□ Parasitology □ Research note

# Parasitic Helminths Obtained from the Alimentary Tracts of Wild Birds in the Chubu District, Japan

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（2011 年 9 月 21 日受領，2012 年 5 月 16 日採択）

## 中部地方の野生鳥類の消化管内から得られた寄生蠕虫類

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**ABSTRACT**. From 1999 to 2007, one trematode, one cestode, 23 nematode, and two acanthocephalan species were collected from the alimentary tracts of 21 wild birds belonging to 19 species from Chubu District, Japan. Eight

nematode and two acanthocephalan species were identified to the species level. *Porrocaecum ensicaudatum* was collected from White's thrushes (*Zoothera dauma*) in Kanagawa and Komatsu Cities, which is a new host record for this helminth species, and the first record of this parasite in Japan. Two other new host records were also obtained: *Thominx tenuissima* from a Sunda scops owl (*Otus lempiji*) in Komatsu City, and *Dispharynx emberizae* from a White's thrush in Kanazawa City.

Key words：Chubu District, parasitic helminths, wild birds

*Jpn. J. Zoo. Wildl. Med.* 18(1)：33-39, 2013

Many researchers have investigated the parasitic helminth fauna of Japanese birds [1]; however, the present knowledge on the fauna is incomplete due to the high diversity of host animals and associated helminths. Here, the authors conducted an investigation of the parasitic helminths found in the alimentary tracts of wild birds from the Chubu District, which is central area in Honshu, Japan and characterized with many high mountains and diverse biota, including many endangered species, such as mountain hawk eagle (*Spizaetus nipalensis*). A large number of parasitic helminths were collected mainly through necropsy of carcasses, and the results of this investigation are reported in this article.

In total, 21 birds, belonging to 19 species from eight orders, were investigated during the course of this study spanning from 1999 to 2007. The birds included the following: (1) three Anseriformes: two mallards (*Anas platyrhynchos*), one spot-billed duck (*A. poecilorhyncha*), and one tufted duck (*Aythya fuligula*); (2) one Charadriiformes: one common snipe (*Gallinago gallinago*); (3) one Ciconiiformes: one grey heron (Ardea cinerea) (4) one Coraciiformes: one hoopoe (*Upupa epops*); (5) one Gruiformes: one moorhen (*Gallinula chloropus*); (6) three Falconiformes: one eastern buzzard (*Buteo japonicus*), one black kite (*Milvus migrans*), and one mountain hawk eagle; (7) eight Passeriformes: one brown-eared bulbul (*Hypsipetes amaurotis*), one gray starling (*Sturnus cineraceus*), one Japanese robin (*Erithacus akahige*), one pale-legged willow warbler (*Phylloscopus tenellipes*), one pale thrush (*Turdus pallidus*), one wren (*Troglodytes troglodytes*), and two White's thrushes (*Zoothera dauma*); and (8) two Strigiformes: one Sunda scops owl (*Otus lempiji*) and one Ural owl (*Strix uralensis*). Most of the birds were dead from road kill or unknown causes in the wild. The Ural owl was rescued and reared in the COE (Center Of Excellence) Wildlife Rescue Center, Gifu University, and treated with antihelminthics, after which the worm bodies were discharged in the feces and recovered for analysis. Basic information about the birds (sex, locality, and date) from which parasitic helminths were obtained is shown in Table 1.

The alimentary tracts of all dead birds (excluding the Ural owl) were removed from their carcasses, and then frozen or fixed and stored in 70% ethanol until dissection under a binocular microscope. The collected platyhelminths were softened in 10% acetic acid, flattened on glass slides, and stained with 50% aceto-carmine. Nematodes and acanthocephalans that were detected were fixed or re-fixed in 70% ethanol, and cleared in lacto-phenol or in 5% glycerin-ethanol. These helminths were observed under the microscope, and identified to the order, genus, or species level, except for five nematode cases (Table 1).

All the helminths obtained during this study are shown in Table 1. In total, one trematode, one cestode, 23 nematode, and two acanthocephalan species were obtained from 13 (out of 19) species of host birds. However, just eight species of nematode and two species of acanthocephalans were identified to the species level. Some worm specimens were fragmented and/or lacked males; hence, precise identification was not possible. General measurements of collected male and female nematodes are shown in Tables 2 and 3, respectively. Species of special interest are described below. All measurements are presented in millimeters. Representative specimens were donated to the Meguro Parasitological Museum, Tokyo (Accession Number: MPM Collection No. 20826-20830). Their morphological descriptions and remarks are provided below.

