

Figure S1. Length distribution of (a) 59 mitochondrion genomes of mites in Refseq database, and (b) 1717 mite contaminated contigs in Genbank WGS/TSA database detected in this study.

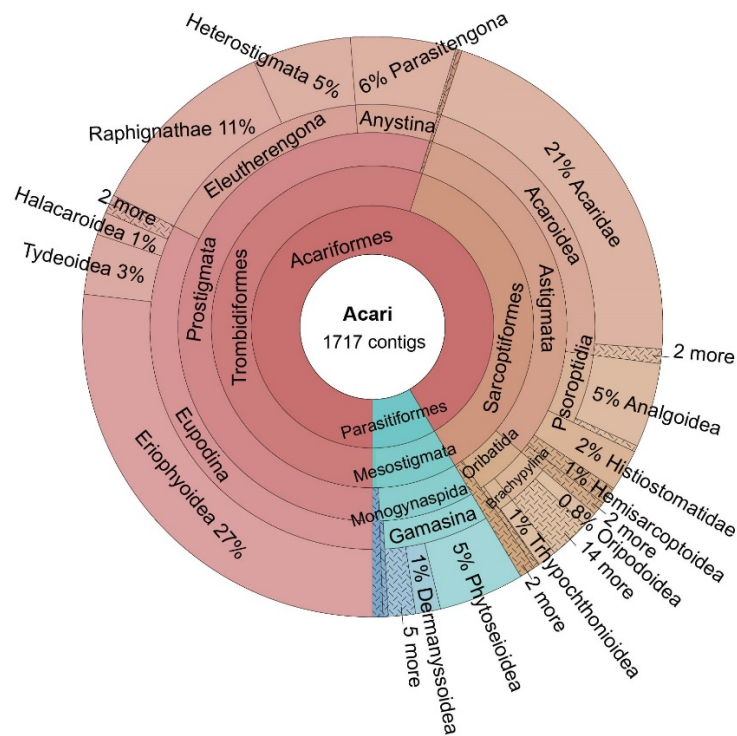


Figure S2. Relative abundance of mite contaminated contigs at various Acari taxonomic levels detected in Genbank WGS/TSA database.

Table S1. List of protein sequences retrieved from Genbank for the phylogenetic analysis.

