

Appendix A: Intersection of HAO, TADS, and SPD					
HAO ID		TADS ID		SPD ID	
HAO:0000000	[Term] id: HAO:0000000 name: anatomical entity def: "Biological entity that is either an individual member of a biological species or constitutes the structural organization of an individual member of a biological species." [HAO:ref "Haendel, M. A., F. Neuhaus, D. Osumi-Sutherland, P. M. Mabee, J. L. V. Mejino, C. J. Mungall, and B. Smith. 2008. CARO - The Common Anatomy Reference Ontology. Pp. 311-333 in: Anatomy Ontologies for Bioinformatics: Principles and Practice; Burger, A, Davidson, D, Baldock, R (Eds.). Springer. 356 pp.", ISBN:978-1-84628-88, http://bioontology.org/wiki/index.php/CARO:Main_Page] xref: CARO:0000000	TADS:0000583	[Term] id: TADS:0000583 name: anatomical entity def: "Biological entity, which constitutes the structural organization of a biological organism, or is an attribute of that organization." [CARO:0000000]	SPD:0000000	[Term] id: SPD:0000000 name: anatomical entity xref_analog: CARO:0000000
HAO:0000004	[Term] id: HAO:0000004 name: portion of organism substance def: "Material anatomical entity in a gaseous, liquid, semisolid or solid state; produced by anatomical structures or derived from inhaled and ingested substances that have been modified by anatomical structures as they pass through the body." [HAO:ref "Haendel, M. A., F. Neuhaus, D. Osumi-Sutherland, P. M. Mabee, J. L. V. Mejino, C. J. Mungall, and B. Smith. 2008. CARO - The Common Anatomy Reference Ontology. Pp. 311-333 in: Anatomy Ontologies for Bioinformatics: Principles and Practice; Burger, A, Davidson, D, Baldock, R (Eds.). Springer. 356 pp.", ISBN:978-1-84628-88, http://bioontology.org/wiki/index.php/CARO:Main_Page] xref: CARO:0000004 is_a: HAO:0000006 ! material anatomical entity	TADS:0000585	[Term] id: TADS:0000585 name: portion of organism substance def: "Material anatomical entity in a gaseous, liquid, semisolid or solid state, with or without the admixture of cells and biological macromolecules; produced by anatomical structures or derived from inhaled and ingested substances that have been modified by anatomical structures as they pass through the body." [CARO:0000004] is_a: TADS:0000587 ! material anatomical entity	SPD:0000008	[Term] id: SPD:0000008 name: portion of organism substance comment: Material anatomical entity in a gaseous, liquid, semisolid or solid state; produced by anatomical structures or derived from inhaled and ingested substances that have been modified by anatomical structures as they pass through the body. is_a: SPD:0000000 ! anatomical entity
HAO:0000012	[Term] id: HAO:0000012 name: multi-cellular organism def: "Anatomical structure that is an individual member of a species and consists of more than one cell." [HAO:ref "Haendel, M. A., F. Neuhaus, D. Osumi-Sutherland, P. M. Mabee, J. L. V. Mejino, C. J. Mungall, and B. Smith. 2008. CARO - The Common Anatomy Reference Ontology. Pp. 311-333 in: Anatomy Ontologies for Bioinformatics: Principles and Practice; Burger, A, Davidson, D, Baldock, R (Eds.). Springer. 356 pp.", ISBN:978-1-84628-88, http://bioontology.org/wiki/index.php/CARO:Main_Page] synonym: "whole organism" [HAO:ref "Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology."] xref: CARO:0000012 xref: CARO:0000012 is_a: HAO:0000003 ! anatomical structure	TADS:0000593	[Term] id: TADS:0000593 name: multi-cellular organism def: "Anatomical structure that is an individual member of a species and consists of more than one cell." [CARO:0000012] is_a: TADS:0000584 ! anatomical structure	SPD:0000001	[Term] id: SPD:0000001 name: whole organism is_a: SPD:0000000 ! anatomical entity
