>Species concerned</u>
<u>Farming</u>	<i>Native farming only</i>	15	63 species
	<i>Non-native farming only</i>	64	
	<i>Native and non-native farming</i>	47	
	<i>Total farming countries</i>	126	
<u>Invasion</u>	<i>Total invaded countries</i>	77	22 species
	<i>Farmed and invaded</i>	30	14 species

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Species	Number of countries		Invasion mechanisms	Impacts	Introduction pathways
	Farmed	Invaded			
Brine shrimp <i>Artemia franciscana</i>	12	13	Competition ⁵³	Displacement of native species ⁵³	Aquaculture, Pet trade, Solar saltwork industry ⁵³
Blue crab <i>Callinectes sapidus</i>	1	8	Competition ⁵⁴	Native species Human activities (fishing, aquaculture) ⁵⁴	Ballast water ³¹ , Unknown ⁵⁵
European shore crab <i>Carcinus aestuarii</i>	1	1	Competition Predation ⁵⁶	Potential on benthic fauna of intertidal areas ⁵⁷	Ballast water ⁵⁶
European green crab <i>Carcinus maenas</i>	2	5	Competition Predation Herbivory/grazing/browsing Interaction with other invasive species ^{58,59}	Threat to or loss of native species: decline of native population (e.g., bivalves) Habitat disruption ⁵⁸ Altered trophic level Modified gene pool or selective loss of genotypes Ecosystem change or habitat alteration Modification of natural benthic communities Greater vulnerability to invasions Damaged ecosystem services Impact on agriculture, human health, livelihoods, aquaculture/fisheries ⁵⁹	Aquaculture, Live food & Live bait, Pet, Research, Habitat material contaminant, Ballast water, Hull fouling, Land vehicles ³¹
Smooth marron <i>Cherax cainii</i>	6	1	Competition Parasitism Disease transmission ^{60,61}	Impact on native species Habitat alteration ^{60,61}	Aquaculture ⁶¹
Common yabby <i>Cherax destructor</i>	5	2	Competition Predation Pest and disease transmission Herbivory/grazing/browsing ⁶²	Food web dynamic changes Habitat alteration Infrastructure damage Negative impact on agriculture Reduced native biodiversity Threat to or loss of endangered species Threat to or loss of native species ^{62,63}	Aquaculture, Fisheries, Live food & Feed trade, Hunting, Angling, Sport or racing, Pet trade, Research ⁶²
Red claw crayfish <i>Cherax quadricarinatus</i>	49	12	Competition Predation ⁹	Impact on native fauna: population decline, species replacement Trophic web alteration Ecosystem service disruption (fisheries, irrigation systems)	Aquaculture, Fisheries, Live food & Feed trade, Hunting, Angling, Pet trade, Research, Natural dispersal ⁶⁴
Chinese mitten crab <i>Eriocheir sinensis</i>	3	18	Competition Predation	Aquaculture/fisheries: predation including target species for commercial (agriculture, aquaculture, fisheries) and recreational fishing Infrastructure damage: greater riverbank erosion and clogging of commercial water intake Damaged ecosystem services Impacts on human health, livelihoods	Aquaculture, Hitchhiker, Interconnected waterways, Live food & Feed trade, Pets and aquariums trade, Ballast water, Hull fouling ⁶⁵

				Damaging aquatic food chain of freshwater and estuarine habitats Ecosystem change or habitat alteration: modification of hydrology Threat to or loss of native species ⁶⁵	
Spinycheek crayfish <i>Faxonius limosus</i>	5	21	Competition Pest and disease transmission Herbivory/grazing/browsing Hybridization Predation ^{66,67}	Threat to or loss of native species: reduced native biodiversity (native crayfish populations) Threat to or loss of endangered species Modified gene pool or selective loss of genotypes Impact on native habitats Impact on fish community Decreased food resources and thus mollusc and amphibian occurrences Altered trophic levels Greater vulnerability to invasions Modification of hydrology Modification of natural benthic communities Ecosystem change or habitat alteration Infrastructure damage (destabilized riverbanks) Damaged ecosystem services Negative impact on aquaculture/fisheries ^{66,67}	Aquaculture, Aquarium trade, Fisheries, Hitchhiker, Hunting, Angling, Sports or racing, Live food & Live bait, Pet, Fishing equipment, Canal and artificial waterways ⁶⁷
Tahitian prawn <i>Macrobrachium lar</i>	2	3	Predation ⁶⁸	Displacing native species	Aquaculture ⁶⁸
Tahitian prawn <i>Macrobrachium nipponense</i>	5	2	Predation ⁶⁹ Competition ⁷⁰ Possible disease transmission ⁷¹	Displacing native species ⁷⁰	Aquaculture ²⁹
Giant river prawn <i>Macrobrachium rosenbergii</i>	53	7	Possible disease transmission Interbreeding with local species ⁷²	Displacement of native species	Aquaculture ^{30,72}
Brown shrimp <i>Metapenaeus monoceros</i>	1	2		Displacement of native species ⁷³	Suez Canal ⁷³
Signal crayfish <i>Pacifastacus leniusculus</i>	5	20	Competition Pest and disease transmission Predation ⁷⁴⁻⁷⁶	Modification of natural benthic communities Reduced native biodiversity Threat to or loss of native species (decline of native species <i>Austropotamobius pallipes</i>) ⁷⁶	Aquaculture, Stocking ^{31,76}
Northern Brown Shrimp <i>Penaeus aztecus</i>	1	2	Disease transmission ⁷⁷	Potential disease transmission for native species ⁷⁷	Aquaculture, Ballast water ⁷⁷

