## **Biogeography of Indiana Trichoptera**

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#### Introduction

The caddisflies constitute one of the largest orders of aquatic insects in North America, with approximately 1,200 species recognized North of Mexico. The first Indiana caddisfly records were reported by Banks and Ulmer independently in 1907. From 1907 to the present 89 species were reported by various workers. An additional 101 species records resulted from our study. Collections made principally over the past 11 years by McCafferty and others at Purdue University have provided the bulk of data. Specimens from non-Purdue collections were also examined, most notably from the Illinois Natural History Survey. A checklist of the 190 Indiana species has been prepared by Waltz and McCafferty (in press).

## **Extralimital Affinities**

On a world basis the 58 known Indiana genera are more closely affiliated with the Palearctic fauna than to that of any other outside the Nearctic (Table 1). This suports data earlier presented by others, particularly Ross (7) and Chandler (2).

TABLE 1.World distribution of Ind	iana Trichoptera Genera.
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Distribution	No. of Gener
COSMOPOLITAN	9
NEARCTIC EXCLUSIVELY	11
HOLARCTIC (PALEARCTIC & NEARCTIC) EXCLUSIVELY	14
HOLARCTIC & ORIENTAL	7
HOLARCTIC & AFROTROPICAL	1
HOLARCTIC & ORIENTAL & AUSTRALIAN	1
HOLARCTIC & ORIENTAL & AFROTROPICAL	3
HOLARCTIC & ORIENTAL & AFROTROPICAL & AUSTRALIAN	3
HOLARCTIC & ORIENTAL & AFROTROPICAL & NEOTROPICAL	2
NEARCTIC & NEOTROPICAL	5
NEARCTIC & ORIENTAL	2

Within North America, as similarly demonstrated for the Illinois Trichoptera (6), Indiana caddisflies have strong affinities with the northeastern U.S., eastern Canada, central U.S., and, to a lesser extent, the southeastern U.S. (Table 2). It

**TABLE 2.** Distributions of Indiana Trichoptera in Other Geographic Regions. (Regions after McCafferty, 4)

REGION	# SPECIES IN COMMON	% OF INDIANA FAUNA		
Central	190/190	100.0		
Eastern (Canada)	132/190	69.5		
Western (Canada)	33/190	17.4		
Southeastern (US)	108/190	56.8		
Northeastern (US)	145/190	76.3		
Northwestern (US)	46/190	24.2		
Southwestern (US)	20/190	10.5		

should be noted that of the species occurring in the southwestern U.S. and Indiana, ten are widespread transcontinental species (e.g., *Oecetis avara*, *O. inconspicua*). The Indiana fauna is very distinct from that of western North America. Ross (6,7,8,9,10) provided most of the present information on the origins of North American Trichoptera. He (9) concluded that major elements of Indiana and the Midwest were Tertiary.

We have found three major faunal elements of Trichoptera in Indiana. The first consists of the lotic Temperate Deciduous Forest species restricted to cool, first and second order streams. These species are most abundant in the unglaciated area, characterized as the South-Central Upland (2) from Perry, Crawford, and Harrison counties northward to an apex in Morgan County (Figure 1). This area served as a glacial refugium during the Pleistocene (2,9). Another such area exists in Parke and Montgomery counties (Turkey Run and Shades State Parks, respectively). Other widely scattered, localized areas also are characterized predominantly by this faunal element, which is represented best by the genera *Neophylax*, *Agapetus*, and *Pycnopsyche* (9). Other caddisflies such as *Potamyia flava* and the *Hydropsyche scalaris* complex share the same history of invasion but inhabit larger streams; they tend to be widely distributed and represent some of the most abundantly and commonly collected species in the state.

The second faunal element consists of widespread transcontinental species. Species such as *Oecetis inconspicua*, *O. avara*, and *Helicopsyche borealis* are reported from Mexico and Central America northward into Canada from coast to coast. Their origin is difficult to ascertain. Similar to the *H. scalaris* complex, they often occur in larger streams where they may be a dominant component of the fauna.

The third major trichopteran faunal element consists of Northern Transcontinental species that are more restricted in the state. They are most abundant in the northern third, an area with many glacial lakes and coolwater streams, and are mostly of the family Limnephilidae and Phryganeidae, although members of at least four other families are represented. Several of these species are Holarctic and of unknown origin. Some have disjunct distributions, occurring also in Perry, Harrison and Crawford counties.

Indiana species are comparable in number and composition with those reported from contiguous states (Table 3). These data indicate the presence of a rather homogeneous midwestern fauna of which Indiana is a central element.

#### **Faunal Provinces in Indiana**

Chandler (2) redefined the faunal provinces of Indiana and reviewed the earlier works on Indiana (1,3). Species found within each of these faunal provinces (Figure 1, Table 4) were compared using Sorenson's coefficient of similarity (Table 5).

