The following supplement accompanies the article

Contrasting ecological impacts of native and non-native marine crabs: a global meta-analysis

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- Table S1. Survey of invasive marine and euryhaline crab introductions, www.int-res.com/articles/suppl/m577p093_supp.xls
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- Literature used in meta-analysis

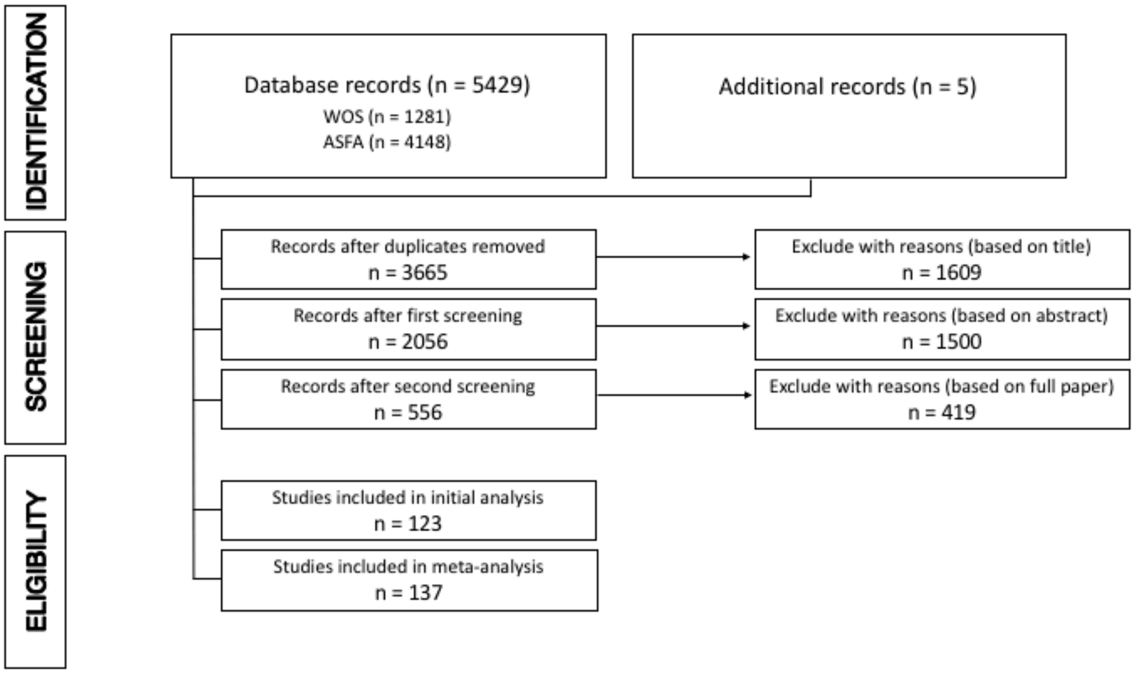

Figure S1. Summary of literature selection results. Sample sizes (n) are shown for each step of the systematic search. WOS: Web of Science; ASFA: Aquatic Science and Fisheries Abstracts.