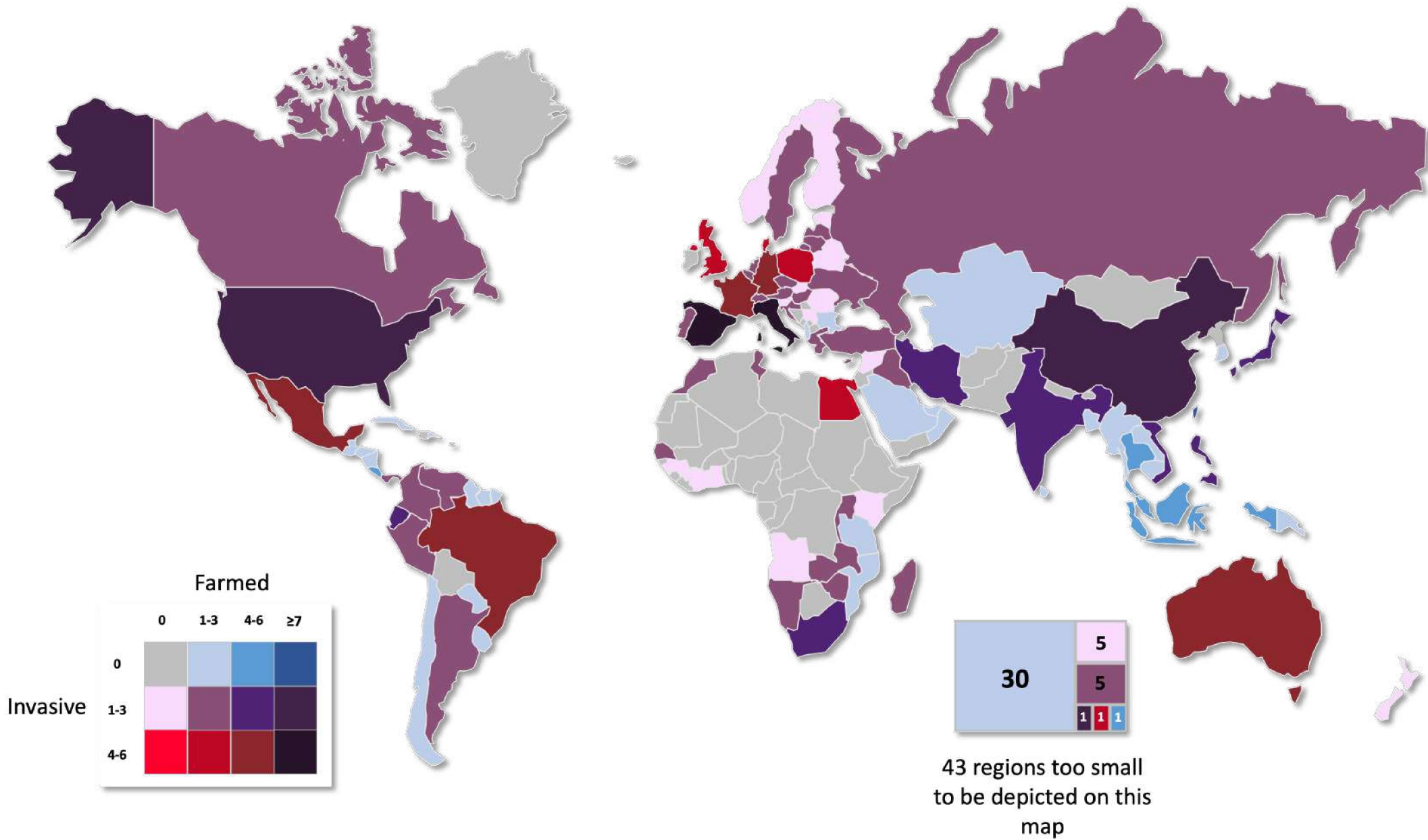
Japanese king prawn <i>Penaeus japonicus</i>	17	4	Competition	Outcompeted native penaeid shrimp <i>Melicertus kerathurus</i> ⁷⁸	Aquaculture ⁷⁸
Tiger prawn <i>Penaeus monodon</i>	32	8	Competition Herbivory Parasitism ^{79,80}	Threatened native species Modification of natural benthic communities Modification of nutrient regime Impacts on aquaculture and fisheries	Aquaculture, Breeding, Food, Research, Smuggling, Stocking ⁸⁰
Green tiger prawn <i>Penaeus semisulcatus</i>	4	2	Disease transmission to Human ⁸¹	Human health ⁸¹	Aquaculture ⁸¹
Whiteleg shrimp <i>Penaeus vannamei</i>	54	3	Pest and disease transmission Competition for habitat and food ^{80,82}	Modified gene pool or selective loss of genotypes Modification of natural benthic communities Modification of nutrient regime Negative impact on aquaculture/fisheries Threat to or loss of native species ⁸⁰	Aquaculture, Food, Research, Smuggling, Stocking, Breeding ⁸²
Narrow-clawed crayfish <i>Pontastacus leptodactylus</i>	17	5	Competition ⁸³	Decline of the noble crayfish (<i>Astacus astacus</i>) in Eastern Europe ⁸³	Aquaculture, Fisheries ⁸³
Blue crab <i>Portunus pelagicus</i>	2	5	Competition Pest and disease transmission Predation ⁸⁴	Altered trophic level Modification of natural benthic communities Reduced native biodiversity Threat to or loss of native species ⁸⁴	Aquaculture, Interbasin transfers, Interconnected waterways ⁸⁴
Red swamp crayfish <i>Procambarus clarkii</i>	11	25	Competition Predation on insects and molluscs Disease transmission ⁸⁵	Reduced resources available for native species (e.g. destruction of macrophytes). Human activities (infrastructure, agriculture). Ecosystem change or habitat alteration Human health Threat to or loss of native species ⁸⁵	Aquaculture, Biological control, Live food & live bait, Pet, Hunting, Angling, Sports or racing ^{31,85}

<i>Scientific name</i>	<i>Status</i>	<i>Native region</i>	<i>Environment</i>
<i>Acetes indicus</i>	Non invasive	Indo-West Pacific	Brackish water
<i>Acetes japonicus</i>	Non invasive	Indo-West Pacific	Brackish water
<i>Artemia franciscana</i>	Invasive	North and Central America ⁵⁸	Brackish water
<i>Artemia salina</i>	Non invasive	South Europe	Brackish water
<i>Astacus astacus</i>	Non invasive	North Europe	Freshwater
<i>Callinectes sapidus</i>	Invasive	Western Atlantic: From Nova Scotia to Rio de la Plata, Argentina	Brackish water
<i>Carcinus aestuarii</i>	Invasive	Eastern Atlantic, Mediterranean Sea, Black Sea, and Sea of Azov	Brackish water
<i>Carcinus maenas</i>	Invasive	Eastern Atlantic coast: from Great Britain to Iceland, North Sea and Norway, south to Portugal and Spain to Mauritania	Marine
<i>Cherax cainii</i>	Invasive	Southern Australia ⁶⁶	Freshwater
<i>Cherax destructor</i>	Invasive	Inland waters of central and eastern Australia and some coastal drainage regions of Victoria and New South Wales ⁶⁷	Freshwater
<i>Cherax quadricarinatus</i>	Invasive	Northeastern Australia and southern New Guinea ⁹²	Freshwater
<i>Eriocheir sinensis</i>	Invasive	Northwest Pacific: native from Valdivostok Russia to the west coast of North Korea South to Hong Kong, China	Freshwater
<i>Faxonius limosus</i>	Invasive	United States and Canada ¹³	Freshwater
<i>Macrobrachium lanchesteri</i>	Non invasive	Southern Asia: Thailand	Freshwater
<i>Macrobrachium lar</i>	Invasive	East Africa to the Ryukyu Islands and the Marquesas. Australia, French Polynesia, Guam, Indonesia, Japan, Kenya, Madagascar, Malaysia, Mauritius, Mozambique, New Caledonia, Northern	Freshwater

