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Editorial

FIRST IN A SPECIAL SERIES: ANALYSIS OF THE IMPACT OF PAPERS PUBLISHED IN *ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY* OVER THE PAST 30 YEARS—AN OVERVIEW AND COMING ATTRACTIONS

The Publications Advisory Committee (PAC) within the Society of Environmental Toxicology and Chemistry (SETAC) is involved in several activities related to SETAC publications, including books, the *Globe* (society newsletter) and, of course, the two society-sponsored journals, *Environmental Toxicology and Chemistry* (*ET&C*) and *Integrated Environmental Assessment and Management* (*IEAM*). One of the PAC's tasks is to increase the visibility of the journals both to Society membership and the broader scientific community. One way to do this, for example, is to assess the impacts of their content on science and regulation in the field of environmental sciences.

A common metric of journal impact in social, physical, and biological sciences is the Impact Factor (IF). The IF, calculated annually for a journal, is defined as the total number of indexed citations to papers a journal has published over the prior two years, divided by the total number of papers published by that journal during that same period. The current IF for *ET&C* is about 3. An IF is not available for *IEAM* because the journal is not yet indexed. The IF has become an increasingly important determinant of where authors publish their work; hence, it is highly linked with journal visibility. Although the IF can provide important insights, using this metric in isolation to judge the impact of a journal is limited. For example, due to the relatively slow pace of change in regulatory procedures/activities in response to new science, highly applied papers in environmental toxicology and chemistry might be prone to delayed acknowledgments in terms of significant citations, which would not be captured by use measurements, such as the IF, which are focused on the shorter term.

To help address the challenge of assessing the long-term impact of *ET&C* publications, the PAC recently analyzed the citations of all papers published in the journal since its inception in 1982. The analysis used the Thompson-Reuters Web of Science database and software. Over the course of its 30-year history, *ET&C* has published a total of 7,674 indexed (citable) papers as of February 2012 when the analysis was conducted. The top 100 cited papers from that analysis (actually 102 papers—the 100th position was a tie) are listed in Table 1. Notably, all papers had been cited more than 100 times, ranging from 117 citations for papers published by Nebeker et al. ([1]; toxicity test methods for sediments), Meylan et al. ([2]; predicting water solubility of chemicals), and Arukwe et al. ([3]; effects of nonylphenol on Atlantic salmon) to a manuscript by Jobling et al. ([4]; concerning estrogenicity of nonylphenol in fish), which had been cited 818 times. This top 100 list spans a substantial time period, featuring two papers from as early as 1984 (Nebeker et al. [1] and Mount and Norberg [5], which are arguably "classics" in the areas of sediment and effluent test methods, respectively), to a comparatively recent review (2008) on nanomaterials by Klaine et al. [6]. Perusing the topical content of the top 100 papers reveals a broad range of topics have been covered in environmental chemistry, toxicology, and risk assessment, with authors from several countries in North America and Europe represented. Not unexpectedly, the authors of many of the papers are highly accomplished scientists in their fields.

Taken as a whole, the papers on the top 100 list are an excellent reflection of the high-visibility scientific and regulatory issues published over the past 30 years relative to evaluating the risk of wide-ranging inorganic and organic contaminants in both terrestrial and aquatic environments. It is impossible in this short editorial to address the significance and impacts of the individual papers and topical areas encompassed on the list. As such, we are implementing an innovative communication strategy to share some of this information with SETAC members and other environmental scientists. Specifically, we have asked prominent scientists involved with the work captured on the top 100 list to write short essays on the specific topic areas reflected in the highly-cited papers. For this effort, the PAC collated representative papers from the top 100 list into a manageable number of topical areas (24) as a basis for the essays. Examples of topical areas for which essays are being developed include: occurrence, causes, and significance of endocrine-disrupting chemicals in the environment; chemical and biological approaches for assessing the effects of effluent or sediment-associated contaminants; advances in risk assessment practices; and detecting and evaluating contaminants of historical and emerging concern.

