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A dictionary of abbreviations used in reptile descriptions

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Abstract

Species are usually described by morphological terms. In order to simplify and shorten descriptions these are often abbreviated (e.g., SVL for snout-vent-length). However, there has been no systematic attempt to define and standardize such terms or their abbreviations. Here we present an initial list of 594 unique abbreviations from a total list of 1,223 abbreviations collected from >50 reptile species descriptions, resulting in a non-redundant list of 344 abbreviations. Most of these abbreviations describe either meristic characters such as scale counts (46%) or measurements such as SVL (snout-vent-length) (30%). The remainder describe presence/absence states, colors, or formulas such as ratios. We highlight the common problem of synonyms and homonyms, i.e., different terms and abbreviations for the same character or the same term for different characters. We propose to standardize definitions of terms and abbreviations in future species descriptions. In order to future-proof species descriptions for machine-readability such as text-mining, standardization is needed for *all* species descriptions in biology, not just reptiles.

Key words: morphology, species description, diagnosis, standardization

Introduction

Over the past ~260 years more than 14,000 extant species and subspecies of reptiles have been described (Uetz *et al*. 2022). The vast majority of these have been diagnosed by external characters such as scale counts and shapes, but also osteological and molecular traits. While these descriptions are highly technical with numerous specialized terms, species descriptions have become harder to decipher with the use of abbreviations. Although they help to shorten texts, they do not necessarily make them easier to understand. Some of these abbreviations are common enough that most readers will understand them, such as SVL (snout-vent length) but others are more ambiguous, such as TL (usually meaning total length, but sometimes tail length). In fact, there are numerous abbreviations and acronyms that are not only synonymous but also use different definitions, hence there is a need to bring some order into the growing chaos of abbreviations and technical terms.

Surprisingly, none of the herpetological dictionaries we consulted (Peters 1964, Lillywhite 2008) mentions more than a handful of abbreviations and Peters 1964 does not even mention SVL, hence there seems to be no reference yet for this kind of information.

The purpose of this paper is thus to create a dictionary of abbreviations and the corresponding terms used to describe reptiles, as well as their definitions and synonymies. We hope that such a list will help to standardize species descriptions. The dictionary should also be useful for automated and computational analysis (text-mining) of species descriptions, including tables and figure legends. However, given the numerous problems discussed below, more work is needed to allow reliable and automated text analysis.

We did not attempt to compile a comprehensive list of morphological terms which would be an equally important goal but that was outside the scope of this analysis. In fact, countless terms used in species descriptions may have not been abbreviated but this can change any day. For instance, the "height of the longest dorsal crest scale" could easily be shortened to HLDCS but this has not been done to our knowledge, hence we removed terms from our list for which we have not found any abbreviations in the literature. We have also refrained from creating new abbreviations as these should be created by community decisions (see discussion below).

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Materials and methods

Data sources. We initially selected 50 recently published papers that described a total of 62 species and subspecies, representing 42 lizards and 20 snakes (**Table 1, Supplementary Table S1**). While the ratio of lizards to snakes (~1.9) roughly represents the total of all reptile species (~2.1), geckos are roughly 2-fold over-represented with a total of 25 species, reflecting the large number of recently described gecko species. The other species include 10 colubrids and members of the families Viperidae (7 species + subspecies), Lacertidae (5), Agamidae (4), Alopoglossidae (4), Liolaemidae (2), Gymnophthalmidae (2), Pareidae (1), Scincidae (1), and Xenodermidae (1). While the distribution across families is not representative of all reptiles, it did allow us to test the hypothesis that characters within a family (e.g. Gekkonidae) are consistently used.

