



Praniza (Isopoda: *Gnathia*) Parasitic on Gills of Arabian carpetshark *Chiloscyllium arabicum* with Notes of its Occurrence on some Marine Fishes of Iraq

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Abstract: Praniza larvae of *Gnathia* sp. were reported on the gills of 18 Iraqi sea fish-species. Hosts were eight elasmobranchs and 10 teleosts. Cartilaginous hosts belong to four families, with highest mean prevalence was 100% in *Pastinachus sephen*, while the lowest prevalence was 25% in *Gymnura poecilura*. Teleost hosts belong to seven families, the highest prevalence was 50% in *Rabdosargus haffara* and the lowest was 1.6% in *Tenualosa ilisha*. The higher mean intensity of infection was 12.3 in *Chiloscyllium arabicum*, and only one in all teleost fish species. Praniza parasite of *C. arabicum* has long body, concave cephalon, narrowing anteriorly with truncate frontal margin, the compound eyes large, pleotelson triangular, uropods have endopods not extending beyond the end of the pleotelson.

Keywords: Elasmobranch, Teleostei, Isopoda, *Gnathia*, praniza, Arabian Gulf, Iraq.

Introduction

Gnathiids are isopod crustaceans, free living as adults but have juvenile stage, the praniza larvae being blood-sucking ectoparasites feed on blood and tissue fluids of both elasmobranchs and teleosts, the larvae attached on the gills and skin and can cause focal lesions on the place of attachments (Lester, 2005; Diniz *et al.*, 2008). Moreover, they are the most unusual isopods, extremely polymorphic, its males have large mandibles, directed forward with five pairs of walking legs. Females have reduced jaws with their thorces being swollen (Cohen & Poore, 1994).

The family Gnathiidae has 12 genera, from which the genus *Gnathia* Leach, 1814, has 133 valid members, thus it has been considered to be the most specious (WoRMS, 2021). The most modern gnathiid genus is *Afrignathia* Hadfield & Smit, 2008 (Boyko *et al.*, 2020).

Some researchers reported gnathid larvae to cause heavy mortalities or fish emaciations in sea cages (Smit & Davies, 2004; McKiernan *et al.*, 2005; Lester & Hayward, 2006), while from our personal observations, isopods may attack their host and smash the outer surface or the mouth cavity of infected

fishes, and this could be more significant in crowded, limited habitats such as fish ponds and cages. They are, now suggested to have several biological and environmental relations, like being part of scavengers of the sea, thus they play an important role to clean the marine habitats. Also, they are considered as crucial part of the food chain, in addition to their role as vectors of blood parasites, since their larvae are blood suckers (Hadfield *et al.*, 2019).

Both Khamees *et al.* (2015) and Mhaisen *et al.* (2018) published review articles on marine fish parasites of Iraq. They nominated 18 fish host of praniza, and updated the scientific names of their hosts, thus three elasmobranch hosts, viz. *Himantura imbricatæ*, *H. randalli* and *H. bleekeri* were updated as *Brevitrygon imbricata* (Bloch & Schneider, 1801), *Maculabatis randalli* (Last, Manjaji-Matsumoto & Moore, 2012) and *Pateobatis bleekeri* (Blyth, 1860), respectively. Moreover, they stated interesting information dealing with the priority of first record of praniza, since one of us (TKA) and A. R. Jassim recorded this parasite from *Acanthopagrus arabicus* Iwatsuki, 2013 during their unpublished theses in 2013, from the same general area. However, TKA has the priority, while ARJ insisted to nominate the same host as *Acanthopagrus latus* (= *A. arabicus* Iwatsuki 2013 or *A. sheim* Iwatsuki, 2013), due to actual distribute *A. latus* around Japanese waters only (Iwatsuki, 2013; Ali *et al.*, 2018).