Only one immature worm with 35 collar spines was obtained of the *Echinostoma* sp. Eleven species of this genus have ever known as with identical number of collar spines [2], but none of them have apparently never obtained in Japan [1]. Other characteristics could not be compared to these species due to the specimen being immature.

In this study, three species of the genus *Porrocaecum*, belonging to the family Anisakidae and order Ascaridida, were detected. *P. reticulatum* is distinguished from other species in this genus by the presence of a gubernaculum [3]. Female worms have well-developed labia of 0.26-0.28 in length, and interlabia of 0.16-0.20 in length. The gubernaculum was 0.26 in length and 0.063 in width. To date, this species has been collected from at least nine species of Ardeidae [3], including a grey heron, which was the host species in the current study. In Japan, this nematode species has been collected from the intermediate egret in Gifu and Mie Prefectures [4], the night heron (*Nycticorax nycticorax*) in Hokkaido Prefecture [5], Kanto District [6], and unknown prefecture in Japan [7], and the Ardeidae gen. sp(p). in Iwate Prefecture [8]. *P. ensicaudatum* was collected from a White's thrush. It is distinguished from other members of the genus *Porrocaecum* by the absence of the gubernaculum and cervical alae, and the presence of a short intestinal cecum [3]. Hosts of this nematode species include many passerine species in various genera, such as *Corvus, Ixoreus, Quiscalus, Sturnus and Turdus* in the Northern Hemisphere [3, 9-12]. The present study provides the first report of this species in Japan, and presents a new host record of the White's thrush. In addition to the general measurements (Table 2, 3), its labia and interlabia

