Elytra, *Tokyo*, **38**(2): 299–306, November 13, 2010

Popularity of Different Coleopteran Groups Assessed by Google Search Volume in Japanese Culture — Extraordinary Attention of the Japanese to "Hotaru" (Lampyrids) and "Kabuto-mushi" (Dynastines) (Cultural Entomology)

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Abstract I investigated the popularity of different coleopteran groups (132 families, 2 subfamilies and 1 common group) in Japanese culture, as a part of a study on cultural entomology. Popularity was assessed by the Google search volume for Japanese coleopteran group names in katakana and hiragana scripts, using the Keyword Tool of Google AdWords. The search volume of "Hotaru" (lampyrid) and "Kabuto-mushi" (dynastines) in either or both Japanese syllabic scripts was enormously high relative to other coleopteran groups, indicating that lampyrids and dynastines are extraordinarily popular in Japanese culture. As a whole, a relatively small number of coleopteran groups were represented by a high search volume, while an abundance of other groups was represented by a low number, indicating the biased attention of Japanese to a small number of coleopteran groups. In addition, comparison of search volumes for different coleopteran families between Japanese syllabic scripts (hiragana and katakana) suggests that the attitude of the Japanese public toward lampyrids differs from their attitude toward other coleopteran groups.

Introduction

The field of cultural entomology examines the influence of insects on human practice for nourishment of the mind, soul, arts and humanities (HOGUE, 1987; MITSUHASHI, 2000; TAKADA, 2009, 2010), and contributes to provide much insight into our current attitudes towards insects and nature in general (SEAR, 1993). A fascinating question in cultural entomology is which and how insect groups are represented in human culture, *i.e.* the popularity of insects in human societies (COELHO, 2000; TAKADA, 2009). Previous studies on cultural entomology mentioned the influence of various insects on human practice with biased attention of humans to a small number of insect groups, such as dipterans, lepidopterans, hymenopterans, orthopterans and coleopterans (*e.g.*, MERTINS, 1986; LESKOSKY & BERENBAUM, 1988; COELHO, 2000, 2004; DICKE, 2004). However, these studies focused on the popularity of different insect orders in only certain cultural contexts or media (*e.g.*, music, cartoons) from western

culture. Thus, questions remain as to which and how lesser taxonomic groups of insect orders are represented in the culture of general public in regions other than western nations.

Coleoptera is the most attractive insect order in cultural entomology, because coleopterans influence various aspects of human practice and have cultural but ambiguous significance due to their extraordinarily diverse (TAKADA, 2010). Thus, many entomologists are interested in the popularity of different coleopteran groups. Although TAKADA (2010) mentioned that only a small number of coleopteran families, such as scarabaeids, lucanids, lampyrids, coccinellids and bupresdtids have an important role in human culture, there has been no numerical analysis of the popularity of different coleopteran groups, despite importance of coleopteran insects in human culture. Methodological constraints may have limited the cultural entomologist's attempt to investigate the popularity of different coleopteran groups (TAKADA, 2009).

I investigated the popularity of different coleopteran groups and examined which and how coleopteran groups are represented in Japanese culture. The Japanese have a highly developed tradition of aesthetic appreciation for insects and use them in various cultural contexts (HOGUE, 1987; KELLERT, 1993; COELHO, 2000; MITSUHASHI, 2000; LAURENT, 2001; TAKADA, 2009, 2010), indicating the importance of Japanese culture in light of cultural entomology. The popularity of different coleopteran groups was assessed by the Google search volume of group names. The search volume is the number of search queries matching each keyword result (in this case, the keyword was the Japanese name of a coleopteran taxon). This statistic is used as a yardstick to measure a term's intention, interest or popularity, and is thus applied for internet marketing and search engine optimization (BATELLE, 2005; RANGASWAMY *et al*., 2009).

Material and Methods

I conducted a survey on the popularity of coleopteran groups on 10 August 2009, assessing the global monthly search volume using the Keyword Tool in Google AdWords (http://adwords.google.com). The global monthly search volume shows the approximate average monthly number of search queries matching each keyword result. This statistic (called 'search volume') applies to searches performed on Google and the search network over the past 12-month period. When Google AdWords has insufficient data on a particular keyword, it returns "not enough data". Such a case was regarded as no search volume (0) for the keyword.