		Mariana Islands, Papua New Guinea, Philippines, Taiwan, China, Tanzania ⁹³	
<i>Macrobrachium malcolmsonii</i>	Non invasive	Asia	Freshwater
<i>Macrobrachium nipponense</i>	Invasive	Southeast Asia: mainland China, Japan, Korea, Myanmar, and Taiwan ³¹	Brackish water & Freshwater
<i>Macrobrachium rosenbergii</i>	Invasive	Philippines (including Palawan), Lesser Sunda Islands, New Guinea and northern Australia ⁷⁷	Marine
<i>Maja squinado</i>	Non invasive	Mediterranean Sea	Marine
<i>Metapenaeopsis novaeguineae</i>	Non invasive	Western Central Pacific	Brackish water & Marine
<i>Metapenaeus brevicornis</i>	Non invasive	Indo-West Pacific	Brackish water & Marine
<i>Metapenaeus ensis</i>	Non invasive	Indo-West Pacific	Brackish water & Marine
<i>Metapenaeus macleayi</i>	Non invasive	West Pacific	Brackish water & Marine
<i>Metapenaeus monoceros</i>	Invasive	Indo-West Pacific and Southern Atlantic	Brackish water & Marine
<i>Metapenaeus moyebi</i>	Non invasive	Indo-West Pacific	Freshwater
<i>Neocaridina denticulata</i>	Non invasive	Asia	Freshwater
<i>Pacifastacus leniusculus</i>	Invasive	Northwest United States ⁹⁴	Freshwater
<i>Palaemon adspersus</i>	Non invasive	Northeast Atlantic	Brackishwater & Marine
<i>Palaemon paucidens</i>	Non invasive	Northwest Pacific	Freshwater
<i>Palaemon serratus</i>	Non invasive	East Atlantic	Brackishwater & Marine
<i>Palaemon varians</i>	Non invasive	Northeast Atlantic	Brackishwater & Marine
<i>Panulirus argus</i>	Non invasive	West Pacific	Marine
<i>Panulirus homarus</i>	Non invasive	Indo Pacific	Marine

<i>Panulirus japonicus</i>	Non invasive	India, Taiwan, Fiji	Marine
<i>Panulirus longipes</i>	Non invasive	Indo Pacific	Marine
<i>Panulirus ornatus</i>	Non invasive	Indo-West Pacific	Marine
<i>Panulirus polyphagus</i>	Non invasive	Indo-West Pacific	Brackishwater
<i>Panulirus stimpsoni</i>	Non invasive	Indo-West Pacific	Marine
<i>Penaeus aztecus</i>	Invasive	Western Atlantic Ocean	Marine
<i>Penaeus chinensis</i>	Non invasive	Northwest Pacific	Brackishwater & Marine
<i>Penaeus esculentus</i>	Non invasive	Australia	Brackishwater & Marine
<i>Penaeus indicus</i>	Non invasive	Indo-West Pacific	Brackishwater
<i>Penaeus japonicus</i>	Invasive	Indo-West Pacific	Brackishwater & Marine
<i>Penaeus kerathurus</i>	Non invasive	East Atlantic	Brackishwater & Marine
<i>Penaeus marginatus</i>	Non invasive	Indo-Pacific	Marine
<i>Penaeus merguensis</i>	Non invasive	Indo-West Pacific	Brackishwater & Marine
<i>Penaeus monodon</i>	Invasive	Indo-West Pacific, from the east coast of Africa, Arabian Peninsula, Southeast Asia, Taiwan, China, Sea of Japan, New Guinea and Northern Australia ⁸⁵	Brackishwater & Marine
<i>Penaeus penicillatus</i>	Non invasive	Indo-West Pacific	Brackishwater & Marine
<i>Penaeus plebejus</i>	Non invasive	Australia	Brackishwater & Marine
<i>Penaeus schmitti</i>	Non invasive	Southeast Pacific and West Atlantic	Brackishwater & Marine
<i>Penaeus semisulcatus</i>	Invasive	Indo-West Pacific and the Mediterranean	Brackishwater & Marine
<i>Penaeus setiferus</i>	Non invasive	Western Atlantic	Brackishwater & Marine

<i>Penaeus stylirostris</i>	Non invasive	East Pacific	Marine
<i>Penaeus vannamei</i>	Invasive	Tropical East Pacific from the Gulf of California, Mexico to northern Peru	Marine
<i>Pontastacus leptodactylus</i>	Invasive	Ponto-Caspian	Brackishwater & Freshwater
<i>Portunus pelagicus</i>	Invasive	China, Japan and Korea to Philippines and westwards to the Straits of Malacca, also present in the Northern Territory, Australia	Brackishwater & Marine
<i>Portunus trituberculatus</i>	Non invasive	Indo-West Pacific	Marine
<i>Procambarus clarkii</i>	Invasive	Northeastern Mexico and south-central USA from Texas Eastward to Western Florida and Northward through the Mississippi River valley into Southern Illinois ⁹⁰	Brackishwater & Freshwater
<i>Scylla olivacea</i>	Non invasive	Indo-West Pacific	Brackishwater
<i>Scylla paramamosain</i>	Non invasive	Indo-West Pacific	Brackishwater
<i>Scylla serrata</i>	Non invasive	Indo-West Pacific	Brackishwater & Marine
<i>Scyllarides squammosus</i>	Non invasive	Indo Pacific	Marine
<i>Thenus orientalis</i>	Non invasive	Indo-West Pacific	Marine



<i>Scientific name</i>	<i>Farmed country</i>	<i>Farming status</i>
<i>Acetes indicus</i>	Indonesia	Native
<i>Acetes japonicus</i>	Indonesia	Native
<i>Artemia franciscana</i>	Argentina	Non-native
<i>Artemia franciscana</i>	Brazil	Non-native
<i>Artemia franciscana</i>	China	Non-native
<i>Artemia franciscana</i>	Croatia	Non-native
<i>Artemia franciscana</i>	India	Non-native
<i>Artemia franciscana</i>	Irak	Non-native
<i>Artemia franciscana</i>	Kazakhstan	Non-native
<i>Artemia franciscana</i>	Russia	Non-native
<i>Artemia franciscana</i>	Thailand	Non-native
<i>Artemia franciscana</i>	United States of America	Native
<i>Artemia franciscana</i>	Uzbekistan	Non-native
<i>Artemia franciscana</i>	Viet Nam	Non-native
<i>Artemia salina</i>	Australia	Non-native
<i>Artemia salina</i>	Bahamas	Non-native
<i>Artemia salina</i>	Madagascar	Non-native
<i>Artemia salina</i>	Peru	Non-native
<i>Astacus astacus</i>	Bulgaria	Native
<i>Astacus astacus</i>	Denmark	Native
<i>Astacus astacus</i>	Estonia	Native
<i>Astacus astacus</i>	France	Native
<i>Astacus astacus</i>	Romania	Native
<i>Astacus astacus</i>	Ukraine	Native
<i>Callinectes sapidus</i>	United States of America	Native
<i>Carcinus aestuarii</i>	Greece	Native
<i>Carcinus maenas</i>	Canada	Non-native
<i>Carcinus maenas</i>	Spain	Native
<i>Cherax cainii</i>	Australia	Native
<i>Cherax cainii</i>	China	Non-native
<i>Cherax cainii</i>	Japan	Non-native
<i>Cherax cainii</i>	South Africa	Non-native
<i>Cherax cainii</i>	United States of America	Non-native
<i>Cherax cainii</i>	Zimbabwe	Non-native
<i>Cherax destructor</i>	Australia	Non-native
<i>Cherax destructor</i>	Italy	Non-native

