## Supplementary Table 1: Identity matrix across species based on amino acid compositions (S Table 1.1-1.11)

S Table 1.1. Amino acid identity across crustacean species based on cytoplasmic CA (CAc)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. cainii* | *C. destructor* | *L. vannamei* | *P. monodon* | *C. sapidus* | *P. trituberculatus* |
|  *Cherax quadricarinatus CAc (KM538165)* |  | 97.786 | 97.786 | 76.015 | 76.015 | 73.801 | 73.063 |
|  *Cherax cainii CAc (KP221715)* | 97.786 |  | 97.786 | 76.015 | 76.015 | 73.801 | 73.063 |
| *Cherax destructor (KP299962)* | 97.786 | 97.786 |  | 75.646 | 75.277 | 73.801 | 72.694 |
| *Litopenaeus vannamei (HM991703)* | 76.015 | 76.015 | 75.646 |  | 97.778 | 73.432 | 73.063 |
| *Penaeus monodon (EF672697)* | 76.015 | 76.015 | 75.277 | 97.778 |  | 73.432 | 72.694 |
| *Callinectes sapidus (EF375490)* | 73.801 | 73.801 | 73.801 | 73.432 | 73.432 |  | 94.465 |
| *Portunus trituberculatus (JX524149)* | 73.063 | 73.063 | 72.694 | 73.063 | 72.694 | 94.465 |  |

S Table 1.2. Amino acid identity across crustacean species based on membrane-associated CA (CAg)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. cainii* | *C. destructor* | *L. vannamei* |  *H. rubra* | *C. sapidus* | *P. trituberculatus* | *C. maenas* |
| *Cherax quadricarinatus (KM538166)* |   | 99.355 | 92.929 | 71.104 | 72.903 | 73.701 | 73.377 | 70.13 |
| *Cherax cainii (KP221716)* | 99.355 |   | 92.256 | 71.429 | 73.226 | 73.701 | 73.377 | 70.455 |
| *Cherax destructor (KP299963)* | 92.929 | 92.256 |   | 66.78 | 68.35 | 68.475 | 68.136 | 67.119 |
| *Litopenaeus vannamei (JX975725)* | 71.104 | 71.429 | 66.78 |   | 75.806 | 70.779 | 69.481 | 69.481 |
| *Halocaridina rubra (KF650061)* | 72.903 | 73.226 | 68.35 | 75.806 |   | 71.935 | 71.613 | 70.645 |
| *Callinectes sapidus (EF375491)* | 73.701 | 73.701 | 68.475 | 70.779 | 71.935 |   | 95.13 | 88.636 |
| *Portunus trituberculatus (JX524150)* | 73.377 | 73.377 | 68.136 | 69.481 | 71.613 | 95.13 |   | 87.338 |
| *Carcinus maenas (EU273944)* | 70.13 | 70.455 | 67.119 | 69.481 | 70.645 | 88.636 | 87.338 |   |

S Table 1.3. Amino acid identity across crustacean species based on beta CA (CA-beta)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. cainii* | *C. destructor* | *B. terrestris*  | *Apis dorsata*  | *N. vitripennis*  | *Athalia rosae* |
| *Cherax quadricarinatus (KM538167)* |   | 99.222 | 98.833 | 62.745 | 60.392 | 63.529 | 63.137 |
| *Cherax cainii (KP221717)* | 99.222 |   | 98.054 | 63.137 | 60.784 | 63.922 | 63.529 |
| *Cherax destructor (KP299965)* | 98.833 | 98.054 |   | 63.137 | 61.176 | 64.314 | 63.922 |
| *Bombus terrestris (XM\_003402502)* | 62.745 | 63.137 | 63.137 |   | 82.745 | 84.706 | 86.275 |
| *Apis dorsata (XM\_006612942)* | 60.392 | 60.784 | 61.176 | 82.745 |   | 81.569 | 83.529 |
| *Nasonia vitripennis (XM\_001606922)* | 63.529 | 63.922 | 64.314 | 84.706 | 81.569 |   | 94.902 |
| *Athalia rosae (XM 012404250)* | 63.137 | 63.529 | 63.922 | 86.275 | 83.529 | 94.902 |   |

