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A checklist of ciliate parasites (Ciliophora) of fishes from Mexico

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Abstract

A database with all available published accounts of the ciliate parasite species of Mexican fishes was assembled. This information, along with records derived from own recent research, allow generating a checklist containing all the records, which is a necessary first step to address future questions in the areas of ecology, evolutionary biology and biogeography of these host-parasite associations. The checklist is presented as a parasite-host list, and a host-parasite list. The checklist contains 30 nominal species, from 9 genera and 8 families of ciliate parasites. Most of the primary records were done for exotic fish species, artificially introduced to Mexico for aquaculture purposes; however, recent works have been conducted in diverse species of native fishes. Excepting one, all the ciliate species listed here have been previously recorded for diverse fish species from different localities around the world. Based on the amount of information contained in this checklist, much more effort is necessary to accurately know the diversity of species of this type of parasites in fish fauna of Mexico.

Key words: Ciliophora, parasites, Mexico

Introduction

Parasites are extremely abundant and diverse in nature, representing a substantial portion of global biodiversity. Inclusion of parasites in biodiversity surveys provides insights into the history and biogeography of other organisms, as well as into the structure of ecosystems the processes behind the diversification of life (Brooks & Hoberg, 2000; Poulin & Morand, 2000, 2004). In this context, parasites have, according to Brooks & Hoberg (2006), a dual and conflicting significance because they may regulate host populations, playing a central role in maintenance of genetic diversity and structuring host communities and, at the same time, they represent treats to human health, agriculture, natural systems, conservation practices, and the global economy (see Horwitz & Wilcox, 2005).

To date, many groups of parasites such as helminths (e.g. Platyhelminthes, Nematoda and Acanthocephala) have been widely recorded in freshwater fishes from Mexico, and some authors have considered that their inventory is near to be completed because representative helminth fauna of most of the Mexican fish families is currently known (Pérez-Ponce de León & Choudhury, 2010). However, other parasites such as protists are poorly known (Scholz & Chohudury, 2014), and the available records of these parasites have been mainly published only in local journals. In response to this, the present study compiles the current knowledge of the taxonomic composition and distribution of ciliate parasites of fish in Mexico. A list makes available the current nomenclature and specimens occurrence records, providing a portal to the information available about different species, which is necessary to successfully document and understand the causes and consequences of biotic diversity. Species lists form a vital element of distribution studies because they aid in generating hypotheses to guide the application of experimental or comparative methods. It is expected that this checklist will facilitate future research on taxonomy, biogeography, ecology, and biodiversity. The main objective of this study is to compile all the available published accounts on the ciliate parasites of fishes in Mexico, incorporating some new records derived from our own work in order to assemble a checklist providing parasite-host and host-parasite lists. A brief discussion on the importance of our findings is also provided.

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Material and methods

Bibliographic search. All the published records on the ciliate species reported from fishes in Mexican waters were compiled. Databases and electronic resources such as Zoological Record, Biological Abstracts, ISI Web of Knowledge, Google Scholar, Aquatic Sciences and Fisheries Abstracts, Biological and Agricultural Index Plus, Scopus, Latindex and TESIUNAM were consulted to guarantee we retrieved all possible information; the bibliographic search was undertaken up to May, 2015. We considered all these studies whose datasets provided taxonomic information regarding the helminth taxa found in a sample of individual hosts. Literature where data was compiled but no original information provided was not considered (e.g., Madrazo-Garibay *et al.*, 1987, 1990; Aladro-Lubel *et al.*, 2006). The fish species names were used according to Miller *et al.* (2005), and supplemented by Froese & Pauly (2015).

Survey work. Data derived from our own research was also included. Fish were collected between January and May 2015 with nets, kept alive and studied within no more than 3 hours after capture. Gills from each host were obtained and placed in Petri dishes with tap water. Squash slides of gills were made; these slides were impregnated by silver-nitrate to observe the adhesive disc of trichodinids as described by Lom (1958). In order to study the nuclear apparatus, air-dried slides of trichodinids were stained with either Harris-Lillie's hematoxylin or Ehrlich's acid hematoxylin and mounted in Canada balsam for light microscopy. Identification was made using specialized literature.

