Supporting Information

Marek and Moore 10.1073/pnas.1500014112

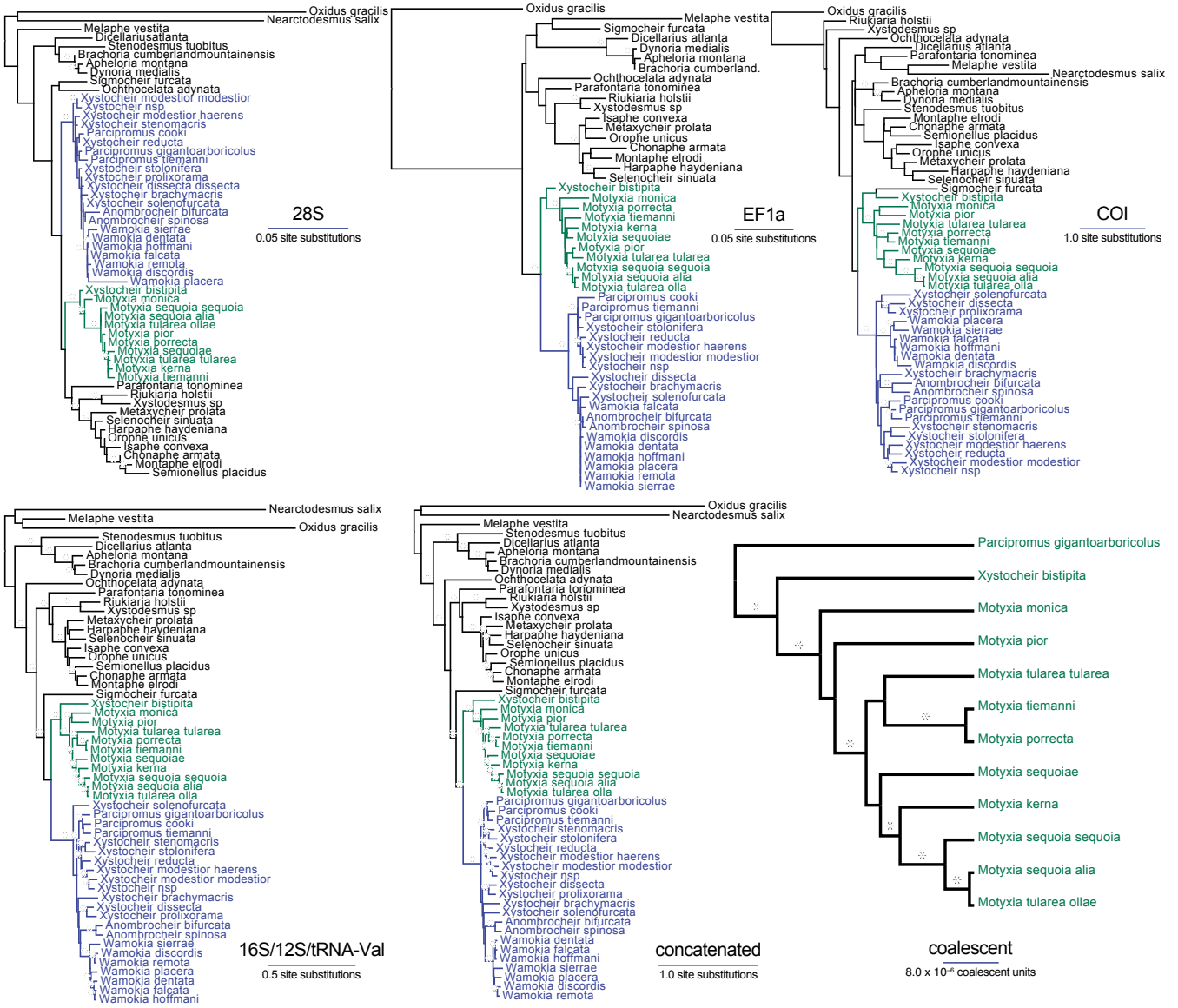

Fig. S1. Separate gene histories for the loci concatenated in Fig. S4 analyzed in RAxML and the *Motyxia* species phylogeny from the multispecies coalescent model in *BEAST. (Scale bar, expected substitutions per site.) Branch lengths of *BEAST tree are shown in coalescent units. Asterisks denote bootstrap/posterior probability support values ≥ 70%. [Nuclear: elongation factor-1 alpha (EF1-a); 28S ribosomal RNA (28S); mitochondrial: small subunit ribosomal RNA (16S/12S/tRNA-Val); and cytochrome *c* oxidase subunit I (COI)].