Gnathia praniza was globally recorded from fishes belonging to families Carcharhinidae, Dasyatidae, Gymnuridae, Rhinobatidae, Ariidae, Clupeidae, Haemulidae, Nemipteridae, Sciaenidae and Sparidae. All are inshore dwellers in Indo-Pacific region and Arabian Gulf (Carpenter *et al.*, 1997). Some of these fishes have

commercial values as fish food and in aquaculture industry (Abdi *et al.*, 2011). This study was, a part of comprehensive survey on parasitic crustaceans of marine fishes of Iraq. Such parasites are considered as extreme threat to the intensive growing industry of marine culture around the world. Moreover, identifying these parasites (such as praniza larvae) and survey of their hosts, may improve the efforts to avoid their impact on such future projects in Iraq.

Materials & Methods

Fish samples were collected during the period from January 2011 till June 2012 (Table 1), from the coastal waters of Iraq that located between latitudes 48° 44' to 48° 46' and longitude 29° 46' to 29° 47'. Trawlers were used in fish collection. Each sample was kept in a plastic sac inside icebox (Plumb & Bowser, 1983). Fish identification was according to Carpenter *et al.* (1997), Bishop (2003) and Iwatsuki (2013). Scientific names were updated according to Ali *et al.* (2018) and Froese & Pauly (2021). Fish total lengths were obtained up to the nearest mm. using measuring board, while large fishes were measured using 1.5 m. tape. Fishes were weighted to the nearest gm. using Mettler PE 3600 4.5 Kg, and ADAM 16 Kg balances. Gills were isolated in dishes half full with tap water and detected the parasites using dissecting microscope. Parasites were removed from their site of infection using fine forceps, and transferred to petri dishes with 5% water solution of sodium hypochlorite to remove excess debris (Johnson, 1969). Gentle current of this solution was flushed on the specimens using glass dropper and soft hair brush to activate the removal of the host tissues from parasites (Khamees, 1996; Grobler *et al.*, 2003). Clean parasitic larva were preserved in 70% ethanol and cleared in

85% lactic acid. Microscopical examinations were achieved using Humes & Gooding (1964) modified glass-slide method. Measurements (in mm.) and drawings of

Results

Gnathiid larvae (Praniza)

A total of 878 fish specimens (799 bony fishes and 79 elasmobranch fishes) were collected. Larvae of the genus *Gnathia* Leach, 1814 were found on the gill lamellae of *C. arabicum*. The prevalence value was 69%, the mean intensity of infection was 12.3 while the highest value was 40. The mean intensity of

parasites were made using ocular micrometer and camera Lucida.

infection was 1 in both *P. bleekeri* and *H. randalli*. The highest prevalence was 100% in *P. sephen*, while the lowest prevalence was 25% in *G. poecilura*. The teleost highest prevalence was 50% in *R. haffara* and the lowest was 1.6% in *T. ilisha* and the mean intensity of infection was 12.3 in *C. arabicum*, only one in all species of teleost fishes. Occurrence of praniza from all hosts are mentioned in table (1).

Table (1): Examined and infected fishes and their prevalence and intensity of infection with praniza larvae.

Host Species	No. fish Examined	No. fish Infected	Mean Prevalence (%)	Mean Intensity	Host Family
<i>Carcharhinus dussumeiri</i>	2	1	50	1	*Carcharhinidae
<i>Chiloscyllium arabicum</i>	42	29	69.0	12.3	*Carcharhinidae
<i>Glaucostegus granulatus</i>	5	2	40	1.5	*Rhinobatidae
<i>Pateobatis bleekeri</i>	3	1	33.3	1	*Dasyatidae
<i>Brevitrygon imbricata</i>	10	4	40	2.2	*Dasyatidae
<i>Maculabatis randalli</i>	6	3	50	1	*Dasyatidae
<i>Pastinachus sephen</i>	4	4	100	2.2	*Dasyatidae
<i>Gymnura poecilura</i>	7	1	25	4	*Gymnuridae
<i>Nematalosa nasus</i>	40	1	2.5	1	Clupeidae
<i>Tenualosa ilisha</i>	122	2	1.6	1	Clupeidae
<i>Netuma thalassina</i>	31	1	3.2	1	Ariidae
<i>Diagramma pictum</i>	62	3	4.8	1	Haemulidae
<i>Acanthopagrus arabicus</i>	168	1	0.6	1	Sparidae
<i>Diplodus sargus</i>	23	1	4.3	1	Sparidae
<i>Rhabdosargus haffara</i>	6	3	50	1	Sparidae
<i>Nemipterus japonicus</i>	294	10	3.4	1.1	Nemipteridae
<i>Johnius dussumieri</i>	12	1	8.3	1	Sciaenidae
<i>Ephippus orbis</i>	41	1	2.4	1	Ephippidae

