

**Fig. S1:** Alignment of amino-acid sequences for zebrafish (*Danio rerio*, Dr) casp3A and casp3B (NCBI Reference Sequence number NP\_571952.1 and NP\_001041531.1, respectively) and crucian carp (*Carassius carassius*, Cc) casp3ai and casp3aii (translated from the sequences obtained through partial cloning), aligned using the Clustal Omega tool (EMBL-EBI). Darker shading indicates higher degree of conservation across isoforms and species.

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casp3A_Dr      1  ----- MNGDCVDAKRVDTTDASKDGASASQP--MQVDAK---PQSHAFRYSLNYPNI GHCI I I NNKDFDRRTGMNPRNG
casp3ai_Cc     1  ----- SLNYPNI GHCI I I NNKNFDRSTGMNQORNG
casp3aii_Cc    1  -----
casp3B_Dr      1  NSHVKPKGEDTVDARQSDAKQS---SSVTDPGVVQMDAKSHSDDNVDYQYKTNYPNLGQCLI I NNKNFHKRTGMGVRRNG
casp3b_Cc      1  ----- NG

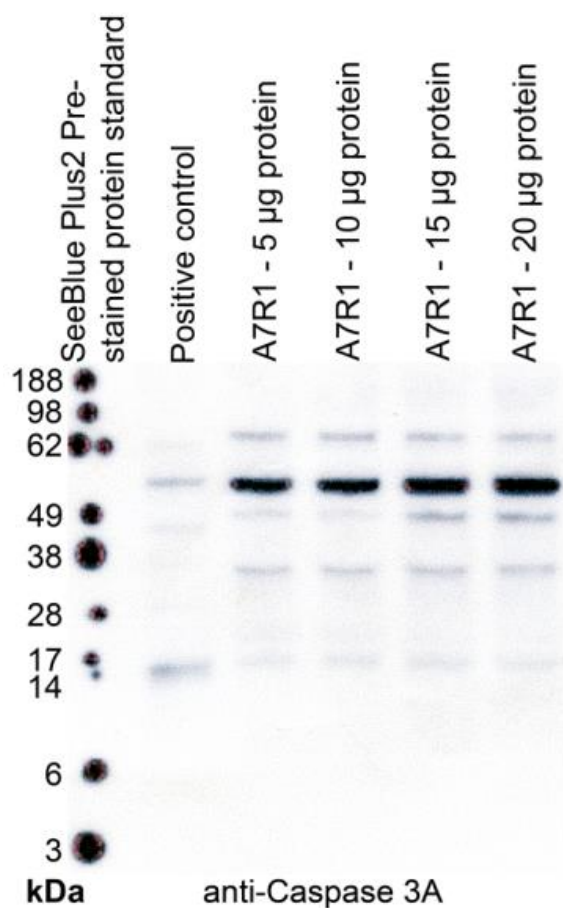
casp3A_Dr      70  TDVDAGNVMNVFRKLGVIKVVYNDQIVAQIMQVLTVAHDDHSRCASLVCVLLSHGDEGVFFGTDTSDVLKSLTSLFRGD
casp3ai_Cc     30  TDVDAGNVMNVFRKLGVIKVVYNDQIVAQIKQVLTAVARGDHSRCASLVCVLLSHGDEGVFFGTDTSDVLKSLTSLFRGD
casp3aii_Cc    1  ----- VAHDDHSRCASLVCVLLSHGDEGVFFGTDTSDVLKSLTSLFRGD
casp3B_Dr      77  TDKDAKKVFETFSQLGFEMKPYNDLTVSCVMALLTKASEEDHSKSAFACVLLSHGDDGLI YGTDDSLIELKRLFAHFRGD
casp3b_Cc      3  TDKDAKNAMETFTNLGFKIKVTNDQTVSQVRDLLAKVSEQEDHSKSAFACVLLSHGDDGLI YGTDDSLIELKRLFTLFRGD