In the coming calendar year, *ET&C* will publish 24 essays derived from the top 100 analysis that the PAC conducted. These essays will describe the science/regulatory challenge the research/analysis sought to address, explain how the research/paper(s) met this challenge, account for the practical impacts of the papers on science and regulatory activities, and identify remaining uncertainties/future directions for the line of research described in the cited papers. In addition to being published in *ET&C*, the essays will be archived and readily available electronically; details on this portion of the effort are being finalized and will be communicated to Society membership in the near future. The PAC feels that developing and publishing the various essays derived from the list of top 100 papers will have the dual benefit of highlighting the impact of past *ET&C* publications and providing an important and unique historical accounting of high-impact environmental research conducted by scientists associated with SETAC. In addition, we feel that the essays will provide significant insights regarding evolving

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Table 1. Ranking by citation frequency of the top 100 (102) papers published in *Environmental Toxicology and Chemistry*

Rank	Title	Authors	Publication year	Volume	Pages	Total citations
1	Inhibition of testicular growth in rainbow trout (*Oncorhynchus mykiss*) exposed to estrogenic alkylphenolic chemicals	Jobling S, Sheahan D, Osborne JA, Matthiessen P, Sumpter JP	1996	15	194–202	818
2	Estrogenic activity of surfactants and some of their degradation products assessed using a recombinant yeast screen	Routledge EJ, Sumpter JP	1996	15	241–248	752
3	Technical basis for establishing sediment quality criteria for nonionic organic-chemicals using equilibrium partitioning	Di Toro DM, Zarba CS, Hansen DJ, Berry WJ, Swartz RC, Cowan CE, Pavlou SP, Allen HE, Thomas NA, Paquin PR	1991	10	1541–1583	727
4	Ecological risk assessment of atrazine in North American surface waters	Solomon KR, Baker DB, Richards RP, Dixon DR, Klaine SJ, LaPoint TW, Kendall RJ, Weisskopf CP, Giddings JM, Giesy JP, Hall LW, Williams WM	1996	15	31–74	461
5	Biotic ligand model of the acute toxicity of metals. 1. Technical basis	Di Toro DM, Allen HE, Bergman HL, Meyer JS, Paquin PR, Santore RC	2001	20	2383–2396	423
6	Toxicity of cadmium in sediments: The role of acid volatile sulfide	Di Toro DM, Mahony JD, Hansen DJ, Scott KJ, Hicks MB, Mayr SM, Redmond MS	1990	9	1487–1502	392
7	Estrogenic activity in five United Kingdom rivers detected by measurement of vitellogenesis in caged male trout	Harries JE, Sheahan DA, Jobling S, Matthiessen P, Neall M, Sumpter JP, Taylor T, Zaman N	1997	16	534–542	390
8	Critical appraisal of the evidence for tributyltin-mediated endocrine disruption in mollusks	Matthiessen P, Gibbs PE	1998	17	37–43	321
9	Groundwater ubiquity score: A simple method for assessing pesticide leachability	Gustafson DI	1989	8	339–357	304