**Table 1** Parasitic helminths obtained from birds from Hokuriku District, Japan

| Parasitic helminths | | | Hosts | | | Site | Locality** | Date |
|---|---|---|---|---|---|---|---|---|
| Groups | Species | Number of worms* | Order | Species | Sex* | | | |
| Trematodes | *Echinostoma* sp. | 1 (I 1) | Anseriformes | *Anas platyrhynchos* | M | Intestine | Marunouchi, Komatsu City (I) | Mar. 10, 2006 |
| Cestodes | Cyclophyllidea fam. gen. sp. | many (I) | Anseriformes | *Anas platyrhynchos* | M | Intestine | Marunouchi, Komatsu City (I) | Mar. 10, 2006 |
| Nematodes | *Porrocaecum reticulatum* | 7 (M 1, IF 4, U 2) | Ciconiiformes | *Ardea cinerea* | M | Intestine | Komatsu City (I) | Feb. 23, 2004 |
| | *P. ensicaudatum* | 5 (M 1, F 4) | Passeriformes | *Zoothera dauma* | U | Intestine | Hirosaka, Kanazawa City (I) | Feb. 16, 1999 |
| | *P. ensicaudatum* | 4 (M 3, F 1) | Passeriformes | *Zoothera dauma* | U | Intestine | Wakasugi, Komatsu City (I) | Oct. 4, 2005 |
| | *P. anguisticolle* | 1 (M 1) | Falconiformes | *Milvus migrans* | M | Intestine | Yoshitake, Komatsu City (I) | Feb. 8, 2004 |
| | Ascaroidea fam. gen. sp. | 1 (U 1) | Passeriformes | *Turdus dauma* | U | Gizzard | Hirosaka, Kanazawa City (I) | Feb. 16, 1999 |
| | *Strongyloides avium* | 1 (F 1) | Anseriformes | *Anas poecilorhyncha* | U | Gizzard | Kureha, Toyama City (T) | Oct. 3, 2002 |
| | *Amidostomum acutum* | 6 (M 3, F 2, U 1) | Anseriformes | *Aythya fuligula* | M | Gizzard | Ukiyanagi, Komatsu City (I) | Feb. 6, 2004 |
| | *Amidostomum* sp. | 1 (M 1) | Anseriformes | *Anas poecilorhyncha* | U | Gizzard | Kureha, Toyama City (T) | Oct. 3, 2002 |
| | *Thominx tenuissima* | 8 (M 5, F 3) | Strigiformes | *Otus lempiji* | U | Intestine and colon | Hasadani, Komatsu City (I) | Feb. 19, 2004 |
| | Capillariidae gen. sp. 1 | 1 (F 1) | Falconiformes | *Milvus migrans* | M | Intestine | Yoshitake, Komatsu City (I) | Feb. 8, 2004 |
| | Capillariidae gen. sp. 2 | 1 (M 1) | Anseriformes | *Anas poecilorhyncha* | U | Gizzard | Kureha, Toyama City (T) | Oct. 3, 2002 |
| | Capillariidae gen. sp. 3 | 1 (M 1) | Passeriformes | *Turdus pallidus* | U | Intestine | Kosurido, Nyuzen (T) | Nov. 14, 2004 |
| | *Synhimantus nipponensis* | 5 (M 1, F 4) | Falconiformes | *Spizaetus nipalensis* | U | Gizzard | Shizuoka Prefecture*** | Feb. 8, 2006 |
| | *Synhimantus* sp. | 2 (F 2) | Strigiformes | *Strix uralensis* | U | Unknown (feces) | Mizunami City (G) | Feb. 19, 2004 |
| | *Dispharynx emberizae* | 6 (M 4, F 2) | Passeriformes | *Zoothera dauma* | U | Gizzard | Hirosaka, Kanazawa City (I) | Feb. 16, 1999 |
| | *Dispharynx* sp. | 4 (F 4) | Strigiformes | *Strix uralensis* | U | Unknown*** | Mizunami City (G) | Feb. 19, 2004 |
| | *Tetrameres* sp. | 1 (M 1) | Anseriformes | *Aythya fuligula* | M | Gizzard | Ukiyanagi, Komatsu City (I) | Feb. 6, 2004 |
| | Spirurida fam. gen. sp. 1 | 1 (U 1) | Anseriformes | *Anas poecilorhyncha* | U | Gizzard | Kureha, Toyama City (T) | Oct. 3, 2002 |
| | Spirurida fam. gen. sp. 2 | 3 (M 3) | Falconiformes | *Buteo buteo* | M | Gizzard | Takuei,Komatsu City (I) | Feb. 9, 2007 |
| | unknown nematodes Ⅰ | 2 (U 2) | Strigiformes | *Otus lempiji* | U | Intestine | Hasadani, Komatsu City (I) | Feb. 19, 2004 |
| | unknown nematodes Ⅱ | 1 (U 1) | Passeriformes | *Turdus dauma* | U | Gizzard | Hirosaka, Kanazawa City (I) | Feb. 16, 1999 |
| | unknown nematodes Ⅲ | 1 (U 1) | Passeriformes | *Turdus dauma* | U | Gizzard | Hirosaka, Kanazawa City (I) | Feb. 16, 1999 |
| | unknown nematodes Ⅳ | 1 (U 1) | Passeriformes | *Turdus dauma* | U | Gizzard | Wakasugi, Komatsu City (I) | Oct. 4, 2005 |
| | unknown nematodes Ⅴ | 2 (U 1) | Coraciiformes | *Upupa epops* | U | Intestine | Hegura-jima Island, Wajima City (I) | May 4, 2006 |
| Acanthocephalans | *Centrorhynchus magnus* | 3 (M 1, IU 2) | Falconiformes | *Milvus migrans* | M | Intestine | Yoshitake, Komatsu City (I) | Feb. 8, 2004 |
| | *Centrorhynchus trudi* | 4 (M 2, F 2) | Passeriformes | *Turdus pallidus* | U | Intestine | Kosurido, Nyuzen (T) | Nov. 14, 2004 |

(* M：male, F：female, U：unknown, I：immature; ** I：Ishikawa Prefecture, T：Toyama Prefecture, G：Gifu Prefecture, ***：precise locality is concealed)