HAO:0000040	[Term] id: HAO:0000040 name: acellular anatomical structure def: "Anatomical structure that consists of cell parts and cell substances and together does not constitute a cell or a tissue." [HAO:ref "Haendel, M. A., F. Neuhaus, D. Osumi-Sutherland, P. M. Mabee, J. L. V. Mejino, C. J. Mungall, and B. Smith. 2008. CARO - The Common Anatomy Reference Ontology. Pp. 311-333 in: Anatomy Ontologies for Bioinformatics: Principles and Practice; Burger, A, Davidson, D, Baldock, R (Eds.). Springer. 356 pp.", ISBN:978-1-84628-88, http://bioontology.org/wiki/index.php/CARO:Main_Page] xref: CARO:0000040 is_a: HAO:0000003 ! anatomical structure	TADS:0000604	[Term] id: TADS:0000604 name: acellular anatomical structure def: "Anatomical structure that consists of cell parts and cell substances and together does not constitute a cell or a tissue." [CARO:0000040] is_a: TADS:0000584 ! anatomical structure	SPD:0000456	[Term] id: SPD:0000456 name: acellular anatomical structure xref_analog: CARO:0000040 is_a: SPD:0000000 ! anatomical entity

HAO:0000228	<p>[Term] id: HAO:0000228 name: coxa def: "The leg segment that is connected to the body and to the trochanter via conjunctivae and muscles." [HAO:ref "HAO:im"] synonym: "H?fte" [HAO:ref "Sz?pligeti, G. 1903. Neue Evaniiden. Annales Historico-Naturales Musei Nationalis Hungarici:3783-388."] is_a: HAO:0000495 ! leg segment relationship: part_of HAO:0000494 ! leg</p>	TADS:0000278	<p>[Term] id: TADS:0000278 name: adult coxa def: "The leg segment where the leg is attached to the body. Powerful coxal muscles from the body wall move the coxa and, as a result, the entire leg in an antero-posterior direction." [ISBN:0-19-505910-7] comment: Fig. 2-3; Fig. 4-1; Fig. 4-20; in Biology of Ticks ISBN:0-19-505910-7. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000373	<p>[Term] id: SPD:0000373 name: coxa def: "The basal, 1st segment of the leg. It articulates with the trochanter through a prolateral ball-socket articulation." [SPDrf:Parry_1957] comment: Figs 72:19, 72:26, 72:75 in SPDrf:Ubick_et_al_2005_glossary. is_a: SPD:0000451 ! leg article</p>
HAO:0000240	<p>[Term] id: HAO:0000240 name: cuticle def: "The acellular anatomical structure that is the external layer of the integument (covers the entire body surface as well as lines ectodermal invaginations such as the stomodeum, proctodeum and tracheae) and produced by the epidermal cells." [HAO:ref "HAO:im"] synonym: "cuticula" [HAO:ref "Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology.", HAO:ref "Snodgrass, R. E. 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York & London 667 pp."] synonym: "exoskeleton" [HAO:ref "Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology."] is_a: HAO:0000040 ! acellular anatomical structure relationship: part_of HAO:0000421 ! integument</p>	TADS:0000110	<p>[Term] id: TADS:0000110 name: adult cuticle def: "Dead outer part of the integument made up of primarily of protein and chitin." [ISBN:0-19-505910-7] comment: Fig. 5-1; Fig. 5-2; Fig. 5-3; Fig. 5-4; Fig. 5-5; Fig. 5-6; Fig. 5-7; Fig. 5-13; Fig. 5-14; Fig. 5-15; in Biology of Ticks ISBN:0-19-505910-7. related_synonym: "Exoskeleton" [] is_a: TADS:0000604 ! acellular anatomical structure relationship: part_of TADS:0000000 ! adult capitulum relationship: part_of TADS:0000002 ! adult leg relationship: part_of TADS:0000108 ! adult integument</p>	SPD:0000004	<p>[Term] id: SPD:0000004 name: cuticle def: "The outer non-living layer of the integumentary system derived from the epidermis." [SPD:Curator] xref_analog: FBbt:00004970 is_a: SPD:0000456 ! acellular anatomical structure relationship: part_of SPD:0000043 ! integumentary system</p>
