**S23 Table. Field and laboratory studies on responses of biomarkers of effect in fish to metals and other contaminants: histopathology and gross indices.** Most studies measured contaminants in the environment in addition to those identified as of concern for Gladstone Harbour (Al, Cd, Cu, Ga, Pb, Se, Zn); these are also presented for completeness.

| Species | LHS | Laboratory or Field | Metals | Other contaminants | HA | HIS/ LSI | GSI | CF | K index | RNA:DNA ratio | TLC | Other | Reference |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Acanthopagrus latus* | A | Field sed | As, Cr, Cu, Ni, Pb, V, Zn | PAHs |  | - |  | = |  |  |  |  | (1) |
| *Anguilla anguilla* | Glass eels | Field sed | Cd, Cr, Cu, Hg, Ni, Pb, V, Zn | PAH |  |  |  |  | = |  |  |  | (2) |
| *Anguilla anguilla* | Yellow eels | Field sed | Cd, Cr, Cu, Hg, Ni, Pb, V, Zn | PAH |  |  |  |  | - |  |  |  | (2) |
| *Aphanius fasciatus* | A | Field water and sed | Cd, Cu, Zn | PAHs |  |  |  | +/- |  |  |  |  | (3) |
| *Aphanius fasciatus* | J | Field sed | Cd, Cd, Cu, Cu, ZnZn | PAHs | + (Collagen) |  |  |  | = |  |  | COL1A2 +/- | (4) |
| *Aphanius fasciatus* | J | Lab water toxicity test | Cd |  |  |  |  |  |  |  |  | COl1A2 - | (4) |
| *Atherina presbyter* | A | Field sed | Cd, Hg, Ni, Pb, Zn | PAHs |  |  |  |  | = | +/- |  |  | (5) |
| *Atherinops affnis* | L | Lab water toxicity test | Cd |  |  |  |  |  |  |  |  | Food intake - | (6) |
| *Centropomus parallelus* | J | Field sed and water | Ag, Al, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Zn |  | = |  |  |  |  |  |  |  | (7) |
| *Chanos chanos* | A | Field sed and water | Cd, Cu, Fe, Mn, Pb, Zn |  | + |  |  |  |  |  |  |  | (8) |
| *Coris julis* | A | Field sed | Cd, Co, Cr, Cu, Ni, Pb, Sb, Zn |  | + |  |  |  |  |  |  |  | (9) |
| *Cynoglossus arel* | A | Field sed | As, Cr, Cu, Ni, Pb, V, Zn | PAHs |  | = |  | = |  |  |  |  | (1) |
| *Dicentrarchus labrax* | A | Caged field sed | Cu, Pb, Zn | PAHs |  | - |  |  |  |  |  |  | (10) |
| *Dicentrarchus labrax* | A | Field sed | Cr, Cu, Ni, Pb, Zn | PAHs |  |  |  |  |  | - | - | TPC -; | (11) |
| *Dicentrarchus labrax* | J | Caged field sed | Al, Cd, Cr, Cu, Mn, Ni, Pb, V, Zn |  |  |  |  |  | - | - |  | Growth index -; TAG:ST - | (12) |
| *Dicentrarchus labrax* | J | Lab field sed toxicity | As, Cd, Co, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Sb, V, Zn |  | + |  |  |  |  |  |  |  | (13) |
| *Dicentrarchus labrax* | J | Lab water toxicity test | Cd |  |  |  |  |  |  |  |  | Lateral line tissue + | (14) |
| *Epinephelus coioides* | J | Lab water toxicity test | Cu |  | + |  |  |  |  |  | - | Digestive enzymes -; TSFA +; MFA +; TPFA -; | (15) |
| *Fundulus heteroclitus* | A | Field and lab sed | Cd, Cu, Hg, Pb, Zn | PAHs, PCBs |  |  |  |  |  |  |  | Prey capture -; | (16) |