The search volume of Japanese names of coleopteran groups was assessed in hiragana and katakana, which are Japanese syllabic scripts, components of the Japanese writing system. Hiragana is used for words for which there are no kanji, and in words for which the kanji form is not known to the writer or readers, or is too formal for the writing purpose. Katakana is most often used for the transcription of words from foreign languages, onomatopoeia and technical and scientific terms, such as the names of animal and plant species and minerals.

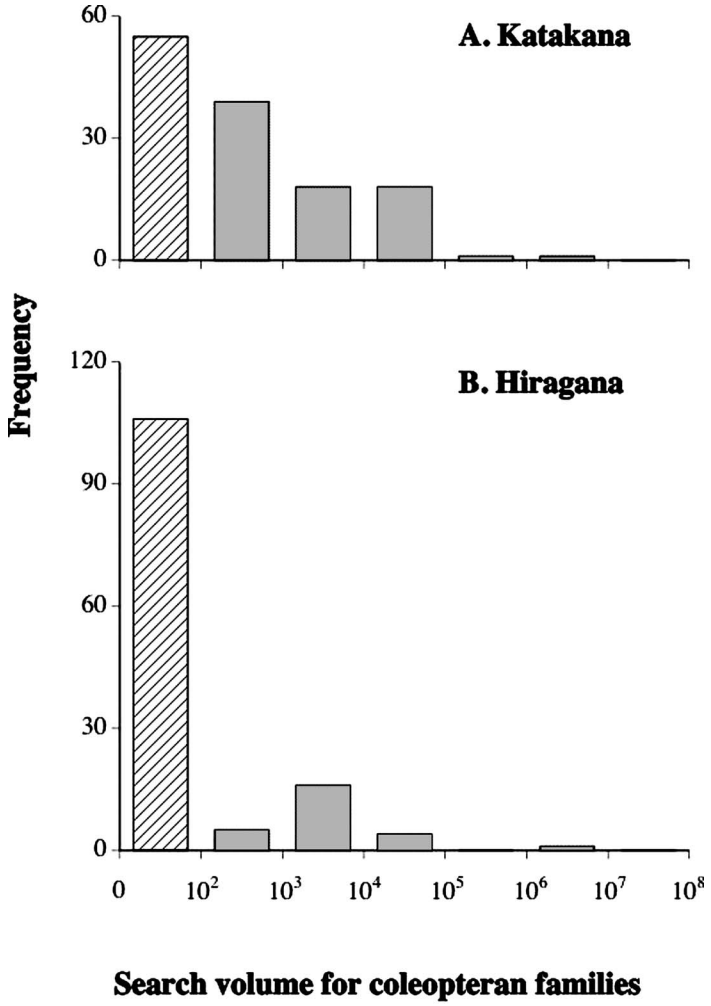

Fig. 1. Frequency distribution of Google search volumes for different coleopteran families in katakana (A) and hiragana (B) scripts.

I used 132 familial names of coleopterans listed in MORIMOTO and HAYASHI (1986) as keywords to evaluate the search volume of coleopteran groups (Table 1). We also examined the search volume of 2 subfamilial name ("Kabuto-mushi" and "Hana-muguri") and 1 general name for several taxa ("Gomi-mushi" as a general term for carabids except for Carabinae) of coleopterans, because these names were largely different from the familial name mentioned above (*e.g.*, [Kogane-mushi] is the Japanese name for scarabaeids, and [Kabuto-mushi] is the Japanese name of dinastines in a broad sense and Japanese rhinoceros beetles, *Allomyrina dichotoma* (LINNÉ), which is a

Table 1. Google search volume for different coleopteran groups (132 families, 2 subfamilies and 1 common groups) in katakana and hiragana scripts.

