The mitochondria play a key role in normal growth and cellular homeostasis, housing the oxidative phosphorylation machinery and several biosynthetic activities linking the environment and metabolic condition. However, it remains largely unclear the extent to which mitochondria operate as specialized cellular sentinels that monitor the conditions of the cell to finely adapt its metabolic activity, to coordinate adaptive responses to stress. The aim of the current study was to phenotype the transcriptionally-mediated response of liver mitochondria of gilthead sea bream exposed to three different intermittent and repetitive environmental stressors. A PCR array of 60 mitochondria-related genes was used selecting markers of transcriptional regulation, oxidative metabolism, respiration uncoupling, antioxidant defence, protein import/folding/assembly, as well as mitochondrial dynamics and apoptosis. All gene sequences are derived from the recently updated reference transcriptome database of gilthead sea bream (Calduch-Giner et al., 2013).

**EXPERIMENTAL DESIGN**

- **Juvenile** gilthead sea bream of 265 g initial BW were allocated in triplicate groups of 27 fish each (500 L tanks) at three different environmental stressors:
  - Changes in water temperature (T-ST)
  - Changes in water level & chasing (C-ST)
  - Multiple sensory perception stressors (shakes and sounds, window wiper movements, reverse water flow, light flashes) (M-ST).

**TISSUE SAMPLING**

- **Blood** was taken for hormone and metabolite analyses.
- **Livers** were sampled for gene expression analyses by means of a mitochondrial PCR-array using the EpMotion 5070 Liquid Handling Robot.

**RESULTS**

- Feed intake
- Growth
- Feed conversion
- Hc-Hb
- Cortisol
- Lactate

**CONCLUSIONS**

- The mitochondrial phenotype of T-ST fish improves the aerobic oxidative capacity of fish with a reduced feed intake, haemocrit and circulating haemoglobin content.
- The mitochondrial response of C-ST fish switches from aerobic to anaerobic metabolism with increased production of lactate and negligible effects on fish performance.
- The down-regulated mitochondrial response of M-ST fish lowered energy demand with a reduced lactate production and feed efficiency, and the highest allostatic load score.