



**STATE OF MAINE**  
**DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**  
**BOARD OF PESTICIDES CONTROL**  
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 AUGUSTA, MAINE 04333

**PAUL R. LePAGE**  
 GOVERNOR

TO: Board of Pesticides Control Members  
 From: Mary Tomlinson, Pesticides Registrar/Water Quality Specialist  
 RE: Gulf of Maine Coastal Pesticide Study Update for 2015  
 Date: December 16, 2016

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In February 2014, the Environmental Risk Advisory Committee (ERAC) was convened to “examine whether current pesticide residues have the potential to affect the lobster industry in Maine directly or via impact on other marine organisms.” Maine’s Joint Standing Committee on Agriculture, Conservation and Forestry, in a letter to the BPC, supported the formation and purpose of the ERAC and requested reports in January 2015 and January 2017. Stormwater and sediment sampling was to take place in 2014 and 2015. Due to laboratory contract issues and lack of significant rain storms, only sediment sampling occurred in 2014. Results from the 2014 sampling season were reported in the 2015 ERAC Report to the Legislature. Monitoring for the 2015 sampling season was completed in October 2015.

Based on the 2014 sediment sampling results, characteristics of juvenile lobster behavior and habitat, and budgetary constraints, the Environmental Risk Advisory Committee limited sediment sampling to the Casco Bay coastlines. Sediments were collected in 2015 from 13 intertidal sites in Casco Bay. One site on the Saco River, below Biddeford, was sampled to follow up a cypermethrin detection at that location in 2014. Stormwater sampling was conducted at 19 sites, from Kittery to Whiting, over one storm event in August 2015. One stormwater sample was collected in Ellsworth in September.

Sediment samples were analyzed for 21 pyrethroids, piperonyl butoxide (PBO), and methoprene. Montana Analytical Laboratory analyzed for 14 pyrethroids and piperonyl butoxide (PBO). Southwest Research Institute (SwRI) analyzed for 19 pyrethroids, piperonyl butoxide (PBO), and methoprene. Samples were also sent to the University of Maine Analytical Laboratory for analysis of total organic carbon and particle size. Results of the 2015 sediment sampling were received late 2015.

Montana Analytical Laboratory reported detections of bifenthrin in sediment at seven sites and esfenvalerate at one site; Southwest Research Institute reported only bifenthrin detections at four sites (Table 1). Four time-series sediment samples were collected at two sites from April through October. Bifenthrin was detected in every sample at each site. Montana results are reported in wet weight and SwRI results are reported in dry weight. Until Montana results are converted to dry weight and all results normalized for organic carbon, results cannot be compared among samples or sites. The values can only be interpreted as detections at a single point in time. There were no detections in sediments collected from sites previously identified as juvenile lobster habitat or adjacent to lobster habitat.

The stormwater sample from Ellsworth was overlooked by the Southwest Research Institute (SwRI) and was not analyzed; therefore, the pyrethroid, methoprene, and fipronil results reflect only 19 sites. The Montana method does not include methoprene or the fipronil degradates in the method and the detection limit for fipronil is parts per billion compared to parts per trillion used by SwRI. The complete analyte lists are attached.

Twenty pesticides and fipronil degradates were detected in stormwater (Table 2). The pesticides and degradates detected and number of sites (in parentheses) with detects are as follows: 2,4-D (5), bentazon (1), bifenthrin (7), carbaryl (1),

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cis/trans-permethrin (1), diuron (1), fipronil (12), fipronil desulfinyl (11), fipronil sulfide (8), fipronil sulfone (12), hexazinone (7), hydroxy atrazine (1), imazapyr (3), imidicloprid (11), MCPA (2), MCPP (4), metolachlor (2), prometon (2), propiconazole (1), terbacyl (2), triclopyr (1). One urban site was selected for a four-hour time series. 2,4-D, bifenthrin, fipronil, fipronil desulfinyl, fipronil sulfone, imidicloprid, and MCPP were detected every hour; fipronil sulfide the first three hours; and imazapyr, triclopyr, and cis/trans-permethrin the first two hours. The number of pesticides detected in each community in descending order are: Portland (14); South Portland and Rockland (9); Biddeford (8); Kittery and Belfast (7); Boothbay Harbor (6); Ogunquit, Freeport, Bath, Camden (5); Yarmouth and Brunswick (4); Blue Hill (2); Ellsworth (1); Cherryfield and Columbia Falls (2); and Jonesboro, Machias, and Whiting (1).