S Table 1.4. Amino acid identity across crustacean species based on Na+/K+-ATPase alpha subunit (NKA)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarnatus NKA* | *Cherax cainii (KP221718)* | *C. destructor* |  *P. monodon* |  *F. indicus* |  *L. stylirostris* | *C. sapidus* | *P. trituberculatus* |  *P. marmoratus* | *E. sinensis* |
| *Cherax quadricarnatus NKA* |   | 99.904 | 99.711 | 93.545 | 94.027 | 91.908 | 95 | 95 | 95.568 | 95.665 |
| *Cherax cainii (KP221718)* | 99.904 |   | 99.807 | 93.545 | 94.027 | 92.004 | 95.096 | 95.096 | 95.665 | 95.761 |
| *Cherax destructor (KP299966)* | 99.711 | 99.807 |   | 93.449 | 93.931 | 91.908 | 95 | 95 | 95.568 | 95.665 |
|  *Penaeus monodon (|DQ399797)* | 93.545 | 93.545 | 93.449 |   | 98.844 | 95.472 | 92.212 | 92.404 | 92.1 | 92.004 |
|  *Fenneropenaeus indicus (HM012803)* | 94.027 | 94.027 | 93.931 | 98.844 |   | 96.243 | 92.596 | 92.788 | 92.775 | 92.293 |
|  *Litopenaeus stylirostris (JN561324)* | 91.908 | 92.004 | 91.908 | 95.472 | 96.243 |   | 90.577 | 90.865 | 90.655 | 90.366 |
| *Callinectes sapidus (AF327439)* | 95 | 95.096 | 95 | 92.212 | 92.596 | 90.577 |   | 99.326 | 97.69 | 97.209 |
| *Portunus trituberculatus (JX173959)* | 95 | 95.096 | 95 | 92.404 | 92.788 | 90.865 | 99.326 |   | 97.594 | 97.113 |
|  *Pachygrapsus marmoratus (DQ173924)* | 95.568 | 95.665 | 95.568 | 92.1 | 92.775 | 90.655 | 97.69 | 97.594 |   | 98.457 |
| *Eriocheir sinensis (KC691291)* | 95.665 | 95.761 | 95.665 | 92.004 | 92.293 | 90.366 | 97.209 | 97.113 | 98.457 |   |

S Table 1.5. Amino acid identity across crustacean species based on V- type H+-ATPase (HAT-A)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. destructor* | *C. cainii* | *W. auropunctata* | *P. barbatus* | *C. floridanus* | *B. terrestris* |
| *Cherax quadricarinatus* |  | 99.158 | 98.676 | 71.059 | 70.824 | 71.025 | 71.226 |
| *Cherax.destructor (KP299969)* | 99.158 |  | 99.278 | 70.824 | 70.588 | 70.907 | 70.991 |
| *Cherax.cainii (KP221721)* | 98.676 | 99.278 |  | 70.824 | 70.588 | 70.907 | 70.991 |
| *Wasmannia auropunctata (XM 011701129)* | 71.059 | 70.824 | 70.824 |  | 96.908 | 95.838 | 88.889 |
| *Pogonomyrmex barbatus (XM 011643683)* | 70.824 | 70.588 | 70.588 | 96.908 |  | 95.244 | 88.416 |
| *Camponotus floridanus (XM 011263300)* | 71.025 | 70.907 | 70.907 | 95.838 | 95.244 |  | 89.125 |
| *Bombus terrestris (XM 003397650)* | 71.226 | 70.991 | 70.991 | 88.889 | 88.416 | 89.125 |  |

S Table 1.6. Amino acid identity across crustacean species based on Na+/K+/2Cl- cotransporter (NKCC)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. destructor* | *C. cainii* | *C. sapidus*  | *H. rubra*  | *M. domestica* | *B. cucurbitae*  | *D. melanogaster* |  *B. terrestris*  |
| *Cherax quadricarinatus* |   | 96.934 | 97.288 | 49.25 | 49.024 | 49.664 | 49.943 | 50 | 47.119 |
| *Cherax destructor (KP299986)* | 96.934 |   | 97.03 | 50.431 | 49.893 | 51.207 | 51.386 | 51.86 | 48.837 |
| *Cherax cainii (KP221733)* | 97.288 | 97.03 |   | 48.448 | 47.711 | 48.802 | 49.101 | 49.282 | 47.25 |
| *Callinectes sapidus (AF190129)* | 49.25 | 50.431 | 48.448 |   | 76.245 | 49.359 | 49.118 | 49.722 | 47.903 |
| *Halocaridinarubra (KF650065)* | 49.024 | 49.893 | 47.711 | 76.245 |   | 48.168 | 48.37 | 48.597 | 47.23 |
| *Musca domestica (XM\_011298324)* | 49.664 | 51.207 | 48.802 | 49.359 | 48.168 |   | 84.898 | 81.795 | 57.713 |
| *Bactrocera cucurbitae (XM 011181369)* | 49.943 | 51.386 | 49.101 | 49.118 | 48.37 | 84.898 |   | 81.803 | 58.079 |
| *Drosophila melanogaster (NM\_140315)* | 50 | 51.86 | 49.282 | 49.722 | 48.597 | 81.795 | 81.803 |   | 58.318 |
| *Bombus terrestris (XM 003399442)* | 47.119 | 48.837 | 47.25 | 47.903 | 47.23 | 57.713 | 58.079 | 58.318 |   |

