



Genome-wide investigation and expression pattern of immunoglobulin superfamily in the discus fish (*Symphysodon aequifasciatus*)

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Introduction

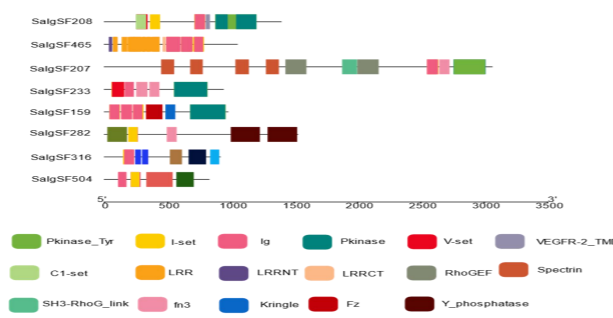
- Discus fish *Symphysodon* spp. employs an unusual parental care behavior where free-swimming fry feed on parental epidermal mucus after hatching.
- The immunoglobulin superfamily (IgSF), refers to a combination of at least one immunoglobulin (Ig) domain, is one of the largest superfamilies in vertebrate genomes.
- Despite the potentially important role of immunoglobulin in discus fish, there is no systematic and comprehensive identification.
- In this study, we identified discus fish IgSF proteins with at least one type of Ig domain based on the discus fish whole-genome data measured by our lab.

Materials and methods

- The comprehensive analysis including phylogenetic construction, gene structures, chromosome location, conserved motifs, and gene duplications of the IgSF genes in discus fish were further investigated.
- Skin samples of seven periods of discus fish were collected for RNA-seq analysis, including be sexually mature but were not currently engaged in a breeding activity (NB), eggs spawned (E), eggs hatched (H), free-swimming fry bited on parents' skin mucus on the first day (D1), on the seventh day (D1), on the fourteenth day (D14) and on the fifth day after fry stopped biting on parents' skin mucus (NP).