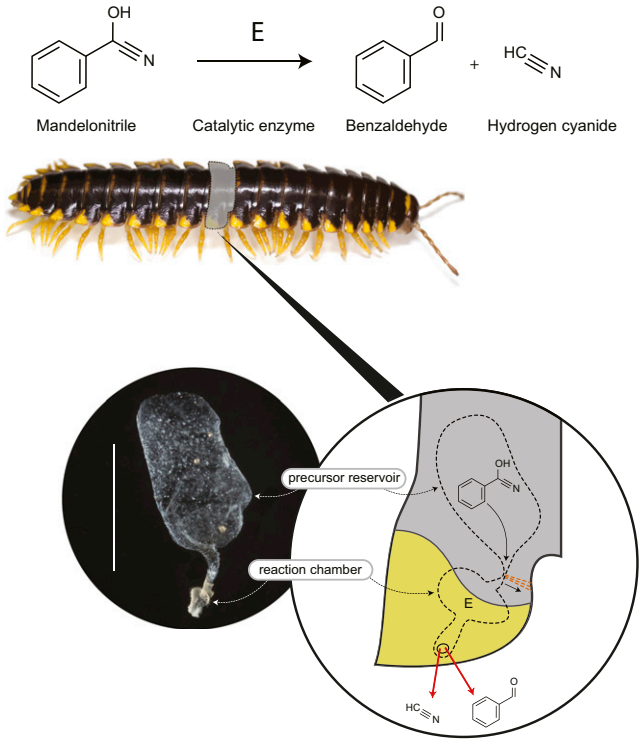

Fig. S2. Bicompartmental cyanide glands of polydesmidan millipedes, including *Motyxia* and relatives. Through a cyanohydrin reaction, mandelonitrile (a biologically stable chemical housed in the precursor reservoir) is disassociated by a catalytic enzyme (E) present in the reaction chamber to produce cyanide and benzaldehyde. Data from ref. 1. (Scale bar: 1.0 mm.)

1. Eisner T, Meinwald J (1966) Defensive secretions of arthropods. *Science* 153(3742):1341–1350.

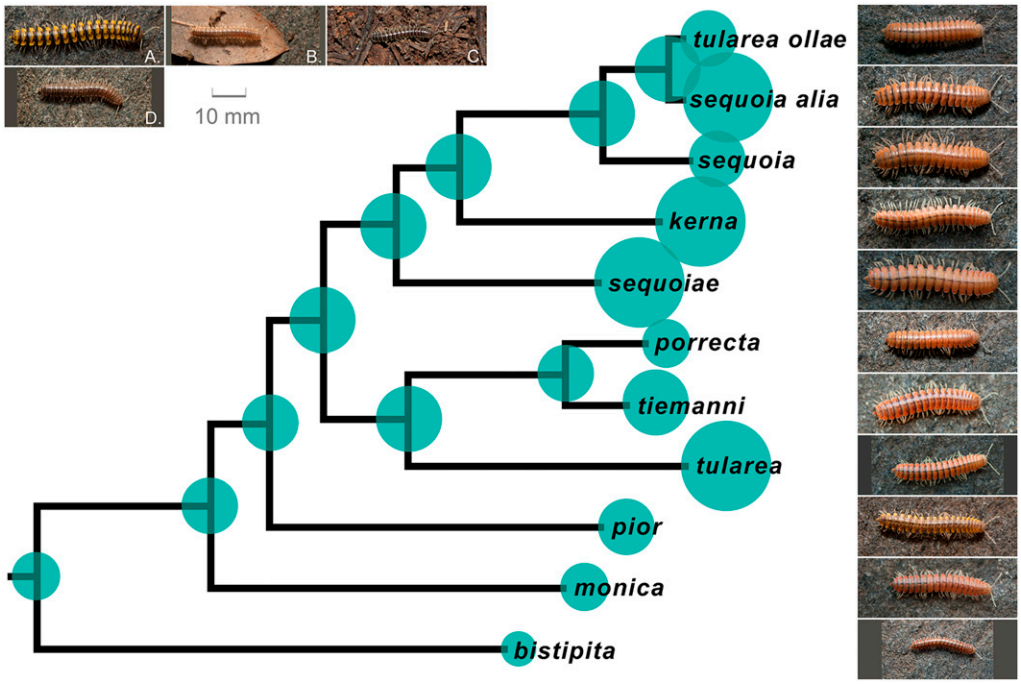

Fig. S3. Live habitus photographs of *Motyxia* and related xystodesmid species showing colors in life. *Motyxia* taxa photographed are to the right of the tree. Xystodesmid species: *Sigmocheir furcata* (*A*), *Xystocheir* new species (on dead oak leaf from habitat) (*B*), *Stenodesmus tuobitus* (*C*), and *Xystocheir stenomacris* (*D*). Character history of bioluminescent intensity are as in Fig. 2. All millipede images are calibrated to the scale bar shown in gray.