The results of this study are presented in a parasite-host list, where parasites are organized by class following the proposal of Adl *et al.* (2012), and then by family. Species within each family are listed alphabetically followed by authority name. Next category is the site where each ciliate species was found. In the next category, host family and species are provided, followed by the locality and the bibliographical reference from which the information was obtained, except by those records established in this work, which are presented as NR (new record). In those parasite species found in more than one host species, the latter are listed alphabetically, and host species for which more than one locality was recorded, are listed together. The host-parasite list (Table 2) is organized alphabetically; each fish species is separated by host family following Froese & Pauly (2015), and species are listed in alphabetical order, then, ciliate parasites are listed alphabetically.

Results

A total of 16 studies have been published establishing host and locality records for ciliates parasites infecting fishes in Mexico (a whole list of localities is provided in Table 1). The analysis of all available information allowed us to establish a list of 30 taxa parasitizing fishes in Mexico, which are contained in 9 genera and 8 families. Most taxa were identified to species level.

The ciliate family with the highest number of species recorded in Mexico was Trichodinidae. Twenty trichodinid species have been found in 21 fish species of 11 families. Fish host family with the largest number of records was Cyprinidae, however, most of these records were done for exotic introduced species of Asian carps. Most of the studies have been carried out in different localities of central and northern Mexico; however, Oaxaca is the state with the largest number of localities recorded.

Parasite-host list

CLASS ARMOPHOREA Lynn

Family Nyctotheridae Amaro

Nyctotherus dilleri Earl & Jiménez
Site: Intestine
Hosts and records: Cichlidae: *Paraneetroplus fenestratus*, Río Jaltepec, Veracruz (Earl & Jiménez, 1969).

CLASS LITOSTOMATEA Small & Lynn

Family Amphileptidae Bütschli

Amphileptus branchiarum Wenrich
Site: Gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán (Herróz-Zamorano, 1998).

CLASS OLIGOHYMENOPHOREA de Puytorac, Batisse, Bohatier, Corliss, Deroux, Didier, Dragesco, Fryd-Versavel, Grain, Grollere, Horasse, Mode, Laval, Roque, Savoie & Tuffrau

Family Epistylididae Kahl

Apiosoma piscicola (Blanchard)
Site: Skin and gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán, (Herróz-Zamorano & Aladro-Lubel, 1996; Herróz-Zamorano, 1998).

Epistylis hentscheli Kahl
Site: Skin and gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán (Herróz-Zamorano, 1998).

Epistylis rotans Svec
Site: Skin and fins
Hosts and records: Cyprinidae: *Cyprinus carpio*, *Carrassius auratus*, Laguna de Salazar, Estado de México (Armijo, 1968).

Records as *Epistylis* sp.
Site: Fins, operculus
Hosts and records: Cichlidae: *Paraneetroplus synspilus*, Laguna el Camarón and Laguna el Horizonte, Municipio Centro, Tabasco (Mendoza & Pineda, 1991).

Family Ichthyophthiriidae Kent

Ichthyophthirius multifilis Fouquet
Site: Gills
Hosts and records: Characidae: *Astyanax aeneus*, Camino a Guelatao, Oaxaca (Lagunas-Calvo, 2014); Cichlidae: *Oreochromis aureus*, Cuautla, Morelos (Constantino-Casas *et al.*, 1997); Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos" Zacapu, Michoacán (Herróz-Zamorano, 1998), Laguna de Salazar, Estado de México (Armijo, 1968), *Notropis moralesi*, San Miguel Tecomatlán, Oaxaca (Lagunas-Calvo, 2014); Goodeidae: *Girardinichthys* sp., Lago de Chapultepec, Distrito Federal (Pérez-Reyes & Salas-Gómez, 1961); Poeciliidae: *Poeciliopsis gracilis*, Camino a Guelatao, Oaxaca (Lagunas-Calvo, 2014); Salmonidae: *Onchorhynchus mykiss*, Cuautla, Morelos (Constantino-Casas *et al.*, 1997).
Remarks: Some individuals of *Xenoophorus captivus* (Goodeidae) collected from the state of San Luis Potosí, were experimentally exposed to infections with *I. multifilis*, using fishes of the species *Heterandria bimaculata* (Poeciliidae) as vectors (Ávila *et al.*, 2011).