Species	Hyporder/ Suborder/ Infraorder	Superfamily	Family	Accession
<i>Hygrobat</i> <i>longiporus</i>	Anystina	Hygrobatoidea	Hygrobatidae	YP_009866786.1
<i>Sperchon</i> <i>plumifer</i>	Anystina	Sperchontoidea	Sperchontidae	YP_009535749.1
<i>Unionicola</i> <i>parkeri</i>	Anystina	Hygrobatoidea	Unionicolidae	YP_004021457.1
<i>Walchia</i> <i>hayashii</i>	Anystina	Trombiculoidea	Trombiculidae	YP_001837111.1
<i>Trombidiidae</i> sp. BIOUG18253-A07	Anystina	Trombidoidea	Trombidiidae	AWS19674.1
<i>Stegodyphus</i> <i>mimosarum</i>	Araneomorphae	Eresoidea	Eresidae	ABJ96298.1
<i>Lepidoglyphus</i> <i>destructor</i>	Astigmata	Glycyphagoidea	Glycyphagidae	YP_010354348.1
<i>Blomia</i> <i>tropicalis</i>	Astigmata	Glycyphagoidea	Echimyopodidae	YP_010354335.1
<i>Carpoglyphus</i> <i>lactis</i>	Astigmata	Hemisarcoptoidea	Carpoglyphidae	YP_009862148.1
<i>Trouessartia</i> <i>rubecula</i>	Astigmata	Analgoidea	Trouessartiidae	YP_009560912.1
<i>Histiostoma</i> <i>feroniarum</i>	Astigmata	Histiostomatoidea	Histiostomatidae	YP_009504242.1
<i>Rhizoglyphus</i> <i>robinii</i>	Astigmata	Acaroidea	Acaridae	YP_009498332.1
<i>Histiostoma</i> <i>blomquisti</i>	Astigmata	Histiostomatoidea	Histiostomatidae	YP_009306839.1
<i>Tyrophagus</i> <i>putrescentiae</i>	Astigmata	Acaroidea	Acaridae	YP_009114537.1
<i>Aleuroglyphus</i> <i>ovatus</i>	Astigmata	Acaroidea	Acaridae	YP_009019414.1
<i>Dermatophagoides</i> <i>farinae</i>	Astigmata	Analgoidea	Pyroglyphidae	YP_003162772.1
<i>Ovanoetus</i> sp. AD678	Astigmata	Histiostomatoidea	Histiostomatidae	ATY50495.1
<i>Chaetodactylus</i> <i>krombeini</i>	Astigmata	Hemisarcoptoidea	Chaetodactylidae	ATY50504.1
<i>Crabrovidia</i> sp. AD610	Astigmata	Hemisarcoptoidea	Winterschmidtidae	ATY50500.1
<i>Ingrassia</i> <i>philomachi</i>	Astigmata	Analgoidea	Xolalgidae	AOO33910.1
<i>Hyadesia</i> <i>curassaviensis</i>	Astigmata	Hemisarcoptoidea	Hyadesiidae	ATY50501.1
<i>Vidia</i> sp. AD452	Astigmata	Hemisarcoptoidea	Winterschmidtidae	ATY50499.1
<i>Congovidia</i> sp. AD699	Astigmata	Hemisarcoptoidea	Hemisarcoptidae	ATY50496.1
<i>Fusohiercia</i> <i>lawrencei</i>	Astigmata	Hemisarcoptoidea	Algophagidae	ATY50503.1
<i>Tyrophagus</i> <i>fanetzhangorum</i>	Astigmata	Acaroidea	Acaridae	AVX48499.1
<i>Picidectes</i> <i>chapini</i>	Astigmata	Hypoderatoidea	Hypoderatidae	UJR87502.1
<i>Oribatula</i> <i>sakamorii</i>	Brachypylina	Oripodoidea	Oribatulidae	QYF07803.1
<i>Oribatula</i> sp. XFX	Brachypylina	Oripodoidea	Oribatulidae	QFG71641.1
<i>Eueremaeus</i> <i>valkanovi</i>	Brachypylina	Eremaeidea	Eremaeidae	WFK33970.1
<i>Demodex</i> <i>folliculorum</i>	Eleutherengona	Cheyletoidea	Demodicidae	YP_009114835.1
<i>Tetranychus</i> <i>pueraricola</i>	Eleutherengona	Tetranychidea	Tetranychidae	YP_009051530.1
<i>Tetranychus</i> <i>phaselus</i>	Eleutherengona	Tetranychidea	Tetranychidae	YP_009051517.1
<i>Tarsonemidae</i> gen. sp. AD1063	Eleutherengona	Tarsonemoidea	Tarsonemidae	ATY50430.1
<i>Trochometridium</i> sp. AD1884	Eleutherengona	Pyemotoidea	Trochometridiidae	ATY50433.1
<i>Agistemus</i> <i>gratus</i>	Eleutherengona	Raphignathoidea	Stigmaeidae	WAK43286.1
<i>Tarsocheyleidae</i> gen. sp. AD1095	Eleutherengona	Tarsocheyleidea	Tarsocheyleidae	ATY50428.1
<i>Podapolipus</i> <i>luzoni</i>	Eleutherengona	Tarsonemoidea	Podapolipidae	ARI47195.1
<i>Brevipalpus</i> <i>lewisi</i>	Eleutherengona	Tetranychidea	Tenuipalpidae	QAU55254.1
<i>Pygmephoridae</i> sp. BIOUG24576-E03	Eleutherengona	Pygmephoridea	Pygmephoridae	AYN51884.1
<i>Tarsonemidae</i> sp. BOLD: AAZ5832	Eleutherengona	Tarsonemoidea	Tarsonemidae	AFW14558.1