10	Predicting modes of toxic action from chemical structure: Acute toxicity in the fathead minnow (*Pimephales promelas*)	Russom CL, Bradbury SP, Broderius SJ, Hammermeister DE, Drummond RA	1997	16	948–967	290
11	Determination of octanol water partition-coefficients for hydrophobic organic-chemicals with the slow-stirring method	Debruijn J, Busser F, Seinen W, Hermens J	1989	8	499–512	282
12	Effects of the synthetic estrogen 17 alpha-ethinylestradiol on the life-cycle of the fathead minnow (*Pimephales promelas*)	Lange R, Hutchinson TH, Croudace CP, Siegmund F, Schweinfurth H, Hampe P, Panter GH, Sumpter JP	2001	20	1216–1227	281
13	A survey of estrogenic activity in United Kingdom inland waters	Harries JE, Sheahan DA, Jobling S, Matthiessen P, Neall P, Routledge EJ, Rycroft R, Sumpter JP, Tylor T	1996	15	1993–2002	264
14	Degradation of azo dyes by environmental microorganisms and helminths	Chung KT, Stevens SE	1993	12	2121–2132	261
15	Estrogenic potency of chemicals detected in sewage treatment plant effluents as determined by in vivo assays with Japanese medaka (*Oryzias latipes*)	Metcalfe CD, Metcalfe TL, Kiparissis Y, Koenig BG, Khan C, Hughes RJ, Croley TR, March RE, Potter T	2001	20	297–308	259
16	Biochemical responses in aquatic animals: A review of determinants of oxidative stress	Digiulio RT, Washburn PC, Wenning RJ, Winston GW, Jewell CS	1989	8	1103–1123	252
17	Sorption dynamics of hydrophobic pollutants in sediment suspensions	Karickhoff SW, Morris KR	1985	4	469–479	251
18	Nanomaterials in the environment: Behavior, fate, bioavailability, and effects	Klaine SJ, Alvarez PJJ, Batley GE, Fernandes TF, Handy RD, Lyon DY, Mahendra S, McLaughlin MJ, Lead JR	2008	27	1825–1851	249
19	Induction of testis-ova in Japanese medaka (*Oryzias latipes*) exposed to *p*-nonylphenol	Gray MA, Metcalfe CD	1997	16	1082–1086	248
20	Analysis of acid-volatile sulfide (AVS) and simultaneously extracted metals (SEM) for the estimation of potential toxicity in aquatic sediments	Allen HE, Fu GM, Deng BL	1993	12	1441–1453	246
21 (A)	Predicting toxicity in marine sediments with numerical sediment quality guidelines	Long ER, Field LJ, MacDonald DD	1998	17	714–727	236
21 (B)	Principal response curves: Analysis of time-dependent multivariate responses of biological community to stress	Van den Brink PJ, Ter Braak CJF	1999	18	138–148	236
23	Overview of a workshop on screening methods for detecting potential (anti-) estrogenic/ androgenic chemicals in wildlife	Ankley G, Mihaich E, Stahl R, Tillitt D, Colborn T, McMaster S, Miller R, Bantle J, Campbell P, Denslow N, Dickerson R, Folmar L, Fry M, Giesy J, Gray LE, Guiney P, Hutchinson T, Kennedy S, Kramer V, LeBlanc G, Mayes M, Nimrod A, Patino R, Peterson R, Purdy R, Ringer R, Thomas P, Touart L, Van der Kraak G, Zacharewski T	1998	17	68–87	225
24	Environmental factors affecting the formation of methylmercury in low pH lakes	Winfrey MR, Rudd JWM	1990	9	853–869	221

