

Tools for generating OWL and RDF for biodiversity data in spreadsheets and unstructured text

Cynthia Sims Parr
Joel Sachs
Lushan Han
T. David Wang
Timothy Finin

UMBC
AN HONORS UNIVERSITY IN MARYLAND



SPIRE

Semantic Prototypes in Research Ecoinformatics



<http://spire.umbc.edu/>

OWL, RDF, and the Semantic Web

OWL (Web Ontology Language) and the related RDF (Resource Description Framework) are XML-style languages designed to represent the semantics of data.

Web documents in such formats enable the **Semantic Web**; software should be able to interpret the meaning of data in online documents, enabling better discovery and easier integration.

The problem

Though OWL and RDF might solve data discovery and integration issues in biodiversity science, adoption of these formats has so far been limited to computer scientists, database administrators, and highly trained ontologists.

Our solution

We developed two tools that aim to make it easier for individual scientists and citizens to convert their information to RDF and OWL. We report on tests of these tools using biodiversity data. For example, of 1200 Blogger BioBlitz observations, 47 of them were of species defined as “of concern” by USFWS.

Spotter Firefox extension for adding observation data in RDF to blogs

Write a blog entry or post a photo



Fill out Spotter form

Observation _____

Reporter ☐ Cynthia Parr _____


Observer ☐ Tara _____

Location ☐ Prince George's County, MD _____

Latitude ☐ 38.9922212/74.74143 _____

Longitude ☐ -76.9358306/30.51514 _____

[Find location](#)



Date mm dd yyyy

Common Name ☐ _____

Scientific Name ☐ _____

[Find Scientific Name](#)

How Many ☐ _____

Post URL ☐ _____

Image URL ☐ _____

Comments ☐ _____

Link to the RDF



garage door. In about an hour he'd reoriented to be head down, brought him inside and gave him a couple of twigs in jar. He im-

24 hours had transformed into a motionless pupa.



I had recognized the general shape as a *Papilio* caterpillar, but not before pupation. *Papilio* caterpillars turn brown. This guy is looking



FieldMarking

August 2, 2007

A tiger swallowtail at just the right moment

Filed under: [phenology](#), [home](#), [observation](#) — cyndy @ 10:01 pm [Edit This](#)

A few days ago I discovered an interesting brown, big-headed caterpillar lethargically exploring the frame of my garage door. In about an hour he'd reoriented to be head down, but hadn't moved much. After I took this photo, I brought him inside and gave him a couple of twigs in jar. He immediately lashed onto one with a little silk, and within 24 hours had transformed into a motionless pupa.

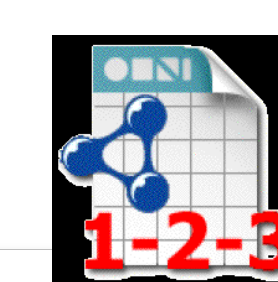
I had recognized the general shape as a *Papilio* caterpillar, but recalled that they were green. Turns out that just before pupation *Papilio glaucus* turns brown. This guy is looking forward to looking like [this](#) after metamorphosis in a few weeks. It is possible, I guess, that he might be planning to overwinter with us. Will wait and see.