Abbreviations. Terms and abbreviations were extracted from the cited papers (Supplementary **Table S1**) as provided and then converted into an excel file (**Table 2** and **Supplementary Table S2**). Typically, authors used in-text explanations, e.g. as in Wang *et al*. 2020:225 (our bold, not in original):

"snout–vent length (**SVL**); tail length (**TAL**); head width (**HW**); head length (**HL**); head depth (**HD**); snout–eye length (**SEL**); length of tallest nuchal crest (**TNC**); fore-limb length (FLL); hind limb length (**HLL**); Toe IV length (**T4L**); trunk length (**TRL**); supralabial count (**SL**); infralabial count (**IL**); number of scales between nasal and first supralabials (**NSL**); number of scale rows between supralabials and orbit circle (**SOR**); enlarged, modified, post-occipital scale count (**POS**); enlarged, modified, post-tympanic scale count (**PTY**); enlarged, modified, post-rictal scale count (**PRS**); Finger IV subdigital lamellae count (**F4S**); Toe IV subdigital lamellae count (**T4S**); middorsal scale count (**MD**); and keel status of ventral body scales (**KVS**)."

Some authors, like Wang *et al*. 2020, refer to previous publications for more detailed definitions, but many do not. We did not attempt to track down all definitions from previous publications. Converting texts to lists helped us to consolidate all terms and their associated abbreviations and definitions.

After extracting abbreviations from papers, we screened species descriptions in the Reptile Database (http://www.reptile-database.org, July 22, 2022 release) for uppercase strings using a custom Python script, manually inspecting them and removing all cases that were not abbreviations of morphological terms (e.g. uppercase author names, such as WANG). This screen yielded 221 additional abbreviations, resulting in a total of 1,223 abbreviations (**Supplementary Table S2**).

Searching species descriptions for abbreviations. In order to find all descriptions that abbreviated morphological characters, we ran a script that iterates over all species in the reptile database looking for all unique original abbreviations in **Supplementary Table S2** in the tokenized description text. Tokenization was done with the python package NLTK (https://www.nltk.org), initially in a case-insensitive way. Subsequently we used case sensitive searches in cases that were manually identified, (e.g. when abbreviations were also used as regular English words such as 'IS' and 'SO'). Uppercase strings are almost always abbreviations in species descriptions but would have produced large numbers of false positives as lower-case strings. Diagnosis texts (or text parts) that are marked as genus definition were ignored in this process. We manually classified these abbreviations into categories (**Table 2**).

Synonyms and homonyms. Abbreviations were manually inspected for synonymous and homonymous abbreviations, and then converted to a standardized list of abbreviations. See results and **Tables 3** and **4** for examples.

Family statistics. Based on the output from above, we counted all abbreviations across species and their respective families as used in the Reptile Database, to see if and which abbreviations were preferentially used in certain taxonomic groups. The results from this analysis are summarized in **Tables 5** and **6**.

Results

Initially, we extracted abbreviations from 50 papers describing new species (**Table 1**). Furthermore, we screened all species descriptions in the Reptile Database for additional abbreviations, resulting in a total of 1,223 (redundant) abbreviations, ranging from "A" (for *anal plates*) to "XY" (for *dorsal scales from hind margin of tympanum to insertion of hind legs*). Overall, the 1,223 abbreviations represent 344 non-redundant traits. Some examples are discussed below. For a complete list see **Supplementary Table S2**.

Use of abbreviations over time. Our initial attention to abbreviations was drawn by the species descriptions in the Reptile Database, 3,189 of which used at least one abbreviation. This corresponds to about 45% of all species with descriptions and to 27% of all 11,820 species. Notably, the use of abbreviations has markedly increased over the past decades (**Fig. 1**). That is, both the number of species descriptions and the total number of abbreviations used has increased steadily over the past decades (**Fig. 1**).

TABLE 1. The 50 source papers used to extract abbreviations of morphological terms. Entries are sorted by species name. See text for details. An extended version with complete citations is provided in **Supplementary Table S1**.