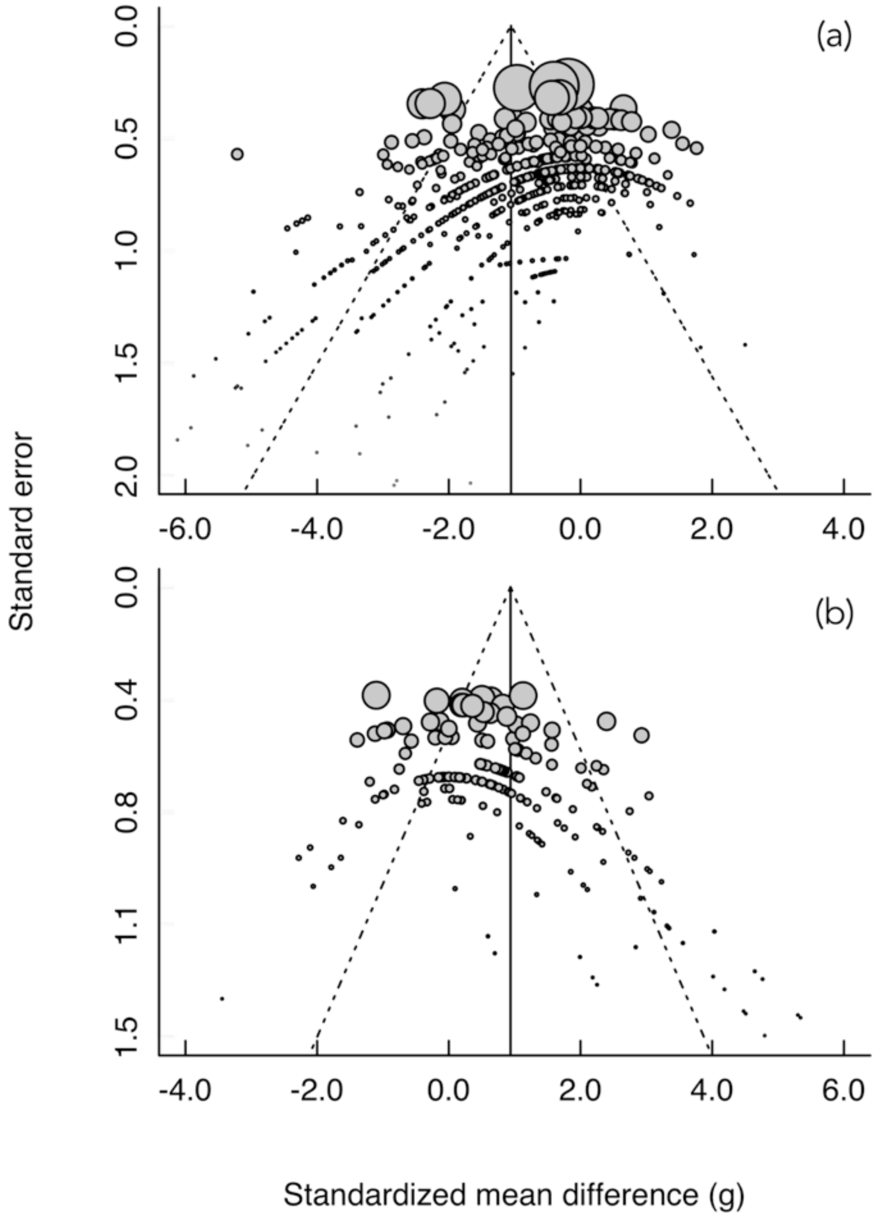

Figure S2. Funnel plots relating standard error to effect size for experiments of (a) direct effects and (b) indirect effects of crabs on responding species. Point size represents the weight of the experiment, calculated as the inverse of the sample variance (Viechtbauer 2010). Dashed lines represent the 95% CI. The asymmetric shape of the funnels suggests publication bias against small, non-significant experiments.

