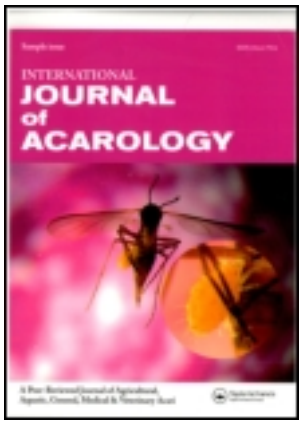

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Two new species of the genus Notophthiracarus (Acari: Oribatida: Phthiracaridae) from China

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Two new species of the genus *Notophthiracarus* (Acari: Oribatida: Phthiracaridae) from China

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The genus *Notophthiracarus* (Acari: Oribatida: Phthiracaridae) was represented in China by one species prior to this work. In this paper, two new species of *Notophthiracarus* are described from China: *Notophthiracarus fusiformis* **sp. nov.** collected from Jiangsu Province and *Notophthiracarus protrusus* **sp. nov.** collected from Hainan Province. A key to all known species of *Notophthiracarus* in China is provided.

http://zoobank.org/urn:lsid:zoobank.org:pub:52E20094-76AC-40D1-BD75-DA27A6F81FCC

Keywords: soil mites; Oribatida; Phthiracaridae; *Notophthiracarus*; new species; China

Introduction

Ramsay (1966) proposed the genus *Notophthiracarus* with *Phthiracarus maculatus* Trägårdh, 1931 as type species. This genus is characterized as having notogaster with 15 pairs of setae, rarely neotrichous; nine pairs of genital setae arranged in a single row, distance between g_6 and g_9 longer than that between g_5 and g_4 or g_3 and g_4; five pairs of setae on anoadanal plates present, setae ad_1 and ad_2 far away from paraxial margin, normal, minute or vestigial; setae v' on femora I (if present) short; setae l' on genua IV always present; setae ft'' on tarsi I normal; setae d on tibiae IV short, coupled with solenidions (Niedbała 2000). It is a relatively large genus of the family Phthiracaridae, with wide distribution except Holarctic Region. Up till now, more than 140 species was included in this genus (Subías 2012). Prior to this work, only one species, *Notophthiracarus tohivea* Niedbała, 1998, has ever been recorded from Taiwan in China (Niedbala 2007; Chen et al. 2010). While studying the specimens of ptyctimous mites collected from China, we identified two new species of *Notophthiracarus*. The purpose of this paper is to give detailed descriptions of the two new species and a key to all known species of *Notophthiracarus* in China.

Methods

Specimens were mounted in temporary cavity slides and were studied using a light microscope equipped with a drawing attachment. Terminology generally follows Niedbała (1992, 2000). The unit of measurement is micrometre (μm).

Descriptions of new species

Notophthiracarus fusiformis sp. nov.

(Figure 1)

Diagnosis

Surface of body punctate, except prodorsum weakly foveolate; median crista and lateral carinae absent; median sigillar field narrow, longer than lateral fields; posterior furrows absent; sensilli short and fusiform; interlamellar setae long and thick; lamellar setae minute; rostral setae spiniform and semi-erect; exobothridial setae short; distance between rostral setae narrow; notogastral setae thick and medium long, covered with small spines in distal half; vestigial setae f_1 posterior to setae h_1; three pairs of lyrifissures present; $h < h - h$; genital setae with formula: 6: 3; setae d on femora I far away from distal end of article, inserted at level of setae v'.

Description

Measurements. Holotype: Prodorsum: length 320, width 217, height 100, setae: *ss* 45, *ro* 55, *le* 15, *in* 160, *ex* 25; notogaster: length 590, width 380, height 350; setae: c_1 135, c_2 120, c_3 100, c_p 85, d_1 115, d_2 105, e_1 110, e_2 100, h_1 135, h_2 120, h_3 70, ps_1 130, ps_2 120, ps_3 100, ps_4 95; genitoaggenital plate 127×125, anoadanal plate 115×225. Paratypes: Prodorsum: length 290–360, width 210–260, height 100–115; notogaster: length 535–680, width 385–460, height 375–430.

Integument. Colour grey-brown. Surface of body punctate, except prodorsum weakly foveolate.