Source paper	Species described	Source paper	Species described
Wagner *et al*. 2021	*Acanthocercus margaritae*	Chandramouli *et al*. 2021	*Gekko stoliczkai*
Kurnaz & Şahin 2021	*Acanthodactylus ilgazi*	Shi *et al*. 2021	*Gloydius lipipengi, G. swild*
Li *et al*. 2021	*Achalinus dehuaensis*	Harvey *et al*. 2021	*Gonocephalus pyrius*
Lam *et al*. 2021	*Ahaetulla rufusoculara*	Liu *et al*. 2021	*Gonyosoma coeruleum*
Ribeiro-Júnior *et al*. 2021	*Alopoglossus gansorum, A. indigenorum, A. tapajosensis*	Peng *et al*. 2021	*Gonyosoma hainanense*
Ribeiro-Júnior *et al*. 2020	*Alopoglossus theodorusi*	Lobón-Rovira *et al*. 2021	*Hemidactylus carivoensis, H. cinganji, H. faustus, H. pfindaensis*
Ganesh *et al*. 2021	*Boiga whitakeri*	Amarasinghe *et al*. 2021	*Hemidactylus kimbulae*
Weinell *et al*. 2021	*Calamaria alcalai*	Khandekar *et al*. 2021	*Hemidactylus tamhiniensis*
Lee 2021	*Calamaria nebulosa*	Do *et al*. 2021	*Hemiphyllodactylus dalatensis*
Karunarathna *et al*. 2020	*Ceratophora ukuwelai*	Khandekar *et al*. 2021	*Hemiphyllodactylus goaensis*
Hamdan & Fernandes 2015	*Chironius brazili*	Agung *et al*. 2021	*Hemiphyllodactylus zhutangxiangensis*
Agarwal *et al*. 2021	*Cnemaspis krishnagiriensis*	Fernández *et al*. 2021	*Liolaemus brizuelai*
Khandekar *et al*. 2021	*Cnemaspis uttaraghati*	Ubalde-Mamani *et al*. 2021	*Liolaemus warjantay*
Kamei & Mahony 2021	*Cyrtodactylus bapme*	Pizzigalli *et al*. 2021	*Mesalina adrarensis, M. simoni saharae*
Liu & Rao 2021	*Cyrtodactylus dianxiensis*	Amarasinghe *et al*. 2021	*Oligodon tolaki*
Liu *et al*. 2021	*Cyrtodactylus gulinqingensis*	Barr *et al*. 2021	*Oligosoma kakerakau*
Riyanto *et al*. 2021	*Cyrtodactylus hamidyi*	Patel & Vyas 2020	*Ophisops agarwali*
Zhang *et al*. 2021	*Cyrtodactylus hekouensis*	Le *et al*. 2021	*Pareas temporalis*
Purkayastha *et al*. 2021	*Cyrtodactylus karsticolus, C. aaronbaueri, C. agarwali, C. bengkhuaiai*	Parrinha *et al*. 2021	*Pedioplanis serodioi*
Do *et al*. 2021	*Cyrtodactylus orlovi*	Torres-Carvajal *et al*. 2021	*Selvasaura almendarizae*
Edwards & Melville 2011	*Diporiphora phaeospinosa*	Echevarría *et al*. 2021	*Selvasaura evasa*
Pauwels *et al*. 2021	*Dixonius mekongensis*	Trevine *et al*. 2021	*Thamnodynastes silvai*
Nguyen *et al*. 2021	*Dixonius somchanhae*	Chandramouli *et al*. 2020	*Trimeresurus davidi*
Qi *et al*. 2021	*Elaphe xiphodonta*	Sumontha *et al*. 2021	*Trimeresurus kuiburi*
Meesook *et al*. 2021	*Gekko pradapdao*	Martínez-Freiría *et al*. 2021	*Vipera latastei arundana, V. monticola atlantica, V. m. saintgironsi*