**Table 1.** Results for sediment collected 2015 in 13 Casco Bay coastal sites and Saco River.

Sample ID	Site	MT Lab Results (wet wt)		SwRI Lab Results (dry wt)	
		Bifenthrin (RL=0.045 ppb)	Fenvalerate / Esfenvalerate (RL=0.13 ppb)	Bifenthrin (ppb)	Fenvalerate / Esfenvalerate (RL=0.13 ppb)
150807MLP01	Biddeford (Saco R)	0.11	ND	ND (RL=0.222)	ND (0.444)
150807MLP02	Kettle Cove*	0.064	ND	ND (0.228)	ND (0.456)
150415MLP01	S. Portland (4/15)	0.31	ND	1.19	ND (0.435)
150612MLP02	S. Portland (6/12)	0.35	ND	2.15	ND (0.520)
150807MLP03	S. Portland (8/7)	0.36	ND	2.19	ND (0.499)
151007MET01	S. Portland (10/7)	0.35	ND	2.06	ND (0.501)
150810MLP01	Falmouth-Foreside	0.19	ND	ND (0.197)	ND (0.395)
150810MLP02	Falmouth-Foreside (duplicate)	0.17	ND	ND (0.197)	ND (0.394)
150415MLP02	Yarmouth (4/15)	0.19	ND	3.23	ND (0.528)
150612MLP01	Yarmouth (6/12)	0.26	ND	2.8	ND (0.594)
150807MLP04	Yarmouth (8/7)	0.21	ND	2.81	ND (0.632)
151007MET02	Yarmouth (10/7)	0.17	ND	2.39	ND (0.587)
150810MLP04	Winslow	0.063	ND	0.272	ND (0.485)
150810MLP05	Little Flying Point	ND	ND	ND (0.221)	ND (0.442)
150810MLP06	Little Flying Point (replicate)	0.058	ND	0.423	ND (0.450)
150806MET03	Lookout Point	ND	0.21	ND (0.211)	ND (0.422)
150806MET01	Lowell's Cove*	ND	ND	ND (0.212)	ND (0.424)
150806MET02	Basin Point*	ND	ND	ND (0.209)	ND (0.418)
150810MLP03	Cousins Island	ND	ND	ND (0.196)	ND (0.392)
150819MET01	Chebeague Island*	ND	ND	ND (0.202)	ND (0.381)
150819MET02	Long Island*	ND	ND	ND (0.197)	ND (0.393)
150819MET03	Peaks Island	ND	ND	ND (0.190)	ND (0.405)

\*Juvenile lobster habitat

Results are not normalized for organic carbon and are not comparable among sites.

MT lab reported in wet weight versus dry weight report from SwRI; therefore, results are not comparable.

**Table 2.** Range of pesticide concentrations detected in stormwater, August 2015, Kittery to Whiting, Maine and comparison with EPA Aquatic Life Benchmarks.

Range of Pesticide Concentrations			EPA Aquatic Life Benchmarks Freshwater (ppb)					
			Fish		Invertebrates		Nonvascular Plants	Vascular Plants
Pesticide	Reporting Limits (ppb)	Conc. Range (ppb)	Acute	Chronic	Acute	Chronic	Acute	Acute
2,4-D	Q-4.6	Q-4.6			12500			
Atrazine			2650		360	60	0.001	
Bentazon	0.037	0.037	>5000		>5000		4500	5350
Bifenthrin	0.0012(J) - 0.016	0.0012(J) - 0.016	0.075	0.04	0.8	0.0013		
Carbaryl	Q	Q	110	6	0.85	0.5	660	1500
Diuron	Q	Q	200	26.4	80	200	2.4	15
Fipronil	0.00061-0.00543	0.00061-0.00543	41.5	6.6	0.11	0.011	140	>100
Fipronil desulfonyl	0.00024(J)-0.00139	0.00024(J)-0.00139	10	0.59	100	10.3	140	>100
Fipronil sulfide	0.00026(J)-0.00046(J)	0.00026(J)-0.00046(J)						
Fipronil sulfone	0.00040 (J)-0.00279	0.00040 (J)-0.00279	12.5	0.67	0.36	0.037	140	>100
Hexazinone	Q-0.22	Q-0.22	137000	17000	75800	20000	7	37.4
Hydroxy atrazine	0.040	Q						
Imazapyr	Q-0.052	Q-0.052	> 50000	43100	> 50000	97100	12200	24
Imidicloprid	Q-0.73	Q-0.73	41500	1200	34.5	1.05	>10000	
MCPA	Q-0.072	Q-0.072				300	170	
MCCP	Q-1.1	Q-1.1			>45500	50800		
Metolachlor ESA	Q-0.15	Q-0.15	24000		>54000		>99450	43000
cis-permethrin	0.014-0.020	0.014-0.020						
trans-permethrin	0.017-0.023	0.017-0.023						
Permethrin	0.031-0.043*	(0.031-0.043)*	0.395	0.0515	0.0106	0.0014	68	
Prometon	Q-0.047	Q-0.047	6000	19700	12850	3450	98	
Propiconazole	Q	Q	425	95	650	260	21	4828
Terbacil	Q-0.052	Q-0.052	23100	1200	32500	640	11	140
Triclopyr	Q	Q	58500		66450		32500	