<i>Tenuipalpus</i> sp. AD1957	Eleutherengona	Tetranychoida	Tenuipalpidae	ATY50462.1
<i>Hypochthonius rufulus</i>	Enarthronota	Hypochthonoidea	Hypochthoniidae	UYZ39297.1
<i>Halotydeus destructor</i>	Eupodina	Eupodoidea	Penthaleidae	YP_010385508.1
<i>Spinibdella lignicola</i>	Eupodina	Bdelloidea	Bdellidae	YP_010516613.1
<i>Rhinotergum shaoguanense</i>	Eupodina	Eriophyoidea	Diptilomiopidae	YP_009351807.1
<i>Phyllocoptes taishanensis</i>	Eupodina	Eriophyoidea	Eriophyidae	YP_009228533.1
<i>Epitrimerus sabinae</i>	Eupodina	Eriophyoidea	Eriophyidae	YP_009228520.1
<i>Agauopsis itassussensis</i>	Eupodina	Halacaroida	Halacaridae	UJR87586.1
<i>Triophytydeus</i> sp. BOLD:ADF3063	Eupodina	Tydeoidea	Triophytydeidae	QGW41996.1
<i>Aculodes holcusi</i>	Eupodina	Eriophyoidea	Eriophyidae	QQK89385.1
<i>Setoptus pini</i>	Eupodina	Eriophyoidea	Phytoptidae	QHB50645.1
<i>Anthocoptes recki</i>	Eupodina	Eriophyoidea	Eriophyidae	QQK89387.1
<i>Trisetacus silvestris</i>	Eupodina	Eriophyoidea	Phytoptidae	QHB50694.1
<i>Bdellidae</i> sp. BIOUG25925-B12	Eupodina	Bdelloidea	Bdellidae	AYN51502.1
<i>Stereotydeus</i> sp. IDH-2006a	Eupodina	Eupodoidea	Penthalodidae	ABD17886.1
<i>Aceria</i> sp. A PEC-2023a	Eupodina	Eriophyoidea	Eriophyidae	WIW35252.1
<i>Tydeidae</i> sp. BOLD:ACY2916	Eupodina	Tydeoidea	Tydeidae	QQQ51928.1
<i>Tydeidae</i> sp. BIOUG27249-E04	Eupodina	Tydeoidea	Tydeidae	AWK31052.1
<i>Aceria</i> sp. 1 DOJ-2017	Eupodina	Eriophyoidea	Eriophyidae	ASO96446.1
<i>Shevtchenkella serrata</i>	Eupodina	Eriophyoidea	Eriophyidae	UCS82606.1
<i>Parasitus fimetorum</i>	Gamasina	Parasitoidea	Parasitidae	YP_010321832.1
<i>Neoseiulus californicus</i>	Gamasina	Phytoseioidea	Phytoseiidae	YP_010584664.1
<i>Dermanyssus gallinae</i>	Gamasina	Dermanyssoidea	Dermanyssidae	YP_010045993.1
<i>Hypoaspis linteyini</i>	Gamasina	Dermanyssoidea	Laelapidae	YP_009731531.1
<i>Blattisocius tarsalis</i>	Gamasina	Phytoseioidea	Blattisociidae	YP_009731518.1
<i>Macrocheles muscaedomesticae</i>	Gamasina	Eviphidoidea	Macrochelidae	YP_009731505.1
<i>Varroa destructor</i>	Gamasina	Dermanyssoidea	Varroidae	NP_758874.1
<i>Galendromus occidentalis</i>	Gamasina	Phytoseioidea	Phytoseiidae	YP_001096000.1
<i>Digamasellidae</i> sp. BOLD:ACJ4515	Gamasina	Rhodacaroida	Digamasellidae	ALS53963.1
<i>Echinolaelaps echidninus</i>	Gamasina	Dermanyssoidea	Laelapidae	WHL46305.1
<i>Transeius volgini</i>	Gamasina	Phytoseioidea	Phytoseiidae	QPZ18645.1
<i>Phytoseiulus persimilis</i>	Gamasina	Phytoseioidea	Phytoseiidae	ACS15261.1
<i>Euseius nicholsi</i>	Gamasina	Phytoseioidea	Phytoseiidae	AGX31987.1
<i>Blattisociidae</i> sp. BIOUG30402-A10	Gamasina	Phytoseioidea	Blattisociidae	AYK98228.1
<i>Steganacarus magnus</i>	Mixonomata	Phthiracaroida	Steganacaridae	YP_002317272.1
<i>Trichouropoda</i> sp. n. 10WK	Uropodina		Trematuridae	AEW49442.1
<i>Ixodes scapularis</i>		Ixodoidea	Ixodidae	YP_010535455.1
<i>Rhipicephalus microplus</i>		Ixodoidea	Ixodidae	YP_008999527.1
<i>Mesobuthus martensii</i>		Buthoidea	Buthidae	YP_001427343.1

Table S2. Contaminations of family Demodicidae. 12 Contigs in red fonts with identities more than 96% are supposed to be artificial contaminations of human *Demodex* mites. The other 2 contigs (GGWL01055778.1 and GGWL01055779.1) from black howler monkey assembly (GGWL01) with identities less than 91.4% were not assigned to family level.