<i>Cherax destructor</i>	Samoa	Non-native
<i>Cherax destructor</i>	Singapore	Non-native
<i>Cherax destructor</i>	Spain	Non-native
<i>Cherax quadricarinatus</i>	Argentina	Non-native
<i>Cherax quadricarinatus</i>	Australia	Non-native
<i>Cherax quadricarinatus</i>	Bahamas	Non-native
<i>Cherax quadricarinatus</i>	Barbados	Non-native
<i>Cherax quadricarinatus</i>	Belgium	Non-native
<i>Cherax quadricarinatus</i>	Belize	Non-native
<i>Cherax quadricarinatus</i>	Cambodia	Non-native
<i>Cherax quadricarinatus</i>	Chile	Non-native
<i>Cherax quadricarinatus</i>	China	Non-native
<i>Cherax quadricarinatus</i>	Colombia	Non-native
<i>Cherax quadricarinatus</i>	Costa Rica	Non-native
<i>Cherax quadricarinatus</i>	Cuba	Non-native
<i>Cherax quadricarinatus</i>	Ecuador	Non-native
<i>Cherax quadricarinatus</i>	Fiji	Non-native
<i>Cherax quadricarinatus</i>	Germany	Non-native
<i>Cherax quadricarinatus</i>	Guatemala	Non-native
<i>Cherax quadricarinatus</i>	Honduras	Non-native
<i>Cherax quadricarinatus</i>	India	Non-native
<i>Cherax quadricarinatus</i>	Indonesia	Non-native
<i>Cherax quadricarinatus</i>	Israel	Non-native
<i>Cherax quadricarinatus</i>	Italy	Non-native
<i>Cherax quadricarinatus</i>	Jamaica	Non-native
<i>Cherax quadricarinatus</i>	Japan	Non-native
<i>Cherax quadricarinatus</i>	Laos	Non-native
<i>Cherax quadricarinatus</i>	Malaysia	Non-native
<i>Cherax quadricarinatus</i>	Martinique	Non-native
<i>Cherax quadricarinatus</i>	Mauritius	Non-native
<i>Cherax quadricarinatus</i>	Mexico	Non-native
<i>Cherax quadricarinatus</i>	Morocco	Non-native
<i>Cherax quadricarinatus</i>	Namibia	Non-native
<i>Cherax quadricarinatus</i>	New Caledonia	Non-native
<i>Cherax quadricarinatus</i>	Paraguay	Non-native
<i>Cherax quadricarinatus</i>	Peru	Non-native
<i>Cherax quadricarinatus</i>	Philippines	Non-native
<i>Cherax quadricarinatus</i>	Poland	Non-native

<i>Cherax quadricarinatus</i>	Puerto Rico	Non-native
<i>Cherax quadricarinatus</i>	Réunion	Non-native
<i>Cherax quadricarinatus</i>	Russia	Non-native
<i>Cherax quadricarinatus</i>	Samoa	Non-native
<i>Cherax quadricarinatus</i>	South Africa	Non-native
<i>Cherax quadricarinatus</i>	Spain	Non-native
<i>Cherax quadricarinatus</i>	Swazilana	Non-native
<i>Cherax quadricarinatus</i>	Taiwan Province of China	Non-native
<i>Cherax quadricarinatus</i>	Thailand	Non-native
<i>Cherax quadricarinatus</i>	Trinidad and Tobago	Non-native
<i>Cherax quadricarinatus</i>	United States of America	Non-native
<i>Cherax quadricarinatus</i>	Uruguay	Non-native
<i>Cherax quadricarinatus</i>	Viet Nam	Non-native
<i>Cherax quadricarinatus</i>	Zambia	Non-native
<i>Eriocheir sinensis</i>	China	Native
<i>Eriocheir sinensis</i>	Korea, Republic of	Native
<i>Eriocheir sinensis</i>	Taiwan Province of China	Native
<i>Faxonius limosus</i>	Austria	Non-native
<i>Faxonius limosus</i>	France	Non-native
<i>Faxonius limosus</i>	Germany	Non-native
<i>Faxonius limosus</i>	Hungary	Native
<i>Faxonius limosus</i>	Poland	Native
<i>Macrobrachium lanchesteri</i>	Taiwan Province of China	Native
<i>Macrobrachium lar</i>	Hawaii	Native
<i>Macrobrachium lar</i>	Vanuatu	Non-native
<i>Macrobrachium malcolmsonii</i>	India	Native
<i>Macrobrachium malcolmsonii</i>	Pakistan	Native
<i>Macrobrachium nipponense</i>	China	Native
<i>Macrobrachium nipponense</i>	Irak	Non-native
<i>Macrobrachium nipponense</i>	Iran	Non-native
<i>Macrobrachium nipponense</i>	Ukraine	Non-native
<i>Macrobrachium nipponense</i>	Viet Nam	Native
<i>Macrobrachium rosenbergii</i>	Argentina	Non-native
<i>Macrobrachium rosenbergii</i>	Bangladesh	Non-native
<i>Macrobrachium rosenbergii</i>	Brazil	Non-native
<i>Macrobrachium rosenbergii</i>	Brunei Darussalam	Native

<i>Macrobrachium rosenbergii</i>	Cambodia	Non-native
<i>Macrobrachium rosenbergii</i>	China	Non-native
<i>Macrobrachium rosenbergii</i>	Colombia	Non-native
<i>Macrobrachium rosenbergii</i>	Costa Rica	Non-native
<i>Macrobrachium rosenbergii</i>	Dominican Republic	Non-native
<i>Macrobrachium rosenbergii</i>	Ecuador	Non-native
<i>Macrobrachium rosenbergii</i>	El Salvador	Non-native
<i>Macrobrachium rosenbergii</i>	Fiji	Non-native
<i>Macrobrachium rosenbergii</i>	French Guiana	Non-native
<i>Macrobrachium rosenbergii</i>	French Polynesia	Non-native
<i>Macrobrachium rosenbergii</i>	Grenada	Non-native
<i>Macrobrachium rosenbergii</i>	Guadeloupe	Non-native
<i>Macrobrachium rosenbergii</i>	Guam	Non-native
<i>Macrobrachium rosenbergii</i>	Guatemala	Non-native
<i>Macrobrachium rosenbergii</i>	Guyana	Non-native
<i>Macrobrachium rosenbergii</i>	Honduras	Non-native
<i>Macrobrachium rosenbergii</i>	India	Non-native
<i>Macrobrachium rosenbergii</i>	Indonesia	Native
<i>Macrobrachium rosenbergii</i>	Iran	Non-native
<i>Macrobrachium rosenbergii</i>	Israel	Non-native
<i>Macrobrachium rosenbergii</i>	Jamaica	Non-native
<i>Macrobrachium rosenbergii</i>	Malawi	Non-native
<i>Macrobrachium rosenbergii</i>	Malaysia	Non-native
<i>Macrobrachium rosenbergii</i>	Martinique	Non-native
<i>Macrobrachium rosenbergii</i>	Mauritius	Non-native
<i>Macrobrachium rosenbergii</i>	Mexico	Non-native
<i>Macrobrachium rosenbergii</i>	Myanmar	Non-native
<i>Macrobrachium rosenbergii</i>	New Caledonia	Non-native
<i>Macrobrachium rosenbergii</i>	Panama	Non-native
<i>Macrobrachium rosenbergii</i>	Paraguay	Non-native
<i>Macrobrachium rosenbergii</i>	Peru	Non-native
<i>Macrobrachium rosenbergii</i>	Philippines	Native
<i>Macrobrachium rosenbergii</i>	Puerto Rico	Non-native
<i>Macrobrachium rosenbergii</i>	Réunion	Non-native
<i>Macrobrachium rosenbergii</i>	Saint Lucia	Non-native
<i>Macrobrachium rosenbergii</i>	Senegal	Non-native
<i>Macrobrachium rosenbergii</i>	Singapore	Non-native
<i>Macrobrachium rosenbergii</i>	Solomon Islands	Non-native