Latin name	Japanese	Species	Search volume (Rank in families)	
			Katakana	Hiragana
Cupedidae	[Naga-Hirata-Mushi]	3	28 (64)	0 (27)
Rhysodidae	[Sesuji-Mushi]	10	16 (70)	0 (27)
Paussidae	[Higebuto-Osa-Mushi]	9	36 (58)	0 (27)
Cicindelidae	[Hanmyou]	22	5400 (11)	480 (12)
Carabidae	[Osa-Mushi]	1000	2900 (15)	320 (13)
Brachinidae	[Kubiboso-Gomi-Mushi]	10	16 (70)	0 (27)
Haliplidae	[Kogashira-Mizu-Mushi]	10	46 (51)	0 (27)
Phreatodytidae	[Mukashi-Gengorou]	1	12 (77)	0 (27)
Noteridae	[Kotubu-Gengorou]	5	46 (51)	0 (27)
Dytiscidae	[Gengorou]	90	9900 (3)	1000 (6)
Gyrinidae	[Mizu-Sumashi]	15	880 (22)	880 (8)
Hydrophilidae	[Ga-Mushi]	80	720 (23)	1300 (4)
Histeridae	[Enma-Mushi]	84	91 (39)	0 (27)
Ptiliidae	[Mukuge-Kinoko-Mushi]	20	28 (64)	0 (27)
Leiodidae	[Tama-Kinoko-Mushi]	50	16 (70)	0 (27)
Catopidae	[Chibi-Shide-Mushi]	40	22 (68)	0 (27)
Silphidae	[Shide-Mushi]	38	1300 (20)	140 (19)
Staphylinidae	[Hanekakushi]	800	1900 (16)	110 (20)
Pselaphidae	[Arizuka-Mushi]	150	91 (39)	0 (27)
Scydmaenidae	[Koke-Mushi]	23	3600 (14)	46 (23)
Scaphidiidae	[Deo-Kinoko-Mushi]	70	16 (70)	0 (27)
Helodidae	[Maru-Hananomi]	40	46 (51)	0 (27)
Lucanidae	[Kuwagata-Mushi]	34	8100 (7)	720 (10)
Passalidae	[Kurotsuya-Mushi]	1	58 (47)	0 (27)
Trogidae	[Kobusuji-Kogane]	11	36 (58)	0 (27)
Geotrupidae	[Senchi-Kogane]	9	720 (23)	0 (27)
Scarabaeidae	[Kogane-Mushi]	390	9900 (3)	1900 (3)
Byrrhidae	[Marutoge-Mushi]	13	16 (70)	0 (27)
Psephenidae	[Hirata-Doro-Mushi]	16	170 (35)	0 (27)
Elmidae	[Hime-Doro-Mushi]	44	73 (43)	0 (27)
Dryopidae	[Doro-Mushi]	2	73 (43)	28 (26)
Buprestidae	[Tama-Mushi]	200	5400 (11)	1000 (6)
Elateridae	[Kometsuki-Mushi]	600	1600 (18)	170 (18)
Eucnemidae	[Kometsuki-Damashi]	66	46 (51)	0 (27)
Lycidae	[Beni-Botaru]	90	390 (29)	0 (27)
Lampyridae	[Hotaru]	40	135000 (1)	368000 (1)
Omethidae	[Hotaru-Modoki]	3	28 (64)	0 (27)
Cantharidae	[Joukaibon]	70	210 (33)	0 (27)
Dermestidae	[Katuobushi-Mushi]	40	9900 (3)	260 (14)
Bostrichidae	[Naga-Shinkui-Mushi]	21	110 (37)	0 (27)
Anobiidae	[Siban-Mushi]	54	9900 (3)	110 (20)

Table 1 (continued).