CONTIG ACCESSION	CONTIG LENGTH	ASSEMBLY HOST	BEST BLAST SUBJECT	IDENTITY	BLAST LENGTH	SUBJECT DESCRIPTION
GGWL01055778.1	1519	Mammalia	KM114226.1	83.433	1509	Demodex folliculorum mitochondrion, complete genome
GGWL01055779.1	302	Mammalia	OP900959.1	88.889	297	Demodex melesinus isolate SB11 cytochrome c oxidase subunit I (COX1) gene, partial cds; mitochondrial
JAODFX010125061.1	248	Insecta	KM114225.1	100	248	Demodex brevis mitochondrion, complete genome
HBDQ01152762.1	1190	Bivalvia	KM114226.1	96.057	989	Demodex folliculorum mitochondrion, complete genome
GHHL01022903.1	325	Arachnida		100	325	
GHHL01022904.1	360	Arachnida		96	350	
	360	Arachnida		100	58	Demodex folliculorum
GHHL01022905.1	325	Arachnida		100	246	voucher UMMZ BMOC
	325	Arachnida	KY922187.1	100	86	07-0815-005 AD1011
GHHL01034003.1	226	Arachnida		100	148	18S ribosomal RNA gene,
	226	Arachnida		100	82	partial sequence
GHHL01034004.1	208	Arachnida		100	167	
	208	Arachnida		98	50	
GHHL01075817.1	231	Arachnida		98.701	231	Demodex folliculorum
GHHL01075818.1	218	Arachnida		98.165	218	voucher UMMZ BMOC
GKBK01103287.1	296	Insecta	KY922058.1	98.986	296	07-0815-005 AD1011
HBDQ01066108.1	346	Bivalvia		98.83	342	28S ribosomal RNA gene, partial sequence
GKEF01806478.1	228	Actinopteri	MH540325.1	100	200	Demodex brevis isolate D3-1 28S ribosomal RNA gene, partial sequence

Table S3. Contaminations related to the order Sarcoptiformes in fish (Actinopteri) assemblies. Contaminated contigs were blasted against Genbank nt database, the best score hits were listed in the table.

CONTAMINATED CONTIG ACCESSION	ASSEMBLY HOST	BEST BLAST SUBJECT	IDENTITY	BLAST LENGTH	SUBJECT Family
JAODHT010034050.1	<i>Nemapteryx augusta</i>	KY922458.1	99.649	285	Haplochthoniidae
GDHT01210928.1	<i>Austrofundulus limnaeus</i>	JQ000249.1	100	224	
HALZ01069874.1	<i>Sardina pilchardus</i>	XR_006959345.1	95.11	409	
HAMA01003558.1	<i>Sardina pilchardus</i>	XR_003474832.1	99.153	236	Pyroglyphidae
HAMB01025712.1	<i>Sardina pilchardus</i>	XR_006959345.1	97.835	231	
HBV01088761.1	<i>Platichthys flesus</i>	XR_006959345.1	100	205	
GIAU01075596.1	<i>Lucifuga dentata</i>	JQ000367.1	96.226	318	Histiostomatidae
GFMN01017841.1	<i>Chionodraco hamatus</i>	MN857506.1	99.62	526	
GIAU01155259.1	<i>Lucifuga dentata</i>	MN857505.1	100	246	
GIAU01165557.1	<i>Lucifuga dentata</i>	MN857506.1	98.529	408	
GIAU01192799.1	<i>Lucifuga dentata</i>	KM277806.1	98.026	304	
GIAU01192800.1	<i>Lucifuga dentata</i>	KM277806.1	96.711	304	
GIAU01202434.1	<i>Lucifuga dentata</i>	MN857506.1	100	254	
GIAU01367655.1	<i>Lucifuga dentata</i>	KM277818.1	99.694	327	
GIAU01367663.1	<i>Lucifuga dentata</i>	KM277818.1	96.697	333	
GIAU01399740.1	<i>Lucifuga dentata</i>	MK393792.1	100	206	Acaridae
GIAU01472509.1	<i>Lucifuga dentata</i>	MN857505.1	99.526	211	
GJOL01045947.1	<i>Cotylopus acutipinnis</i>	KM277806.1	99.825	570	
GKAU01101372.1	<i>Tenualosa ilisha</i>	MN857505.1	99.231	260	
HANK010104528.1	<i>Pleuronectes platessa</i>	KM277817.1	100	251	
HANK010201860.1	<i>Pleuronectes platessa</i>	KM277818.1	100	342	
HANK010573285.1	<i>Pleuronectes platessa</i>	KM277818.1	92.857	266	
HANK010592382.1	<i>Pleuronectes platessa</i>	MN857506.1	99.82	1114	
HANK010592383.1	<i>Pleuronectes platessa</i>	MN857506.1	100	548	