casp3A_Dr      150  RCPSLVGKPKLFFI QACRGTELDPGVETDHPDHPDI PDGRVRI PVEADFLYAYSTVPGYYSWRNTMTGSWFI QSLCEMT
casp3ai_Cc     110  RCPSLVGKPKLFFI QACRGTELDPGVETDSV-----DKSIRI PVEADFLYAYSTVPGYYSWRNTMTGSWFI QSLCEMT
casp3aii_Cc    45  RCPSLVGKPKLFFI QACRGTELDPGVEADS-----DSSMRI PVEADFLYAYSTVPGYYSWRNTMTGSWFI QSLCEMVA
casp3B_Dr      157  RCTSLVGKPKLFFI QACRGTDLDSEIECDGVGD---EETORI PVEADFLYAYSTVPGYYAWRNVANGSWFI SSLCDMLL
casp3b_Cc      83  RCRSLVGKPKLFFI QACRGSELDGGEIADS VGE---EDTQKI PVEADFFYAYSTVPGYYSRRNVNGSWFI FSLCEMLS

casp3A_Dr      230  KYGSELELLQI MTRVNHKVALDFESTSNMPGFDAKKQI PCI VSM LTKEMYFTP
casp3ai_Cc     184  KYGKELELLQI MTRVNHKVALDFESTSNMPGFDAKKQI PCI VSM LTKEMYFSA
casp3aii_Cc    119  KYGRELELLQI MTRVNHKVALDFESTSNMPGFDAKKQI PCI VSM LTKEMYFSA
casp3B_Dr      233  KYGKQLELLQI MTRVNHKVALDFESTSNMPGFDAKKQI PCI VSM LTKELYFPK
casp3b_Cc      159  KYGKELELLQI MTRVNHKVALDFESTSNMPGFDE-----

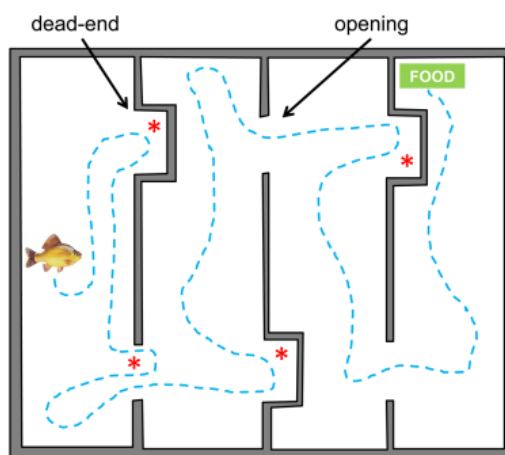
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**Fig. S2:** Western blotting positive control (gill tissue from crucian carp exposed to 25-30°C) and different protein loading concentrations (brain tissue from crucian carp exposed to anoxia for 7 days followed by one day of re-oxygenation).

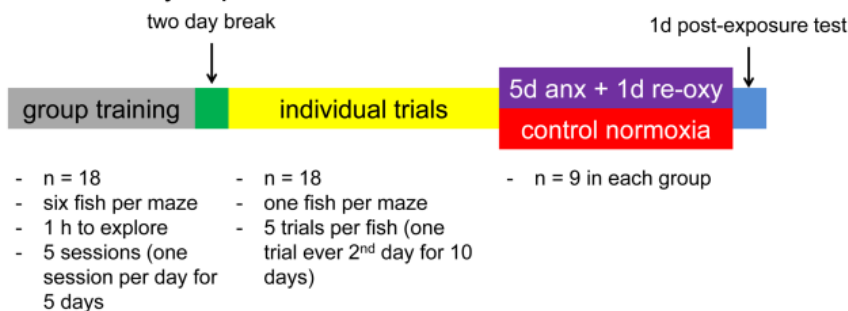


**Fig. S3:** Schematic representation of the maze used to assess the effect of anoxia exposure on crucian carp memory and learning (A). The time it took for the fish to reach the food as well as the number of errors made (i.e. going into a dead end or reversing course and returning through an opening, as indicated by asterisks) were recorded during each individual trial. Schematic representation of the daily schedule and protocol for the experiments designed to examine if crucian carp show (B) impaired memory and (C) impaired learning after anoxia/re-oxygenation.

