

BIO 366 Ecology Lab: Library Session

Part Two: Accessing Scientific Literature

Objectives:

1. To understand that many indexes (i.e. databases) are available and that each has a limited scope based on several factors including subject, publication types, time period, and intended audience;
2. To understand basic concepts of searching, including database structure, access points, word proximity, truncation, and Boolean logic;
3. To perform searches for needed information efficiently and effectively.

Introduction:

As you begin researching a topic, you may not be aware of any published material on your topic. And with multiple systems for accessing information, knowing where to begin can be a difficult and overwhelming task; particularly if one is not an expert or familiar with a specific area of study. Knowing what sources are available for finding this information and how to search these sources is a critical function of a well-trained scientist.

For this portion of the lab we will identify several leading databases that index scientific literature. We will also discuss basic concepts of database structure and search techniques to understand how to efficiently access the literature in the databases. Specifically, we will practice searching one of these databases, **Biological Abstracts**, a standard index to the literature of biology.

INDEX FORMATS

Indexes to scientific literature have been available for decades. In the late 1960s and early 1970s, publishers of these indexes began using computer technology to compile and produce printed indexes. Once the data was compiled in digital form, it could be made accessible in new formats: first through remote online access to a host computer storing many databases, then on CD-ROM (Compact Disc-Read Only Memory), and most recently, over the Internet. Search software has been developed by companies such as Cambridge Scientific Abstracts, SilverPlatter, Ebsco, and many others.

Once trained in using databases, researchers generally prefer them over their printed counterparts for several reasons. There are, however, a few disadvantages to using them as well. Both advantages and disadvantages are listed below.

Advantages of Databases versus Print Indexes:

- **Multi-year cumulations:** most databases allow the user to search the entire range of indexed years in one file.
- **Speed:** computers can search thousands of records in a matter of seconds.
- **Access points:** print indexes provide limited access points, such as author and subject. Databases allow the user to search for any word or phrase in a record.
- **Flexibility:** you can link several concepts together to increase the relevance of results. By specifying the proximity of words, the user can broaden/narrow the search results. Additional search features such as truncation and field-specific searching can be used to easily retrieve relevant records on a user's topic. These features will be discussed in further detail on the following pages.

Disadvantages of Databases versus Print Indexes:

- **Time period covered:** since most index producers began using computers in the 1970s, most databases are limited to publications published since that time. In many cases, searching for information published prior to the 1970s still requires the use of printed indexes although some database producers are beginning to retrospectively index materials published before the 1970s.
- **Search interface:** there are many variations in how database producers present information on the computer. While their search functions are similar, users will need to familiarize themselves with the structure and layout of each database's interface in order to search it efficiently.
- **Intolerance for error:** databases are intolerant of typographical errors. Any mistake by the user from simple misspelling to incorrect commands can prevent them from retrieving information they need.

DATABASE SCOPE

As scientists begin any research project, they will often perform a review search of the literature to see if and what has been discussed relating to their project. Frequently, scientists will have a need to be as comprehensive as possible in their search for relevant literature; however, no single database will typically fulfill that need due to limits that are placed on what is indexed. These limits, or **scope** (range of coverage), are usually based upon the following criteria:

- **Subject:** *Biological Abstracts* covers all aspects of biology, while *Zoological Record*, as its title implies, includes references relating to animals only. Plant references are included, but only in their relationship to animals. *Aquatic Sciences and Fisheries Abstracts (ASFA)* focuses solely on the aquatic environments.
- **Publication types indexed:** *Biological Abstracts* only indexes journal articles. *Zoological Record* and *Aquatic Sciences and Fisheries Abstracts* both index journal articles, books, technical reports, and conference proceedings.
- **Time Period:** Most databases only index a limited period of time. For example, while *Biological Abstracts* has been published since 1926, the database only indexes 1969-present. *Zoological Record* has been published since 1864, but the database version only indexes 1978-present. In cases where one might need to search for literature published prior to 1969 or 1978, one would need to use the print equivalents of these two resources.
- **Audience:** *Biological Abstracts*, *Zoological Record*, and *Aquatic Sciences and Fisheries Abstracts* are all intended for scientific audiences. Conversely, *EBSCOHost MasterFILE Premier* includes a higher percentage of articles intended for laypersons and a small percentage of articles for scientific audiences.