<i>Macrobrachium rosenbergii</i>	Sri Lanka	Non-native
<i>Macrobrachium rosenbergii</i>	Suriname	Non-native
<i>Macrobrachium rosenbergii</i>	Taiwan Province of China	Non-native
<i>Macrobrachium rosenbergii</i>	Thailand	Non-native
<i>Macrobrachium rosenbergii</i>	Trinidad and Tobago	Non-native
<i>Macrobrachium rosenbergii</i>	Uganda	Non-native
<i>Macrobrachium rosenbergii</i>	United States of America	Non-native
<i>Macrobrachium rosenbergii</i>	Vanuatu	Non-native
<i>Macrobrachium rosenbergii</i>	Venezuela	Non-native
<i>Macrobrachium rosenbergii</i>	Viet Nam	Non-native
<i>Macrobrachium rosenbergii</i>	Zimbabwe	Non-native
<i>Maja squinado</i>	Spain	Native
<i>Metapenaeopsis novaeguineae</i>	Indonesia	Native
<i>Metapenaeus brevicornis</i>	Indonesia	Native
<i>Metapenaeus brevicornis</i>	Malaysia	Native
<i>Metapenaeus brevicornis</i>	Indonesia	Native
<i>Metapenaeus ensis</i>	Taiwan Province of China	Native
<i>Metapenaeus macleayi</i>	Australia	Native
<i>Metapenaeus monoceros</i>	Bangladesh	Native
<i>Metapenaeus moyebi</i>	Malaysia	Native
<i>Metapenaeus moyebi</i>	Singapore	Native
<i>Neocaridina denticulata</i>	Korea, Republic of	Native
<i>Pacifastacus leniusculus</i>	France	Non-native
<i>Pacifastacus leniusculus</i>	Japan	Non-native
<i>Pacifastacus leniusculus</i>	Spain	Non-native
<i>Pacifastacus leniusculus</i>	Sweden	Non-native
<i>Pacifastacus leniusculus</i>	United Kingdom	Non-native
<i>Palaemon adspersus</i>	Ukraine	Native
<i>Palaemon paucidens</i>	Indonesia	Non-native
<i>Palaemon serratus</i>	Italy	Native
<i>Palaemon serratus</i>	Jamaica	Non-native
<i>Palaemon serratus</i>	Spain	Native
<i>Palaemon varians</i>	Portugal	Native
<i>Palaemon varians</i>	Spain	Native
<i>Panulirus argus</i>	Bahamas	Non-native
<i>Panulirus argus</i>	British Virgin Islands	Non-native

<i>Panulirus homarus</i>	Indonesia	Native
<i>Panulirus japonicus</i>	Taiwan Province of China	Native
<i>Panulirus longipes</i>	Indonesia	Native
<i>Panulirus ornatus</i>	Viet Nam	Native
<i>Panulirus polyphagus</i>	Myanmar	Native
<i>Panulirus polyphagus</i>	Singapore	Native
<i>Panulirus stimpsoni</i>	China	Native
<i>Panulirus stimpsoni</i>	Viet Nam	Native
<i>Penaeus aztecus</i>	Egypt	Non-native
<i>Penaeus chinensis</i>	China	Native
<i>Penaeus chinensis</i>	Korea, Republic of	Native
<i>Penaeus esculentus</i>	Australia	Native
<i>Penaeus indicus</i>	Bangladesh	Native
<i>Penaeus indicus</i>	Cyprus	Non-native
<i>Penaeus indicus</i>	India	Native
<i>Penaeus indicus</i>	Iran	Native
<i>Penaeus indicus</i>	Mozambique	Native
<i>Penaeus indicus</i>	Oman	Native
<i>Penaeus indicus</i>	Saudi Arabia	Native
<i>Penaeus indicus</i>	South Africa	Non-native
<i>Penaeus indicus</i>	United Arab Emirates	Native
<i>Penaeus indicus</i>	Viet Nam	Native
<i>Penaeus indicus</i>	Yemen	Native
<i>Penaeus japonicus</i>	Albania	Non-native
<i>Penaeus japonicus</i>	Australia	Non-native
<i>Penaeus japonicus</i>	Brazil	Non-native
<i>Penaeus japonicus</i>	China	Native
<i>Penaeus japonicus</i>	Cyprus	Non-native
<i>Penaeus japonicus</i>	Fiji	Non-native
<i>Penaeus japonicus</i>	France	Non-native
<i>Penaeus japonicus</i>	French Polynesia	Non-native
<i>Penaeus japonicus</i>	Greece	Non-native
<i>Penaeus japonicus</i>	Italy	Non-native
<i>Penaeus japonicus</i>	Japan	Native
<i>Penaeus japonicus</i>	Korea, Republic of	Native
<i>Penaeus japonicus</i>	Portugal	Non-native
<i>Penaeus japonicus</i>	Singapore	Native