Table 1. (*Continued*)

Rank	Title	Authors	Publication year	Volume	Pages	Total citations
25	Biotic ligand model of the acute toxicity of metals. 2. Application to acute copper toxicity in freshwater fish and *Daphnia*	Santore RC, Di Toro DM, Paquin PR, Allen HE, Meyer JS	2001	20	2397–2402	218
26	Polybrominated diphenyl ethers and hexabromocyclododecane in sediment and fish from a Swedish river	Sellstrom U, Kierkegaard A, de Wit C, Jansson B	1998	17	1065–1072	215
27	Bioconcentration and tissue distribution of perfluorinated acids in rainbow trout (*Oncorhynchus mykiss*)	Martin JW, Mabury SA, Solomon KR, Muir DCG	2003	22	196–204	212
28	Assimilation efficiencies of chemical contaminants in aquatic invertebrates: A synthesis	Wang WX, Fisher NS	1999	18	2034–2045	208
29	Effects of mercury on wildlife: A comprehensive review	Wolfe MF, Schwarzbach S, Sulaiman RA	1998	17	146–160	207
30	Factors affecting mercury accumulation in fish in the upper Michigan peninsula	Grieb TM, Driscoll CT, Gloss SP, Schofield CL, Bowie GL, Porcella DB	1990	9	919–930	203
31	Acetylcholinesterase inhibition in estuarine fish and invertebrates as an indicator of organophosphorus insecticide exposure and effects	Fulton MH, Key PB	2001	20	37–45	198
32	Technical basis and proposal for deriving sediment quality criteria for metals	Ankley GT, DiToro DM, Hansen DJ, Berry WJ	1996	15	2056–2066	197
33	The effects of water chemistry on the toxicity of copper to fathead minnows	Erickson RJ, Benoit DA, Mattson VR, Nelson HP, Leonard EN	1996	15	181–193	193
34	Distribution of acidic and neutral drugs in surface waters near sewage treatment plants in the lower Great Lakes, Canada	Metcalfe CD, Miao XS, Koenig BG, Struger J	2003	22	2881–2889	192
35	Dietary accumulation and depuration of hydrophobic organochlorines: Bioaccumulation parameters and their relationship with the octanol/water partition coefficient	Fisk AT, Norstrom RJ, Cymbalisty CD, Muir DCG	1998	17	951–961	191
36	Survey of estrogenic activity in United Kingdom estuarine and coastal waters and its effects on gonadal development of the flounder *Platichthys flesus*	Allen Y, Scott AP, Matthiessen P, Haworth S, Thain JE, Feist S	1999	18	1791–1800	189
37	An equilibrium model of organic-chemical accumulation in aquatic food webs with sediment interaction	Thomann RV, Connolly JP, Parkerton TF	1992	11	615–629	188
38	Polycyclic aromatic hydrocarbons in sediments and mussels of the western Mediterranean sea	Baumard P, Budzinski H, Garrigues P	1998	17	765–776	186
39	Assessing the toxicity of freshwater sediments	Burton GA	1991	10	1585–1627	185
40	Description and evaluation of a short-term reproduction test with the fathead minnow (*Pimephales promelas*)	Ankley GT, Jensen KM, Kahl MD, Korte JJ, Makynen EA	2001	20	1276–1290	184
41	*Daphnia magna* mortality when exposed to titanium dioxide and fullerene (C-60) nanoparticles	Lovern SB, Klaper R	2006	25	1132–1137	183
42 (A)	Toxicokinetics in aquatic systems: Model comparisons and use in hazard assessment	Landrum PF, Lee H, Lydy MJ	1992	11	1709–1725	181
42 (B)	Analysis of estrogenic hormones in municipal wastewater effluent and surface water using enzyme-linked immunosorbent assay and gas chromatography/tandem mass spectrometry	Huang CH, Sedlak DL	2001	20	133–139	181
44	Survey of receiving-water environmental impacts associated with discharges from pulp-mills: 2. Gonad size, liver size, hepatic erod activity and plasma sex steroid levels in white sucker	Munkittrick KR, Vanderkraak GJ, McMaster ME, Portt CB, Vandenheuvel MR, Servos MR	1994	13	1089–1101	180
45	Desorption kinetics of chlorobenzenes, polycyclic aromatic hydrocarbons, and polychlorinated biphenyls: Sediment extraction with Tenax® and effects of contact time and solute hydrophobicity	Cornelissen G, vanNoort PCM, Govers HAJ	1997	16	1351–1357	179
46	Is the per capita rate of increase a good measure of population-level effects in ecotoxicology?	Forbes VE, Calow P	1999	18	1544–1556	178
47	Bioaccumulation and toxicity of silver compounds: A review	Ratte HT	1999	18	89–108	176
48	Aquatic toxicity testing using the nematode, *Caenorhabditis elegans*	Williams PL, Dusenbery DB	1990	9	1285–1290	173
49	Dynamics of organochlorine compounds in herring gulls: 3. Tissue distribution and bioaccumulation in Lake Ontario gulls	Braune BM, Norstrom RJ	1989	8	957–968	167

(*Continued*)

Table 1. (*Continued*)