After a database or index producer determines limits on its scope of coverage, it also decides which journals or other types of publications will be indexed. *Biological Abstracts* indexes approximately 6,500 journal titles while *Zoological Record* indexes over 6,000 journal titles and approximately 1,500 other types of publications each year. *Aquatic Sciences and Fisheries Abstracts* indexes nearly 5,500 journal titles in the aquatic environments along with books, reports, conference proceedings, translations and limited distribution literature. Below is a list of databases that are leading resources for access to the biological literature.

LEADING DATABASES in the BIOLOGICAL SCIENCES

The following databases are leading indexing resources in the biological sciences. Please note that each of these is a **stand alone** bibliographic database. This means that each will identify citations to literature based on the terms that are entered in a search. They will not necessarily provide the full-text of the articles indexed in the database; nor does it mean that the library at your university or institution has access to the article being referenced. In these cases, you will need to search the library catalog of your home institution to determine if your library provides access to the article referenced in the database.

- **Agricola** – developed by the National Agricultural Library of the U.S. Department of Agriculture (USDA), the Agricola database is the most comprehensive database to citations of journal articles, theses, patents, software and technical reports on all aspects of agriculture and allied disciplines, including plant and animal sciences, forestry, entomology, soil and water resources, and food and nutrition. (Years covered: 1979-present).
- **Aquatic Sciences and Fisheries Abstracts (ASFA)** – the ASFA database is the premier database for accessing literature on the science, technology & management of marine, freshwater, & brackish water environments & organisms. (Years covered: 1971-present).
- **Biological Abstracts (BA)** – indexing nearly 6,500 international journals, BA is the most comprehensive index for worldwide journal literature in the life sciences. Included are all aspects of biology, plant and animal science, ecology, and paleontology, and is the best source for biological topics that are not well covered by *PubMed*, such as field, experimental, evolutionary, and descriptive biology. Interdisciplinary fields such as pharmacology, biochemistry, biophysics and bioengineering are included as well. Unfortunately, BA only indexes journal articles. (Years Covered: 1969-Present; Print Coverage: 1926-1996).
- **Ecology Abstracts** – available as part of the Cambridge Scientific Abstracts system, Ecology Abstracts indexes journal articles, books & other sources on climate impact, conservation, ecosystems, erosion, food chains, habitats, land reclamation, pollution, soil, water resources, etc. The database is a leading source for information on the interactions between organisms and their environments (Years covered: 1982-Present).
- **Environmental Sciences & Pollution Management Database** – a multidisciplinary database that covers all areas of air, land, water, and noise pollution as well as basic science areas of bacteriology, ecology, toxicology, environmental engineering, environmental biotechnology, waste management, and water resources. More than 1,000 primary journal literature titles in major scientific languages are covered as well as trade literature, patents, conference proceedings, chapters in books, and reports. (Years covered: 1967-present).
- **GEOBASE** – multidisciplinary database indexing geography and geology, including cartography, hydrology, climatology, meteorology, energy, paleontology, ecology, environment, petrology, geochemistry, photogrammetry, geomorphology, sedimentology, geophysics and volcanology from 1980 to the present. The database contains over 600K references with abstracts from journals, books, monographs, conference proceedings, and reports.