HAO:0000324	<p>[Term] id: HAO:0000324 name: female genitalia def: "The genitalia that is part of the female organism." [HAO:ref "HAO:ad"] is_a: HAO:0000374 ! genitalia</p>	TADS:0000352	<p>[Term] id: TADS:0000352 name: adult female reproductive system def: "This system consists of the ovary, the oviducts, the uterus, the cervical vagina, the seminal receptacle, the vestibular vagina, accessory glands and the genital pore. In addition, Gene's organ, located separately in the dorsal body cavity, serve as the eggwaxing organ." [ISBN:0-19-505910-7] comment: Fig. 16-1; Fig. 16-2; Fig. 16-3; Fig. 16-4; in Biology of Ticks ISBN:0-19-505910-7. is_a: TADS:0000605 ! anatomical cluster</p>	SPD:0000044	<p>[Term] id: SPD:0000044 name: female genitalia relationship: part_of SPD:0000058 ! epigastrium</p>
HAO:0000327	<p>[Term] id: HAO:0000327 name: femur def: "The leg segment that is distal to the trochanter and proximal to the tibia." [HAO:ref "HAO:ad"] synonym: "Schenkel" [HAO:ref "Sz?pligeti, G. 1903. Neue Evaniiden. Annales Historico-Naturales Musei Nationalis Hungarici:3783-388."] is_a: HAO:0000495 ! leg segment relationship: part_of HAO:0000494 ! leg</p>	TADS:0000280	<p>[Term] id: TADS:0000280 name: adult femur def: "The segment of the leg that articulates with the trochanter on the proximal side and the tibia on the distal side. Internal leg muscles from the trochanter enable the joint to flex and extend. In some species, the femur may appear to be divided into a basifemur and a telofemur but this is superficial since it is not reflected in the internal musculature." [ISBN:0-19-505910-7] comment: Fig. 4-20, with permission from the editor, Journal of Parasitology. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000375	<p>[Term] id: SPD:0000375 name: femur def: "The 3rd segment of the leg, between trochanter and patella. It articulates with the patella through a pair of dorsal-lateral condyles." [SPD:Curator] comment: Figs 72:19,72:75 in SPDrf:Ubick_et_al_2005_glossary. is_a: SPD:0000451 ! leg article</p>
HAO:0000494	<p>[Term] id: HAO:0000494 name: leg def: "The anatomical cluster that is composed of the coxa and all distal leg segments and is connected to the pectus." [HAO:ref "HAO:mb"] is_a: HAO:0000041 ! anatomical cluster relationship: part_of HAO:0001015 ! thorax</p>	TADS:0000002	<p>[Term] id: TADS:0000002 name: adult leg def: "Ticks have 4 pairs of walking legs as adults and nymphs (only 3 pair occur in larvae). Each leg consists of 6 segments, the coxa, trochanter, femur, patella, tibia and tarsus. The tarsus of each leg bears an apotele comprising the claws and the pulvillus (the latter is absent in most argasid tick nymphs and adults). A complex sensory organ, Haller's organ, is located on the dorsal surface of the tarsus of leg I." [ISBN:0-19-505910-7] comment: Fig. 4-20; Fig. 4-21; Fig. 4-22; Fig. 4-23; Fig. 4-24; in Biology of Ticks ISBN:0-19-505910-7. is_a: TADS:0000603 ! organism subdivision</p>	SPD:0000372	<p>[Term] id: SPD:0000372 name: leg def: "Any of the four appendages of cephalothorax, behind the palp." [SPD:Curator] is_a: SPD:0000331 ! appendage cephalothorax</p>

