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1 **Article**

2

3 **Title:** Code word usage in the online trade in ivory across four EU member States

4

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6

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12

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14

15 **Word Count:** 3,553

16

17

18 **Abstract**

19 Illegal wildlife trade is a rapidly evolving environmental crime that is expanding
20 through e-commerce. Due to the nature of the internet, detection of online illegal
21 wildlife and enforcement has proven to be difficult and time-consuming, often based
22 on manual searches through the use of keywords. Due to the scrutiny the trade in
23 elephant ivory has come under, sellers now use code words to disguise the trade,
24 thus adding an additional level of complexity. Here we look at the use of 19 code
25 words and phrases associated with the online trade in elephant ivory items on eBay
26 across four European Union member States. Results show that, in spite of eBay's
27 ban on ivory, elephant ivory is still being offered for sale across all four EU sites we
28 searched (183 ivory items offered by 113 sellers between the 18th January and 5th
29 February 2017). Beyond the violation of eBay's Terms and Conditions, other potential
30 illegalities included offers for sale across international borders without mention of
31 CITES permits requirements, and the offer of ivory that maybe considered
32 'unworked', which violates EU regulations. Code word usage was found to be
33 consistent across all four EU countries. While the rise of online wildlife trade is of
34 concern, the growth of global markets may homogenise conventions within trading
35 communities, such as in this case the code words used. Homogenisation of
36 conventions may therefore offer opportunities in tackling the illegal online trade in
37 wildlife.

38

39 **Keywords:** CITES; e-commerce; elephant; enforcement; illegal wildlife trade;
40 keyword; linguistics; search term

41 **Introduction**

42 The illegal wildlife trade is an extremely lucrative environmental crime. The scale is
43 vast and as a result estimating its extent is challenging. Current estimates suggest
44 environmental crime is worth as much as \$23 billion per year (Nellemann et al.
45 2016), making it the fourth most valuable illicit transnational trade after the trafficking
46 of narcotics, humans and counterfeit items (UNGA 2015). With its global reach, the
47 internet has become the focus of concern in terms of the illegal wildlife trade, with
48 trade occurring over a variety of platforms including auction websites (Hernandez-
49 Castro & Roberts 2015) and social media (Yu & Jai 2015; Hinsley et al. 2016); little
50 has been found on the darkweb (Harrison et al. 2016; Roberts & Hernandez-Castro
51 2017). As a result, governments and businesses have been called to take action to
52 tackle the growing problem of the illegal online wildlife trade (WWF/Dalberg 2012).
53 However, identifying suspected illegalities online is time consuming; often involving
54 manual keyword searches (Hernandez-Castro & Roberts 2015).

55

56 The online trade in elephant ivory represents an interesting case, as the term ivory is
57 used both for the material (including elephant, mammoth, hippo, narwhal and walrus
58 tusks, as well as sperm whale teeth) and for the colour. As such, use of the search
59 term “ivory” will result in a large proportion of unrelated items (Hernandez-Castro &
60 Roberts 2015). Further, with the push for businesses to ban the trade in ivory to
61 adapt to current legislations (e.g. eBay’s ban on items with >5% ivory – Coghlan
62 2008), the trading community has developed a number of code words to disguise the
63 trade. Added to this already challenging situation, it is unclear whether these code
64 words are common within the trading community or specific to a particular country,
65 language or trading community.

66

67 In this study, we analysed the use of 19 code words for elephant ivory (IFAW 2014;
68 and used in a previous study (Hernandez-Castro & Roberts 2015)) across eBay
69 market places in four linguistically different European Union (EU) countries.

70 Understanding how search terms associated with the illegal wildlife trade, including
71 code words, are used across different languages will not only help inform future
72 research into the illegal online wildlife trade, but also streamline the manual search
73 by law enforcers.

74

75 **Methods**

76 The study was approved by the University of Kent's Research and Ethics Committee
77 (ref. no. 0321617). The research was conducted on the open, publicly available,
78 auction website eBay, across four linguistically different eBay market places, namely
79 the eBay UK (ebay.co.uk), eBay France (ebay.fr), eBay Italy (ebay.it) and eBay
80 Spain (ebay.es). eBay was chosen as previous studies had shown continuing trade
81 in elephant ivory (e.g. Hernandez-Castro & Roberts 2015) and as it represented a
82 stable platform used across several different countries. The specific marketplaces
83 were selected based on the linguistic abilities of one of the authors (SA), and
84 because they fall within the EU, allowing free trade between member States.