- **GeoRef** – established by the American Geological Institute in 1966, provides access to the geoscience literature of the world. GeoRef is the most comprehensive database in the geosciences and covers the geology of North America from 1785 to the present and the geology of the rest of the world from 1933 to the present. The database contains over 2.6 million references to geoscience journal articles, books, maps, conference papers, reports and dissertations/theses along with references to all publications of the US Geological Survey
- **Oceanic Abstracts** – this database is focused exclusively on worldwide technical literature pertaining to the marine and brackish-water environment. Oceanic Abstracts has long been recognized as a leading source of information on topics relating to oceans and includes focal points on marine biology and physical oceanography, fisheries, aquaculture, non-living resources, meteorology and geology, plus environmental, technological, and legislative topics. Oceanic Abstracts is totally comprehensive in its coverage of living and non-living resources, meteorology and geology, plus environmental, technological, and legislative topics. Documents indexed include journal articles, monographs, technical reports, theses, letters, meeting abstracts, papers and reports. (Years covered: 1981-Present).
- **PubMed** – the PubMed database is a **FREE** database (<http://www.pubmed.gov>) developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine. PubMed is the most comprehensive biomedical research database. It provides access to more than 15 million articles in nearly 5,000 biomedical and life science journals published in the US and 70 foreign countries. PubMed also includes links to many sites providing full text articles and other related resources (Years covered: 1950s-Present).
- **SciFinder Scholar** – the proprietary online version of *Chemical Abstracts*, and includes 16 million abstracts of journal articles and patents extending back to 1907, and 22 million substance and 33 million sequence records of the CAS Registry. An interface for searching six integrated bibliographic, substance, and reaction databases, SciFinder Scholar can be searched by research topic, substance identifier, chemical structure, chemical reaction, and/or author's name. In addition to chemistry, it includes coverage in the areas of agricultural sciences, biology and life sciences, engineering sciences, food sciences, geological sciences, material sciences, medical sciences, physics, and polymer science.
- **Zoological Record (ZR)** – as the premier resource comprehensively indexing literature in zoology, ZR indexes every aspect of zoology including biochemistry, behavior, ecology, evolution, genetics, etc. ZR indexes over 4,500 international serials, and includes approximately 1,500 non-serial publications (i.e. professional journals, magazines, newsletters, monographs, books, reviews, and conference proceedings) related to a phylum or class of the animal kingdom. Information on plants is included, but only in relation to animals. ZR is published by BIOSIS and the Zoological Society of London. (Years Covered: 1978-Present; Print or Microform coverage: 1864-1994).
- **Web of Science** – The Web of Science provides seamless access to current and retrospective multidisciplinary information from approximately 8,700 of the most prestigious, high impact research journals in the world. Web of Science also provides a unique search method, cited reference searching. With it, users can navigate forward, backward, and through the literature, searching all disciplines and time spans to uncover all the information relevant to their research. Users can also navigate to electronic full-text journal articles.
 - a. Navigate backward in time using cited references to uncover the research that influenced an author's work;

- b. Navigate forward in time using Times Cited to discover the impact a paper or other published item has had on current research;
- c. Link to the full text of primary literature;
- d. Export records directly to leading bibliographic management programs: EndNote®, Reference Manager® and ProCite®;
- e. Access groundbreaking scientific journal articles from the entire twentieth century, through the Century of Science initiative;
- f. Use the Analyze tool to view an analysis of search results;
- g. See the number of and access shared references for each related record;
- h. Use term lists (dictionary) for author names, cited authors, cited work, and source title;
- i. Access all records retrieved by searches.

DATABASE STRUCTURE

After selecting a database appropriate for one's research needs, one should become familiar with the basic structure of the database. Many databases are rigid and complicated to use, so familiarizing oneself with each database's structure, will improve and enhance one's abilities to search the database.

- **Records** - For each publication (e.g., periodical article, book, book chapter, conference proceeding, dissertation, etc.) a **record** (or entry) is created in a standardized form so that the same type of information is provided for each publication.
- **Field** - A part (or element or category of data) of a record. For instance, each record will have an author field, a title field, and a publication date field. Depending upon the type of publication indexed, it will have appropriate fields for additional publication facts, such as journal title field (if it is a periodical article) or publisher and publisher's location (if it is a book). Index producers also create additional relevant fields, such as a corporate source or institution field (where the author works) or a genus species field (sometimes called the taxonomic field).
- **Abstracts** - A summary, usually no longer than a paragraph, describing the content of a publication. Those indexes which provide abstract fields are often referred to as "abstracting" services, or just "abstracts," such as *Biological Abstracts*.
- **Descriptors** - Also called **subject headings**, these are terms the index producer assigns to each record to indicate the *major subjects* covered by an article. Because these labels are added to records, the searcher is provided more subject access than just those words used in the title of the publication. A database search can also be limited to the descriptor field of a record, thereby increasing the relevance of the term. Since a limited number of descriptors are assigned to the record, the word or phrase must be an important concept to the publication's content. Most index producers compile a list of terms "authorized" for use as descriptors, **controlling the vocabulary** and minimizing the number of synonymous terms necessary for comprehensive searching.
- **Access Points** - Fields which are searchable become access points for retrieving a reference. For instance, in a printed index, access may be provided under a limited number of fields, e.g., author, descriptors, species name. In a computerized database, **any** word in the record, including the abstract, may be searchable.