Family Tetrahymenidae Corliss

Tetrahymena corlissi Thompson
Site: Skin and gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán (Herróz-Zamorano, 1998).

Family Trichodinidae Claus

Trichodina acuta Lom
Site: Gills and scales
Hosts and records: Poeciliidae: *Heterandria jonesii*, Los Ocotes, Oaxaca (Lagunas-Calvo, 2014).

Trichodina centrostrigeata Basson, Van As & Paperna
Site: Gills
Hosts and records: Cichlidae: *Oreochromis* sp., Río Cuchujaqui, Sonora (Islas-Ortega, 2013); *Tilapia nilotica*, Centro Piscícola SAGARPA, Chametla, Sinaloa (Rodríguez, 2002); *T. zillii*, Presa Yosocuta, Oaxaca (Lagunas-Calvo, 2014).

Trichodina colisae Asmat & Sultana
Site: Gills
Hosts and records: Characidae: *Astyanax mexicanus*, Río Conchos, Chihuahua (Islas-Ortega, 2013).

Trichodina compacta Van As & Basson
Site: Gills
Hosts and records: Poeciliidae: *Heterandria jonesii*, Los Ocotes, Oaxaca (Lagunas-Calvo, 2014); *Poeciliopsis latidens*, *P. presidionis*, Arroyo Chupaderos, Sinaloa (Islas-Ortega, 2013).

Trichodina domerguei (Wallengren)
Site: Gills, skin and fins
Hosts and records: Cyprinidae: *Ctenopharyngodon idella*, Laguna de Salazar, Estado de México (Armijo, 1968); Pociliidae: *Heterandria bimaculata*, Pedregal, Distrito Federal (NR).

Trichodina heterodentata Duncan
Site: Gills
Hosts and records: Centrarchidae: *Micropterus salmoides*, San José del Molino, Durango (Islas-Ortega, 2013); Cichlidae: *Tilapia zillii*, Presa Yosocuta, Oaxaca (Lagunas-Calvo, 2014); Cyprinidae: *Campostoma ornatum*, *Gila pulchra*, Río Santa Isabel, Chihuahua (Islas-Ortega, 2013).

Trichodina jadranica Raabe
Site: Gills
Hosts and records: Tripterygiidae: *Enneanectes reticulatus*, San Carlos, Sonora (NR).

Trichodina magna Van As & Basson
Site: Skin and fins
Hosts and records: Cichlidae: *Tilapia nilotica*, Centro Piscícola SAGARPA, Chametla, Sinaloa (Rodríguez, 2002).

Trichodina cf. *maritinkae* Basson & Van As
Site: Gills
Hosts and records: Characidae: *Astyanax mexicanus*, Río Conchos, Chihuahua (Islas-Ortega, 2013).

Trichodina modesta Lom
Site: Gills
Hosts and records: Characidae: *Astyanax mexicanus*, Río Conchos, Chihuahua (Islas-Ortega, 2013); Poeciliidae: *Heterandria bimaculata*, Sola de Vega, Oaxaca (NR).

Trichodina mutabilis Kazubski & Migala
Site: Skin and gills
Hosts and records: Characidae: *Astyanax mexicanus*, Anteojo San Juan, Cuatro Ciénegas, Coahuila (Islas-Ortega & Aguilar-Aguilar, 2014); Río Conchos, Chihuahua (Islas-Ortega, 2013).

Trichodina nigra Lom
Site: Skin and fins
Hosts and records: Cichlidae: *Tilapia nilotica*, Centro Piscícola SAGARPA, Chametla, Sinaloa (Rodríguez, 2002).

Trichodina pediculus Ehrenberg
Site: Skin and fins
Hosts and records: Cichlidae: *Tilapia nilotica*, Centro Piscícola SAGARPA, Chametla, Sinaloa (Rodríguez, 2002).