85

86 Following Harrison et al. (2016), we consulted a list of 30 code words and phrases
87 previously identified by the International Fund for Animal Welfare (IFAW 2014) as
88 being associated with the online trade in ivory products. Of the 30 code words, 19
89 were selected; excluded words or phrases were those that represented redundancy,
90 were too generic or had an unreliable translation. Each code word was translated

91 from English to French, Italian and Spanish. During the analysis, each code word
92 was anonymised and assigned a random alphabetical letter to avoid compromising
93 ongoing enforcement efforts.

94

95 A systematic search was conducted over a 21-day period, between the 18th January
96 and 5th February 2017; this was the time taken to conduct a single search of each of
97 the four website using all the code words. For consistency, searches for a particular
98 code word were conducted at the same time across all four marketplaces, and
99 restricted to the 'Header' and 'Description' of the adverts, and the 'Antiques' section.
100 Each search was performed only once. All items of the resulting search were
101 scrutinised if the total number of items was less than 5,000. In cases where searches
102 resulted in more than 5,000, a sample of the first 100 items were analysed due to
103 time availability. For each elephant ivory item identified, the details and sale
104 characteristics (i.e. code word used, item number, username, item location, postage
105 options and information regarding the object's age and certifications) were recorded.
106 Postage options were classified into three categories, specifically 'Within country',
107 'Within the rest of the EU' or 'Outside the EU'.

108

109 Given the lack of access to the physical items, identification of elephant ivory items
110 was based on the most precise available indicator, which was the presence of
111 Schreger lines in the images; a unique structure indicative of elephant ivory (Locke
112 2008); the only other characteristic being the shape of the item in the case of
113 unworked ivory. An alternative option was to discounting other materials associated
114 with ivory used such as man-made materials, bone, horn and antlers, and other
115 ivories including hippo, narwhal, sperm whale and walrus. A 2-person Kappa analysis

116 was performed using a 100 items sample to test identification consistency among
117 researchers (i.e. raters 1 and 2). Cohen's Kappa was calculated to confirm
118 identification consistency. Differences in the classification of items were then
119 discussed among researchers until an agreement was reached.

120

121 **Results**

122 **Elephant ivory identification consistency**

123 Kappa analysis was used to determine the coefficient of agreement between two
124 raters' identification of elephant ivory or non-elephant ivory based on a sample of 100
125 items and showed a good level of agreement ($k = 0.67$, $p < 0.01$). During a follow-up
126 consultation, a technical issue experienced by rater 2 using the eBay's image zoom
127 feature was identified as the main cause of difference in classification of items
128 between raters. After reanalysis following the correction of the zoom issue,
129 agreement was achieved for 14 of the 15 disputed items ($k = 0.98$, $p < 0.01$).

130

131 **Elephant ivory items' sale characteristics**

132 A total of 15,152 adverts were analysed resulting from the 19 code words searched
133 across the four websites, leading to the identification of 183 unique elephant ivory
134 items. Of these 183 unique items, 84 (1.14% of the total number of adverts analysed
135 on the country's website) were found on eBay UK, 55 (1.42%) on eBay France, 44
136 (1.42%) on eBay Italy and 42 (6.35%) on eBay Spain. These items were offered for
137 sale by 113 unique sellers. Most sellers ($n = 86$, 76%) were offering a single ivory
138 item at the time of the survey, with a median of 1 item per seller and a maximum of
139 14 (Figure 1).

140

141 Of the 21 items located outside the EU trading area, 20 were in the USA and 1 was
142 in Israel (Figure 2). All other items were located within the EU in the four countries of
143 study, except for a substantial number that were for sale in Germany (n = 26, 14%).
144 There was a significant difference in the distribution of items on offer among the
145 categories 'Within country' and 'Within the rest of the EU' in each of the four
146 countries' eBay sites ($\chi^2 (3) = 51.3, p < 0.05$), with the UK being under represented
147 and Spain over represented in terms of numbers of items located within the EU. The
148 category 'Outside the EU' was excluded from the test as it only applied to the UK.