DATABASE SEARCHING TECHNIQUES

FREE-TEXT SEARCHING – retrieves terms located in **any field** of each record/article indexed in the database.

Example:

Select a search option: ✓ MY START PAGE

Quick search: Example: wheat aphid*

Search Hint:
Looking for a topic, author, or journal? Use General Search.

FIELD-SPECIFIC SEARCHING – retrieves terms located in a **specific field** of each record indexed in the database.

Example: finds *estuaries* in the TITLE field of articles indexed in the database.

Advanced Search MAKE THIS MY START PAGE

Select timespan:

Latest (updated August 10, 2007)

Year

From to (default is all years)

To remember these settings, first [sign in or register](#).

Search General Search fields only, using 2-character tags. Combine sets using Boolean operators. Nest terms using parentheses ().

Examples:
TS=(nanotub* SAME carbon) NOT AU=Smalley RE [more examples](#)

[View our Advanced Search tutorial](#)

Search Aids:
[Author Index](#) | [Source Index](#) | [Organism Classifiers](#) | [Major Concepts](#) | [Concept Codes](#)

Booleans: AND, OR, NOT, SAME	
Field Tags:	
TS=Topic	CB=Chem & Biochem
TI=Title	CA=CAS Registry No.
AU=Author	DS=Disease
SD=Source	PS=Parts & Structure
PY=Publication Year	MQ=Methods & Equip.
AD=Address	GE=Geographic
TA=Taxonomic	GT=Geological Time
MC=Major Concepts	DE=Misc. Descriptors
CC=Concept Code	IC=Identifying Codes
CH=Chemical	
GN=Gene Name	
SQ=Sequence	

BOOLEAN OPERATORS

Used to combine *words* or *phrases* in a search, use the Boolean operators AND, OR, and NOT. These operators can narrow or broaden a search.

AND – When wanting to **narrow** a search to require two or more terms to be in the **same** record, use a Boolean AND. Remember: AND = Less records.

Example of a Topic search using AND: TS=(callinectes sapidus) AND TS=(blue crab)

Example of a Title search using AND: TI=(hydric soil) AND TI=(wetlands)

OR – When wanting to **broaden** a search to include any one of several terms, use a Boolean OR between the terms. Use this connection between synonymous terms, such as popular and scientific names for organisms (e.g., blue crab OR callinectes sapidus); closely related terms (e.g., temperature OR heat OR cold) or when willing to accept one term or another (e.g., eutrophication OR nutrients). Remember: OR = MORE records.

Example of a Topic search using OR: TS=(pinus radiata) OR TS=(monterey pine)

Example of a Title search using OR: TI=(eutrophication) OR TI=(nutrient loading)

NOT – When wanting to **exclude** certain terms from a search, use a Boolean NOT.

Example: (North NOT South) AND Carolina

WORD PROXIMITY OPERATORS

Used to retrieve terms within a certain proximity to one another use the following operator:

SAME – use SAME to find records where the terms separated by the operator appear in the same sentence. A sentence is defined as:

- the title of an article;
- a sentence in the abstract; or
- a single address.

NOTE: Using the SAME operator instead of AND is a good way to narrow your search. The SAME operator does not work in searches of indexing fields such as the Source Publication, Major Concepts, and Taxonomic Data fields.

WILDCARDS

Can be used in all search fields that accepts words and phrases. They can be used in a search query to represent unknown characters.

- The asterisk (*) represents any group of characters, including no character.
- The question mark (?) represents any single character.
- The dollar sign (\$) represents zero or one character (useful when searching for expressions).

Rules about Wildcards:

- Wildcards can be used to retrieve a word that has **variant** endings, various databases will provide a truncation tool to expand a search term to include all forms of a stem word.

Example 1: populat* = populate, populates, population, populations, populating

Example 2: ecolog* = ecology, ecologies, ecologist, ecologists, ecological, ecologically

- Wildcards may be used inside or at the end of search terms -- but not at the beginning. For example, **sul*ur** is allowed, but ***ploid** is not.
- When you search by Topic or Title, you must use at least three characters before the asterisk, question mark, or dollar sign or your search will generate an error.
- When you search by any other field in the product (except the Topic field), you must use at least one character before the asterisk, question mark, or dollar sign or your search will generate an error.
- The asterisk is useful when you truncate the titles of publications. For example, **Cellular*** finds publications with titles that begin with Cellular, such as *Cellular and Molecular Neurobiology* and *Cellular Signalling*.
- The dollar sign is useful for finding both the British and American spellings of the same word. For example, **flav\$or** finds flavor and flavour.
- The dollar sign is useful for searching last names of authors which may contain a space, hyphen or apostrophe.
- You cannot search on a wildcard if it appears in a word or name.
- You cannot use wildcards in a publication year search. For example, **2006** is OK but **200*** is not.