Classification of terms and abbreviations. The abbreviations used in species descriptions can be broadly classified into 5 categories (**Table 2**). The most commonly used are meristic characters such as scale counts (46%) and measurements such as distances (30%), such as SVL. The remainder describe presence/absence states, colors or

ratios. For instance, certain skink genera have species with limbs absent or present. Ratios are also used relatively frequently, e.g. the ratio between SVL and tail length or tail length as fraction of total length (TaL/TL). Colors are a special case as they are much harder to quantify, given their subjective nature, especially when combined with patterns. For instance, colored blotches are present in numerous species but they are rarely quantified as either size, area, or number. While there are standardized color references (e.g. Köhler 2012) they appear to be rarely used in the literature and they will be difficult to use with photographs as these often have their own coloration artifacts.

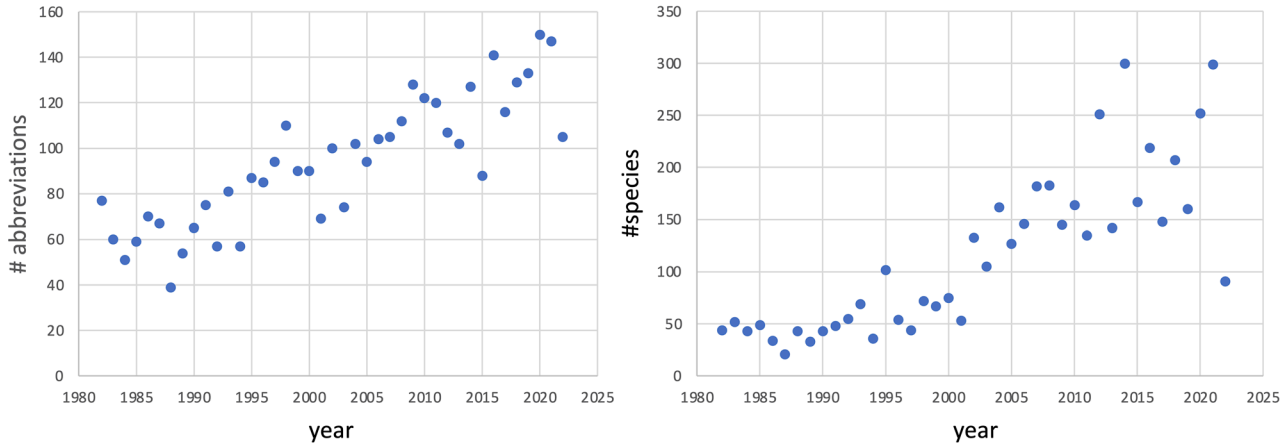

FIGURE 1. The use of abbreviations in reptile species descriptions has increased steadily. (A) The total number of abbreviations used in species descriptions described in a given year. (B) The number of species that use abbreviations in species descriptions since 1982. In (B) year indicates the year when the *description* used in our analysis was published, *not* the year when a species was formally described. Note that the last data points in A and B represent only 7 months of the year 2022.

TABLE 2. Classification of terms and abbreviations. Frequencies are numbers from Supplementary Table S2. Some characters can be interpreted as meristic or as "presence/absence", e.g. if a scale is present it could be counted as 1 or as 0 when absent. The difference to 100% are uncategorized and ambiguous terms.

Category	frequency	Example
Meristic (counts)	148 (36.5%)	Number of ventral scales (snakes)
Distances	98 (30.8%)	Snout-vent-length (SVL)
Absence/presence	41 (12.9%)	Keels on dorsal scales (KDS)
Ratios and formulas	12 (3.8%)	Relative tail length (TaL/TL)
Colors	10 (3.1%)	Dorso-lateral body color (DLC)
Degree	3 (0.9%)	Strength of gular fold ("strong", "weak", "medium")

Synonyms. Our list contains many terms that have been abbreviated in multiple ways and thus are often synonymous. For instance, *axilla-groin-distance* has been abbreviated as AGD, but also as AG or TrunkL or TRL (for *trunk length*, **Fig. 2**). Overall, among the 1,223 abbreviations, about 49% (597) were unique, hence each abbreviation had on average one synonym. For some examples see **Table 3** and for a complete list see **Supplementary Table S2**.