149

150 In terms of the postage options available for the items whose physical location fell
151 within the four countries of study (n = 59 for the UK, n = 35 for France, n = 23 for Italy
152 and n = 12 for Spain), there was a significant difference across countries in
153 distribution of items among the categories ($\chi^2 (6) = 31.6, p < 0.01$), with Spain being
154 over represented for number of items for sale within the EU (Figure 3). Due to
155 several low expected counts (41.5%), a Fisher's Exact test was also conducted,
156 producing analogous results ($p < 0.01$).

157

158 Information regarding the declared age of the items and certifications was found in
159 the 'Heading' or 'Description' of most items (n = 139, 76%). One object was reported
160 holding an antiquity certificate, 82 (45%) were dated by sellers as pre-1947, though
161 without using the term 'pre-convention', and 40 (22%) were simply described as
162 'antiques'. A minority were also described as 'vintage' (n = 7), 'old' (n = 3) or 'original'
163 (n = 2). Only one Italian seller reported holding CITES permits for both items found
164 for sale. Two sellers explicitly mentioned eBay's Terms and Conditions in relation to
165 the sale of elephant ivory. Finally, 5 of the items were in the original, easily

166 recognisable form of tusks, either highly polished or carved but still obvious due to
167 their shape.

168

169 **Code words and phrases' usage across countries**

170 Of the 19 code words analysed, 6 accounted for nearly 80% ($n = 276$) of the total
171 number of elephant ivory items found for sale across the four eBay websites (Table
172 3). The code words usage was compared across countries through the analysis of
173 their rank order. There were significant correlations between pairs of countries in the
174 rank order of the code word hits, with a p -value < 0.01 for each pair (France v Italy r_s
175 $= 0.876$, France v Spain $r_s = 0.797$, Italy v Spain $r_s = 0.874$), except for all
176 comparisons with the UK (UK v France $r_s = 0.701$, UK v Italy $r_s = 0.595$, UK v Spain r_s
177 $= 0.668$), which was significant at $p < 0.05$. Results for code words with a fixed
178 sample size of 100 items were excluded from this analysis to avoid biases, as they
179 are possibly not representative of the complete list of items.

180

181 **Discussion**

182 While ivory sales on eBay have been banned since 2009 (Coghlan 2008), elephant
183 ivory is still being offered for sale across the four analysed countries. However, as
184 noted in a previous study (Yeo et al. 2017), three-quarters of the trade was by sellers
185 offering only as single item; although one individual was offering 14 items, the next
186 highest number of items offered by a single seller was 6 items (Figure 1).

187

188 Besides two sellers explicitly making the false statement that they complied with
189 eBay's Terms and Conditions (see eBay 2017a, 2017b, 2017c), a number of
190 analysed items were potentially illegal for reasons other than the violation of the

191 website's regulations, specifically regarding international, EU and national legislation.
192 In fact, most sellers identified in this study were willing to sell outside of the EU,
193 made no explicit mention as to whether the items were 'pre-convention' (45% were
194 described as pre-1947) other than wording related to the age of the item (e.g.
195 'antique'). There was a further lack of acknowledgement regarding the need for a
196 CITES permit for international trade, particularly into and out of the EU. Presence of
197 a CITES permit was mentioned by only one seller who was not willing to send the
198 two items for sale outside their country. Finally, five items of ivory were found to
199 potentially violate the EU's regulations as they may represent unworked ivory. While
200 in most cases the tusk was carved, the shape was still obvious; defining what is
201 worked or unworked is contentious (pers. comm.). According to the EU regulations
202 Article 2w of Regulation (EC) No 338/97 defines worked ivory to be "specimens that
203 were significantly altered from their natural raw state for jewellery, adornment, art,
204 utility or musical instruments ... Such specimens shall be considered as worked only
205 if they ... require no further carving, crafting or manufacture to affect their purpose".
206 Further, pre-convention antiques that remain substantially unaltered from their
207 natural state (i.e. are still in the form of a tusk) do not qualify as 'worked specimens'.
208
209 Difference between countries did exist in terms of the volume of ivory items found for
210 sale in each of the four countries, with a higher volume in the UK. The lower overall
211 volume of ivory items found on eBay France, Italy and Spain could be due to the
212 sellers' preferential use of different auction websites in these countries. Further,
213 unlike other countries, there were a higher number of items being offered from
214 outside the EU (mainly US) into the UK. In contrast France, Italy and Spain had high

215 numbers of items for sale from other EU countries, notably from Germany, overall
216 differentiating the four markets in their characteristics.