BIOLOGICAL ABSTRACTS: A SAMPLE RECORD

Sample Record: A typical record from Biological Abstracts can be seen below. Notice that each element of the publication is placed into fields. For example, the author of the article, *Michael A. Mallin* is located in the **Author (AU)** field, while the article title, *Phytoplankton ecology of North Carolina estuaries*, is located in the **Title (TI)** field. The journal of the journal in which this article was published, *Estuaries*, is located in the **Source (SO)** field along with the corresponding volume and issue number in which the article can be found.

Full Record

◀ Record 10 of 21 (Set #2) ▶
▲ SUMMARY ▼

Accession Number: BACD199598119826

Document Type: Article

Title: **Phytoplankton ecology** of North Carolina estuaries

Author(s): [Mallin, Michael A.](#)

Source: Estuaries 17 (3) : 561-574 1994

Language: English

Abstract: Numerous **phytoplankton**-oriented ecological studies have been conducted since 1965 in the extensive North Carolina estuarine system. Throughout a range of geomorphological estuarine types, a basic underlying pattern of **phytoplankton** productivity and abundance following water temperature seasonal fluctuations was observed. Overlying this solar-driven pattern was a secondary forcing mechanism consisting of a complex interaction between meteorology and hydrology, resulting in periodic winter or early spring algal blooms and productivity pulses in the lower riverine resulted in low winter **phytoplankton** abundance and primary production. Dinoflagellates (*Heterocapsa triquetra*, *Prorocentrum minimum*, *Gymnodinium* spp.) and various cryptomonads dominated these cool-weather estuarine blooms. Sounds were less productive than the riverine estuaries, and were dominated by diatoms such as *Skeletonema costatum*, *Thalassiosira* found that nitrogen was the principal limiting nutrient in these estuarine systems over a range of trophic states, with phosphorus occasionally co-limiting. Freshwater and oligohaline portions of large coastal plain rivers were often subject to summer blue-green algal blooms. Formation of these blooms on a year-to-year basis was also determined by meteorology and hydrology: wet winters or springs and consequent nutrient loading, coupled with low summer flow conditions and regeneration of nutrients from the sediments. Dry winters or springs resulted in less available nutrients for subsequent summer regeneration, and high flow conditions in summer flushed out the blooms. In recent years, there has been a dramatic increase in reported fish kills attributed to toxic dinoflagellate blooms, particularly in nutrient-enriched estuarine areas. This issue has become a major coastal ecological and economic concern.

Address: Cent. Marine Sci. Res., Univ. North Carolina Wilmington, 7205 Wrightsville Ave., Wilmington, NC 28403, USA

ISSN: 0160-8347

MAJOR CONCEPTS: [Ecology](#) (Environmental Sciences); [Estuarine Ecology](#) ([Ecology](#), Environmental Sciences); [Physiology](#); [Toxicology](#)

CONCEPT CODE: [07506, Ecology: environmental biology - Plant](#); [07510, Ecology: environmental biology - Oceanography and limnology](#); [12510, Pathology - Necrosis](#); [22506, Toxicology - Environment and industry](#); [64002, Invertebrata: comparative, experimental morphology, physiology and pathology - Protozoa](#)

Taxonomic Data:

SUPER TAXA	TAXA NOTES	Organism Classifier	Organism Name
Plantae	Algae, Microorganisms, Nonvascular Plants, Plants	Algae [13000]	algae
Vertebrata, Chordata, Animalia	Animals, Chordates, Fish, Nonhuman Vertebrates, Vertebrates	Pisces [85200]	Pisces

Geographic Data:

Term	GEOPOLITICAL TERMS	ZOOGEOGRAPHICAL REGION
USA	North America	Nearctic region

Miscellaneous Descriptors: FISH KILL, TOXIC DINOFLAGELLATE BLOOM

Flow Chart for Accessing
Articles based on Citations
Retrieved in a Database

