**Supplementary Table S1.**

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| Abbreviations | Full species name | Accession numbers (NCBI) |
| *A\_rub* | *Asterias rubens* | KT601711 |
| *S\_pur* | *Strongylocentrotus purpuratus* | XM\_003724442.2 |
| *S\_kow* | *Saccoglossus kowalevskii* | FF512954 |
| *B\_flo* | *Branchiostoma floridae* | XM\_002608950 |
| *C\_int* | *Ciona intestinalis* | AB432887 |
| *H\_sapVP* | *Homo sapiens* | M25647 |
| *H\_sapOT* | *Homo sapiens* | M25650 |
| *E\_fet* | *Eisenia fetida* | AB014478 |
| *L\_gig* | *Lottia gigantea* | FC764872.1 |
| *D\_pul* | *Daphnia pulex* | EFX71881 |
| *T\_cas* | *Tribolium casteneum* | NP\_001078831 |
| *C\_ele* | *Caenorhabditis elegans* | AFJ42491 |

**Supplementary Table S2.**

|  |  |  |
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| Abbreviations | Full species name | Accession numbers |
| Hs\_V1aR | *Homo sapiens* | NM\_000706.4 a |
| Hs\_V1bR | *Homo sapiens* | NM\_000707.4 a |
| Hs\_V2R | *Homo sapiens* | NM\_000054.5 a |
| Hs\_OTR | *Homo sapiens* | NM\_001354655.1 a |
| Ci\_VPOTR | *Ciona intestinalis* | 18586058 b |
| Sk\_VPOTR | *Saccoglossus kowalevskii* | XP\_002735546 a |
| Sp\_VPOTR | *Strongylocentrotus purpuratus* | XM\_779280.4 a |
| Ar\_VPOTR | *Asterias rubens* | MK279533 b |
| Ls\_VPOTR | *Lymnaea stagnalis* | U27464.1 a |
| Ef\_VPOTR | *Eisenia fetida* | AB121771.1 a |
| Tc\_VPOTR | *Tribolium casteneum* | EU128495.1 a |
| Hs\_NPSR | *Homo sapiens* | AY310326.1 a |
| Bf\_NPSR1 | *Branchiostoma floridae* | XP\_002605431 a |
| Bf\_NPSR2 | *Branchiostoma floridae* | XP\_002605430 a |
| Sk\_NPSR | *Saccoglossus kowalevskii* | XP\_006813812 a |
| Ar\_NGFFYR | *Asterias rubens* | KP171535 b |
| Sp\_NGFFFR | *Strongylocentrotus purpuratus* | KP171538 b |
| Lg\_CCAPR | *Lottia gigantea* | XP\_009061331 a |
| Ct\_CCAPR | *Capitella teleta* | ELU12393 b |
| Dm\_CCAPR | *Drosophila melanogaster* | AY219842 a |
| Tc\_CCAPR | *Tribolium casteneum* | NM\_001083326 a |
| Hs\_GnRHR | *Homo sapiens* | NP\_000397.1 b |
| Bf\_GnRHR1 | *Branchiostoma floridae* | ACC68665.1 b |
| Bf\_GnRHR2 | *Branchiostoma floridae* | ACC68666.1 b |
| Ar\_GnRHR | *Asterias rubens* | KU888680 b |
| Sp\_GnRHR1 | *Strongylocentrotus purpuratus* | NP\_001116990.1 b |
| Sp\_GnRHR2 | *Strongylocentrotus purpuratus* | NP\_001116992 b |
| Sp\_GnRHR2 | *Strongylocentrotus purpuratus* | NP\_001116991 b |
| Dr\_GnRHR1 | *Danio rerio* | NP\_001138452 b |
| Dr\_GnRHR2 | *Danio rerio* | NP\_001138451 b |
| Gg\_GnRHR1 | *Gallus gallus* | NP\_989984 b |
| Gg\_GnRHR2 | *Gallus gallus* | NP\_001012627.1 b |
| Dp\_AKHR | *Daphnia pulex* | ACD75498 b |
| Bm\_AKHR | *Bombyx mori* | NP\_001037049.1 b |
| Rp\_AKHR | *Rhodnius prolixus* | KF534791 b |
| Ag\_AKHR | *Anopheles gambiae* | ABD60146.1 b |
| Bm\_ACPR | *Bombyx mori* | NP\_001127726.1 b |
| Rp\_ACPR | *Rhodnius prolixus* | AKO62856.1 b |
| Ag\_ACPR | *Anopheles gambiae* | ABX52399.1 b |
| Bf\_CRZR3 | *Branchiostoma floridae* | ACC68668.1 b |
| Bf\_CRZR4 | *Branchiostoma floridae* | ACN79527.1 b |
| Ar\_CRZR | *Asterias rubens* | KU888681 b |
| Sp\_CRZR4 | *Strongylocentrotus purpuratus* | XP\_011680711.1 b |
| Sk\_CRZR | *Saccoglossus kowalevskii* | XP\_006819806.1 b |
| Lg\_CRZR | *Lottia gigantea* | ESP05621 b |
| Ct\_CRZR | *Capitella teleta* | ELT93721.1 b |
| Ov\_CRZR | *Octopus vulgaris* | Q2V2K5 b |
| Dp\_CRZR | *Daphnia pulex* | EFX87464.1 b |
| Bm\_CRZR | *Bombyx mori* | NP\_001127719.1 b |
| Ag\_CRZR | *Anopheles gambiae* | AAQ67361.1 b |

NCBI: a

GenBank: b

Uniprot: c