**Table 2** General measurements (mm) of male parasitic nematodes obtained from wild birds in Chubu District, Japan

| Species | n*1 | Body length | Maximum width | Esophageal length | Cordon length | Spicule length |
|---|---|---|---|---|---|---|
| *Porrocaecum reticulatum* | 1 | 60.0 | 1.50 | not measured | — | 0.79 |
| *P. ensicaudatum* | 4 | 33.0-50.0 | 0.61-0.75 | 3.00-3.20 | — | 0.55-0.74 |
| *P. anguisticolle* | 1 | 55.0 | 0.75 | not measured | — | 1.13 |
| *Amidostomum acutum* | 3 | 8.0-8.8 | 0.09 | 0.54-0.64 | — | 0.12 |
| *Thominx tenuissima* | 5 | 6.6-10.5 | 0.04-0.06 | 2.60-3.20 | — | 0.55-0.76 |
| *Synhimantus nipponensis* | 1 | 10.4 | not measured | not measured | 0.71 | 0.99 [R], 0.20 [L]*2 |
| *Dispharynx emberizae* | 4 | 5.5-7.1 | 0.26-0.29 | not measured | 0.40-0.46 | 0.09-0.18 [R], 0.48-0.55 [L]*2 |

*1 : number of worms measured, *2 : [R]; right, [L]; left.

were 0.12-0.22 and 0.06-0.12 long in males, and 0.24-0.26 and 0.13-0.16 long in females, and nerve ring locates 0.7-1.0 and 0.7-1.1 from oral end, and tail lengths are 0.29-0.34 and 0.58-0.80, in males and females, respectively, in our study. These measurements are identical to those in McNeill and Anderson [10]. *P. angusticolle* is identified by the absence of the gubernaculum and presence of cervical alae, in addition to certain characteristics on the oral lips [3]. The labia and interlabia were 0.22 and 0.08-0.09 long in males. This species mainly parasitizes Falconiformes [4, 6, 12], and was collected from an eastern marsh harrier (*Circus spilonotus*) in Aichi Prefecture [4], a black kite in Kyoto Prefecture [4] and Shiga Prefecture [6], Falconidae and/or Strigidae gen. sp(p). in Iwate Prefecture [8]. and an intermediate egret in Kanto District [7].

A fragmented body of a female worm, *Strongyloides avium*, belonging to the family Strongyloididae and order Rhabditida, was obtained during this study. This species has been collected from various birds around the world [13-15], including the present host species, the spot-billed duck. However, in Japan to date, this species has only been obtained from a water rail (*Rallus aquaticus*) in Hokkaido [15]. The present case is the first recovery of this nematode species in Honshu.

*Amidostomum acutum* has been collected from many waterfowl (mainly Anseriformes) in the Northern Hemisphere [3, 16-22], including Hokkaido [23, 24]. However, the finding of this species in the present study is the first confirmed case in Honshu, Japan. The gubernaculum was 0.06-0.07 long. Two males of *Amidostomum* sp. were possibly identified as individuals of *A. acutum* or *A. petrovi* [3, 24] (treated as *A. orientale* in Barus et al. [3], also see Lomakin [21] and Kavetska [22]), based on the length of the spicules (0.13, 0.14) and gubernacula (0.08, 0.09). However, the anterior end of both specimens was lost, preventing identification to the species level [3, 21, 22]. The related species, *A. anseris* and *A. fulicae* (recently treated as *Quasiamidostomum fulicae* [25]), were collected from three and one Anseriforme species, respectively, in Hokkaido Prefecture [5, 26]. Nakamura et al. [27] collected *Amidostomum* sp. from a tundra swan (*Cygnus columbianus*) in Niigata Prefecture, which is near the Ishikawa and Toyama Prefectures, where *A. acutum* and *Amidostomum* sp. were collected, respectively. The nematodes of this genus are known to cause serious intestinal disorders in both