A major challenge was to map synonymous abbreviations to each other, given that each abbreviation (and thus character) may have slightly different definitions. Often characters are not sufficiently defined in papers hence there are cases in which it was uncertain if they exactly correspond to each other. For example, trunk length is not only abbreviated by different terms but also slightly differently defined in different studies (**Table 3**).

Homonyms. While synonyms refer to the same character, homonyms are terms that mean different things. For instance, the trunk in lizards can be measured in multiple different ways, hence "trunk length" is not always the same thing. While most authors measure trunk length as *axilla-groin-distance* (AGD), some define it as the length from the anterior edge of the cloaca to the collar, especially in lizards that have a collar (e.g., in *Pedioplanis* as exemplified by Parrinha *et al*. 2021, **Fig. 2**). In many cases, the same abbreviation means completely different things, such as AL which can stand for "anal plate length" or "body width". See **Table 4** for a list of such cases and their sources.

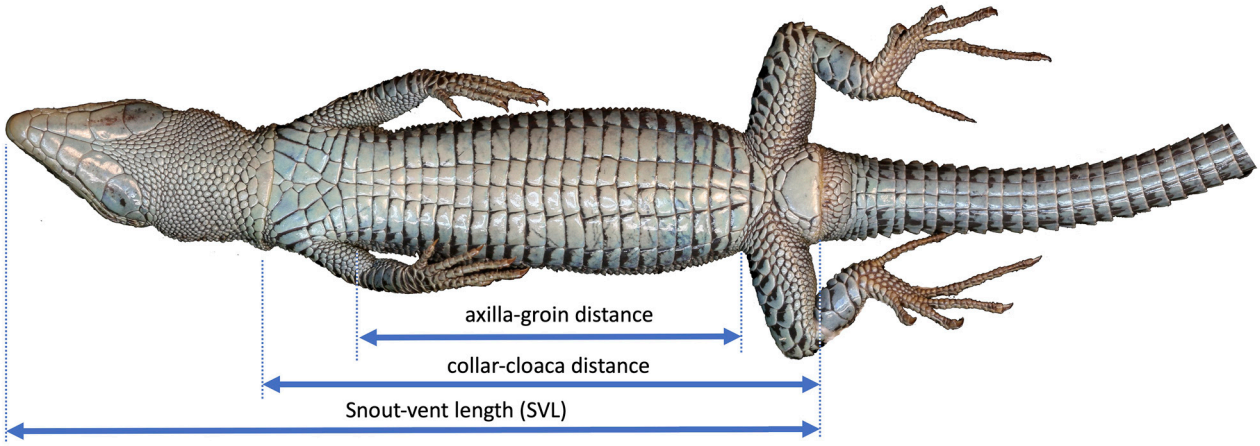

FIGURE 2. Synonyms and homonyms in traits, e.g., *body length* vs *trunk length*. There are different ways to define and measure the body or trunk length in lizards, e.g., as the distance from axilla to groin, or from collar to cloaca, or as SVL, but other definitions have been used as well. At least 7 different synonyms and homonyms have been used for trunk length (AG, AGD, AGL, BL [body length], TrunkL, TL, TRL, see **Table 3**). The species shown here is *Dinarolacerta mosorensis* (ZSM 362/1976). See text for details.