Trichodina rectuncinata Raabe
Site: Gills
Hosts and records: Blenniidae: *Scartella cristata*, Playa Hermosa, Veracruz (NR); Gobiesocidae: *Tomicodon myersi*, Ixtapa-Zihuatanejo, Guerrero; Gobiidae: *Bathygobius mystacium*, Playa Hermosa, Veracruz (NR); Tripterygiidae: *Enneanectes reticulatus*, San Carlos, Sonora (Aguilar-Aguilar *et al.*, 2015).

Trichodina reticulata Hirschmann & Partsch
Site: Gills
Hosts and records: Goodeidae: *Girardinichthys multiradiatus*, Salazar, Estado de México (NR).

Trichodina steini Claparède & Lachmann
Site: Not available
Hosts and records: "Young fishes", Valle de México (Sámano & Sokoloff, 1931).
Remarks: Since the authors of this record did not mention any taxonomic feature of the hosts, and that "Valle de México" is actually a wide region in the center of Mexico, data derived of this record cannot be allocated in Tables 1 and 2.

Trichodina symmetrica Davis
Site: Gills, skin and fins
Hosts and records: Cyprinidae: *Carassius auratus*, *Cyprinus carpio*, Laguna de Salazar, Estado de México (Armijo, 1968).

Trichodina wellborni Lom
Site: Skin and gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos" Zacapu, Michoacán (Herróz-Zamorano, 1998); *Cyprinus rubrofuscus*, Centro Acuícola de Tezontepec, Hidalgo (Herróz-Zamorano, 1999).

Records as *Trichodina* sp.
Site: Skin and gills
Hosts and records: Ictaluridae: *Ictalurus punctatus*, Vicente Guerrero, Tamaulipas (Rábago-Castro *et al.*, 2011); Poeciliidae: *Heterandria jonesii*, Los Ocotes, Oaxaca (Lagunas-Calvo, 2014).

Trichodinella epizootica (Raabe)
Site: Gills
Hosts and records: Cyprinidae: *Dionda episcopa*, Río Tomochi, Chihuahua (Islas-Ortega, 2013).

Family Vorticellidae Ehrenberg

Carchesium polypinum (Linneaus)
Site: Skin and gills
Hosts and records: Cyprinidae: *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán (Herróz-Zamorano, 1998).

CLASS PHYLLOPHARYNGEA de Puytorac, Batisse, Bohatier, Corliss, Deroux, Didier, Dragesco, Fryd-Versavel, Grain, Grollere, Horasse, Mode, Laval, Roque, Savoie & Tuffrau [Adl *et al.* (2012) not considered Phyllopharyngea as a Class, replacing it by the acronym CONthreeP, because this taxa share ancestor with Colpodea (C), Oligohymenophorea (O), Nassophorea (N), Prostomatea (P), and Plagiopylea (P)].

Family Chilodonellidae Deroux

Chilodonella uncinata (Ehrenberg)
Site: Skin and gills
Hosts and records: Cyprinidae: *Carassius auratus*, Laguna de Salazar, Estado de México (Armijo, 1968); *Cyprinus carpio*, Centro Acuícola "Morelos", Zacapu, Michoacán (Herróz-Zamorano, 1998); Centro Acuícola de Tezontepec, Hidalgo (Herróz-Zamorano, 2000).