<i>Penaeus japonicus</i>	South Africa	Non-native
<i>Penaeus japonicus</i>	Spain	Non-native
<i>Penaeus japonicus</i>	Taiwan Province of China	Native
<i>Penaeus kerathurus</i>	Algeria	Native
<i>Penaeus kerathurus</i>	Spain	Native
<i>Penaeus marginatus</i>	Taiwan Province of China	Native
<i>Penaeus merguensis</i>	Guam	Non-native
<i>Penaeus merguensis</i>	Indonesia	Native
<i>Penaeus merguensis</i>	Malaysia	Native
<i>Penaeus merguensis</i>	Philippines	Non-native
<i>Penaeus merguensis</i>	Singapore	Native
<i>Penaeus merguensis</i>	Thailand	Native
<i>Penaeus merguensis</i>	Viet Nam	Native
<i>Penaeus monodon</i>	Australia	Native
<i>Penaeus monodon</i>	Bangladesh	Native
<i>Penaeus monodon</i>	Brazil	Non-native
<i>Penaeus monodon</i>	Brunei Darussalam	Native
<i>Penaeus monodon</i>	China	Native
<i>Penaeus monodon</i>	Cook Islands	Non-native
<i>Penaeus monodon</i>	Fiji	Non-native
<i>Penaeus monodon</i>	Ghana	Non-native
<i>Penaeus monodon</i>	Greece	Non-native
<i>Penaeus monodon</i>	India	Native
<i>Penaeus monodon</i>	Indonesia	Native
<i>Penaeus monodon</i>	Italy	Non-native
<i>Penaeus monodon</i>	Madagascar	Native
<i>Penaeus monodon</i>	Malaysia	Native
<i>Penaeus monodon</i>	Mauritius	Native
<i>Penaeus monodon</i>	Mozambique	Native
<i>Penaeus monodon</i>	Myanmar	Native
<i>Penaeus monodon</i>	Papua New Guinea	Native
<i>Penaeus monodon</i>	Philippines	Non-native
<i>Penaeus monodon</i>	Saudi Arabia	Native
<i>Penaeus monodon</i>	Seychelles	Native
<i>Penaeus monodon</i>	Singapore	Native
<i>Penaeus monodon</i>	Solomon Islands	Native
<i>Penaeus monodon</i>	South Africa	Native

<i>Penaeus monodon</i>	Spain	Non-native
<i>Penaeus monodon</i>	Sri Lanka	Native
<i>Penaeus monodon</i>	Taiwan Province of China	Native
<i>Penaeus monodon</i>	Tanzania, United Rep. of	Native
<i>Penaeus monodon</i>	Thailand	Native
<i>Penaeus monodon</i>	United Arab Emirates	Native
<i>Penaeus monodon</i>	Venezuela	Non-native
<i>Penaeus monodon</i>	Viet Nam	Native
<i>Penaeus penicillatus</i>	Taiwan Province of China	Native
<i>Penaeus plebejus</i>	Australia	Native
<i>Penaeus schmitti</i>	Cuba	Native
<i>Penaeus semisulcatus</i>	Israel	Non-native
<i>Penaeus semisulcatus</i>	Italy	Native
<i>Penaeus semisulcatus</i>	Oman	Native
<i>Penaeus semisulcatus</i>	United Arab Emirates	Native
<i>Penaeus setiferus</i>	United States of America	Native
<i>Penaeus stylirostris</i>	Brunei Darussalam	Non-native
<i>Penaeus stylirostris</i>	Ecuador	Native
<i>Penaeus stylirostris</i>	El Salvador	Native
<i>Penaeus stylirostris</i>	Fiji	Non-native
<i>Penaeus stylirostris</i>	French Polynesia	Non-native
<i>Penaeus stylirostris</i>	Indonesia	Non-native
<i>Penaeus stylirostris</i>	New Caledonia	Non-native
<i>Penaeus stylirostris</i>	Nicaragua	Native
<i>Penaeus stylirostris</i>	Panama	Native
<i>Penaeus stylirostris</i>	Vanuatu	Non-native
<i>Penaeus stylirostris</i>	Venezuela	Non-native
<i>Penaeus vannamei</i>	Austria	Non-native
<i>Penaeus vannamei</i>	Bahamas	Non-native
<i>Penaeus vannamei</i>	Belize	Non-native
<i>Penaeus vannamei</i>	Brazil	Non-native
<i>Penaeus vannamei</i>	Brunei Darussalam	Non-native
<i>Penaeus vannamei</i>	Bulgaria	Non-native
<i>Penaeus vannamei</i>	Cabo Verde	Non-native
<i>Penaeus vannamei</i>	China	Non-native
<i>Penaeus vannamei</i>	Colombia	Native
<i>Penaeus vannamei</i>	Costa Rica	Native

<i>Penaeus vannamei</i>	Cuba	Non-native
<i>Penaeus vannamei</i>	Dominican Republic	Non-native
<i>Penaeus vannamei</i>	Ecuador	Native
<i>Penaeus vannamei</i>	Egypt	Non-native
<i>Penaeus vannamei</i>	El Salvador	Native
<i>Penaeus vannamei</i>	Germany	Non-native
<i>Penaeus vannamei</i>	Guam	Non-native
<i>Penaeus vannamei</i>	Guatemala	Native
<i>Penaeus vannamei</i>	Hawaii	Non-native
<i>Penaeus vannamei</i>	Honduras	Native
<i>Penaeus vannamei</i>	India	Non-native
<i>Penaeus vannamei</i>	Indonesia	Non-native
<i>Penaeus vannamei</i>	Iran	Non-native
<i>Penaeus vannamei</i>	Jamaica	Non-native
<i>Penaeus vannamei</i>	Korea, Republic of	Non-native
<i>Penaeus vannamei</i>	Lebanon	Non-native
<i>Penaeus vannamei</i>	Lithuania	Non-native
<i>Penaeus vannamei</i>	Malaysia	Non-native
<i>Penaeus vannamei</i>	Mexico	Native
<i>Penaeus vannamei</i>	Myanmar	Non-native
<i>Penaeus vannamei</i>	Nicaragua	Native
<i>Penaeus vannamei</i>	Northern Mariana Is.	Non-native
<i>Penaeus vannamei</i>	Panama	Native
<i>Penaeus vannamei</i>	Peru	Native
<i>Penaeus vannamei</i>	Philippines	Non-native
<i>Penaeus vannamei</i>	Qatar	Non-native
<i>Penaeus vannamei</i>	Saint Kitts and Nevis	Non-native
<i>Penaeus vannamei</i>	Saudi Arabia	Non-native
<i>Penaeus vannamei</i>	Singapore	Non-native
<i>Penaeus vannamei</i>	South Africa	Non-native
<i>Penaeus vannamei</i>	Spain	Non-native
<i>Penaeus vannamei</i>	Sri Lanka	Non-native
<i>Penaeus vannamei</i>	Suriname	Non-native
<i>Penaeus vannamei</i>	Switzerland	Non-native
<i>Penaeus vannamei</i>	Taiwan Province of China	Non-native
<i>Penaeus vannamei</i>	Thailand	Non-native
<i>Penaeus vannamei</i>	Timor-Leste	Non-native
<i>Penaeus vannamei</i>	Tunisia	Non-native