Latin name	Japanese	Species	Search volume (Rank in families)	
			Katakana	Hiragana
Ptinidae	[Hyouhon-Mushi]	7	91 (39)	0 (27)
Trogossitidae	[Kokunusuto]	20	1900 (16)	36 (24)
Cleridae	[Kakkou-Mushi]	50	58 (47)	0 (27)
Melyridae	[Joukai-Modoki]	40	73 (43)	0 (27)
Nitidulidae	[Keshikisui]	160	590 (27)	0 (27)
Cucujidae	[Hirata-Mushi]	28	170 (35)	0 (27)
Silvanidae	[Hoso-Hirata-Mushi]	24	36 (58)	0 (27)
Cryptophagidae	[Kisui-Mushi]	39	36 (58)	0 (27)
Languriidae	[Kometsuki-Modoki]	37	91 (39)	0 (27)
Erotylidae	[Oo-Kinoko-Mushi]	96	73 (43)	0 (27)
Corylophidae	[Mijin-Mushi]	29	36 (58)	0 (27)
Endomychidae	[Tentou-Mushi-Damashi]	47	720 (23)	91 (22)
Coccinellidae	[Tentou-Mushi]	162	14800 (2)	9900 (2)
Lathridiidae	[Himemaki-Mushi]	26	210 (33)	0 (27)
Colydiidae	[Hosokata-Mushi]	36	36 (58)	0 (27)
Mycetophagidae	[Ko-Kinoko-Mushi]	26	22 (68)	0 (27)
Melandryidae	[Naga-Kuchiki-Mushi]	82	16 (70)	0 (27)
Mordellidae	[Hananomi]	170	110 (37)	210 (15)
Oedemeridae	[Kamikiri-Modoki]	52	390 (29)	0 (27)
Pyrochroidae	[Akahane-Mushi]	19	46 (51)	0 (27)
Anthicidae	[Ari-Modoki]	60	58 (47)	0 (27)
Meloidae	[Tsuchi-Hanmyou]	15	480 (28)	0 (27)
Lagriidae	[Ha-Mushi-Damashi]	22	46 (51)	0 (27)
Alleculidae	[Kuchiki-Mushi]	25	28 (64)	0 (27)
Tenebrionidae	[Gomi-Mushi-Damashi]	305	1600 (18)	36 (24)
Cerambycidae	[Kamikiri-Mushi]	700	6600 (9)	880 (8)
Chrysomelidae	[Ha-Mushi]	500	5400 (11)	1300 (4)
Bruchidae	[Mame-Zou-Mushi]	23	260 (31)	0 (27)
Anthribidae	[Higenaga-Zou-Mushi]	157	260 (31)	0 (27)
Attelabidae	[Otoshibumi]	84	1000 (21)	210 (15)
Brentidae	[Mitsugiri-Zou-Mushi]	27	58 (47)	0 (27)
Apionidae	[Hosokuchi-Zou-Mushi]	28	16 (70)	0 (27)
Curculionidae	[Zou-Mushi]	634	8100 (7)	720 (10)
Rhynchophoridae	[Osa-Zou-Mushi]	37	46 (51)	0 (27)
Platypodidae	[Naga-Kikui-Mushi]	18	720 (23)	0 (27)
Scolytidae	[Kikui-Mushi]	305	6600 (9)	210 (15)
Other 55 Families		360	0 (78)	0 (27)
(Carabidae)	[Gomi-mushi]*		6600	320
Dynastinae	[Kabuto-mushi]		201000	18100
Cetoniinae	[Hanamuguri]		2900	140

*: General name for carabids except for Carabinae.

species belonging to dynastines, in a narrow sense).

To evaluate the search volume, I employed the browser Mozilla Firefox 2.0.0.2.0. The operating system was Mac OS 10.2.8 installed on a MacIntosh iBook G3 800 MHz (M8862J/A).

Results and Discussion

The search volume for "Hotaru", which is lampyrids in Japanese, was the highest of the familial names of coleopterans in both hiragana and katakana, and these were over 100,000 searches for lampyrids in both katakana (135,000 searches) and Hiragana (368,000 searches) (Table 1, Fig. 1). The search volume for "Tentou-mushi" (coccinellids) in katakana was the second highest familial name in katakana, and was between 10,000 and 100,000 searches (14,800 searches). For familial names in katakana and hiragana, a search volume frequency of 1,000 to 10,000 searches occurred for 19 and 6 families, respectively. On the other hand, no search volume was obtained for 55 familial names in katakana and 106 familial names in hiragana, due to the lack of data on these keywords in Google AdWords. In addition to the names of coleopteran families, we examined for the search volume of 2 subfamilies and 1 general term for several taxa. When these results were included, the search volume for "Kabuto-mushi" (dynastines) was the highest of the coleopteran groups in katakana but not in hiragana (201,000 and 18,100 searches in katakana and hiragana, respectively).

These results indicated a trend in the popularity of different coleopteran groups in Japanese culture, but the search volumes were possibly higher for some coleopteran groups, due to the existence of homophones implying both a coleopteran taxon and others, such as "Koke-mushi" (implying both scydmaenids and bryozoan).