Prodorsum (Figure 1A–E). Median crista and lateral carinae absent; sigillar fields distinct, median field narrow, longer than lateral fields; posterior furrows absent; sensilli (*ss*) short, fusiform, covered with minute spines distally; interlamellar setae (*in*) long and thick, covered with minute spines in distal half; lamellar setae (*le*) minute; rostral setae (*ro*) thin, rough, spiniform and semi-erect; exobothridial setae (*ex*) short and fine; comparative length: *in* > *ro* > *ss* > *ex* > *le*; mutual distance of setae: *in–in*/*ro–ro* ≈ 4.1.

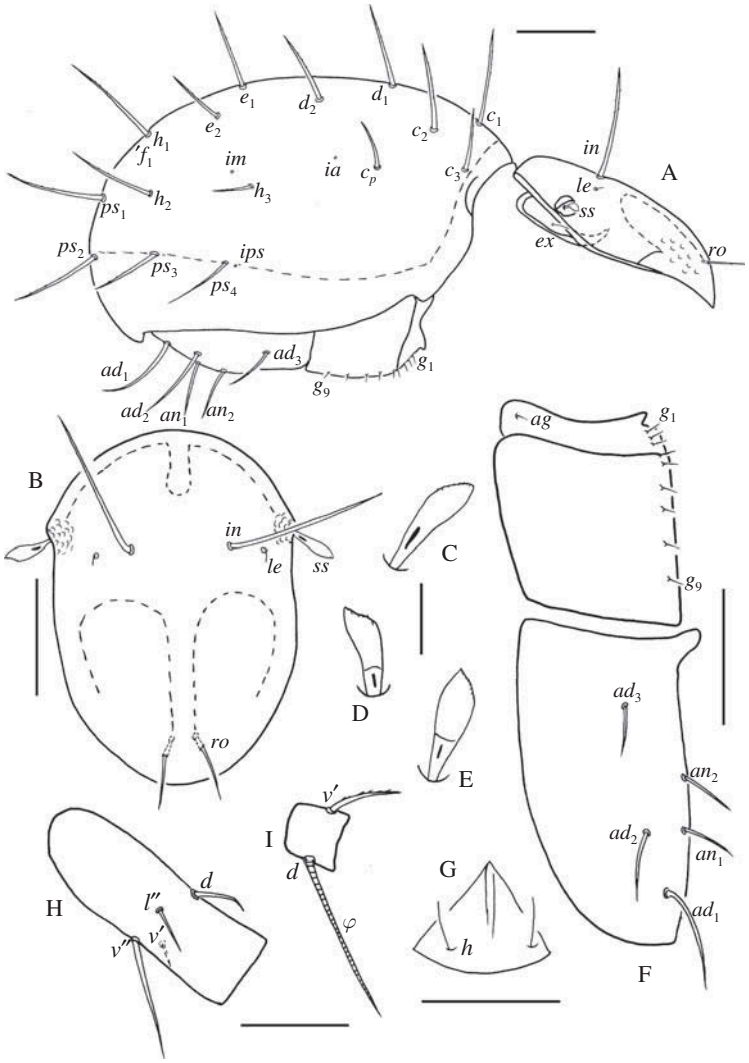

Figure 1. *Notophthiracarus fusiformis* **sp. nov.** (A) lateral view of body (legs removed); (B). prodorsum, dorsal view; (C) sensillus of holotype, dorsal view; (D–E) sensilli of paratypes, dorsal view; (F) right side of ventral plate; (G) mentum of infracapitulum; (H) femur of leg I; (I) tibia of leg IV. Scale bars: 100 μm (A, B, F, G), 25 μm (C, D, E), 50 μm (H, I).

Notogaster (Figure 1A). 15 pairs of setae distributed as in Figure 1A, medium long ($c_1/c_1 - d_1 \approx 1$), thick, pointed distally, covered with small spines in distal half, setae c_1 and h_1 longest, setae h_3 shortest; setae c_2 far away from anterior border, and setae c_3 near border; vestigial setae f_1 posterior to setae h_1; three pairs of lyrifissures *ia*, *im* and *ips* distributed as depicted in Figure 1A.