217

218 Identification of elephant ivory items based on the unique Schreger lines was found
219 to be consistent based on Kappa analysis, even after brief training. However, the
220 number of photographs and their quality was a limiting factor. While Schreger lines
221 appears to be a simple and reproducible method for manual identification online
222 trade in elephant ivory, basing identifications purely on the presence of Schreger
223 lines is likely to be an underestimation of the total volume of ivory for sale.

224

225 There were surprising correlations in usage of code words for the sale of ivory across
226 all four EU countries, even though they differ linguistically, suggesting such
227 conventions maybe to some extent homogeneous beyond individual markets.

228 Correlations were highest between France, Italy and Spain, potentially due to the
229 closer linguistic relationships. Of the 19 code words that have been associated with
230 the trade in elephant ivory, 6 made up the vast majority of the items traded (80%).

231 Restricting the code words used in the search will therefore reduce the amount of
232 effort considerably if the search is conducted by hand, as is currently the case.

233 Further, should new code words be identified, it would be beneficial to share these
234 between law enforcement agencies, even if there are linguistic differences. Machine
235 learning, based on code words and other attributes of advertisements for elephant
236 ivory (e.g. Hernandez-Castro & Roberts 2015), offer opportunities to automate the
237 process of identification for law enforcement agencies as well as marketplaces.

238

239 Illegal wildlife trade is a lucrative transnational environmental crime that warrants
240 concerted efforts (Economic and Social Council 2013). The internet offers a global
241 reach to sellers and buyers, and at first sight it may present enforcement officers with
242 a potential problem due to its scale. However, the global market may result in
243 homogeneity of conventions for communication. In the case of sale of elephant ivory,
244 code words usage was comparable across the four countries and translatable across
245 the four languages analysed. It is less clear how these conventions further translate
246 across different online platforms such as between free-text social media and
247 classified advert platforms (e.g. Facebook and Craigslist), or structured auctions sites
248 (e.g. eBay), or other platforms that use limited text and/or tags (e.g. instagram or
249 Twitter). We therefore suggest that further research should explore the
250 characteristics of these platforms. However, if there exists a 'digital fingerprint' of
251 ivory trade or wildlife trade across platforms, languages and countries, global
252 monitoring of wildlife trade would be worthwhile and potentially easier than perceived.

253

254 **Acknowledgements**

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256 and Prof Julio Hernandez-Castro for providing technical advice in the stage of study
257 design.

258

259 **Author Contributions**

260 DLR conceived the product, SA collected the data and preformed the analysis, and
261 SA and DLR wrote the manuscript.