HAO:0000820	<p>[Term] id: HAO:0000820 name: pretarsus def: "The anatomical cluster that is apical to the telotarsus and composed of the empodium, auxilia, planta, pulvillum, unguis, unguitactor plate, auxiliar sclerite and manubrium." [HAO:ref "HAO:mb"] is_a: HAO:0000041 ! anatomical cluster relationship: part_of HAO:0000992 ! tarsus</p>	TADS:0000284	<p>[Term] id: TADS:0000284 name: adult apotele def: "The apotele comprises the claws and the pulvillus on a hinged joint at the tip of the tarsus. The entire structure is capable of movement, flexing and extending in the same plane (1 degree of freedom)." [ISBN:0-19-505910-7] comment: Fig. 4-21; in Biology of Ticks ISBN:0-19-505910-7. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000450	<p>[Term] id: SPD:0000450 name: pretarsus def: "The 8th, most distal article of the leg, articulated with the tarsus and containing the claws." [SPD:Curator] is_a: SPD:0000451 ! leg article</p>
HAO:0000935	<p>[Term] id: HAO:0000935 name: seta def: "The sensillum that is multicellular and consists of trichogen, tormogen, and sense cells." [HAO:ref "HAO:im"] synonym: "bristle" [HAO:ref "Masner, L. 1980. Key to genera of Scelionidae of the Holarctic region, with descriptions of new genera and species (Hymenoptera: Proctotrupoidea). Memoirs of the Entomological Society of Canada 113:1-54."] synonym: "trichoid sensillum" [HAO:ref "Gibson, G. A. P., J. D. Read, and R. Fairchild. 1998. Chalcid wasps (Chalcidoidea): illustrated glossary of positional and morphological terms .."] is_a: HAO:0000933 ! sensillum</p>	TADS:0000301	<p>[Term] id: TADS:0000301 name: adult seta def: "A hair like process that extends from the cuticle to the exterior. The seta is the most common type of sensillum. The seta is inserted into a socket, a depression in the cuticle surrounded by a slight ridge. The interior of the seta is hollow and connected directly to a duct that extends through the cuticle to the epidermis. Several neurons embedded in the epidermis innervate the setiform sensillum, sending dendrites into the shaft of the seta. Axons from the neuron cell bodies extend into the interior of the body and communicate via nerves to the synganglion. Most setae are simple, without pores and serve as mechanosensilla and are innervated by mechanosensory neurons. Specialized setae have either single pores at the tip (gustatory sensilla), pores all over the sensilla (olfactosensilla) or pores in ridges along the side walls or with grooves that lack pores. These latter sensilla are believed to function as hygro-sensilla or thermosensilla or both." [ISBN:0-19-505910-7] comment: Fig. 5-1; Fig. 5-10; in Biology of Ticks ISBN:0-19-505910-7. relationship: part_of TADS:0000000 ! adult capitulum relationship: part_of TADS:0000001 ! adult body relationship: part_of TADS:0000296 ! adult peripheral sensillum relationship: part_of TADS:0000549 ! adult sensory system</p>	SPD:0000359	<p>[Term] id: SPD:0000359 name: seta def: "An articulate cuticular outgrowth, often innervated to conform a mechanical or chemical sensillum." [SPD:Curator] comment: Fig 72:44 in SPDrf: Ubick_et_al_2005_glossary. relationship: part_of SPD:0000004 ! cuticle</p>
HAO:0000989	<p>[Term] id: HAO:0000989 name: tarsal claw def: "The spur that is curved and projects from the apex of the last tarsal segment on either side of the arolium of the pretarsus." [HAO:ref "HAO:im"] synonym: "pretarsal claw" [HAO:ref "Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology.", HAO:ref "Snodgrass, R. E. 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York & London 667 pp."] synonym: "unguis" [HAO:ref "Curators, H. A. O. 2009. The Hymenoptera Anatomy Ontology Curation Team. Hymenoptera Anatomy Ontology.", HAO:ref "Snodgrass, R. E. 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York & London 667 pp."] is_a: HAO:0000951 ! spur relationship: part_of HAO:0000820 ! pretarsus</p>	TADS:0000285	<p>[Term] id: TADS:0000285 name: adult claw def: "Curved claws at the end of the apotele." [ISBN:0-19-5505910-7 "0-19-5505910-7"] relationship: part_of TADS:0000284 ! adult apotele</p>	SPD:0000381	<p>[Term] id: SPD:0000381 name: claw def: "A hook-shaped sclerotized structure arising from the leg pretarsus." [SPD:Curator] is_a: SPD:0000456 ! acellular anatomical structure relationship: part_of SPD:0000450 ! pretarsus</p>