| *Fundulus heteroclitus* | L | Field sed / lab | Cd, Cu, Hg, Pb, Zn | PAHs, PCBs |  |  |  |  |  |  |  | Prey capture -; | (17) |
| *Gadus morhua L.* | A | Cage field water | Cd, Cu, Hg, Pb, Zn | PAHs, PCBs |  | = | = | = |  |  |  | SSI = | (18) |
| *Gadus morhua L.* | J | Lab water toxicity test | As, Cd, Co, Cr, CuHg, Mn, Ni, Pb, Zn | PAHs | = |  |  |  |  |  |  |  | (19) |
| *Galaxias maculatus* | E | Lab water and sed toxicity test | Cu, Pb, Zn |  |  |  |  |  |  |  |  | Phototactic response - | (20) |
| *Lates calcarifer* | A | Field sed | Cd, Cr, Cu, Ni, Zn | Diuron, PAHs |  | = |  |  | = | - |  |  | (21) |
| *Lates calcarifer* |  | Lab water toxicity test | Cu |  | + |  |  |  |  |  |  |  | (22) |
| *Limanda limanda* | A | Field sed | Cd, Cr, Cu, Hg, Ni, Pb, Zn | PAHs, PCBs | = |  |  | + |  |  |  | Parasites =; | (23) |
| *Lutjanus russellii* | A | Field sed and water | Cd, Cu, Fe, Pb, Zn |  |  | - |  |  |  |  |  |  | (24) |
| *Mugil cephalus* | A | Field sed and water | Cu, Fe, Mn, Pb, Zn |  | + |  |  | - |  |  |  |  | (25) |
| *Mugil cephalus* | F | Lab water toxicity test | Pb |  | + |  |  |  |  |  |  |  | (26) |
| *Mugil cephaus* | J | Field sed and water | Cd, Cu, Mn, Ni, Pb | AHCs, PAHs, PCBs, DDTs, TBT |  |  |  | = |  |  |  |  | (27) |
| *Mullus barbatus* | A | Field sed | As, Cd, Cu, Hg, Pb, Zn | PAHs, CBs, DDT, HCB, trans-nonachlor, Lindane, Dieldrin |  | = | - | - |  |  | - |  | (28) |
| *Plastichthys flesus* | A | Cage field water | Cd, Cu, Hg, Pb, Zn | PAHs, PCBs |  | = |  | = |  |  |  |  | (18) |
| *Plastichthys flesus* | A | Field sed | Al, Cd, Cr, Cu, Fe, Hg, Mn, Pb, Zn | PCB,DDD,DDE, HCH |  |  |  |  |  |  |  | Parasites - | (29) |
| *Plastichthys flesus* | J | Field sed | Al, Cd, Cr, Cu, Hg, Mn, Ni, Pb, V, Zn | PAHs |  |  |  |  | - |  | - | TAG:ST - | (30) |
| *Plastichthys flesus* | J | Field sed | Al, Cd, Cr, Cu, Hg, Mn, Ni, Pb, V, Zn |  |  |  |  |  | - | - |  |  | (31) |
| *Plastichthys flesus* | J | Lab field sed toxicity | As, Cr, Cu, Hg, Ni, Pb, Zn | PAHs, DDT, HCB, CB, TBT, DBT |  |  | = |  |  |  |  |  | (32) |
| *Platichthys flesus* | A | Field sed | Cd, Hg, Pb, Zn | PAHs, PCBs | + lesions | = |  | +/- |  |  |  | Epidermal disease = | (33) |
| *Platichthys flesus L.* | A | Field water and sed | As, Cd, Cr, Cu, Hg, Ni, Pb, Zn | PAHs, PCBs, OCPs | = | = | = | - |  | +/- |  | TPC +\-; | (34) |
| *Pogpmichthys macrolepidotus* | L | Lab food | MeHgSe |  | + |  |  | = |  |  |  |  | (35) |
| *Pomadasys hasta* | A | Field sed and water | Cd, Cu, Fe, Pb, Zn |  |  | - |  |  |  |  |  |  | (24) |
| *Pomatoschistus microps* | A | Field sed | Cd, Cr, Cu, Hg, Ni, Pb, Zn | PAHs |  |  |  |  | = | = |  |  | (36) |
| *Pomatoschistus microps* | A | Field sed | Cd, Hg, Ni, Pb, Zn | PAHs |  |  |  |  | = | +/- |  |  | (5) |