TABLE 3. Synonymous abbreviations and their definitions (examples only). The original abbreviation was used in a publication, the "standard" is our suggested standardization. For a complete list see **Supplementary Table S2** which also lists sources for all abbreviations and definitions.

original	standard	Term	Definition
TrunkL TRL AG AGD	AGD	trunk length / axilla–groin length	taken from the posterior margin of the forelimb at its insertion point on the body to the anterior margin of the hind limb at its insertion point on the body
BL	BL	body length	from the anterior edge of the cloaca to the collar (alternative definition of trunk length)
Atem aTMP ATP	ATEM	anterior temporals	number of anterior temporals
CL CrusL T TBL TFL TibL	CL	crus length	length of the tibia (+ fibula), from base of heel to knee; often measured on the ventral surface from posterior surface of knee while flexed at 90° to base of the heel

Examples like this abound. We only mention two more examples: first, the length of the lower leg, also called *crus length* (CL), is often called *tibia length* (TBL, TibL etc.) although the tibia is technically only one of the two bones in the lower leg, the other being the fibula. Hence, some authors call the measure *tibia-fibula length* (TFL). Obviously, the tibia may have a slightly different length than the fibula (especially common in birds, Alberch *et al*. 2016) and the bones may have a different length than the lower leg altogether. We did not intend to make a decision which one is the "correct" or "best" definition but we want to point out these issues and simply provide the lists of definitions as provided by authors in **Supplementary Table S2**. A last example is the diameter of the ear which most authors define as the maximum diameter of the ear. However, some authors define ear size as the horizontal diameter while others as vertical diameter (Meesook *et al*. 2021, Wagner *et al*. 2021). Either way may measure the maximum distance in the taxa studied (here certain geckos in *Dixonius* vs. agamas in *Acanthocercus*) but it may be different in other species or genera.

TABLE 4. Homonyms (the same abbreviation meaning different traits). **Original** indicates the abbreviation suggested by authors as cited. **Standard** is our suggested revised abbreviation. **Description** is the definition in the cited source. **Asterisks** indicate abbreviations that need further definitions, possibly split into multiple abbreviations.

Original	Standard	Description	Source	Genus	Family
AL	APL	Anal plate length	Kurnaz *et al*. 2021	*Acanthodactylus*	Lacertidae
AL	BW	body width	Ubalde *et al*. 2021	*Liolaemus*	Liolaemidae
D	D*	Dorsal scale numbers, counted longitudinally from shoulders to posterior margin of hind limbs	Wagner *et al*. 2021	*Acanthocercus*	Agamidae
D	DSR	dorsal scales, counted around midbody	Pizzigalli *et al*. 2021	*Mesalina*	Lacertidae
DS	D*	dorsal scales between occiput and thighs region	Fernández *et al*. 2021	*Liolaemus*	Liolaemidae
DS	DS	Dorsal scales homogeneous or heterogeneous	Wagner *et al*. 2021	*Acanthocercus*	Agamidae
EL	ED	eye length (maximum vertical eye length)	Peng *et al*. 2021	*Gonyosoma*	Colubridae
EL	ESLEL	Number of enlarged scales on the lower eyelid	Pizzigalli *et al*. 2022	*Mesalina*	Lacertidae
FL	FEL	Femur length	Wagner *et al*. 2021	*Acanthocercus*	Agamidae
FL	FLL	forearm length	Agarwal *et al*. 2021	*Cnemaspis*	Gekkonidae
FL	FOL	foot length from the tip of four toe to ankle	Fernández *et al*. 2022	*Liolaemus*	Liolaemidae
HeL	FOL*	Heel to second largest toe	Bahuguna *et al*. 2015	*Sitana*	Agamidae
HEL	HEEL	heel length from wrist to tip of fourth finger	Karunarathna *et al*. 2020	*Ceratophora*	Agamidae
INS	IN	internasal space (distance between nostrils)	Shi *et al*. 2021	*Gloydius*	Viperidae
InS	INSU	infranasal suture length	Kaiser *et al*. 2019	*Stegonotus*	Colubridae
MSR	DSR	midbody dorsal scale rows	Lam *et al*. 2021	*Ahaetulla*	Colubridae
MSRs	MSR	scale rows around midbody	Okamoto & Hikida 2012	*Plestiodon*	Scincidae
PP	APP	apical pits at posterior region of the body	Hamdan *et al*. 2015	*Chironius*	Colubridae
PP	FP	numbers of continuous precloacal-femoral pores	Zhang *et al*. 2021	*Cyrtodactylus*	Gekkonidae
PP	PCP	precloacal pores	Agarwal *et al*. 2021	*Cnemaspis*	Gekkonidae