J=estimated value

\*Total permethrin concentrations not analyzed. Concentrations reflect range of totaled of cis/trans-permethrin concentrations in each sample.

## 2015 Montana Analytical Laboratory Stormwater Analyte List

2,4-D	Fipronil sulfone	Oxamyl
Acetochlor	Flucarbazono	Parathion methyl oxon
Acetochlor ESA	Flucarbazono sulfonamide	Phorate sulfone
Acetochlor OA	Flumetsulam	Phorate sulfoxide
Alachlor	Fluroxypyr	Picloram
Alachlor ESA	Glutaric acid	Picoxystrobin
Alachlor OA	Hydroxy-atrazine (HA)	Prometon
AMBA	Halsulfuron methyl	Propiconazole
Aminocyclopyrachlor	Hexazinone	Prosulfuron
Aminopyralid	Imazamethabenz methyl acid metabolite	Pyrasulfotole
Atrazine	Imazamethabenz methyl ester	Pyroxsulam
Azoxystrobin	Imazamox	Saflufenacil
Bentazon	Imazapic	Simazine
Bromacil	Imazapyr	Sulfentrazone
Bromoxynil	Imazethapyr	Sulfometuron methyl
Carbaryl	Imidicloprid	Sulfosulfuron
Chlorpyrifos	Indaziflam	Tebuconazole
Chlorsulfuron	Isoxaben	Tebuthiuron
Clodinafop acid	Isoxaflutole	Tembotrione
Clopyralid	Malathion	Terbacil
Clothianidin	Malathion oxon	Terbufos sulfone
Deethyl-atrazine	MCPA	Tetraconazole
Deethyl deisopropyl atrazine	MCPP	Thiamethoxam
Deisopropyl-atrazine	Metalaxyl	Thiencarbazono methyl
Dicamba	Methomyl	Thifensulfurone
Difenoconazole	methoxyfenozide	Tralkoxydim
Dimethenamid	Metolachlor	Tralkoxydim acid
Dimethenamid OA	Metolachlor ESA	Triallate
Dimethoate	Metolachlor OA	Triasulfuron
Disulfoton sulfone	Metsulfuron methyl	Triclopyr
Diuron	Nicosulfuron	Trifloxystrobin
FDAT (indazaflam met)	Pinoxaden metabolite (NOA 407854)	
Fipronil	Pinoxaden metabolite (NOA 447204)	
Fipronil desulfinyl (FDS)	Norflurazon	
Fipronil sulfide	Norflurazon desmethyl	

## 2015 Southwest Research Institute Stormwater Analyte List

Allethrin - Total  
Bifenthrin  
lambda-cyhalothrin  
Cyfluthrin - Total  
Cypermethrin - Total  
Deltamethrin - Total  
Fenvalerate/esfenvalerate  
Etofenprox  
Fenpropathrin  
tau-Flauvalinate - Total  
Imiprothrin - Total  
Methoprene  
cis-Permethrin  
trans-Permethrin  
PBO  
Prallethrin  
Pyrethrum  
Resmethrin - Total  
Phenothrin/Sumithrin  
Tefluthrin  
Tetramethrin  
Fipronil  
Fipronil desulfinyl  
Fipronil sulfide  
Fipronilsulfone