* Elasmobranch fishes. The rest are teleosts. (Fish arranged according to Fricke *et al.*, 2021).

Morphology of praniza

Based on 10 specimens collected from *C. arabicum*, four specimens of this parasite

were kept in the British Natural History Museum. The body (Fig. 1A) is 3.54-4.69

mm (4.5 mm) long, divided into the cephalosome (Fig.1B), the pereon with five pairs of pereopods, the pleon (Fig. 1C) consists of five pleonites each with pair of pleopods, and the telson with one pair of uropods. The cephalon is narrowing anteriorly with truncate frontal margin, the antennae sl extended to

pereonite 1, the posterior margin of cephalon being much narrower than the anterior margin of pereonite 1, the compound eyes large, oval and located on the lateral margin (Fig. 1B).

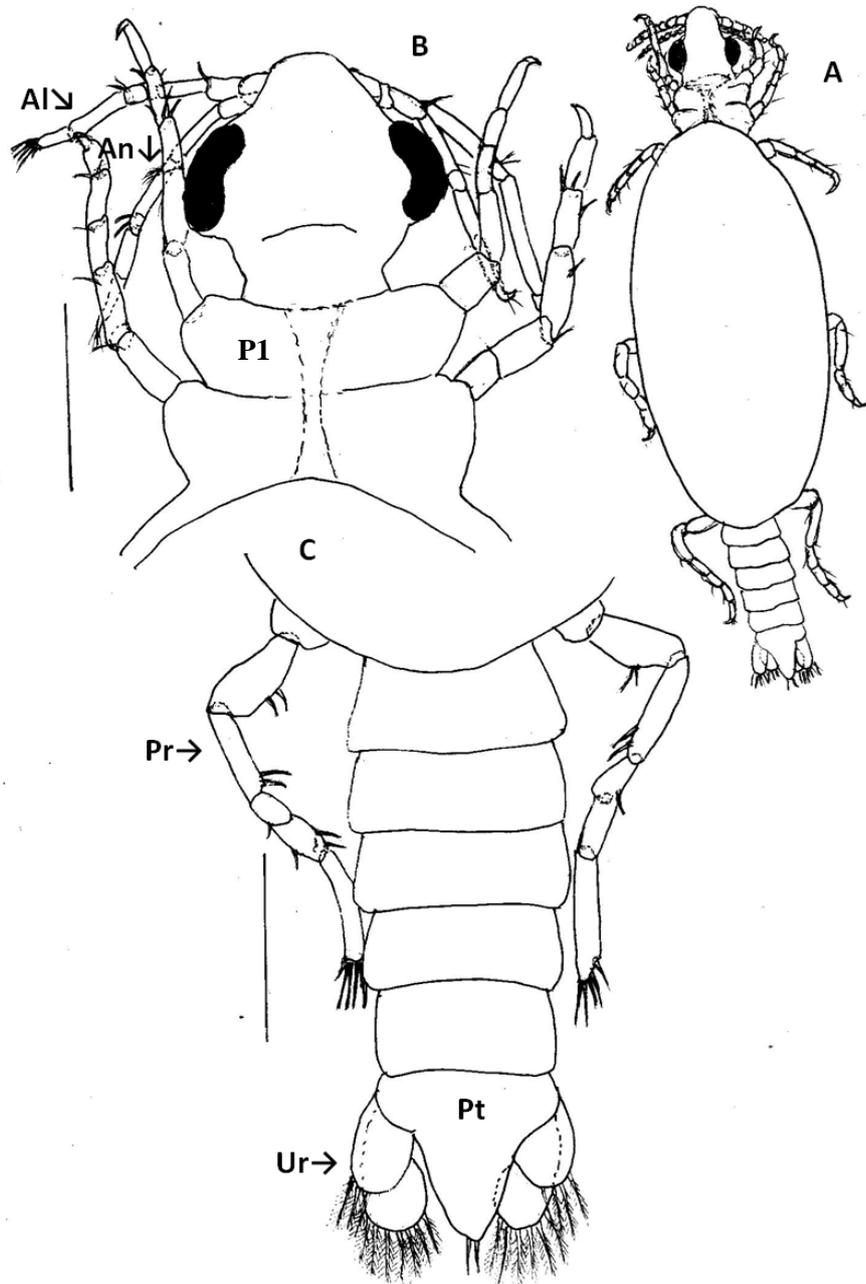


Fig. (1): *Gnathia* larvae (Praniza) A, habitus, dorsal view; B, cephalosome; C, pleon; Al, antennule; An, antenna; P1, pleonite 5; P1, pereonite 1; Pr, pereopod 5; Pt, pleotelson; Ur, uropod (Scale bars: 1.5 mm. in A; 0.1 mm. in B and C).

The first and second pereonites being obviously segmented, while the remaining are unsegmented and fused into large, elongated and parallel part (Fig. 1A). Pereonite 1 is fused with the cephalon (Fig. 1B) with convex anterior and posterior margins. Pereonite 2 slightly wider than pereonite 1. Pereonites 3 and 4 are largest part of the peraeon, especially when the larvae are full with blood. Pereonite 4 overlaps pereonite 5. Pereonites 6 and 7 are invisible. All pereopods with six segments carrying varying numbers of setae (Fig. 1C). The pleon with its five segments being much narrower than the former pereonite. Each pleonite bears a pair of foliated biramous pleopods fringed with several plumose simple setae. The pleotelson is triangular as long as wide, with its distal end bears a pair of simple setae (Fig. 1C). The uropods (Fig. 1C) have endopods not extending beyond the end of the pleotelson and the exopods are much shorter, both bears several plumose setae.