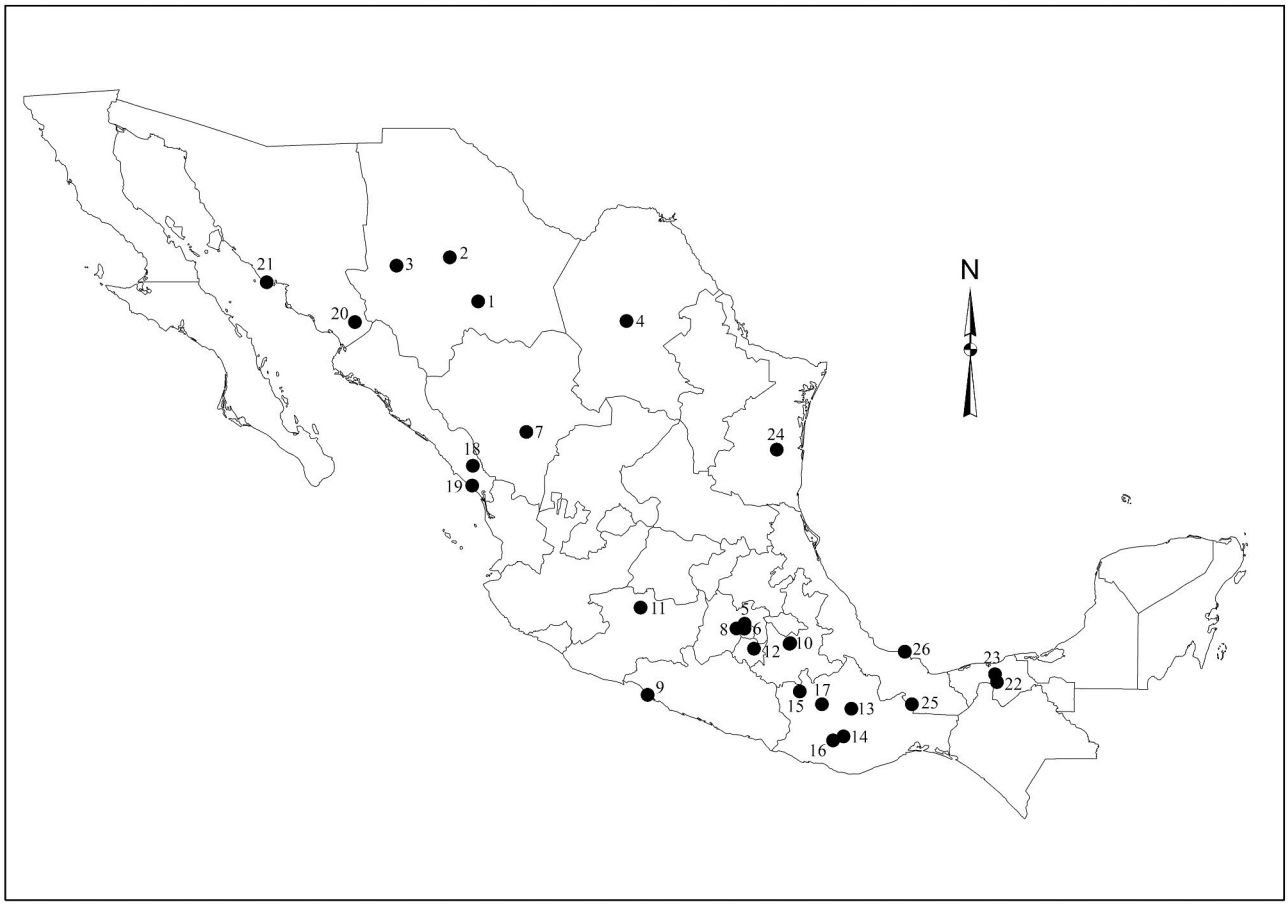

FIGURE 1. Map of Mexico showing the localities where ciliates parasites of fishes have been recorded.

TABLE 1. Localities in Mexico with records of ciliate parasites of fishes. The code for each locality is used in Fig. 1. Asterisk (*) indicates an approximate coordinate. (c) = coastal saline water, (l) = lake, (p) = pond, (r) = river, (s) = stream.