<i>Penaeus vannamei</i>	Turkey	Non-native
<i>Penaeus vannamei</i>	United Kingdom	Non-native
<i>Penaeus vannamei</i>	United States of America	Non-native
<i>Penaeus vannamei</i>	Vanuatu	Non-native
<i>Penaeus vannamei</i>	Venezuela	Non-native
<i>Penaeus vannamei</i>	Viet Nam	Non-native
<i>Pontastacus leptodactylus</i>	Armenia	Native
<i>Pontastacus leptodactylus</i>	Belgium	Non-native
<i>Pontastacus leptodactylus</i>	Bulgaria	Native
<i>Pontastacus leptodactylus</i>	Czech Republic	Non-native
<i>Pontastacus leptodactylus</i>	Denmark	Non-native
<i>Pontastacus leptodactylus</i>	France	Non-native
<i>Pontastacus leptodactylus</i>	Germany	Non-native
<i>Pontastacus leptodactylus</i>	Iran	Native
<i>Pontastacus leptodactylus</i>	Italy	Non-native
<i>Pontastacus leptodactylus</i>	Latvia	Non-native
<i>Pontastacus leptodactylus</i>	Lithuania	Non-native
<i>Pontastacus leptodactylus</i>	Moldova, Republic of	Native
<i>Pontastacus leptodactylus</i>	Netherlands	Non-native
<i>Pontastacus leptodactylus</i>	Poland	Non-native
<i>Pontastacus leptodactylus</i>	Spain	Non-native
<i>Pontastacus leptodactylus</i>	Switzerland	Non-native
<i>Pontastacus leptodactylus</i>	United Kingdom	Non-native
<i>Portunus pelagicus</i>	Singapore	Native
<i>Portunus pelagicus</i>	Taiwan Province of China	Native
<i>Portunus trituberculatus</i>	Japan	Native
<i>Procambarus clarkii</i>	China	Non-native
<i>Procambarus clarkii</i>	Costa Rica	Non-native
<i>Procambarus clarkii</i>	Dominican Republic	Non-native
<i>Procambarus clarkii</i>	Ecuador	Non-native
<i>Procambarus clarkii</i>	Italy	Non-native
<i>Procambarus clarkii</i>	Mexico	Non-native
<i>Procambarus clarkii</i>	Panama	Non-native
<i>Procambarus clarkii</i>	Spain	Non-native
<i>Procambarus clarkii</i>	United States of America	Native
<i>Procambarus clarkii</i>	Zambia	Non-native
<i>Procambarus clarkii</i>	Zimbabwe	Non-native

<i>Scylla olivacea</i>	Bangladesh	Native
<i>Scylla olivacea</i>	India	Native
<i>Scylla olivacea</i>	Indonesia	Native
<i>Scylla olivacea</i>	Myanmar	Native
<i>Scylla paramamosain</i>	China	Native
<i>Scylla serrata</i>	Australia	Native
<i>Scylla serrata</i>	Brunei Darussalam	Native
<i>Scylla serrata</i>	Cambodia	Native
<i>Scylla serrata</i>	Fiji	Native
<i>Scylla serrata</i>	Indonesia	Native
<i>Scylla serrata</i>	Madagascar	Native
<i>Scylla serrata</i>	Malaysia	Native
<i>Scylla serrata</i>	Mauritius	Native
<i>Scylla serrata</i>	Myanmar	Native
<i>Scylla serrata</i>	Papua New Guinea	Native
<i>Scylla serrata</i>	Philippines	Native
<i>Scylla serrata</i>	Samoa	Native
<i>Scylla serrata</i>	Singapore	Native
<i>Scylla serrata</i>	Sri Lanka	Native
<i>Scylla serrata</i>	Taiwan Province of China	Native
<i>Scylla serrata</i>	Tanzania, United Rep. of	Native
<i>Scylla serrata</i>	Thailand	Native
<i>Scylla serrata</i>	Timor-Leste	Native
<i>Scylla serrata</i>	Viet Nam	Native
<i>Scyllarides squammosus</i>	Indonesia	Native
<i>Thenus orientalis</i>	Philippines	Native

<i>Scientific name</i>	<i>Invaded country</i>
<i>Artemia franciscana</i>	Australia
<i>Artemia franciscana</i>	Brazil
<i>Artemia franciscana</i>	China
<i>Artemia franciscana</i>	France
<i>Artemia franciscana</i>	India
<i>Artemia franciscana</i>	Iran
<i>Artemia franciscana</i>	Italy
<i>Artemia franciscana</i>	Madagascar
<i>Artemia franciscana</i>	Morocco
<i>Artemia franciscana</i>	New Zealand
<i>Artemia franciscana</i>	Portugal
<i>Artemia franciscana</i>	Spain
<i>Artemia franciscana</i>	Tunisia
<i>Callinectes sapidus</i>	Bahamas
<i>Callinectes sapidus</i>	Croatia
<i>Callinectes sapidus</i>	Denmark
<i>Callinectes sapidus</i>	Egypt
<i>Callinectes sapidus</i>	Greece
<i>Callinectes sapidus</i>	Montenegro
<i>Callinectes sapidus</i>	Russia
<i>Callinectes sapidus</i>	Spain
<i>Carcinus aestuarii</i>	Japan
<i>Carcinus maenas</i>	Argentina
<i>Carcinus maenas</i>	Australia
<i>Carcinus maenas</i>	Canada
<i>Carcinus maenas</i>	South Africa
<i>Carcinus maenas</i>	United States of America
<i>Cherax cainii</i>	Australia
<i>Cherax destructor</i>	Australia
<i>Cherax destructor</i>	Mexico
<i>Cherax quadricarinatus</i>	Australia
<i>Cherax quadricarinatus</i>	Bahamas
<i>Cherax quadricarinatus</i>	Colombia
<i>Cherax quadricarinatus</i>	Ecuador
<i>Cherax quadricarinatus</i>	Jamaica
<i>Cherax quadricarinatus</i>	Mexico
<i>Cherax quadricarinatus</i>	Namibia
<i>Cherax quadricarinatus</i>	Philippines
<i>Cherax quadricarinatus</i>	Singapore

<i>Cherax quadricarinatus</i>	Viet Nam
<i>Cherax quadricarinatus</i>	Zambia
<i>Cherax quadricarinatus</i>	Zimbabwe
<i>Eriocheir sinensis</i>	Belgium
<i>Eriocheir sinensis</i>	Canada
<i>Eriocheir sinensis</i>	Denmark
<i>Eriocheir sinensis</i>	Estonia
<i>Eriocheir sinensis</i>	Finland
<i>Eriocheir sinensis</i>	France
<i>Eriocheir sinensis</i>	Germany
<i>Eriocheir sinensis</i>	Irak
<i>Eriocheir sinensis</i>	Italy
<i>Eriocheir sinensis</i>	Latvia
<i>Eriocheir sinensis</i>	Netherlands
<i>Eriocheir sinensis</i>	Poland
<i>Eriocheir sinensis</i>	Romania
<i>Eriocheir sinensis</i>	Russia
<i>Eriocheir sinensis</i>	Sweden
<i>Eriocheir sinensis</i>	Ukraine
<i>Eriocheir sinensis</i>	United Kingdom
<i>Eriocheir sinensis</i>	United States of America
<i>Faxonius limosus</i>	Austria
<i>Faxonius limosus</i>	Belarus
<i>Faxonius limosus</i>	Belgium
<i>Faxonius limosus</i>	Canada
<i>Faxonius limosus</i>	Croatia
<i>Faxonius limosus</i>	Czech Republic
<i>Faxonius limosus</i>	France
<i>Faxonius limosus</i>	Germany
<i>Faxonius limosus</i>	Hungary
<i>Faxonius limosus</i>	Italy
<i>Faxonius limosus</i>	Lithuania
<i>Faxonius limosus</i>	Netherlands
<i>Faxonius limosus</i>	Poland
<i>Faxonius limosus</i>	Romania
<i>Faxonius limosus</i>	Russia
<i>Faxonius limosus</i>	Serbia
<i>Faxonius limosus</i>	Slovakia
<i>Faxonius limosus</i>	Slovenia
<i>Faxonius limosus</i>	Switzerland