**Table 3** General measurements (mm) of female parasitic nematodes obtained from wild birds in Chubu District, Japan

| Species | n*1 | Body length | Maximum body width | Esophageal length | Cordon length | Egg length | Egg width |
|---|---|---|---|---|---|---|---|
| *Porrocaecum reticulatum* | 4 | 76.7-92.6 | 1.7-2.1 | not measured | — | not measured | not measured |
| *P. ensicaudatum* | 5 | 60.0-70.0 | 0.94-1.00 | 4.20-4.70 | — | 0.080-0.094 | 0.056-0.064 |
| *Amidostomum acutum* | 2 | 8.0*2 | 0.08-0.10 | 0.50 | — | 0.076 | 0.049 |
| *Thominx tenuissima* | 3 | 14.0*2 | 0.08-0.09 | not measured | — | 0.059-0.062 | 0.027-0.031 |
| Capillariidae sp. 1 | 1 | 20.0 | 0.10 | not measured | — | 0.052-0.060 | 0.028-0.032 |
| *Synhimantus nipponensis* | 4 | 12.7-14.0 | not measured | not measured | 0.60-0.72 | not measured | not measured |
| *Synhimantus* sp. | 2 | 17.0, 19.0 | 0.55, 0.56 | 0.84*2,*3 | 0.56, 0.70 | 0.040-0.044 | 0.020-0.024 |
| *Dispharynx emberizae* | 2 | 5.3, 5.5 | 0.30, 0.50 | not measured | 0.29, 0.55 | 0.032-0.040 | 0.014-0.024 |
| *Dispharynx* sp. | 4 | 20.0-21.0 | 0.54-.056 | 0.80-0.90*3 | 0.66-0.71 | 0.036-0.040 | 0.016-0.020 |

*1 : number of worms measured, *2 : only one worm was measureable, *3 : muscular portion only

domestic and wild waterfowl [28].

*Thominx tenuissima* was collected from the Sunda scops owl. This nematode species was previously obtained from an Ural owl in Mie Prefecture [4] and Falconidae and/or Strigidae gen. sp(p). in Iwate Prefecture [8]. Hence, the present case is a new host record for this nematode species. It was difficult to identify the other three capillariid nematodes obtained during this study (Capillariidae gen. sp. 1, 2 and 3, Table 1) to the genus level, due to the samples being fragments and/or the lack of males.

Three species of Acuariidae, belonging to the order Spirurida (*Synhimantus nipponensis* and *Dispharynx emberizae*), were obtained in this study. Characteristic cordons on their head portions confirmed that they belong to this family (Fig. 1). *S. nipponensis* was previously only reported parasitizing a brown hawk owl (*Ninox scutulata*) in Taiwan and a mountain hawk eagle in Wakayama Prefecture [4]. Hence, the present case is the second report of this nematode species in Japan, and the first report of its presence in the central part of this country. *D. emberizae* has cervical papillae at 0.40-0.42 and 0.46 from oral end in males and females, respectively. The pharynx length of this species was 0.10-0.12 in males, and 0.08-0.10 in females. To date, this species has only been obtained from a black-faced bunting (*Emberiza spodocephala*) in the Shizuoka Prefecture[7]. Hence, the present case of this species collected from a White's thrush is a new host record of this host species. Furthermore, *Synhimantus* sp. and *Dispharynx* sp. were collected from an Ural owl; however, all collected worms were females, preventing identification to the species level. These acuariid nematodes are known to cause ulceration, hemorrhage, and proliferative inflammatory nodular lesions on the mucosal surface of the gastrointestinal tract [28].

Two species of acanthocephalans, belonging to the genus *Centrorhynchus*, were collected. One mature male worm of *C. magnus* was 20.00 long, with a proboscis of 0.28 in length and 0.37 in width, in addition to a proboscis sheath of 1.64 in length. More than 20 hooks, 0.056 in length, were arranged in 36 longitudinal rows on the proboscis. The anterior and posterior testes were 0.78 and 0.90 in length, respectively. This species has been collected from a black kite and a common kestrel (*Falco tinnunculus*) in Shizuoka Prefecture [29, 30], a black kite in Kyoto Prefecture and an eastern buzzard in Tokushima Prefecture [31]. Further, Yamaguti [31] and Amin [32] treated another avian acanthocephala, *Centrorhynchus microrchis,* described in Fukui [29] as a synonym of *C. magnus. C. microrchis* has ever been reported from night herons in Shizuoka and Kyoto Prefecture [29, 33], a black kite from Shiga Prefecture [33] and a hawk (precise species is unknown) in Shizuoka Prefecture [29]. Two mature male worms of *C. turdi* were 5.2 and 5.7 long, with proboscis lengths of 0.24 and 0.28, proboscis widths of 0.32, and proboscis sheaths of 0.68 and 0.76 in length and 0.28 in width. Eleven and 12 hooks of 0.036 and 0.040 length were arranged in each of 20 and 26 longitudinal rows on the proboscis (Fig. 2). The anterior testes were 0.72 long and 0.47 wide (only one worm was measurable), while the posterior testes were 0.66 and 0.71 long and 46.4 wide (both had the same width) in each species. Two mature females of this species were 9.8 and 10.4 long each, with a proboscis length of 0.34 and 0.38, a proboscis width of 0.36, and a proboscis sheath length of 0.80 and 0.82 and width of 0.24 and 0.32, respectively. Eleven and 12 hooks, both 0.040 long, were arranged in each of 26 longitudinal rows on the proboscis. Eggs were 0.051 and 0.054 long, and 0.016 and 0.018 wide, respectively. This species has been previously collected from ten species of passerines, including the present host species, the pale thrush, from many prefectures including the Aomori, Kanagawa, Aichi, Mie, and Kyoto [1, 30, 31, 34, 35]. Nakamura et al. [27] obtained some acanthocephalans of this genus from a night heron, a cattle egret, a grey heron, and