262

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324

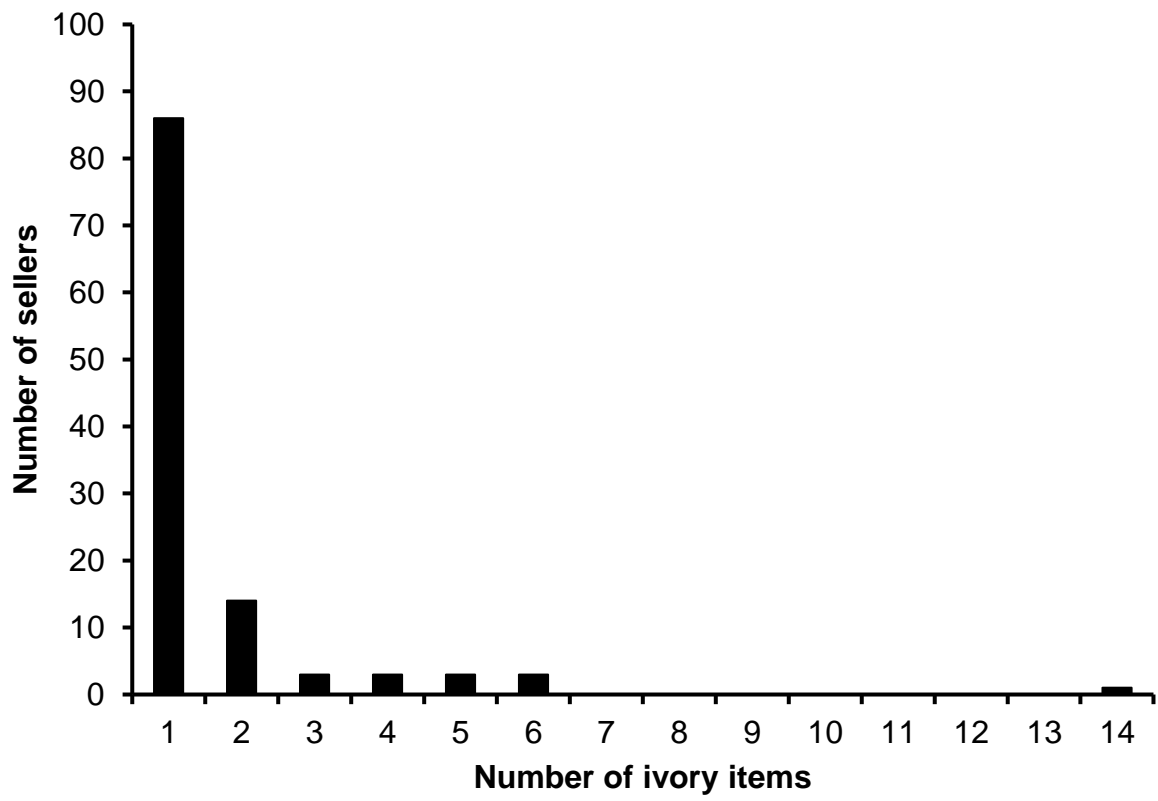
325 **Biographical Sketches**

326 Sara Alfino holds a Master's Degree in Conservation and International Wildlife Trade
327 from the University of Kent and is passionate about researching on socio-ecological
328 systems.

329 David Roberts is a Reader in Biodiversity Conservation with an interest in the wild
330 trade, both legal and illegal, from livelihoods to end consumers, but with a particular
331 interest in the online trade. Before moving to the University of Kent he worked for 8
332 years as an orchid specialist at the Royal Botanic Gardens, Kew, where he became
333 interested in CITES and the wildlife trade.

334

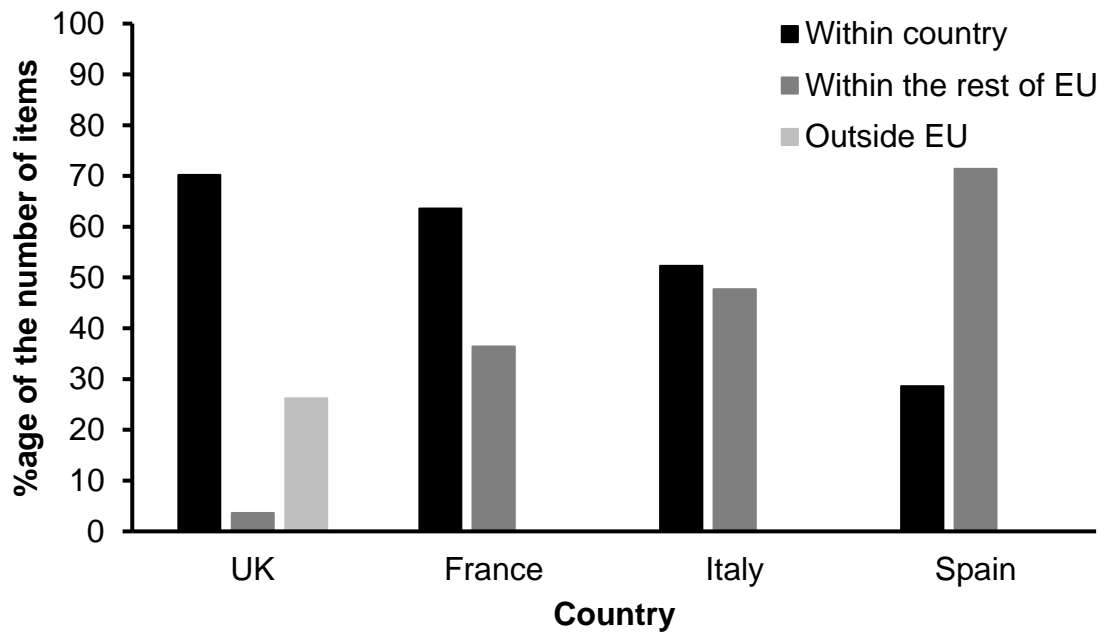
335 **Figure 1:** Frequency of ivory items found per seller across four eBay sites