Rank	Title	Authors	Publication year	Volume	Pages	Total citations
50	Polychlorinated biphenyl residues and egg mortality in double-crested cormorants from the Great Lakes	Tillitt DE, Ankley GT, Giesy JP, Ludwig JP, Kuritamatsuba H, Weseloh DV, Ross PS, Bishop CA, Sileo L, Stromborg KL, Larson J, Kubiak TJ	1992	11	1281–1288	160
51 (A)	Slowly reversible sorption of aliphatic halocarbons in soils. 1. Formation of residual fractions	Pignatello JJ	1990	9	1107–1115	158
51 (B)	The potential for estradiol and ethinylestradiol degradation in English rivers	Jurgens MD, Holthaus KIE, Johnson AC, Smith JJL, Hetheridge M, Williams RJ	2002	21	480–488	158
53	Predictive models for photoinduced acute toxicity of polycyclic aromatic-hydrocarbons to *Daphnia magna*, Strauss (cladocera, crustacea)	Newsted JL, Giesy JP	1987	6	445–461	156
54 (A)	Predicting the bioavailability of organic xenobiotics to *Pontoporeia hoyi* in the presence of humic and fulvic materials and natural dissolved organic matter	Landrum PF, Reinhold MD, Nihart SR, Eadie BJ	1985	4	459–467	155
54 (B)	An in vivo testing system for endocrine disruptors in fish early life stages using induction of vitellogenin	Tyler CR, van Aerle R, Hutchinson TH, Maddix S, Trip H	1999	18	337–347	155
56 (A)	Chlorinated and brominated persistent organic compounds in biological samples from the environment	Jansson B, Andersson R, Asplund L, Litzen K, Nylund K, Sellstrom U, Uvemo UB, Wahlberg C, Wideqvist U, Odsjo T, Olsson M	1993	12	1163–1174	153
56 (B)	Predictability of the toxicity of multiple chemical mixtures to *Vibrio fischeri*: Mixtures composed of similarly acting chemicals	Altenburger R, Backhaus T, Boedeker W, Faust M, Scholze M, Grimme LH	2000	19	2341–2347	153
58	Environmental dechlorination of PCBs	Brown JF, Wagner RE, Feng H, Bedard DL, Brennan MJ, Carnahan JC, May RJ	1987	6	579–593	152
59	Bioindicators of contaminant exposure and sublethal effects: Studies with benthic fish in Puget Sounds, Washington	Stein JE, Collier TK, Reichert WL, Casillas E, Hom T, Varanasi U	1992	11	701–714	151
60	Fish reproduction: An ecologically relevant indicator of endocrine disruption	Arcand-Hoy LD, Benson WH	1998	17	49–57	149
61 (A)	A seven-day life-cycle cladoceran toxicity test	Mount DI, Norberg TJ	1984	3	425–434	147
61 (B)	Rapid assessment of induced cytochrome P4501A protein and catalytic activity in fish hepatoma cells grown in multiwell plates: Response to TCDD, TCDF, and two planar PCBS	Hahn ME, Woodward BL, Stegeman JJ, Kennedy SW	1996	15	582–591	147
63	Bioaccumulation of PCBs by algae: Kinetics versus equilibrium	Swackhamer DL, Skoglund RS	1993	12	831–838	146
64	Pesticides and amphibian population declines in California, USA	Sparling DW, Fellers GM, McConnell LL	2001	20	1591–1595	144
65	A critique of ecosystem health concepts and indexes	Suter GW	1993	12	1533–1539	143
66 (A)	Response of hepatic MFO activity and plasma sex steroids to secondary treatment of bleached kraft pulp mill effluent and mill shutdown	Munkittrick KR, Vanderkraak GJ, McMaster ME, Portt CB	1992	11	1427–1439	142
66 (B)	Improved method for estimating bioconcentration/ bioaccumulation factor from octanol/water partition coefficient	Meylan WM, Howard PH, Boethling RS, Aronson D, Printup H, Gouchie S	1999	18	664–672	142
66 (C)	Assessing sediment contamination in estuaries	Chapman PM, Wang FY	2001	20	3–22	142
66 (D)	Occurrence of neutral and acidic drugs in the effluents of Canadian sewage treatment plants	Metcalfe CD, Koenig BG, Bennie DT, Servos M, Ternes TA, Hirsch R	2003	22	2872–2880	142
70	Review of the environmental behavior and fate of methyl tert-butyl ether	Squillace PJ, Pankow JF, Korte NE, Zogorski JS	1997	16	1836–1844	141
71 (A)	Calibrating the uptake kinetics of semipermeable membrane devices using exposure standards	Booij K, Sleiderink HM, Smedes F	1998	17	1236–1245	140
71 (B)	Aquatic toxicity of triclosan	Orvos DR, Versteeg DJ, Inauen J, Capdevielle M, Rothenstein A, Cunningham V	2002	21	1338–1349	140
71 (C)	Dietary accumulation of perfluorinated acids in juvenile rainbow trout (*Oncorhynchus mykiss*)	Martin JW, Mabury SA, Solomon KR, Muir DCG	2003	22	189–195	140
74	Reduction in bioavailability to bluegills of polycyclic aromatic-hydrocarbons bound to dissolved humic material	McCarthy JF, Jimenez BD	1985	4	511–521	138
75	Measurement of triclosan in wastewater treatment systems	McAvoy DC, Schatowitz B, Jacob M, Hauk A, Eckhoff WS	2002	21	1323–1329	137
76	Reduction in bioavailability of organic contaminants to the amphipod *Pontoporeia hoyi* by dissolved organic matter of sediment interstitial waters	Landrum PF, Nihart SR, Eadie BJ, Herche LR	1987	6	11–20	135