Usage of abbreviations. We wondered how many species descriptions actually use abbreviations and whether there is any pattern with regard to taxonomy or other factors. For this purpose, we searched all descriptions available in the Reptile Database (see methods for details). Out of a total of 7,328 descriptions, 3,189 used at least one of the abbreviations listed in our dictionary, although there is some margin of error that accounts for ambiguities or abbreviations used in other contexts. For instance, we tried to remove all uppercase strings that are included in author names or museum collections such SL (supralabial scale) that is a substring or NMSL (the National Museum of Sri Lanka). The problem becomes even more pronounced as some abbreviations are real words in English, such as IN (often used for *internarial distance*) although we considered only strings with at least 2 uppercase characters.

Taxonomic differences. There are notable differences in terms of abbreviations used for different taxonomic groups (**Table 5**). For instance, while almost all descriptions of diplodactlyid geckos use some abbreviations, only 36% of tropidurid iguanas use them. The time of descriptions certainly plays a role in this, but also the fact that some speciose families have so many descriptions that authors tend to use abbreviations more generously to keep their descriptions short, especially when multiple species are described in the same paper.

TABLE 5. Summary of species counts with descriptions and abbreviations. Only families with more than 100 species are shown. For a complete list see **Supplementary Table S3**. For instance, among the 557 agamid species, 400 (71.8%) had descriptions in the Reptile Database (Aug 2022 release), including a total of 1,153 abbreviations. 365 (91.3%) of these descriptions use abbreviations.

Family	species	**with descr.**	**Tot.abbr.**	**sp. w. abbr.**	**%sp descr.**	**%descr. w. abbr.**
Agamidae	557	400	1153	365	71.8	91.3
Amphisbaenidae	183	94	251	75	51.4	79.8
Chamaeleonidae	222	74	275	70	33.3	94.6
Colubridae	2066	1162	2348	882	56.2	75.9
Dactyloidae	437	277	782	266	63.4	96
Diplodactylidae	161	97	319	96	60.2	99
Elapidae	390	234	520	196	60	83.8
Gekkonidae	1505	1125	4394	1010	74.8	89.8
Gymnophthalmidae	278	188	629	165	67.6	87.8
Lacertidae	363	163	444	146	44.9	89.6
Leptotyphlopidae	141	100	198	93	70.9	93
Liolaemidae	338	192	726	164	56.8	85.4
Phrynosomatidae	171	86	252	77	50.3	89.5
Phyllodactylidae	160	98	256	76	61.3	77.6
Scincidae	1744	856	2537	770	49.1	90
Sphaerodactylidae	229	169	528	161	73.8	95.3
Teiidae	172	91	301	84	52.9	92.3
Tropiduridae	146	110	117	40	75.3	36.4
Typhlopidae	275	171	317	145	62.2	84.8
Viperidae	376	180	535	165	47.9	91.7

However, the usage of abbreviations is also determined by the use of characters. Most prominently, almost all descriptions of lizard species refer to the snout-vent-length (SVL) while this measure is much less used in snakes (where total length and tail length are much more common). We have summarized the most common abbreviations in **Table 6**, with a more comprehensive list of other common abbreviations in **Supplementary Table S4**.