HAO:0000992	<p>[Term] id: HAO:0000992 name: tarsus def: "The leg segment that is apical to the tibia." [HAO:ref "HAO:ad"] is_a: HAO:0000495 ! leg segment relationship: part_of HAO:0000494 ! leg</p>	TADS:0000283	<p>[Term] id: TADS:0000283 name: adult tarsus def: "Terminal segment of the leg that bears the claws, pulvillus (when present) and the Haller's organ. Some authors subdivide the tarsus into a posterior metatarsus and the anterior tarsus, but this is a superficial separation since there is no joint or muscle distinction." [ISBN:0-19-505910-7] comment: Fig. 4-20, with permission from the editor, Journal of Parasitology. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000379	<p>[Term] id: SPD:0000379 name: tarsus def: "The 7th segment of the leg, between the metatarsus and the pretarsus. It articulates with the pretarsus through a pair of lateral condyles." [SPD:Curator] comment: Fig 72:19, 72:75 in SPDrf: Ubick_et_al_2005_glossary. exact_synonym: "distitarsus" [SPDrf: Ubick_et_al_2005_glossary] is_a: SPD:0000451 ! leg article</p>

HAO:0001017	<p>[Term] id: HAO:0001017 name: tibia def: "The leg segment that is proximal to the tarsus and distal to the femur." [HAO:ref "HAO:im"] synonym: "Schiene" [HAO:ref "Sz?pligeti, G. 1903. Neue Evaniiden. Annales Historico-Naturales Musei Nationalis Hungarici:3783-388."] is_a: HAO:0000495 ! leg segment relationship: part_of HAO:0000494 ! leg</p>	TADS:0000281	<p>[Term] id: TADS:0000281 name: adult tibia def: "The segment of the leg that articulates between the femur on the proximal side and the metatarsus on the distal side. Internal muscles from the femur enable the segment to flex and extend so that the leg can be flexed against the body for protection or extended for walking." [ISBN:0-19-505910-7] comment: Fig. 4-20, with permission from the editor, Journal of Parasitology. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000377	<p>[Term] id: SPD:0000377 name: tibia def: "The 5th segment of the leg, between patella and metatarsus. It articulates with the metatarsus through a pair of dorsal-lateral condyles." [SPDd:Curator] comment: Figs 72:19, 72:75 in SPDrf: Ubick et al 2005 glossary. is_a: SPD:0000451 ! leg article</p>
HAO:0001034	<p>[Term] id: HAO:0001034 name: trochanter def: "The leg segment that is located proximal to the femur and distal to the coxa." [HAO:ref "HAO:ad"] is_a: HAO:0000495 ! leg segment relationship: part_of HAO:0000494 ! leg</p>	TADS:0000279	<p>[Term] id: TADS:0000279 name: adult trochanter def: "The segment of the leg that is attached to the coxa on the proximal side and the femur on the distal side. The trochanter can be flexed or extended by internal muscles from the coxa to the trochanter. Soft articulatory cuticle occurs between the two joints." [ISBN:0-19-505910-7] comment: Fig. 4-20, with permission from the editor, Journal of Parasitology. relationship: part_of TADS:0000002 ! adult leg</p>	SPD:0000374	<p>[Term] id: SPD:0000374 name: trochanter def: "Second segment of the leg, between the coxa and femur. It articulates with the femur through a pair of lateral condyles." [SPD:Curator] comment: Figs 72:19, 72:75 in SPDrf: Ubick et al 2005 glossary. is_a: SPD:0000451 ! leg article</p>