Table 1. (*Continued*)

Rank	Title	Authors	Publication year	Volume	Pages	Total citations
77	Development of a passive, in situ, integrative sampler for hydrophilic organic contaminants in aquatic environments	Alvarez DA, Petty JD, Huckins JN, Jones-Lepp TL, Getting DT, Goddard JP, Manahan SE	2004	23	1640–1648	133
78 (A)	Predictability of the toxicity of a multiple mixture of dissimilarly acting chemicals to *Vibrio fischeri*	Backhaus T, Altenburger R, Boedeker W, Faust M, Scholze M, Grimme LH	2000	19	2348–2356	131
78 (B)	Effects of the androgenic growth promoter 17-β-trenbolone on fecundity and reproductive endocrinology of the fathead minnow	Ankley GT, Jensen KM, Makynen EA, Kahl MD, Korte JJ, Hornung MW, Henry TR, Denny JS, Leino RL, Wilson VS, Cardon MC, Hartig PC, Gray LE	2003	22	1350–1360	131
78 (C)	Assessing the long-range transport potential of polybrominated diphenyl ethers: A comparison of four multimedia models	Wania F, Dugani CB	2003	22	1252–1261	131
81	Endocrine disruptors in sewage treatment plants, receiving river waters, and sediments: Integration of chemical analysis and biological effects on feral carp	Petrovic M, Sole M, de Alda MJL, Barcelo D	2002	21	2146–2156	130
82	Substances with estrogenic activity in effluents of sewage treatment plants in southwestern Germany. 1. Chemical analysis	Spengler P, Korner W, Metzger JW	2001	20	2133–2141	129
83 (A)	Sigma-PAH: A model to predict the toxicity of polynuclear aromatic hydrocarbon mixtures in field-collected sediments	Swartz RC, Schults DW, Ozretich RJ, Lamberson JO, Cole FA, Dewitt TH, Redmond MS, Ferraro SP	1995	14	1977–1987	128
83 (B)	Factors affecting sequestration and bioavailability of phenanthrene in soils	White JC, Kelsey JW, Hatzinger PB, Alexander M	1997	16	2040–2045	128
85 (A)	Bond contribution method for estimating Henry's law constants	Meylan WM, Howard PH	1991	10	1283–1293	127
85 (B)	Declining bioavailability and inappropriate estimation of risk of persistent compounds	Kelsey JW, Alexander M	1997	16	582–585	127
87 (A)	Reproduction in mallards fed selenium	Heinz GH, Hoffman DJ, Krynitsky AJ, Weller DMG	1987	6	423–433	124
87 (B)	Ecotoxicology of arsenic in the marine environment	Neff JM	1997	16	917–927	124
87 (C)	Acute and chronic toxicity of imidazolium-based ionic liquids on *Daphnia magna*	Bernot RJ, Brueseke MA, Evans-White MA, Lamberti GA	2005	24	87–92	124
90 (A)	Bioaccumulation and biotransformation of polychlorinated dibenzo-*p*-dioxins and dibenzofurans in fish	Opperhuizen A, Sijm DTHM	1990	9	175–186	123
90 (B)	Mercury cycling and effects in freshwater wetland ecosystems	Zillioux EJ, Porcella DB, Benoit JM	1993	12	2245–2264	123
90 (C)	Time-dependent isotherm shape of organic compounds in soil organic matter: Implications for sorption mechanism	Xing BS, Pignatello JJ	1996	15	1282–1288	123
93	Pesticide concentration patterns in agricultural drainage networks in the Lake Erie basin	Richards RP, Baker DB	1993	12	13–26	121
94 (A)	Swimming behavior as the indicator of sublethal toxicity in fish	Little EE, Finger SE	1990	9	13–19	119
94 (B)	Occurrence and fate of tributyltin compounds and triphenyltin compounds in western Mediterranean coastal enclosures	Tolosa I, Merlini L, Debertrand N, Bayona JM, Albaiges J	1992	11	145–155	119
94 (C)	Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval Pacific herring (*Clupea pallasi*)	Carls MG, Rice SD, Hose JE	1999	18	481–493	119
94 (D)	Effect of kinetics of complexation by humic acid on toxicity of copper to *Ceriodaphnia dubia*	Ma HZ, Kim SD, Cha DK, Allen HE	1999	18	828–837	119
98 (A)	Effects of bleached kraft mill effluent on fish in the St. Maurice River, Quebec	Hodson PV, McWhirter M, Ralph K, Gray B, Thivierge D, Carey JH, Vanderkraak G, Whittle DM, Levesque MC	1992	11	1635–1651	118
98 (B)	Predicting the toxicity of metal-spiked laboratory sediments using acid-volatile sulfide and interstitial water normalizations	Berry WJ, Hansen DJ, Mahony JD, Robson DL, DiToro DM, Shipley BP, Rogers B, Corbin JM, Boothman WS	1996	15	2067–2079	118
100 (A)	Biological methods for determining toxicity of contaminated freshwater sediments to invertebrates	Nebeker AV, Cairns MA, Gakstatter JH, Malueg KW, Schuytema GS, Krawczyk DF	1984	3	617–630	117
100 (B)	Improved method for estimating water solubility from octanol water partition coefficient	Meylan WM, Howard PH, Boethling RS	1996	15	100–106	117
100 (C)	Xenobiotic and steroid biotransformation enzymes in Atlantic salmon (*Salmo salar*) liver treated with an estrogenic compound, 4-nonylphenol	Arukwe A, Forlin L, Goksoyr A	1997	16	2576–2583	117

