

[“Impact of GM crops on biodiversity,”](#) by Janet E. Carpenter; GM Crops Vol. 2, Issue 1, 2011 (17 pages)

**Box 2.** The importance of study design. There are several examples of study design leading to unwarranted conclusions on the impact of Bt crops on non-target above-ground invertebrates. **Monarch Butterfly:** Following an initial report of toxic effects of Bt corn pollen to Monarch butterfly larvae that was based on a no-choice laboratory feeding study,<sup>61</sup> numerous additional studies have been conducted, including both laboratory and field studies. Naranjo’s analysis of the potential impact of Bt crops on non-target herbivore species was dominated by studies on the monarch butterfly, showing significant impacts in laboratory studies, but no impact in field studies.<sup>68</sup> This finding mirrors an earlier analysis of the impact on monarch butterflies, based on a collaborative research effort by scientists from several US states and Canada, which showed that risks in the field were negligible.<sup>62</sup> **Green Lacewing:** In a study by Dutton et al. the potential tritrophic effects of Cry1Ab-expressing Bt corn on green lacewing were studied in reference 63. Three different prey organisms were fed Bt or non-Bt corn leaves and were then fed to lacewing larvae. Lacewing larvae that fed on Bt-susceptible leafworms had significantly higher mortality and development time than those in the control treatment. These findings led to further research to explain the results. A follow-up study confirmed that the protein was transferred from prey to predator, and the biological activity of the Bt protein, for two of three prey organisms, spider mites and leafworms.<sup>64</sup> The concentrations of Cry1Ab was much higher in the spider mites, which had no effect on lacewing larvae. These additional experiments led researchers to believe that the effects of the Bt-fed leafworms were due to low quality prey, since leafworms are susceptible to Cry1Ab protein.<sup>65</sup> **Caddisflies:** A 2007 paper suggested that Bt maize affects caddisflies.<sup>66</sup> In that study, two caddisfly species were fed either pollen or leaves from Bt and non-Bt corn in groundwater or streamwater. For one caddisfly species, *Helicopsyche borealis*, the higher tested concentration of Bt corn pollen was associated with increased mortality. The other species, *Lepidostoma liba* had greater than 50% lower frother rates when fed Bt corn litter compared with non-Bt corn litter, although mortality was not different. The Rosi-Marshall study has been criticized for not using appropriate controls.<sup>67</sup> Specifically, the study did not use non-Bt near isolines as the comparator, and therefore may have led to erroneous conclusions based on other factors that differ between corn hybrids. Further, no quantification of the Bt protein, or other chemical parameters in tested groundwater or streamwater was provided. As the level of Bt expression in pollen is quite low, the observed effects may have been due to other factors.<sup>68</sup> **Ladybird Beetle:** The results of 2009 paper that showed mortality to ladybird beetle at an intermediate tested concentration<sup>69</sup> have been questioned based on methodological flaws and inconsistencies.<sup>70</sup> The criticism cites a lack of quantification of exposure and unexplained high variability in mortality for control groups. In addition, the results contradict classical dose-response models, as mortality was lower at the highest tested concentration than at the intermediate concentration. The study also contradicts established findings that susceptible organisms suffer from sub-lethal effects long before direct toxic effects can be observed.