State	Locality	Code	Geographical coordinates
Chihuahua	Río Conchos (r)	1	27º27'31"N, 105º49'20"W
	Río Santa Isabel (r)	2	28º33'28"N, 106º31'38"W
	Río Tomochi (r)	3	28º21"06"N, 107º51'10"W
Coahuila	Anteojo San Juan (p)	4	26º58'07"N, 102º07'38"W
Distrito Federal	Lago Chapultepec (p)	5	19º25'20"N, 99º11'05"W
	Pedregal (p)	6	19º17'58"N, 99º11'27"W
Durango	San José del Molino (r)	7	24º12'20"N, 104º37'06"
Estado de México	Laguna de Salazar (p)	8	19º18'14"N, 99º23'18"W
Guerrero	Ixtapa-Zihuatanejo (c)	9	17º39'00"N, 101º36'00"W
Hidalgo	Centro Acuícola Tezontepec (p)	10	20º03'N, 99º17'W
Michoacán	Centro Acuícola Morelos (p)	11	19º49'30"N, 101º46'28"W*
Morelos	Cuautla (p)	12	18º48"N, 98º57"W*
Oaxaca	Camino a Guelatao (r)	13	17º18'28"N, 96º31'28"W
	Los Ocotes (p)	14	16º37'01"N, 96º43'12"W
	Presa Yososcuta (p)	15	17º44'06"N, 97º48'45"W
	Sola de Vega (r)	16	16º30'49"N, 96º58'52"W
	Tecomatlán (r)	17	17º25'04"N, 97º15'35"W
Sinaloa	Arroyo chupaderos (s)	18	23º21'42"N, 105º57'15"W
	Centro Piscícola SAGARPA (p)	19	22º52'N, 105º58'W*
Sonora	Río Cuchujaqui (r)	20	26º56'30"N, 108º53'08"W
	San Carlos (c)	21	27º56'20"N, 111º05'03"W
Tabasco	Laguna el Camarón (l)	22	17º58'N, 92º54'W*
	Laguna el Horizonte (l)	23	18º10'N, 92º57'W*
Tamaulipas	Vicente Guerrero (p)	24	23º46'N, 98º23'W*
Veracruz	Río Jaltepec (r)	25	17º25'N, 95º01'W*
	Playa Hermosa (c)	26	18º40'00"N, 95º07'47"W

Discussion

Based on all information compiled, as well as the novel information generated by our own research, this study represents the most comprehensive inventory for ciliate parasites of freshwater fishes in Mexico. The taxonomic list includes 30 taxa, most of them identified up to species level, and it is the result of the examination of 30 fish species. Most of the records retrieved from the literature review came from unpublished theses dissertations, and very few were formally published but they are not known or cited because they were published in local journals.

Many of the studies have been focused on exotic species of carps (i. e. *Cyprinus carpio* and *Carassius auratus*) and African cichlids (species of the genera *Oreochromis* and *Tilapia*), which were introduced to Mexico for aquaculture purposes; on the contrary, records of ciliates parasitizing native Mexican fish fauna have been scarcely provided. Notwithstanding Mexico possess a very rich fish fauna, conformed by more than 500 freshwater and more than 2500 marine and brackish fish species (Espinosa-Pérez, 2014), just a very reduced number of these species have been studied in order to record their associated ciliates. In fact, the first record of ciliate species parasitizing marine fishes in Mexico has been recently published (Aguilar-Aguilar *et al.*, 2015).

Except for *Nyctotherus dilleri*, all the recorded ciliate parasites species have been previously described for other fish taxa from other regions of the world. There may be two main reasons for this: 1) Since most of the hosts

recorded herein are exotic anthropogenically introduced species, it seems probable that several ciliate species originating in Asia or Africa, such as *Trichodina centrostrigeata*, *T. heterodentata*, or *T. reticulata*, among others, have been disseminated to diverse various localities and native hosts of Mexico together with transcontinental shipments of fishes destined for aquaculture. These kinds of introductions have been widely reported for different regions in the world (Albaladejo & Arthur, 1989; Van As & Basson 1989; Basson & Van As 2006; Pádua *et al.*, 2012). 2) Recognition and delimitation of ciliate species are based in a reduced number of morphological characters, with reduced plasticity due the small size of the organisms, which could result on a limited morphological variability hiding a higher species richness, which we are unable to describe with traditional taxonomy. Future directions for the research of ciliate parasites of fishes must strongly consider the role of DNA-based species delimitation criteria for recognizing parasite species, but also in discovering cryptic species (see Pérez-Ponce de León & Choudhury 2010; Nadler & Pérez-Ponce de León, 2011). In this sense, future studies combining morphological and molecular taxonomy appear as a necessary step in order to properly analyze host preferences, species delimitation, or historical biogeography.

TABLE 2. Host-parasite list. E = Exotic species, M = Marine species, N = Native species.