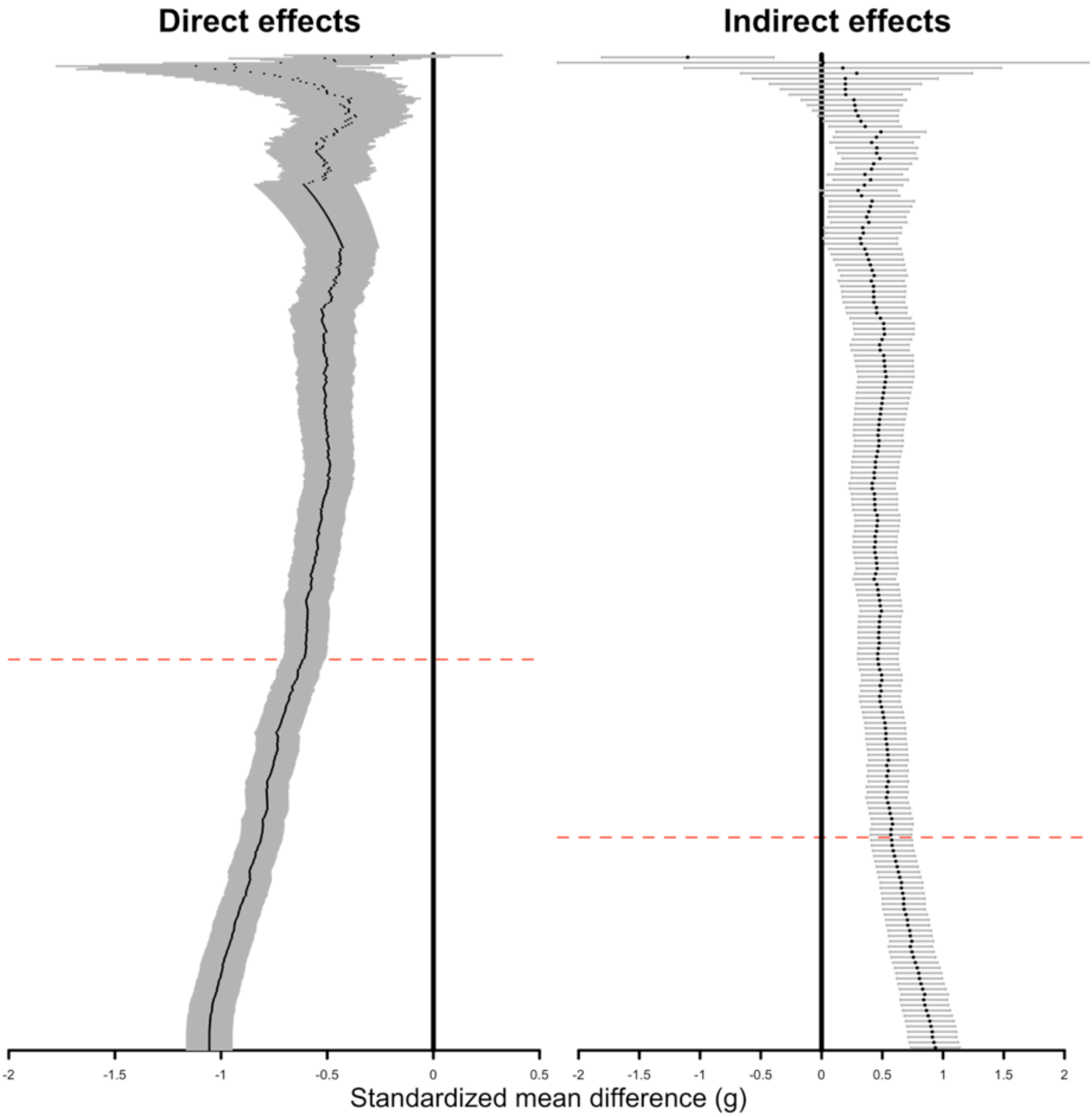

Figure S3. Cumulative forest plots for experiments reporting direct and indirect interactions between crabs and prey, added in order of smallest (top) to largest (bottom) variance. Horizontal red lines indicate approximate variance values at which small studies start to shift the effect size. These thresholds were estimated visually at values of 0.73 for studies of direct effects of crabs and 1.02 for studies of indirect effects. Studies with variances smaller than these thresholds were included in "large-studies-only" datasets.