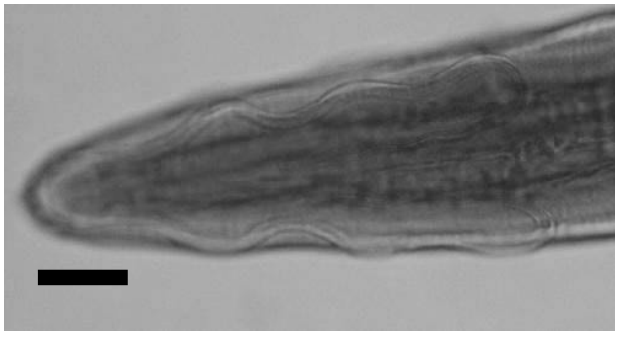

**Fig. 1** Anterior end of *Dispharynx emberizae* with a well-developed cordon (Bar: 0.1 mm)

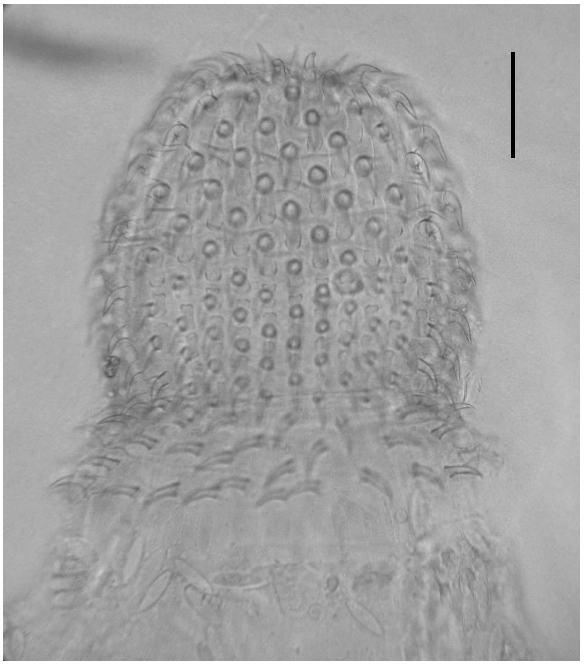

**Fig. 2** Proboscis of *Centrorhynchus trud*i with hooks (Bar: 0.1 mm)

a great egret (*Egretta alba*) in the Niigata Prefecture, which is near the Ishikawa and Toyama Prefectures where the present two species of this genus were obtained.

The authors thank Dr. Takashi Iwaki from the Meguro Parasitological Museum for providing information about genus *Amidostomum, C. magnus and C. trudi.* The authors also acknowledge Dr. Shin Watanabe from the Graduate School of Science and Engineering, University of Toyama, for his kind advice and helpful support.

## 要　　約

1999 年から 2007 年にかけて，中部地方産の野鳥 19 種 21 個体から吸虫，条虫各 1 種，線虫 23 種，鉤頭虫 2 種を得た．8 種の線虫と 2 種の鉤頭虫を種まで同定した。トラツグミから得られた *Porrocaecum ensicaudatum* は新宿主報告および国内初報告となった。オオコノハズクからの *Thominx tenuissima*，トラツグミの *Dispharynx emberizae* も新宿主報告となった。

**キーワード**：寄生蠕虫，中部地方，野生鳥類

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