Discussion

Isopods are one of the most morphologically diverse crustacean group (Bayoumy *et al.*, 2013). Gnathiid isopods are temporary ectoparasites that occur in a variety of habitats ranging in depth, water currents, temperature, climate and salinity (Hadfield *et al.*, 2019). Gnathiids have a polymorphic and biphasic life cycle (Ectoparasitic larval stage and free living fasting reproductive stage). It has three larval stages each with two forms, praniza and zuphea (Hadfield *et al.*, 2009).

The Praniza is the only parasitic hematophagous gnathid larval stage, sucking host's blood to full its gut, then leaves to develop into free-living benthic forms and molts to become an adult (Kabata, 1996; Diniz *et al.*, 2008). Grutter (1996) mentioned that praniza mainly infect fish during the

night to avoid the cleaning activity of fish that in the present study praniza guts mainly were found half full, because the collections of host fishes were mainly achieved at night, so the parasites had no enough time to full their guts.

Alaş *et al.* (2009) investigated the infestations and hosts distribution of *Gnathia* sp. in Turkey. They showed that praniza have been reported in fish cultures of sparids, serranids and mugiliids in the Mediterranean coasts. In such circumstances, fish hosts are closely gathered in limited spaces, which turned to be easy targets to be infested by highly modified swimmer parasites. McKiernan *et al.* (2005) stated that there are two phases in each gnathiid juvenile stage, the first is praniza and the other, a non-feeding benthic dweller that molts into the next stage, known as "zuphea". Smit *et al.* (2003) found that *G. africana* has six larval stages, consisting of three unfed (zuphea) and three fed (praniza) stages.