Ventral region (Figure 1A, F–G). Setae *h* of mentum shorter than distance between them. Nine pairs of genital setae (*g*) present with formula: 6: 3; anoadanal plates each with five setae (*ad* and *an*); setae ad_1 and ad_2 rough, longer and slightly thicker than other setae; comparative length: $ad_1 > ad_2 > ad_3 = an_1 = an_2$.

Legs (Figure 1H–I). Setal counts for leg segments (without tarsi): I: 1-4-2(2)-4(1); II: 1-3-4(1)-3(1), III: 2-2-1(1)-2(1), IV: 2-1-1-2(1); setae *d* on femora I far away from distal end of article, inserted at level of setae *v*′; setae *a*″ on tarsi I and tarsi II curved distally; setae *ft*″ on tarsi II straight; setae *s* and *pv*′ on tarsi IV present; setae *s* on tarsi I and II absent.

Material examined

Holotype: adult (NIGA, in alcohol), China: Jiangsu Province, Lianyungang City, Liandao Island (34°45′28.64″N, 119°27′37.43″E), from litter, 14 February 2013, leg. Dong Liu. Paratypes: four adults (NIGA, in alcohol), same data as holotype.

Type deposition

All types are deposited in the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun (NIGA).

Etymology

The new specific name "*fusiformis*" is from Latin, and refers to the shape of sensillus.

Remark

This new species is similar to the species *Notophthiracarus ignobilis* Niedbala, 2000 in the presence of similar shape of sensilli, interlamellar setae long and thick, lamellar setae minute, lateral carinae absent, and vestigial setae f_1 posterior to setae h_1, but can be easily distinguished from the latter species by the following ten characters (a versus b): in *N. fusiformis* **sp. nov.**, (1a) posterior furrows absent; (2a) exobothridial setae present; (3a) distance between rostral setae shorter, $in–in/ro–ro \approx 4.1$; (4a) interlamellar and notogastral setae much longer (in 160, c_1 135, $c_1/c_1 - d_1 \approx 1$); (5a) setae ps_4 situated anterior to the insertion level of ad_2; (6a) three pairs of lyrifissures *ia*, *im* and *ips* present; (7a) setae *h* of mentum shorter than distance between them; (8a) genital setae with formula: 6: 3; (9a) setae ad_2 inserted at the level of setae an_1; (10a) $ad_1 > ad_2 > ad_3 = an_1 = an_2$; in *N. ignobilis*, (1b) posterior furrows present; (2b) exobothridial setae absent; (3b) distance between rostral setae longer, $in–in/ro–ro \approx 2.8$; (4b) interlamellar and notogastral setae much shorter (in 78, c_1 76, $c_1/c_1 - d_1 = 0.58$); (5b) setae ps_4 situated at same level of ad_2; (6b) only two pairs of lyrifissures *ia* and *im* present; (7b) setae *h* of mentum longer than distance between them; (8b) genital setae with formula: 7: 2; (9b) setae ad_2 inserted between the level of setae an_1 and an_2; (10b) $ad_1 > an_1 > ad_2 > an_2 > ad_3$.

Notophthiracarus protrusus sp. nov
(Figure 2)

Diagnosis

Surface of body covered with large foveolae; median crista on prodorsum and crista-like structure on notogaster present; median sigillar field narrow, longer than lateral fields; lateral carinae very short; posterior furrows present; sensilli long with narrow pedicel and knife-like head; interlamellar setae long, thick and procumbent; lamellar setae shorter, thin and procumbent; rostral setae spiniform and procumbent; exobothridial setae short and fine; anterodorsal part of notogaster strongly protrudent;