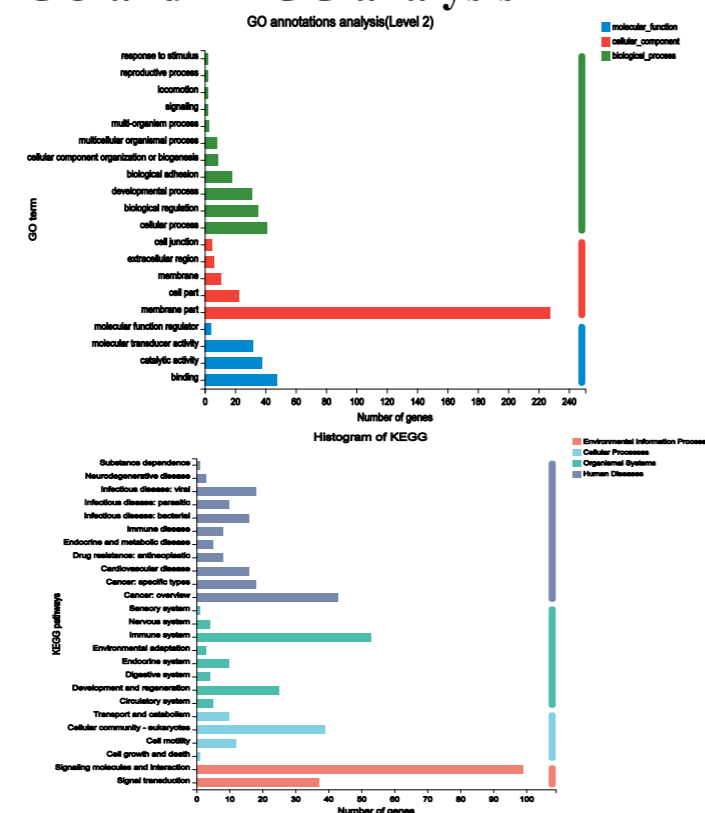
Results

➤ Domain Analysis of IgSF discus fish



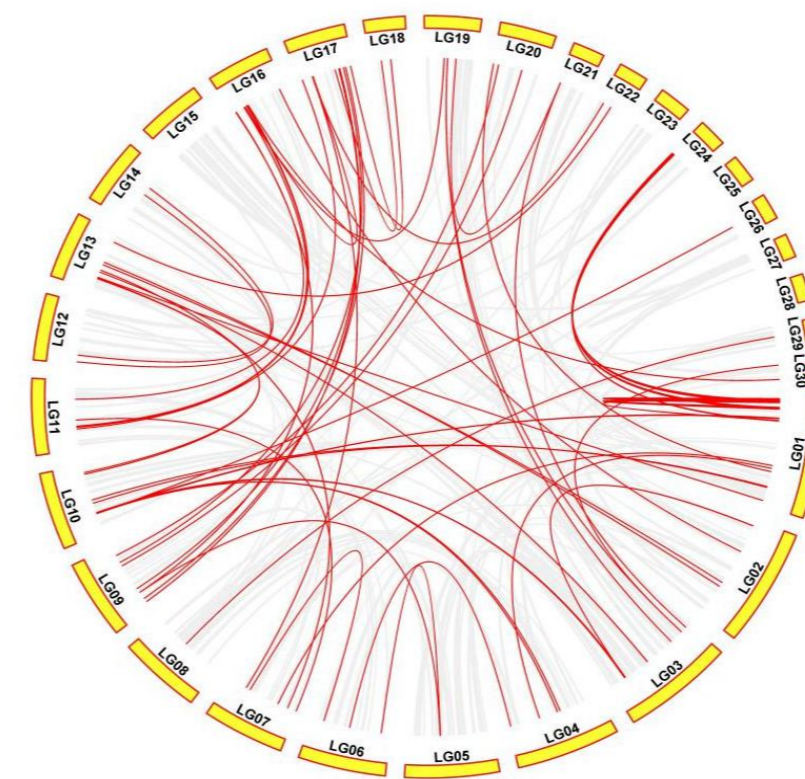
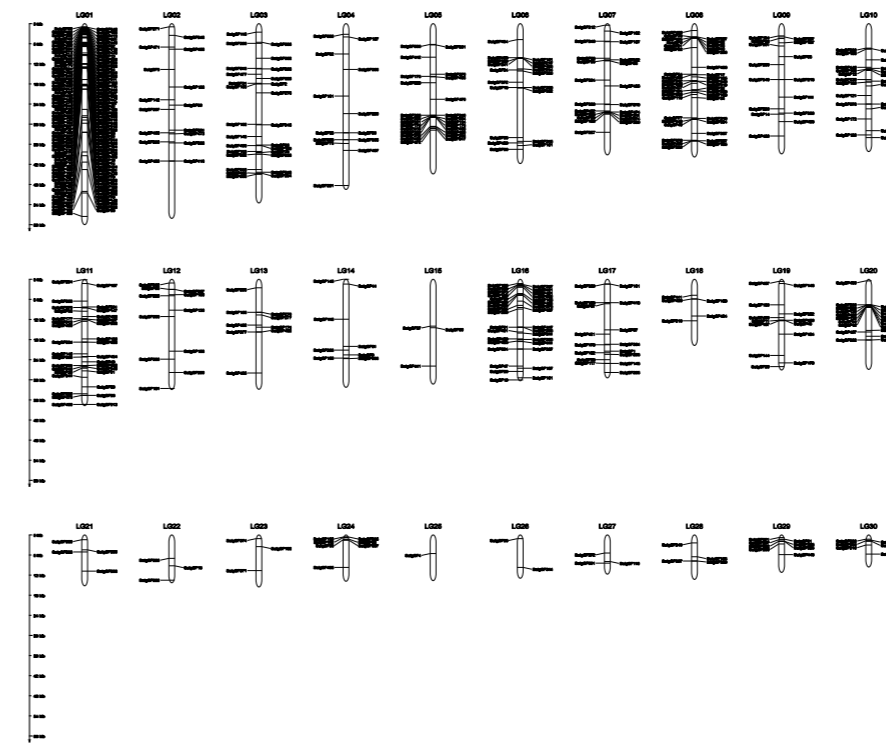
We found five types of Ig domain, including immunoglobulin, immunoglobulin C2-set_2, immunoglobulin C1-set, immunoglobulin I-set and immunoglobulin V-set, and 70 types of other associated domains by using PFAM and SMART analysis.

➤ GO and KEGG analysis



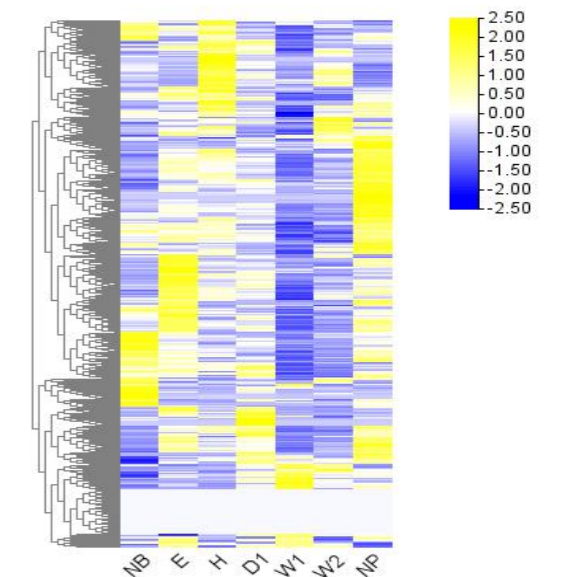
Functional annotations showed that IgSF genes were involved in cellular component, molecular function, and biological process. KEGG analysis indicated that IgSF genes were connected to 20 pathways and functionally critical in signal transduction, immune system, and cell communication.

➤ Homology analysis of IgSF genes in discus fish



IgSF genes of discus fish were unevenly distributed in 30 linkage groups, and there were a total of 135 pairs of collinearity events, including 94 pairs of tandem duplication and 41 pairs of segmental duplication..

➤ Expression profiles of the discus fish IgSF genes



Distinct expression patterns of IgSF genes in the skin of discus fish at different parental care stages were analyzed by RNA-seq. And we identified transcriptional changes associated with immune and lactation of a breeding circle.

Conclusion

- A comprehensive analysis of the phylogenetic construction, gene structures, chromosome location, conserved motifs, and gene duplications of 518 IgSF genes in discus fish was carried out in the current study.
- IgSF genes played significant roles in the skin immune of discus fish as indicated by their expression profiles in the skin at the different stages of during the reproduction of discus fish.
- These results provide an overview of IgSF members in discus fish and give a valuable resource for better understanding the functions of the IgSFs in the skin of discus fish.