Upon completion the feed, the larvae which appeared to have lost all apparent segmentation between somite five and seven during feeding is referred to as praniza (Hadfield *et al.*, 2009). According to Cohen & Poore (1994) female praniza larva has its pereonites 4-6 being fused and inflated. In the present study, pereonite 4 overlaps pereonite 5 and pereonites 6 and 7 are invisible. Smit & Davies (2004) recorded 10 genera of Gnathiidae and about 172 species, *Gnathia* was the major genus.

The present records of praniza indicate its first occurrence in fishes of Iraq. Bayoumy *et al.* (2013) recorded praniza from the grouper *Epinephelus tauvina* in the Saudi coasts of Araban Gulf, so all the remaining hosts in this study represent new hosts record. The description of praniza depends on specimens

that taken from Arabian carpet shark (*C. arabicum*), because it had the high prevalence value and the mean intensity of infection. This shark, is a coral reefs and other shallow coastal habitats dweller (Carpenter *et al.*, 1997). Jassim (2013) mentioned the prevalence of infection in sparid hosts (*A. arabicus* or *A. sheim*) was 21.9% and the mean intensity of infections was 1.4, while in this study, the sparid fish, *A. arabicus* had 0.6% prevalence and 1 mean intensity. Diniz *et al.* (2008) gave the prevalence and mean intensity of infection for five different fish hosts, that were 9.1-33.8 and 1.0- 19.6, respectively.

Dr. Jean-Paul Trilles confirmed the identification of this parasite, and he advised us to draw it not in details and measure its total length only. Moreover, many specimens were sent to Dr. G. Boxshall of the BMNH for deposition, who confirmed receiving of the specimens, but without museum deposition's number since the materials represented larval stages only.

Conclusions

Results indicated the first occurrence of the praniza gnathid larvae from different elasmobranchs and teleosts of the Arabian Gulf at Iraqi waters. All infected fishes were considered as new hosts record in the region.

Conflict of interest

The authors declared that they have no conflict of interest.

Ethical approval

All applicable national and international guidelines for the care and use of animals were followed.

Orchid

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تطفل يرقات متشابهة الأقدام (*Isopoda: Gnathia* spp.) *Praniza* على قرش الخيزران العربي *Chiloscyllium arabicum* مع ملاحظات حول ظهورها على بعض الأسماك البحرية العراقية

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المستخلص: سجلت يرقات الجنس *Gnathia* المسماة *Praniza* من غلاصم 18 نوعا من أسماك المياه البحرية الساحلية العراقية للخليج العربي. مثلت المضيفات ثمانية أنواع من الأسماك الغضروفية و10 أنواع من الأسماك كاملة التعظم الحديثة Teleostei. تعود الأسماك الغضروفية لأربع عوائل مختلفة، حيث سجلت أعلى نسبة إصابة بينها (100%) من القوبع *Pastinachus sephen*، بينما كانت أدنى نسبة إصابة (25%) في القوبع *Gymnura poecilura*. تنتمي الأسماك العظمية المسجلة في الدراسة الحالية لسبع عوائل، حيث سجلت أعلى نسبة إصابة بيرقات *Praniza* (50%) في سمكة الشانك *Rabdosargus haffara* بينما كانت أدنى نسبة إصابة (1.6%) في سمكة الصبور *Tenualosa ilisha*، كانت أعلى شدة إصابة مسجلة (12.3) من القرش *Chiloscyllium arabicum* بينما كانت أدنى شدة إصابة (1) وسجلت من كل أنواع الأسماك العظمية قيد الدراسة. تمتلك يرقات *Praniza* المسجلة من أسماك القرش *C. arabicum* جسما طويلا والرأس محدب يضيق باتجاه الأمام وتكون حافة الجبهة الأمامية مقطوعة. العيون المركبة كبيرة والذنب Pleotelson مثلث الشكل. تمتلك الأقدام الذنبية أفراعا داخلية لا تمتد أبعد من نهاية الحافة الخلفية للذنب.

كلمات مفتاحية: أسماك غضروفية، أسماك عظمية، متشابهة الأقدام، يرقات *Praniza*، الخليج العربي، العراق.