Table S3. Description of moderator levels

Moderator	Level	Description	n (overall dataset)
Interaction type	Direct	Experiment tests a direct, consumptive interaction between a crab and responding species. Interaction either known or strongly expected to be direct by the original authors.	647
	Indirect	Experiment tests an indirect interaction between a crab and responding species. Interaction either known or strongly expected to be indirect by the original authors. Mechanism of interaction typically assumed to be a trophic cascade, however we did not require this to be demonstrated.	187
Crab origin	Native	Crab species is confirmed to be native to the region.	292
	Non-native	Crab species is introduced, invasive, or otherwise being tested against responding species that is does not co-occur with naturally.	542
Prey functional group	Mobile infauna	Clams, marine worms, and infaunal crustaceans (amphipods and isopods).	246
	Mobile epifauna	Surface-dwelling decapods (including hermit crabs, shrimps, etc.), gastropods, scallops, and mobile echinoderms.	189
	Primary producers	Seaweeds, seagrasses, and phytoplankton.	123
	Sessile invertebrates	Mussels, oysters, barnacles, and other encrusting epifauna.	263
	Vertebrates	Limited to birds and fish.	13
Experimental design	Natural field experiments	No species controlled experimentally (including crab). Without- and with-crab "treatments" are a result of spatial or temporal changes in crab presence (e.g. before/after an introduction or spatially different abundances of crab).	22
	Unstocked enclosures	Field enclosures or exclosures where only the crab species was manipulated experimentally while the remainder of the community was left undisturbed.	256
	Stocked enclosures	Field enclosures or exclosures where densities of one or multiple responding species were manipulated along with crab presence, while remainder of the community was left undisturbed.	152
	Laboratory mesocosm	A closed or mostly closed laboratory-based mesocosm requiring a minimum of two trophic levels and three species. Densities of all species, including crab, were controlled by the original authors.	193
	Predation experiment	Only one crab predator and one prey species or type (e.g. two species of mussel) in a closed laboratory system. This setup excluded indirect interactions as they tested direct predation only.	211

Table S4. Reported average carapace widths (mm) of all crab species included in the meta-analysis. See Table S2 for the native/non-native status of crab species.

Crab species	**Carapace width (mm)**	**Source**
Acanthocyclus gayi	24.0	Garth (1957)
Acanthocyclus hassleri	25.0	Rathbun (1930)
Achelous spinimanus	110.0	Williams (1984)
Callinectes sapidus	168.0	Williams (1984)
Cancer antennarius	118.0	Rathbun (1930)
Cancer borealis	143.0	Williams (1984)
Cancer irroratus	119.0	Williams (1984
Cancer pagurus	130.0	Ingle (1997)
Cancer productus	157.5	Rathbun (1930)
Caphyra rotundifrons	13.0	Jenkins (2012)
Carcinus aestuarii	65.0	sealifebase.org
Carcinus maenas	79.4	Rathbun (1930)
Cyclograpsus lavauxi	28.0	McLay (1988)
Dotilla fenestrata	12.0	Hartnoll (1973)
Dyspanopeus sayi	29.7	Williams (1984)
Dyspanopeus texanus	27.0	Rathbun (1930)
Eurypanopeus depressus	25.0	Williams (1984)
Eurytium limosum	43.0	Williams (1984)
Grapsus grapsus	80.0	eol.org
Hemigrapsus sanguineus	42.0	Richerson (2017)
Heterozius rotundifrons	23.0	McLay (1988)
Hyas araneus	76.5	Miller & O'Keefe (1981)
Liocarcinus depurator	51.0	Hayward & Ryland (1995)
Macrocoeloma diplacanthum	12.8	Rathbun (1925)
Menippe adina	10.0	tpwd.texas.gov
Menippe mercenaria	129.0	Williams (1984)
Mennipe nodifrons	72.0	Rathbun (1930)
Metacarcinus gracilis	91.0	Rathbun (1930)
Metacarcinus magister	198.0	Rathbun (1930)
Micropanope sp.	6.5	Williams (1984)
Mictyris longicarpus	25.0	ala.org.au
Mithraculus forceps	38.0	Williams (1984)
Mithraculus sculptus	26.4	Rathbun (1925)
Necora puber	109.0	Hearn (2002)
Neohelice granulata	32.0	Angeletti & Cervellini (2015)
Ovalipes catharus	150.0	McLay (1988)
Ovalipes ocellatus	87.0	Williams (1984)
Pachygrapsus crassipes	48.0	eol.org.au
Pachygrapsus transversus	26.4	Williams (1984)
Panopeus herbstii	62.0	Williams (1984)
Paragrapsus gaimardii	48.0	Campbell & Griffin (1966)
Percnon gibbesi	28.0	Williams (1984)
Petrolisthes armatus	14.0	Masterson (2007)
Pilumnus caribaeus	21.6	Rathbun (1930)
Rhithropanopeus harrisii	21.3	Williams (1984)