Host species	Ciliate parasite species
Blenniidae	
Scartella cristata (M, N)	*Trichodina rectuncinata*
Centrarchidae	
Micropterus salmoides (N)	*Trichodina heterodentata*
Characidae	
Astyanax aeneus (N)	*Ichthyophtirius multifilis*
Astyanax mexicanus (N)	*Trichodina colisae*
	Trichodina maritinkae
	Trichodina modesta
	Trichodina mutabilis
Cichlidae	
Oreochromis aureus (E)	*Ichthyophtirius multifilis*
Oreochromis niloticus (E)	*Trichodina centrostrigeata*
	Trichodina magna
	Trichodina nigra
	Trichodina pediculus
Oreochromis sp. (E)	*Trichodina centrostrigeata*
Paraneetroplus fenestratus (N)	*Nyctotherus dilleri*
Paraneetroplus synspilus (N)	*Epistylis* sp.
Cyprinidae	
Campostoma ornatum (N)	*Trichodina heterodentata*
Carassius auratus (E)	*Chilodonella uncinata*
	Epistylis rotans
	Trichodina symmetrica
Ctenopharyngodon idella (E)	*Trichodina domerguei*
Cyprinus carpio (E)	*Amphileptus branchiarum*
	Apiosoma piscicola
	Carchesium polypinum
	Chilodonella uncinata
	Epistylis hentscheli

.....continued on the next page

TABLE 2. (Continued)

Host species	Ciliate parasite species
	Epistylis rotans
	Ichthyophtirius multifilis
	Tetrahymena corlissi
	Trichodina wellborni
Cyprinus rubrofuscus (E)	*Trichodina wellborni*
Dionda episcopa (N)	*Trichodinella epizootica*
Gila pulchra (N)	*Trichodina heterodentata*
Notropis moralesi (N)	*Ichthyophtirius multifilis*
Gobiesoscidae	
Tomicodon myersi (M, N)	*Trichodina rectuncinata*
Gobiidae	
Bathygobius mystacium (M, N)	*Trichodina rectuncinata*
Goodeidae	
Girardinichthys multiradiatus (N)	*Trichodina reticulata*
Girardinichthys sp. (N)	*Ichthyophtirius multifilis*
Ictaluridae	
Ictalurus punctatus (N)	*Trichodina* sp.
Poeciliidae	
Heterandria bimaculata (N)	*Trichodina domerguei*
	Trichodina modesta
Heterandria jonesii (N)	*Trichodina acuta*
	Trichodina compacta
	Trichodina sp.
Poeciliopsis gracilis (N)	*Ichthyophtirius multifilis*
Poeciliopsis latidens (N)	*Trichodina compacta*
Poeciliopsis presidionis (N)	*Trichodina compacta*
Salmonidae	
Onchorhynchus mykiss (N)	*Ichthyophtirius multifilis*
Tripterygiidae	
Enneanectes reticulatus (M, N)	*Trichodina jadranica*
	Trichodina rectuncinata

Parasitic protists are the causative agents of diseases in the global aquaculture causing, among other things, damage and reduced growth of the host fish and favoring secondary bacterial infections and mortality (Martins *et al.* 2015), causing great losses to the commercial fishing industry, but also for a negative social impact in developing countries where aquaculture activities contribute to food production of high nutritional value to the needy population (Hoffmann 1999; Bondad-Reantaso *et al.* 2005). Aquaculture activities in Mexico has considerably increased in the last decades; for this reason, an adequate knowledge of parasites taxa affecting its fish fauna is fundamental to evaluate their impact on this highly profitable activity.

Much more effort will be required in order to describe and record the entire diversity of ciliate parasites of fishes in Mexico; completion of the inventory for these parasites is necessary to better understand this component of the biodiversity in this country. Based on the lessons from other symbiotic taxa (e.g. Pérez-Ponce de León and Choudhury 2010; Martínez-Aquino *et al.* 2014), future studies must combine the selection of missing components of the host spectrum with the choice of until now neglected drainages, however, we have to consider that most of the ciliate parasite species are considered generalists, that can be found in many geographical regions, because of

that, the list of species presented herein could represents a good amount of the ciliate parasitic diversity in Mexican fishes.

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