Discussion

More than 200 reptile species are described every year (Uetz *et al*. 2022) which would extrapolate to more than 30,000 species per year across all phyla. Since the foundation of scientific taxonomy by Linné in 1758 more than 2 million species have been described (https://www.catalogueoflife.org). With increasing digitization of both species descriptions as well as specimen collections, the users of taxonomic information need FAIR data (*findable, accessible, interoperable*, and *reusable*, Matthews 2016). Although most scientific papers, including species descriptions, have been findable and accessible in digital formats, the data in them is rarely interoperable or reusable. To fulfill these latter criteria, data must be highly structured and standardized. This paper is a contribution to solving this challenge for species descriptions in herpetology. However, similar efforts are needed for other taxonomic groups.

Given that squamates are by far the largest group within (extant) reptiles, we have focused on this group and largely ignored turtles and crocodiles which make up only ~3% of all extant reptiles. However, most turtles and crocodiles have been described decades if not centuries ago when technical abbreviations were not common. Similarly, other small groups (such as oplurid iguanas) may have not needed many abbreviations, especially since most species have been described decades ago. Among the 92 families represented in the Reptile Database 31 have fewer than 10 species. Some of these underrepresented groups may not need their own terminology but many of the families of medium size will be worth considering in future lists.

TABLE 6. Commonly used abbreviations in the largest families (>100 species). Only abbreviations with 2 or more letters are listed. For instance, among the 557 species of Agamidae, 400 have a description of which 146 use **SVL** (snout-vent-length) etc. **DO** = usually dorsal scale rows (suggested standard: DSR), **VS** = ventral scales, **EN** = usually eye-to-nostril distance, **SE** = usually snout-to-eye distance (suggested: ESD). Note that all given abbreviations were counted, without individually verifying what they mean. For a complete table with all families and abbreviations see **Supplementary Table S4**.

Family	Species	Descriptions	SVL	DO	VS	EN	SE
Agamidae	557	400	146	9	13	2	3
Amphisbaenidae	183	94	22	3	0	0	1
Chamaeleonidae	222	74	40	5	9	3	0
Colubridae	2066	1162	203	39	19	17	17
Dactyloidae	437	277	222	5	3	1	1
Diplodactylidae	161	97	69	5	4	0	0
Elapidae	390	234	26	14	4	2	4
Gekkonidae	1505	1125	716	71	46	5	4
Gymnophthalmidae	278	188	65	10	6	4	4
Lacertidae	363	163	34	1	2	1	0
Leptotyphlopidae	141	100	5	0	4	3	2
Liolaemidae	338	192	87	22	31	28	23
Phrynosomatidae	171	86	15	3	1	0	0
Phyllodactylidae	160	98	33	8	3	2	0
Scincidae	1744	856	404	24	68	5	2
Sphaerodactylidae	229	169	116	10	2	2	0
Teiidae	172	91	53	4	1	2	0
Tropiduridae	146	110	15	5	0	0	0
Typhlopidae	275	171	5	2	8	3	2
Viperidae	376	180	22	9	6	3	3

Recommendations and call for action

Given the non-standard nature of many abbreviations, we currently recommend not to use them in species diagnoses or original descriptions although they may be useful in descriptions of additional specimens and in tables. Their use can severely impair re-use and automated analysis of descriptions. Even when abbreviations are defined elsewhere in a paper, this will likely be an unsurmountable roadblock for text-mining tools for the foreseeable future.

This study is a first attempt to get an understanding of how abbreviations are used in reptile species descriptions. However, it only scratches the surface. There are certainly hundreds of additional abbreviations in the literature. We invite the herpetological community to help add and complete our list of abbreviations and, more importantly, standardize them. It may be worthwhile to create a committee to standardize not only abbreviations but also morphological terms, ideally for each taxonomic group, but we are certainly aware of the organizational complexity of such an undertaking.

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SUPPLEMENTARY INFORMATION

TABLE S1. All source papers and species described therein

TABLE S2. All abbreviations and definitions and their sources

TABLE S3. Species counts across families with descriptions and abbreviations (expanded Table 5).

TABLE S4. All abbreviations across families (expanded Table 6)