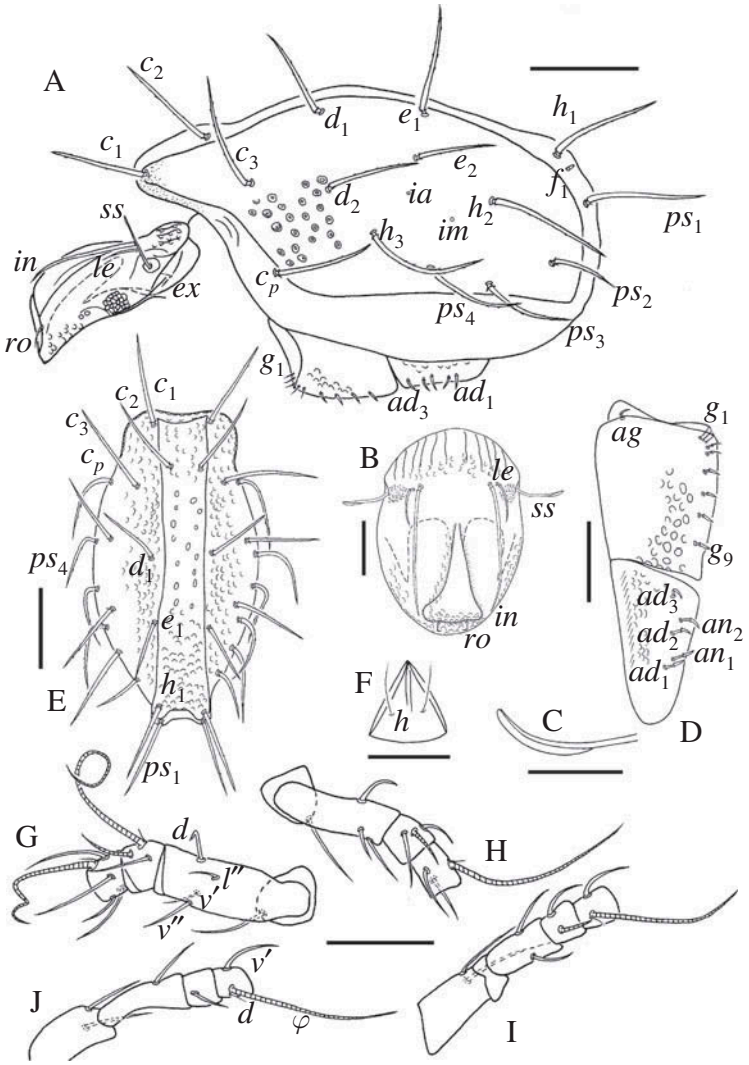

Figure 2. *Notophthiracarus protrusus* **sp. nov.** (A) lateral view of body (legs removed); (B) prodorsum, dorsal view; (C) sensillus, dorsal view; (D) right side of ventral plate; E, notogaster, dorsal view; F, mentum of infracapitulum; (G–J), trochanter, femur, genu and tibia: (G) leg I, (H) leg II, (I) leg III, (J) leg IV. Scale bars: 200 μm (A, E–J), 100 μm (B, D), 50 μm (C).

15 pairs of long notogastral setae present; setae c_2, h_1 and ps_1 inserted on crista-like structure; vestigial setae f_1 posterior to setae h_1; two pairs of lyrifissures present; $h > h$–h; genital setae with formula: 6: 3; all genital setae short and similar in length, setae $g_{6–9}$ much thicker than $g_{1–5}$; anoadanal setae similar in shape and length as setae $g_{6–9}$, setae ad_1 very close to an_1; setae d on femora I far away from distal end of article, inserted at level of setae v'.

Description

Measurements. Holotype: Prodorsum: length 370, width 235, height 185, setae: *ss* 105, *ro* 40, *le* 70, *in* 220, *ex* 12.5; notogaster: length 840, width 405, height 485; setae: c_1 195, c_2 195, c_3 250, c_p 175, d_1 170, d_2 195, e_1 195, e_2 185, h_1 195, h_2 210, h_3 230, ps_1 195, ps_2 140, ps_3 178, ps_4 170; genitoaggenital plate 167×190, anoadanal plate 105×205. Paratype: Prodorsum: length 290, width 190, height 105; notogaster: length 660, width 320, height 390.

Integument. Colour grey-brown. Surface of body covered with large foveolae.

Prodorsum (Figure 2A–C). One strong median crista present, like a crown in lateral view and triangular shape in dorsal view; lateral carinae very short, far away from sinus; posterior furrows present; sigillar fields distinct, median field narrow, longer than lateral fields; sensilli (*ss*) long with narrow pedicel and knife-like head; interlamellar setae (*in*) thick, rough, procumbent and very long, nearly reach the insertion level of rostral setae (*ro*); lamellar setae (*le*) thinner, rough and procumbent; rostral setae spiniform, thin, short, rough and procumbent; exobothridial setae (*ex*) short and fine; comparative length: *in* > *ss* > *le* > *ro* > *ex*; mutual distance of setae: *in*–*in*/*ro*–*ro* ≈ 2.5.