S Table 1.7. Amino acid identity across crustacean species based on Na+/HCO3- cotransporter (NBC)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. destructor*  | *C. destructor* | *C. cainii* | *C. cainii* | *C. quadricarinatus* | *W. auropunctata* | *P. barbatus* |
| *Cherax destructor (KP299976)* |   | 99.914 | 98.497 | 98.361 | 97.412 | 60.371 | 59.354 |
| *Cherax destructor (KP299977)* | 99.914 |   | 98.361 | 98.447 | 97.498 | 60.371 | 59.354 |
| *Cherax cainii (KP221727)* | 98.497 | 98.361 |   | 99.914 | 97.323 | 60.455 | 59.437 |
| *Cherax cainii (KP221728)* | 98.361 | 98.447 | 99.914 |   | 97.409 | 60.455 | 59.437 |
| *Cherax quadricarinatus (KP221728)* | 97.412 | 97.498 | 97.323 | 97.409 |   | 60.796 | 59.933 |
| *Wasmannia auropunctata (XM 011705063)* | 60.371 | 60.371 | 60.455 | 60.455 | 60.796 |   | 94.187 |
| *Pogonomyrmex barbatus (XM 011642543)* | 59.354 | 59.354 | 59.437 | 59.437 | 59.933 | 94.187 |   |

S Table 1.8. Amino acid identity across crustacean species based on Na+/H+ exchanger (NHE)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus* | *C. destructor* | *C. cainii* | *A. echinatior* | *A. echinatior* | *V. emeryi* | *P. barbatus*  | *B. impatiens* |
| *Cherax quadricarinatus (KM880153)* |   | 92.628 | 91.161 | 40.833 | 40.535 | 40.457 | 40.99 | 40.04 |
| *Cherax destructor (KP299982)* | 92.628 |   | 92.259 | 41.071 | 40.774 | 40.597 | 41.089 | 40.681 |
| *Cherax cainii (KP221730)* | 91.161 | 92.259 |   | 39.603 | 39.319 | 39.242 | 39.754 | 38.725 |
| *Acromyrmex echinatior (XM\_011069477)* | 40.833 | 41.071 | 39.603 |   | 96.753 | 91.516 | 92.769 | 78.524 |
| *Acromyrmex echinatior (XM\_011069496)* | 40.535 | 40.774 | 39.319 | 96.753 |   | 88.37 | 89.534 | 76.42 |
| *Vollenhovia emeryi (XM 012027471)* | 40.457 | 40.597 | 39.242 | 91.516 | 88.37 |   | 90.095 | 78.178 |
| *Pogonomyrmex barbatus (XM\_011649419)* | 40.99 | 41.089 | 39.754 | 92.769 | 89.534 | 90.095 |   | 79.037 |
| *Bombus impatiens (XM 003491441)* | 40.04 | 40.681 | 38.725 | 78.524 | 76.42 | 78.178 | 79.037 |   |

S Table 1.9. Amino acid identity across crustacean species based on Na+/Ca+2 exchanger (NCX)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. destructor* | *C. cainii* | *C. quadricarinatus* | *P. barbatus* |  *A. cephalotes* | *W. auropunctata* | *C. floridanus* | *A. dorsata* |
| *Cherax destructor (KP299983)* |   | 98.94 | 98.469 | 38.317 | 37.721 | 38 | 37.751 | 37.458 |
| *Cherax cainii (KP221731)* | 98.94 |   | 98.231 | 38.206 | 37.611 | 37.889 | 37.639 | 37.347 |
| *Cherax quadricarinatus* | 98.469 | 98.231 |   | 38.206 | 37.611 | 37.889 | 37.639 | 37.458 |
| *Pogonomyrmex barbatus (XM 011636160)* | 38.317 | 38.206 | 38.206 |   | 95.293 | 93.8 | 91.734 | 87.011 |
| *Atta cephalotes (XM 012203310)* | 37.721 | 37.611 | 37.611 | 95.293 |   | 95.293 | 93.456 | 87.371 |
| *Wasmannia auropunctata (XM 011701097)* | 38 | 37.889 | 37.889 | 93.8 | 95.293 |   | 93.318 | 87.112 |
| *Camponotus floridanus (XM\_011255402)* | 37.751 | 37.639 | 37.639 | 91.734 | 93.456 | 93.318 |   | 87.112 |
| *Apis dorsata (XM 006616508)* | 37.458 | 37.347 | 37.458 | 87.011 | 87.371 | 87.112 | 87.112 |   |