| *Pomatoschistus microps* | A | Field sed | Cr, Cu, Ni, Pb, Zn | PAHs |  |  |  |  |  | - | = | TPC +/- | (11) |
| *Scophtalmus maximus* | J | Caged field sed | Al, Cd, Cr, Cu, Mn, Ni, Pb, V, Zn |  |  |  |  |  | - | = |  | Growth index =; TAG:ST - | (12) |
| *Scophtalmus maximus* | J | Lab field sed | Al, Cd, Cr, Cu, Mn, Ni, Pb, V, Zn |  |  |  |  |  | - | +/- |  | Growth index +\-; TAG:ST - | (37) |
| *Seriola lalandi* | J | Lab food | Se |  | = | - |  |  |  |  |  |  | (38) |
| *Solea senegalensis* | A | Field sed | Cr, Cu, Ni, Pb, Zn | PAHs |  |  |  |  |  | +/- | +/- | TPC +\- | (11) |
| *Solea senegalensis* | J | Field sed | Cd, Cr, Cu, Ni, Pb, Zn | PAHs |  |  |  |  | + | +/- |  |  | (39) |
| *Solea senegalensis* | J | Lab and field sed | As, Cu, Zn | PAHs, PCBs, DDT | + |  |  |  |  |  |  |  | (40) |
| *Solea senegalensis* | J | Lab field sed toxicity | As, Cd, Cr, Cu, Hg, Ni, Pb, Zn | PAHs | + |  |  | + |  |  |  |  | (41) |
| *Solea senegalensis* | J | Lab field sed toxicity | Cd, Cr, Cu, Ni, Pb, Zn | PAHs, PCBs, DDT | + |  |  |  |  |  |  |  | (42) |
| *Sparus aurata* | J | Lab field sed toxicity | As, Cd, Cr, Cu, Hg, Ni, Pb, Zn | PAHs | + |  |  | + |  |  |  |  | (41) |
| *Squalus acanthias* | A | Lab water toxicity test | Pb |  |  |  |  |  |  |  |  | TPC liver +/-; glycogen muscle - | (43) |
| *Symphodus melops* | A | Field water and sed | Fe, Pb, Zn |  |  | = | - | = |  |  |  | SSI - | (44) |
| *Synechogobius hasta* | J | Lab water toxicity test | Cd |  | + | + |  | = |  |  | + | VSI = | (45) |
| *Terapon jarbua* | F | Lab water toxicity test | Pb |  | + |  |  |  |  |  |  |  | (26) |
| *Terapon jarbua* | J | Lab food | Cd |  |  |  |  | = |  |  |  |  | (46) |

Abbreviations: LHS: life history stage; A: adult, E: eggs, F: fingerlings, J: juvenile, L: larvae: Lab: laboratory; Sed: Sediment; HCB: hexachlorobenzene; OCP: total organochlorine pesticides; CB: chlorinated biphenyls; naph: naphthalenes; PAHs : total polycyclic aromatic hydrocarbons; PCBS: polychlorinated biphenyl; TBT: tributyltin; DBT: dibutytin; DDD: 1,1-dichloro-2.2-bis(p-chlorophenyl) ethane; DDE: 1,1-dichloro-2.2-bis(p-chlorophenyl) ethylene; HCH: hexachlorcyclohexane; DDT: dichlorodiphenyltrichloroethane; HCB: hexachlorobenzene; HA: histological alteration; HSI: hepatosomatic index; LSI: liver somatic index; GSI: gonadosomatic index; CF: condition factor; + induction; - inhibition; = no significant induction; +/- mixed response; TAG:ST - lipid storage index; TLC - total lipid content; TPC - total protein content; TPFA - total polyunsaturated fatty acids; MFA - monounsaturated fatty acids; TSFA - total saturated fatty acids; COL1A2: Collagen 1A2; VSI: viscerosomatic index; Vac: Vacuolation; Fibr: Fibrillar structures.

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