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## 28\*. CLASSIFICATION OF REEF FISH: NOMENCLATURE AND KEYS

### Background:

Butterflyfish are popular tropical reef fish. But there are more than a dozen species of butterflyfish. Common names are not adequate for identifying fish species for several reasons:

1. Different common names are often used for a single species. In English, for example, the fish pictured below is called a raccoon butterflyfish in Hawaii, a cross butterflyfish in other parts of Polynesia, and a red-striped butterflyfish in Melanesia.
2. A common name may refer to several similar but different species. In Hawaiian, for example, only two common names, *kikakapu* and *lauhau*, are used for the 15 species of butterflyfish listed in Table 2 and shown in Figure 1.
3. Common names sometimes contain misleading descriptive words. For example, starfish, jellyfish, and crayfish are not fish.

### Binomial Nomenclature

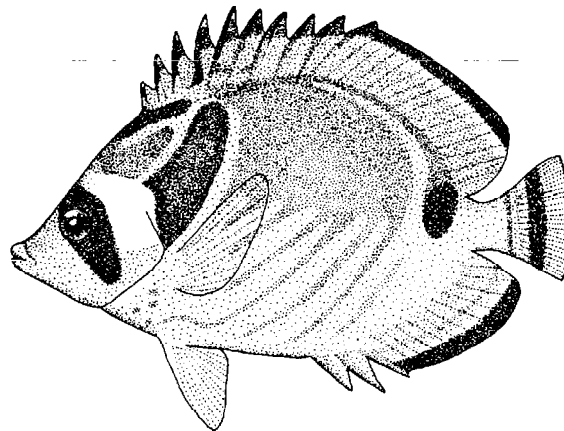
Scientists around the world, no matter what their language, use a two-name or **binomial** system for naming organisms.

**Scientific names** usually combine word parts from Latin (L) or Greek (G). Table 1 shows Latin and Greek word parts used in naming the butterflyfish. A scientific name includes the names of both the genus and the species. For example, the scientific name of the raccoon butterflyfish is *Chaetodon lunula*. The genus name comes before the species name. In writing, both names are either underlined or printed in italics (slanting type). The first letter of the genus name is always capitalized. If the genus has already been mentioned, its scientific name may be abbreviated: *C. Lunula*.

### Identification Keys

Over 2 million species of organisms have been named

- A. Common names  
 In Hawaii: raccoon butterflyfish  
 In Polynesia: cross butterflyfish  
 In Melanesia: red-striped butterflyfish



### B. Using biological classification

Category	Key characteristic	Meaning
Kingdom	Animalia	= animal
Phylum	Chordata	= has a notochord (a supporting bony rod)
Subphylum	Vertebrata	= has a vertebral column (a "backbone")
Class	Osteichthyes	= fish with a bony skeleton
Order	Perciformes	= shaped like a perch
Family	Chaetodontidae	= teeth shaped like bristles
Genus	<i>Chaetodon</i>	= bristle teeth
Species	<i>lunula</i>	= shaped like a moon

- C. Scientific name: *Chaetodon lunula*  
 Abbreviated scientific name: *C. lunula*

by scientists; probably millions more are still unnamed. To distinguish species, biologists make keys using easily identifiable features. A biological key is a series of decisions for identifying a species by its features.

In a **word key**, each number on the left identifies a decision point related to a pair of descriptive statements. The user selects a decision point, then looks at the number on the right (at the end of the sentence) that tells where to find the next level of descriptions. A number in parentheses shows the previous decision point, the one that led to this point in the key.

**Activity:** Use a word classification key to identify several species of butterflyfish.

**Materials:**  
 copy of Table 2 and Fig. 1  
 scissors  
 optional (glue and sheet of construction paper)

**Procedure:**

1. (Optional) Cut out the fish cards from Fig 1.
2. Select the butterflyfish M. Using the word key in Table 2, key out butterflyfish M by following these steps:
  - a. Starting at decision point 1, read the two statements describing a feature of butterflyfish.
  - b. Decide which statement fits the picture of fish M. (The description “Pelvic fin dark” is the correct description for fish M.)
  - c. Note the number to the right side of this statement. It is 2.
  - d. Go to decision point 2. Read the two descriptions. Decide which statement better describes fish M. (The second statement “Lacks two large white spots below dorsal fin,” is the correct choice.)
  - e. Find the number in the right-hand column for the statement you chose. Go to the decision point with that number at the left.
  - f. Again select the proper description. (Of the two choices there, “Tail with one dark bar at tip” is the correct choice.) This description identifies the organism, and its name appears: *Chaetodon kleini*.
  - g. Record the name of your fish below its picture in Figure 1 (Because all fish in Fig. 1 are in the genus *Chaetodon*, the name of the genus may be abbreviated as *C* and *Chaetodon kleini* may be identified as *C. kleini*.)
3. Identify all the butterflyfish in Figure 1.
  - a. Read the two descriptions at each decision point, then select the description that matches the fish.
  - b. When you identify a fish, write its scientific name under its picture. Continue until you identify all the fish.
  - c. If you are using cards, remove each card from the deck when you identify the fish on it.