S Table 1.10. Amino acid identity across crustacean species based on Arginine kinase

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus*  | *C. destructor*  |  *C. cainii* | *P. clarkii*  | *H. vulgaris* | *C. maenas* | *S. serrata*  | *C. sapidus* | *L. vannamei* | *P. monodon* |
| *Cherax.quadricarinatus*  |   | 98.599 | 98.039 | 96.639 | 94.944 | 92.717 | 92.135 | 92.997 | 90.169 | 90.73 |
| *Cherax destructor (KP299970)* | 98.599 |   | 97.479 | 96.359 | 94.663 | 92.437 | 92.135 | 92.717 | 89.607 | 89.607 |
| *Cherax cainii (KP221722)* | 98.039 | 97.479 |   | 96.078 | 94.101 | 92.157 | 91.573 | 91.877 | 89.045 | 89.607 |
| *Procambarus clarkii (JN828651)* | 96.639 | 96.359 | 96.078 |   | 95.225 | 93.838 | 94.382 | 94.678 | 91.292 | 91.011 |
| *Homarus vulgaris (X68703)* | 94.944 | 94.663 | 94.101 | 95.225 |   | 92.697 | 92.697 | 93.82 | 91.011 | 91.011 |
| *Carcinus maenas (AF167313)* | 92.717 | 92.437 | 92.157 | 93.838 | 92.697 |   | 97.191 | 97.199 | 91.292 | 92.135 |
| *Scylla serrata (GQ851626)* | 92.135 | 92.135 | 91.573 | 94.382 | 92.697 | 97.191 |   | 98.034 | 93.258 | 94.101 |
| *Callinectes sapidus (AF233355)* | 92.997 | 92.717 | 91.877 | 94.678 | 93.82 | 97.199 | 98.034 |   | 92.978 | 92.978 |
| *Litopenaeus vannamei (DQ975203)* | 90.169 | 89.607 | 89.045 | 91.292 | 91.011 | 91.292 | 93.258 | 92.978 |   | 96.067 |
| *Penaeus monodon (KF177337)* | 90.73 | 89.607 | 89.607 | 91.011 | 91.011 | 92.135 | 94.101 | 92.978 | 96.067 |   |

S Table 1.11. Amino acid identity across crustacean species based on Calreticulin

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *C. quadricarinatus*  | *C. destructor*  | *C. cainii*  | *F. chinensis*  | *P. monodon*  | *L. vannamei*  | *E. carinicauda*  | *P. leniusculus*  | *S. paramamosain*  |
| *Cherax quadricarinatus (KM538170)* |   | 98.759 | 99.005 | 86.946 | 87.192 | 86.453 | 85.714 | 91.832 | 86.207 |
| *Cherax destructor (KP299971)* | 98.759 |   | 98.263 | 86.7 | 86.946 | 86.207 | 85.961 | 91.111 | 85.714 |
| *Cherax cainii (KP221723)* | 99.005 | 98.263 |   | 87.192 | 87.192 | 86.453 | 85.961 | 91.337 | 86.207 |
| *Fenneropenaeus chinensis (DQ323054)* | 86.946 | 86.7 | 87.192 |   | 98.768 | 96.798 | 88.424 | 86.7 | 85.222 |
| *Penaeus monodon (GU140040)* | 87.192 | 86.946 | 87.192 | 98.768 |   | 98.03 | 88.67 | 86.946 | 83.99 |
| *Litopenaeus vannamei (JQ682618.)* | 86.453 | 86.207 | 86.453 | 96.798 | 98.03 |   | 88.177 | 86.207 | 83.99 |
| *Exopalaemon carinicauda (JX508647)* | 85.714 | 85.961 | 85.961 | 88.424 | 88.67 | 88.177 |   | 85.222 | 83.99 |
| *Pacifastacus leniusculus (HQ596362)* | 91.832 | 91.111 | 91.337 | 86.7 | 86.946 | 86.207 | 85.222 |   | 84.975 |
| *Scylla paramamosain (HQ260918)* | 86.207 | 85.714 | 86.207 | 85.222 | 83.99 | 83.99 | 83.99 | 84.975 |   |