issues/needs within the field of environmental toxicology and chemistry. We hope that the society membership enjoys and benefits from this retrospective and prospective analysis.

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REFERENCES

1. Nebeker AV, Cairns MA, Gakstatter JH, Malueg KW, Schuytema GS, Krawczyk DF. 1984. Biological methods for determining toxicity of contaminated freshwater sediments to invertebrates. *Environ Toxicol Chem* 3:617–630.
2. Meylan WM, Howard PH, Boethling RS. 1996. Improved method for estimating water solubility from octanol water partition coefficient. *Environ Toxicol Chem* 15:100–106.
3. Arukwe A, Forlin L, Goksoyr A. 1997. Xenobiotic and steroid biotransformation enzymes in Atlantic salmon (*Salmo salar*) liver treated with an estrogenic compound, 4-nonylphenol. *Environ Toxicol Chem* 16:2576–2583.
4. Jobling S, Sheahan D, Osborne JA, Matthiessen P, Sumpter JP. 1996. Inhibition of testicular growth in rainbow trout (*Oncorhynchus mykiss*) exposed to estrogenic alkylphenolic chemicals. *Environ Toxicol Chem* 15:194–202.
5. Mount DI, Norberg TJ. 1984. A seven-day life-cycle cladoceran toxicity test. *Environ Toxicol Chem* 3:425–434.
6. Klaine SJ, Alvarez PJJ, Batley GE, Fernandes TF, Handy RD, Lyon DY, Mahendra S, McLaughlin MJ, Lead JR. 2008. Nanomaterials in the environment: Behavior, fate, bioavailability, and effects. *Environ Toxicol Chem* 27:1825–1851.