RDF123 Publishing spreadsheet data in RDF

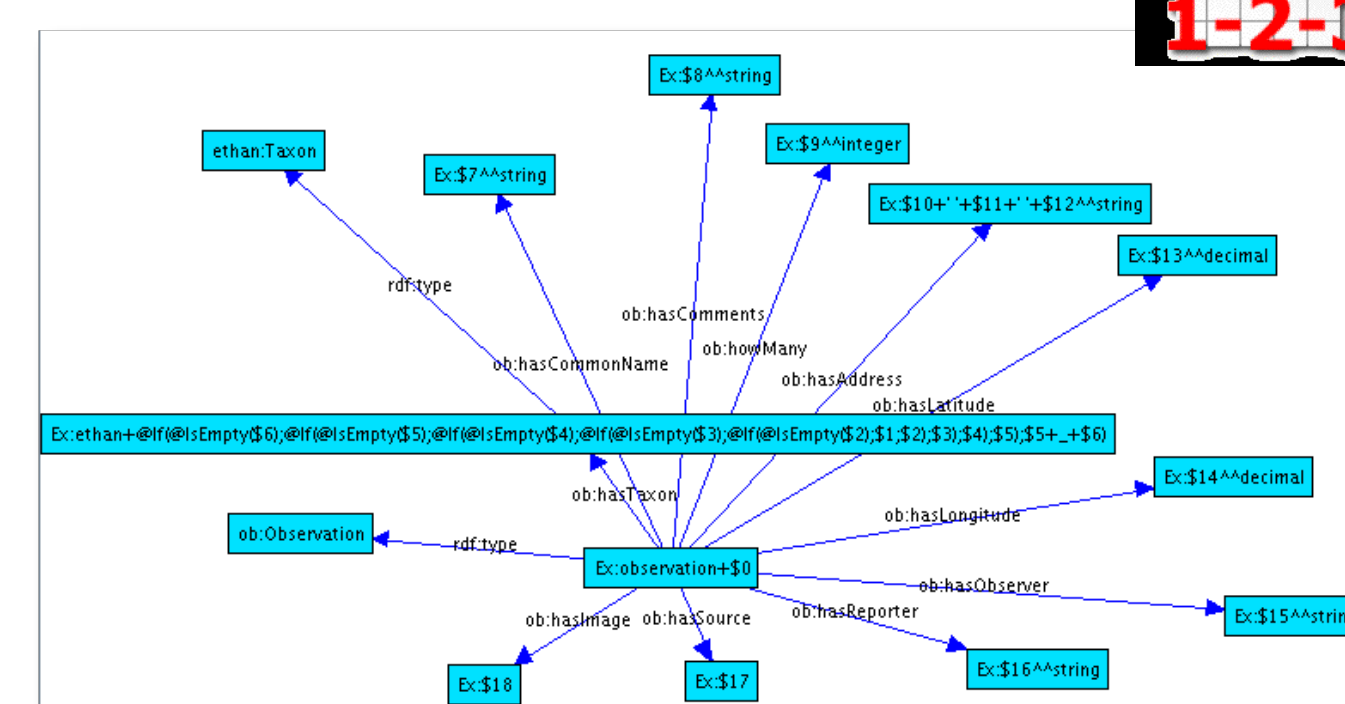
Make spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	aa	ab	ac	ad	ae	af	ag	ah	ai	aj	ak	al	am	an	ao	ap	aq	ar	as	at	au	av	aw	ax	ay	az	ba	bb	bc	bd	be	bf	bg	bh	bi	bj	bk	bl	bm	bn	bo	bp	bq	br	bs	bt	bu	bv	bw	bx	by	bz	ca	cb	cc	cd	ce	cf	cg	ch	ci	cj	ck	cl	cm	cn	co	cp	cq	cr	cs	ct	cu	cv	cw	cx	cy	cz	da	db	dc	dd	de	df	dg	dh	di	dj	dk	dl	dm	dn	do	dp	dq	dr	ds	dt	du	dv	dw	dx	dy	dz	ea	eb	ec	ed	ee	ef	eg	eh	ei	ej	ek	el	em	en	eo	ep	eq	er	es	et	eu	ev	ew	ex	ey	ez	fa	fb	fc	fd	fe	ff	fg	fh	fi	fj	fk	fl	fm	fn	fo	fp	fq	fr	fs	ft	fu	fv	fw	fx	fy	fz	ga	gb	gc	gd	ge	gf	gg	gh	gi	gj	gk	gl	gm	gn	go	gp	gq	gr	gs	gt	gu	gv	gw	gx	gy	gz	ha	hb	hc	hd	he	hf	hg	hh	hi	hj	hk	hl	hm	hn	ho	hp	hq	hr	hs	ht	hu	hv	hw	hx	hy	hz	ia	ib	ic	id	ie	if	ig	ih	ii	ij	ik	il	im	in	io	ip	iq	ir	is	it	iu	iv	iw	ix	iy	iz	ja	jb	jc	jd	je	jf	jj	jk	jl	jm	jn	jo	jp	jq	jr	js	jt	ju	jv	jw	jx	ky	kz	la	lb	lc	ld	le	lf	lg	lh	li	lj	lk	ll	lm	ln	lo	lp	lq	lr	ls	lt	lu	lv	lw	lx	ly	lz	ma	mb	mc	md	me	mf	mg	mh	mi	mj	mk	ml	mm	mn	mo	mp	mq	mr	ms	mt	mu	mv	mw	mx	my	mz	na	nb	nc	nd	ne	nf	ng	nh	ni	nj	nk	nl	nm	nn	no	np	nq	nr	ns	nt	nu	nv	nw	nx	ny	nz	oa	ob	oc	od	oe	of	og	oh	oi	oj	ok	ol	om	on	oo	op	oq	or	os	ot	ou	ov	ow	ox	oy	oz	pa	pb	pc	pd	pe	pf	pg	ph	pi	pj	pk	pl	pm	pn	po	pp	pq	pr	ps	pt	pu	pv	pw	px	py	pz	qa	qb	qc	qd	qe	qf	qg	qh	qi	qj	qk	ql	qm	qn	qo	qp	qq	qr	qs	qt	qu	qv	qw	qx	qy	qz	ra	rb	rc	rd	re	rf	rg	rh	ri	rj	rk	rl	rm	rn	ro	rp	rq	rr	rs	rt	ru	rv	rw	rx	ry	rz	sa	sb	sc	sd	se	sf	sg	sh	si	sj	sk	sl	sm	sn	so	sp	sq	sr	ss	st	su	sv	sw	sx	sy	sz	ta	tb	tc	td	te	tf	tg	th	ti	tj	tk	tl	tm	tn	to	tp	tq	tr	ts	tt	tu	tv	tw	tx	ty	tz	ua	ub	uc	ud	ue	uf	ug	uh	ui	uj	uk	ul	um	un	uo	up	uq	ur	us	ut	uu	uv	uw	ux	uy	uz	va	vb	vc	vd	ve	vf	vg	vh	vi	vj	vk	vl	vm	vn	vo	vp	vq	vr	vs	vt	vu	vv	vw	wx	wy	wz	xa	xb	xc	xd	xe	xf	xg	xh	xi	xj	xk	xl	xm	xn	xo	xp	xq	xr	xs	xt	xu	xv	xw	xx	xy	xz	ya	yb	yc	yd	ye	yf	yg	yh	yi	yj	yk	yl	ym	yn	yo	yp	yq	yr	ys	yt	yu	yv	yw	yx	yy	yz	za	zb	zc	zd	ze	zf	zg	zh	zi	zj	zk	zl	zm	zn	zo	zp	zq	zr	zs	zt	zu	zv	zw	zx	zy	zz	aa	ab	ac	ad	ae	af	ag	ah	ai	aj	ak	al	am	an	ao	ap	aq	ar	as	at	au	av	aw	ax	ay	az	ba	bb	bc	bd	be	bf	bg	bh	bi	bj	bk	bl	bm	bn	bo	bp	bq	br	bs	bt	bu	bv	bw	bx	by	bz	ca	cb	cc	cd	ce	cf	cg	ch	ci	cj	ck	cl	cm	cn	co	cp	cq	cr	cs	ct	cu	cv	cw	cx	cy	cz	da	db	dc	dd	de	df	dg	dh	di	dj	dk	dl	dm	dn	do	dp	dq	dr	ds	dt	du	dv	dw	dx	dy	dz	ea	eb	ec	ed	ee	ef	eg	eh	ei	ej	ek	el	em	en	eo	ep	eq	er	es	et	eu	ev	ew	ex	ey	ez	fa	fb	fc	fd	fe	ff	fg	fh	fi	fj	fk	fl	fm	fn	fo	fp	fq	fr	fs	ft	fu	fv	fw	fx	fy	fz	ga	gb	gc	gd	ge	gf	gg	gh	gi	gj	gk	gl	gm	gn	go	gp	gq	gr	gs	gt	gu	gv	gw	gx	gy	gz	ha	hb	hc	hd	he	hf	hg	hh	hi	hj	hk	hl	hm	hn	ho	hp	hq	hr	hs	ht	hu	hv	hw	hx	hy	hz	ia	ib	ic	id	ie	if	ig	ih	ii	ij	ik	il	im	in	io	ip	iq	ir	is	it	iu	iv	iw	ix	iy	iz	ja	jb	jc	jd	je	jf	jj	jk	jl	jm	jn	jo	jp	jq	jr	js	jt	ju	jv	jw	jx	ky	kz	la	lb	lc	ld	le	lf	lg	lh	li	lj	lk	ll	lm	ln	lo	lp	lq	lr	ls	lt	lu	lv	lw	lx	ly	lz	ma	mb	mc	md	me	mf	mg	mh	mi	mj	mk	ml	mm	mn	mo	mp	mq	mr	ms	mt	mu	mv	mw	mx	