The chemical defensome of fish

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**Table 1: Overview of teleost genome assemblies retrieved from ENSEMBL and NCBI**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Latin name** | **Genome** | **Gene build release** | **Base pairs** | **Gene transcripts** |
| Zebrafish | *Danio rerio* | GRCz11 | Mar 2018 | 1,674,207,132 | 59,876 |
| Three-spined stickleback | *Gasterosteus aculatus* | BROAD S1 | Aug 2006 | 446,627,861 | 29,245 |
| Atlantic killifish (mummichog) | *Fundulus heteroclitus* | GCA\_000826765.1 | Jan 2015 | 1,021,898,560 | 35,597 |
| Japanese medaka HdrR  (Southern Japan) | *Oryzias latipes* | ASM223467v1 | Jul 2018 | 734,057,086 | 38,211 |
| Atlantic cod | *Gadus morhua* | gadMor3 | Jul 2019 | 669,966,409 | 51,642 |

**Table 2: Overview of identified genes in the nuclear receptor (nr) subfamilies related to the chemical defensome in zebrafish (Danio rerio), Atlantic killifish (Fundulus heteroclitus), medaka (Oryzias latipes), three-spined stickleback (Gasterosteus aculeatus), and Atlantic cod (Gadus morhua).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subfamily** | **Gene** | **Zebrafish** | **Killifish** | **Medaka** | **Stickleback** | **Atlantic cod** |
| *nr1a1* | *thra* | x | x | x | x | x |
|  |  | x | x | x | x | x |
| *nr1a2* | *thrb* | x | x | x | x | x |
| *nr1b1* | *rara* | x | x | x | x | x |
|  |  | x | x | x |  | x |
|  |  |  | x |  |  | x |
| *nr1b2* | *rarb* |  |  | x |  | x |
| *nr1b3* | *rarg* | x | x | x | x | x |
|  |  | x | x | x | x | x |
|  |  |  | x |  | x | x |
|  |  |  |  |  | x |  |
| *nr1c1* | *ppara* | x | x | x | x | x |
|  |  | x | x | x | x | x |
| *nr1c2* | *ppard* | x | x | x | x | x |
|  |  | x |  |  |  |  |
| *nr1c3* | *pparg* | x | x | x | x | x |
| *nr1h3* | *lxr* | x | x | x | x | x |
| *nr1h4* | *fxr* | x | x | x | x | x |
| *nr1h5* | *fxrb* | x | x | x | x | x |
| *nr1i1* | *vdr* | x | x | x | x | x |
|  |  | x | x | x | x | x |
| *nr1i2* | *pxr* | x | x | x |  |  |
| *nr2a1* | *hnf4a* | x | x | x | x | x |
| *nr2a1* | *hnf4a* |  | x |  |  | x |
| *nr2a2* | *hnf4g* | x | x | x | x | x |
| *nr2a3* | *hnf4b* | x |  |  |  |  |
| *nr2b1* | *rxra* | x | x | x | x | x |
|  |  | x |  |  |  |  |
| *nr2b2* | *rxrb* | x | x | x | x | x |
|  |  | x | x | x | x | x |
| *nr2b3* | *rxrg* | x | x | x | x | x |
| *nr3a1* | *esr1* | x | x | x | x | x |
| *nr3a2* | *esr2* | x | x | x | x | x |
|  |  | x | x | x | x | x |
| *nr3b1* | *esrra* | x | x | x | x | x |
| *nr3b2* | *esrrb* | x | x | x | x | x |
|  |  |  | x | x | x | x |
|  |  |  | x |  |  |  |
|  | *esrrd* | x |  | x |  |  |
| *nr3b3* | *esrrg* | x | x | x | x | x |
|  |  | x | x | x | x | x |
|  |  |  |  |  | x |  |
| *nr3c1* | *gr* | x | x | x | x | x |
|  |  |  | x | x | x | x |
| *nr3c2* | *mr* | x | x | x | x | x |
| *nr3c3* | *pgr* | x | x | x | x | x |
| *nr3c4* | *ar* | x | x | x | x | x |
|  |  |  | x | x | x | x |

**Table 3: Number of cytochrome P450 (cyp) genes related to the chemical defensome identified in zebrafish (Danio rerio) and Atlantic cod (Gadus morhua) in previous and current studies.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cyp subfamily** | **Zebrafish** | | | **Atlantic cod** | | |
| **Goldstone et al. 2010** | **Current study** | **Karlsen et al. 2012** | | **Current study** |
| **Genome** | Zv6 and Zv7 | GRCz11 | GmG100427 and GmE100215 (EST) | | gadMor3 |
| **Cyp1** | 5 | 5 | 5 | | 3 |
| **Cyp2** | 47 | 40 | 14 | | 18 |
| **Cyp3** | 5 | 4 | 5 | | 4 |
| **Cyp4** | 5 | 4 | 3 | | 5 |

**Table 4: Overview of identified genes in the ATP-binding cassette (abc) subfamilies related to the chemical defensome in zebrafish (Danio rerio), Atlantic killifish (Fundulus heteroclitus), medaka (Oryzias latipes), three-spined stickleback (Gasterosteus aculeatus), and Atlantic cod (Gadus morhua).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Zebrafish** | **Killifish** | **Medaka** | **Stickleback** | **Atlantic cod** |
| abcb | 10 | 9 | 10 | 9 | 8 |
| abcc | 14 | 14 | 14 | 14 | 12 |
| abcg | 8 | 8 | 8 | 7 | 7 |