The search volume of "Hotaru" (lampyrids) and "Kabuto-mushi" (dynastines) in either or both Japanese syllabic scripts are enormously high relative to the other coleopteran groups, indicating that lampyrids and dynastines are extraordinarily popular in Japanese culture, as mentioned by several studies. Lampyrids are known as coleopteran groups with cultural significance in Japan. Historically, lampyrids have been appreciated as a pastime by many Japanese people and are well represented in literature, such as haiku and tanka poems, as a symbol of early summer or love, and in various topics in Japanese newspaper (DUNN, 2000; KOBORI & PRIMACK, 2003 a, b; YUMA, 2004; TAKEDA *et al*., 2006; TAKADA, 2009, 2010). It is also known that dynastines (especially Japanese rhinoceros beetles) are very popular in Japanese popular culture and subcultures. Dynastines have been sold as pets in department stores in Japan since about the 1960's, and are also frequently depicted in popular media, such as picture books, anime, comics, tokusatsu, computer games, advertisements, televisions, and films in Japan (LAURENT, 2001; GULLAN & CRANSTON, 2004; MIYANOSHITA, 2007; ANONYMOUS, 2009; TAKADA, 2009, 2010).

As a whole, a relatively small number of coleopteran groups was represented by an extraordinarily high search volume, while an abundance of other groups was represented

by a low search volume, indicating the biased attention of Japanese to only a small number of coleopteran groups, such as lampyrids, dynastines, coccinellids, dytiscids, anobiids, scarabaeids, curculionids and lucanids (Table 1, Fig. 1). It appears that most popular coleopterans have characteristics of (1) apparent morphological and ecological traits, (2) association with human survival (beneficial insects and pests), and/or (3) occurrence around human habitation, such as bioluminescence of lampyrids and large body and well-developed horns of dynastines, as mentioned by TAKADA (2010). On the other hand, most coleopteran species have characteristics of (1) unapparent morphological and ecological traits, such as a small body (1 to 5 mm in length), cryptic coloration and dwelling in closed and compact habitats and (2) occurrence far from human habitation (MORIMOTO & HAYASHI, 1986), and thus are perhaps not found and perceived by casual observers.

The pattern of the search volume of coleopteran groups differed between Japanese syllabic scripts (hiragana and katakana). The search volumes were extremely high for lampyrids and dynastines of coleopteran groups in katakana, against only lampyrids in hiragana (Fig. 1, Table 1). In addition, the search volume of lampyrids was clearly higher in hiragana than katakana, while the search volumes of other coleopteran groups, such as dynastines, were clearly higher in katakana than hiragana or almost the same in katakana and hiragana (Table 1). These results suggest that the attitude of the Japanese public toward lampyrids differs from their attitude toward other coleopteran groups, and that they have a special significance in Japanese culture, because Japanese syllabic scripts (hiragana and katakana) are chosen according to the writing purpose. This may suggest that lampyrids are often used symbolically for non-biological purposes as compared with all other coleopteran groups as dynastines, which are directly used for biological or biologically related purposes.

要　　約

高田兼太：Google の検索数によって評価した日本におけるコウチュウ目に属する分類群グループの知名度―日本人は，ホタルとカブトムシが異常に好き．―― 文化昆虫学の研究の一環として，日本文化におけるコウチュウ目に属する各分類グループ（甲虫グループ：132 科，2 亜科，その他 1 甲虫グループ）の知名度を調べた．甲虫グループの知名度は，平仮名と片仮名で表記した甲虫グループの名前に対応した Google の検索数（インターネット・ユーザーが，Google を使ってあるキーワードを検索した回数）により評価し，Google の検索数は Google AdWords のキーワードツールを用いて査定した．調査の結果，甲虫グループの中でもホタルとカブトムシの Google 検索数（平仮名と片仮名，あるいはそのどちらかの結果）が極端に高く，コウチュウ目のなかではホタルとカブトムシの知名度が群をぬいて高いことがわかった．全体として，ごく僅かな甲虫グループの検索数が極めて高く，一方で他のほとんどの甲虫グループの検索数は低かったことから，極めて少数の甲虫グループのみが，日本人に注目されていることがわかった．加えて，甲虫グループの検索数のパターンは平仮名表記と片仮名表記で異なっており，ほとんどの甲虫グ

ループでは平仮名表記より片仮名表記のほうが検索数が高いのに対して，ホタルでは片仮名表記より平仮名表記のほうが検索数が高かった．これは，ホタルにむけられる日本人の意識が，カブトムシをはじめとする他の甲虫グループとは異なることを示唆するものであろう．

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