my	mz	na	nb	nc	nd	ne	nf	ng	nh	ni	nj	nk	nl	nm	nn	no	np	nq	nr	ns	nt	nu	nv	nw	nx	ny	nz	oa	ob	oc	od	oe	of	og	oh	oi	oj	ok	ol	om	on	oo	op	oq	or	os	ot	ou	ov	ow	ox	oy	oz	pa	pb	pc	pd	pe	pf	pg	ph	pi	pj	pk	pl	pm	pn	po	pp	pq	pr	ps	pt	pu	pv	pw	px	py	pz	qa	qb	qc	qd	qe	qf	qg	qh	qi	qj	qk	ql	qm	qn	qo	qp	qq	qr	qs	qt	qu	qv	qw	qx	qy	qz	ra	rb	rc	rd	re	rf	rg	rh	ri	rj	rk	rl	rm	rn	ro	rp	rq	rr	rs	rt	ru	rv	rw	rx	ry	rz	sa	sb	sc	sd	se	sf	sg	sh	si	sj	sk	sl	sm	sn	so	sp	sq	sr	ss	st	su	sv	sw	sx	sy	sz	ta	tb	tc	td	te	tf	tg	th	ti	tj	tk	tl	tm	tn	to	tp	tq	tr	ts	tt	tu	tv	tw	tx	ty	tz	ua	ub	uc	ud	ue	uf	ug	uh	ui	uj	uk	ul	um	un	uo	up	uq	ur	us	ut	uu	uv	uw	ux	uy	uz	va	vb	vc	vd	ve	vf	vg	vh	vi	vj	vk	vl	vm	vn	vo	vp	vq	vr	vs	vt	vu	vv	vw	wx	wy	wz	xa	xb	xc	xd	xe	xf	xg	xh	xi	xj	xk	xl	xm	xn	xo	xp	xq	xr	xs	xt	xu	xv	xw	xx	xy	xz	ya	yb	yc	yd	ye	yf	yg	yh	yi	yj	yk	yl	ym	yn	yo	yp	yq	yr	ys	yt	yu	yv	yw	yx	yy	yz	za	zb	zc	zd	ze	zf	zg	zh	zi	zj	zk	zl	zm	zn	zo	zp	zq	zr	zs	zt	zu	zv	zw	zx	zy	zz
1	Family:	Genus:	Species:	Common Name:	Found:	City/Town:	State/Province:	Country:	Latitude:	Longitude:	Discoverer	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
637		<i>Miconia</i>		Canlio B	5	Amiba	Chiriqui	Parana	8.66601	82.37419	family	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
638		<i>Mimus</i>	<i>polyglottus</i>	Northern Mockingbird	2	Washington	DC	United States	39.89617	75.59948	Beetham	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
639	Mimidae	<i>Mimus</i>	<i>polyglottus</i>	northern mockingbird		Woodstock	MD	USA	39.68276	76.8228	Par	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
640		<i>Myiophobus</i>	<i>peruvius</i>						73.59831	82.3375	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
641	Rubiaceae	<i>Michelia</i>	<i>peruvius</i>	parigide berry	1				42.4436	78.6146	Sandy P	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
642		<i>Myiophobus</i>		White					42.4313	83.371	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
643	Micropodae	<i>Miconia</i>	<i>magnum</i>	magnum	1	Deatrom	MI	USA	42.4436	78.6146	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
644	Dematiaceae	<i>Mollisia</i>	sp. #1						42.4436	78.6146	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
645		<i>Mollisia</i>	sp. #2						42.4436	78.6146	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
646	teridae	<i>Mothrus</i>		Brown-headed Cowbird					42.4436	78.6146	Kath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
647	Frugilidae	<i>Mothrus</i>	ater	Brown-headed Cowbird	1	Lanark County	ON	Canada	44.76788	76.28351	Wigney	Wjg																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
648		<i>Mothrus</i>	ater						44.7681	76.2835	Wigney	Wjg																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
649	teridae	<i>Mothrus</i>	ater						44.429745	77.293616	Canada	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
650	teridae	<i>Mothrus</i>	ater						42.4313	83.371	Nath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
651	teridae	<i>Mothrus</i>	ater						42.4313	83.371	Nath	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
652	teridae	<i>Mothrus</i>	ater						38.86978	76.99948	Beetham	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
653	Procyonidae	<i>Momones</i>	<i>undulatus</i>						57.18	136.42	LaBounty/D	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
654	Procyonidae	<i>Momones</i>	<i>undulatus</i>						57.18	136.42	LaBounty/D	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
655		<i>Momonium</i>							57.0746	136.354	ay	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
656	Muscicapidae	<i>Monticola</i>	<i>monticola</i>						29.2906	76.86966	Lusa	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
657	Muscicapidae	<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
658	Muscicapidae	<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
659	Muscicapidae	<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
660		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
661		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
662		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
663		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
664		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
665		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
666		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
667		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
668		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
669		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
670		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
671		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
672		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
673		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
674		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
675		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
676		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
677		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
678		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
679		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
680		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
681		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
682		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
683		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
684		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
685		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
686		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
687		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
688		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
689		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
690		<i>Monticola</i>	<i>monticola</i>								Rutherford	Bl																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
691																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