336

337

338 **Figure 2:** Number of ivory items found per physical location on the four eBay
339 websites searched

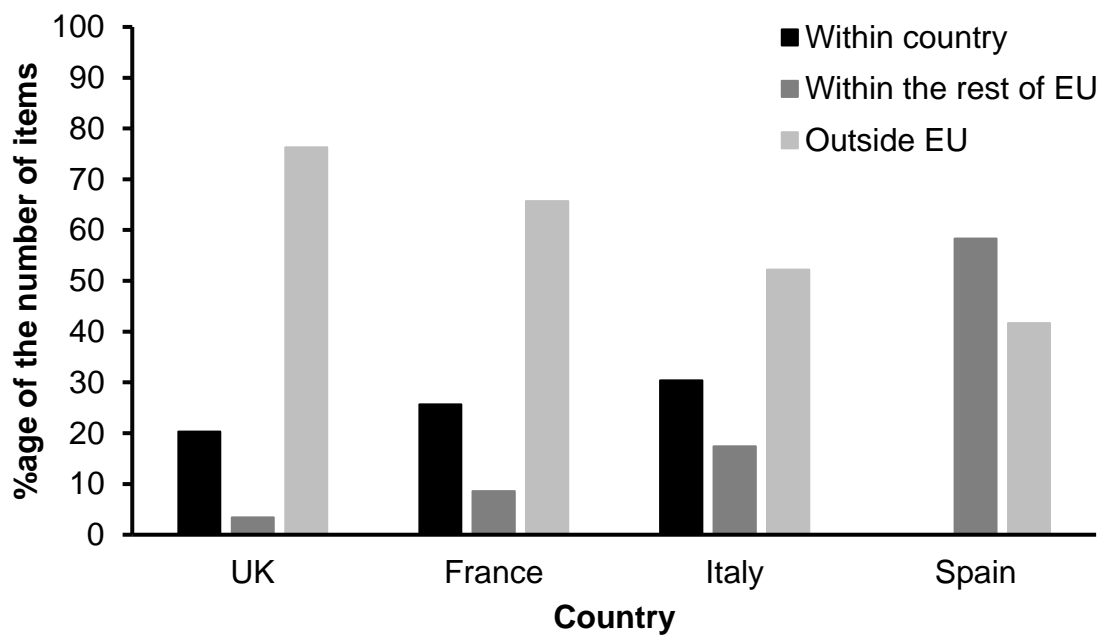


340

341

342 **Figure 3:** Number of ivory items found per postage option on the four eBay websites

343 searched



344

345

346

347 **Table 3:** Number of ivory items found per code word on the four eBay websites

348 searched

Code words (anonymised)	Number of ivory items found in each country (%age of the number of items searched per code word)			
	UK	France	Italy	Spain
A	30 (2.7%)	5 (1.0%)	2 (5.9%)	3 (37.5%)
B	11 (4.2%)	2 (2.0%)	0 (0.0%)	0 (0.0%)
C	1 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
D	2 (3.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
E	1 (0.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
F *	2 (2.0%)	1 (1.8%)	0 (0.0%)	1 (1.0%)
G	4 (2.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
H	1 (9.1%)	1 (2.6%)	0 (0.0%)	0 (0.0%)
I	3 (0.1%)	10 (0.1%)	7 (0.3%)	1 (0.9%)
J *	10 (10.0%)	13 (13.0%)	17 (17.0%)	31 (31.0%)
K *	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
L *	7 (7.0%)	13 (31.7%)	16 (37.2%)	14 (37.8%)
M	15 (3.6%)	10 (5.5%)	3 (8.6%)	0 (0.0%)
N *	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
O	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
P	2 (0.5%)	2 (0.1%)	1 (2.0%)	0 (0.0%)
Q *	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
R *	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
S	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

349 * Code words whose search was limited to the first 100 items