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## New Distributional Record for *Balcha indica* (Hymenoptera: Eupelmidae) in Eastern West Virginia Discovered During Emerald Ash Borer Parasitoid Recovery Surveys

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### Abstract

Between 2010 and 2012, approximately 6,300 *Spathius agrili* Yang (Hymenoptera: Braconidae) and 9,500 *Tetrastichus planipennisi* Yang (Hymenoptera: Eulophidae) parasitoids were released for biological control of the invasive emerald ash borer, *Agrilus planipennis* Fairmaire, at Cacapon State Park and the Cool Front Development in Morgan County, West Virginia. The invasive beetle was first detected there in 2009, and extensive ash mortality is currently occurring. We conducted parasitoid recovery surveys in 2013 but did not recover either of the released parasitoid species. However, we did rear *Balcha indica* Mani and Kaul (Hymenoptera: Eupelmidae), which is native to Asia and is a documented parasitoid of *A. planipennis*, from bolts infested with *A. planipennis*. This is the first documented record of *B. indica* for West Virginia.

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Emerald Ash Borer (EAB) *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) is a wood-boring beetle introduced from eastern Asia (Haack et al. 2002, Poland and McCullough 2006) that is causing severe mortality in North American ash (Tluczek et al. 2011, Herms and McCullough 2014). EAB affects all species and diameter classes of ash and often kills both healthy and stressed trees within three to five years after becoming infested (Siegert et al. 2006).

In addition to the economic damages caused by EAB, there are ecological consequences associated with the loss of ash from North American forests. Ash provides food and habitat for several bird and mammal species (Faanes 1984, Rumble and Gobeille 1998), and it contributes to nutrient cycling in hardwood forests (Reiners and Reiners 1970). Moreover, at least 43 native arthropod species are thought to be at high risk due to their association with ash for breeding or feeding (Gandhi et al. 2010).

One management strategy currently being used against EAB is a classical biological control program, which was initiated in the early 2000s (Liu et al. 2003). Under this program, three parasitoid species, *Spathius agrili* Yang (Hymenoptera: Braconidae), *Tetrastichus planipennisi* Yang (Hymenoptera: Eulophidae), and *Oobius agrili* Zhang and Huang (Hymenoptera: Encyrtidae) were imported from China after environmental safety assessment, mass reared in the United States (US), and released in the US at various locations (Bauer et al. 2008). Since 2010, the Animal and Plant Health Inspection Service (APHIS) has released a total of 72,305 parasitoids at 11 locations throughout West Virginia; site selection was based on developed guidelines, site access, and other site condition criteria (Gould et al. 2012). Two of these parasitoids, *S. agrili* and

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*T. planipennis*, were released at Cacapon State Park (CSP) and the Cool Front Development (CFD) in Morgan County, West Virginia. Between 2010 and 2012, approximately 6,300 *S. agrili* and 9,500 *T. planipennis* have been released. The parasitoids were produced and supplied by the United States Department of Agriculture (USDA) EAB Parasitoid Rearing Facility in Brighton, MI. Both the CSP and CFD sites have been infested with EAB for several years and both have experienced extensive ash mortality recently. The primary objective of this study was to determine if any of the released EAB parasitoids had established successfully at CSP or CFD. As part of this study, we identified another EAB parasitoid not previously known to be present in West Virginia.

### Materials and Methods

Five green ash (*Fraxinus pennsylvanica* Marshall) trees with symptoms of EAB infestation (e.g., woodpecker damage) and an average dbh (diameter at breast height 1.37 m above ground) of 25 cm were felled at Cacapon State Park (39° 29' 53.63" N, 78° 17' 49.02" W) and at the Coolfont Development (39° 34' 30.00" N, 78° 16' 42.02" W) in Morgan County, WV on 20 and 21 March 2013. Felled trees were delimited and cut into 1.3 m long bolts. Alternating bolts were either debarked on site or set aside for rearing. The debarked bolts were peeled using draw knives and exposed EAB larvae were collected using forceps and placed in plastic vials. Vials were sent to the USDA APHIS Center for Plant Health Science and Technology (Buzzards Bay, MA) for rearing. The rearing bolts were transported to the USDA Forest Service Morgantown Field Office (Morgantown, WV), placed in cardboard 35 cm diameter rearing tubes (Nzokou et al. 2006, Gould et al. 2012), and placed in an outdoor insectary. Emerging arthropods were collected weekly for identification.

### Results and Discussion

EAB emergence from rearing bolts began on 21 May, and continued through 30 August 2013. In total 105 EAB were collected (Table 1). Six species of hymenopteran parasitoids were recovered; only one, *Balcha indica*, was likely to be associated with EAB because previous studies (Duan et al. 2009, Duan et al. 2011, Duan et al 2013) have demonstrated its association in North America. The remaining species (Table 1) were fly, caterpillar or other parasites unlikely to be associated with EAB (John Strazanac, personal communication, West Virginia University). Voucher specimens of all species identified were deposited in the U.S. Forest Service collection in Morgantown, WV. Voucher specimens of *B. indica* were deposited with the West Virginia Department of Agriculture in Charleston, WV. In the bolts that were debarked, 19 EAB larvae were collected but none were parasitized. None of the released parasitoids were found during this survey. Several reasons exist to explain the failure to recover the two released parasitoids at either site. These include the small sample size (only five trees/site), the short time since release (2 years) or the most probable reason, the high EAB-population densities which have caused extensive localized ash mortality at the release sites.

This is the first collection of *B. indica* in West Virginia (Laura Millar, personal communication, West Virginia University). *B. indica* is an exotic solitary introduced eupelmid parasitoid that attacks EAB (Bauer et al. 2004) and likely other wood-boring beetles (Gibson 2005). *B. indica* was first collected in Virginia in 1994 (Gibson 2005) and has since been collected in Maryland, Michigan, and Pennsylvania, where it has been found parasitizing various stages of EAB, including larvae, prepupae, and pupae (Bauer et al. 2004, Gibson 2005, Duan et al. 2009).

Table 1. Summary arthropod data for ash log rearing from Cacapon State Park and Cool Front Development, Morgan County, West Virginia, May through November 2013.

Class	Order	Family	Subfamily	Species	Number of Species	
Arachnida	Araneae				4	
	Oribatida				3	
Insecta	Coleoptera*				7	
	Collembola				1	
	Diptera				9	
	Hemiptera				2	
	Hymenoptera				7	
		Bethylidae				1
		Braconidae	Alysiinae			1
		Braconidae	Microgasterinae			1
		Eupelmidae		<i>Balcha indica</i>		1
		Ichneumonidae				1
		Sphecidae				2
Neuroptera					3	
Psocoptera					3	

\* Includes the emerald ash borer *A. planipennis*.

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