Sesarma reticulatum	28.0	Williams (1984)
Trapezia rufopunctata	28.0	Poupin & Juncker (2010)
Uca annulipes	18.5	Crane (1975)
Uca polita	25.0	Crane (1975)
Uca pugilator	26.0	Williams (1984)
Uca pugnax	23.0	Williams (1984)
Uca vocans	22.5	Crane (1975)
Uca vomeris	27.0	Crane (1975)

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Table S5. Summary comparison of results from analyses of the full and large-studies-only datasets. Differences are highlighted in bold. NS indicates a statistically non-significant result.

Results of the full dataset	**Remains true with large-studies-only data?**
Direct and indirect effects were significant in opposing directions	Yes
Direct effects dataset	
No significant difference between the direct effects of non-native and native crabs	Yes
Significant differences in effect size among different experimental designs	Yes
All experimental designs have a significantly negative effect on prey abundance	Yes
Experimental designs with the strongest effects are laboratory mesocosms and single-species predation experiments	**Natural experiments now have the strongest effect**
Non-native crabs reduced prey abundance significantly more than native crabs in laboratory mesocosms	Yes
Significant differences in effect size among prey functional groups	Yes
All prey functional groups were significantly negatively affected by crab predation	Yes, except for vertebrates (now **NS** because of small sample size)
Non-native crabs reduced abundance of primary producers significantly more than predation by native crabs	Trend same but **NS**
Native crabs reduced abundance of mobile epifauna significantly more than predation by non-native crabs	Yes
Indirect effects dataset	
No significant difference between the indirect effects of non-native and native crabs	Yes
No significant difference in effect size among different experimental designs	Yes
Mesocosm experiments had the only significant effect on responding species abundance	Stocked enclosures and mesocosms now **both significant**
Non-native crabs increased basal prey abundance significantly more in unstocked field enclosures than did native crabs	Yes
Significant differences in effect size among prey functional groups	Yes
Effect sizes for sessile invertebrates and primary producers were both significantly positive	Yes
Non-native crabs increased abundance of primary producers significantly more than native crabs	Yes

Table S6. Summary comparison of results from analyses with and without studies of European green crab (*Carcinus maenas*). Differences are highlighted in bold. NS indicates a statistically non-significant result.

Results of the full dataset	**Remains true when green crab studies removed?**
Direct and indirect effects were significant in opposing directions	Yes
Direct effects dataset	
No significant difference between the direct effects of non-native and native crabs	Yes
Significant differences in effect size among different experimental designs	Yes
All experimental designs have a significantly negative effect on prey abundance	Yes
Experimental designs with the strongest effects are laboratory mesocosms and single-species predation experiments	Yes
Non-native crabs reduced prey abundance significantly more than native crabs in laboratory mesocosms	Yes
Significant differences in effect size among prey functional groups	Yes
All prey functional groups were significantly negatively affected by crab predation	Yes
Non-native crabs reduced abundance of primary producers significantly more than predation by native crabs	Trend same but **NS**
Native crabs reduced abundance of mobile epifauna significantly more than predation by non-native crabs	Yes
Indirect effects dataset	
No significant difference between the indirect effects of non-native and native crabs	**No**
No significant differences in effect size among different experimental designs	**No**
Mesocosm experiments had the only significant effect on responding species abundance	Yes
Non-native crabs increased basal prey abundance significantly more in unstocked field enclosures than did native crabs	Insufficient sample size to test for this difference
Significant differences in effect size among prey functional groups	Yes
Effect sizes for sessile invertebrates and primary producers were both significantly positive	Yes
Non-native crabs increased abundance of primary producers significantly more than native crabs	Trend same but **NS**

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