Create or link to a map file (to ontology terms)



Generate RDF



```
<rdf:RDF>
  <?Observation rdf:about="">
    <hasReporter rdf:datatype="http://www.w3.org/2001/XMLSchema:string">Kathie Hodge<hasReporter>
    <hasObserver rdf:datatype="http://www.w3.org/2001/XMLSchema:string">
    <hasAddress rdf:datatype="http://www.w3.org/2001/XMLSchema:string">
    <hasLatitude rdf:datatype="http://www.w3.org/2001/XMLSchema:decimal">42.4636000<hasLatitude>
    <hasLongitude rdf:datatype="http://www.w3.org/2001/XMLSchema:decimal">-76.4116000<hasLongitude>
    <hasDate rdf:datatype="http://www.w3.org/2001/XMLSchema:date">2007-04-28<hasDate>
    <hasTaxon rdf:resource="http://spire.umbc.edu/ontologies/EthanAnimals.owl#Molodrus_ater">
    <hasCommonName rdf:datatype="http://www.w3.org/2001/XMLSchema:string">Brown-headed Cowbird<hasCommonName>
    <howMany rdf:datatype="http://www.w3.org/2001/XMLSchema:string">0<howMany>
    <hasSource rdf:datatype="http://www.w3.org/2001/XMLSchema:anyURI">http://hosts.cce.cornell.edu/musmorum_blog/?p=401<hasSource>
    <hasImage rdf:datatype="http://www.w3.org/2001/XMLSchema:anyURI">
    <hasComments rdf:datatype="http://www.w3.org/2001/XMLSchema:string">

  </Observation>
</rdf:RDF>
```

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX ethan: <http://spire.umbc.edu/ontologies/EthanAnimals.owl#>
PREFIX ob: <http://spire.umbc.edu/ontologies/Observation.owl#>
PREFIX inv: <http://spire.umbc.edu/ontologies/InvasivesOntology.owl#>

```
SELECT DISTINCT ?taxon ?observer ?address
WHERE {
    ?observation rdf:type ob:Observation .
    ?observation ob:hasTaxon ?taxon .
    ?observation ob:hasObserver ?observer .
    OPTIONAL { ?observation ob:hasAddress ?address }
    ?taxon rdfs:subClassOf inv:ThingOfConcern
}
```

SPARQL query

RDF documents now available for Semantic Web Search and Querying