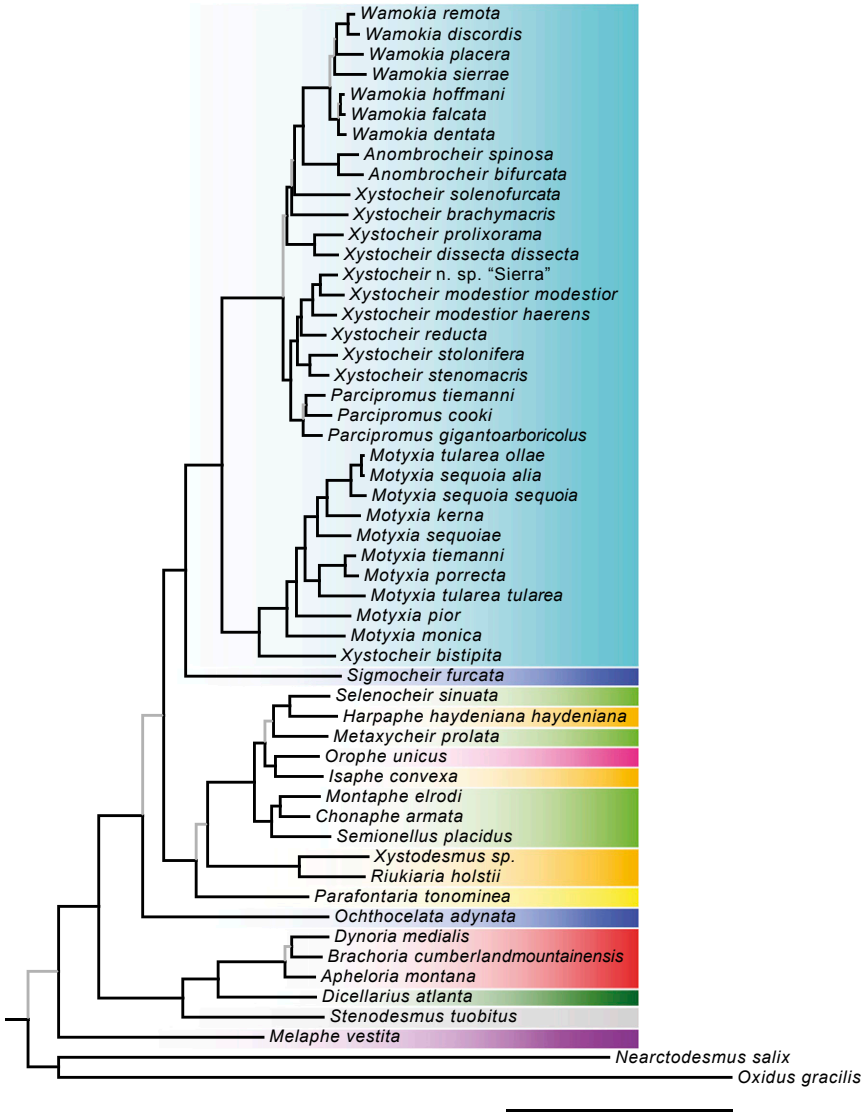

Fig. S4. Species phylogeny of the millipede tribe Xystocheirini including the bioluminescent genus *Motyxia* and a broad taxonomic sample of representatives from 9 of the 12 tribes of the family Xystodesmidae. Tree estimated using five single-copy mitochondrial and nuclear genes under a mixed-model partitioned Bayesian analysis. Branches in gray indicate <0.95 posterior probability for the clade, and black branches are ≥0.95. Color key to taxa: Xystocheirini (light blue), Sigmocheirini (dark blue), Chonaphini (light green), Xystodesmini (orange), Orophini (magenta), Parafontariinae (yellow), Apheloriini (red), Pachydesmini (dark green), Rhysodesmini (gray), and Melaphini (purple). Outgroups without color: *Nearctodesmus salix* (Trichopolydesmidae) and *Oxidus gracilis* (Paradoxosomatidae). (Scale bar: 0.5 expected substitutions per site.)