**Table 1.** Some Latin (L) and Greek (G) word parts

<i>Word part and its meaning</i>	
<b>auri-</b> (L). Gold, golden	<b>lineo</b> (L). A line
<b>bi-</b> (L). Two	<b>lun-</b> (L). The moon
<b>chaet</b> (G). Bristle	<b>macula</b> (L). Spot, spotted
<b>cinct</b> (L). Girdled	<b>miliar</b> (L). Millet (a grass) seed
<b>citrin</b> (G). A lemon	<b>multi-</b> (L). Many
<b>-ellus</b> (L). Small	<b>-odon</b> (G). Tooth
<b>ephippi</b> (G). A saddle	<b>ornat</b> (L). Adorned
<b>fasciat</b> (L). Banded	<b>quadri-</b> (L). Four
<b>frem</b> (L). Roar, murmur	<b>reticul</b> (L). A network
<b>-latus</b> (L). Side, broad, wide	<b>tri-</b> (L). Three

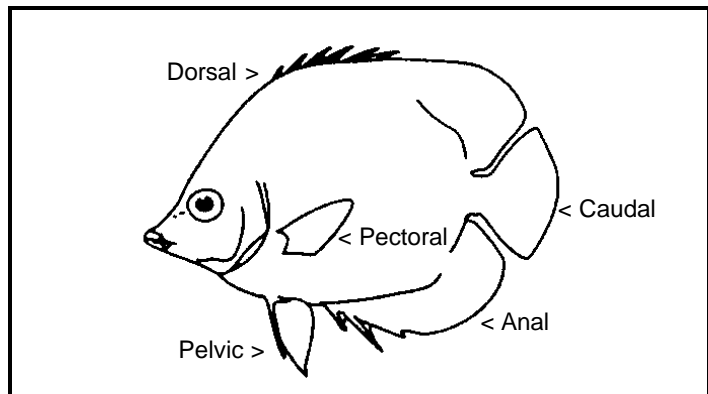
**Questions:**

4. What kind of feature should be used to construct a key for a group of animals or plants?
5. How might biological keys handle the problem of a species of fish that has different color patterns in juvenile and adult stages?
6. Color and markings are usually poor characteristics to use in identification keys. Why?

<i>Decision Point</i>	<i>Choices</i>	<i>Decision</i>
1	Pelvic fin dark Pelvic fin light	2 4
2	(1) Two large white spots below dorsal fin Lacks two large white spots below dorsal fin	<i>C. quadrimaculatus</i> 3
3	(2) Tail with two dark bars at tip Tail with one dark bar at tip	<i>C. reticulatus</i> <i>C. kleini</i>
4	(1) Posterior or dorsal fin has long filament extension Filament extension lacking from dorsal fin	5 6
5	(4) Large dark spot on body near filament Small dark spot on body near filament	<i>C. ephippium</i> <i>C. auriga</i>
6	(4) No vertical band through eye Vertical band through eye	<i>C. fremblii</i> 7
7	(6) Incomplete eyeband on face (does not go to top of head) Complete eyeband on face (extends to top of head)	<i>C. multicinctus</i> 8
8	(7) Nose area with band Nose area lacks band	9 10
9	(8) Fewer than eight diagonal bands on body More than eight diagonal bands on body	<i>C. ornatissimus</i> <i>C. trifasciatus</i>
10	(8) Distinct white spot splits eyeband above eye No white spot above eye; eyeband not split	<i>C. lineolatus</i> 11
11	(10) Upper third of body under dorsal fin dark Upper third of body under dorsal fin not dark	<i>C. tinkeri</i> 12
12	(11) Distinct small spots arranged in rows No distinct small spots; body has large spot or band	13 14
13	(12) No black band on caudal fin Obvious black band on caudal peduncle	<i>C. citrinellus</i> <i>C. miliaris</i>
14	(12) Side with a large black teardrop; no dark bars on tail Large black shoulder patch; tail with dark bars	<i>C. unimaculatus</i> <i>C. lunula</i>