Notogaster (Figure 2A, E). One long and strong crista-like structure present, from anterior to posterior; anterodorsal part of notogaster strongly protrudent to form a hook-like projection covering posterior part of prodorsum; 15 pairs of long ($c_1/c_1 - d_1 \approx 0.52$) notogastral setae distributed as in Figs. 2A and 2E, thicker than interlamellar setae, covered with small spines in distal half; setae c_3 longest, setae ps_2 and e_2 shortest; setae c_1 close to anterior border, setae c_2 far away from c_1 and c_3; setae c_2, h_1 and ps_1 inserted on crista-like structure; vestigial setae f_1 posterior to setae h_1; two pairs of lyrifissures *ia* and *im* present.

Ventral region (Figure 2A, D, F). Setae *h* of mentum much longer than distance between them. Nine pairs of genital setae (*g*) present with formula: 6: 3; all genital setae short and similar in length, setae $g_{6–9}$ much thicker than $g_{1–5}$; anoadanal plates each with five short and thick setae (*an* and *ad*), similar in shape and length as setae $g_{6–9}$.

Legs (Figure 2G–J). Setal counts for leg segments (without tarsi): I: 1-4-2(2)-5(1); II: 1-3-2(1)-3(1), III: 2-2-1(1)-2(1), IV: 2-1-1-2(1); setae *d* on femora I far away from distal end of article, inserted at level of setae v'; setae a'' on tarsi I and tarsi II curved distally; setae ft'' on tarsi II straight; setae *s* and pv' on tarsi IV present; setae *s* on tarsi I and II absent.

Material examined

Holotype: adult (NZMC, in alcohol, H9405L2b), China: Hainan Province, Jianfengling (18°41′48.4″N, 108°47′18.0″E), from litter, May, 1994, leg. Chong-Hui Liao. Paratype: one adult (NZMC, in alcohol), same data as holotype.

Type deposition

All types are deposited in the National Zoological Museum of China, Institute of Zoology, Chinese Academy of Sciences, Beijing (NZMC).

Etymology

The new specific name "*protrusus*" is from Latin, and refers to the protrudent part of notogaster.

Remark

This new species is similar to *Notophthiracarus lienhardi* Mahunka, 1996 in the presence of median crista on prodorsum and crista-like structure on notogaster, similar shape of sensilli and rostral setae, similar length of interlamellar and lamellar setae, posterior furrows present, anterodorsal part of notogaster protrudent, and two pairs of lyrifissures *ia* and *im* present, but can be easily distinguished from the latter species by the following ten characters (a versus b): in *N. protrusus* **sp. nov.**, (1a) median crista of prodorsum triangular shape in dorsal view; (2a) lateral carinae present; (3a) lamellar setae much longer than rostral setae; (4a) interlamellar setae rough, notogastral setae sparsely barbed, not blunt at tip; (5a) anterodorsal part of notogaster protrudent much strongly (but not dilated laterally), covering posterior part of prodorsum; (6a) dorsal surface of crista-like structure of notogaster foveolate; (7a) 15 pairs of notogastral setae present and notogastral setae much longer; (8a) setae c_2, h_1 and ps_1 inserted on crista-like structure; (9a) all genital setae similar in length, setae $g_{6–9}$ much thicker than $g_{1–5}$; (10a) all anoadanal setae thick, similar shape as setae $g_{6–9}$, setae ad_1 very close to an_1; in *N. lienhardi*, (1b) median crista of prodorsum not trangular shape in dorsal view; (2b) lateral carinae absent; (3b) lamellar setae similar in length with rostral setae; (4b) interlamellar and notogastral setae densely barbed and blunt at tip; (5b) anterodorsal part of notogaster slightly protrudent (but dilated laterally), only covering a little posterior part of prodorsum; (6b) dorsal surface of crista-like structure of notogaster smooth; (7b) 17 pairs of notogastral setae present and notogastral setae much shorter; (8b) only setae c_1 inserted on crista-like structure; (9b) setae $g_{1–5}$ short and fine, $g_{6–9}$ longer but not much thicker than setae $g_{1–5}$; (10b) all anoadanal setae thin, setae ad_1 more far away from an_1.