<i>Faxonius limosus</i>	United Kingdom
<i>Faxonius limosus</i>	United States of America
<i>Macrobrachium lar</i>	Hawaii
<i>Macrobrachium lar</i>	Marquesas
<i>Macrobrachium lar</i>	Tahiti
<i>Macrobrachium nipponense</i>	Moldova, Republic of
<i>Macrobrachium nipponense</i>	Singapore
<i>Macrobrachium rosenbergii</i>	Brazil
<i>Macrobrachium rosenbergii</i>	Colombia
<i>Macrobrachium rosenbergii</i>	Jamaica
<i>Macrobrachium rosenbergii</i>	Panama
<i>Macrobrachium rosenbergii</i>	Peru
<i>Macrobrachium rosenbergii</i>	South Africa
<i>Macrobrachium rosenbergii</i>	Venezuela
<i>Metapenaeus monoceros</i>	Israel
<i>Metapenaeus monoceros</i>	Tunisia
<i>Pacifastacus leniusculus</i>	Austria
<i>Pacifastacus leniusculus</i>	Croatia
<i>Pacifastacus leniusculus</i>	Denmark
<i>Pacifastacus leniusculus</i>	Estonia
<i>Pacifastacus leniusculus</i>	Finland
<i>Pacifastacus leniusculus</i>	France
<i>Pacifastacus leniusculus</i>	Germany
<i>Pacifastacus leniusculus</i>	Hungary
<i>Pacifastacus leniusculus</i>	Italy
<i>Pacifastacus leniusculus</i>	Japan
<i>Pacifastacus leniusculus</i>	Latvia
<i>Pacifastacus leniusculus</i>	Lithuania
<i>Pacifastacus leniusculus</i>	Norway
<i>Pacifastacus leniusculus</i>	Poland
<i>Pacifastacus leniusculus</i>	Portugal
<i>Pacifastacus leniusculus</i>	Romania
<i>Pacifastacus leniusculus</i>	Slovenia
<i>Pacifastacus leniusculus</i>	Spain
<i>Pacifastacus leniusculus</i>	Sweden
<i>Pacifastacus leniusculus</i>	United Kingdom
<i>Penaeus aztecus</i>	Greece
<i>Penaeus aztecus</i>	Montenegro
<i>Penaeus japonicus</i>	Egypt
<i>Penaeus japonicus</i>	Israel

<i>Penaeus japonicus</i>	Syrian Arab Republic
<i>Penaeus japonicus</i>	Turkey
<i>Penaeus monodon</i>	Angola
<i>Penaeus monodon</i>	Brazil
<i>Penaeus monodon</i>	Côte d'Ivoire
<i>Penaeus monodon</i>	Gambia
<i>Penaeus monodon</i>	Guinea
<i>Penaeus monodon</i>	Mexico
<i>Penaeus monodon</i>	Senegal
<i>Penaeus monodon</i>	Venezuela
<i>Penaeus semisulcatus</i>	Egypt
<i>Penaeus semisulcatus</i>	Israel
<i>Penaeus vannamei</i>	Brazil
<i>Penaeus vannamei</i>	Philippines
<i>Penaeus vannamei</i>	Venezuela
<i>Pontastacus leptodactylus</i>	Denmark
<i>Pontastacus leptodactylus</i>	Finland
<i>Pontastacus leptodactylus</i>	Latvia
<i>Pontastacus leptodactylus</i>	Switzerland
<i>Pontastacus leptodactylus</i>	United Kingdom
<i>Portunus pelagicus</i>	Israel
<i>Portunus pelagicus</i>	Lebanon
<i>Portunus pelagicus</i>	Syrian Arab Republic
<i>Portunus pelagicus</i>	Tunisia
<i>Portunus pelagicus</i>	Turkey
<i>Procambarus clarkii</i>	Austria
<i>Procambarus clarkii</i>	Brazil
<i>Procambarus clarkii</i>	China
<i>Procambarus clarkii</i>	Colombia
<i>Procambarus clarkii</i>	Cyprus
<i>Procambarus clarkii</i>	Egypt
<i>Procambarus clarkii</i>	France
<i>Procambarus clarkii</i>	Germany
<i>Procambarus clarkii</i>	Hawaii
<i>Procambarus clarkii</i>	Italy
<i>Procambarus clarkii</i>	Japan
<i>Procambarus clarkii</i>	Kenya
<i>Procambarus clarkii</i>	Malta
<i>Procambarus clarkii</i>	Mexico
<i>Procambarus clarkii</i>	Netherlands

<i>Procambarus clarkii</i>	Philippines
<i>Procambarus clarkii</i>	Poland
<i>Procambarus clarkii</i>	Portugal
<i>Procambarus clarkii</i>	South Africa
<i>Procambarus clarkii</i>	Spain
<i>Procambarus clarkii</i>	Sweden
<i>Procambarus clarkii</i>	Switzerland
<i>Procambarus clarkii</i>	Uganda
<i>Procambarus clarkii</i>	United Kingdom
<i>Procambarus clarkii</i>	Zambia

Farmed crustacean species

N = 63

Does it have a reported invasion history somewhere?

No
N = 41

Yes
N = 22

Has it been farmed in a non native country?

No
N = 34

Yes
N = 7

No
N = 5

Yes
N = 17

- Artemia salina*
- Palaemon paucidens*
- Palaemon serratus*
- Panulirus argus*
- Penaeus indicus*
- Penaeus merguensis*
- Penaeus stylirostris*

Has it already been introduced by aquaculture?

No
N = 3

Yes
N = 2

Yes
N = 17

- Carcinus aestuarii*
- Callinectes sapidus*
- Metapenaeus monocerosx*

- Eriocheir sinensis*
- Portunus pelagicus*

- Artemia franciscana*
- Carcinus maenas*
- Cherax cainii*
- Cherax destructor*
- Cherax quadricarinatus*
- Faxonius limosus*
- Macrobrachium lar*
- Macrobrachium nipponense*
- Macrobrachium rosenbergii*
- Pacifastacus leniusculus*
- Penaeus aztecus*
- Penaeus japonicus*
- Penaeus monodon*
- Penaeus semisulcastus*
- Penaeus vannamei*
- Pontastacus leptodactylus*
- Procambarus clarkii*