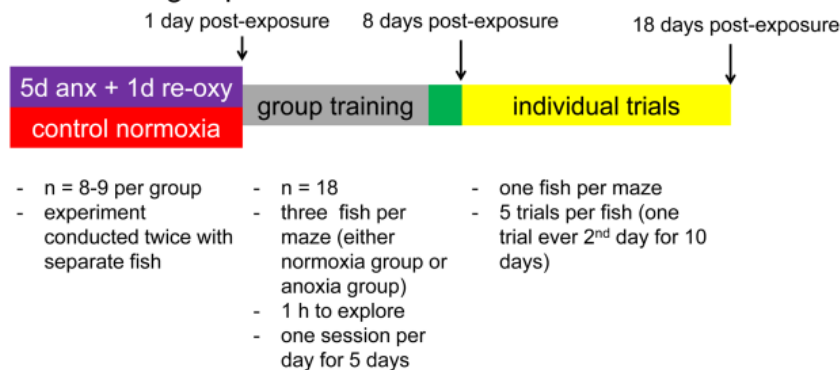
### A Maze



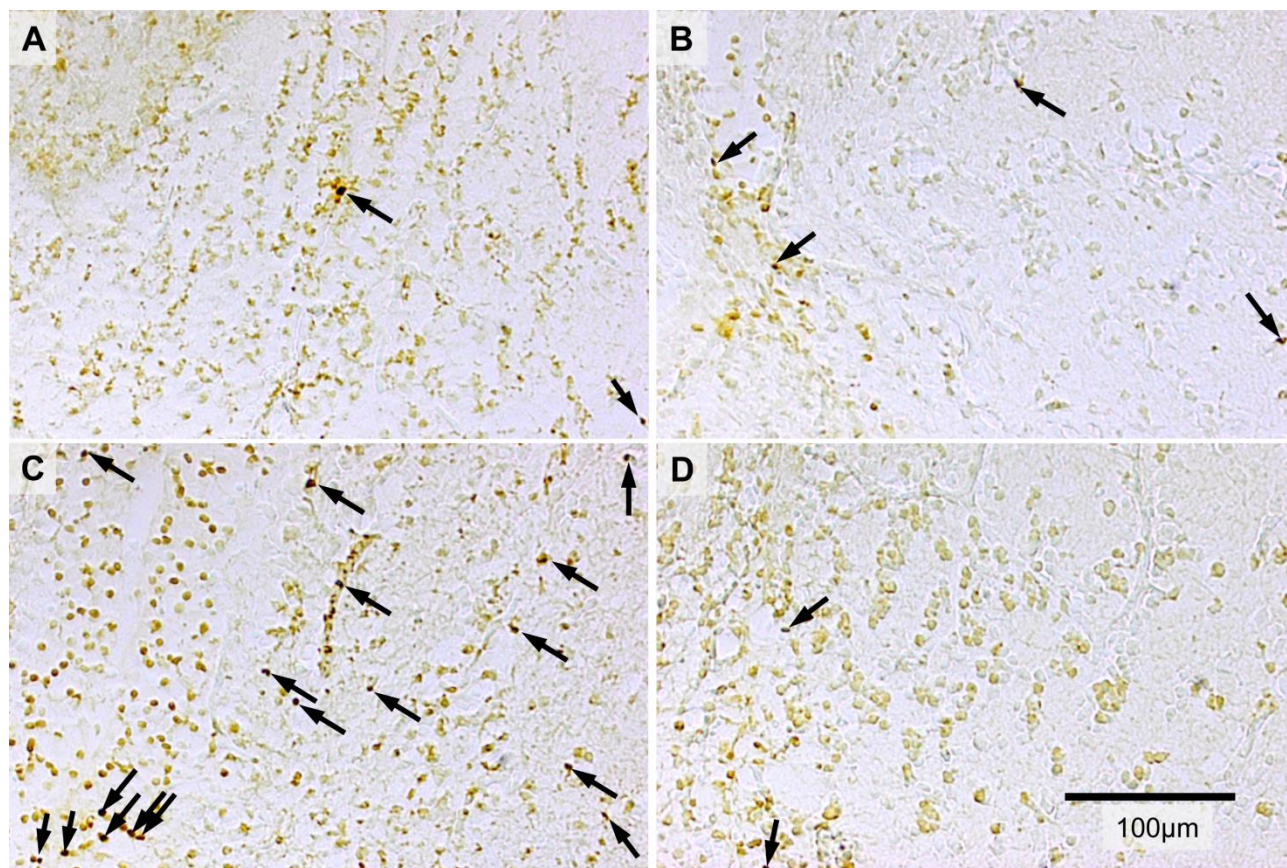
### B Memory experiment



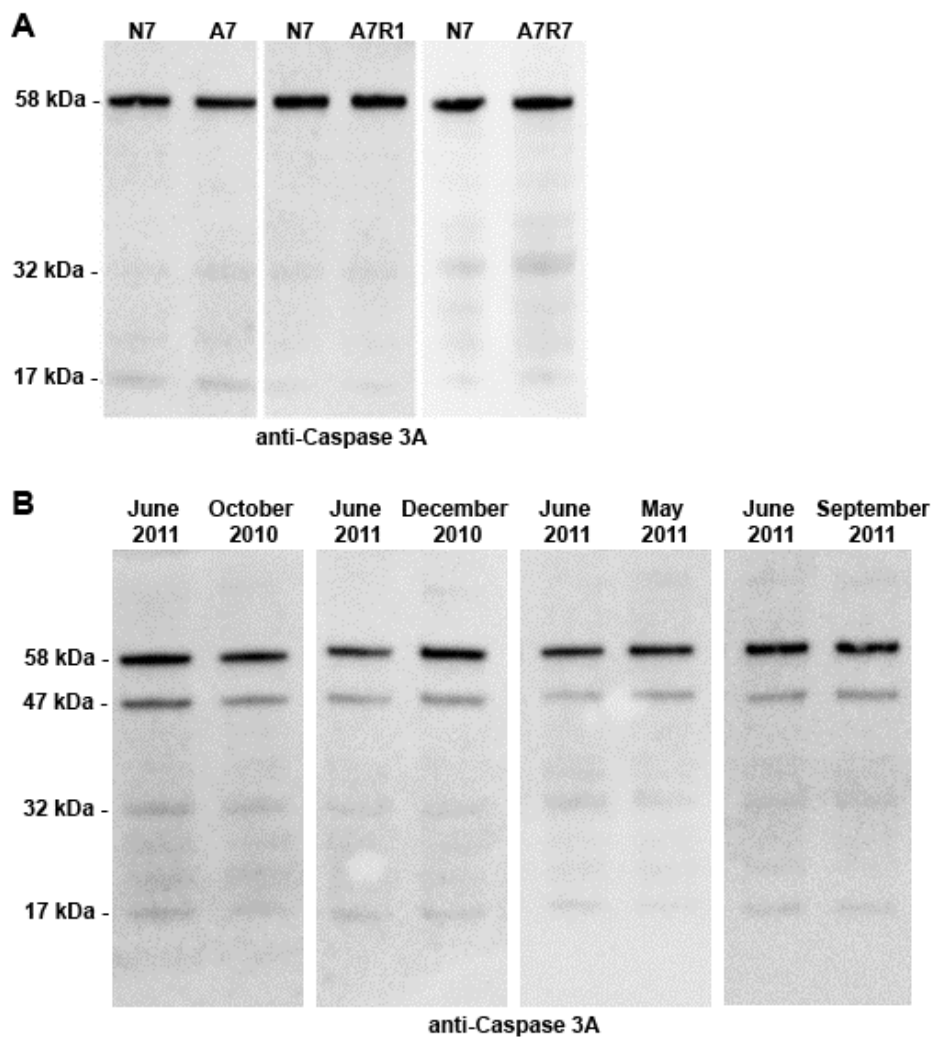
### C Learning experiment



**Fig. S4:** Examples of images from TUNEL staining taken at 20X magnification of telencephalon tissue from crucian carp after 7 days normoxia (A), 7 days anoxia (B), 1 day re-oxygenation (C), and 7 days re-oxygenation (D). Apoptotic cell bodies stained by the TUNEL assay are identified with black arrows.



**Fig. S5:** Western blotting gel images of casp3a protein expression from brains of crucian carp after 7 days exposure to normoxia (N7) or anoxia (A7), and 7 days anoxia followed by one or seven days of re-oxygenation (A7R1 and A7R7, respectively) (A) and in brains from crucian carp caught in Tjærnsrudtjernet at different times of the year (B).





**Fig. S6:** Feeding activity measured as the percentage of partitions of the maze with feeding activity (A) and feeding activity as the percentage of pellets consumed (B). Due to the small sample size ( $n = 10$  for the normoxia-group and  $n = 12$  for the anoxia-group) and the nature of the experiment, statistical significance was not assessed, but it was clear that the post-exposure appetite in most of the anoxic fish was maintained.