Table S1. Taxa sampled

Tribe	Species	Specimen no.	12S–16S	EF1a	28S	COI
Xystocheirini	*Anombrocheir bifurcata*	MTX0174	JN383854	JN383878	KR135885	KR135987
	Anombrocheir spinosa	MTX0180	JN383855	JN383879	KR135886	KR135988
	Motyxia kerna	MTX0129	JN383849	JN383874	KR135897	KR135999
	Motyxia monica	MTX0008	JN383871	JN383847	KR135898	KR136000
	Motyxia pior	MTX0022	JN383848	JN383872	KR135899	KR136001
	Motyxia porrecta	MTX0006/253	JN383851	JN383877	KR135938	KR136002
	Motyxia sequoia alia	MTX0242	KR135952	KR136052	KR135900	KR136003
	Motyxia sequoia sequoia	MTX0249	KR135954	KR136054	KR135902	KR136005
	Motyxia sequoiae	MTX0024	JN383850	JN383875	KR135901	KR136004
	Motyxia tiemanni	MTX0011	JN383852	JN383876	KR135903	KR136006
	Motyxia tularea ollae	MTX0228	KR135955	KR136055	KR135904	KR136007
	Motyxia tularea tularea	MTX0033	JN383853	JN383873	KR135905	KR136008
	Parcipromus cooki	MTX0431	KR135961	KR136060	KR135911	KR136014
	Parcipromus gigantoarboricolus	MTX0021	JN383856	JN383882	KR135912	KR136015
	Parcipromus tiemanni	MTX0040	JN383857	JN383883	KR135913	KR136016
	Wamokia dentata	MTX0334	KR135968	KR136065	KR135919	KR136022
	Wamokia discordis	MTX0335	KR135969	KR136066	KR135920	KR136023
	Wamokia falcata	MTX0329	KR135970	KR136067	KR135921	KR136024
	Wamokia hoffmani	MTX0183/324	JN383859	JN383880	KR135922	KR136025
	Wamokia placera	MTX0340	KR135971	KR136068	KR135923	KR136026
	Wamokia remota	MTX0313	KR135972	KR136069	KR135924	—
	Wamokia sierrae	MTX0303	KR135973	KR136070	KR135925	KR136027
	Xystocheir bistipita	MTX0452	KR135976	KR136073	KR135926	KR136030
	Xystocheir brachymacris	MTX0182	JN383860	JN383881	KR135927	KR136031
	Xystocheir dissecta dissecta	MTX0437	KR135977	KR136074	KR135928	KR136032
	Xystocheir modestior haerens	MTX0381	KR135978	KR136075	KR135929	KR136033
	Xystocheir modestior modestior	MTX0371	KR135979	KR136076	KR135930	KR136034
	Xystocheir Sierra	MTX0395	KR135980	KR136077	KR135931	KR136035
	Xystocheir prolixorama	MTX0442	KR135981	—	KR135932	KR136036
	Xystocheir reducta	MTX0407	KR135982	KR136078	KR135933	KR136037
	Xystocheir solenofurcata	MTX0308	KR135983	KR136079	KR135934	KR136038
	Xystocheir stenomacris	MTX0396	KR135984	—	KR135935	KR136039
	Xystocheir stolonifera	MTX0383	KR135985	KR136080	KR135936	KR136040
Sigmocheirini	*Ochthocelata adynata*	MTX0152	JN383846	JN383885	KR135907	KR136010
	Sigmocheir furcata	MTX0367	KR135966	KR136064	KR135917	KR136020
Orophini	*Orophe unicus*	MTX0126	JN383865	JN383868	KR135908	KR136011
Xystodesmini	*Harpaphe haydeniana haydeniana*	MTX0137	JN383862	JN383870	KR135892	KR135994
	Isaphe convexa	MTX0106	JN383863	JN383869	KR135893	KR135995
	Riukiaria holstii	MTX0191	KR135963	KR136062	KR135914	KR136017
	Semionellus placidus	MTX0460	KR135965	—	KR135916	KR136019
	Xystodesmus sp.	MTX0186	KR135986	KR136081	KR135937	KR136041
Chonaphini	*Chonaphe armata*	MTX0097	JN383861	JN383866	KR135889	KR135991
	Metaxycheir prolata	MTX0107	KR135949	KR136047	KR135895	KR135997
	Montaphe elrodi	MTX0083	KR135950	KR136048	KR135896	KR135998
	Selenocheir sinuata	MTX0319	KR135964	KR136063	KR135915	KR136018
Rhysodesmini	*Stenodesmus tuobitus*	MTX0199	KR135967	—	KR135918	KR136021
Apheloriini	*Apheloria montana*	SPC000134	DQ490660	KR136042	KR135887	KR135989
	Brachoria cumberlandmountainensis	SPC000651	EU127864	KR136043	KR135888	KR135990
	Dynoria medialis	SPC000431	DQ490700	KR136045	KR135891	KR135993
Pachydesmini	*Dicellarius atlanta*	SPC000428	DQ490648	KR136044	KR135890	KR135992
Melaphinae	*Melaphe vestita*	MEL1	KR135948	KR136046	KR135894	KR135996
Parafontariinae	*Parafontaria tonominea*	MTX0189	KR135960	KR136059	KR135910	KR136013
Trichopolydesmidae	*Nearctodesmus salix*	MTX0215	KR135958	—	KR135906	KR136009
Paradoxosomatidae	*Oxidus gracilis*	MTX0216	KR135959	KR136058	KR135909	KR136012

—, denotes missing data.