This new species is also similar to *Notophthiracarus orientalis* (Mahunka, 1985) in the presence of median crista on prodorsum and crista-like structure on notogaster, lamellar setae short, 15 pairs of notogastral setae present, setae c_2 inserted on crista-like structure, two pairs of lyrifissures *ia* and *im* present, and vestigial setae f_1 posterior to setae

h_1; but differs from the latter species by the following nine characters (a versus b): in *N. protrusus* **sp. nov.**, (1a) lateral carinae present; (2a) interlamellar setae much longer; (3a) sensilli with narrow pedicel and sickle-like head; (4a) anterodorsal part of notogaster protrudent much strongly; (5a) notogastral setae long and setiform; (6a) setae c_2, h_1 and ps_1 inserted on crista-like structure; (7a) genital setae arranged with formula: 6: 3; (8a) all genital setae similar in length, setae $g_{6–9}$ much thicker than $g_{1–5}$; (9a) anoadanal setae thick, similar in shape and length as setae $g_{6–9}$; in *N. orientalis*, (1b) lateral carinae absent; (2b) interlamellar setae short; (3b) sensilli without head; (4b) anterodorsal part of notogaster slightly protrudent; (5b) notogastral setae phylliform and much shorter; (6b) setae c_1, d_1, e_1 and h_1 inserted on crista-like structure; (7b) genital setae arranged with formula: 5: 4; (8b) setae $g_{1–5}$ short and fine, $g_{6–9}$ longer but not much thicker than setae $g_{1–5}$; (9b) anoadanal setae thin, setae an_2 much longer than other anoadanal setae.

Key to species of *Notophthiracarus* reported from China

1. Prodorsum with median crista; notogaster with crista-like structure ..... ***N. protrusus* sp. nov.**
– Prodorsum without median crista; notogaster without crista-like structure **2**

2. Interlamellar setae more than ten times longer than lamellar setae; exobothridial setae present ....***N. fusiformis* sp. nov.**
– Interlamellar setae less than two times longer than lamellar setae; exobothridial setae vestigial .... ***N. tohivea* Niedbała, 1998**

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References

Chen J, Liu D, Wang HF. 2010. Oribatid mites of China: a review of progress, with a checklist. Zoosymposia. 4: 186–224

Mahunka S. 1985. New and interesting mites from the Geneva Museum LIV. Oribatids from South India I (Acari: Oribatida). Revue Suisse de Zoologie. 92:367–383.

Mahunka S. 1996. New and interesting mites from the Geneva Museum LXXVIII. Oribatids from Sarawak I. (Acari: Oribatida). Revue Suisse de Zoologie. 103:259–282.

Niedbała W. 1992. Phthiracaroidea (Acari, Oribatida). Systematic Studies. Warszawa: PWN-Polish Scientific Publishers.

Niedbała W. 1998. Ptyctimous mites of the Pacific Islands. Recent knowledge, origin, descriptions, redescriptions, diagnoses and zoogeography (Acari: Oribatida). Genus. 9: 431–558.

Niedbała W. 2000. The ptyctimous mites fauna of the Oriental and Australian Regions and their centres of origin (Acari: Oribatida). Genus. supplement:1–493

Niedbała W. 2007. New distributional records and redescriptions of oriental ptyctimous mites (Acari, Oribatida) of the Oriental Region. Systematic and Applied Acarology. 12: 73–79

Ramsay GW. 1966. Three new box-mites (Acari: Oribatei: Phthiracaroidea) from the Brothers, Cook Strait, New Zealand. New Zealand Journal of Science. 9:901–912

Subías LS. 2012. Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes: Oribatida) del mundo (Excepto fósiles). Graellsia [Internet]. [cited 2013 Apr 26]; 60(número extraordinario): 3–305 (2004) (Actualizado en junio de 2006, en abril de 2007, en mayo de 2008, en abril de 2009, en julio de 2010, en febrero de 2011 y en abril de 2012). Available from: http://www.ucm.es/info/zoo/Artropodos/Catalogo.pdf