**Table 2.** Word key to the butterfly fish of the genus *Chaetodon*.

**Table 3.** Fish fins.



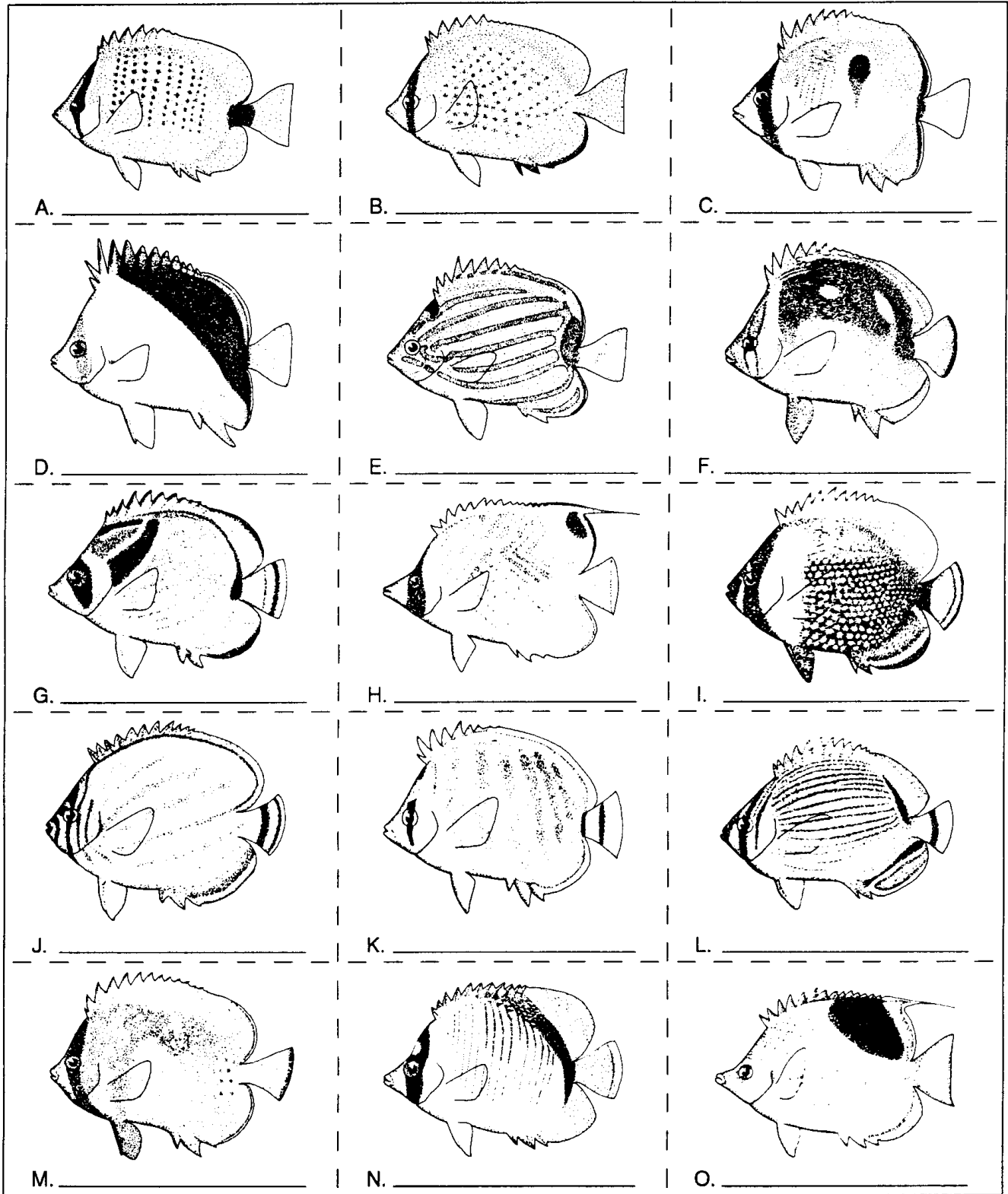


Figure 1. Butterfly fish

**Correlation to National Standards from McREL ( <http://www.mcrel.org> ) :**

Life Sciences

5. Understands the structure and function of cells and organisms
7. Understands biological evolution and the diversity of life