	#SPECIES	#GENERA	SPECIES SIMILARITY		GENERIC SIMILARITY			
TEST			Jaccard	Sorenson	Jaccard	Sorenson		
IN	190	58	1.0	1.0	1.0	1.0		
хMI	181	61	.4220	.5935	.6667	.8000		
xKY	175	54	.4622	.6322	.7813	.8772		
xIL	184	58	.6860	.8138	.8281	.9059		
xOH	192	56	.4920	.6595	.7692	.8695		

TABLE 3. Similarity of the Trichoptera Fauna of Indiana and Adjoining States.

'Jaccard's Coefficient: a/(a + b + c); Sorenson's Coefficient: 2a/(2a + b + c); Where a = # in common (both states), b = # reported in Indiana only, c = # reported in alternate state only. ENTOMOLOGY

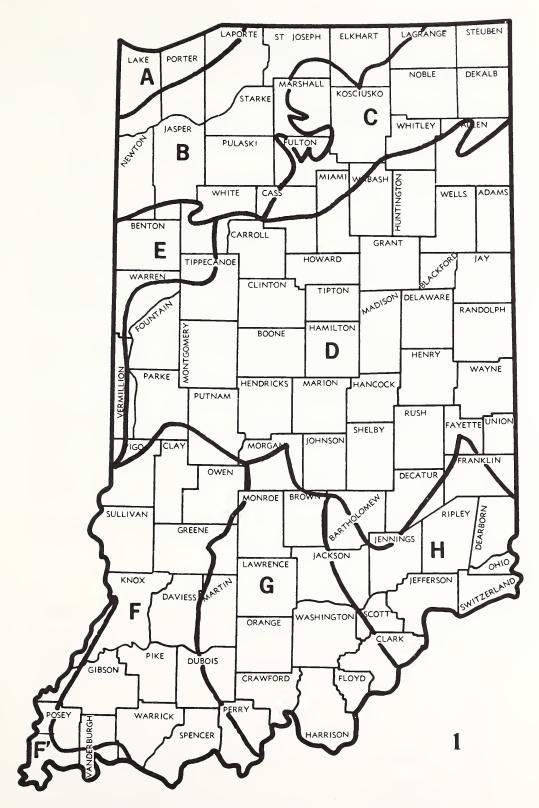


FIGURE 1. Indiana counties and faunal provinces (after Chandler, 2). A. Dunes. B. Kankakee Sand Ridge. C. Northern Lake. D. Tipton Till Plain. E. Prairie. F. Southwestern Plains and Upland. G. South-Cental Upland. H. Southeastern Till Plain. F'. Lower Wabash Valley.

PROVINCE	# Species	# Unique
Tipton Till Plain	73	17
Southeastern Till Plain	15	2
Southwestern Plains and Upland (Inclusive of Lower Wabash Valley)	21	2
Prairie	4	3
Kankakee Sand Ridge	51	5
Northern Lake	62	13
South Central Upland	76	23
Dunes	8	2

 TABLE 4.
 Trichoptera of Indiana Faunal Provinces (after Chandler, 2).

This analysis indicates a considerable obscuring of some of the provinces that may in part be attributable to the dispersal ability of caddisflies in addition to caddisflies' dependence on aquatic rather than terrestrial habitats, which formed the basis of Chandler's regions. Our distributional data share some similarity with that presented for the Indiana Odonata (5).

The northern third of Indiana, the most heavily glaciated region, is rich in lake and marsh habitats. It isn't surprising that the two faunal regions recognized in this area (based on aquatic characters) are very similar in composition (Tables 4 and 5) as was demonstrated by Montgomery (5).

One of the most interesting areas is the South-Central Upland, which is best characterized by the presence of a distinct but diluted Appalachian fauna. We found 23 species in this area but nowhere else; this is the largest number of "area endemic" caddisflies in Indiana (Table 4). This province supports some species (e.g., *Hydatophylax argus*) that typically occur only in the Northern Lake area and Kankakee Sand Ridge in unimpacted streams (e.g., Pigeon River, LaGrange County).

Little can be said of the remaining faunal areas. The Prairie province of Indiana, although small, may prove to be faunistically unique and a source of several more records.

	SCU	TTP	NL	KSR	SWPU	SETP	DUNES	PRAIRIE
South Central Upland								
(SCU)	1.0	.429	.348	.315	.247	.154	.071	.025
Tipton Till Plain								
(TTP)		1.0	.444	.468	.234	.250	.074	.026
Northern Lake								
(NL)			1.0	.584	.193	.104	.086	.030
Kankakee Sand Ridge								
(KSR)				1.0	.277	.090	.102	.036
Southwestern Plains &								
Uplands (SWPU) (Inclusive					1.0	.056	.276	.080
of Lower Wabash Valley)								
Southeastern Till Plain								
(SETP)						1.0	.087	-
Dunes							1.0	-
Prairie								1.0

TABLE 5. Intrastate Faunal Province Affinities Based on Trichoptera Composition.(Based on Sorenson's coefficient of similarity, SCS = 2a/(2a + b + c).

#### ENTOMOLOGY

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